

Integrating the Rights-based and Capability Approaches in the Analysis of Maternal Healthcare Utilization in sub-Saharan Africa: A Multilevel Modelling Study

Simona Simona (✉ simona.simona@unza.zm)

University of Zambia

Nakena Likando

University of Zambia

Andrew Banda

University of Zambia

Million Phiri

University of Zambia

Research Article

Keywords: rights-based approach, capability approach, maternal health care, sub-Saharan Africa, multilevel analysis

Posted Date: May 9th, 2022

DOI: <https://doi.org/10.21203/rs.3.rs-1627881/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background: The rights-based and capability approaches have received increased attention relative to maternal health in the aftermath of the 2015 Millennium Development Goals (MDGs). This is in view of the sub-optimal progress gained in reducing maternal and child mortality, especially in developing countries. Despite the combined potential of these models, limited empirical studies testing their viability in maternal health exist. This is what this study sought to accomplish.

Method: We combined several datasets for this study, including the Demographic Health Survey (DHS), World Development Indicators, the World Governance Indicators and Freedom House. Using the R programming environment and the *R2MLwiN* package, Bayesian multilevel logistic regression models were applied on three indicators of maternal healthcare (antenatal care visits, institutional delivery, and postnatal check-ups) in relation to selected individual, community and country-level factors representing right-based and capability approaches. All the models report posterior odd ratios (POR).

Results: The results support the potency of the rights-based and capability approaches in bolstering maternal healthcare utilization in sub-Saharan Africa. Living in countries which have high freedom status (POR = 1.19) and higher female secondary school enrolments (POR = 1.54) increases the odds of adequate antenatal care. Living in countries with high freedom status (POR = 1.33) and higher voice and accountability (POR = 1.72) also increases the odds of institutional delivery. Similar results are reported for postnatal care where country freedom status (POR = 1.89), voice and accountability (POR = 1.25) and female school enrolment (POR = 1.41) are significant predictors.

Conclusion: The results imply that the rights-based and capability approaches have the potential to enhance maternal healthcare utilization in sub-Saharan Africa. Therefore, policy strategies emphasizing on freedoms, accountability and individual capability functionings should be encouraged in the pursuit of achieving Sustainable Development Goals number 3.

1 Introduction

The rights-based approach to health and health care has been the subject of much discourse since the 1948 Universal Declaration of Human Rights (UDHR). Article 25 of the UDHR bestows on everyone “the right to a standard of living adequate for them to enjoy good health and well-being including food, clothing, housing, medical care, social services and the right to security in the event of circumstances beyond their control such as unemployment, disability, sickness, widowhood, old age or any other lack of livelihood” [1]. However, there has been considerable emphasis on the rights-based approach by scholars and practitioners alike post 2015 MDGs, especially in relation to maternal health care [2]. This is due to the sub-optimal progress gained in reducing maternal mortality in the past few decades, particularly in developing countries. In the light of the sustainable development goals (SDGs) number 3 calling for a reduction in maternal mortality ratio (MMR) of less than 70 per 100,000 live births, it is reasonable that the rights-based approach is on the centre stage of research and practice.

Generally, it is argued that access and utilization of maternal health care services such as antenatal care, skilled birth attendance and emergency obstetric care for all, are essential in the prevention of maternal and child mortality [3]. Often the insufficient progress in maternal health care and utilization of health services in general is attributed to weak and underdeveloped health systems and lack of political commitment to improving women's health due to their secondary status in society [2,4,5]. This points to issues of public policy and politics rather than medical science per se, as the main source of inadequacies in the prevention of maternal mortality. This is because it is within the realm of politics and public policy that national resources are distributed across the population, including health and health care expenditure. The human rights framework is important in this regard as it creates the political and social benchmarks to assess the process and outcomes of development and to underscore the power hierarchies that may lead to injustices in the social, economic and health sector [6].

Furthermore, the rights-based approach provides the powerful normative role of human rights in establishing accountability for protections and freedoms of the people, especially the vulnerable [7]. It also ensures active agency by those vulnerable to human rights violations. Since national governments tend to designate deserving and undeserving claimants of rights, it is plausible to assume that this distinction depends on the extent to which governments are accountable to the population [8]. Accountability is possible only with a vigorous and well organised civil society, which is also only possible in a society that respects civil and political rights [7].

Agency is a critical element in the rights-based approach because the right to health and health care, for example, cannot be left to governments alone to address. The government is not the only entity capable of inflicting suffering on vulnerable populations, individuals and the social system also can. A human rights approach seeks to give voice to those who are vulnerable and enable them to change their conditions for better outcomes. In this framework, rights are not only universal standards that should be followed by states, but a medium through which the suffering of people by the state, individuals acting in response to the social structure or the social structure itself, is ameliorated. Thus, individuals, groups, and communities whose rights have been or are likely to be violated should have choices and capabilities enabling them to claim their rights to better conditions [7,9–11]. Thus, the rights-based approach is or should be complemented by the capability approach as highlighted by many proponents of both the rights-based and the capability approach [12–15].

The capability and the human rights approach have a common motivation of fostering the dignity and freedoms of the individual. The capability approach highlights the critical importance of substantive freedoms and opportunities of individuals and groups while the human rights approach highlights the importance of values such as freedom, dignity and respect, equality and non-discrimination, participation and autonomy and the arrangements that are needed to protect and promote these [15]. In practical terms, what people can positively achieve including good maternal health outcomes, is influenced by economic opportunities, political liberties, social power and the enabling conditions of good health, basic education and encouragement and cultivation of initiatives.

It can be argued that disparities in maternal health care utilization in SSA are a manifestation of limited freedoms in the sense that societal gender division of labour assigns responsibilities of pregnancy and childbirth to women, whom at the same time occupy subordinate positions and have limited access to resources in society. Beyond this, it is also established that women die during childbirth because of specific organisational failures [3]. It is important for the rights and freedom approaches to maternal health care to form core strategies and tools to address root causes of maternal morbidity and mortality (MMM) within and beyond health systems as well as the other violations of women's sexual and reproductive health and rights across their lives including formative gender inequalities and structural violence against women [3].

The implication of the rights-based and capability approaches is that women who are empowered by capability functionings and live in countries that respect human rights and are accountable to the population, may be better able to utilize maternal healthcare services. However, there are still debates in literature whether in fact civil liberties contribute to attainment of socioeconomic entitlements such as health and health care [16]. Additionally, we have seen that the social system though community agency, as well as individual agency is important in ameliorating the suffering of individual persons. Reviewed literature indicates that there are no studies which considers these issues especially in low resource societies like sub-Saharan Africa and many researchers call for further studies linking civil and political rights to specific outcomes [12]. The current study fills the gap in literature by examining the extent to which the rights-based and capability approaches can contribute to maternal healthcare utilisation. We apply multilevel models on country, community and individual level variables representing freedom and capability functionings to not only delineate the effects of country and community level factors but also to control for individual level characteristics.

2 Methods

2.1 Data sources

This analysis is based on a combination of datasets from several sources including the Demographic and Health Surveys (DHS), the World Development Indicators from the World Bank Data Bank, country freedom ratings from Freedom House and governance effectiveness from the World Governance Indicators of the World Bank. The DHS is a nationally representative periodic cross-sectional survey administered to randomly selected women and men of reproductive age group in more than 90 low- and middle-income countries. The DHS follows international standards to ethically collect data on several topics including maternal health care. Details on sampling, topics and ethical procedures are reported in DHS final reports. Data for this analysis were derived from the most recent DHS for 35 sub-Saharan African countries.

World Development Indicators (WDI) are the primary World Bank collection of development indicators, compiled from officially recognised international sources. These are the most current and accurate global development data available, and they provide national, regional and global estimates (The World Bank,

2018). Freedom House is a nongovernmental organisation that has been publishing a *freedom in the world* report on the state political rights and civil liberties of over 190 countries since the early 1970s. This analysis uses the 2016 freedom status scores for the 35 sub-Saharan countries included in the analysis. The freedom score is based on the events and activities happening in a particular country for the concerned period. The score is arrived at by consensus and deliberated over a series of meetings involving of more than 130 analysts, advisers and staff with a global representation. They use a suite of data sources including newspapers, academic research, NGO reports, professional contact and on-the-ground research. All details are found on the Freedom House website: <https://freedomhouse.org>

The World Government Indicators (WGI) are research datasets summarising cross-country indicators of the quality of governance from 31 different sources capturing governance perceptions from non-governmental organisations, commercial business information providers, public sector organisations, surveys of households and firms worldwide. The WGI consist of six composite indicators of governance including voice and accountability, governance effectiveness, political stability, regulatory quality, rule of law and control of corruption [17]. They use unobserved components model statistical methodology to standardise the data from different sources to make it comparable and then aggregate weighted averages of the individual source variables to create composite indicators. Margins of errors are also constructed to reflect the imprecision inevitable in governance measurements.

2.2 Measurements

2.1.1 Outcome variables

The outcome variable for this study uses three dichotomous indicators of maternal healthcare utilization from the DHS including antenatal care visits, institutional delivery and postnatal check-ups for mothers and new-born babies. Antenatal care visits in the DHS were measured by the question which asked all women who had given birth in the last five years prior to the survey how many times they received antenatal care during the pregnancy. The responses were recoded the variable into a binary of at least three times and four or more times for purposes of providing uniformity with other outcomes. Regarding institutional delivery care, the DHS asked women where they delivered their baby from for the most recent birth. Many options were given which included public hospital, private hospital, public clinic, private clinic, or home among others. The variable was recoded to either home or institutional delivery. About postnatal care, women were asked whether they and their baby(s) were checked within the first one month of delivery and their responses were also recoded into a binary variable taking the value of “0” if they were not checked and the value of “1” if they were checked.

2.1.2 Country-level independent variables

The country-level independent variables include country freedom status from Freedom House and voice and accountability (VA) from the WGI. Both are used as indicators for civil and political liberties in the country which form the core of the rights-based approach. Freedom status ratings are derived from 25 questions representing political rights and civil liberties. The overall scores of both political rights and

civil liberties add up 100 points. This paper uses these overall average ratings of 1 to 100. The VA captures people's perceptions of the extent to which the country's citizen are able and free to engage in the selection of their government, together with freedom of expression, freedom of association and media freedom. Female secondary school enrolment derived from the World Bank indicators represents the capability approach. It is Sen 1999, who recognizes education as a major capability functionings that give agency to individuals especially women. Human development is a controlling variable in this analysis. All country level variables are standardised in the analysis with the mean of 0 and standard deviation of 1 for easy comparability and interpretations. Data used here is for the 2016 iteration to be as close to the survey years of the DHS data as possible.

2.1.3 Community-level independent variables

Community-level factors were aggregates of individual level variables at the primary sampling units (PSU) or cluster level because the DHS only collects individual-level data. Community level variables included community education, autonomy, distance to health facilities and place of residence. These community level variables are considered as control variables for this paper, and they were selected because they are important predictors of maternal healthcare utilisation as observed above. Women's autonomy which is often used interchangeably with women empowerment or women decision-making authority for example, is selected because it signifies the agency of individual women, which signifies individual capability. The aggregates were computed using the mean values of the proportions of women in each category of a given individual variable. Since the aggregate values may not have pragmatic meaning, the aggregate values of clusters were categorised into groups of 'Lower' and 'Higher' proportions based on national median values. Community education has three categories of 'lower', 'middle' and 'higher' while place of residence retains the original categorization of 'rural' and 'urban'.

2.1.4 Individual-level independent variables

Individual level variables included educational status, autonomy, and distance to health facilities. Educational status is categorized as no education, primary, and secondary/higher. Autonomy is a composite variable from a few questions asking women about the person who usually decides on the respondent's health care, large household purchases, purchases for daily use, and visits to family and relatives. In this paper, a woman who made lone decisions or together with a partner in any of the items listed was considered to have autonomy, otherwise they did not. The distance variable is derived from a question in the DHS asking residents to indicate whether they had problems with the distance to health facilities and the variable was categorized as 'more problems' or 'less problem'.

2.3 Statistical analysis

All the analysis in this study is done in R computing language version 3.4.4 [18]. There are several packages that have been used from preparation of data through to implementation of statistical modelling. Data preparation and management relied mostly on the *dplyr* package [19] and statistical models were implemented using *MLwiN* called from R through the *R2MLwiN* package [20] was used for Bayesian multilevel analysis.

In view of the large sample used in this study (245,944), our analysis did not report bivariate analysis between each of the independent variables and outcome variables. All bivariate associations were found to be significant and thus were deemed to be non-informative as the bivariate test statistic could have been affected by the large sample size. We instead reported a description of the DHS data per country including the sample size, survey year, number of clusters, median number of respondents per cluster and the range of respondents per community. We also reported results from multilevel analysis accordingly.

To determine the relative influence of contextual factors (country and community factors) on maternal health care utilisation indicators as well examine between country and cluster variations in maternal health care utilization, we applied the Bayesian multilevel models. Multilevel models are appropriate because of the nature of the hierarchical data structure whereby individual women are nested within communities which in turn nested within countries. This structure violates the assumption of independence associated with standard regression analysis. Statistical models that ignore hierarchy in the data structure may underestimate standard errors and thus, make erroneous inferences [21–23].

Markov chain Monte Carlo (MCMC) methods are used in the estimation of parameters. Uninformative prior distributions were specified, running for 50,000 iterations with a burn-in period of 5,000. We specifically used the Metropolis-Hastings sampling methods, which is the default algorithm for non-normal models in MLwiN. A number of tests were done to measure convergence but we retained the Raftery-Lewis diagnostics [24]. The Raftery-Lewis test shows the minimum number of iterations that would be needed to obtain the desired precision of estimation if the samples were independent. If the Raftery-Lewis diagnostics tests produced larger values than those specified in the model, the number of iterations were adjusted upwards accordingly.

We specified four models on each outcome indicator. The first model in each table will consist of an empty or null model (before the individual and community-level variables are introduced) with only contains the intercept. It is intended to measure between country and cluster variations in maternal health care utilization. The second model contains the country-level factors specified as country freedom status, voice and accountability, female secondary school enrolment and human development. In the third model, we introduced the community-level factors: community education, community, distance, autonomy, and place of residence. The relevant individual-level control variables of educational status, female autonomy and distance were introduced in the fourth model.

Multilevel logistic regression models are used in this study to examine the probability p_{ijk} of a woman i in the community j and country k having adequate maternal healthcare utilisation. This analysis is represented by:

$$\text{logit}(p_{ijk}) = \beta_0 + \beta X_{ijk} + u_{jk} + v_k$$

where X_{ijk} is the vector of explanatory variables at individual, community, and country levels, u_{jk} is normally distributed with variance σ_u^2 ; v_k is normally distributed with σ_v^2 .

In terms of variances used to understand the between country and between cluster variations in maternal health care utilization, we used the median odds ratios (MOR) and the variance partition coefficients (VPC). The MOR is on the same scale as the odds ratios and is interpreted as the median value of the odds ratios between individuals from units at high or low risk when randomly choosing 2 individuals from different units. In this study, that would be the odds of having inadequate utilisation of maternal healthcare that are determined by unexplained factors at the community and country levels.

The VPC provides information on the share of the variance at each level of analysis (individual, community, and country-levels). The VPC at each level was calculated using the latent method. It assumes a threshold model and approximating the level-1 (individual) variance by $\pi^2/3$ (≈ 3.29) (Dundas et al., 2014; Merlo et al., 2005; Goldstein et al., 2002; Rodriguez, 2008). Higher VPC values denote that a greater share of total variation in the outcome variables is attributable to higher level membership.

$$VPC_{country} = \frac{\sigma_{u(3)}^2}{\sigma_{u(3)}^2 + \sigma_{u(2)}^2 + \pi^2/3}$$

and

$$VPC_{community} = \frac{\sigma_{u(2)}^2}{\sigma_{u(3)}^2 + \sigma_{u(2)}^2 + \pi^2/3}$$

The Bayesian Deviance Information Criterion (DIC) was used to evaluate the goodness of fit of the models [25–27]. When different models are compared, a smaller DIC means the model better fits the data than one with a high DIC value.

3 Results

3.1 Background Characteristics of Participants

For this study, Table 1 presents the 34 sub-Saharan African countries included in the study, survey years, final sample per country, number of communities in a country, median number of respondents per community and range of respondents in a community. The surveys were conducted between 2006 and 2015. The total number of respondents per country ranged between the smallest, 1,445 for Sao Tome and Principe and the largest, which was 20,192 for Nigeria. The number of communities in the sample ranged from 104 for Sao Tome and Principe and 1612 for Kenya. The median number of respondents per community is between 7 and 21.

Table 1
Description of the DHS data by country and community (cluster)

Country	Survey year	Sample	Number of Communities	Median number of respondents per community	Range of Respondents in community
Angola	2015-16	8,947	625	15	1–26
Benin	2011-12	9,111	750	12	2–31
Burkina Faso	2010	3,960	210	17	2–49
Burundi	2010	4,916	376	13	4–21
Cameroon	2011	7,655	580	13	1–34
Chad	2014-15	11,104	626	18	3–40
Congo	2011-12	6,463	384	17	4–39
Congo DR	2013-14	11,293	540	21	9–38
Cote d'Ivoire	2011-12	5,431	352	14	4–37
Ethiopia	2011	7,764	650	13	1–26
Gabon	2012	4,143	336	12	1–34
Gambia	2013	5,385	281	17	2–72
Ghana	2014	4,294	427	9	1–33
Guinea	2012	4,999	300	16	6–41
Kenya	2014	14,949	1,612	9	1–25
Lesotho	2014	2,596	400	6	1–17
Liberia	2013	5,348	322	16	5–32
Madagascar	2008-09	8,569	600	14	4–31
Malawi	2015-16	13,448	850	16	4–27
Mali	2012-13	6,723	585	16	2–30
Mozambique	2011	7,623	611	12	2–33

Country	Survey year	Sample	Number of Communities	Median number of respondents per community	Range of Respondents in community
Namibia	2013	3,974	600	7	1–18
Niger	2012	7,680	480	16	3–39
Nigeria	2013	20,192	904	20	3–55
Rwanda	2014-15	5,955	492	12	3–23
Sao Tome	2008-9	1,445	104	12	3–48
Senegal	2010-11	8,151	392	20	5–47
Sierra Leone	2013	8,524	435	19	5–43
Swaziland	2006-7	2,136	275	7	1–18
Tanzania	2015-16	7,050	608	11	1–18
Togo	2013-14	5,016	330	14	2–34
Uganda	2011	4,909	712	12	1–25
Zambia	2014-15	9,353	722	13	3–26
Zimbabwe	2015	4,833	400	12	2–25

3.2 Freedom status, capability functionings and antenatal care in sub-Saharan Africa

A pooled Bayesian multilevel analysis was applied to understand the influence of human rights status and capability functionings on maternal health care utilization in sub-Saharan Africa. Four models were specified for each of the outcome variables. Table 2. reports the results of the influence of country freedom status, voice and accountability, and secondary school enrolment for females on antenatal care visits. Human development indicator is included as a country-level control variable. Significant relationships are denoted by the non-inclusion of 1 in the confidence intervals and are highlighted for emphasis in these analyses. Freedom status is found to be significantly associated with antenatal care throughout the four models. For one standard deviation increase in the country freedom status, the odds of having four or more antenatal care visits increases by a factor of 1.01–1.30 after relevant factors are controlled for. The presence of civil liberties in a country has, therefore, proved to be essential in encouraging use of maternal health care in sub-Saharan Africa.

Girl child education is another factor of great importance to antenatal care. It was found that living in countries with higher secondary school female enrolment increased the propensity of antenatal care by a factor of 1.31–1.72. This is after the relevant variables are taken into consideration. Education has always been an important predictor of antenatal care at the community level [28]. This finding introduces an important dimension because unlike other common studies, education is also measured at the country-level. Voice and accountability seem to only be significantly associated with antenatal care only after community and individual level variables are controlled for. The reason for this finding could be cross-level interactions whereby the relationship between voice and accountability is being moderated by some community and individual-level factors included in the analysis. Human development index was only found to be associated with antenatal care after other relevant factors were taken into consideration.

In terms of control variables, education, distance to health facilities and autonomy and place of residence are significantly associated with antenatal care at the community level. The results show that living in communities with a high proportion of women with secondary or higher education, who are autonomous and have less problems with distance to health facilities increases the odds of having adequate antenatal care visits. All individual level variables are also significantly associated with adequate antenatal care visits.

The analysis also examined between community and between country variations in antenatal care visits. VPCs and MORs were calculated for all models for this purpose. Individual-level factors seem to have a bigger share in determining antenatal care visits compared to contextual factors—community and country-level. The results indicate that 15.2% and 19.0% of variance in antenatal care is explained by country and community-level factors respectively. The VPCs are significantly large which indicates the importance of community and country-level factors in explaining the cross-country variations in antenatal care visits in sub-Saharan Africa. MORs results also bolster the importance of contextual factors because they are way above 1 in all the models, indicating the large influence of higher-level factors on antenatal care. It is interesting to note that the significant drop in the VPC values when country and community-level factors are introduced. This phenomenon indicates that community factors and country level factors are important predictors of antenatal care visits in sub-Saharan Africa. The DIC values show that they are decreasing with additional variables which implies that the full model is a better fit than the other models.

Table 2

Posterior odds ratios for multilevel logistic regression for freedom status, capability functionings and antenatal care in sub-Saharan Africa with 95% credible intervals (N = 245,955)

Variable	Model 1	Model 2	Model 3	Model 4
Country-level variables				
Intercept	1.45(1.30,1.62)	0.71(0.63,0.80)	0.90(0.71,1.06)	0.47(0.43,0.52)
Freedom status		1.12(0.97,1.23)	1.23(1.10,1.33)	1.19(1.01,1.30)
Female secondary school enrolment		1.43(1.29,1.56)	1.60(1.37,2.05)	1.54(1.31,1.72)
voice and accountability		0.49(0.43,0.56)	1.00(0.82,1.21)	1.09(0.92,1.41)
Human development		1.31(1.15,1.51)	0.79(0.72,0.93)	0.92(0.70,1.06)
Community controls				
Community education				
Low			1	1
Medium			2.10(1.99,2.21)	1.60(1.52,1.67)
High			3.35(3.08,3.44)	1.84(1.73,1.98)
Community distance problem				
Low			1	1
High			0.78(0.75,0.81)	0.88(0.85,0.93)
Community autonomy				
Low			1	1
High			1.23(1.19,1.28)	1.17(1.14,1.19)
Residence				
Urban			1	1
Rural			0.63(0.61,0.66)	0.86(0.82,0.90)
Individual controls				
Educational status				
No education				1
Primary				1.35(1.31,1.38)
Secondary/higher				1.87(1.81,1.95)

Variable	Model 1	Model 2	Model 3	Model 4
Distance				
Less problems				1
More problems				0.87(0.85,0.90)
Autonomy				
No				1
Yes				1.17(1.14,1.19)
Random effects				
Country-level				
Variance (SE)	0.76(0.19)	0.44(0.12)	0.42(0.12)	0.43(0.12)
VPC* (%)	15.2	9.32	9.61	9.91
MOR*	2.3	1.88	1.86	1.87
Community-level				
Variance (SE)	0.95(0.057)	0.99(0.02)	0.66(0.01)	0.62(0.01)
VPC (%)	19.00	20.97	15.10	14.20
MOR	2.53	2.58	2.17	2.12
DIC*	288,168.99	270,625.48	269,179.56	229,089.90

3.3 Freedom status, capability functionings, and institutional delivery in SSA

The effects of country freedom status and socioeconomic entitlements on institutional delivery was estimated using multilevel models reported in Table 3. Country freedom status is again showing to be an important predictor of maternal health care utilisation. Country freedom status is associated with institutional delivery in the sense that women living in countries with higher freedom scores are more likely to deliver in health facilities. For a one standard deviation increase in the country's freedom status, the odds of delivering in a health facility are expected to increase by a factor of 1.17–1.53 after other variables are considered.

Education and voice and accountability are significantly associated with institutional delivery only in model 2 but loses significance when control factors at both community and individual levels are introduced. As indicated above, this could be a sign of cross-level interaction where there is a shared explanatory power among predictor variables.

Community autonomy is found to be significant here in the sense that women who live in communities in which women have higher decision-making autonomy have higher odds of delivering in institutions compared to those who don't. It is a logical finding because it is expected that women who are autonomous have a bigger say in ways that resources are distributed within the household. Community education is also an important predictor of institutional delivery. Women who live in communities with more women who are educated up to primary and secondary or higher have better odds of delivering in health facilities than those who do not.

Control variables are human development index at the country level, distance to health facilities, place of residence at the community level. At the individual level, there are, educational status, female autonomy, and distance to health facilities. All of them were found to be significantly associated with institutional delivery.

Just like in the case of antenatal care visits, the VPC and MOR were calculated to estimate the relative magnitude of variation explained by country and community-level factors and it was established that the combined explanatory share of contextual factors was larger than individual level factors. The results show that 22.68% and 38.66% of cross-national variation in institutional delivery is accounted for by country and community-level factors respectively. These values remain higher throughout the modelling process even after community and individual level variables are introduced. The MOR also shows values that are considerably larger than 1 indicating the importance of contextual factors in explaining cross-national variations in institutional delivery.

Civil liberties at the country-level and socioeconomic status at the community level remain significant predictors of facility delivery. It is interesting that country-level secondary school female enrolment is no longer a significant predictor when the outcome variable is institutional delivery. It could be because the two variables are not uniformly distributed. Some countries have higher secondary school female enrolment and at the same time have very lower proportions of institutional delivery. This could explain the inconsistencies in the nature of the relationship between secondary female enrolment and use of maternal health care. The DIC still indicates that the full model, containing individual, community and country-level variables is a better predictor of institutional delivery compared to other models.

Table 3

Posterior odds ratios for multilevel logistic regression for freedom status, capability functionings, and institutional delivery in sub-Saharan Africa with 95% credible intervals (N = 245,955)

Variable	Model 1	Model 2	Model 3	Model 4
Country-level variables				
Intercept	2.41(2.09,3.03)	1.89(1.60,2.34)	3.21(2.66,3.91)	1.83(1.60,2.15)
Freedom status		1.38(0.19,1.52)	1.29(1.11,1.41)	1.33(1.17,1.53)
Female secondary school enrolment		1.57(1.238,1.79)	1.22(0.99,1.41)	1.19(0.90,1.62)
Voice and accountability		0.73(0.58,0.95)	1.27(0.98,1.49)	1.72(1.40,2.08)
Human development		1.33(1.13,1.57)	0.83(0.75,0.92)	0.81(0.66,1.15)
Community controls				
<i>Community education</i>				
Low			1	1
Medium			3.87(3.64,4.09)	2.45(2.30,2.67)
High			10.29(9.62,11.01)	3.88(3.56,4.23)
Community distance problem				
Low			1	1
High			0.48(0.46,0.51)	0.81(0.78,0.84)
Community autonomy				
Low			1	1
High			1.22(1.15,1.29)	1.10(1.07,1.13)
Residence				
Urban			1	1
Rural			0.28(0.26,0.30)	0.50(0.47,0.53)
Individual controls				
Educational status				
No education				1
Primary				1.46(1.41,1.56)
Secondary/higher				2.75(2.63,2.87)

Variable	Model 1	Model 2	Model 3	Model 4
Distance				
Less problems				1
More problems				0.81(0.79,0.84)
Autonomy				
No				1
Yes				1.10(1.07,1.13)
Random effects				
Country-level				
Variance (SE)	1.93(0.49)	1.41(0.37)	1.05(0.28)	1.22(0.33)
VPC (%)	22.68	17.49	17.86	20.78
MOR	3.76	3.1	2.66	2.87
Community-level				
Variance (SE)	3.29(0.05)	3.36(0.06)	1.54(0.03)	1.36(0.03)
VPC (%)	38.66	41.69	26.19	23.17
MOR	5.64	5.75	3.27	3.04
DIC	210,315.11	198,551.46	196,751.45	163,466.40

3.4 Freedom status, capability functionings and postnatal care in SSA

The last maternal health care indicator analysed was postnatal care. Country freedom status posits highest effect sizes of postnatal care in comparison with antenatal care and institutional delivery and the significant relationship is shown throughout the four models. Women living in countries with higher freedom status scores are more likely to receive postnatal check-ups for them and their newly born babies. A one standard deviation increase in country freedom score, increases the odds of postnatal care by a factor of 1.66–2.48. Postnatal care happens at the end of the pregnancy and childbirth continuum, it is therefore surprising that it is more freedom status is positing higher effect sizes compared to the other indicators at the beginning and middle of the continuum. But it does make sense because at this stage the baby has been born and many people especially in rural Africa may no longer see the importance of visiting the hospital. It would therefore only be in countries which are more inclined to freedom that women would be encouraged to seek postnatal check-ups. Otherwise, any civil or political hurdles would discourage women from postnatal care because the baby is already born.

Secondary school female enrolment was not significantly associated with institutional delivery but has a significantly positive effect on postnatal care. Women living in countries with higher secondary school enrolment have a higher propensity of postnatal care. In the sense that one standard deviation increase in secondary school female employment increases the odds of postnatal care by a factor of 1.28–1.52. School enrolment is consistent across the three models. This is logical because higher school enrolment means more women are education up to at least secondary school. Which means that they are not only likely to know the importance of postnatal care but also to have control over resources, which ultimately makes them have power to make decisions. Several studies have shown that such women are more likely to have check-ups after birth compared to those who don't.

Voice and accountability is associated with postnatal care when all other variables are controlled for. It shows that women who live in countries where people have freedom of speech and higher governmental accountability are more likely to have postnatal care. This finding is rather strange because it is usually expected that a predictor variable would be significant before other variables are introduced and not the other way around. One explanation is that the association could be moderated by some other community or individual level variables. Higher voice and accountability scores mean that national governments put the interest of the people and that people have a bigger say in what happens in their country. Such countries could be expected to prioritise certain important sectors like quality health care. In which health facilities would be accessible and well-equipped with adequate skilled personnel to undertake check-ups.

Community autonomy and educational status are other important factors that are found to positively influence postnatal care. Women who live in communities with more women with decision making authority and in communities with more educated women are more likely to receive postnatal care compared to those who don't. Decision-making autonomy for any positive action and even much so with maternal health care. When women have the freedom to make decisions in households, it makes sense that their health and that of their babies will be prioritised. On the other hand, when there are more educated women in the community, they are more likely to understand the importance of postnatal checks and share information with others that may indeed result in higher odds of postnatal care

Control variables were the same as the other maternal health utilisation indicators. Distance to health facilities and place of residence at the community level were found to be associated with postnatal care just like in other models. Distance to health facilities, female autonomy and educational status measured at the individual level are also predictors of postnatal care.

Just like in other maternal health indicators, relative importance of factors at the three levels were measured using VPCs and MORs and indeed for postnatal care, cross-national variations are attributable to higher-level factors (community and country-levels) compared to individual-level factors. The VPC for country level factors is 27.4% which means that cross-national variation in postnatal care is significantly attributable to country-level factors while that of community-level factors is 24.45%. The combined contextual level factors explain more than 50% of variations in postnatal care. These values underscore the importance of contextual factors in maternal health care.

Table 4

Posterior odds ratios for multilevel logistic regression for freedom status, capability functionings and postnatal care in sub-Saharan Africa with 95% credible intervals (N = 245955)

Variable	Model 1	Model 2	Model 3	Model 4
Country-level factors				
Intercept	0.82(0.74,1.04)	0.70(0.60,0.81)	0.48(0.42,0.54)	0.41(0.32,0.57)
Freedom status		1.33(1.10,1.52)	1.72(1.35,2.00)	1.89(1.66,2.48)
Female secondary school enrolment		1.23(1.00,1.34)	1.20(1.03,1.43)	1.41(1.28,1.53)
Voice and accountability		0.86(0.70,1.00)	0.88(0.69,1.11)	1.25(1.11,1.51)
Human development		0.78(0.68,1.00)	0.66(0.58,0.78)	0.80(0.67,0.98)
Community controls				
Community education				
Low			1	1
Medium			1.79(1.69,1.92)	1.45(1.35,1.58)
High			2.59(2.45,2.80)	1.77(1.60,1.92)
Community distance problem				
Less problems			1	1
More problems			0.74(0.70,0.78)	0.81(0.77,0.86)
Community autonomy				
Low			1	1
High			1.32(1.25,1.38)	1.13(1.10,1.16)
Residence				
Urban			1	1
Rural			0.84(0.79,0.90)	1.03(0.93,1.08)
Individual controls				
Educational status				
No education				1
Primary				1.24(1.19,1.28)
Secondary/higher				1.48(1.41,1.54)

Variable	Model 1	Model 2	Model 3	Model 4
Distance				
Less problems				1
More problems				0.86(0.83,0.88)
Autonomy				
No				1
Yes				1.13(1.10,1.16)
Random effects				
Country-level				
Variance (SE)	1.87(0.50)	1.58(0.44)	1.29(0.36)	1.31(0.39)
VPC (%)	27.4	24.12	21.22	21.58
MOR	3.69	3.32	2.95	2.98
Community-level				
Variance (SE)	1.67(0.03)	1.68(0.03)	1.50(0.03)	1.47(0.03)
VPC (%)	24.45	25.65	24.67	24.22
MOR	3.43	3.44	3.22	1.18
DIC	205,651.72	189,817.10	189,523.38	174,088.32

4 Discussion

This study addressed the integration of rights-based and capability approach in the analysis maternal health care in SSA using freedom status, voice and accountability, and female secondary school enrolment as well as related controlling variables at the individual, community, and country-level. Freedom status and voice and accountability are important part of the guiding framework of the rights-based approach to health and health care. The goal of the rights-based approach to health is to support and sustain good outcomes by analysing and addressing the inequalities, discriminatory practices, and unjust relations in line with the UDHR and other international human rights treaties, which are often at the heart of health problems.

Consistent relationships were found between country-level freedom status and all indicators of maternal healthcare utilization, suggesting that countries which guarantee civil and political liberties to citizen are more likely to also have higher utilisation of maternal health care service and thus, increasing chances of reducing maternal mortality. The relationship between civil liberties and maternal health care utilisation is straightforward. The success in implementing human rights obligations, including health care depends

on the state's willingness to build a health system based on the human rights approach. Accountability, as articulated by [8] is an important element in the state's disposition to prioritise human rights obligations. Civil and political liberties encourage strong parliamentary oversight on the executive branch of government in a manner that supports the poor and underprivileged in society and in ways that increases leverage for the health and health care sectors. Civil liberties also support strong civil society mobilisation and reinforcing community agency to advance health rights to poor communities [8–10].

Secondary school female enrolment was equally consistently associated with indicators of maternal health care, except in the last model for institutional delivery. Education is an important part of the socioeconomic entitlements as well as the capability approach. Educated women are not only expected to understand the risks associated with failure to use maternal health care services but also are more likely to have the resources and decision-making authority essential to access and utilise maternal health care in SSA [28–30]. In other words, education offers women the capability functionings to circumvent the conditions of vulnerability and claim their rights to maternal health care services.

Community agency is essential in both the rights-based and capability approach to maternal health care utilisation because on one hand it enables women in the community to fight elements of sub-judication by the cultural and social systems, and on the other hand, it gives people and groups the freedom and capabilities to make choices about their own health and health care [15]. In this study, community autonomy was analysed, and it was found that it was associated with use of maternal health care utilisation. This finding gives credibility to the rights-based and capability approach, integration because, even though they are distinct, they have often times been regarded as complementary [12,15]. Amartya Sen, the foremost architect of the capability approach posited that the two concepts (capability and human rights) go well with each other as long as they are not combined within each other's territory [14]. Martha Nussbaum, another prominent proponent of the capability approach also acknowledges the link between capabilities and human rights when she posits that "capabilities are closely related to rights and that the language of capabilities gives important procession and supplementation to the language of rights" [13]. Indeed, supporters of the human rights-based approaches also conceptualise the relationship between human rights and capabilities in a similar fashion. Stephen Marks, for example, sees capabilities as starting points of the human rights approach [31].

The relative importance of contextual factors (community and country-level factors) is demonstrated by the between community and country variations in maternal healthcare utilization. For instance, variations in institutional delivery and postnatal care were attributable to community and country-level factors more than individual-level factors. This is the reason why it is important for researchers studying health and health care in sub-Saharan Africa to focus more on the effects of broader "upstream" factors as much as they do on individual-level factors [32–34]. High variance partition values at the community level imply clustering, which suggests that people living in the same community have similar characteristics. This is plausible because people living in the same neighbourhoods share culture including economic activities, educational as well as health facilities. The same applies to people of the same country. Although there may be enormous within-county variations, there are some characteristics that are inherent to them by

virtue of belonging to the same country. The respect for human rights and government accountability, for example, would affect everyone in the country and would induce variations in certain outcomes like maternal health care utilization in comparison with other countries.

The strength of this paper lies in the fact that it is among the first such papers to integrate rights-based approaches with capability approaches to study maternal healthcare in sub-Saharan Africa. The use of three-level models provides variance partitions at a level which gives more information about relative effects of selected independent variables on maternal healthcare utilization. Additionally, the application of a Bayesian multilevel logistic regression approach addresses the methodological challenges that would be problematic if a standard frequentist approach was used. This is because frequentist inference relies on the assumption of repeated sampling with replacement, which is not the case in the third level unit (country-level) comprising non-stochastic country data [35,36].

The limitations of this study are not different from any study of this nature. Being cross-sectional in design, it uses regression methods which provide only relationships and associations between variables and not causality. However, cross-sectional data may be the best option in low resource countries like SSA, where there is a problem of limited data infrastructure. Recall bias is another weakness that is often discussed in analyses which use data collected through survey methods. This is the case in this study. Recall bias is taken to mean the likely failure of research respondents to recall information properly due to the time lapse between relevant events and the interview. This may be true for this study about the DHS data, although it should be noted that the study focused on life-changing events of pregnancy and childbirth and therefore the possibility of forgetting when such matters are involved is minimal. Moreover, the DHS is conducted with enormous rigour by well-trained personnel.

5 Conclusion

This study integrated the rights-based and capabilities approach to analyse maternal health care utilization in sub-Saharan Africa. Freedom status and voice and accountability are proxies for civil and political liberties, which are the fulcrum of the rights-based approach. The female secondary school enrolment variable is a proxy for the capability functionings at the country level. Related individual and community level factors were controlled for. The results indicated that freedoms and capability functionings are largely positively associated with maternal healthcare utilisation in sub-Saharan Africa. These results underscore the health benefits of upholding civil, political, and socioeconomic rights. The results presented in this paper render credence to the assertion that freedom opens room for strong people, parliamentary and civil society oversight holding governments accountable, which results in better provision of social, health and economic services to the larger population. It is therefore important to focus on the rights-based and capability approach among other strategies in the quest to meet the SDGs number 3 by 2030.

Abbreviations

DHS	Demographic and Health Surveys
McMC	Markov chain Monte Carlo
MDGs	Millenium Development Goals
MMM	Maternal Morbidity and Mortality
MMR	Maternal Mortality Ratio
MOR	Median Odds Ration
POR	Posterior Odds ratio
SSA	Sub-Saharan Africa
SDGs	Sustainable Development Goals
UDHR	Universal Declaration of Human Rights
VPC	Variance Partition Coefficient
WDI	World Development Indicators
WGI	World Governance Indicators

Declarations

Authors' contributions SS conceptualised the study, conducted data analysis and contributed to writing the manuscript. NL, AB and MP contributed to the study design, interpretation of results, writing and refining the manuscript. All authors read and approved the final manuscript.

Funding The study did not receive any funding

Data availability Data used in the study is publicly available on the DHS program, Freedom House, and World bank websites

Code availability we used R statistical programming environment which is freely available on the r-project website.

Declarations

Conflicts of interest Authors declare no conflict of interest

Ethics approval and consent to participate The study uses publicly available data and did not require any further approval. The DHS follows international ethical standards to ensure the protection of

respondents. More information about ethical procedures and standards can be accessed at: <https://bit.ly/3P5pQAC>

References

1. Assembly UG. Universal declaration of human rights. UN Gen Assem. 1948;302: 14–25.
2. Das S. Maternal health, human rights, and the politics of state accountability: Lessons from the Millennium Development Goals and implications for the Sustainable Development Goals. *J Hum Rights*. 2018;17: 550–567.
3. Yamin AE. From ideals to tools: applying human rights to maternal health. *PLoS Med*. 2013;10: e1001546.
4. Hunt P, Bueno De Mesquita J. Reducing maternal mortality: the contribution of the right to the highest attainable standard of health. 2007.
5. Maclean GD. An historical overview of the first two decades of striving towards Safe Motherhood. *Sex Reprod Healthc*. 2010;1: 7–14.
6. Yamin AE, Maine DP. Maternal mortality as a human rights issue: measuring compliance with international treaty obligations. *Hum Rights Q*. 1999;21: 563–607.
7. London L. What is a human-rights based approach to health and does it matter? *Health Hum Rights*. 2008; 65–80.
8. London L, Schneider H. Globalisation and health inequalities: can a human rights paradigm create space for civil society action? *Soc Sci Med*. 2012;74: 6–13.
9. Allison MC. Balancing responsibility for sanitation. *Soc Sci Med*. 2002;55: 1539–1551.
10. Cornwall A. Locating citizen participation. 2002.
11. Stuttaford M. Balancing collective and individual rights to health and health care. *Law Soc Justice Glob Dev J*. 2004;1.
12. Birdsall WF. Development, Human Rights, and Human Capabilities: The Political Divide. *J Hum Rights*. 2014;13: 1–21.
13. Nussbaum M. Capabilities as fundamental entitlements: Sen and social justice. *Fem Econ*. 2003;9: 33–59.
14. Sen A. Human rights and capabilities. *J Hum Dev*. 2005;6: 151–166.
15. Vizard P, Fukuda-Parr S, Elson D. Introduction: the capability approach and human rights. *J Hum Dev Capab*. 2011;12: 1–22.
16. Morris L. Sociology and rights—an emergent field. *Rights Sociol Perspect*. 2006; 1–16.
17. Kaufmann D, Kraay A, Mastruzzi M. The worldwide governance indicators: Methodology and analytical issues1. *Hague J Rule Law*. 2011;3: 220–246.
18. Team RC. R: A language and environment for statistical computing. 2013.

19. Wickham H, Francois R, Henry L, Müller K. dplyr: A grammar of data manipulation. R Package Version 04. 2015;3: p156.
20. Zhang Z, Parker RM, Charlton CM, Leckie G, Browne WJ. R2MLwiN: A package to run MLwiN from within R. J Stat Softw. 2016;72: 1–43.
21. Snijders TA, Bosker RJ. Multilevel analysis: An introduction to basic and advanced multilevel modeling. sage; 2011.
22. Heeringa SG, West BT, Berglund PA. Applied survey data analysis. chapman and hall/CRC; 2017.
23. Carle AC. Fitting multilevel models in complex survey data with design weights: Recommendations. BMC Med Res Methodol. 2009;9: 1–13.
24. Raftery AE, Lewis S, Banfield JD. Three Short Papers on Sampling-Based Inference: 1. How Many Iterations in the Gibbs Sampler? 2. Model Determination. 3. Spatial Statistics. WASHINGTON UNIV SEATTLE DEPT OF STATISTICS; 1991.
25. Browne WJ. MCMC estimation in MLwiN. Cent Multilevel Model Univ Bristol. 2015.
26. Gelman A, Hill J. Data analysis using regression and multilevel/hierarchical models. Cambridge university press; 2006.
27. Lynch SM. Introduction to applied Bayesian statistics and estimation for social scientists. Springer Science & Business Media; 2007.
28. Ononokpono DN, Odimegwu CO, Imasiku E, Adedini S. Contextual determinants of maternal health care service utilization in Nigeria. Women Health. 2013;53: 647–668.
29. Simona S, Muchindu M, Ntalasha H. Intimate Partner Violence (IPV) in Zambia: Socio-demographic Determinants and Association with Use of Maternal Health Care. Intl J Soc Sci Stud. 2018;6: 42.
30. Stephenson R, Baschieri A, Clements S, Hennink M, Madise N. Contextual influences on the use of health facilities for childbirth in Africa. Am J Public Health. 2006;96: 84–93.
31. Marks SP. The human rights framework for development: Seven approaches. Reflect Right Dev. 2005; 23–60.
32. Phelan JC, Link BG, Diez-Roux A, Kawachi I, Levin B. “Fundamental causes” of social inequalities in mortality: a test of the theory. J Health Soc Behav. 2004;45: 265–285.
33. Phelan JC, Link BG. Controlling disease and creating disparities: a fundamental cause perspective. J Gerontol B Psychol Sci Soc Sci. 2005;60: S27–S33.
34. Simona S, Lumamba C, Moyo F, Ng’andu E, Phiri M. The Influence of Contextual Factors on Maternal Healthcare Utilization in sub-Saharan Africa: A Scoping Review of Multilevel Models. medRxiv. 2022.
35. Jackman S. Bayesian analysis for the social sciences. John Wiley & Sons; 2009.
36. Western B. Bayesian analysis for sociologists: An introduction. Sociol Methods Res. 1999;28: 7–34.