


RESEARCH ARTICLE

# Correlates of mistimed and unwanted pregnancy among women in the Democratic Republic of Congo

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## Abstract

Unwanted and mistimed pregnancies impose threats on the health and well-being of the mother and child and limit the acquisition of optimal sexual and reproductive health services, especially in resource-constrained settings like the Democratic Republic of Congo (DRC). This study aimed to determine the prevalence and correlates of mistimed and unwanted pregnancies among women in the DRC. Data were drawn from the 2013–14 DRC Demographic Health Survey (EDS-RDC II). Bivariate and multivariate logistic regression analysis was performed to identify correlates of mistimed and unwanted pregnancies. Sequential logistic regression modelling including distal (place of residence), intermediate (socio-demographic and socioeconomic factors) and proximal (reproductive health and family planning) factors was performed using multivariate analysis. More than a quarter (28%) of pregnancies were reported as unintended (23% mistimed and 5% unwanted). Women who wanted no more children (aOR 1.21; CI: 1.01, 1.44) had less than 24 months of birth spacing (aOR 2.14; CI: 1.80, 2.54) and those who intended to use a family planning method (aOR 1.24; CI: 1.01, 1.52) reported more often that their last pregnancy was mistimed. Women with five or more children (aOR 2.13; CI: 1.30, 3.49), those wanting no more children (aOR 13.07; CI: 9.59, 17.81) and those with more than 48 months of birth spacing (aOR 2.31; CI: 1.26, 4.23) were more likely to report their last pregnancy as unwanted. The high rate of unintended pregnancies in the DRC shows the urgency to act on the fertility behaviour of women. The associated intermediate factors for mistimed and unwanted pregnancy indicate the need to accelerate family planning programmes, particularly for women of high parity and those who want no more children. Likewise, health promotion measures at the grassroots level to ensure women's empowerment and increase women's autonomy in health care are necessary to address the social factors associated with mistimed pregnancy.

**Keywords:** Unintended pregnancy; Reproductive health; DRC

## Introduction

Unwanted and mistimed pregnancy is collectively known as unintended pregnancy (Santelli *et al.*, 2003). As the term suggests, unwanted pregnancies occur when no children or no more children are desired, and are sometimes termed 'number failures'. Similarly, pregnancies that occur earlier than desired or are mistimed are known as 'timing failures' (Santelli *et al.*, 2003). The notion of unintended pregnancy is vital in exploring a woman's capacity to decide whether she wants to conceive, the best timing of the pregnancy and the number of children she desires (Johnson-Mallard *et al.*, 2017). Therefore, studying the prevalence and associated factors of

unintended pregnancy is important to understand the fertility trend of a population and identify unmet sexual and reproductive health needs (Johnson-Mallard *et al.*, 2017).

Studies suggest that the following factors are associated with women reporting unintended pregnancy: delayed care during pregnancy and the post-natal period, poor prenatal care (Brown & Eisenberg, 1995), poor maternal mental health, reduced mother/child relationship quality, physical abuse and violence against women (Pallitto *et al.*, 2005; Tiruneh *et al.*, 2017), poor development outcomes in the children, increased risk of low birth weight of babies and negligence in meeting nutritional demands and completion of vaccination for children. Women experiencing these problems have increased maternal and child morbidity and mortality (Gipson *et al.*, 2008; Singh *et al.*, 2013). Under restrictive abortion laws, unintended pregnancy leads to clandestine termination of pregnancies, affecting women's health and life. In addition to predisposing health risks in women and children, unintended pregnancies lead to unwanted population growth, putting a strain on an already inadequate health care system, financial capacity and compromising the governments' efforts to provide efficient health care services (Bradley *et al.*, 2011; Sonfield *et al.*, 2011; Trussell *et al.*, 2013).

According to Sedgh *et al.* (2014), an estimated 86 million unintended pregnancies occurred worldwide in 2012, of which 74 million (86%) occurred in less-developed countries. Despite recent developments in reproductive health and family planning, the burden of unintended pregnancy is disproportionately high in low- and middle-income countries (Kott, 2011), and the Democratic Republic of Congo (DRC) is no exception. The DRC, the third most populous country in sub-Saharan Africa, is among the five countries with the highest rates of maternal mortality worldwide (Bongaarts, 2016), with a rate of 693 per 100,000 live births. It has a high total fertility rate of 6.6 births per woman, a low contraceptive prevalence rate (20%), a high unmet need for family planning services (28%) and an alarming number of rape cases (Banwell, 2014; Ministère de la Santé Publique (MSP) & ICF International, 2014).

Family planning and reproductive health have been neglected over the last four decades in this war-torn country (Black *et al.*, 2014). The inclusion of family planning as an integral component of government maternal health and poverty reduction only occurred recently, in 2012. The formation of reproductive health policy directives, especially for family planning, is commendable, but translating these into local health system provision remain a significant challenge (Mukaba *et al.*, 2015). These factors create a conducive environment for unintended pregnancy. A study from 2016 conducted in the Kwango district of the DRC found an unintended pregnancy prevalence of 51.4% among women of reproductive age (Dhokal *et al.*, 2016), whereas the prevalence of unintended pregnancies in the neighbouring countries of Congo Brazzaville and Uganda were 40% and 43%, respectively (Uganda Bureau of Statistics (UBOS) & ICF International, 2012; Ndziessi & Kaboru, 2016).

There are considerable challenges to measuring unintended pregnancy. A retrospective questionnaire for pregnancy intention is subject to post-facto rationalization, whereby women are likely to report a pregnancy as wanted even though it was initially unwanted (Rosenzweig & Wolpin, 1993). Irrespective of development status, cultural beliefs, norms and practices pertaining to pregnancies affect the reporting of the intention of pregnancies throughout the world (Exavery *et al.*, 2014; Rice *et al.*, 2017). In the context of the DRC, religious beliefs do not promote the use of family planning methods, and with its patriarchal cultural setting, women's decisions and access to reproductive health services and its utilization are curtailed (Yazdkhasti *et al.*, 2015; Arousell & Carlbom, 2016). Consequently, these women are less likely to report their pregnancy as unintended. It is also essential to evaluate the distinction between unwanted and mistimed pregnancies, because unintended pregnancy alone fails to reflect the factors that determine women's desirability of their specific pregnancy and its consequences (D'Angelo *et al.*, 2004; Exavery *et al.*, 2014; Santelli *et al.*, 2003).

To the best of the authors' knowledge, no study has been conducted in the DRC at the national level to understand the correlates of mistimed and unwanted pregnancy separately. This study is

the first of its type to use nationally representative survey data from the second Demographic Health Survey (DHS) in the Democratic Republic of Congo conducted in 2013–14 (EDS-RDC II), to determine the prevalence and factors associated with unintended (mistimed and unwanted) pregnancies among women of reproductive age in the DRC.

## Methods

### *Study area and data collection*

The study was based on data from the DHS conducted in the Democratic Republic of Congo (EDS-RDC II) in 2013–14. This was the second comprehensive nationally representative survey to be conducted in the country as a part of the global DHS project. The survey used a multistage cluster sampling method, which was stratified by the primary sampling unit. The details of the sampling method are available in the full survey report (Ministère de la Santé Publique (MSP) & ICF International, 2014).

The study included women's individual data and household data. Eligible women were those aged 15–49 years who had had at least one live birth in the 5 years preceding the survey ( $N=19,097$ ). Of these, 18,827 were successfully interviewed (a response rate of 99%), and these comprised the unweighted population of this study. Because the DHS used sample weights to make the sampled data representative of the entire population, the same method of weighted calculation was applied in the downloaded identifier decoded datasets. Thus, after adjusting the stratified sample design and sample weight, the weighted population size was 16,340.

The third-party DHS data used in this study can be accessed from publicly available repositories owned by the DHS Program. A request to download the dataset can be submitted to the DHS Program at: <https://dhsprogram.com/data/Using-Datasets-for-Analysis.cfm>. After approval, the non-transferrable dataset can be freely downloaded from the data repository. The authors did not have any special privileges in obtaining this dataset.

### *Study variables*

#### *Outcome measures*

Women who had at least one live birth within the 5 years preceding the survey were questioned on their pregnancy intention for their last live birth. Widely used concepts and definitions of mistimed and unwanted pregnancy were used as dependent variables. The DHS question was 'When you became pregnant, did you want to become pregnant at that time?' The response was categorized as: (1) 'yes' or (2) 'no'. If the answer was 'yes', it was labelled as an 'intended pregnancy'. If the answer was 'no', the participants were further asked: 'Did you want to have a baby later or did you not want any more children?' The response was recorded as: (1) 'later' or (2) 'no more'; 'later' reflected a mistimed pregnancy and 'no more' reflected an unwanted pregnancy. The responses to these two questions were used as the outcome variables in this study. Mistimed and unwanted pregnancies were converted into two separate dummy variables.

#### *Exposure measures*

The probable correlates of mistimed and unwanted pregnancy identified in datasets were grouped into geographical factors, socio-demographic and socioeconomic factors, and reproductive health and family planning factors. Place of residence (urban, rural) was the only geographical factor included in the study. Among the socio-demographic and socioeconomic factors, wealth quintile was calculated using principal component analysis and categorized into five equal categories (poorest, poorer, middle, richer and richest). Similarly, religion was divided into Protestant, Catholic, other Christians and Other (Muslim, Kimbanguiste, animist and atheist). Likewise, other exposure variables included women's educational level (no education, primary education and

secondary/higher level of education), marital status (never in a union, currently in a union/living with a male partner and formerly in a union) and occupation (unemployed, official/managerial jobs, sales, agricultural and other (unskilled and manual work)). Women's autonomy in deciding about the use of health care was described as 'sole/partial autonomy' if the respondent decided alone or discussed it with her husband or someone else, and as 'no autonomy' if her husband, partner or someone else made the decision. Women were considered as having been 'exposed' to mass media if they read newspapers, listened to the radio or watched television at least once a week; otherwise, they were coded as 'not exposed'.

The following reproductive health and family planning factors were included in the analysis: age (<24 years, 25–34 years, 35–49 years), age at first birth (<20 years, 20 years and older), parity (1–2, 3–4, 5 and above), history of abortion, defined with the inclusion of spontaneous abortion (yes, no) and preceding birth interval (first birth, <24 months, 24–47 months, 48 months or more). Likewise, women were coded as 'knowledgeable' about the ovulatory cycle if they knew that the fertile period lay in the middle of the menstruation cycle and 'not knowledgeable' if they did not know this. Based on their intention to use family planning services, the respondents were grouped into the categories: 'current users', 'not using with the intention to use in future' and 'do not intend to use'. A visit to family planning workers within the past 12 months (yes, no) was also considered as an independent variable in the analysis.

### Statistical analysis

Statistical analysis was performed based on the survey analysis technique (*svy* command) in STATA version 14.0 (Pitblado, 2009). Cross-tabulation with Pearson's chi-squared test was used to test the association between the independent variables and pregnancy intention. A logistic regression analysis was conducted to measure the association between women's pregnancy intention, defined as mistimed and unwanted pregnancy, and geographical, socio-demographic, socioeconomic, family planning and fertility variables.

The conceptual framework of the study was based on the socio-ecological model (SEM), which recognizes the intertwined relationship between individual and their environment. The four-layer socio-ecological model of Dahlgren and Whitehead (1991) was modified and adapted, in a similar way to Koren and Mawn (2010). This interplay of multilevel and multiple factors has previously been used to study the correlates of mistimed and unwanted pregnancies (Koren & Mawn, 2010; Calvert *et al.*, 2013; Hall *et al.*, 2016); a similar concept was adopted for the present study (Dahab *et al.*, 2010; Acharya & Khanal, 2015). The framework included individual factors that are closely associated with women's reproductive health and family planning use, socioeconomic and socio-demographic factors and place of residence (urban and rural) as a geographical factor.

A multivariate logistic regression analysis was used to identify the variables that are simultaneously associated with women's pregnancy intention status. Odds ratios (OR) and 95% confidence intervals (CI) were calculated for the different logistic regression models (Model I, Model II and Model III). Model I consisted of geographical factors as the distal correlates for unintended pregnancy. In Model 2, socioeconomic and socio-demographic variables were added, and in Model 3, reproductive health and family planning factors, regarded as proximate factors, were adjusted. Variables that were significant in the previous model ( $p < 0.05$ ) were additionally adjusted in the succeeding models until the final model was obtained with all the significant variables. The analytical framework of the study is presented in Figure 1.

### Results

More than seven in ten women with a live birth within 5 years of the survey wanted to become pregnant when they became pregnant and had a live birth, whereas 23% of women wanted to

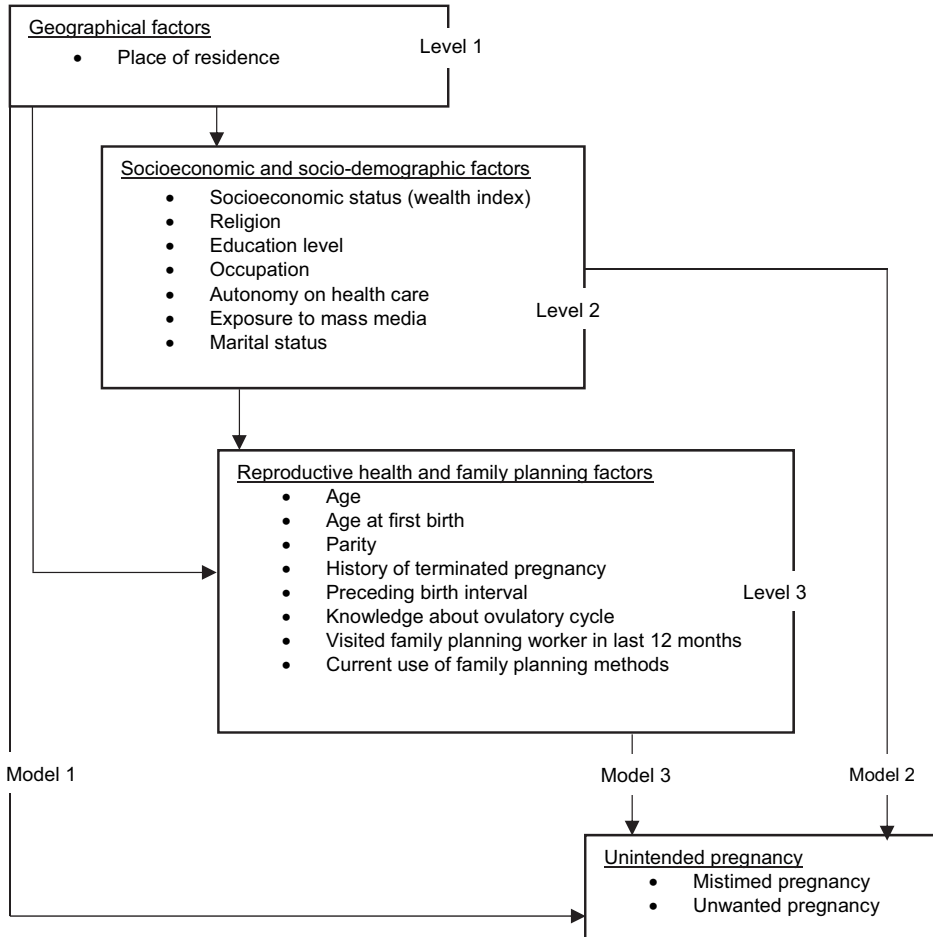


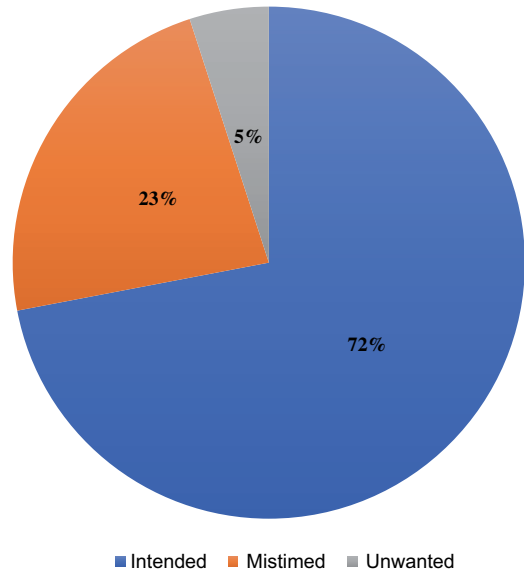
Figure 1. Analytical framework of the study modified and adapted from Hall *et al.* (2016) and Calvert *et al.* (2013).

become pregnant at a later time (had a mistimed pregnancy) and 5% never wanted to become pregnant again (had an unwanted pregnancy) (Fig. 2).

Table 1 shows the background characteristics of study respondents. Over half were 25–34 years old. Most (69.32%) were from rural areas, and more than a quarter were Catholic. More than 50% worked in the agricultural sector, and fewer than two in every ten respondents were in the richest wealth index quintile. Most had no autonomy in decision-making about their health care. Seven out of ten women had given birth for the first time before the age of 20, and more than four out of ten had given birth more than five times. Nearly half of study participants had a preceding birth interval of 24–48 months, and fewer than one in ten had visited a family planning health worker in the last 12 months.

**Characteristics of women experiencing a mistimed or unwanted pregnancy**

The percentages of women reporting mistimed and unwanted pregnancies were greater for women living in urban areas and those from the richest wealth quintile compared with their counterparts (Table 1). Similarly, the percentage of mistimed pregnancies increased with an increase in women’s level of education and decreased with an increase in the level of autonomy



**Figure 2.** Pregnancies by intention status among women of reproductive age in the Democratic Republic of Congo, 2013–14,  $N=16,340$ .

in decision-making on health care use. The proportion of women reporting a mistimed pregnancy decreased with an increase in age, while the percentage of unwanted pregnancies increased with age. The majority (62.03%) of pregnancies among the women who were never in any union were mistimed.

### **Factors influencing mistimed pregnancies**

The multiple logistic regression findings (Table 2) showed that the Protestant religion and women's occupation in the agricultural sector were negatively correlated with experiencing a mistimed pregnancy. Similarly, women with primary education (aOR 1.32; CI: 1.07, 1.63) and secondary and above education (aOR 1.79; CI: 1.45, 2.22) had higher odds of experiencing a mistimed pregnancy compared with uneducated women in the adjusted model. The respondents currently in a union (aOR 0.22; CI: 0.17, 0.27) and formerly in a union (aOR 0.41; CI: 0.29, 0.56) had a low probability of the occurrence of a mistimed pregnancy compared with women who were never in a union. Similarly, the adjusted model showed that the odds of a mistimed pregnancy decreased with an increase in respondent's age and preceding birth interval, but the odds ratio was found to be higher than that of the unadjusted analysis. Women who were not using family planning methods but who intended to use them in the future with the unmet need for family planning methods reported higher odds (aOR 1.24; CI: 1.01, 1.52) of mistimed pregnancies, while those who did not have any intention of using family planning methods had lower odds (aOR 0.64; CI: 0.51, 0.80) of a mistimed pregnancy compared with current users.

### **Factors influencing unwanted pregnancies**

The final model of the analysis indicated that women involved in the agricultural sector had a 38% lower chance of reporting their last pregnancy as unwanted compared with unemployed women (Table 3). Women with parity of more than five had higher odds (aOR 2.13; CI: 1.30, 3.49) of rating their last pregnancy as unwanted, with women with a parity of less than two as the reference group. Respondents who intended to have another child were 13 times less likely to report their last pregnancy as unwanted compared with women who did not want any more children. The adjusted model reported that women with a preceding birth interval of more than 48 months

**Table 1.** Distribution of sample women by pregnancy intention and background characteristics ( $N=16,340$ )

Women's characteristic	Total (%)	Mistimed pregnancy (%)	Unwanted pregnancy (%)
<b>Place of residence</b>			
Urban	30.7	31.0	7.1
Rural	69.3	20.1	3.9
<b>Religion</b>			
Catholic	26.8	25.0	5.3
Protestant	28.8	20.0	4.2
Other Christian	37.6	25.0	5.3
Other	6.8	24.0	3.4
<b>Wealth Index</b>			
Poorest	21.9	20.0	3.7
Poor	22.2	19.0	4.4
Middle	20.4	20.3	4.2
Richer	18.4	26.9	4.8
Richest	17.0	33.8	7.7
<b>Education</b>			
No education	19.0	15.3	4.1
Primary education	43.6	21.3	4.9
Secondary education and above	37.4	30.0	5.2
<b>Occupation</b>			
Unemployed	18.7	28.7	5.0
Professional/managerial	4.3	23.9	4.3
Sales	22.4	28.8	7.3
Agricultural	52.9	19.0	3.7
Other	1.8	32.3	9.0
<b>Autonomy on health care decisions</b>			
Sole or partial autonomy	40	19.4	4.9
No autonomy	60	26.1	4.8
<b>Exposure to mass media</b>			
Exposed	72.4	21.5	4.4
Unexposed	27.6	28.6	6.1
<b>Age</b>			
<24	26.4	31.9	1.7
25–34 years	50.3	22.5	3.0
35–49 years	23.2	15.8	12.5
<b>Age at first birth</b>			
<20 years	70.0	24.4	5.42
≥20 years	30.0	21.3	3.59

*(Continued)*

Table 1. (Continued)

Women's characteristic	Total (%)	Mistimed pregnancy (%)	Unwanted pregnancy (%)
<b>Parity</b>			
1–2	28.2	30.8	1.27
3–4	30.1	20.8	2.15
5+	41.7	20.3	9.24
<b>Marital status</b>			
Never in union	3.9	62.0	6.1
Currently in union/living with a man	88.1	20.9	4.5
Formerly in union/living with a man	8.0	32.9	8.2
<b>Preceding birth interval</b>			
First birth	18.5	30.2	1.1
<24 months	21.0	30.2	4.7
24–47 months	47.5	20.8	5.2
48+ months	13.0	12.8	9.4
<b>History of pregnancy termination</b>			
No	83.9	21.1	7.1
Yes	16.1	23.9	4.4
<b>Fertility preference</b>			
Wants another child	71.4	23.2	1.0
Wants no more child	23.4	24.4	17.0
Other	5.2	23.0	3.4
<b>Visited FP worker in last 12 months</b>			
Yes	7.7	23.3	4.0
No	92.3	23.5	4.9
<b>Knowledge about ovulatory cycle</b>			
No knowledge	52.2	23.6	5.2
Knowledgeable	47.8	23.3	4.6
<b>Use of family planning methods</b>			
Current user	21.4	26.3	6.4
Not using/intends to use in future	43.6	30.3	5.4
Do not intend to use	44.1	16.7	3.7
Total N (%)	16,340 (100.0)	3828 (23.0)	794 (5.0)

had higher odds (aOR 2.31; CI: 1.26, 4.23) of reporting their last pregnancy as unwanted. Analysing the influence of the use of family planning methods showed that women with no intention to use family planning methods had lower odds (aOR 0.70; CI: 0.50, 0.98) of reporting their last pregnancy to be unwanted compared with current users.



**Table 2.** Association of background characteristics with mistimed pregnancy using hierarchical multiple logistic regression

Women's characteristic	Model 1		Model 2		Model 3		Model 4	
	OR	95%CI	aOR	95%CI	aOR	95%CI	aOR	95%CI
Place of residence (Ref.: Urban)								
Rural	0.56	[0.47 0.67]	***	0.86	[0.68 1.10]			
Wealth Index (Ref.: Poorest)								
Poor				0.96	[0.79 1.17]			
Middle				0.96	[0.76 1.21]			
Richer				1.19	[0.90 1.57]			
Richest				1.24	[0.89 1.73]			
Religion (Ref.: Catholic)								
Protestant				0.78	[0.62 0.98]	*	0.76	[0.61 0.96] *
Other Christian				0.86	[0.72 1.01]		0.87	[0.73 1.04]
Other				0.94	[0.70 1.27]		0.98	0.71 1.35] 0.99 [0.72 1.36]
Education (Ref.: No education)								
Primary education				1.38	[1.12 1.70]	**	1.34	[1.08 1.65] ** 1.32 [1.07 1.63] **
Secondary education+				1.71	[1.33 2.19]	***	1.84	[1.48 2.29] *** 1.79 [1.45 2.22] ***
Marital status (Ref.: Never in union)								
Currently in union/ living with a man				0.21	[0.16 0.26]	***	0.22	[0.17 0.27] *** 0.22 [0.17 0.27] ***
Formerly in union/ living with a man				0.35	[0.27 0.47]	***	0.41	[0.29 0.56] *** 0.41 [0.29 0.56] ***
Occupation (Ref.: Unemployed)								
Professional/ managerial				0.67	[0.49 0.91]	*	0.82	[0.60 1.12] 0.81 [0.60 1.11]
Sales				1.01	[0.85 1.19]		1.04	[0.87 1.24]
Agricultural				0.83	[0.65 1.06]		0.77	[0.62 0.95] * 0.77 [0.62 0.96] *
Other				0.87	[0.55 1.38]		0.93	[0.58 1.51]
Autonomy on health care decision (Ref.: Sole or partial autonomy)								
No autonomy				1.19	[1.03 1.37]	*	1.17	[1.01 1.35] * 1.18 [1.03 1.36] *
Exposure to mass media (Ref.: Exposed)								
Unexposed				1.10	[0.85 1.41]			
Age (Ref.: <24 years)								
25–34 years							0.75	[0.63 0.89] ** 0.73 [0.63 0.86] ***
35+ years							0.49	[0.38 0.63] *** 0.48 [0.38 0.60] ***

(Continued)

Table 2. (Continued)

Women's characteristic	Model 1		Model 2		Model 3		Model 4	
	OR	95%CI	aOR	95%CI	aOR	95%CI	aOR	95%CI
Age at first birth (Ref.: <20 years)								
≥20 years					0.99	[0.85 1.14]		
Parity (Ref: 1–2)								
3–4					0.75	[0.61 0.93]	**	0.76 [0.62 0.93] **
5+					0.94	[0.75 1.18]		0.95 [0.76 1.18]
History of pregnancy termination (Ref.: No)								
Yes					0.95	[0.80 1.14]		
Fertility preference (Ref.: Wants another child)								
Wants no more children					1.21	[1.01 1.44]	*	1.21 [1.01 1.44] *
Other					1.25	[0.93 1.68]		1.25 [0.93 1.69]
Preceding birth interval (Ref.: First birth)								
<24 months					2.14	[1.80 2.55]	***	2.14 [1.80 2.54] ***
24–47 months					1.31	[1.09 1.57]	**	1.31 [1.09 1.56] **
48+ months					0.70	[0.54 0.90]	**	0.70 [0.54 0.90] **
Knowledge about ovulatory cycle (Ref.: No knowledge)								
Knowledgeable					0.89	[0.77 1.03]		
Use of family planning methods (Ref.: Current user)								
Not using/intend to use in future					1.22	[0.99 1.51]	**	1.24 [1.01 1.52] **
Do not intend to use					0.63	[0.50 0.79]	***	0.64 [0.51 0.80] ***
Visited FP worker in last 12 months (Ref.: Yes)								
No					1.10	[0.83 1.46]		

OR: Odds Ratio; aOR: Adjusted Odds Ratio; CI: Confidence Interval; Ref.: Reference category.

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

## Discussion

More than a quarter of pregnancies among women of reproductive age in the Democratic Republic of Congo in 2013–14 were reported to be unintended; 23% were mistimed and 5% were unwanted. The unintended pregnancy prevalence reported here is similar to that of the neighbouring country of Tanzania (22% mistimed and 4% unwanted pregnancies) (Uganda Bureau of Statistics (UBOS) & ICF International, 2012) and higher than that of Ethiopia (17.1% mistimed and 6.9% unwanted) (Habte *et al.*, 2013). It was lower than that reported in

**Table 3.** Association of background characteristics with unwanted pregnancy: results of hierarchical multiple logistic regressions

Women's characteristic	Model 1		Model 2		Model 3		Model 4	
	OR	95%CI	aOR	95%CI	aOR	95%CI	aOR	95%CI
Place of residence (Ref.: Urban)								
Rural	0.53	[0.40 0.69]	***	0.64	[0.43 0.94]	*	0.76	[0.57 1.02]
Wealth Index (Ref.: Poorest)								
Poor				1.28	[0.84 1.95]			
Middle				1.15	[0.82 1.61]			
Richer				1.04	[0.68 1.59]			
Richest				1.29	[0.76 2.18]			
Religion (Ref.: Catholic)								
Protestant				0.79	[0.55 1.14]		0.85	[0.59 1.23]
Other Christian				0.83	[0.60 1.15]		0.89	[0.64 1.25]
Other				0.60	[0.37 0.98]	*	0.62	[0.37 1.03]
Education (Ref.: No education)								
Primary education				1.05	[0.74 1.49]			
Secondary education and above				0.76	[0.52 1.12]			
Marital status (Ref.: Never in union)								
Currently in union/living with a man				0.74	[0.46 1.18]			
Formerly in union/living with a man				1.50	[0.84 2.70]			
Occupation (Ref.: Unemployed)								
Professional/managerial				0.83	[0.46 1.50]		0.73	[0.39 1.37]
Sales				1.47	[1.06 2.03]	*	1.07	[0.77 1.49]
Agricultural				0.88	[0.59 1.32]		0.67	[0.46 0.98]
Other				1.45	[0.75 2.81]		1.27	[0.61 2.67]
Autonomy on health care decision (Ref.: sole or partial autonomy)								
No autonomy				0.86	[0.68 1.08]			
Exposure to mass media (Ref.: Exposed)								
Unexposed				1.21	[0.87 1.68]			

(Continued)

Table 3. (Continued)

Women's characteristic	Model 1		Model 2		Model 3		Model 4		
	OR	95%CI	aOR	95%CI	aOR	95%CI	aOR	95%CI	
Women's age (Ref.: <24 years)									
25–34 years					0.59	[0.35 0.97]	*	0.52 [0.32 0.85]	*
35+					1.22	[0.66 2.24]		1.00 [0.57 1.75]	
Age at first birth (Ref.: <20 years)									
≥20 years					0.74	[0.54 1.01]			
Parity (Ref.:1–2)									
3–4					1.08	[0.62 1.85]		1.10 [0.65 1.85]	
5+					1.94	[1.12 3.36]	*	2.13 [1.30 3.49]	**
History of pregnancy termination (Ref.: No)									
Yes					1.07	[0.77 1.49]			
Fertility preference (Ref.: Wants another child)									
Wants no more children					12.5	[9.11 17]	***	13.07 [9.59 17.81]	***
Other					2.64	[1.47 4.73]	**	2.75 [1.55 4.85]	**
Preceding birth interval (Ref.: First birth)									
<24 months					1.31	[0.71 2.42]		1.31 [0.72 2.40]	
24–47 months					1.39	[0.80 2.42]		1.40 [0.81 2.42]	
48+ months					2.24	[1.20 4.17]	*	2.31 [1.26 4.23]	**
Knowledge about ovulatory cycle (Ref.: No knowledge)									
Knowledgeable					0.78	[0.60 1.02]			
Use of family planning methods (Ref.: Current users)									
Not using/intend to use in future					0.82	[0.59 1.12]		0.83 [0.59 1.16]	
Do not intend to use					0.68	[0.48 0.97]	*	0.70 [0.50 0.98]	*
Visited FP worker in last 12 months (Ref.: Yes)									
No					1.45	[0.87 2.44]			

OR: Odds Ratio; aOR: Adjusted Odds Ratio; CI: Confidence Interval; Ref.: Reference category.

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

the recent study by Dhakal *et al.* (2016) conducted in Kwango District of the DRC (54.1%) and that of the overall African region, with 35% unintended pregnancies (Sedgh *et al.*, 2014). However, this study's definition of an unintended pregnancy did not include abortion, unlike Sedgh *et al.* (2014). This relatively lower prevalence of unintended pregnancy in the DRC could be linked to the fact that the DRC has recently experienced a decrease in death rate and increase in birth rate (Guengant & May, 2013). Pregnancy in such a scenario is accepted because it leads to a large family size. Hence, Congolese women, on average, want six children, and men desire seven children (Ministère de la Santé Publique (MSP) & ICF International, 2014). Despite the development of policy provision for reproductive health and family planning in the DRC, societal preference and pride in a large family still dominate (Mukaba *et al.*, 2015). Therefore, women from this setting might be less likely to report their last pregnancy as unwanted or mistimed.

Moreover, reproductive decisions derive from conscious choice (Van de Walle, 1992). Women in the DRC still have little agency over pregnancy. This study found that six out of ten women said that they had no autonomy over their health care decision-making. Consequently, women who mentioned not having sole or partial autonomy in health care decisions had an 18% higher chance of reporting their last pregnancy as mistimed. Thus, the conscious choice to decide family size and plan the timing of a newborn is very limited in the patriarchal society of the DRC. This study showed that women involved in agriculture as a major occupation and women with education below secondary level were less likely to report their last pregnancy as mistimed compared with their counterparts. Women working in the agricultural sector, and primarily in non-commercial and subsistence farming areas, prefer more children as they provide helping hands in farm work. This finding is congruent with the results of a study by Acharya *et al.* (2016) in Nepal, where the majority of women work in the informal sector.

Similarly, women with secondary school education and above had a higher probability of mistimed pregnancy; however, this association was not significant for unwanted pregnancy. Educated women aspire to have careers and therefore are more likely to try to avoid pregnancy because they are subjected to the higher opportunity cost of being forced to leave school or work for the sake of the family (Plummer *et al.*, 2010); they thus have a higher probability of reporting mistimed pregnancy. Moreover, educated women have a conducive environment to be able to control the timing of their pregnancies (Okonofua *et al.*, 1999); when it fails, they are aware that the pregnancy was mistimed. This result is similar to those of studies conducted in Nepal and India (Acharya *et al.*, 2014, 2016; Dutta *et al.*, 2015) and previous research in the DRC (Dhakal *et al.*, 2016). Nonetheless, an insignificant or inconsistent relationship of the educational status of women with unintended pregnancy has been reported in different studies (Kassa *et al.*, 2012; Ikamari *et al.*, 2013; Ali *et al.*, 2016). Thus, the finding needs to be cautiously and contextually interpreted because the importance of education and developing life skills for preventing and decreasing unintended pregnancy has been widely reported (Singh *et al.*, 2005; Boonstra, 2015).

Recent research has shown that religious belief systems guide sexual and reproductive health behaviours and affect the utilization of reproductive health services (Arousell & Carlbom, 2016). However, the influence of religion on such behaviours is interwoven with personal interpretations of belief systems and socioeconomic influences (Santelli *et al.*, 2003). Since different religions vary from conservative to liberal, it is difficult to isolate the influence of religion in willingness to report intention of pregnancy (Kramer *et al.*, 2007). However, consistent with an earlier study from the Kwango District of the DRC (Dhakal *et al.*, 2016), the current study showed that Catholic women were more likely to report their last pregnancy as being mistimed than Protestant women; however, no significant correlation was observed with the occurrence of unwanted pregnancy. This can be partly linked to Catholics being more conservative on issues of abortion and sexual reproductive health, specifically in the use of family planning methods (O'Brien, 2010). This is consistent with findings from the Philippines and Nigeria (Sedgh *et al.*, 2006; Abada & Tenkorang, 2012). However, the majority of health services in the DRC are delivered through

the Church and Church-related institutions, which are mostly conservative with a few exceptions, so perceptions of sexual and reproductive health services are largely derived from religious groups (Lusey *et al.*, 2014).

Marital status was revealed to have a strong influence on mistimed pregnancy but did not show any association with an unwanted pregnancy. Women who were never in a union (single) had a higher likelihood of experiencing mistimed pregnancies. This result partly implies that single women are more likely to engage in sexual activities with motivations other than giving birth to children, such as pleasure or other exchanges. Similarly, studies have reasoned that single women are likely to be young and school-going, and thus more prone to conceive by mistake, even if they are not ready for childbearing (Exavery *et al.*, 2012; Ali *et al.*, 2016). This study showed a similar finding, with young people being more likely to report mistimed pregnancy. Younger women may have lower experiential knowledge and skills regarding pregnancy control mechanisms such as contraceptive use compared with their older counterparts, thus increasing their probability of experiencing unintended pregnancies (Exavery *et al.*, 2014). This result can also be ascribed to the fact that married/formerly married women are more secure since they have a father for their child/children and so they may be hesitant to categorize their pregnancy as unintended compared with those who were never in a union. The observed association of marital status and unintended pregnancies is coherent with another study conducted in Tanzania (Calvert *et al.*, 2013) and studies conducted elsewhere (RamaRao *et al.*, 2006; Ikamari *et al.*, 2013). This reaffirms that family planning and reproductive health programmes should not be limited to married women and older women because reaching out to unmarried young women with appropriate interventions can help to decrease mistimed pregnancies.

One of the persistent findings of this study was the linkage of family planning measures and their effect on unintended pregnancy. The unmet need for fertility-limiting contraception for both long-term spacing and short-term measures is high in DRC. The average family size in the DRC is 5.9, and there is a 28% unmet need for family planning (Ministère de la Santé Publique (MSP) & ICF International, 2014). This was reflected in the current study as women with a parity of 3–4 were less likely to report mistimed pregnancies compared with women with a parity of less than 2, whereas women with a parity of more than 5 were over twice as likely to report unwanted pregnancies. This result strongly reflects that women need long-term spacing between their first and second childbirth so that their pregnancy is not mistimed. After five children, their need for a permanent contraceptive method was visible because their last childbirth was unwanted. This was further stressed by the finding that women who did not want any more children had higher odds of reporting their last pregnancy as unwanted. This suggests that even their last pregnancy could have been avoided by using fertility-limiting contraception. Importantly, it was also found that consecutive smaller spacing between children led to a higher likelihood of the last birth being mistimed, whereas the opposite was observed in an unwanted pregnancy. Those with greater birth spacing had a higher probability of their last pregnancy being unwanted. Both of these phenomena can be linked once again to the unmet need for long-term birth spacing, permanent family planning or failure of contraceptive measures in the DRC (Romaniuk, 2011). Non-use of family planning methods and contraceptive failure are among the leading causes of unwanted pregnancy (Klima, 1998); the current study found that women who did not intend to use family planning methods were less likely to report their last pregnancy as unwanted compared with current users. This may be linked to the pro-natal government policies of colonial times that restricted the use of family planning devices and promoted larger families (Mukaba *et al.*, 2015).

The main strength of this study is that was based on nationally representative data from diverse population groups with wide geographic coverage, using a standard questionnaire and standard data processing through the DRC Demographic Health Survey. Moreover, to the authors' knowledge, this is the first country-level study to be conducted in the DRC to assess the factors correlated with mistimed and unwanted pregnancy among women of reproductive age in the

country. The sequential model used for the multivariate analysis also strengthened the study because it analyses the complex inter-relationships between variables. Proximate variables are considered to have more direct effects than distal and intermediate variables. This method of analysis helps to study the effect of distal and intermediate determinants such as socioeconomic conditions, which if not considered, will be overshadowed and eliminated by incorrectly adjusting proximate factors (Hall *et al.*, 2016).

The study has its limitations. It did not include pregnancies that ended in early miscarriages and induced abortion within the five years preceding the survey. This may have led to an underestimation of the prevalence of unintended pregnancies. Another limitation was self-reporting of pregnancy intention by respondents. Studies on unintended pregnancies are complicated by the fact that women's perception of whether the pregnancy was planned or wanted can change over time (Santelli *et al.*, 2009; Moreau *et al.*, 2013). Evidence suggests that asking women to report on their intentions retrospectively has the propensity to report children as intended when initially they were unintended, thus underestimating the prevalence (Hall *et al.*, 2019). Similarly, with change in circumstances, some women may have answered differently than if they had been asked at the time of the pregnancy or immediately after childbirth. The answer is more likely to be accurate if pregnancy intention is asked in the early stage rather than in the late stage of pregnancy or after the pregnancy. In this study, the women were retrospectively asked about their pregnancy intentions for the last live birth within the five years preceding the survey. Additionally, this was a cross-sectional study that used logistic regression for statistical analysis; therefore, it was not possible to claim a cause-effect relationship between unintended pregnancies and associated factors. There were also missing data in the survey, so the study could not include different variables that could be plausible for unintended pregnancy such as husband's education, husband's occupation and some family planning and contraceptive-related variables.

In conclusion, the findings of this study reaffirm the role of social determinants in defining pregnancy intentions among women of reproductive age in the DRC. Not all the factors associated with mistimed pregnancy were related to unwanted pregnancy; hence, interventions to address these two different aspects of pregnancy intention require specific health promotion approaches and separate tailored interventions. Family planning and sexual reproductive health programmes among young, unmarried, multiparous women and those women who are out of reach of family planning programmes due to cultural and religious barriers should be prioritized so that they can plan the timing of their pregnancy and have the desired number of children. However, these direct sexual and reproductive health interventions alone are not sufficient to address this multifaceted problem of unintended pregnancy. Gender equity programmes to enhance women's autonomy in health care decision-making can have the double benefit of reducing mistimed pregnancy on the one hand and raising women's empowerment on the other.

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