Do urban areas still have advantages over rural areas in antenatal care discontinuity in Sub-Saharan Africa?

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ABSTRACT

In sub-Saharan Africa, among the small proportion of women who had at least one antenatal visit, many of them no longer return to ensure continuity of antenatal care. This antenatal care discontinuity is a matter of serious concern for maternal health. Using Demographic and Health Survey data collected between 2000 and 2016 in 26 sub-Saharan countries, this study aims to analyse urban/rural differences in antenatal care discontinuity. Although in the majority of countries, urban areas have considerable advantages in terms of antenatal care continuity, there are countries where urban/rural differences are not significant, as well as atypical countries (Rwanda, Gambia and Zambia) where antenatal care discontinuity is higher in urban areas compared to rural areas. This study is a contribution to tackle the complex disparities in the discontinuity of care during pregnancy in maternal health policies in sub-Saharan Africa.

Keywords: Maternal health, antenatal care, urban, rural, sub-Saharan Africa.

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INTRODUCTION

Maternal health issues continue to be of concern in both developed and developing countries (Alam et al., 2015; Bauserman et al., 2015). More than 70% of maternal mortality is classically due to five major obstetric causes: haemorrhage (25%), infections (15%), unsafe abortion (13%), eclampsia (12%), and dystocia (8%) (Liu et al., 2015). Maternal mortality is partly linked to diseases such as malaria or HIV/AIDS (Buchmann et al., 2015; Kamuliwo et al., 2015). Every day, about 800 women die worldwide during the delivery process (OMS, 2015). Although a number of countries have halved the maternal mortality ratio since 1990, sub-Saharan Africa remains the region of the world with the highest risks associated with pregnancy, childbirth and postpartum, with approximately 510 deaths per 100,000 live births (WHO, 2014). In recent years, African countries south of Sahara have reduced their maternal mortality by 41%. Of the 44 countries for which MDG4 data are available, only one (Egypt) has achieved Millennium Development Goal 5 (MDG-5 to reduce the maternal mortality ratio by two-thirds), two countries are on track, 23 countries are making progress towards the goal, 9 countries have made sufficient progress, while 9 other countries have made no progress at all (Union Africaine, 2013).

Sub-Saharan Africa is also the region where women are attending fewer obstetric services set up to fight maternal morbidity and mortality. According to World Health Organization (WHO) estimates, the use of antenatal care is 63% in sub-Saharan Africa compared to 97% in Europe, 95% in North America, 73% in Latin America and the Caribbean and 65% in Asia (WHO, 2014). Between 1990 and 2000, the proportion of women having done at least one antenatal visit increased by only 5% in sub-Saharan Africa compared to 31% in Asia excluding China (UNICEF, 2001). Whereas maternal mortality could be significantly reduced if women have access to adequate care during pregnancy, childbirth and the postpartum period.

In sub-Saharan Africa, among women who did at least one antenatal visit, many no longer return to ensure continuity of antenatal care (Beninguisse and Nikiema, 2005; Bouba Djourdebbé, 2010). This constitutes a discontinuity of care and a danger to maternal health, since each stage of pregnancy carries its share of risks, culminating in late pregnancy, while it is estimated that two thirds of maternal deaths occur (Abou-Zahr and

Boerma, 2005; Hill et al., 2007).

Thus, antenatal care must be received at an early stage and, more importantly, it must continue with some consistency until delivery to be effective. WHO recommends at least 4 antenatal visits at regular intervals throughout pregnancy. Given the HIV/AIDS pandemic, discontinuing care during pregnancy would contribute to jeopardize the prevention of mother-to-child transmission and malaria and the control of anaemia and malnutrition (Beninguisse and Nikiema, 2005; Bouba Djourdebbé, 2010; Bonono and Ongolo-Zogo, 2012). If we cannot reach all pregnant women, it would be an important step towards reducing maternal mortality if we could retain them from the first contact and ensure continuity of care throughout the childbirth process (Beninguisse and Nikiema, 2005; Bouba Djourdebbé, 2010).

Prenatal visits are an excellent opportunity to provide essential services recommended for all pregnant women, such as tetanus toxoid vaccination, prevention of anaemia through nutrition education and provision of iron or folic acid pills (Bouba Djourdebbé, 2010). This is an excellent opportunity to prevent and manage malaria as well as other priority diseases that affect pregnant women (blood pressure, anaemia, etc). In a continuum with reproductive health care, antenatal care is a platform for providing important health services, including health promotion, screening and diagnosis, and disease prevention. There is also evidence that, through the timely implementation of appropriate evidence-based practices, antenatal care can save lives (OMS, 2017). Because of significant disparities between countries, within countries and between urban and rural areas in terms of maternal health, it can be assumed that there are significant differences between urban and rural areas in terms of discontinuity of care during pregnancy.

Despite the abundant literature on the use of health facilities during pregnancy, determinants of discontinuity of care are less studied. Because of significant disparities between countries, within countries, and between urban and rural areas, it can be assumed that there are significant differences between urban and rural areas in terms of discontinuity of care during pregnancy, just as there may be urban areas that are more prone to discontinuity due to the spatial heterogeneity observed in many sub-Saharan cities. The purpose of this paper is to improve knowledge on maternal health in order to provide decision-makers with evidence to guide health policies to reduce morbidity in pregnancy and therefore reduce maternal mortality.

MATERIALS AND METHODS

Countries involved and data

Data used in this study derive from the latest Demographic and Health Surveys (DHS) conducted between 2000 and 2016 in 26 sub-Saharan countries (Benin, Cameroon, Chad, Comoros, Congo, Côte d'Ivoire, Democratic Republic of Congo, Ethiopia, Gabon, Gambia, Guinea, Kenya, Lesotho, Liberia, Malawi, Mozambique, Namibia, Niger, Rwanda, Sao Tome and Principe, Senegal, Swaziland, Tanzania, Togo, Zambia and Zimbabwe), i.e. 50% of the countries on the African continent (**Table** 1). About 68% of African women aged 15 to 49 reside in these countries. DHS data are nationally representative for monitoring and evaluating population, health and nutrition programmes. They also have the advantage of being comparable across countries and are freely available. These data are suitable to analyse urban-rural differences in the discontinuity of care during pregnancy, as they include number of antenatal visits, the woman's age, parity, level of education, and pregnancy timing.

Table 1. List of selected countries.

No.	Country	Year of survey	Data base
1	Benin	2011-12	EDS-VI
2	Cameroon	2011	EDS-VI
3	Comores	2012	EDS-VI
4	Congo	2011-12	EDS-VI
5	Côte d'Ivoire	2011-12	EDS-VI
6	Ethopia	2016	EDS-VII
7	Gabon	2012	EDS-VI
8	Gambia	2013	EDS-VI
9	Guinea	2012	EDS-VI
10	Kenya	2015	EDS-VII
11	Lesotho	2014	EDS-VII
12	Liberia	2013	EDS-VI
13	Malawi	2015-16	EDS-VII
14	Mozambique	2011	EDS-VI

Table 1. Continues.

15	Namibia	2013	EDS-VI
16	Niger	2012	EDS-VI
17	Democratic Republic of Congo	2013-14	EDS-VI
18	Rwanda	2014-15	EDS-VII
19	Sao Tome and Principe	2008-09	EDS-V
20	Senegal	2016	EDS-VII
21	Swaziland	2006-07	EDS-V
22	Tanzania	2015-16	EDS-VII
23	Chad	2014-15	EDS-VII
24	Togo	2013-14	EDS-VI
25	Zambia	2013-14	EDS-VI
26	Zimbabwe	2015	EDS-VII

Variables

Discontinuity of prenatal care is the dependent variable, and it's captured by the number of prenatal visits (a woman should have had at least one prenatal visit for her last child), and the independent variable is the woman's area of residence (urban, rural). The controling variables are the woman's age, parity, pregnancy timing, the woman's level of education, household head gender and household's standard of living. These variables could be useful in adressing biases in the estimation of woman's residence environment effects on the discontinuity of care during pregnancy (Bouba Djourdebbé, 2010).

Data analysis

We used to multivariate analysis based on the binomial logit model to estimate effects of woman's home environment on discontinuity of care during pregnancy. To meet the requirements of the binomial logit model, the dependent variable was recodified into 2 modalities: the value 1 was assigned to women who had at least 4 antenatal consultations as recommended by WHO, and 0 to those who had made 4 or more antenatal consultations. Missing observations were removed from the sample. To ensure the non-selectivity of missing observations, some tests were performed and data were weighted in order to be able to infer them to the population of each country. A variance inflation calculation was also carried out to identify the issue of multicollinearity between explanatory variables. Due to the small sample size and the high probability of intrinsic random variation in the discontinuity of prenatal care among women, significance levels of 1, 5 and 10% were used.

RESULTS

The results of the study are presented in two main parts.

It will be presented in the first part the effects of the woman's home environment in terms of the discontinuity of antenatal care in sub-Saharan Africa. In the second part, it will be presented the effects of demographic, socio-economic and socio-cultural variables in terms of discontinuity of care during pregnancy.

Effects of the woman's home environment

Results from the multivariate analysis indicate that there are three main groups of countries with regard to the discontinuity of antenatal care in sub-Saharan Africa (Figure 1).

The first group of countries is the one where there are significant differences between urban and rural areas in terms of the discontinuity of antenatal care, with advantages for urban areas. This first group includes Cameroon, Chad, Congo, Côte d'Ivoire, Democratic Republic of Congo, Ethiopia, Gabon, Guinea, Liberia, Malawi, Niger, Senegal, Tanzania and the United Republic of Tanzania. In these countries, women living in rural areas are about 1.5 times more likely to experience discontinuity of care during pregnancy. Discontinuity of care in rural areas is relatively higher, particularly in Togo, Guinea, Chad, Côte d'Ivoire and Gabon. In these countries, women in rural areas are nearly twice as likely to experience discontinuity in pregnancy as their urban counterparts (Table 2).

The second group of countries includes those where there are no statistically significant differences between urban and rural areas in terms of discontinuity of antenatal care. This second group includes the following countries: Benin, Comoros, Kenya, Lesotho, Mozambique, Namibia, Sao Tome and Principe, Swaziland and Zimbabwe.

The third group of countries is the group with atypical situations, where the discontinuity of antenatal care is greater in urban areas compared to rural areas. In this third group, we have Gambia, Rwanda and Zambia. Rural women in Gambia are 21% less likely to
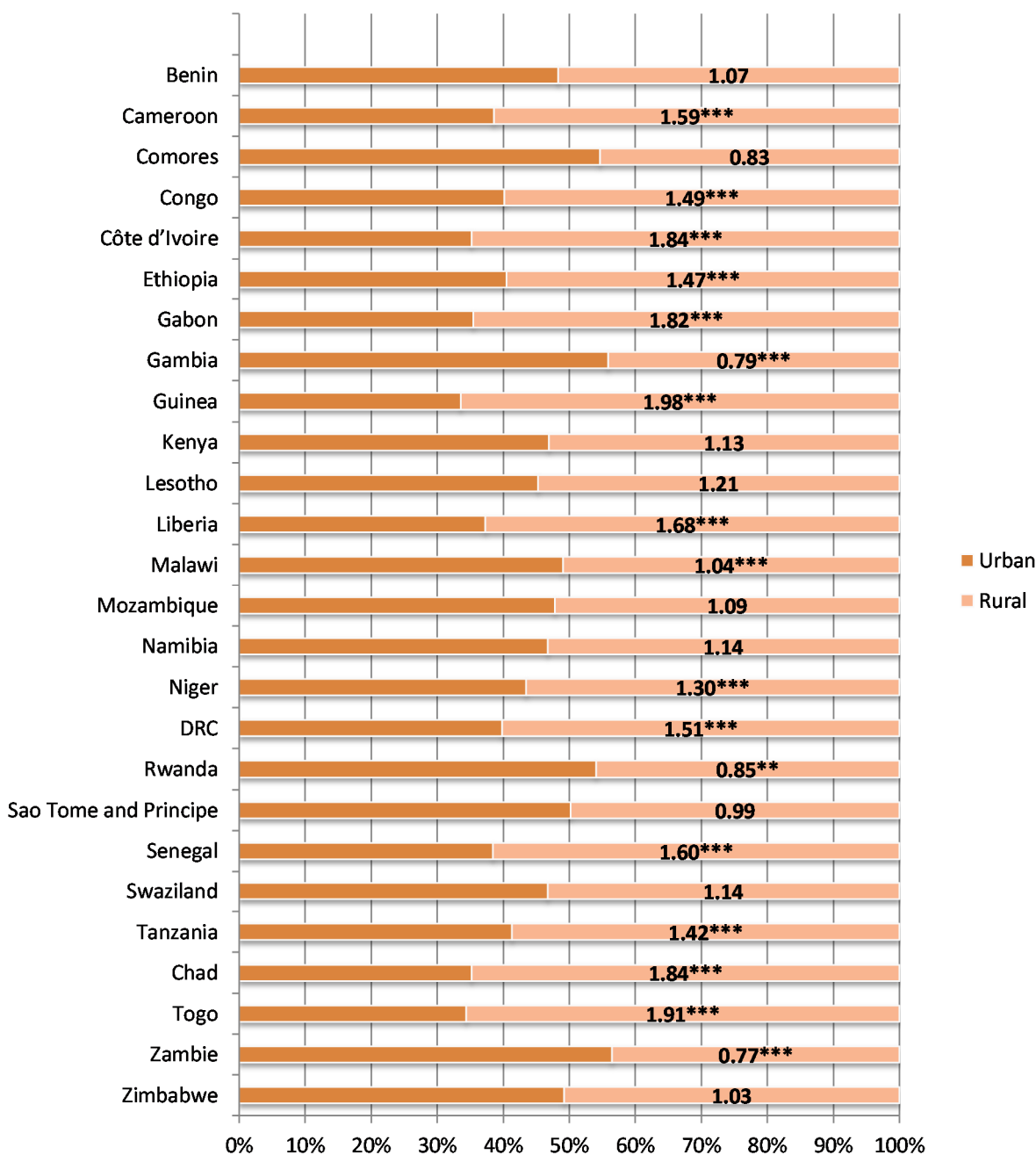
Figure 1. Effects of a woman's place of residence on the discontinuity of antenatal care in 26 sub-Saharan countries (DHS 2000-2016). *** Significant at 1%; ** significant at 5%; * significant at 10%.

Table 2. Effects of a woman's place of residence on the discontinuity of antenatal care in 26 sub-Saharan countries (DHS 2000-2016).

Country	Sources	Year	Number	Place of residence	
				Urban	Rural
Benin	DHS-VI	2011-2012	7585	1.00	1.07
Cameroon	DHS-VI	2011	6617	1.00	1.59***
Comoros	DHS-VI	2012	1589	1.00	0.83
Congo	DHS-VI	2011-2012	5805	1.00	1.49***
Côte d'Ivoire	DHS-VI	2011-2012	4902	1.00	1.84***

Table 2. Continues.

Ethiopia	DHS-VII	2016	4693	1.00	1.47***
Gabon	DHS-VI	2012	3767	1.00	1.82***
Gambia	DHS-VI	2013	5343	1.00	0.79**
Guinea	DHS-VI	2012	4312	1.00	1.98***
Kenya	DHS-VII	2015	2450	1.00	1.13
Lesotho	DHS-VII	2014	2456	1.00	1.21
Liberia	DHS-VI	2013	4941	1.00	1.68***
Malawi	DHS-VII	2015-2016	13158	1.00	1.04***
Mozambique	DHS-VI	2011	6973	1.00	1.09
Namibia	DHS-VI	2013	2978	1.00	1.14
Niger	DHS-VI	2012	6472	1.00	1.3***
DRC	DHS-VI	2013-2014	9776	1.00	1.51***
Rwanda	DHS-VII	2014-2015	5905	1.00	0.85**
Sao Tome and Principe	DHS-V	2008-2009	1345	1.00	0.99
Senegal	DHS-VII	2016	4274	1.00	1.60***
Swaziland	DHS-V	2006-2007	2017	1.00	1.14
Tanzania	DHS-VII	2015-2016	6893	1.00	1.42***
Chad	DHS-VII	2014-2015	6454	1.00	1.84***
Togo	DHS-VI	2013-2014	4640	1.00	1.91***
Zambia	DHS-VI	2013-2014	9116	1.00	0.77***
Zimbabwe	DHS-VII	2015	4560	1.00	1.03

experience ANC discontinuity. In Rwanda, women living in rural areas are 15% less likely to experience ANC discontinuation.

These results are statistically significant at the 5% threshold. The findings from Zambia indicate that women living in rural areas are 23% more likely to experience discontinuity of care during pregnancy (at the 1% threshold).

Effects of demographic, socio-economic and socio-cultural variables

Results also show statistically significant effects of controlling variables (Tables 3 and 4). In almost all countries except Chad and Zambia, woman's age is significantly associated with discontinuation of antenatal care. For most countries including Benin, Cameroon, Congo, Côte d'Ivoire, Democratic Republic of Congo, Ethiopia, Gabon, Gambia, Guinea, Kenya, Lesotho, Liberia, Malawi, Mozambique, Namibia, Senegal, Swaziland, Tanzania, Togo and Zimbabwe, the discontinuity of antenatal care decreases with the woman's age. In Niger, discontinuity of antenatal care is decreasing mainly among adult women compared to younger women.

There are no statistically significant differences between the latter and older women. In contrast, in Rwanda and Sao Tome and Principe, discontinuity of antenatal care decreases among older women compared to younger women. In those two countries, differences between young and adult women are not significant.

With the exception of Niger and Chad, analyses indicate that the parity effect is statistically significant in almost all countries. In general, discontinuation of care during pregnancy increases with the number of children born alive.

Timeliness of pregnancy significantly influences the discontinuity of antenatal care only in a relatively limited number of countries: Congo, Lesotho, Mozambique, Namibia, Rwanda, Senegal, Swaziland and Zimbabwe. In these countries, the discontinuity of care during pregnancy is higher when the pregnancy is untimely for the woman.

There is a significant association between woman's level of education and discontinuity of care during pregnancy in almost all countries (except Lesotho, Swaziland and Zimbabwe). As woman's level of education increases, she is more likely to consult medical staff during pregnancy. However, in Gabon, there are no statistically significant differences between women with no level of education and their counterparts with primary education.

It has beeen found that marital status influences the discontinuation of care during pregnancy in the majority of countries in sub-Saharan Africa. Married women are in most cases less likely to experience discontinuation of antenatal care.

The statistically significant effect of the gender of the household head is found in only 6 countries, namely Benin, Côte d'Ivoire, Guinea, Lesotho, Democratic Republic of Congo and Rwanda. However, the effect of the sex of the head of household does not point in the same direction. In Benin, Côte d'Ivoire, Guinea and

Table 3. Effects of control variables on discontinuity of care in pregnancy.

Variables	Benin	Cameroon	Comoros	Congo	Côte d'Ivoire	Ethiopia	Gabon	Gambia	Guinea	Kenya	Lesotho	Liberia	Malawi
Place of residence													
Urban	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Rural	1.07	1.59***	1.59***	1.49***	1.84***	1.47***	1.82***	0.79**	1.98***	1.13	1.21	1.68***	1.04***
Woman's age													
Youth (15-24 years)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adults (25-34 years)	0.83**	0.53***	0.53***	0.71***	0.8***	0.67***	0.61***	0.67***	0.71***	0.69***	0.77**	0.79**	0.74***
Older women (35 yearsor more)	0.75***	0.43***	0.43***	0.60***	0.85***	0.52***	0.67***	0.49***	0.65***	0.54***	0.37***	0.62***	0.62***
Parity													
Less than 2 children	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
3-5 children	1.21***	1.40***	1.40***	1.04	1.39***	1.18*	1.44***	1.08	1.33***	1.38***	1.32**	1.15	1.15***
5 children or more	1.38***	1.86***	1.86***	1.60***	1.79***	1.52***	1.71***	1.44***	1.27*	1.50**	1.62*	1.49***	1.33***
Opportunity pregnancy													
Timely	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Untimely	0.99	1.03	2.03	1.36*	1.25	0.98	1.19	0.66	1.11	-	1.95***	1.18	1.06
Woman's educational level													
Never went to school	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Primary	0.56***	0.65***	0.65***	0.75**	0.50***	0.62***	1.11	0.79**	0.68***	0.66***	2.27	0.83**	0.80***
Secondary or more	0.38***	0.38***	0.38***	0.50***	0.31***	0.40***	0.70*	0.8	0.50***	0.32***	1.79	0.53***	0.66***
Marital status													
Single	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	-	1.00	1.00	1.00
Married	0.67**	0.98	1.98	1.1	0.74***	2.12**	0.91	0.50***	0.72**	-	0.67**	0.9	0.73***
Divorced and widowed	0.9	1.14	2.14	0.83	0.52***	2.02*	1.91*	0.60**	0.76	-	0.78	0.91	0.73***
Household head's sex													
Man	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Women	0.82***	0.99	1.99	1.09	0.85*	1.03	1.06	0.87	0.71***	1.05	0.79*	0.92	1.02
Household standard of living													
Poor	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Not poor	2.17***	1.62***	1.62***	1.88***	1.88***	1.64***	1.48***	1.34***	1.66***	1.08	1.48**	1.63	1.30***
Total	7585	6617	1589	5805	4902	4693	3767	5343	4312	2450	2456	4941	13158

*** Significant at 1%; ** significant at 5%; * significant at 10%.

Table 4. Effects of control variables on discontinuity of care in pregnancy.

Variables	Mozambique	Namibia	Niger	DRC	Rwanda	Sao Tome and Principe	Senegal	Swaziland	Tanzania	Chad	Togo	Zambia	Zimbabwe
Place of residence													
Urban	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Rural	1.09	1.14	1.3***	1.51***	0.85**	0.99	1.60***	1.14	1.42***	1.84***	1.91***	0.77***	1.03
Woman's age													
Youth (15-24 years)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adults (25-34 years)	0.76***	0.51***	0.88*	0.89**	0.93	0.84	0.65***	0.55**	0.68***	1.1	0.62***	0.79	0.71***
Older women (35 years or more)	0.66***	0.38***	0.89	0.81***	0.75***	0.47*	0.55***	0.38***	0.55***	0.98	0.50***	0.57	0.49***
Parity													
Less than 2 children	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
3-5 children	1.17**	1.18	1.04	1.06	1.44***	1.87***	1.39***	1.29	1.50***	0.94	1.38***	1.1	1.47***
5 children or more	1.26**	1.49*	1.03	1.28***	1.94***	3.32***	2.05***	2.40***	2.20***	0.87	1.76***	1.25***	1.78***
Opportunity pregnancy													
Timely	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Untimely	1.22*	1.52***	1.36	1.03	1.19**	0.93	1.47**	1.26*	1.06	1.22	1.18	1.02	1.58***
Woman's educational level													
Never went to school	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Primary	0.78***	0.54***	0.86**	0.85***	0.80***	0.55**	0.63***	0.74	0.77***	0.67***	0.70***	0.83**	1.59
Secondary or more	0.38***	0.30***	0.48***	0.59***	0.63***	0.20***	0.46***	0.76	0.57***	0.44***	0.46***	0.74***	1.76
Marital status													
Single	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Married	1.09	1.01	0.45*	0.99	0.55***	0.26**	0.60**	0.62***	0.88	0.50***	0.55***	0.84**	0.51***
Divorced and widowed	1.28***	0.75	0.39**	0.75*	0.66***	0.18*	0.53**	0.52	0.84	0.46***	0.60**	0.91	0.54***
Household head's sex													
Man	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Woman	0.93	0.96	1.11	1.10**	1.16**	1.24	1	1.06	0.93	0.93	0.93	0.97	0.92
Household standard of living													
Poor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Not poor	1.15*	1.1	1.40***	1.67***	1.25**	1.72***	1.42***	1.06	1.28***	1.23*	1.61**	1.54***	1.17
Total	6973	2978	6472	9776	5905	1345	4274	2017	6893	6454	4640	9116	4560

*** Significant at 1%; ** significant at 5%; * significant at 10%.

Lesotho, when the head of household is female, women tend to experience less discontinuity of care during pregnancy. While in Democratic Republic of Congo and Rwanda, when the head of household is male, women are less likely to experience discontinuity in antenatal care.

Not surprisingly, the standard of living positively influences the medical management of pregnancy. The results of the study show that in several sub-Saharan countries, the discontinuity of antenatal care decreases with the household's standard of living. Women from poor households are more likely to experience discontinuity of care during pregnancy.

DISCUSSION

Sexual and reproductive health issues remain as an important public health concern in sub-Saharan African countries. The aim of this study was to analyse urban/rural differences in the discontinuity of antenatal care in sub-Saharan Africa. By taking into account control variables, it was possible to account for biases in the estimation of the effects of residence environment on the discontinuity of antenatal care.

Multivariate analysis generally indicate that the effects of residency remain stable in the presence of socio-economic and demographic variables and are not evenly distributed across countries. The urban/rural dichotomy is relevant in sub-Saharan Africa, with health benefits in urban areas. The discontinuity of antenatal care in rural areas is relatively higher, particularly in Chad and Cameroon.

These results corroborate those obtained in numerous studies on sexual and reproductive health in many countries and are mostly explained by what is known as the urban bias, which translates into the concentration of quality infrastructure and human resources in urban areas (Beninguisse and Nikiema, 2005; Bouba Djourdebbé, 2010; Bonono and Ongolo-Zogo, 2012).

The results indicate that there is a situation in which it is difficult to make a statement about the advantage of urban areas over rural areas, since there is insufficient statistical evidence: effects of woman's place of residence are not statistically significant. This finding could be related to the definition of urban/rural concept, which varies from one country to another (Ouédraogo and Bouvier-Colle, 2008; Adjiwanou and LeGrand, 2014). Criteria for defining a city are not necessarily the same for sub-Saharan Africa countries. In some countries, there is no clear socio-spatial demarcation of urban versus rural areas. Sometimes for political reasons, a countryside can be equated with a city, which could introduce observation biases. Health indicators in rural areas are more often burdened by high morbidity under the influence of social determinants of health, poorer education, less structured health care and limited access to preventive medicine.

The atypical situation observed in Rwanda, where it is rather the rural areas that stand out positively in terms of continuity of antenatal care for young people, should also be highlighted. This situation could be explained by the implementation of a genuine development policy through reproductive health services that work well in rural areas, or by the opportunities offered that are likely to have favorable effects on health (Lochner et al., 2003) through women's associations involved in sexual and reproductive health (Beck et al., 2015). Socio-spatial reconfigurations of environments increasingly call into question the permanence of the urban-rural distinction and invite us to re-examine rural and urban realities in order to grasp the new boundries that are emerging between the urban and rural environments.

CONCLUSION

Counter-intuitive results are not related to the quality of data, since data evaluation by several graphical and statistical methods reassures about the confidence that can be placed in the results. These counter-intuitive results rather indicate the complexity of the urban/rural concept. This suggests the need to consider spatial heterogeneity in terms of the discontinuity of antenatal care in sub-Saharan Africa. An effort should be made to conduct a similar study throughout sub-Saharan Africa using more recent DHS data and to consider the quality of antenatal services through a composite indicator including height, weight, blood pressure, urine testing, blood sampling and tetanus vaccination. These components are part of the characteristics of the health system and the minimum medical standard to be offered to a woman during pregnancy (Bouba Djourdebbé, 2010). The quality of services should be considered good when a pregnant woman, during the antenatal visit for her last child, has had her height, weight, blood pressure, urine and blood taken, has received at least one dose of tetanus vaccination, iron tablets, malaria prevention and health education on the signs of pregnancy complications.

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