

ORIGINAL RESEARCH ARTICLE

Link between pregnancy planning and antenatal care utilization in sub-Saharan Africa: An analysis of DHS data (2010-2023)

DOI: 10.29063/ajrh2024/v28i9.5

Sibiri C. Ouedraogo^{1*} and Moussa Bougma²

National Institute of Statistics and Demography, Interdisciplinary Research Laboratory in Social Sciences and Health, Joseph KI-ZERBO University, Burkina Faso¹; Higher Institute of Population Sciences, Joseph KI-ZERBO University, Burkina Faso²

*For Correspondence: Email: clementouedraogo100@gmail.com; Phone: 0022654772811

Abstract

This study aims to analyse the relationship between pregnancy planning and antenatal care in sub-Saharan Africa and to identify which categories of mothers are most likely to make inadequate use of antenatal care in the event of a mistimed or unwanted pregnancy. The latest data from the Demographic and Health Surveys of 32 countries were analysed using bivariate and multivariate descriptive methods. The results show that compared with planned births, mistimed and unwanted births are respectively 27% (OR=0.733) and 29% (OR=0.711) less likely to have an antenatal visit in the first three months of pregnancy, and 25% (OR=0.752) and 29% (OR=0.705) less likely to have the four recommended antenatal visits. In addition, the births of the most privileged women (richest, educated and exposed to the media) are the least likely to have an adequate prenatal visit in the event of mistimed or unwanted pregnancies, probably due to an increased psychosocial impact linked to school dropouts, damage to professional projects and a desire to hide the pregnancy from those around her. (*Afr J Reprod Health* 2024; 28 [9]: 45-62).

Keywords: Pregnancy planning, unintended, mistimed, unwanted, antenatal care, sub-Saharan Africa

Résumé

Cette étude vise à analyser la relation entre planification de la grossesse et recours aux soins prénataux en Afrique subsaharienne et à déterminer les catégories de mères les plus enclines à ne pas recourir adéquatement aux soins prénataux en cas de grossesse mal planifiée ou non désirée. Les dernières données en date des enquêtes démographiques et de santé de 32 pays ont été analysées à travers des méthodes descriptives bivariées et multivariées. Les résultats obtenus indiquent que comparativement aux naissances planifiées, celles mal planifiées et non désirées ont respectivement 27% (OR=0,733) et 29% (OR=0,711) moins de chances de recourir à une visite prénatale dans les trois premiers mois de la grossesse et 25% (OR=0,752) et 29% (OR=0,705) moins de chances de recourir aux quatre visites prénatales recommandées. En outre, les naissances des femmes les plus favorisées (riches, instruites et exposées aux médias) sont celles qui bénéficient le moins de visites prénatales adéquates en cas de grossesse mal planifiées ou non désirée du fait probablement d'un impact psychosocial accru liés aux abandons scolaires, atteintes aux projets professionnels et volontés de cacher la grossesse à son entourage. (*Afr J Reprod Health* 2024; 28 [9]: 45-62).

Mots-clés: Planification, grossesse, mal planifiées, non désirées, soins prénataux, Afrique subsaharienne

Introduction

According to principle 8 of the International Conference on Population and Development, " *All couples and individuals have the basic right to decide freely and responsibly the number and spacing of their children and to have the information, education and means to do so.*"¹. All pregnancies should therefore be consciously and clearly desired at the time of conception. However, unwanted and mistimed pregnancies are both common and widespread around the world. It is estimated that 44% of pregnancies worldwide were

unintended between 2010 and 2014. In sub-Saharan Africa in particular, an estimated 14 million unintended pregnancies occur each year².

However, this phenomenon has significant effects. « *The consequences of unintended pregnancy are serious, imposing appreciable burdens on children, women, men, and families* »³. Studies have shown that unintended pregnancies are associated with a delay in the perception of the first signs of pregnancy, inadequate or delayed prenatal and postnatal care, overexposure of the foetus to harmful substances such as tobacco or alcohol, a higher prevalence of premature births, unassisted

deliveries, low birth weight and size, low breastfeeding rates, non-compliance with recommended vaccinations, low resources for healthy development, poor nutritional status and child maltreatment^{3,4}.

Inadequate use of antenatal care remains one of the most recurrent consequences of mistimed or unwanted pregnancies identified in previous studies. Indeed, the World Health Organization (WHO) recommends four prenatal visits¹ during pregnancy, including one during the first trimester. However, the application of this recommendation depends on the planning of the pregnancy. Mistimed or unwanted pregnancies can reduce the need for antenatal care for a variety of reasons. For example, if the woman does not recognize that she is pregnant, does not want to acknowledge her pregnancy, or does not want others to know about it (which may be the case if the pregnancy is the result of rape or incest), she may not seek antenatal care⁵. As such, a systematic review and meta-analysis indicate an increased likelihood of late and inadequate use of antenatal care among women with unintended pregnancies compared to women with planned pregnancies⁶. Similarly, in low- and middle-income countries, mothers with unwanted pregnancies have a 3.6% lower probability of attending four or more antenatal visits than mothers with planned pregnancies⁴. Authors have also shown that in Peru, Bolivia, Egypt, Kenya, and the Philippines, use of antenatal care before the sixth month of gestation is significantly influenced by pregnancy planning⁷.

In addition to this research at supranational scales, other studies conducted at national scales have also highlighted the association between pregnancy planning and the use of antenatal care in the American^{3,8-14}, European¹⁵ and Asian^{5,16,17} contexts. In the sub-Saharan context, women with mistimed and unwanted pregnancies are 20% and 19% less likely respectively to have early antenatal visits than those with planned pregnancies. They are also 4% less likely to have an additional antenatal visit¹⁸. In addition, a meta-analysis carried out in Ethiopia shows that the likelihood of late initiation of antenatal care was 2.16 times higher for women with unintended pregnancies compared to women who intended to become pregnant¹⁹. Similarly, in southwestern Ethiopia, unintended pregnancies are significantly (Odds Ratios OR: 0.75, 95% CI, 0.58-0.97) associated with use of antenatal care services

and receipt of adequate antenatal care (OR: 0.67, 95% CI, 0.46-0.96)²⁰. Similar results were also found in Rwanda^{21,22}, Lesotho²³, Kenya²⁴ and Tanzania²⁵. In addition, a study conducted in 5 countries, including 4 in sub-Saharan Africa (Ghana, Guinea-Bissau, Ethiopia, Uganda and Bangladesh) found that in 2017-2018, women with unintended pregnancies were less likely to have more than 4 antenatal care visits (Adjusted Odds Ratios AOR: 0.73, 95% CI 0.64-0.83) and to have their first visit in the first trimester (AOR: 0.71, 95% CI 0.63-0.79) compared with women with planned pregnancies²⁶.

Most of the studies carried out in the sub-Saharan context, with the exception of one¹⁸, are at national scales and largely carried out in East Africa, which does not ensure that they can be generalized to the entire sub-Saharan region. In addition, they do not give any indication of women's categories in which the consequences of mistimed or unwanted pregnancies are most significant; something that could improve understanding of the phenomenon as well as the formulation of more targeted policies. The aim of this study is therefore to analyse the relationship between pregnancy planning and the use of antenatal care in sub-Saharan Africa, while highlighting the disparities that may exist between countries and sub-regions. It also aims to assess the impact of mother's characteristics on this relationship and thus to identify the categories of mothers who would be most likely to make inadequate use of prenatal care in the event of mistimed or unwanted pregnancy. To this end, we assume that the variables that determine women's decision-making have a significant impact on the relationship between pregnancy planning and prenatal care use.

Methods

Data

The target population for this study is all live births that occurred during the five years preceding the various surveys, whether they were alive or not during the survey period. The data used are those of the Demographic and Health Surveys (DHS) carried out in sub-Saharan African countries. Conducted as part of the DHS program, the DHS aim to estimate numerous socio-economic, demographic and health

indicators for the population as a whole and for sub-populations of women aged 15 to 49, children under 5 and men aged 15 to 59. In addition, the data is collected using a similar methodology, making it easier to compare data between countries.

The latest data from each country are used for the analyses. Also, countries without relatively recent data (after 2010) were excluded. Data are available for 34 countries, including 8 countries in Southern Africa, 6 in Central Africa, 7 in East Africa and 13 in West Africa. Table 1. The levels of analysis used are national, subregional and regional. For weighting of data at the regional and subregional levels, there are essentially two options. The first is to re-scale the weight of each country so that it is proportional to the population of the country at the time of the survey. The second option is to re-scale so that the total weight will be the same for each country. The first option has the problem that in general a large country, such as Nigeria, will completely dominate the results; As a result, we opt for the second.

Variables

To carry out the analyses, three categories of variables were used: dependent variables, the key independent variable and the other independent variables. The dependent variables are the variables of interest, the ones we are trying to explain. These are the early use of early antenatal care (in the first 3 months of pregnancy) and the use of at least 4 antenatal visits during pregnancy.

This analysis will use one key independent variable and several other independent variables. The key independent variable is the variable that we wish to highlight influence on the dependent variables. This is pregnancy planning (m4 in the DHS database) which is captured through the following questions addressed to women aged 15-49 for each of their births that occurred in the last five years: *When you became pregnant, did you want to be pregnant at that time? Did you want to have a child later or did you not want (or not) any more children?* This variable has inherent limitations in its retrospective nature. Reporting an unwanted pregnancy is subject to criticism because it is reported by mothers after the birth of children and can therefore be subject to recall bias. However, in the absence of a reliable alternative, this variable can be used as a basis for highlighting trends in the consequences of mistimed

Table 1: Years in which the most recent DHS was carried out, by country in sub-Saharan Africa

Country	Survey
Southern Africa	
Angola	2015-16
Botswana	-
Lesotho	2014
Malawi	2015-16
Mozambique	2011
Namibia	2013
South Africa	2016
Swaziland	2006-07*
Zambia	2018
Zimbabwe	2015
East Africa	
Comoros	2012
Djibouti	-
Eritrea	2002*
Ethiopia	2016
Kenya	2022
Madagascar	2021
Maurice	-
Rwanda	2019-20
Seychelles	-
Somalia	-
Sudan	1989-90*
Tanzania	2022
Uganda	2016
Central Africa	
Burundi	2016-17
Cameroon	2018
Central African Republic	1994-95*
Chad	2014-15
Congo	2011-12
Democratic Republic of the Congo	2013-14
Equatorial Guinea	-
Gabon	2019-21
São Tome and Principe	2008-09*
West Africa	
Benin	2017-18
Burkina Faso	2021
Cape Verde	2005*
Gambia	2019-20
Ghana	2022
Guinea	2018
Ivory Coast	2021
Liberia	2019-20
Mali	2018
Niger	2012
Nigeria	2018
Senegal	2019
Sierra Leone	2019
Togo	2013-14

- No DHS carried out in the country

* Not included because carried out before 2010

pregnancies that can be refined by possible subsequent studies using longitudinal data. The "pregnancy planning" variable includes 3 modalities: Planned (pregnancy wanted at the time), Mistimed (pregnancy wanted later) and Unwanted (pregnancy not wanted, neither at the time nor later). Mistimed and unwanted pregnancies constitute unintended pregnancies.

The other independent variables refer to socioeconomic and demographic characteristics that are generally known to be associated with the dependent variables. They will be used to control the relationship between the key independent variable and each dependent variable. We selected the place of residence (urban-rural), the household's wealth quintile (very low, low, medium, high, very high), the mother's level of education (none, primary, secondary or higher), the mother's occupation (active, inactive), her marital status (in a union or not in a union), her age group (15-19 years, 20-34 years, 35-45 years), her media exposure (highly, low, or not exposed), birth order (1, 2-3, 4-5, 6 or more) and interval from previous birth (first birth, less than 24 months, 24-47 months, 48 months or more).

Analysis methods

Two types of analyses are used in this study: descriptive and explanatory. The descriptive analysis consists of an analysis of the association between pregnancy planning and each of the dependent variables through cross-tabulations and proportion tests in view of their qualitative nature. This first descriptive analysis is carried out by sub-region and by country. It will then be controlled at the global level (sub-Saharan Africa) by the other explanatory variables taken individually. The aim is to assess the effect of each of these other variables on the relationships between pregnancy planning and dependent variables.

At the explanatory level, the relationship is analysed in the presence of the other independent variables taken simultaneously through binomial or binary logistic regressions (the dependent variables each having two modalities). The objective was to identify the net effects of pregnancy planning on dependent variables. The analysis model can be illustrated by the following mathematical equation:

$$Z_i = \text{Ln} \left[\frac{P_i}{1 - P_i} \right] = \beta_0 + \beta_1 x X_1 + \beta_2 x X_2 + \dots$$

$$+ \beta_n x X_n \text{ et } P_i = F(Z_i) = \frac{1}{1 + e^{-Z_i}}$$

where P_i is the probability that the birth has the trait under studied (a trait that varies according to the dependent variable), X_j is the j^{th} independent variable and β_j is the coefficient of the j^{th} independent variable. Each coefficient measures the impact of a change in the related independent variable on the probability of having the trait studied. The quotient is called odds, $\frac{P_i}{1 - P_i}$.

The logarithmic transformation of this quotient is the logit z . The odds ratios (OR) are given by (e^z). If this value is less than 1, we will say that births in category k are $(1 - \text{RC}) * 100$ less likely than their counterparts in the reference group to have the trait studied. An "odd ratio" greater than 1 means that this chance is CR times greater than the children in the reference category.

Different regression models are performed for each of the dependent variables: A regression model per country, a model per sub-region and for sub-Saharan Africa as a whole, three models will be estimated, one with a raw effect, one with a net effect and the third taking into account the interactions between pregnancy planning and the other explanatory variables. The inclusion of these interactions in the models responds to the need to identify the variables that affect the relationship between pregnancy planning and the use of antenatal visits. The variables that are assumed to have an impact on mothers' decision-making, namely their standard of living, their place of residence, their education, their occupation and their exposure to the media, will be used.

In the previous equation, we considered the effect of each independent variable x_1, x_2, \dots, x_k as constant regardless of the value taken by the other independent variables. However, the possibility exists that the effect of x_1 , or x_2 , or... of x_k is not constant, but varies according to the values taken by one of the other independent variables introduced into the model. For example, that the effect of x_1 differs depending on the value taken by x_2 . In this case, we say that there is an interaction between x_1 and x_2 . Let us assume that the negative effect of the occurrence of a mistimed or unwanted pregnancy on the use of prenatal care is stronger for people living in urban areas. If this hypothesis is correct, then there is an interaction between pregnancy planning and the place of residence.

Results

Descriptive analysis of link between pregnancy planning and early prenatal visit

The first prenatal visit marks the start of the pregnancy follow-up, which must include at least four visits. This medical visit is an opportunity to take stock of the mother's state of health for appropriate follow-up. Its objective is to confirm the pregnancy, date it, monitor its progress, detect any risk situations and establish the pregnancy schedule. Despite its importance, only 4 out of 10 births (40.3%) received an early antenatal visit (visit carried out in the first three months of pregnancy) in sub-Saharan Africa. This proportion varies according to the planning of the pregnancy: 41.5% of planned pregnancies benefited from it compared to 38.0% and 36.0% respectively for mistimed and unwanted pregnancies (Figure 1). Early use of prenatal visits is therefore more frequent when the pregnancy is planned. The differences between planned pregnancies and mistimed or unwanted pregnancies in terms of the use of early antenatal visits are statistically significant at the 5% threshold (Table 2).

In addition, the proportion of births that received an early antenatal visit varies from region to region. It is estimated at 36% in Southern Africa and 38% in East Africa compared to 43% in Central and West Africa. Depending on pregnancy planning, the differences between planned and mistimed pregnancies are significant in Southern and East Africa. On the other hand, those between planned and unwanted pregnancies are in East and West Africa. Thus, in the eastern part of Africa, the differences are statistically significant for both mistimed and unwanted pregnancies, while in Central Africa no differences are significant. In other words, in central Africa, pregnancy planning has no impact on early use of antenatal care.

Depending on the country, the proportion of births that received an early antenatal visit ranged from a low of 13.2% in Mozambique to 71.2% in Liberia. The largest gaps between planned and mistimed pregnancies in terms of the use of early antenatal visits are observed in Gabon (-15.8%), Rwanda (-16.1%) and Gambia (-15.7%). The gaps between planned and unintended pregnancies are larger in Lesotho (-21.8%) and Rwanda (-21.4%). It should also be noted that in countries such as

Angola, Namibia, Cameroon, Chad, Benin, Niger, Nigeria, Sierra Leone and Togo, pregnancy planning has no impact on the early use of antenatal visits.

Depending on the socio-economic and demographic characteristics of mothers, the impact of pregnancy planning on the early use of antenatal visits in sub-Saharan Africa varies.

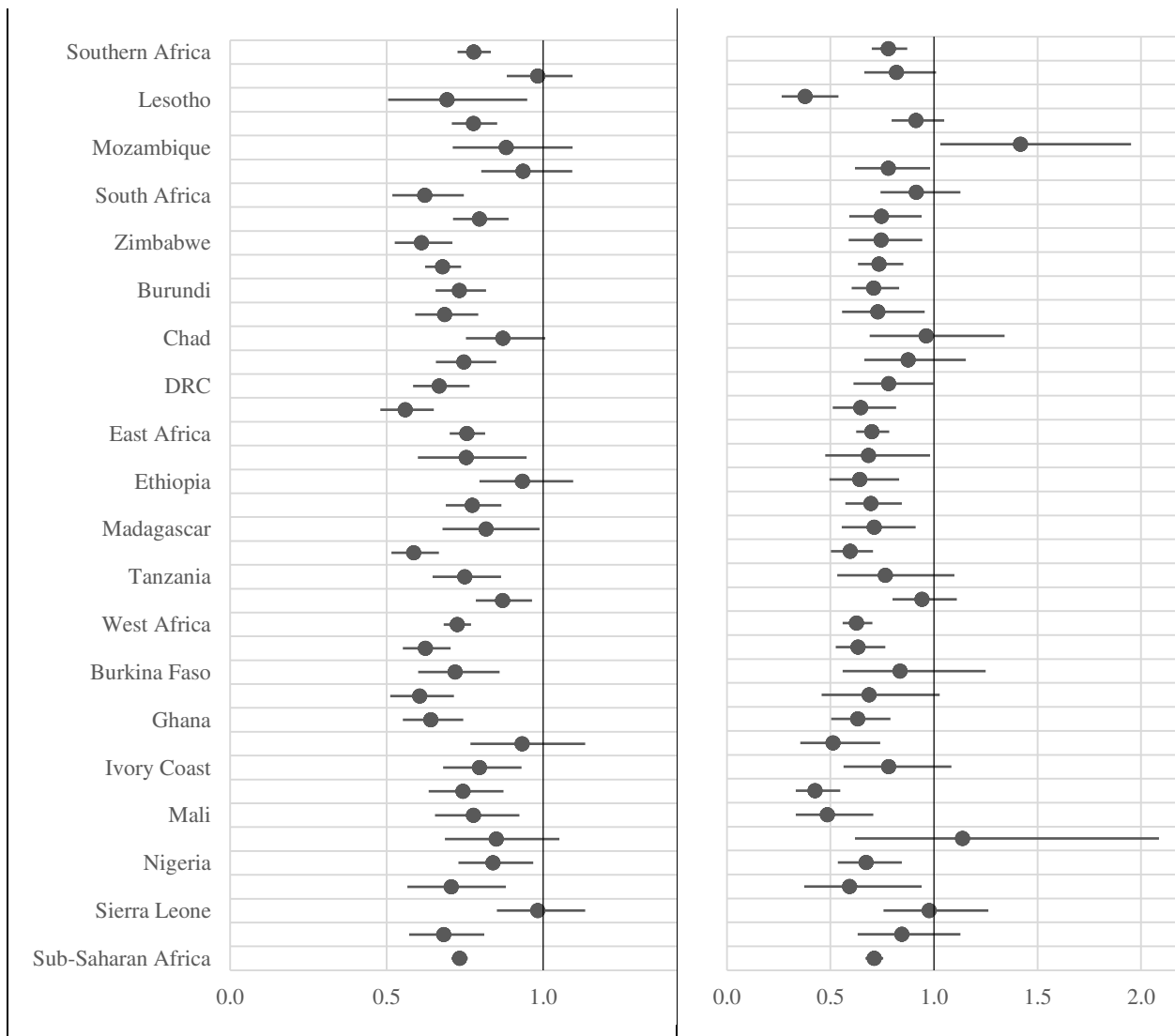
Depending on the place of residence, the use of early prenatal visits is influenced by pregnancy planning in both urban and rural areas. However, the influence is more pronounced in urban areas, where 51.1% of planned births have early prenatal visits, compared with 43.2% and 42.5% respectively for mistimed and unwanted births. The gaps are reduced in rural areas with proportions estimated at 36.2%, 34.2% and 32.0% respectively for planned, mistimed and unwanted births.

By wealth index, it appears that in very rich, rich and middle-income households, the proportion of births that received early prenatal visits is higher when the pregnancy is planned compared to those who are mistimed or unwanted. In poor and very poor households, on the other hand, no difference is found according to pregnancy planning. Among uneducated women, pregnancy planning does not affect early use of antenatal visits. Among those with primary and secondary education or above, the proportion of births that received early prenatal visits was higher when the pregnancy was planned compared to those who were mistimed or unwanted.

Depending on the woman's occupation, the early use of prenatal visits among working women is less likely to occur when the pregnancy is mistimed or unwanted compared to planned pregnancies. Among inactive women, there was no difference between planned and unwanted pregnancies for early use of antenatal care. In addition, the differences between planned pregnancies on the one hand and mistimed or unwanted pregnancies on the other hand are greater as media exposure increases. Among women not exposed to the media, the differences are relatively small, while they are stronger among women with high media exposure.

Overall, bivariate analyses show that the lower use of early antenatal visits for mistimed or unwanted pregnancies is more common in urban areas, among rich and very rich households, and among educated, active, and media-exposed mothers. Table 3

Mistimed and unwanted



Source: EDS Logistic regressions controlled by region of residence, place of residence, occupation, media exposure and level of education and age of the mother, order of birth, interval with the previous birth, household’s wealth index of the and, for supranational levels, the country of residence.

Figure 1: Odds ratio of logistic regressions on the relationship between pregnancy planning and early use of antenatal visits by country (95% CI)

Descriptive analysis of link between pregnancy planning and using four or more prenatal visits

The World Health Organization recommends four antenatal visits during pregnancy. In sub-Saharan Africa, however, about 6 out of 10 births (62.0%) received the recommended four antenatal visits. According to pregnancy planning, 62.3% of planned pregnancies received recommended antenatal visits in sub-Saharan Africa, compared to 62.3% and

58.9% respectively for mistimed and unwanted pregnancies (Figure 2). There is therefore no difference between planned and mistimed pregnancies. In other words, having a mistimed pregnancy would not affect access to four or more antenatal visits in sub-Saharan Africa. However, the difference between planned and unwanted pregnancies for access to the four recommended antenatal visits is statistically significant at the 5% threshold (Table 4). The proportion of births with four or more antenatal visits is much lower in East

Table 2: Proportion of births with a first antenatal visit in the first 3 months of pregnancy by pregnancy planning by country

Country/Sub-region	Pregnancy Planning			(2)-(1)	(3)-(1)	N	
	Ensemble	Planned (1)	Mistimed (2)				Unwanted (3)
Southern Africa	36.0	37.4	34.3	34.3	-3.1***	-3.1*	70 123
Angola	40.3	39.6	42.8	35.0	3.2ns	-4.6ns	14 243
Lesotho	41.3	50.3	37.2	28.5	-13.1***	-21.8***	3 136
Malawi	24.0	26.0	20.9	22.5	-5.1***	-3.5*	17 148
Mozambique	13.2	12.7	14.6	18.4	1.9ns	5.7**	11 102
Namibia	42.9	45.2	41.7	38.1	-3.5ns	-7.1*	5 022
South Africa	47.6	53.8	39.4	47.2	-14.4***	-6.6ns	3 523
Zambia	36.8	39.4	33.3	31.0	-6.1**	-8.4**	9 871
Zimbabwe	38.5	42.9	28.7	35.5	-14.2***	-7.4*	6 078
Central Africa	42.7	43.3	40.9	43.2	-2.4ns	-0.1ns	75 523
Burundi	47.3	51.2	40.6	37.5	-10.6***	-13.7***	13 101
Cameroon	41.4	41.8	40.1	38.4	-1.7ns	-3.4ns	9 689
Chad	28.8	28.2	33.7	31.2	5.5*	3.0ns	18 456
Congo	46.2	48.7	40.1	43.7	-8.6***	-5.0ns	9 297
DRC	17.0	18.6	13.7	14.2	-4.9**	-4.4ns	18 642
Gabon	69.4	76.3	60.5	64.9	-15.8***	-11.4**	6 338
East Africa	37.9	39.9	34.8	30.4	-5.1***	-9.5***	67 848
Comoros	59.0	63.6	50.4	48.1	-13.2**	-15.5**	3 101
Ethiopia	20.4	21.4	21.0	11.8	-0.4ns	-9.6***	10 571
Kenya	30.3	32.8	28.2	20.6	-4.6**	-12.2***	11 728
Madagascar	31.3	32.1	26.9	22.8	-5.2*	-9.3***	12 399
Rwanda	58.7	66.2	50.1	44.8	-16.1***	-21.4***	8 033
Tanzania	34.3	36.7	29.0	22.3	-7.7***	-14.4***	6 574
Uganda	29.1	31.0	27.1	25.5	-3.9**	-5.5**	15 442
West Africa	43.4	43.7	43.2	40.1	-0.5ns	-3.6**	133 370
Benin	51.0	51.8	49.6	46.5	-2.2ns	-5.3ns	13 493
Burkina Faso	54.1	55.1	45.3	51.4	-9.8***	-3.7ns	6 955
Gambia	42.9	45.9	30.2	38.9	-15.7***	-7.0ns	8 316
Ghana	63.8	68.6	56.8	54.6	-11.8***	-14.0***	5 768
Guinea	28.7	29.1	30.2	17.8	1.1ns	-11.3**	7 899
Ivory Coast	39.7	41.3	35.6	31.3	-5.7ns	-10.0*	6 293
Liberia	71.2	75.7	67.1	58.0	-8.6***	-17.7***	5 665
Mali	36.4	37.7	31.5	21.1	-6.2*	-16.6***	9 883
Niger	22.2	22.1	22.6	31.9	0.5ns	9.8ns	12 507
Nigeria	18.3	18.2	20.8	15.3	2.6ns	-2.9ns	33 741
Senegal	62.6	64.5	51.1	49.6	-13.4***	-14.9ns	6 056
Sierra Leone	44.1	44.6	41.6	42.3	-3.0ns	-2.3ns	9 841
Togo	27.7	29.1	24.4	24.7	-4.7ns	-4.4ns	6 953
Sub-Saharan Africa	40.3	41.5	38.0	36.0	-3.5***	-5.5***	346 864

Source: DHS Significance: *** 1%; ** 5% ; * 10% ; Ns not significant

Africa (54.8%) and higher in Southern Africa (67.5%). Depending on pregnancy planning, the differences between planned pregnancies and mistimed or unwanted pregnancies are statistically significant only in East Africa with differences of -6.3 and -13.0 percentage points. In the other sub-regions, having a mistimed pregnancy or an unwanted pregnancy would not affect access of the four recommended antenatal visits.

Depending on the country, the proportion of births with four or more antenatal peaks in Sierra Leone (89.5%) while its lowest value is observed in Chad (31.7%). Differences in the proportions of planned and mistimed pregnancies who had access to at least four early antenatal visits are greater in Rwanda (-15.9%), Gambia (-13.2%) and Senegal (-14.3%). The gaps between planned and unwanted pregnancies are wider in Lesotho (-19.4%), Rwanda

Table 3: Proportion of births with a first antenatal visit in the first 3 months of pregnancy by pregnancy planning and maternal characteristics in sub-Saharan Africa

Characteristics	Total	Planned (1)	Mistimed (2)	Unwanted (3)	(2)-(1)	(3)-(1)	N
Place of residence							
Rural	35.4	36.2	34.2	32.0	-2.0***	-4.2***	240 545
Urban	48.3	51.1	43.2	42.5	-7.9***	-8.6***	106 319
Household wealth index							
Poorest	33.3	33.0	34.6	32.9	1.6ns	-0.1ns	89 231
Poor	36.2	36.6	35.5	35.0	-1.1ns	-1.6ns	75 587
Medium	38.7	39.8	37.0	34.8	-2.8**	-5.0***	68 528
Rich	42.1	44.0	38.8	36.2	-5.2***	-7.8***	61 073
Richest	53.1	56.6	45.2	43.3	-11.4***	-13.3***	52 445
Mother's instruction							
No education	33.7	33.8	34.5	31.1	0.7ns	-2.7ns	135 263
Primary	37.0	38.4	35.0	32.7	-3.4***	-5.7***	111 772
Secondary or higher	48.8	53.1	41.5	42.8	-11.6***	-10.3***	99 796
Mother's occupation							
Inactive	39.1	39.9	37.4	38.0	-2.5**	-1.9ns	104 909
Active	41.2	42.5	38.8	35.9	-3.7***	-6.6***	229 455
Mother's exposure to the media							
No exposure	31.7	31.8	32.5	28.9	0.7ns	-2.9**	136 901
Low exposure	41.4	42.9	38.5	37.5	-4.4***	-5.4***	150 717
High exposure	50.1	53.7	43.1	42.3	-10.6***	-11.4***	58 594
Total	40.3	41.5	38.0	36.0	-3.5***	-5.5***	346 864

Source: DHS Significance: *** 1%; ** 5% ; * 10% ; Ns not significant

(-21.2%) and Guinea (-19.0%). In many countries, access to four or more antenatal visits is not conditional on pregnancy planning. These are South Africa, Angola and Mozambique in Southern Africa, Cameroon, Congo, DRC and Chad in Central Africa; Benin, Ivory coast, Mali and Niger in West Africa. Pregnancy planning has a significant influence on the use of four or more antenatal visits in all East African countries except Comoros. The impact of pregnancy planning on the access to at least four antenatal visits in sub-Saharan Africa remains variable depending on the socioeconomic and demographic characteristics of mothers.

Depending on the place of residence, access to four or more prenatal visits is influenced by pregnancy planning only in urban areas, where 76.4% of planned births have four or more prenatal visits, compared with 70.7% and 69.2% respectively for mistimed and unwanted births. The differences remain significant in urban areas but not significant in rural areas.

By wealth index, in very rich and rich households, the proportion of births with four antenatal visits is higher when the pregnancy is planned than when the pregnancy is mistimed or unwanted. In poor and very poor households, on the

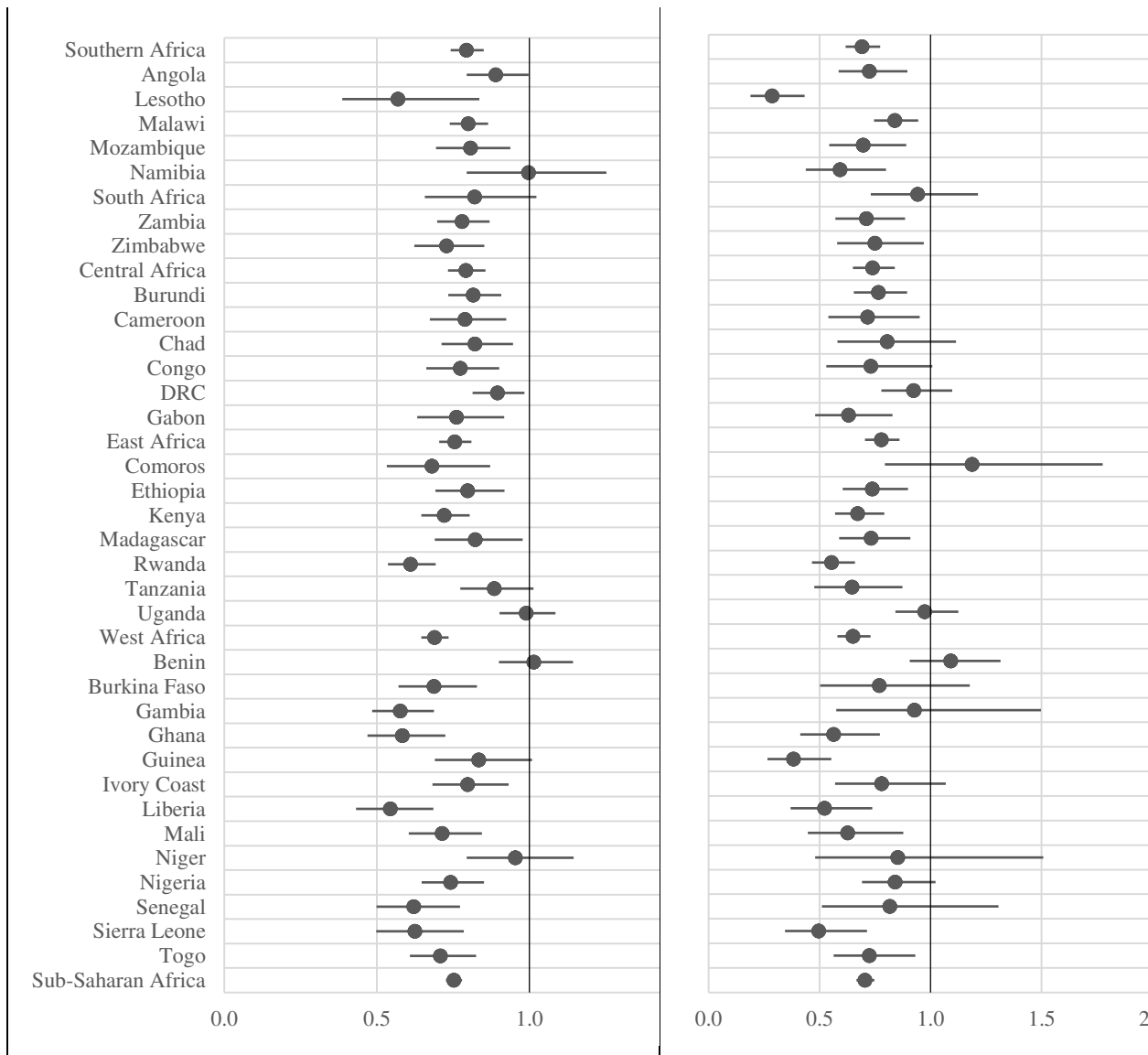
other hand, it is paradoxically apparent that mistimed pregnancies have more access to the four antenatal visits compared to planned pregnancies.

Depending on the mother's education, among women with primary and secondary education or above, the proportion of births with four or more prenatal visits is higher when the pregnancy is planned than when the pregnancy is mistimed or unwanted. In contrast, among uneducated women, pregnancy planning does not affect access of four or more antenatal visits.

Depending on the woman's occupation, among working women, access to four or more prenatal visits is less increased when the pregnancy is unwanted compared to planned pregnancies. Among inactive women, no difference was found between planned and unwanted pregnancies, while mistimed pregnancies paradoxically have more access to the recommended four antenatal visits compared to planned pregnancies.

Depending on media's exposure, the differences between planned pregnancies and mistimed or unwanted pregnancies are greater for women with high media exposure and less so for women who are not. Overall, the bivariate results indicate that the lower access to four or more

Mistimed and unwanted



Source: DHS Logistic regressions controlled by region of residence, place of residence, occupation, media exposure and level of education and age of the mother, order of birth, interval with the previous birth, household's wealth index of the and, for supranational levels, the country of residence.

Figure 2: Odds ratio of logistic regressions on the relationship between pregnancy planning and access to four or more antenatal visits by country (95% CI)

antenatal visits for mistimed or unwanted pregnancies is more common in urban areas, in rich and very rich households, among educated and working mothers with high media exposure. Table 5

Multivariate analysis of link between pregnancy planning and early prenatal visit

For sub-Saharan Africa as whole, the results show that compared to planned pregnancies, mistimed and unwanted pregnancies are respectively 27%

(OR=0.733) and 29% (OR=0.711) less likely to have an antenatal visit in the first three months of pregnancy (Table 6). The occurrence of a mistimed or unwanted pregnancy thus has a negative influence on the early use of prenatal visits. This result holds true for all sub-regions, although at different levels. In Central Africa, mistimed pregnancies are 32% (OR=0.678) less likely to have an antenatal visit in the first three months of pregnancy than planned pregnancies, compared to 22% (OR=0.778) in Southern Africa.

Table 4: Proportion of births with at least four antenatal visits according to pregnancy planning by country

Country/Sub-region	Total	Pregnancy Planning			(2)-(1)	(3)-(1)	N
		Planned (1)	Mistimed (2)	Unwanted (3)			
Southern Africa	67.5	68.4	66.8	65.5	-1.6ns	-2.9*	70 123
Angola	62.1	60.8	65.7	56.8	4.9ns	-4.0ns	14 243
Lesotho	74.9	83.1	71.0	63.7	-12.1***	-19.4***	3 136
Malawi	50.7	53.3	46.6	49.2	-6.7***	-4.1ns	17 148
Mozambique	51.2	50.8	54.2	50.0	3.4ns	-0.8ns	11 102
Namibia	81.7	83.8	81.4	74.3	-2.4ns	-9.5**	5 022
South Africa	78.2	79.7	77.1	76.6	-2.6ns	-3.1ns	3 523
Zambia	64.1	67.3	59.6	58.6	-7.7***	-8.7*	9 871
Zimbabwe	75.9	79.3	68.8	71.7	-10.5***	-7.6**	6 078
Central Africa	60.5	59.8	63.0	58.8	3.2*	-1.0ns	75 523
Burundi	49.3	52.3	44.8	40.1	-7.5***	-12.2***	13 101
Cameroon	65.5	65.3	66.5	63.3	1.2ns	-2.0ns	9 689
Chad	31.7	31.3	34.9	31.4	3.6ns	0.1ns	18 456
Congo	79.4	81.0	76.0	73.9	-5.0ns	-7.1ns	9 297
DRC	48.3	48.0	49.3	47.9	1.3ns	-0.1ns	18 642
Gabon	81.8	85.1	78.6	76.4	-6.5**	-8.7*	6 338
East Africa	54.8	57.5	51.2	43.6	-6.3***	-13.9***	67 848
Comoros	57.5	60.4	48.9	59.4	-11.5*	-1.0ns	3 101
Ethiopia	31.8	33.2	29.9	24.2	-3.3ns	-9.0**	10 571
Kenya	67.4	71.8	62.7	54.1	-9.1***	-17.7***	11 728
Madagascar	60.2	61.1	54.7	49.6	-6.4*	-11.5**	12 399
Rwanda	47.2	54.7	38.8	33.5	-15.9***	-21.2***	8 033
Tanzania	65.4	67.2	62.5	49.9	-4.7ns	-17.3***	6 574
Uganda	60.2	61.8	59.7	54.1	-2.1ns	-7.7***	15 442
West Africa	62.8	62.4	64.3	62.5	1.9ns	0.1ns	133 370
Benin	53.4	52.5	56.4	54.9	3.9ns	2.4ns	13 493
Burkina Faso	72.6	73.8	63.3	67.4	-10.5***	-6.4ns	6 955
Gambia	79.0	81.5	68.3	80.6	-13.2***	-0.9ns	8 316
Ghana	88.4	90.9	84.8	83.6	-6.1***	-7.3**	5 768
Guinea	36.3	37.0	37.3	18.0	0.3ns	-19.0***	7 899
Ivory coast	57.4	58.3	55.5	50.1	-2.8ns	-8.2ns	6 293
Liberia	89.0	91.8	85.6	84.3	-6.2**	-7.5**	5 665
Mali	44.3	45.4	39.2	36.1	-6.2ns	-9.3*	9 883
Niger	32.9	32.9	32.7	31.9	-0.2ns	-1.0ns	12 507
Nigeria	57.8	56.8	65.6	64.0	8.8***	7.2**	33 741
Senegal	56.2	58.1	43.8	51.1	-14.3***	-7.0ns	6 056
Sierra Leone	89.5	90.4	86.3	81.0	-4.1*	-9.4**	9 841
Togo	57.4	59.8	52.3	49.9	-7.5**	-9.9**	6 953
Sub-Saharan Africa	62.0	62.3	62.3	58.9	0.0ns	-3.4***	346 864

Source: DHS Significance: *** 1%; ** 5% ; * 10% ; Ns not significant

Also compared to planned pregnancies, unwanted pregnancies are 37% (OR=0.626) less likely to have a prompt antenatal visit in West Africa. This difference in risk is 30% (OR=0.699), 27% (OR=0.734) and 22% (OR=0.780) less for unintended pregnancies in East, Central and Southern Africa respectively (Table 6). The country-specific results indicate that Angola, Chad,

Niger and Sierra Leone are the countries where pregnancy planning has no impact on the early use of antenatal visits. In 26 of the 32 countries, mistimed pregnancies are less likely to have an early antenatal visit. For unwanted pregnancies, differences are significant in 21 countries (Table 6).

Taking interactions into account induce variations in the odds ratios. Mistimed and

Table 5: Proportion of births with at least four antenatal visits by pregnancy planning and maternal characteristics in sub-Saharan Africa

Characteristics	Total	Planned (1)	Mistimed (2)	Unwanted (3)	(2)-(1)	(3)-(1)	N
Place of residence							
Rural	54.8	54.6	56.1	52.8	1.5ns	-1.8ns	240 545
Urban	74.3	76.4	70.7	69.2	-5.7***	-7.2***	106 319
Household wealth index							
Poorest	50.5	49.3	54.8	50.2	5.5***	0.9ns	89 231
Poor	56.9	56.4	59.2	54.9	2.8**	-1.5ns	75 587
Medium	61.3	61.1	62.6	58.8	1.5ns	-2.3ns	68 528
Rich	67.3	68.7	64.6	63.8	-4.1***	-4.9***	61 073
Richest	77.1	79.6	71.0	71.6	-8.6***	-8.0***	52 445
Mother's instruction							
No education	47.5	47.7	47.4	44.9	-0.3ns	-2.8ns	135 263
Primary	59.4	61.2	56.4	55.1	-4.8***	-6.1***	111 772
Secondary or higher	77.5	80.4	72.4	73.1	-8.0***	-7.3***	99 796
Mother's occupation							
Inactive	60.2	59.6	62.0	59.4	2.4**	-0.2ns	104 909
Active	62.7	63.4	62.0	57.9	-1.4ns	-5.5***	229 455
Mother's exposure to the media							
No exposure	50.4	50.1	53.1	46.2	3.0***	-3.9***	136 901
Low exposure	63.5	64.2	62.2	61.0	-2.0**	-3.2**	150 717
High exposure	75.8	77.5	72.4	72.2	-5.1***	-5.3***	58 594
Total	62.0	62.3	62.3	58.9	0.0ns	-3.4***	346 864

Source : DHS Significance: *** 1%; ** 5% ; * 10% ; Ns not significant

unintended pregnancies are 21% (OR=0.786) and 36% (OR=0.640), respectively, less likely to have an early antenatal visit compared to planned pregnancies. These interactions indicate that the relationship between pregnancy planning and early antenatal visits varies according to the mother's wealth index, education and occupation (Table 7).

Compared to births in households with medium wealth index, those in poor households are 11% more likely to have early antenatal visits in the event of mistimed pregnancies. They are also 29% more likely to have early antenatal visits in the event of unwanted pregnancies. In addition, births from poor households are 21% more likely to have early from antenatal visits when they are unwanted. The lower use of antenatal visits in the first three months of pregnancy when it is unwanted is therefore less widespread among the poorest populations compared to others.

By level of education, births of mothers with secondary school or higher are 22% less likely to have early antenatal visits in the event of mistimed pregnancies compared to other women. The negative consequences of poor pregnancy planning on early antenatal visits are therefore more

significant among the most educated women (Table 7).

Similarly, less use of antenatal visits in the first three months of an unintended pregnancy is less common among inactive women. Indeed, their births are 17% more likely to have early prenatal visits in the event of an unwanted pregnancy compared to births of working women (Table 7).

Ultimately, it appears that the negative effect of poor pregnancy planning is not uniform across the characteristics of mothers. Births of the wealthiest mothers, working mothers and mothers with secondary education or higher are the least likely to have early antenatal visits when their pregnancies are mistimed or unwanted.

Multivariate analysis of link between pregnancy planning and access to four or more prenatal visits

As for the access to 4 or more prenatal visits, the results indicate that pregnancy planning is a determining factor. Thus, the odds ratios of the logistic models show that, all other things being equal, the probability of having at least four

Table 6: Outcome of logistic regressions on the relationship between pregnancy planning and the use of antenatal visits by country

Country/Sub-region	Early prenatal visit			4 or more antenatal visits		
	Planned	Mistimed	Unwanted	Planned	Mistimed	Unwanted
Southern Africa	Ref.	0.778***	0.780***	Ref.	0.794***	0.691***
Angola	Ref.	0.983ns	0.819*	Ref.	0.890**	0.725***
Lesotho	Ref.	0.693**	0.377***	Ref.	0.569***	0.286***
Malawi	Ref.	0.777***	0.913ns	Ref.	0.799***	0.839***
Mozambique	Ref.	0.882ns	1.418**	Ref.	0.807***	0.696***
Namibia	Ref.	0.936ns	0.780**	Ref.	0.997ns	0.592***
South Africa	Ref.	0.622***	0.914ns	Ref.	0.820*	0.942ns
Zambia	Ref.	0.796***	0.746**	Ref.	0.779***	0.711***
Zimbabwe	Ref.	0.611***	0.744**	Ref.	0.728***	0.749**
Central Africa	Ref.	0.678***	0.734***	Ref.	0.792***	0.739***
Burundi	Ref.	0.732***	0.708***	Ref.	0.816***	0.765***
Cameroon	Ref.	0.685***	0.729**	Ref.	0.789***	0.717**
Chad	Ref.	0.871*	0.962ns	Ref.	0.821***	0.805ns
Congo	Ref.	0.747***	0.875ns	Ref.	0.773***	0.731*
DRC	Ref.	0.668***	0.781**	Ref.	0.895**	0.924ns
Gabon	Ref.	0.559***	0.646***	Ref.	0.761***	0.631***
East Africa	Ref.	0.756***	0.699***	Ref.	0.755***	0.778***
Comoros	Ref.	0.754**	0.683**	Ref.	0.680***	1.187ns
Ethiopia	Ref.	0.934ns	0.641***	Ref.	0.797***	0.738***
Kenya	Ref.	0.773***	0.695***	Ref.	0.721***	0.672***
Madagascar	Ref.	0.818**	0.711***	Ref.	0.822**	0.732***
Rwanda	Ref.	0.586***	0.595***	Ref.	0.610***	0.554***
Tanzania	Ref.	0.749***	0.765ns	Ref.	0.885*	0.646***
Uganda	Ref.	0.870***	0.942ns	Ref.	0.989ns	0.974ns
West Africa	Ref.	0.725***	0.626***	Ref.	0.689***	0.651***
Benin	Ref.	0.624***	0.633***	Ref.	1.014ns	1.091ns
Burkina Faso	Ref.	0.719***	0.836ns	Ref.	0.687***	0.769ns
Gambia	Ref.	0.605***	0.686*	Ref.	0.577***	0.928ns
Ghana	Ref.	0.641***	0.631***	Ref.	0.583***	0.564***
Guinea	Ref.	0.933ns	0.512***	Ref.	0.834*	0.383***
Ivory Coast	Ref.	0.796***	0.781ns	Ref.	0.797***	0.780ns
Liberia	Ref.	0.744***	0.426***	Ref.	0.544***	0.522***
Mali	Ref.	0.777***	0.485***	Ref.	0.714***	0.627***
Niger	Ref.	0.850ns	1.137ns	Ref.	0.954ns	0.852ns
Nigeria	Ref.	0.840**	0.672***	Ref.	0.742***	0.841*
Senegal	Ref.	0.706***	0.592**	Ref.	0.621***	0.817ns
Sierra Leone	Ref.	0.983ns	0.977ns	Ref.	0.625***	0.496***
Togo	Ref.	0.682***	0.844ns	Ref.	0.708***	0.725**
Sub-Saharan Africa	Ref.	0.733***	0.711***	Ref.	0.752***	0.705***

Source: DHS Ref.: Reference modality Significance: *** 1%; ** 5% ; * 10% ; Ns not significant

Logistic regressions controlled by region of residence, place of residence, occupation, media exposure and level of education and age of the mother, order of birth, interval with the previous birth, household's wealth index of the and, for supranational levels, the country of residence.

Table 7: Logistic regression results on the relationship between pregnancy planning and the use of antenatal visits in sub-Saharan Africa

Characteristics	Early prenatal visit			4 or more antenatal visits		
	Raw effects	Net effects	Net effects with interactions	Raw effects	Net effects	Net effects with interactions
Planned	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Mistimed	0.865***	0.733***	0.786***	0.999ns	0.752***	0.793***
Unwanted	0.792***	0.711***	0.640***	0.869***	0.705***	0.698***
Rural		Ref.	Ref.		Ref.	Ref.
Urban		0.971ns	0.951**		1.049**	1.060**
Poorest		0.848***	0.810***		0.727***	0.700***
Poor		0.934***	0.915***		0.889***	0.881***
Medium		Ref.	Ref.		Ref.	Ref.
Rich		1.132***	1.137***		1.200***	1.249***
Richest		1.615***	1.666***		1.665***	1.775***
No education		0.845***	0.844***		0.758***	0.744***
Primary		Ref.	Ref.		Ref.	Ref.
Secondary or higher		1.132***	1.218***		1.293***	1.358***
Not in union		0.852***	0.863***		0.808***	0.821***
In union		Ref.	Ref.		Ref.	Ref.
Inactive		0.910***	0.912***		0.912***	0.937***
Active		Ref.	Ref.		Ref.	Ref.
No exposure		0.910***	0.900***		0.859***	0.840***
Low exposure		Ref.	Ref.		Ref.	Ref.
High exposure		1.107***	1.106***		1.147***	1.130***
15-19 years old		0.793***	0.799***		0.767***	0.772***
20-34 years old		Ref.	Ref.		Ref.	Ref.
35-49 years old		1.107***	1.108***		1.070***	1.069***
1 month interval		1.161***	1.169***		1.258***	1.263***
2-3 months interval		Ref.	Ref.		Ref.	Ref.
4-5 months interval		0.892***	0.895***		0.979ns	0.983ns
6 months or more interval		0.775***	0.777***		0.864***	0.864***
0 months		Ref.	Ref.		Ref.	Ref.
Less than 24 months		0.901***	0.901***		0.846***	0.849***
24-47 months		Ref.	Ref.		Ref.	Ref.
48 months or more		1.158***	1.160***		1.211***	1.208***
Planned # Rural			Ref.			Ref.
Planned # Urban			Ref.			Ref.
Mistimed # Rural			Ref.			Ref.
Mistimed # Urban			1.044ns			0.970ns
Unwanted # Rural			Ref.			Ref.
Unwanted # Urban			1.106ns			0.945ns
Planned # Poorest			Ref.			Ref.
Planned # Poor			Ref.			Ref.
Planned # Medium			Ref.			Ref.
Planned # Rich			Ref.			Ref.
Planned # Richest			Ref.			Ref.
Mistimed # Poorest			1.113**			1.125**
Mistimed # Poor			1.022ns			1.027ns
Mistimed # Medium			Ref.			Ref.
Mistimed # Rich			0.988ns			0.855***
Mistimed # Richest			0.906ns			0.778***
Unwanted # Poorest			1.292***			1.184**
Unwanted # Poor			1.210**			1.038ns

Unwanted # Medium			Ref.			Ref.
Unwanted # Rich			0.967ns			0.965ns
Unwanted # Richest			0.840ns			0.936ns
Planned # No education			Ref.			Ref.
Planned # Primary			Ref.			Ref.
Planned # Secondary or higher			Ref.			Ref.
Mistimed # No education			1.086*			1.115***
Mistimed # Primary			Ref.			Ref.
Mistimed # Secondary or higher			0.781***			0.892***
Unwanted # No education			1.026ns			1.158**
Unwanted # Primary			Ref.			Ref.
Unwanted # Secondary or higher			0.919ns			0.865*
Planned # Inactive			Ref.			Ref.
Planned # Active			Ref.			Ref.
Mistimed # Inactive			0.956ns			0.903***
Mistimed # Active			Ref.			Ref.
Unwanted # Inactive			1.168**			0.995ns
Unwanted # Active			Ref.			Ref.
Planned # No Exposure			Ref.			Ref.
Planned # Low exposure			Ref.			Ref.
Planned # High Exposure			Ref.			Ref.
Mistimed # No exposure			1.061ns			1.114***
Mistimed # Low exposure			Ref.			Ref.
Mistimed # High Exposure			1.019ns			1.057ns
Unwanted # No Exposure			0.983ns			0.977ns
Unwanted # Low exposure			Ref.			Ref.
Unwanted # High exposure			0.950ns			1.029ns
chi2	150.1	21958.0	22112.7	33.5	26846.6	26886.6
N	244429	235083	235083	241213	231960	231960

Source: DHS Ref.: Reference modality Significance: *** 1%; ** 5%; * 10%; Ns not significant

Logistic regressions controlled by region of residence, place of residence, occupation, media exposure and level of education and age of the mother, order of birth, interval with the previous birth, household's wealth index of the and, for supranational levels, the country of residence.

antenatal visits is reduced by 25% (OR=0.752) and 29% (OR=0.705) respectively for mistimed and unwanted pregnancies, compared to planned pregnancies (Table 6).

In all subregions of sub-Saharan Africa, the occurrence of a mistimed or unwanted pregnancy has a negative influence on the access to the four recommended antenatal visits. This influence is greater in West Africa, where mistimed and unwanted pregnancies are 31% (OR=0.689) and 35% (OR=0.651), respectively, less likely to have four or more antenatal visits compared to planned pregnancies (Table 6).

In terms of country results, pregnancy planning has no impact on the access to at least four antenatal visits in Benin, Niger, South Africa and Uganda. However, its influence is significant in other sub-Saharan countries. In 25 of the 34 countries, mistimed pregnancies are less likely to have four or more antenatal visits, while in the case

of unwanted pregnancies, this number rises to 21 countries (Table 6).

When interactions are taken into account, it appears that mistimed and unwanted pregnancies are respectively 21% (OR=0.793) and 30% (OR=0.698) less likely to have four or more prenatal visits compared to planned pregnancies. Also, these interactions indicate that the relationship between pregnancy planning and access to four prenatal visits varies with the household's wealth index and education, occupation, and degree of media exposure of mother (Table 7). Compared to births in households with medium wealth index, those in very poor households are 13% more likely to receive four or more antenatal visits in the event of mistimed pregnancies. This relative risk is 14% and 22% lower for births that occurred in rich and very rich households. Thus, less access to four antenatal visits when the pregnancy is mistimed is more frequent among the rich and less common among the poor. A

similar result is observed for unwanted births where, compared to households with medium wealth index, births in very poor households are 18% more likely to have four or more prenatal visits in the event of an unwanted pregnancy.

In addition, compared to their counterparts, births of women without education are 12% more likely to receive the recommended four antenatal visits when the pregnancy is mistimed or unwanted. This relative risk is 16% higher in the case of unwanted pregnancies. Births of women with a secondary education or higher are 13% less likely to have these four visits in the case of mistimed pregnancies. Births of the most educated women are the ones who suffer the most from the negative consequences of poor pregnancy planning on the access to the four recommended antenatal visits (Table 7). Also, in the case of mistimed pregnancies, births of inactive women are 10% less likely to have the recommended four prenatal visits compared to active women. Finally, the births of women not exposed to the media are less affected by mistimed pregnancies. When their pregnancy has been mistimed, they are 11% more likely to have four antenatal visits than other births (Table 7).

Ultimately, the negative effect of poor pregnancy planning varies according to certain characteristics of the mothers. Births to the richest households, those of mothers with secondary education or higher, inactive, and exposed to the media are the most affected by the reduced use of the four antenatal visits when the pregnancy is mistimed or unwanted.

Discussion

The issue of the consequences of unwanted or mistimed pregnancies remains a major concern in the field of reproductive health. This article set out to assess the impact of pregnancy planning on antenatal care in sub-Saharan Africa while identifying the characteristics of mothers that influence this relationship. Bivariate and multivariate analyses were therefore conducted using data from the Demographic and Health Surveys of 32 countries.

The results indicate that in sub-Saharan Africa, compared to planned pregnancies, mistimed and unwanted pregnancies are 27% (OR=0.733) and 29% (OR=0.711) respectively less likely to have an antenatal visit in the first three months of pregnancy.

The occurrence of a mistimed or unwanted pregnancy has a negative influence on the early use of prenatal visits. This finding is consistent with another study conducted in sub-Saharan Africa that shows that women with mistimed and unwanted pregnancies are 20% and 19% less likely to have early antenatal visits respectively compared to those with planned pregnancies¹⁸. A meta-analysis¹⁹ leads to similar results in Ethiopia. She reports that in this country, the likelihood of late initiation of antenatal care was 2.16 times higher among women with unintended pregnancies compared to women who intended to become pregnant. In a similar vein, results from a study conducted in south-western Ethiopia show that unintended pregnancies are significantly (OR: 0.75, 95% CI: 0.58-0.97) associated with the use of antenatal care services and the receipt of adequate antenatal care (OR: 0.67, 95% CI, 0.46-0.96)²⁷. Similar results have been recorded in Rwanda^{21,22}, Lesotho²³, Kenya²⁴ and Tanzania²⁵. This result is also observed in Ghana, Guinea-Bissau, Ethiopia, Uganda and Bangladesh where women with unintended pregnancies were less likely to have their first visit in the first trimester (ORa 0.71, 95% CI 0.63-0.79) compared to women with planned pregnancies²⁶. As for the explanation of this result, it appears that unintended pregnancies can reduce the need for antenatal care for various reasons. For example, if the woman does not recognize that she is pregnant, does not want to acknowledge her pregnancy, or does not want others to know about it (which may be the case if the pregnancy is the result of rape or incest), she may not seek antenatal care⁵.

In terms of the use of 4 or more prenatal visits, the results indicate that pregnancy planning is a determining factor. Thus, the odds ratios of the logistic models show that, all else being equal, the probability of having at least four antenatal visits is reduced by 25% (OR=0.752) and 29% (OR=0.705) respectively for mistimed and unwanted pregnancies, compared to planned pregnancies. This result is in line with those obtained by another study conducted in sub-Saharan Africa¹⁸ which indicates a 4% reduction in the chances of making an additional prenatal visit for mistimed and unwanted pregnancies. This result is also corroborated by a study conducted in 5 countries, including 4 in sub-Saharan Africa (Ghana, Guinea-Bissau, Ethiopia, Uganda and Bangladesh), which found that women with unwanted pregnancies were less likely to

attend more than 4 antenatal care visits (aor 0.73, 95% CI 0.64-0.83) compared to women with planned pregnancies²⁶. Finally, similar results were also observed in low- and middle-income countries where an association is observed between unintended pregnancies and the use of four or more antenatal visits: mothers whose pregnancies were unwanted had a 3.6% lower probability of receiving adequate antenatal care [95% CI:1.9-5.4%] compared to those whose pregnancy was desired⁴. The analyses also revealed that the negative effect induced by unintended pregnancy is not uniform. It varies according to the country and sub-region, but also according to certain socio-demographic and economic characteristics of the mothers. Births of the richest mothers, those of working mothers and those of mothers with a secondary level of education or higher are the least likely to have an early antenatal visit when their pregnancies are mistimed or unwanted. Similarly, births of the richest households, births of mothers with secondary education or higher, births of inactive mothers, and births of mothers exposed to the media are most affected by the least use of four or more antenatal visits when the pregnancy is mistimed or unwanted.

These results reflect a greater extent of the consequences of mistimed or unwanted pregnancies among the most advantaged populations (richer, better educated and more exposed to the media). This result could be explained by an increased psychosocial impact in these populations in the event of a mistimed or unwanted pregnancy, which very often rhymes with school dropout and an impairment of life projects. The obligation to interrupt studies or even to end them permanently in the event of an unwanted or mistimed pregnancy is a serious consequence for educated women who are pursuing their studies, which can lead them to not make adequate use of prenatal care. Especially since they are more inclined to hide their pregnancy during the first few months for fear of disappointing those around them or because of the way they will be looked upon by the society. Similar consequences can also be seen at work through obstacles to their promotions or unfair dismissals.

In addition, this study has certain limitations that should be noted. Indeed, DHS data have limitations inherent in any retrospective, cross-sectional and single-pass survey, including selection and omission biases. As such, the main independent

variable (pregnancy planning) has inherent limitations in its retrospective nature. Reporting an unintended pregnancy is subject to criticism because it is reported by mothers after the birth of children and can therefore be subject to recall bias. Also, we have included surveys that were conducted at different times (between 2010 and 2023). This could affect the comparability of data across countries.

Conclusion

The aim of this article was to analyse the relationship between pregnancy planning and prenatal care in sub-Saharan Africa, and to identify the characteristics of mothers that influence this relationship. The latest demographic and health survey data from 32 sub-Saharan African countries were mobilized, and bivariate and multivariate methods using binomial logistic regressions were used for the analysis. The results indicate that in sub-Saharan Africa, unintended pregnancies are less likely to have an antenatal visit in the first three months of pregnancy and to have at least four antenatal visits compared with planned pregnancies. Another major finding is that births of the most advantaged women (the richest, most educated, and most exposed to the media) have least adequate prenatal visits in the event of an unintended pregnancy. This result could be linked to a greater psychosocial impact on these women, due to the consequences on their studies and professional projects; anything that would not encourage them to have adequate prenatal care. The results underline the importance of increasing contraceptive prevalence in sub-Saharan Africa in order to effectively combat mistimed and unwanted pregnancies, but also of raising awareness, particularly among the more privileged populations, via the mass media, with a view to reducing the adverse effects of these pregnancies and improving maternal and child health.

Acknowledgments

We thank the DHS Program for approval and access to the original data.

Ethical considerations

Ethical approval of this study was not required as the data are secondary and available in the public

domain. Further details regarding DHS data and ethical standards are available at <http://dhsprogram.com/data/available-datasets.cfm>.

Data availability

The Demographic and Health Survey data analyzed in this study are available and accessible on the DHS Program website <http://dhsprogram.com/data/available-datasets.cfm>.

Funding

Projet d'Harmonisation et d'Amélioration des Statistiques de l'Afrique de l'Ouest (PHASAO) provided funding for Article Processing Charges (APC)

Competing interests

The authors have declared no conflict of interest with respect to the publication of this article.

Authors' contributions

Sibiri Clement Ouedraogo designed the study, carried out the data analysis and wrote the results. Moussa Bougma critically reviewed the article for its intellectual content. All the authors read and approved the content of the manuscript.

References

1. United Nations. Report of the International Conference on Population and Development. Cairo. 1994;194. <https://www.un.org/fr/conferences/population/lecaire1994>
2. Hubacher D, Mavranezouli I and McGinn E. Unintended pregnancy in sub-Saharan Africa: magnitude of the problem and potential role of contraceptive implants to alleviate it. *Contraception*. 2008;78:73-8. <https://www.sciencedirect.com/science/article/abs/pii/S0010782408001042>
3. Brown SS and Eisenberg L. The best intentions: Unintended pregnancy and the well-being of children and families. Institute of medicine. National Academies Press; 1995. 392 p. <https://www.ncbi.nlm.nih.gov/books/NBK232127/>
4. Hajizadeh M and Nghiem S. Does unwanted pregnancy lead to adverse health and healthcare utilization for mother and child? Evidence from low- and middle-income countries. *Int J Public Health*. 2020;65:457-68. <https://doi.org/10.1007/s00038-020-01358-7>
5. Rahman MM, Rahman MM, Tareque MI, Ferdos J and Jesmin SS. Maternal pregnancy intention and professional antenatal care utilization in Bangladesh: a nationwide population-based survey. *PloS One*. 2016;11:e0157760. <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0157760>
6. Dibaba Y, Fantahun M and Hindin MJ. The effects of pregnancy intention on the use of antenatal care services: systematic review and meta-analysis. *Reprod Health*. 2013;10:50. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3848573/>
7. Marston C and Cleland J. Do unintended pregnancies carried to term lead to adverse outcomes for mother and child? An assessment in five developing countries. *Popul Stud*. 2003;57:77-93. <https://www.tandfonline.com/doi/abs/10.1080/0032472032000061749>
8. Cheng D, Schwarz EB, Douglas E and Horon I. Unintended pregnancy and associated maternal preconception, prenatal and postpartum behaviors. *Contraception*. 2009;79:194-8. <https://pubmed.ncbi.nlm.nih.gov/19185672/>
9. Eggleston E. Unintended pregnancy and women's use of prenatal care in Ecuador. *Soc Sci Med*. 2000;51:1011-8. <https://www.sciencedirect.com/science/article/abs/pii/S0277953600000101>
10. Joyce TJ, Kaestner R and Korenman S. The effect of pregnancy intention on child development. *Demography*. 2000;37:83-94. <https://pubmed.ncbi.nlm.nih.gov/10748991/>
11. Kost K, Landry DJ and Darroch JE. Predicting maternal behaviors during pregnancy: does intention status matter? *Fam Plann Perspect*. 1998;30:79-88. <https://pubmed.ncbi.nlm.nih.gov/9561873/>
12. Kost K and Lindberg L. Pregnancy intentions, maternal behaviors, and infant health: investigating relationships with new measures and propensity score analysis. *Demography*. 2015;52:83-111. <https://pubmed.ncbi.nlm.nih.gov/25573169/>
13. Lindberg L, Maddow-Zimet I, Kost K and Lincoln A. Pregnancy intentions and maternal and child health: an analysis of longitudinal data in Oklahoma. *Matern Child Health J*. 2015;19:1087-96. <https://pubmed.ncbi.nlm.nih.gov/25287250/>
14. Sable MR and Wilkinson DS. Pregnancy Intentions, Pregnancy Attitudes, and the Use of Prenatal Care in Missouri. *Matern Child Health J*. 1998;2:155-65. <https://doi.org/10.1023/A:1021827110206>
15. Erol N, Durusoy R, Ergin I, Döner B and Çiçeklioğlu M. Unintended pregnancy and prenatal care: A study from a maternity hospital in Turkey. *Eur J Contracept Reprod Health Care*. 2010;15:290-300. <https://pubmed.ncbi.nlm.nih.gov/20809676/>
16. Singh A, Singh A and Mahapatra B. The consequences of unintended pregnancy for maternal and child health in rural India: evidence from prospective data. *Matern Child Health J*. 2013;17:493-500. <https://pubmed.ncbi.nlm.nih.gov/22527770/>
17. Singh A and Thapa S. Adverse consequences of unintended pregnancy for maternal and child health in Nepal. *Asia Pac J Public Health*. 2015;27:NP1481-91. <https://pubmed.ncbi.nlm.nih.gov/24097931/>

18. Amo-Adjei J and Anamaale Tuoyire D. Effects of planned, mistimed and unwanted pregnancies on the use of prenatal health services in sub-Saharan Africa: a multicountry analysis of demographic and health survey data. *Trop Med Int Health*. 2016;21:1552-61. <https://onlinelibrary.wiley.com/doi/full/10.1111/tmi.12788>
19. Tolossa T, Turi E, Fetensa G, Fekadu G and Kebede F. Association between pregnancy intention and late initiation of antenatal care among pregnant women in Ethiopia: a systematic review and meta-analysis. *Syst Rev*. 2020;9:191. <https://pubmed.ncbi.nlm.nih.gov/32819428/>
20. Wado YD, Afework MF and Hindin MJ. Unintended pregnancies and the use of maternal health services in Southwestern Ethiopia. *BMC Int Health Hum Rights*. 2013;13:36. <https://pubmed.ncbi.nlm.nih.gov/24011335/>
21. Bagambe PG, Umubyeyi A and Luginaah I. Effect of pregnancy intention on the timing and sustained use of antenatal care services in Rwanda. *Afr J Reprod Health*. 2021;25:90-100. <https://www.ajrh.info/index.php/ajrh/article/view/2607>
22. Mkandawire P, Atari O, Kangmennaang J, Arku G, Luginaah I and Etowa J. Pregnancy intention and gestational age at first antenatal care (ANC) visit in Rwanda. *Midwifery*. 2019;68:30-8. <https://pubmed.ncbi.nlm.nih.gov/30343263/>
23. Mkandawire P, Kangmennaang J, Walker C, Antabe R, Atuoye K and Luginaah I. Pregnancy intention and gestational age at first antenatal care visit in Lesotho. *Afr J Midwifery Womens Health*. 2021;15:1-11. <https://www.magonlinelibrary.com/doi/abs/10.12968/ajmw.2018.0034>
24. Ochako R and Gichuhi W. Pregnancy wantedness, frequency and timing of antenatal care visit among women of childbearing age in Kenya. *Reprod Health*. 2016;13:1-8. <https://link.springer.com/article/10.1186/s12978-016-0168-2>
25. Exavery A, Kanté AM, Hingora A, Mbaruku G, Pemba S and Phillips JF. How mistimed and unwanted pregnancies affect timing of antenatal care initiation in three districts in Tanzania. *BMC Pregnancy Childbirth*. 2013;13:1-11. <https://link.springer.com/article/10.1186/1471-2393-13-35>
26. Yargawa J, Machiyama K, Ponce Hardy V, Enuameh Y, Galiwango E, Gelaye K, Mahmud K, Thysen SM, Kadengye DT, Gordeev VS, Blencowe H, Lawn JE, Baschieri A, Cleland J and the Every Newborn-INDEPTH Study Collaborative Group. Pregnancy intention data completeness, quality and utility in population-based surveys: EN-INDEPTH study. *Popul Health Metr*. 2021;19:6. <https://doi.org/10.1186/s12963-020-00227-y>