Spatial Distribution and Predictive Factors of Antenatal Care in Burundi

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Abstract

Background: The use of obstetric care by pregnant women enables them to receive antenatal and postnatal care. This care includes counseling, health instructions, examinations and tests to avoid pregnancy-related complications or death during childbirth. To avoid these complications, the World Health Organization (WHO) recommends at least four antenatal visits. This study deals with the spatial analysis of antenatal care (ANC) among women aged 15 to 49 with a doctor and associated factors in Burundi.

Methods: Data were obtained from the second Demographic and Health Survey (DHS) carried out in 2010. A spatial analysis of the prevalence of ANC made it possible to map this prevalence by region and province, and to interpolate the cluster-based ANC prevalence at unsampled data points using the kernel method with an adaptive window. The dependent variable is the antenatal care (yes / no) with a doctor and the explanatory variables are place of residence, age, level of education, religion, marital status of the woman, the quintile of economic well-being of the household and place of birth of the woman. Factors associated with ANC were assessed using binary mixed logistic regression. Data were analyzed using R software, version 3.5.0.

Results: The findings of this study clearly show that ANC prevalence varies from 0 to 16.2% with a median of 0.5%. A pocket of prevalence was observed at the junction between Muyinga and Kirundo provinces. Low prevalence was observed in several locations in all regions of the provinces. They also show that woman's education level and place of delivery are significantly associated with antenatal care.

Conclusion: Prevalence of ANC is not the same across the country. It varies between regions and provinces. Besides, there is intra-regional or intra-provincial heterogeneity in the prevalence of ANC.

1. Background

The use of obstetric care by pregnant women enables them to receive antenatal and postnatal care. This care includes counseling, health instructions, examinations and tests to avoid pregnancy-related complications or death during childbirth. To avoid these complications, the World Health Organization (WHO) recommends at least four antenatal visits (ANC) [1]. These visits are a good time to adopt safe behaviors and learn about parenting [2]. From conception to delivery, pregnancy monitoring and postpartum visits promote maternal and child health. The third UN Sustainable Development Goal (SDG), in its targets 1 and 2, aims to reduce maternal mortality to less than 75 per 1000 live births and neonatal mortality to 12 per 1000 live births by 2030 worldwide [3]. In 2017, 260,000 women died from causes related to pregnancy or childbirth worldwide and the risk at birth of dying from these causes is one in 37 in sub-Saharan Africa. A systematic review of 23 countries in sub-Saharan Africa showed that the use of health care services by a pregnant woman reduces neonatal mortality by 39% [4]. In this study, the determinants of antenatal care utilization include educational level of the woman, educational level of her husband, place of residence, economic well-being of the household, health system and pregnancies at

risk [4–7]. Other studies have shown that living in rural areas, low education level, lower economic welfare quintile, low income, and being single predispose women to avoid using obstetric care services [8–10].

In Burundi, the proportion of women with at least four ANC visits varies from 33–49% from 2010 to 2016. In addition, the proportion of women who made their first visit at less than 4 months of pregnancy varies from 21–47% from 2010 to 2016 [11]. The proportion of women who had births attended by medical personnel varies from 60–85% from 2010 to 2016. However, no studies have assessed the factors associated with antenatal care with particular emphasis on the spatial distribution of the prevalence of antenatal care.

The objectives of this article are to study the spatial distribution of the prevalence of antenatal care and examine the predictive factors of antenatal care among women aged 15–49 years in Burundi. Besides, intra-regional and intra-provincial heterogeneity of the prevalence of antenatal care is assessed.

Our study could provide public health decision-makers with information about where in the country women consulted a doctor at high or low rates. This information serves to raise the minds of health decision-makers by showing where (regions, provinces) there is a need for hospitals, health centers and qualified health care personnel. It also serves to identify where awareness of antenatal and postnatal health care should be raised.

2. Methods

2 – 1. Source of data

Data used in this article were obtained from the second Demographic and Health Survey (DHS) carried out in 2010 in Burundi. These data were provided by MEASURE DHS, a United Nations program that assists developing countries in the collection and analysis of population, health and reproductive health data. The survey was carried out by the Institute of Statistics and Economic Studies of Burundi (ISESB) and the National Institute of Public Health (NIPH) of Burundi with technical assistance provided by ICF International [12]. The survey was representative of the population, stratified and drawn at two levels. At the first stage, 376 clusters or enumeration areas (301 rural and 75 urban clusters) were randomly selected with a probability proportional to their size (number of households) from the 8,104 clusters of the 2008 General Census of Population and Housing. At the second stage, 24 households were allocated in each selected cluster, leading to a sample of 9024 households. The stratification was done according to province (there were 17 provinces in 2010) and place of residence (middle/urban). Burundi currently has 18 provinces grouped into 5 health regions (Bujumbura-Mairie, West, South, North and Centre- East). The new province of Rumonge (which was a commune of the province of Bururi) is the result of the merger between three former communes of Bururi (Rumonge, Buyengero and Burambi) and two former communes of Bujumbura-Rural (Bugarama and Muhuta).

During the survey, 9389 women aged 15–49 in all selected households and 4280 men aged 15–59 in half of the selected households were successfully interviewed. Women who had not given birth in the last 5

years prior to the survey and women who had not consulted a health provider (doctor, nurse or midwife) were excluded from the study, resulting in a sample of 5063 women aged 15-49.

Figure 1 shows how clusters are distributed at the national level according to place of residence. The red dots are clusters in urban areas and the green dots are clusters in rural areas.

2-2. Method

The first step was to create Burundi's 18 provinces from Burundi's communes using QGIS, version 1.8.0 [13]. This step led to the creation of Burundi's 5 health regions. To create the province of Rumonge, we merged the communes of Bugarama, Muhuta (which belonged to the province of Bujumbura-Rural), the commune of Rumonge (which belonged to the province of Bururi) and the communes of Burambi and Buyengeri (which also belonged to the province of Bururi).

We computed the total number of women, the number of women who had an ANC with a doctor, the number of women who did not have an ANC with a doctor, and ANC prevalence among women aged 15-49 years by province, region, place of residence, and other characteristics (age groups, household economic well-being, education level, religion, marital status, place of birth) using R software version, 3.2.5 [14]. We also computed the prevalence of ANC by cluster, region, province and other socio-demographic characteristics. We mapped ANC prevalence by region and province and interpolated cluster-based ANC prevalence at unsampled data points using the kernel method. For this, we created a regular interpolation grid (1000×1000) covering the whole country. We eliminated grid pixels that fall outside the country. This led to 85600 interpolation data points. According to Larmarange *N*(2011), the modelling of the optimal value of N_0 as a function of the observed national prevalence (p), the number of people tested (n) and the number of clusters surveyed (g) is given by the following equation [15]:

$$N_0 = 2,688 \times n^{0.419} \times p^{-0.361} \times g^{0.037} - 91,011 \quad (1)$$

We used $N_0 = 258$ (number of women in the search window) and a Gaussian kernel with an adaptive window.

To complete the spatial analysis, we used a mixed binary logistic regression model with the cluster as a random effect. The response variable was a dummy variable showing whether a woman consulted a doctor (yes/no). This variable allowed to compute the prevalence of antenatal care (ANC) taking into account the sampling weights. The explanatory variables were woman's age, place of residence (urban/rural), the economic well-being, woman's level of education, religion (catholic, protestant, muslim, other), place of birth (home, hospital, health center, other) and marital status (single, married, living with a partner, widowed/divorced/separated).

Mathematically, the simple binary logistic model is written as:

$$M_i : \text{logit}(p) = \beta_0 + \beta \times X_i + U \quad (2)$$

where p is the probability of consulting a doctor, X_i a given explanatory variable and U a random effect. An explanatory variable was considered to be significantly associated with ANC when the overall univariate p-value was less than 5%. We introduced in the multivariate logistic model (full model) only the significant variables in univariate models. We also computed the odds ratios (OR) obtained by exponentiating the parameters and their 95% confidence intervals and the critical probability (p-value) which is the probability that the statistic test, under the null hypothesis, will be equal to or will exceed the estimated value. We manually selected the final model using the top-down step-by-step method.

3. Results

3 – 1. Socio-demographic characteristics

Table 1 shows the distribution of the prevalence of ANC by region.

Table 1
Distribution of prevalence of ANC by region

Region	N*	N-*	N+*	%	95% CI
Bujumbura	268	202	66	24,6	[16,2; 33,1]
North	1606	1520	86	5,4	[3,3; 7,5]
Centre-East	1313	1271	42	3,2	[1,7; 4,8]
West	859	840	19	2,7	[1,2; 4,3]
South	1016	968	48	4,3	[2,5; 6,1]
Overall	5063	4801	262	5,2	[4,1; 6,2]
*: weighted numbers are rounded; %: prevalence of ANC; CI: confidence interval					

The proportions of women who have consulted a doctor vary significantly by region. In fact, one in four women (25%) consulted a doctor in Bujumbura-Mairie compared to 5% or less in the other regions.

Table 2 shows the distribution of the prevalence of antenatal care to a doctor for women aged 15–49 years by province.

Table 2
Distribution of prenatal visits by province

Province	N*	N ⁻ *	N ⁺ *	%	IC à 95 %
Bubanza	246	243	03	1.2	[0.0; 2.7]
Bujumbura-Mairie	268	202	66	24.6	[16.2; 33.1]
Bujumbura- Rural	278	266	12	4.2	[0.7; 7.7]
Bururi	169	158	11	6.3	[0.0; 13.1]
Cankuzo	142	138	04	3.1	[0.2; 5.9]
Cibitoke	349	344	05	1.4	[0.0; 3.0]
Gitega	402	383	19	4.7	[0.6; 8.9]
Karusi	290	289	01	0.4	[0.0; 1.1]
Kayanza	345	327	18	5.1	[1.2; 9.1]
Kirundo	423	410	13	3.1	[0.7 ; 5.5]
Makamba	276	267	10	3.7	[0.9; 6.0]
Muramvya	200	191	09	4.4	[1.4; 4.0]
Muyinga	402	371	31	7.7	[1.8; 13.5]
Mwaro	157	146	11	6.9	[5.3; 10.4]
Ngozi	436	412	24	5.6	[2.6; 8.6]
Rumonge	218	207	11	5.1	[1.6; 8.5]
Rutana	196	191	05	2.8	[0.0; 6.3]
Ruyigi	265	256	09	3.2	[0.4; 6.1]
Overall	5063	4801	262	5.2	[4.1; 6.2]
*: weighted numbers are rounded; %: prevalence of antenatal care; CI: confidence interval					

This table shows that the prevalence of ANC is significantly higher in Bujumbura than in the other provinces. However, there are no significant differences in the prevalence of ANC between provinces belonging to the same region. Moreover, there is intra-regional spatial heterogeneity in the prevalence of antenatal care.

Table 3 shows the distribution of antenatal visits according to socio-economic characteristics.

Table 3
Distribution of antenatal care by socio-economic characteristics

Characteristics	N*	N*	N+*	%	95% CI
Residence					
Urban	440	358	82	18,7	[12,8;24,6]
Rural	4623	4443	180	3,9	[2,9; 4,8]
Age (years)					
15–19	158	150	8	5,3	[1,4 ; 9,3]
20–24	1093	1050	43	3,9	[2,6; 5,2]
25–29	1342	1260	82	6,1	[4,4; 7,8]
30–34	933	875	58	6,3	[4,4; 8,1]
35–39	892	849	43	4,8	[3,2 ; 6,4]
40–44	445	427	18	3,9	[2,1; 5,8]
45–49	200	190	10	4,7	[1,6 ; 7,9]
Well-Being Quintile					
Very poor	1078	1047	31	2,9	[1,5; 4,2]
Poor	1093	1061	32	3	[1,6; 4,3]
Medium	1027	992	35	3,5	[1,8; 5,1]
Rich	972	929	43	4,4	[2,7; 6,2]
Very rich	893	772	121	13,4	[10,1; 16,7]
Educational level					
None	2666	2590	76	2,8	[2,0; 3,7]
Primary	2063	1962	101	4,9	[3,5; 6,3]
Secondary	301	237	64	21,2	[15,2; 27,1]
Superior	33	12	21	63,5	[49,6; 77,1]
Religion					
Catholic	3105	170	2935	5,5	[4,2 ;6,7]
Protestant	1570	67	1503	4,3	[3,0 ; 5,5]

*: weighted numbers are rounded; %: prevalence of antenatal care; CI: confidence interval

Characteristics	N*	N-*	N+*	%	95% CI
Muslim or other	388	25	363	14,4	[6,7 ; 22,0]
Marital status					
Single	137	123	14	10,3	[5,0 ; 15,5]
Bride	3120	2937	183	5,9	[4,6 ; 7,1]
Living with a partner	1385	1332	53	3,9	[2,4 ; 5,3]
Widowed/ divorced/separated	421	409	12	2,8	[0,8 ; 4,7]
Overall	5063	4801	262	5,2	[4,1; 6,2]
*: weighted numbers are rounded; %: prevalence of antenatal care; CI: confidence interval					

According to the economic well-being, the proportion of women who consult a doctor presents some variations, i.e. 13% of women from very wealthy families compared to less than 5% for other families. As for educational level, the prevalence of ANC is very high for women with a higher level of education, i.e. about 64% compared to about 3% of women with no level.

Throughout this table, we see that in urban areas, 19% of women received ANC from a doctor, compared to 4% in rural areas. Furthermore, the prevalence of ANC increases with the index of household economic well-being and the level of education of the woman.

3 – 2. Spatial analysis

Figure 2 shows the regional distribution of ANC prevalence for women aged 15–49.

From this figure, we see that the prevalence of ANC varies from 2.7% in the Western region to 24.6% in Bujumbura-Mairie (or simply Bujumbura).

Figure 3 shows the distribution of the prevalence of ANC with a physician for women aged 15–49 by province.

According to this figure, we see that the prevalence of ANC varies from 0.4% in Karusi province to over 8.0% in Bujumbura-Mairie.

The map of ANC prevalence by province has been put in parallel with the map showing the distribution of health care centers of Fig. 4. The crosses were drawn according to the number of health care (HC) center per 400,000 inhabitants in each province in 2013.

With the exception of the Bubanza and Mwaro provinces, we find that provinces with low ANC rates are not necessarily those with a low number of health care center. Similarly, provinces with a high ANC rate are not those with a high number of health care center. This could be explained by the shortage of physicians across the country in general and in the most remote areas of the capital city in particular.

Figure 5 shows the predicted prevalence of ANC at unsampled data points. This prevalence varies from 0 to 16.2% with a median of 0.5%. A pocket of prevalence was observed at the junction between Muyinga and Kirundo provinces. Low prevalence was observed in several locations in all regions of the provinces. As there are no statistical tests to compare the predicted values, we cannot confirm or deny that there is intra-provincial spatial heterogeneity in antenatal care.

3–3. Analysis of associated factors

The Table 4 gives the odds ratio (OR), the 95% confidence interval (CI) and the critical probability (p-value) associated with the explanatory variables when the variable “Antenatal Care” with a doctor’ is taken as the response variable according to the socio-economic characteristics resulting from the univariate analysis of the associated factors and taking into account the sample weight.

Table 4
Univariate analysis of associated factors

Characteristics	OR _a	95% CI	P-value
Age (years)			0,126
15–19	1,00		
20–24	0,73	[0,31; 1,69]	0,462
25–29	1,16	[0,50; 2,65]	0,731
30–34	1,19	[0,54; 2,63]	0,670
35–39	0,90	[0,39; 2,08]	0,807
40–44	0,73	[0,28; 1,89]	0,519
45–49	0,88	[0,30; 2,62]	0,818
Residence environment			< 0,001
Urban	1,00		
Rural	0,18	[0,11; 0,28]	< 0,001
Economic well-being			< 0,001
Very poor	1,00		
Poor	1,03	[0,53; 2,00]	0,924
Medium	1,21	[0,63; 2,32]	0,568
Rich	1,57	[0,85; 2,89]	0,150
Very rich	5,24	[2,99; 9,20]	< 0,001
Education level			< 0,001
None	1,00		
Primary	1,76	[1,26; 2,46]	0,001
Secondary	9,15	[5,74; 14,59]	< 0,001
Superior	59,38	[30,68; 114,90]	< 0,001
Religion			0,122
Catholic	1,00		
Protestant	0,77	[0,56; 1,07]	0,121

OR_a: adjusted odds ratio; CI: confidence interval

Characteristics	OR _a	95% CI	P-value
Muslim or other	1,22	[0,71; 2,09]	0,477
Delivery place			< 0,001
Home	1,00		
Hospital	4,13	[0,18; 4,75]	< 0,001
CDS	0,88	[2,56; 6,97]	0,656
Other	1,51	[0,48; 1,59]	0,339
Marital status			0,003
Single	1,00		
Bride	0,54	[0,30; 0,99]	0,046
Living with a partner	0,35	[0,18; 0,67]	0,002
Widowed/divorced/separated	0,25	[0,09; 0,82]	0,002
Delivery place			< 0,001
Home	1,00		
Hospital	4,13	[0,18; 4,75]	< 0,001
CDS	0,88	[2,56; 6,97]	0,656
Other	1,51	[0,48; 1,59]	0,339
OR _a : adjusted odds ratio; CI: confidence interval			

These results show that women aged 20–24, 35–39, 40–44, 45–49 are 0.73, 0.90, 0.73, and 0.88 times more likely to consult a doctor compared to women aged 15–19, while women aged 25–29 and 30–34 are 1.16 and 1.19 times more likely to consult a doctor compared to women aged 15–19, respectively. In addition, women living in urban areas are 5.56 times more likely to consult a doctor compared to women living in rural areas. According to the economic well-being, women from poor, middle and rich families are 1.03, 1.21 and 1.57 times more likely to consult a doctor compared to women from very poor families, respectively, while women from very rich families are 5.24 times more likely to consult a doctor compared to women from very poor families.

Considering educational level, women with primary and secondary education are 1.76 and 9.15 times more likely to consult a doctor compared to women with no education, respectively, while women with higher education are 59.38 times more likely to consult a doctor compared to women with no education.

In terms of religion, protestant women believers are 0.77 times more likely to consult a doctor compared to catholic women, while muslim and other women are 1.22 times more likely to consult a doctor

compared to catholic women.

Women who gave birth in hospital are 4.13 times more likely to consult a doctor compared to women who gave birth at home, while women who gave birth in a Health care center and other are 0.88 and 1.51 times more likely to consult a doctor compared to women who gave birth at home.

Women who are married, living with a partner, widowed and/or divorced and/or separated are respectively 0.54, 0.35 and 0.25 times more likely to consult a doctor compared to single women. The variables Age and Religion will not be considered in the multiple logistic model because their p-values (0.126 and 0.122) associated with the test are above the 5% threshold.

Results shows that, finally, the factors associated with ANC with a doctor are the woman's level of education and place of birth, as shown in Table 5.

Table 5
Final model

Characteristics	aOR	IC	P-value
Education level			< 0,001
None	1,00		
Primary	1,54	[1,10; 2,17]	0,013
Secondary	6,44	[4,01; 10,32]	< 0,001
Superior	32,34	[17,13; 61,05]	< 0,001
Delivery place			< 0,001
Home	1,00		
Hospital	2,46	[1,55; 3,93]	< 0,001
Health center	0,73	[0,40; 1,31]	0,283
Other	1,45	[0,60; 3,47]	0,407
aOR: adjusted odds ratio; CI: confidence interval			

The final model is written as:

$$M_f : \text{logit}(p) = \beta_0 + \beta_1 \times \text{Education level} + \beta_2 \times \text{Delivery place}$$

where β_0 , β_1 and β_2 are parameters that have been exponentiated in order to obtain adjusted ORs.

These results show that the prevalence of ANC increases significantly with education level, even after adjustment for the place of delivery. In addition, women who gave birth in a hospital are 2.46 times more

likely to consult a doctor than women who gave birth at home.

3. Discussion

The results found in this study are similar to those of a study carried out in other countries which showed that prevalence of ANC is higher in urban than in rural areas [16, 17]. This is because most health care centers (hospitals, clinics, health center) and health professionals are concentrated in Bujumbura. Moreover, this result is due to socio-economic differences and inequalities in access to health services between rural and urban areas in the country [18, 19].

Women who come for antenatal care are from not only the capital city of Bujumbura but also from the hills overlooking the capital in the province of Bujumbura-Rural and elsewhere. Moreover, women living in urban areas are more likely to consult a doctor than women living in rural areas [20]. The prevalence of ANC increases with education level, even after adjustment for the place of delivery. These findings are similar to those found in other studies that have reported disparities in antenatal care by place of residence (urban/rural), economic well-being index and educational level of the woman [20–22].

The use of antenatal care does not imply the use of health services in general. Even though it is advisable to have at least 4 antenatal visits, some women do these consultations because they do not feel healthy and show a disengagement for postnatal care. Women often seek antenatal care based on advice from other women or health professionals who have already given birth. Failure to attend antenatal care increases the risk of maternal mortality, and attending antenatal care increases the likelihood of giving birth in health care facilities [23]. Women who give birth in a hospital setting are more likely to consult a doctor again than women who give birth at home, because women who visit a hospital usually have their own attending physicians. This is also justified by the fact that doctors are concentrated in hospitals in Burundi, and that these, especially private hospitals, offer better quality care to pregnant women than other health care centers.

The strength of our study is that it combined a spatial analysis with an analysis of the factors associated with antenatal care among women aged 15–49 in Burundi. Another strength is that we did a secondary analysis of the data from the Demographic Health Survey (DHS) which gives a more accurate picture of a phenomenon of interest. Antenatal care in a health center is a sign that the woman is going to give birth in a health facility, assisted by a qualified health person, and that she will have post-natal care. Due to lack of knowledge, young women make less use of maternal health services and consult late. Women's economic well-being quintile, marital status, place of residence and educational level all favor the use of maternal health services [24]. Factors that are associated with the increased likelihood of making antenatal visits with a physician in our study are the woman's level of education and the place of the birth.

As a limitation, we did not use spatial logistic regression in the spatial modelling of antenatal care among women aged 15–49 years. We used the non-spatial logistic model as an additional analysis to the spatial

analysis. An additional study could detect spatial aggregates of high and low prevalence of antenatal care.

The combination of the spatial analysis and the logistic regression model reinforces the relevance of our results. The interest of our study is that knowledge of the spatial distribution of the prevalence of antenatal care and associated factors will make it possible to know where awareness of maternal health needs to be strengthened.

Our results could help public health policy decisions-makers to better identify where women are most affected by non-use of obstetric care among pregnant women and the associated factors to help women adopt good obstetric care-seeking behaviors. These behaviors are influenced by socio-cultural characteristics (level of education, place of residence, religion), socio-demographic characteristics (marital status, age and rank of pregnancy, entourage), socioeconomic characteristics (standard of living, salary function) and the geographical accessibility of health care centers (distance to travel, time taken, means of transport) [23, 25–29]. These characteristics, in turn, influence pregnancy care, the choice of place of delivery and, finally, pre- and post-natal consultations [23].

Our results can be generalized to the entire Burundian population. Indeed, the data used in this study comes from the 2010 Burundi Demographic and Health Survey (DHS). This DHS used a randomly, stratified and two-stage sample [12].

3. Conclusion

Results of our study show that the prevalence of ANC is not the same across the country. It varies from region and province. However, there is intra-regional or intra-provincial heterogeneity in the prevalence of ANC. Interpolation of ANC prevalence at unsampled locations showed a pocket of ANC prevalence at the border of Kirundo and Muyinga provinces. Antenatal care was associated with a woman's level of education and place of delivery. An analysis based on a Bayesian spatial approach could provide a good precision on the estimation of the parameters. A subsequent socio-anthropological study could identify women's perceptions of antenatal care, which would facilitate the early management of pregnancy.

Abbreviations

Abbreviations	Full meanings
ANC	Antenatal care
AOR	Adjusted Odds Ratio
CI	Confidence Interval
(C)	Candidate
DHS	Demographic Health System
ISESB	Institute of Statistics and Economic Studies of Burundi
NIPH	National Institute of Public Health
OR	Odds Ratio
QGIS	Quantum Geographic Information System
SDG	Sustainable Development Goals
WHO	World Health Organisation

Declarations

Ethics approval and consent to participate

Not applicable. The study used secondary data from second DHS

Consent to publication

Not applicable

Availability of data and materials

The dataset used in this study are available from the corresponding author on reasonable request

Competing interests

The authors reports no conflicts of interest in this study.

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Author's declarations

All authors contributed toward data analysis, drafting and critically revising the paper and agree to be accountable all the aspect of the work. Specifically, EB, AI and NN wrote the first draft. EB analysed the

Geospatial data. AI and NN provided technical support in data modelling, reviewed the first draft and wrote some sections of the manuscript. WA and JCN assisted in writing first draft and also provided reviews for subsequent versions of this manuscript. All authors read and approved the final version of this manuscript to submission.

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Figures

Figure 1

Spatial distribution of clusters

Figure 2

Regional distribution of ANC prevalence for women aged 15-49

Figure 3

Distribution of prevalence of ANC with a physician for women aged 15-49 by province

Figure 4

Spatial distribution of health center in Burundi

Figure 5

Predicted prevalence of ANC