Empirical analysis of socio-economic determinants of maternal health services utilisation in Burundi

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Abstract
Background Timely and appropriate health care during pregnancy and childbirth are the pillars of better maternal health outcomes. However, factors such as poverty and low education levels, long distance to a health facility, and high costs of health services may present barriers to timely access and utilisation of maternal health services. Despite prenatal, childbirth and postnatal care being free at the point of use in Burundi, utilisation of these services remains low: between 2011 and 2017, only 49% of pregnant women attended at least four antenatal care (ANC) visits. This study explores the socio-economic determinants that affect utilisation of maternal health services in Burundi.

Methods We use data from the 2017 Burundian Demographic and Health Survey (DHS) collected from 8,941 women who reported a live birth in the five years preceding the survey. We use multiple regression analysis to explore the factors that determine the likelihood of seeking ANC services from a trained health professional, the number of ANC visits made and the choice of assisted childbirth.

Results Occupation, marital status and wealth increase the likelihood of seeking ANC services from a trained health professional. The likelihood that a woman consults a trained health professional for ANC services is 18 times and 16 times more for married women and women living in partnership, respectively. More educated women and those who currently live a union or partnership attend more ANC visits than others. At higher birth orders, women tend to not attend ANC visits. The more ANC visits attended, and the wealthier women are; the more likely they are assisted during childbirth. Women who complete four or more ANC visits are 14 times more likely to have an assisted childbirth.

Conclusions In Burundi, utilisation of maternal health services is low. There is inequality in services utilisation among women based on wealth, parity, religion, and occupation. ANC is an important determinant of subsequent delivery care. There is a gap between married and unmarried women. This has a strong health policy implication to improve access to maternal health services for unmarried women.

Background
In low- and middle-income countries (LMICs), women often face poor health outcomes during the course of pregnancy, childbirth, and the postpartum period (1). These include severe bleeding,
infections, high blood pressure, delivery complications, unsafe abortion, and the aggravation of pre-existing health conditions (2, 3). A recent systematic analysis found that of all-causes maternal deaths, haemorrhage accounts for 27.1% deaths while hypertension and sepsis are responsible for 14% and 10.7% deaths, respectively (3). Of about 830 women who die from pregnancy- or childbirth-related complications around the world every day, 99% deaths occur in LMICs (2). It is also estimated that of the 2.6 million stillbirths occurring globally in 2015, 98% were in LMICs (4). Further, the risk of a woman in a LMIC dying from a maternal-related cause during her lifetime is about 33 times higher compared to her counterpart in a high-income country (5). Specifically, such a risk remains high in Burundi (6). It is estimated that about two Burundian women out of 100 will die of pregnancy-related conditions including haemorrhage, infections, eclampsia and unsafe abortion during their reproductive life (7). Despite having made progress in maternal health indicators during the past three decades, Burundi has one of the highest maternal mortality ratios in the world (2). In 2015, 712 maternal deaths per 100,000 live births occurred, which is number eight highest maternal mortality ratio globally (2).

Most health conditions occurring during pregnancy, childbirth, and in the post-partum period are preventable and curable by timely and appropriate maternal health care (4, 8). Evidence has shown that provision of quality antenatal, intrapartum and postnatal care is an effective strategy to avert maternal and neonatal deaths (4, 9, 10). With an aim to improve antenatal care (ANC), the World Health Organisation (WHO) introduced the Focused ANC (FANC) model which recommends a minimum of four ANC visits during the course of the pregnancy period. According to the FANC guidelines, the first and second ANC visits should take place during the first and second trimesters, respectively; and the last two visits during the third trimester of pregnancy (11). The FANC model was updated in 2016 and recommends a minimum of eight ANC contacts between the pregnant woman and a skilled health provider during the course of the pregnancy. Instead of “visit”, the 2016 model uses the word “contact” to imply that a pregnant woman engages an active connection with a health care provider which is more likely to improve the woman’s experience of care. The first contact is scheduled to happen during the first trimester, the second and the third contacts during the second trimester, and
the remaining five contacts during the third trimester of the pregnancy (12, 13). Both the models
emphasise that births be assisted by skilled birth attendant, preferably at a health facility (13).

Across the East African subregion including in Burundi, maternal health indicators remain below the
targets (Table 1).

Table 1. Sub-regional performance in maternal health indicators

|                | women attending at least 4 ANC visits (%) | births assisted by skilled birth attendant (%) |
|----------------|------------------------------------------|----------------------------------------------|
| Burundi        | 49%                                      | 85%                                          |
| Kenya          | 58%                                      | 62%                                          |
| Rwanda         | 44%                                      | 91%                                          |
| Tanzania       | 51%                                      | 63%                                          |
| Uganda         | 60%                                      | 74%                                          |

Source: National DHS surveys (14-18)

In Burundi, a low-income and politically fragile country located astride East and Central Africa,
pregnant women receive full free maternal health services since 2006 (19) while frontline health care
providers receive performance-based incentives (20). However, those policy efforts did not yield
expected results as rates of pregnant women who attend at least four ANC visits (and most
importantly eight contacts) and those delivering in a health facility remain below national targets
(14).

Empirical evidence, mostly from LMICs, has shown that the woman’s health care seeking behavior —
which is governed by her attitude towards health services utilisation and by some individual-,
household- and community-level factors — determines her utilisation of maternal health services (21,
22). For instance, in a study of the socio-economic determinants of maternal health care utilisation
among Turkish women, findings suggested that more educated women and those with lower parity
were more likely to seek ANC services from a qualified health professional and to deliver in a health facility (21). In the same way, a recent meta-analysis study by Finlayson and Downe (2013) found that the lack of decision-making power and the absence of perceived ANC attendance benefits constitutes the key barriers to health seeking among pregnant women (23). Additionally, in their study of the socio-economic determinants of maternal health care utilisation in Ghana, Patience Aseweh Abor et al. (2011) found significant impact of the mother’s age, education level, economic status, ethnicity, religious affiliation, residence and location on her maternal health care seeking behavior (24). According to the same study, the type of pregnancy, single or twin, also affects the mother’s decision both during pregnancy and childbirth (24). Other studies have found similar results in different contexts including in Ghana (25), Nepal (26) and in Benin, Burkina Faso and Cameroon (27). Moreover, a wealth literature claims that women from large and poor families underutilise maternal health services. This trend was confirmed by studies in the Philippines (28), Bangladesh (29), Ghana (24) and recently in Nepal and Nigeria (30, 31). In Turkey for instance, women who belonged to families that own a car were nearly twice more likely to utilise ANC services and be assisted during childbirth (21). The family size has also been found to affect maternal health services utilisation. Women from large and poor families underutilised maternal health services in the Philippines (28), Bangladesh (29), Ghana (24) and recently in Nepal and Nigeria (30, 31). Finally, being from a rural setting can fraught with maternal health services utilisation. In Thailand, the probability that a woman delivers in a health facility and receives childbirth assistance by a skilled birth attendant was significantly reduced by the long commute distance and the mountainous terrain while it was increased by the presence of maternal health services within the neighbourhood (32). Similarly, in a study by Navaneetham and Dharmalingam (2002), the place of residence determined utilisation of maternal health services among women in the states of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu of south India. According to findings from this study, the likelihood of institutional delivery increased by over two times among women in urban settings of Andhra Pradesh, Tamil Nadu and Karnataka and there was a significant difference in the place of delivery between women in rural versus urban areas of Kerala (33).
However, there is a scarcity of published evidence from the East African context about the reasons for poor maternal service utilisation. Specially, in the context of Burundi, there is no study to our knowledge that explores why pregnant women underutilise maternal health services which are already government-subsidised and provided free of charge. Therefore, this study aims to fill this gap by investigating the socio-economic factors that affect the likelihood of attending ANC services provided by a trained health professional, affect the number of ANC visits attended and affect the choice of type of delivery.

Methods
This section introduces the empirical models and describes the data management and analysis procedures.

1. Model specification

1.1. ANC utilisation

We use a logistic regression to estimate the following empirical model to understand women’s likelihood of attending ANC services provided by a trained health professional controlling for individual-, household-, and community-level characteristics;

$$
\log \left( \frac{p_{ij}}{1-p_{ij}} \right) = \beta_0 + \beta_1 X_{ij} + \beta_2 Y_{ij} + \beta_3 Z_{ij} + \epsilon_{ij} \quad (1)
$$

Here, the dependent variable is the log odds that a woman $i$ will choose alternative $j$ relative to alternative $0$, where $0 =$ non-use of ANC services from a trained provider; and $1 =$ consultation with a medical doctor, a nurse or a midwife. Independent variables are grouped into three categories; namely individual-level factors represented by a standard vector of covariates $X$, household-level determinants corresponding to the standard vector of covariates $Y$, and community-level determinants represented by the standard vector of covariates $Z$. The model includes a dummy variable that captures provincial effects $\beta_0$, captures fixed effects and $\beta_{1,2,3}$ detect random effects on the probabilities of using ANC services from a trained provider.

We then estimate the effect of individual-, household-, and community-level factors on the number of ANC visits using a linear regression. The empirical model is specified as
\[ \text{anc_visits}_i = \beta_0 + \beta_1 X_{ij} + \beta_2 Y_{ij} + \beta_3 Z_j + \varepsilon_{ij}^1 \quad (2) \]

Where, the outcome \( \text{anc_visits}_i \) is continuous and represents the number of ANC visits that a woman \( i \) attends during the course of her pregnancy. \( X, Z \), and \( Y \) are the same standard vectors used in the logistic model. This model concerns women who reported attending one or more ANC visits.

### 1.2. Childbirth service utilisation

We use a multinomial logistic model to explore women’s likelihood of seeking childbirth services from a trained birth attendant. The empirical model is given by;

\[ \log \left( \frac{p_{ij}}{p_{i0}} \right) = \beta_0 + \beta_{1j} X_{ij} + \beta_{2j} Y_{ij} + \beta_{3j} Z_j + \varepsilon_{ij}^2 \quad (3) \]

Where response variable is the log odds that a woman \( i \) will choose delivery alternative \( j \) (\( j = 1,2 \)) relative to \( 0 \), where 0 = home delivery without assistance by a skilled birth attendant; 1 = home delivery with assistance by a skilled birth attendant; and 2 = health facility delivery. Independent variables are represented by standard vectors of covariates \( X, Y, \) and \( Z \) used in previous models. In addition to standard covariates, this model includes the number of ANC visits as this has been found to positively predict assisted delivery (34).

All models assume that community-level effects are invariant for all women living in the same setting. With an aim to attempt validate the assumption, we use two dummy variables coding for province and residence. Residence is binary; rural versus urban; and there are 18 provinces each having a rural and an urban component. As such, community-level factors are assumed to be constant for all women living in residence \( i \) within province \( j \).

### 2. Data and variables

We use data from the nationally representative 2017 Burundi Demographic and Health Surveys (DHS). The study sample consists of 8,941 Burundian women who reported at least one live birth history during the period of 5 years preceding the survey. For women who had multiple births, only maternal health services utilisation behaviour associated with the most recent pregnancy is considered; in the view of minimising recall bias.
Dependent variables used in the analysis in models 1-3 are presented in Table 2. The study outcomes consist of ANC services utilisation from a qualified health provider, the number of ANC visits, and the place of delivery and birth assistance. These outcomes are key indicators for the monitoring of maternal health care (35-37).

Table 2. Dependent variables

| Dependent variable | Variable management |
|--------------------|---------------------|
| Outcome 1. ANC services utilisation from a qualified health provider | We create a dummy variable $= 1$ if ANC services provided by a medical doctor, nurse or a midwife were used; and $= 0$ otherwise |
| Outcome 2. Number of ANC visits | We use a continuous outcome attended during pregnancy |
| Outcome 3. Assisted delivery | We create a dummy variable $= 1$ for an unassisted home delivery; $= 2$ for a delivery assisted by a skilled birth attendant; $= 3$ for delivery in a health facility |

The study uses individual-, household-, and community-level predictors as summarised in Table 3. Selection of determinants was based on the literature and the understanding of the country’s context.

Table 3. Independent variables

| Explanatory variables | Sample (N=8,941) |
|-----------------------|-----------------|
|                       | n | % |
| **Individual-level characteristics** | |
| Age                   | |
| 15-19 years           | 232 | 2.60 |
| 20-34 years           | 6131 | 68.57 |
| 35-49 years           | 2578 | 28.83 |
| Birth order           | |
| 1st child             | 1498 | 16.75 |
| 2nd-3rd child         | 3034 | 33.94 |
| 4th-5th child         | 2218 | 24.81 |
| 6th child and above   | 2191 | 24.50 |
| Education             | |
| None                  | 4118 | 46.06 |
| Primary               | 3790 | 42.39 |
| Secondary             | 964  | 10.78 |
| Tertiary              | 69   | 0.77 |
| Occupation            | |
| No                    | 668  | 07.47 |
| Yes                   | 8273 | 92.53 |
| Religion              | |
| Catholic              | 5062 | 56.62 |
| Protestant            | 3352 | 37.49 |
Results

Utilisation of ANC services provided by a trained health professional

A woman's occupation and household wealth have a significant positive impact on the likelihood of seeking ANC from a trained health professional. Women who have occupation and those belonging to the third income quintile are more than three times more likely (OR=3.407) to seek ANC services from a trained provider. The likelihood that a woman consults a trained health provider for ANC during the course of her pregnancy is 18 times (OR=18.334) more for married women, 16 times more (OR=15.857) for women in partnership and four times more (OR=4.410) for single women who ever
lived in partnership or in union compared to the reference category of never married women. Women living in Kirundo or Mwaro province are twice less likely to seek ANC services from a trained health professional (Table 4).
Table 4. Regression results: likelihood of using ANC services

| Explanatory variables                              | Coefficient | OR   | 95% CI         |
|---------------------------------------------------|-------------|------|----------------|
| **Age (reference: 15-19 years)**                  |             |      |                |
| 20-34 years                                       | -0.479      | 0.620| 0.134—2.870    |
| 35-49 years                                       | -1.650      | 0.192| 0.350—1.057    |
| **Birth order (reference: 1st child)**           |             |      |                |
| 2nd-3rd child                                     | -0.203      | 0.817| 0.350—1.907    |
| 4th-5th child                                     | 0.098       | 1.103| 0.396—3.076    |
| 6th child and above                               | 0.202       | 1.223| 0.456—3.281    |
| **Education (reference: none)**                   |             |      |                |
| Primary                                           | 0.442       | 1.557| 0.869—2.788    |
| Secondary                                         | 1.527       | 4.604| 0.820—25.853   |
| Tertiary                                          |             |      |                |
| **Occupation (reference: no)**                    |             |      |                |
| Yes                                               | 1.226       | 3.407| 1.553—7.473    |
| **Religion (reference: Catholic)**                |             |      |                |
| Protestant                                        | -0.270      | 0.763| 0.446—1.307    |
| Muslim                                            | -0.753      | 0.471| 0.054—4.080    |
| Traditional                                       | -0.012      | 0.988| 0.227—4.307    |
| **Health insurance (reference: no)**              |             |      |                |
| Yes                                               | 0.472       | 1.604| 0.716—3.590    |
| **Marital status (reference: never married)**     |             |      |                |
| Legal union                                       | 2.909       | 18.334| 4.526—74.302  |
| Partnership                                       | 2.764       | 15.857| 3.531—71.219  |
| Divorced/separated/widowed                        | 1.484       | 4.410| 1.634—11.904  |
| **Decision-making power (reference: no)**         |             |      |                |
| Yes                                               | 0.182       | 1.120| 0.517—2.787    |
| **Family size (reference: 1-5 people)**           |             |      |                |
| > 5 individuals                                    | -0.171      | 0.843| 0.471—1.509    |
| **Husband’s education (reference: none)**         |             |      |                |
| Primary                                           | -0.192      | 0.826| 0.425—1.602    |
| Secondary                                         |             | 0.551| 0.345—0.890    |
| Tertiary                                          |             |      |                |
| **Husband’s occupation (reference: none)**        |             |      |                |
| Yes                                               | 0.017       | 1.017| 0.333—3.103    |
| **Child’s sex (reference: Male)**                 |             |      |                |
| Female                                            | -0.451      | 0.637| 0.386—1.053    |
| **Income quintile (reference: first)**            |             |      |                |
| Second                                            | 0.504       | 1.655| 0.855—3.200    |
| Third                                             | 1.106       | 3.021| 1.287—7.092    |
| Fourth                                            | 0.753       | 2.124| 0.903—4.992    |
| Fifth                                             | 0.278       | 1.321| 0.488—3.576    |
| **Residence (reference: urban)**                  |             |      |                |
| Rural                                             | -0.873      | 0.419| 0.107—1.630    |
| **Easy access to a health facility (reference: no)**|       |      |                |
| Yes                                               | 0.538       | 1.713| 0.987—2.972    |
| **Province**                                      |             |      |                |
| Kirundo                                           | -1.928      | 0.145| 0.023—0.929    |
| Mwaro                                             | -2.003      | 0.135| 0.019—0.941    |
**Number of ANC visits**

The number of ANC visits increases with education and with a current or previous union relationship. In comparison with the reference category of never married women, being in a current union or partnership corresponds to an increase of about 0.7 (p=0.000) in the number of ANC visits. Also, a previous union is associated with an increase of about 0.6 (p=0.003) in the number of ANC visits. Women who achieved a tertiary education attended 1.3 (p=0.000) more visits than women who did not have any schooling. Moreover, being a resident of Gitega, Kayanza or Kirundo province is associated with an increase of about 0.4 in the number of ANC visits. The number of ANC visits significantly decreases with higher birth orders. With reference to primiparous women, the number of ANC visits attended decrease of 0.2 (p=0.006) for women at their second and third pregnancies, and again decrease of 0.4 (0.000) for the fourth and fifth pregnancies and further halves (p=0.000) for women above the fifth pregnancy (Table 5).
### Table 5. Regression results: the number of ANC visits

| Explanatory variables                           | Sample (N=8,879) |
|------------------------------------------------|------------------|
|                                                | Co-efficient    | S.E. | 95% p-value |
| **Age (reference: 15-19 years)**               |                  |      |             |
| 20-34 years                                    | 0.107            | 0.182| 0.558        |
| 35-49 years                                    | 0.088            | 0.199| 0.659        |
| **Birth order (reference: 1st child)**         |                  |      |             |
| 2nd-3rd child                                  | -0.243           | 0.089| 0.006        |
| 4th-5th child                                  | -0.401           | 0.109| 0.000        |
| 6th child and above                            | -0.520           | 0.130| 0.000        |
| **Education (reference: none)**                |                  |      |             |
| Primary                                        | 0.114            | 0.062| 0.066        |
| Secondary                                      | 0.0              | 0.116| 0.722        |
| Tertiary                                       | 1.277            | 0.332| 0.000        |
| **Occupation (reference: no)**                 |                  |      |             |
| Yes                                            | -0.036           | 0.109| 0.743        |
| **Religion (reference: Catholic)**              |                  |      |             |
| Protestant                                     | 0.051            | 0.061| 0.403        |
| Muslim                                         | 0.270            | 0.149| 0.070        |
| Traditional                                    | 0.291            | 0.187| 0.119        |
| **Health insurance (reference: no)**           |                  |      |             |
| Yes                                            | 0.066            | 0.070| 0.337        |
| **Marital status (reference: never married)**  |                  |      |             |
| Legal union                                    | 0.714            | 0.196| 0.000        |
| Partnership                                    | 0.666            | 0.201| 0.001        |
| Divorced/separated/widowed                      | 0.540            | 0.179| 0.003        |
| **Decision-making power (reference: no)**      |                  |      |             |
| Yes                                            | 0.119            | 0.076| 0.116        |
| **Family size (reference: 1-5 people)**        |                  |      |             |
| > 5 individuals                                 | 0.092            | 0.074| 0.213        |
| **Husband’s education (reference: none)**      |                  |      |             |
| Primary                                        | 0.012            | 0.067| 0.854        |
| Secondary                                      | 0.058            | 0.119| 0.625        |
| Tertiary                                       | 0.446            | 0.236| 0.059        |
| **Husband’s occupation (reference: none)**     |                  |      |             |
| Yes                                            | -0.072           | 0.111| 0.520        |
| **Child’s sex (reference: Male)**              |                  |      |             |
| Female                                         | 0.017            | 0.541| 0.747        |
| **Income quintile (reference: first)**         |                  |      |             |
| Second                                         | -0.006           | 0.086| 0.948        |
| Third                                          | 0.137            | 0.090| 0.127        |
| Fourth                                         | -0.006           | 0.095| 0.950        |
| Fifth                                          | 0.062            | 0.118| 0.601        |
| **Residence (reference: urban)**               |                  |      |             |
| Rural                                          | 0.007            | 0.103| 0.942        |
| **Easy access to a health facility (reference: no)** |      |      |             |
| Yes                                            | -0.026           | 0.061| 0.673        |
| **Province**                                   |                  |      |             |
| Gitega                                         | 0.457            | 0.161| 0.005        |
| Kayanza                                        | 0.333            | 0.164| 0.042        |
| Kirundo                                        | 0.400            | 0.158| 0.012        |
Place of delivery and birth assistance

Results summarised in Table 6 show that none of the determinants predicted a significant impact on the choice of a home delivery, assisted or not. With reference to women who do not receive assistance during childbirth, the likelihood that a woman seeks birth assistance from a health facility is significantly determined by her parity, religion, wealth status, place of residence, access to a health facility and whether she attended ANC visits. The more ANC visits a woman attends, the more likely she delivers in a health facility. With reference to women who do not attend any ANC visit, those who attend one to three visits are eight times (OR=8.341) more likely to seek birth assistance from a health facility. Women who attend four or more ANC visits are 14 times (OR=13.53) more likely to deliver in a health facility. The likelihood of assisted childbirth increases with wealth status and is nearly trice more (OR=2.617) for women who belong to the richest families. Having an easy access to a health facility is associated with an increased likelihood of assisted childbirth (OR=1.302). In contrast, rural women (OR=0.352), those with higher parity (OR=0.374 for women at their second and third pregnancies, OR=0.313 for those at their fourth and fifth pregnancies, and OR=0.300 for higher parities), those practicing traditional religion (OR=0.559), and women from Bururi (OR=0.230), Muramvya (OR=0.490), and Rumonge (OR=0.311) are less likely to deliver in a health facility.

**Table 6. Regression results: the likelihood of choosing a delivery option**

| Base outcome: Home deliveries without assistance by a skilled birth attendant | Sample (N=8,941) |
|---|---|
| **Explanatory variables** | Assisted home deliveries | Health facility deliveries |
| | OR [95% CI] | OR [95% CI] |
| **Age (reference: 15-19 years)** | | |
| 20-34 years | 1.699 [0.534—5.408] | 1.215 [0.576—2.560] |
| 35-49 years | 1.688 [0.496—5.746] | 0.896 [0.401—2.002] |
| **Birth order (reference: 1st child)** | | |
| 2nd-3rd child | 0.786 [0.454—1.363] | 0.374 [0.244—0.572] |
| 4th-5th child | 0.613 [0.312—1.204] | 0.313 [0.191—0.513] |
| 6th child and above | 0.646 [0.326—1.278] | 0.300 [0.177—0.510] |
| **Education (reference: none)** | | |
| Primary | 0.953 [0.709—1.282] | 1.189 [0.960—1.473] |
| Secondary | 0.997 [0.463—2.143] | 1.334 [0.741—2.404] |
| **Occupation (reference: no)** | | |
| Yes | 1.032 [0.528—2.017] | 0.816 [0.494—1.347] |
| **Religion (reference: Catholic)** | | |
| Protestant | 0.853 [0.626—1.164] | 0.969 [0.761—1.235] |
Discussion
In this study, we use secondary data from the 2017 DHS survey from Burundi to explore the socio-economic factors that determine utilisation of maternal health services in the country. Our results indicate that women’s occupation, marital status and wealth have a positive effect on the likelihood of seeking ANC services from a trained health professional. This is consistent with evidence from other LMICs. For instance, a study conducted on 15,782 ever married women aged 15–49 years residing in Madhya Pradesh state of India found that wealthier women are more likely to seek ANC from qualified professional (38). Similar results were obtained in studies set in Nigeria (30) and Kenya (39).

Furthermore, occupation was a significant predictor of the likelihood of seeking ANC from skilled providers in Nigeria, Cambodia, the Philippines and in Timor-Leste (30, 40). Moreover, Kenyan married women were three times more likely to seek ANC services than their single counterparts. The impact
of marital status can be policy related. For instance, in Burundi, a predominantly Catholic country, access to ANC services in public health facilities is conditional on the provision of a legal marriage certificate (14). This may prevent unmarried women from seeking ANC services.

We also find that the woman’s marital status and education have a positive impact on the number of ANC visits. Higher birth orders decrease the number of ANC visits. Additionally, we find that women from Gitega, Kayanza and Kirundo provinces have an advantage in terms of ANC visits. In support to our findings, high parity had also been found to predict poor maternal health care utilisation in Bangladesh (29) and in Ethiopia (41). In a recent study that used DHS data from seven developing countries namely Bangladesh, Burkina Faso, Ethiopia, Mali, Mozambique, Nepal and Niger to determine factors that affect maternal health utilisation; mothers of higher parity were less likely to attend ANC visits across the study countries (42). Reasons might include the fact that women place high value to lower pregnancies and that health care workers strongly recommend institutional delivery for primiparous women (43). Additionally, higher parity women may not feel the need for ANC visits drawing on maternity experience (43, 44).

Our findings show a positive effect of the number of ANC visits attended, wealthier statuses, urbanicity and the accessibility to a health facility on the likelihood of seeking assisted health facility delivery. Similar results had been found in other settings. For example, in Nigeria, findings showed that urban and rich women were about 2 times more likely to receive assisted delivery care (30). In Ghana, with reference to women from poorest families, the likelihood of delivering in a health facility increased from the poorer (OR = 0.159), the middle (OR = 0.325), the richer (OR = 0.807) to the richest (OR = 1.208) women (24). According to the findings of Jat et al. (2011) in Madhya Pradesh state of India, women who received ANC services were about 4 times more likely to deliver in a health facility, as were 2 times more likely for urban versus rural women (38). In our study, the likelihood of assisted deliveries as a result of the number of ANC visits is higher than the literature findings. As for before, this can be attributed to the policy of Burundi whereby women who are eligible for ANC services are the ones eligible for delivery care. In our study, women who believe in traditional religion and those at higher parity are found to less likely deliver in a health facility. In fact, it has been
established that traditional beliefs hinder maternal health care seeking behavior (45). In a study that sought to seize the relevance of religions to maternal health services utilisation in Ghana; traditionalist women were twice less likely to deliver in a health facility and were 70% less likely to attend 4 ANC visits (45).

Our study has some strengths and limitations. The data used for analysis is sourced from a nationally representative survey collected using multistage sampling techniques. The dataset did not contain missing values. Attempts to minimise the recall bias were made by only including information about the most recent pregnancy. Additionally, discrete models used confidence intervals to ascertain significance of coefficients, which the literature claims to be more reliable (29, 46). However, results of this study should be interpreted with some caution as the cross-sectional design does not allow us to understand causality but does offer evidence on associations that can guide policy.

Conclusions
While findings feed into general evidence, some are specifically meaningful for Burundi’s context. For example, in addition to the fact that husbands play an important traditional role in the family and Burundi’s society, today’s maternal health practice obliges a pregnant woman to be accompanied by her husband for each ANC visit (47). Alternatively, a woman can be received for ANC services provided that she presents a marriage certificate alongside convincing evidence to justify the husband’s absence. Therefore, it turns out that married women and those living in partnership are likely to gain company from their husbands which further implies that unmarried women are less likely to attend ANC visits and deliver in a health facility. Most importantly, in this most Christian country where illegal marriages are prohibited, delivery in a public health facility is determined by the provision of a marriage certificate. This also widens the gap between single and married women with regard the seeking of delivery services from a health facility. Therefore, while our results are not new to the literature, they were contextually meaningful.

Owing to the lack of evidence to reject what other studies have found in different contexts, we would recommend further research on the subject. For example, a cohort study of pregnant women whose sample comprises equitable individuals with no schooling and those with primary, secondary and
tertiary education would unpack the real effect of education on the utilisation of maternal health services.

All things put together, we found strong evidence of the effect of marital status of women on their utilisation of maternal health services. This has a strong policy implication. To improve ANC attendance and assisted health facility deliveries, our recommendation is a revisiting of the Burundi’s maternal health policy to enable single women, yet the most socially and financially vulnerable population, have access to free maternal health services. This would pull maternal health indicators up towards the global targets such as eight ANC contacts. An increase in the number of births attended by skilled health personnel will contribute to the SDGs targets of a reduction of maternal mortality ratio to less than 70 per 100,000 live births and that of neonatal mortality ratio to less than 12 per 1,000 live births.

Abbreviations
ANC
Antenatal care
DHS
Demographic and health survey
FANC
Focused antenatal care
HIV
Human immunodeficiency virus
LMICs
Low- and middle-income countries
OR
Odds ratio
WHO
World Health Organization

Declarations

Ethics approval and consent to participate

Before the conduct of the primary data collection, the study was approved by the ICF Institutional Review Board and further received the certificate No. VS201505CNIS of the National Council of the
Statistical Information of Burundi. With attention to the use of DHS datasets, an explicit authorisation to download and use DHS Burundi 2017 datasets was granted by The DHS Program. Most importantly, downloaded data did not contain any personal identifiable information and we did not seek to disclose respondents. Another ethical key point to note is the fact that downloaded data was retained strictly confidential and solely used for the purpose submitted to DHS Program

**Consent for publication**

All authors have consented for this manuscript to be published

**Competing interests**

None

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**Authors’ contributions**

DH conceptualised the study and the paper and BH supervised the study conduct, reporting and the write-up of the manuscript.

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