Journal of African Population Studies (JAPS)

UAPS UEPA

Original Article

A multilevel Analysis of Factors Associated with Unintended Pregnancy in Kenya.

Lawrence Ikamari [1*]

Citation: Ikamari, L. A multilevel Analysis of Factors Associated with Unintended Pregnancy in Kenya: *Journal of African Population Studies* **2024**, *37(1)*, 5291.

https://doi.org/10.59147/jg3nxVbP

Academic Editor: Ngianga-Bakwin Kandala

Received: 23 December 2023
Accepted: 20 June 2024
Published: 31 July 2024

Publisher's Note: JAPS stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

[1] Population Studies and Research Institute, University of Nairobi. P.O. Box 30197 00100 GPO, Nairobi, Kenya
* Correspondence: likamari@uonbi.ac.ke

Abstract: Background: Unintended pregnancy is a significant health and social issue in Kenya. This study used data extracted from the 2022 Kenya Demographic and Health Survey, involving 10,302 women aged 15-49 to investigate the prevalence and associated factors. Descriptive statistics and multilevel logistic regression analysis were used to analyze the data. **Results:** The study revealed that 40% of the pregnancies were unintended. Unintended pregnancy was significantly associated with various factors. Woman's age affected the likelihood of unintended pregnancy, with women aged at least 20 years having lower odds compared to younger women. Education also affected the likelihood of unintended pregnancy, with higher education levels linked to higher odds. Married and formerly married women had lower odds of unintended pregnancy. Women with 4 or more children, and those exposed to mass media had higher odds. Ever use of contraceptives and knowledge of the fertile period were associated with higher odds. Occupation also affected unintended pregnancy, with professional/managerial jobs having lower odds, while domestic work linked to higher odds. Middle and higher wealth statuses were linked to lower odds. Both places and region of residence also affected the likelihood of unintended pregnancy with rural residence was associated with lower odds, and significant regional variations observed. **Conclusion:** The study calls for comprehensive access to sexual and reproductive health services in order to reduce the high prevalence of unintended pregnancies in the country.

Keywords: Multilevel analysis, factors, Unintended pregnancy, Kenya

1. Introduction

Unintended pregnancies include both mistimed and unwanted pregnancies. A mistimed pregnancy occurs when a woman becomes pregnant at a time when she had not planned or desired to be pregnant. An unwanted pregnancy is one that a woman did not intend to have, either because she never intended to become pregnant or because it occurred when she no longer wished to have additional children [1,2]. Unintended pregnancies are fundamental indicators of women's autonomy and their ability to exercise self-determination in deciding whether and when to become parents. When women have control over their reproductive choices, they can better align their family planning with their personal and life goals [2,3]. Globally, almost 50% of pregnancies are unintended. For instance, between 2015 and 2019 there were about 121 million unintended pregnancies globally each year [4]. In Kenya, the most recent national survey indicates a consistent decline in the prevalence of unintended pregnancies over the last three decades. It has decreased from 55% in 1993 to 38% in 2022 [5].

Most unintended pregnancies result from not using contraception or from not using it consistently or correctly [6]. This highlights the importance of access to and proper utilization of contraception in preventing unintended pregnancies. The prevalence of unintended childbearing is a key measure of the success of reproductive health and family planning programs. These programs aim to enable individuals and couples of reproductive ages to realize their desired family

size by providing information, access to contraception, and support for family planning decisions. A low incidence of unintended childbearing suggests that existing reproductive health and family planning programs have effectively empowered the majority of individuals to achieve their fertility preferences. In such cases, these programs have been successful in helping people plan their families according to their desires.

There is hardly any evidence on the cost of unintended pregnancies to the society in developing counties. However, evidence in the USA show that pregnancies can be a big drain on national resources. For instance, Trussell et al [8] estimated that the average cost of unintended pregnancy in the United States of America was $3,795 in a manged care program and $1,680 in a publicly funded program. In 2008, the USA government expenditure on births results from unintended pregnancies were estimated at $12.5 billion [9].

Various factors have been associated with unintended pregnancy. These include non-use of contraceptives [10, 11], place and location of region, education, age, parity, marital status, education, household socioeconomic status, access to mass media [10-16]. It should be noted that the effects of these determinants vary across counties and over-time.

Despite the significant importance of comprehending the prevalence and underlying factors influencing unintended pregnancy, it is evident that there is a dearth of comprehensive nationwide studies on this subject within Kenya's recent history. As a result, the current status of unintended pregnancy levels, along with the variations, as well as the factors associated with unintended pregnancy, remains inadequately understood. This study aims to address this gap and enhance the literature on unintended pregnancy by achieving the following objectives:

This research will investigate the prevalence of unintended pregnancy among women aged 15-49 in Kenya. It will also analyze variations in unintended pregnancy across different regions, age groups, and socio-economic backgrounds to identify disparities. Furthermore, the study will explore and document the socioeconomic and demographic determinants linked to unintended pregnancy in Kenya. By achieving these objectives, this research aims to contribute valuable insights that can inform policies and interventions aimed at reducing unintended pregnancy rates in Kenya, ultimately improving the reproductive health and well-being of women in the country.

To accomplish these objectives, the study will utilize the most recent and nationally representative survey data available, which is the 2022 Kenya Demographic and Health Survey data. This dataset will provide a comprehensive and up-to-date picture of unintended pregnancy in Kenya.

2. Materials and Methods

2.1 Source of data

The data for this study is drawn from the 2022 Kenya Demographic and Health Survey (KDHS) that the Kenya National Bureau of Statistics [KNBS] and partners carried out in the whole country in 2022 [5]. It is a nationally representative survey designed to provide reliable data for the monitoring of demographic and health indicators, including child marriage, in the country. Thus, the 2022 KDHS collected data on fertility, marriage, sexual activity, fertility preferences, family planning, maternal and child health, information about HIV/AIDS and other sexually transmitted diseases, information on malaria, and use of mosquito nets and domestic violence. The survey was carried out as part of the worldwide DHS program.

The 2022 KDHS sample was drawn from the Kenya Household Master Sample Frame [K-HMSF] that KNBS uses to conduct household-based surveys throughout the country [5]. It is based on the 2019 Population Census data. In the K-HMSF, each of the 47 counties was stratified into urban and rural strata, since Nairobi and Mombasa counties have only

urban areas, giving a total of 92 sampling strata. The 2022 KDHS sample was designed to have 42,022 households from 1,692 clusters (enumeration areas (EAs)) spread across the country, 1026 clusters in rural areas, and 666 in urban areas. Using a two-stage sample design, representative samples were selected independently in each of the 92 sampling strata. In the first stage, 1,692 EAs were selected with equal probability from the K-HMSF. In the second stage, 25 households were randomly selected from each of the selected EAs. The interviewers visited only the preselected households, and no replacement of the preselected households was allowed during the data collection. The details of the sampling methodology, as well as an assessment of the quality of the data, are presented and discussed extensively in the first country report of the survey [5].

The 2022 KDHS interviewed a total of 32,156 women aged 15-49 years in the whole country. Out of these 32,156 women, a nationwide sample of 10,302 women aged 15-49 years was used in this study. These were women who had a pregnancy in the three years preceding the survey and provided information about the planning status [wanted then, later and not wanted at all] of her pregnancy. This is a weighted sample.

2.2 Study variables

2.2.1 Dependent variable

In this study, the dependent variable is unintended pregnancy, which is derived from responses to a question in the DHS (Demographic and Health Survey) directed at women who experienced a pregnancy within the three years preceding the survey. Specifically, women were asked about the planning status of each of their pregnancies, with three possible response categories: 'wanted then,' 'wanted later,' or 'not wanted at all.' For the purposes of this study, we focus on the responses to the planning status of their last pregnancy. Women who indicated that their pregnancy was 'wanted later' or 'not wanted at all' were categorized as having experienced an unintended pregnancy. Conversely, women who stated that their pregnancy was 'wanted then' were categorized as having intended pregnancies. In this study, unintended pregnancy is coded as '1,' while intended pregnancy is coded as '0.'

2.2.2 Independent variables

2.2.2.1 Individual level variables

On the basis of the literature, we have included the age of the woman [15-19, 20-34, 35-49], level of education [no education, primary, secondary and higher education], parity [0-1, 2-3, 4+ child], religion [Catholic, Protestant, Muslim, Other], occupation (Not working, Professional/managerial, Service/sales/clerical, Agricultural work, Household and domestic, manual)] ever use of contraceptive [yes, no], knowledge of fertile cycle [yes, no], marital status [single, married, formerly married], and exposure to mass media [yes, no]. Mass media variable was computed from three variables comprising reading newspapers, watching television, and listening to a radio at least once per week. A woman was considered as having exposure to mass media, if she had been exposed to any one of the three at least per week and not if she had no exposure to any one of the three. It is therefore a binary variable with value one [1] if the woman has exposure, value zero [0] otherwise.

2.2.2.2 Contextual level variables

The contextual level variables included in the study are household wealth status (poor, middle, rich), distance to the nearest health facility [near [no problem], far [big problem], type of place of residence [rural, urban], region of residence [Nairobi, Central, Coast, Eastern, Rift Valley, Nyanza, Western, and North-Eastern].

2.3 Methods of data analysis

Data analysis involved the utilization of percentages, cross-tabulation, and multilevel logistic regression. Frequencies were employed to delineate the socio-demographic characteristics of the study population. Bivariate analysis encompassed estimating the prevalence and disparities in unintended pregnancies. These calculations involved presenting percentage distributions of women aged 15-49 years, categorized based on whether they experienced unintended pregnancies, as well as examining individual and contextual level factors. The statistical significance of associations was assessed at a 95% confidence level, with a threshold p-value of ≤ 0.05.

Multilevel logistic regression was employed to assess the effect of both individual and contextual factors on the probability of experiencing an unintended pregnancy. Conforming to the structure of the 2022 KDHS data, women were nested within the sampling clusters to account for variability within the primary sampling units (PSUs). Consequently, the clusters were considered as random effects to accommodate unexplained variations at the contextual level [17]. Four models were constructed for analysis. Model I, the empty model, lacked explanatory variables and served as the random effect model, elucidating the variance in unintended pregnancies attributed to the clustering of the primary sampling units (PSUs).

Model II exclusively included individual-level factors, aiming to scrutinize the fixed effects of these factors. Model III solely incorporated contextual-level factors, while Model IV represented the comprehensive and final model, encompassing both individual and contextual factors. Adjusted odds ratios (aOR) with their corresponding 95% confidence intervals (CI) were used to quantify the fixed effects of the study variables. The Intra-Class Correlation (ICC) was utilized to assess the random effects, providing a measure of variability, i.e., the variation in unintended pregnancies due to disparities among the clusters (PSUs). The Akaike Information Criterion (AIC) tests are employed to compare models. The model with the lowest AIC is considered the best-fit model. The analysis was conducted using Stata version 14.2 for Windows, with the 'melogit' command utilized for multilevel logistic regression analysis.

2.4 Ethical considerations

Ethical permissions were not required for this study because the 2022 KDHS dataset, as part of the DHS program dataset, is already publicly available and used. Institutions that commissioned, funded, or managed the 2022 KDHS were responsible for ensuring ethical considerations and procedures during data collection. The DHS Program, ICF International, Kenya National Bureau of Statistics (KNBS) and Ministry of Health (MOH) approved the 2022 KDHS survey in line with the U.S. Department of Health and Human Services regulations for the protection of human subjects. The data for this study can be accessed on https://dhsprogram.com/data/available-datasets.cfm.

3. Results

3.1 Profile of the study population

The socio-demographic profile of the study population is presented in Table 1. A total of 10,302 women were included in the study. The mean age was 28.31 years (standard deviation 1.420, standard error 0.019, median 27 years [95% CI = 28.18 – 28.43]. 74% of the women were in the prime reproductive 20-34 years, 7% were aged 15-19 and 19% were at least 35 years.

Fifty-six percent [n = 5776] of the sample had at least secondary education and 35% had primary education (n = 3624). The majority of the women were currently married (79% , n= 8127), rural residents [61%, n= 5724], residents in the expansive rift valley province [30%, n= 3120], 45% [n= 4594] belonged to rich households, and 42% [n= 4290] were not working, and 71% [n=4091] were protestants. 62% of the women reported travel time to the nearest health facility was at least more than 30 minutes (big problem) while 38% said it was 30 or less minutes [not a problem].

Table 1: Background characteristics of study population, Kenya, 2022 KDHS

Characteristic	Number	Percentage (%)
Age		
15-19	720	7.0
20-34	7603	36.8
35-49	1979	36.3
Marital status		
Single	1238	12.0
Married	8127	78.9
Formerly married	937	9.1
Education level		
None	901	8.7
Primary	3624	35.2
Secondary	3732	36.2
Higher	2044	19.8
Type of place of residence		
Urban	4000	38.8
Rural	6302	61.2
Region of residence		
Nairobi	1217	11.8
Central	1237	12.0
Coast	935	9.1
Eastern	1037	10.4
Nyanza	1225	11.9
Rift Valley	3120	30.3
Western	1071	10.4
North Eastern	423	4.1
Household Wealth status		
Poor	3908	37.9
Middle	1800	17.5
Rich	4594	44.6
Occupation		
Not working	4290	41.6
Professional/Managerial	1549	18.0
Clerical/Sales/Service	1413	13.7
Agricultural work	1437	14.0
Household and Domestic work	618	6.0
Manual work	997	9.7
Religion		
Catholic	1892	18.4
Protestant	6217	60.3

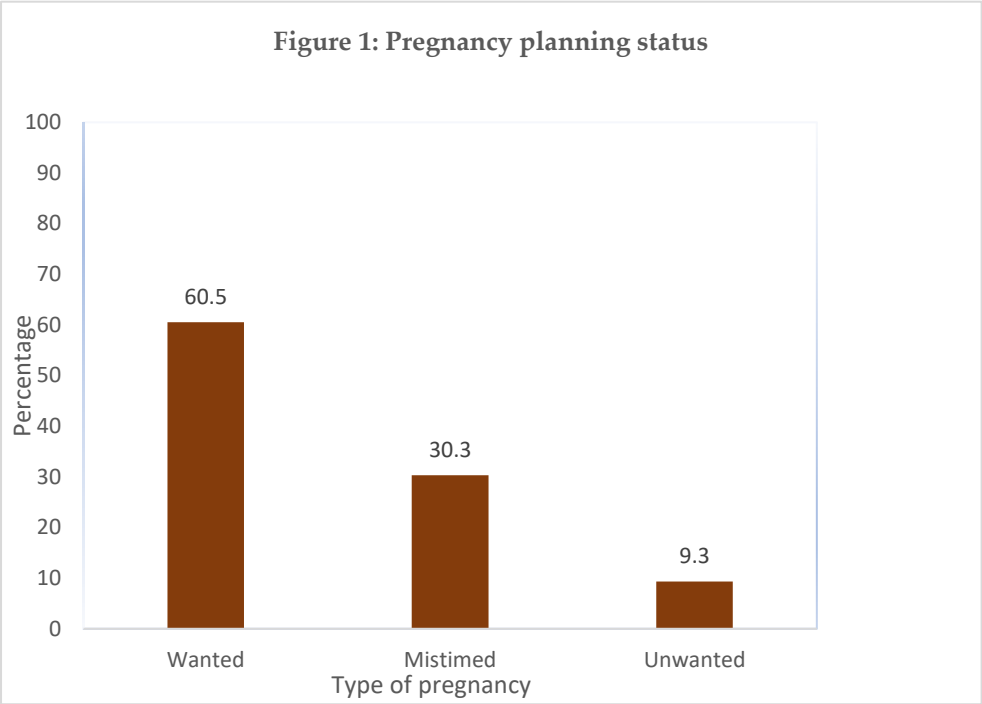
Muslim	876	8.5
Other	1317	12.8
Parity		
0-1	3218	31.2
2-3	4261	41.4
4+	2824	27.4
Exposure to mass media		
No	2364	22.9
Yes	7938	77.1
Knows the fertile period		
No	8278	80.2
Yes	2024	19.6
Distance to the nearest health facility		
A big problem	6390	62.0
Not a big problem	3912	38.0
Total	**10,302**	**100**

Note: These are weighted cases.
Source: Primary Analysis of the 2022 KDHS data.

3.2 Prevalence of unintended pregnancy

In this study, 39.5% [95% CI: 38, 40.5] of the women experienced unintended pregnancies, while 60.5% had intended pregnancies [see Figure 1]. The bivariate results indicate significant disparities in the prevalence of unintended pregnancy among all independent/explanatory study variables, except for exposure to mass media [refer to Table 2]. For example, the prevalence rate of unintended pregnancy decreased notably with a woman's age, ranging from a high of 77% among women aged 15-19 to a low of 36% among women aged 35-49.

The results also demonstrate that the prevalence of unintended pregnancy was higher in rural areas [43%] compared to urban areas (35%), and it significantly varied across the eight regions of the country, with the highest prevalence observed in the Western region [52%] and the lowest in the Northeastern region [8%]. Similarly, the prevalence of unintended pregnancy was higher among women from poor households compared to those from rich households [45% versus 34%]. Additionally, Muslim and Catholic women had lower prevalence rates of unintended pregnancy than Protestants.



Source: Primary Analysis of the 2022 KDHS data.

Table 2: Prevalence of unintended pregnancy according to the selected study variables, Kenya 2022

	Prevalence of unintended pregnancy		
Characteristic	**%**	**95% CI**	**Cases**
Age ***			
15-19	76.8	73.7 – 79.9	720
20-34	36.8	35.7 – 37.9	7603
35-49	36.3	34.2 – 38.5	1979
Marital status*			
Single	73.8	71.3 – 76.2	1238
Married	32.9	31.9 – 33.9	8127
Formerly married	51.4	48.2 – 54.6	937
Education level**			
None	20.5	17.9 – 23.2	901
Primary	45.1	43.5 – 46.8	3624
Secondary	43.5	41.9 – 45.8	3732
Higher	30.6	28.6 – 32.5	2044
Type of place of residence*			
Urban	34.8	33.4 – 36.3	4000
Rural	42.5	41.3 – 43.7	6302
Region of residence*			
Nairobi	36.5	33.8 – 39.2	1217
Central	34.3	31.7 – 37.0	1237
Coast	35.8	32.8 – 38.9	935

Eastern	37.3	34.4 – 40.2	1037
Nyanza	50.7	47.9 – 53.5	1225
Rift Valley	39.9	39.2 – 41.6	3120
Western	52.9	49.9 – 55.9	1071
Northeastern	8.3	5.6 – 10.9	423
Household wealth status*			
Poor	45.3	43.7 - 46.9	3908
Middle	42.2	39.9 – 44.5	1800
Rich	33.5	32.2 – 34.9	4594
Occupation**			
Not working	39.6	38.1 – 41.0	4290
Professional/Managerial	27.1	24.9 – 29.3	1549
Clerical/Sales/Service	35.5	33.0 - 38.0	1413
Agricultural work	45.0	42.4 – 47.6	1437
Household and Domestic work	59.5	55.7 – 63.4	618
Manual work	43.9	40.9 – 47.0	997
Religion**			
Catholic	39.1	36.4 – 41.3	1892
Protestant	41.6	40.4 – 42.9	6217
Muslim	22.8	20.9 – 26.6	876
Other	40.6	37.9 – 43.3	1317
Parity*			
0-1	46.8	45.1 – 48.5	3218
2-3	32.1	30.7 – 33.5	4261
4+	42.4	40.6 – 44.2	2824
Exposure to mass media			
No	39.9	38.8 – 41.0	22.9
Yes	38.2	36.2 – 40.2	77.1
Knows the fertile period**			
No	41.3	40.2 – 42.2	80.2
Yes	32.4	30.4 – 34.4	19.6
Distance to the nearest health facility			
A big problem	41.4	40.2 – 42.6	62.0
Not a big problem	36.4	34.9 – 37.9	38.0
Total	**39.5**	**38.6 – 40.5**	**100**

Notes: * $p < 0.05$ and ** $p < 0.001$.

3.3 Multilevel Analysis results

Table 3 presents the fixed effects results from multilevel logistic regression analysis. As previously mentioned, we employed four distinct models for this analysis. Our initial step involved fitting Model 1 [without any predictors] to evaluate the presence of significant clustering of unintended pregnancies within the clusters. The results of this analysis unveiled an Intraclass Correlation Coefficient (ICC) of 0.17533619, signifying that 17% of the variation in unintended pregnancy can be attributed to differences between the clusters. It's worth noting that in the existing literature, an ICC value of 0.05 is often considered the conventional threshold, indicating compelling evidence of clustering [17, 18]. Based on this significant finding, the utilization of multilevel analysis was deemed necessary. Further, a test for collinearity among explanatory was conducted using the variance inflation factor [VIF] and the results showed no evidence of collinearity among the explanatory variables.

In this subsection, we initially present the fixed effects obtained from Model 4, which represents the final and comprehensive model incorporating both individual-level and contextual-level variables (**See the last Column of Table 3)**. Our focus will be solely on statistically significant results at the 95% confidence level or greater. In the final model, all variables, except for religion and distance to the nearest health facility, exhibit a significant association with unintended pregnancy. The odds of experiencing unintended pregnancy were notably lower by 71% among women aged 20-34 and 72% among those aged 35-49, in comparison to women aged 15-19.

Women with higher levels of education were significantly more likely to experience unintended pregnancy. Specifically, those with secondary education were 2.26 times as likely, those with primary education were 2.02 times as likely, and those with higher education were 1.63 times as likely, compared to those with no education. Married women and those who were formerly married had a reduced likelihood of experiencing unintended pregnancy, with the odds being 81% and 62% lower among married and formerly married women, respectively, compared to single women. Regarding the impact of parity, women who had given birth to at least four children have a greater likelihood of experiencing unintended pregnancy, with the odds being 78% higher compared to women with zero or one child.

Exposure to mass media and the use of contraceptives were both linked to a higher likelihood of experiencing unintended pregnancy. Nevertheless, women who possessed knowledge about the ovulation cycle had 19% lower odds of experiencing unintended pregnancy compared to those who lacked such knowledge. Women who worked as professional or managers had 31% lower odds of experiencing unintended pregnancy compared to women who had no work. However, women who worked as household or domestic workers had 63% higher odds of experiencing unintended pregnancy compared to women who had no work.

In terms of the influence of contextual variables, women belonging to middle and affluent households had a significantly reduced likelihood of encountering unintended pregnancy. Specifically, their odds were 19% and 40% lower, respectively, when contrasted with women from poor households. Additionally, rural women exhibited a 19% lower likelihood of unintended pregnancy in comparison to their urban counterparts.

Furthermore, women in the Nyanza and Western regions were significantly more likely to experience unintended pregnancies than women in Nairobi. Specifically, their odds were 28% and 30% higher, respectively, when compared to women in Nairobi. In contrast, women in the Northeastern region had a 68% lower likelihood of experiencing unintended pregnancy compared to women in the Nairobi region.

Table 4 displays the random effects of the multilevel analysis. As previously mentioned, in Model 1, the empty model, significant variations in the likelihood of unintended pregnancy were observed across the clustering of the Primary Sampling Units [σ^2 = 0.699, 95% CI: 0.593 - 0.8251]. Model 1 revealed that 17.5% of the total variance in unintended

pregnancy could be attributed to inter-cluster variation of the explanatory variables [ICC = 0.1753619]. The between-cluster variations reduced to 6% in Model 2, which included individual-level variables, marking an 11-percentage point reduction from Model 1.

In Model 3, the ICC figure indicated a 10% variation due to inter-cluster differences in explanatory variables. This was further reduced to 5% in Model 4, the final and comprehensive model that incorporated both individual-level and contextual-level explanatory variables, suggesting that only 5% of the variation in unintended pregnancy could be attributed to inter-cluster differences in the explanatory variable. Model 4 is considered the best-fit model in this study as it exhibits the smallest Akaike's information criterion (AIC) value of 12361.23.

Table 3: Multilevel logistic regression models showing fixed effects on unintended pregnancy among women aged 15-49 in Kenya, 2022.

Variable(s)	**Model 1**	**Model 2**	**Model 3**	**Model 4**
	aOR[95% CI]	**aOR[95% CI]**	**aOR[95% CI]**	**aOR[95% CI]**
Individual level variables				
Age				
15-19 (Ref)		1.00		1.00
20-34		0.28 [0.23, 0.34]***		0.29 [0.24, 0.36]***
35-49		0.24 [0.19, 0.31]***		0.28 [0.22, 0.35]***
Education				
None (Ref Cat.)		1.00		1.00
Primary		2.40 [2.01, 2.85]***		2.04 [1.70, 2.44]***
Secondary		2.45 [2.02, 2.98]***		2.26 [1.85, 2.76]***
Higher		1.62 [1.29, 2.03]***		1.63 [1.28, 2.07]***
Marital Status				
Single (Ref)		1.00		1.00
Married		0.18 [0.15, 0.21]***		0.19 [0.16, 0.22]***
Formerly married		0.36 [0.29, 0.44]***		0.38 [0.30, 0.46]***
Parity				
0-1 (Ref)		1.00		1.00
2-3		0.95 [0.84, 1.07]		0.94 [0.83, 1.06]
4+		1.93 [1.65, 2.25]***		1.78 [1.52, 2.07]***
Religion				
Catholic (Ref)		1.00		1.00
Protestant		1.14 [1.01, 1.29]*		1.12 [0.99, 1.26]
Muslim		0.59 [0.48, 0.71]***		0.88 [0.70, 1.11]
Other		0.96 [0.81, 1.13]		0.95 [0.80, 1.13]
Exposure to Mass media				
No		1.00		1.00
Yes		1.09 [0.98, 1.23]		1.17 [1.04, 1.32]**
Ever use of contraceptives				
No		1.00		1.00

Yes		1.69 [1.48, 1.93]***		1.59 [1.39, 1.81]***
Knows the fertile period				
No		1.00		1.00
Yes		0.78 [0.69, 0.87]***		0.81 [0.72, 0.92]**
Occupation				
No work	1.00	1.00		1.00
Professional/managerial		0.68 [0.58, 0.79]***		0.69 [0.59, 0.81]***
Clerical/sales/service		0.87 [0.75, 1.01]		0.89 [0.76, 1.03]
Agricultural work		1.11 [0.97, 1.28]		1.05 [0.92, 1.22]
Household and domestic work		1.58 [1.27, 1.96]***		1.63 [1.31, 2.02]***
Manual work		1.15 [0.97, 1.35]*		1.10 [0.94, 1.30]
Contextual level variables				
Household Wealth status				
Poor			1.00	1.00
Middle			0.81 [0.72, 0.92]**	0.81 [0.72, 0.93]**
Rich			0.45 [0.43, 0.58]***	0.60 [0.51, 0.70]***
Distance to nearest health facility				
Near/ No problem			1.00	1.00
[Far] Big problem			1.09 [0.99, 1.19]	1.03 [0.93, 1.14]
Place of Residence				
Urban (Ref Cat.)			1.00	1.00
Rural			0.78[0.68, 0.89] ***	0.81[0.71, 0.94]**
Region				
Nairobi (Ref Cat.)			1.00	1.00
Central			0.93[0.58, 1.19]	0.80[0.57, 1.13]
Coast			0.62[0.45, 0.89]**	0.92[0.66, 1.29]
Eastern			0.73[0.52, 1.04]*	0.76[0.53, 1.06]
Nyanza			1.35[0.95,1.91]**	1.28[0.92,1.78]*
Rift Valley			0.79[0.57, 1.10]	0.90[0.66, 1.23]
Western			1.33[0.93, 1.90]*	1.30[0.93, 1.84]*
North Eastern			0.11[0.07,0.16]***	0.32[0.21, 0.47]***

Notes: * $p < 0.05$ and ** $p < 0.001$.

Table 4: Multilevel logistic regression models showing random effects on unintended pregnancy among women aged 15-49 in Kenya, 2022

Random effects	**Model 1**	**Model 2**	**Model 3**	**Model 4**
	aOR[95% CI]	**aOR[95% CI]**	**aOR[95% CI]**	**aOR[95% CI]**
PSU variance [95% CI]	0.69[0.59, 0.82]	0.21[0.15, 0.31]	0.35[0.28, 0.45]	0.18 [0.12. 0.27]
ICC	0.17 [0.15, 0.20]	0.06 [0.04, 0.86]	0.10 [0.08,0.12]	0.05 [0.06, 0.08]
LR Test	$\chi2$= 449.03***	$\chi2$= 48.73***	$\chi2$ = 142.75,***	$\chi2$= 35.00***

Wald $\chi 2$	Reference	1344.46***	523.30***	1426.55***
Model fitness				
Log -likelihood	-7029.0525	-6235.2641	-6740.8821	-6147.6154
AIC	14062.11	12514.53	13507.76	12361.23

PSU=Primary Sampling Unit, ICC= Intra-Class Correlation, LR Test= Likelihood ratio text, AIC= Akaike's Information Criterion, *** p =0.000.

4. Discussion

This study aimed to examine the prevalence of unintended pregnancy and analyze variations in this occurrence across various regions, age groups, and socio-economic backgrounds within Kenya. The primary objective was to identify disparities and document the determinants of unintended pregnancy at both individual and contextual levels. To achieve this, we utilized a nationally representative sample of women aged 15 to 49 years. The study incorporated several factors that have been previously documented in the literature as closely associated with unintended pregnancy. The study found an unintended pregnancy rate of 39.5% (95% CI: 38, 40.5) among the women included in the study. The prevalence rate is consistent with those found in Kenya [19, 20], Ethiopia [21, 22], South Africa [23], and Ghana [24], as well as in Pakistan [25]. However, it is moderately high in comparison with the rates reported in Ethiopia [15, 26], Nigeria [27] and rural Ghana [14]. Nevertheless, it is lower than those reported in Malawi [28] and Namibia [29].

In the results of the multivariate multilevel logistic regression analysis, all individual and contextual variables, with the exception of religion and distance to the nearest health facility, were found to exhibit a significant association with unintended pregnancy. These variables encompass age, education, marital status, parity, exposure to mass media, prior contraceptive use, knowledge of the ovulation cycle, occupation, household wealth status, place of residence, and regional location. In terms of age, the risk of experiencing unintended pregnancy was significantly lower among women aged 20-34 and those aged 35-49, in comparison to women aged 15-19. This finding aligns with the results of numerous prior studies conducted in Sub-Saharan Africa [13, 20, 27 29, 30]. The elevated risk of unintended pregnancy among young women aged 15-19 is often attributed to factors such as limited knowledge, insufficient access to contraceptive services due to stigma and discrimination, engaging in risky sexual behavior, and an inability to negotiate safe sex within sexual relationships [31, 32].

The findings indicate a significant association between higher levels of education among women and an increased likelihood of experiencing unintended pregnancy. This result is similar with those found in a comparative study in selected high fertility countries in Sub-Saharan Africa [30] and in Nigeria [27]. However, this finding warrants further investigation for a more comprehensive understanding. This finding may appear contradictory when compared to previous study in Nairobi [13], rural Ghana [14], and Ethiopia [15], which did not find a significant link between education and unintended pregnancies among women, while a study in Tanzania founds a significant negative association between education and unintended pregnancy in Tanzania [34] and also in a more recent study in Kenya [35].

The results also indicated that married women and those who were formerly married had a reduced likelihood of experiencing unintended pregnancy compared to single women, which aligns with previous studies conducted in Kenya [13, 35], rural Ghana [14], and Ethiopia [12, 15]. On the other hand, women with high parity had a greater likelihood of experiencing unintended pregnancy when compared to women with zero or one child, a finding consistent with previous research [12-14]. This outcome may be attributed to the increased likelihood that high parity women had already achieved their desired family size, making any additional pregnancy unintended.

This study has revealed that exposure to mass media is significantly associated with unintended pregnancy, indicating that women exposed to mass media face higher odds of experiencing this outcome. However, a recent comparative study conducted across 10 high-fertility sub-Saharan African countries did not establish a significant association between exposure to mass media and unintended pregnancy [30]. Similarly, in a nationwide study conducted in Ethiopia, Teshale and Tesema [15] found no significant association between exposure to mass media and unintended pregnancy. Therefore, further research is needed to gain a deeper understanding of the unexpected findings observed in this study.

Women who have ever used contraceptives were found to have a higher likelihood of experiencing unintended pregnancy compared to their counterparts who have never used contraceptives. This is finding aligns with the study conducted in Ethiopia [12] and Ivory Coast [16] and in a few other Sub-Saharan countries [30]. It is possible that some of the women who reported ever using contraceptives started using them soon after experiencing an unintended pregnancy in an effort to avoid a recurrence. It is also possible that some of the women who ever used contraceptives may have experienced side effects leading to discontinuation, while others may have encountered method failures [12]. Similarly, the findings revealed a significant association between knowledge about the ovulation period and unintended pregnancy. Women who were knowledgeable about the ovulation cycle had lower odds of experiencing unintended pregnancy. This is in line with similar results reported in other studies [21].

Occupation was found to have a significant association with unintended pregnancy. Women in professional/managerial roles were notably less likely to experience unintended pregnancy compared to those who were not employed. Conversely, women employed as household and domestic workers had a significantly higher likelihood of experiencing unintended pregnancy in comparison to their counterparts without employment. This result aligns with previous study that found significant association between employment status and unintended pregnancy [29, 35].

Household wealth status was found to be a significant factor associated with unintended pregnancy. Women from low and middle-income households had a lower risk of experiencing unintended pregnancy when compared to their counterparts from poor households. This study supports the findings of numerous previous research studies that have established a strong link between poverty and unintended pregnancy [29, 30]. However, it is worth noting that, in a comparative study involving a few sub-Saharan countries by Ahinkorah in 2020 [30], it was found that women from rich households had higher odds (aOR =1.28) of experiencing unintended pregnancy.

Lastly, both the type of place of residence and regional location were identified as significant factors associated with unintended pregnancy. Rural women had a higher likelihood of experiencing unintended pregnancy compared to their urban counterparts. Notably, women in the Northeastern region had significantly lower odds of experiencing unintended pregnancy compared to women in the Nairobi region. In contrast, women in the Western and Nyanza regions had greater odds of experiencing unintended pregnancy compared to women in Nairobi. These findings are consistent with the results of previous studies that reported similar associations [12, 15, 21].

Strengths and limitations of the study

This study has several notable strengths. First and foremost, it leverages data from the most recent nationwide survey, the 2022 KDHS, which is nationally representative and thus provides comprehensive coverage of the entire country. This sets it apart from many previous studies that often lacked such extensive national representation. The second strength lies in the comprehensive inclusion of numerous factors, such as age, exposure to mass media, and knowledge of the ovulation period in the study. Notably, previous studies typically omitted these variables as determinants of unintended pregnancy in the country. The third strength of this study is its methodological rigor. It employs both cross tabulation and multilevel logistic regression analysis. Cross tabulations and the associated Chi-square tests effectively

highlight the variations and the strength of the associations in the prevalence of unintended pregnancy concerning the study variables. In addition, the multilevel logistic regression analysis provides insights into both fixed and random effects of the explanatory variables, as well as the influence of primary sampling units (PSUs). This dual approach enhances the robustness and depth of the study's analysis.

However, the study is subject to a few limitations. First, the data used in this study is of a secondary and cross-sectional nature. Cross-sectional data does not allow for the establishment of causal relationships between the observed variables. Secondly, certain variables such as the history of contraceptive use, household economic status, and occupation may have varied over time, particularly for women who married and transitioned from their parental households to live with their husbands, as is a common practice in Kenya and many Sub-Saharan countries. It is plausible that the economic circumstances of a woman's current family are different from those of her family of origin, especially if the trend is for women to marry into a higher social stratum. Unfortunately, we lack information regarding the characteristics of households prior to or immediately before the women experienced the index pregnancy. In this study, our focus was specifically on pregnancies that took place within the three years preceding the survey, with the aim of mitigating these limitations.

5. Conclusion

This study has successfully ascertained the prevalence of unintended pregnancy in the country and has identified its variations and determinants at both individual and contextual levels. The findings reveal that factors such as age, education, marital status, exposure to mass media, history of contraceptive use, occupation, household wealth status, place of residence, and regional location are significantly associated with unintended pregnancy.

To address the high prevalence of unintended pregnancy, it is imperative to empower girls and women and ensure their access to a comprehensive range of high-quality family planning information and services. Furthermore, targeted interventions should be implemented, focusing on rural, economically disadvantaged, single, less educated, high-parity, and adolescent women. These strategies are crucial in reducing the prevalence of unintended pregnancy in the country.

Funding: This research received no external funding

Institutional Review Board Statement: Ethical approval was not required for this study because the data is secondary and is available in the public domain. As indicated in the main text, the 2022 KDHS data used in this study were sourced from the Demographic and Health Survey (DHS) program. The data set can be accessed from https://dhsprogram.com/data/available-datasets.cfm.

Informed Consent Statement: No consent to publish this study was required because the data is available in the public domain. I have not used any details and or images related to specific individual women.

Acknowledgments: I am grateful to the DHS program for allowing me to use the 2022 KDHS data for this study.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Santelli J. Roachat R, Hatfield -Timajchy K., Gilbert BC., Curtis K, Cabral R. Hirsh JS, Schieve, L. The measurement and meaning of unintended pregnancy. Perspectives in Sexual Reproductive Health 2003, 35:94-101.
2. Adetunji, J.A. 1998. Unintended childbearing in developing countries: levels, trends and determinants. Demographic and Health Survey Analytical Reports No. 8. Macro International Inc. Calverton, Maryland, USA.
3. Brown, S. and L. Eisenberg, 1995. The best intentions: unintended pregnancies and the well-being of children and families. National Academy of Press. Washington D.C.
4. United Nations Fund for Population Activities (UNFPA). 2022. State of World Population (SWOP): Seeing the Unseen: The case of action in the neglected crisis of unintended pregnancy. UNFPA: New York.
5. Kenya National Bureau of Statistics and IFC. 2023. Kenya Demographic and Health Survey 2002, Nairobi, Kenya and Rockville, Maryland, USA: KNBS and IFC.
6. Centers for Disease Control and Prevention (CDC). Unintended Pregnancy Prevention. 2015.Available from https://www.cdc.gov/reproductivehealth/contraception/unintendedpregnancy/index.htm

7. Gipson JD, Koenig MA, Hindin MJ. The effects of unintended pregnancy on infant, child, and parental health: a review of the literature. Studies of Family Planning. 2008; 39:18-38
8. Trussell, J., J. Leveque, J. D. Koenig, C. Ellerton, and F. Stewart. 1997. 'Preventing unintended pregnancy: the cost-effectiveness of the three methods of emergency contraception. American Journal of Public Health 87(6):932-37.
9. Sonfield Adam and Kathryn Kost. Public Costs from Unintended Pregnancies and the Role of Public Insurance Programs in Paying for Pregnancy and Infant Care: Estimates for 2008. Guttmacher Institute, 2013.
10. Guttmacher Institute, 2020. Adding It Up: Investing in Contraception and Maternal and Newborn Health in Sub-Saharan Africa. Retrieved from https://www.guttmacher.org/report/adding-it-up-investing-in-contraception-maternal-newborn-health-africa.
11. Bankole, A., & Singh, S. (2018). Factors Contributing to Levels and Trends in Unintended Pregnancy in Sub-Saharan Africa. Global Public Health, 13(7), 901-916. doi:10.1080/17441692.2017.1393864
12. Bekele, Yibeltal Alemu and Gedefaw Abeje Fekadu. Factors associated with unintended pregnancy in Ethiopia; further analysis of the 2016 Ethiopian Demographic and Health Survey Data. BMC Pregnancy and Childbirth. (2021): 21: 486. http: /doi.org/10.1186/s12884-02-03924-0.
13. Ikamari L, Izugbaru C, Oghako R: Prevalence and determinants of unintended pregnancies in Nairobi, Kenya. BMC Pregnancy Childbirth 2013, 13:69
14. Eliason, Frank Baiden Barbara A Yankey and Kofi Awusabo–Asare, Determinants of unintended pregnancies in rural Ghana. BMC Pregnancy and Childbirth 2014, 14:261http://www.biomedcentral.com/1471-2393/14/261.
15. Teshale, Achameleh Birhanu and Getayeneh Antehunegn Teseme. Magnitude and associated factors of unintended pregnancy in Ethiopia: a multilevel analysis using 2016 EDHS data. MBC Pregnancy and Childbirth (2020) 20: 329 https:/doi.org/10.1186/s12884-020-03024-5.
16. Eugene KY, Harvey AT, Orsot TE, Simplice DNC. Correlates of Unintended Pregnancies in Ivory Coast. Results from a National Survey. Science. 2018.;6(1):6-14. http://www.sciencepublishinggroup.com/sjph.
17. Heck, RH, Thomas SL, and Tabata, LN (2014). Multilevel modeling of categorical outcomes using IBM SPSS (2nd Edition), New York: Routledge.
18. Sommet, N and Morselli D (2017). Keep Calm and Learn Multilevel Logistic Modeling: A Simplified Three-Step Procedure Using Stata, R. Mplus, and SPSS. International Review of Social Psychology 30(1), 203-218, DOI: https://doi.org/10.5334/irsp.90.
19. Idowu Ajayi Anthony, Sally Atieno Odunga, Clement Oduor, Ramatou Ouedraogo, Boniface Ayanbekongshie Ushie and Yohannes Dibaba Wado. "I was tricked": understanding reasons for unintended pregnancy among sexually active adolescent girls. Reproductive Health (2021) 18: 19, https://doi.org/10.1186/s12978-021-01078-y.
20. Ojuok R, Mutai J, Nyamongo D. Determinants of unintended pregnancy among women attending antenatal clinic at Kenyatta National Hospital. F1000Research 2022, 11:585. https://doi.org/10.12688/f1000research.108815.1
21. Habte D, Teklu S, Melese T, Magafu MGMD. Correlates of Unintended Pregnancy in Ethiopia: Results From a National Survey. PlOS ONE 8 (12): e82987. Doi.10.1371/journal.pone.0082987 2014; (December 2013).
22. Beyene Alemayehu Girma. Prevalence of unintended pregnancy and associated factors among pregnant mothers in Jimma town, Southwest Ethiopia: a cross-sectional study. BMC Contraception and Reproductive Medicine, 2019;4:1–8, https://doi.org/10.1186/s40834-019-0090-4.
23. Ajayi Idowu Anthony and Henrietta Chinelo Ezegbe. 2020. Association between sexual violence and unintended pregnancy among adolescent girls and young women in South Africa. BMC Public Health. (2020): 20: 1370. http: //doi.org/10.1186/s12889-09488-6.
24. Nyarko SH. Unintended Pregnancy among Pregnant Women in Ghana: Prevalence and Predictors. Hindawi Journal of Pregnancy. https://doi.org/10.1155/2019/2920491.
25. Habib MA, Raynes-Greenow C. Nausheen S. Soofi SB, Sajid M, Bhutta ZA et al. Prevalence and determinants of unintended pregnancies amongst women attending antenatal clinics in Pakistan, BMC Pregnancy and Childbirth (2017) 17(1):156 https://doi 10.1186/s12884-017-1339-z PMID: 28558671.
26. Ayalew Y, Id G, Yitayew AE. Prevalence and determinant factors of unintended pregnancy among pregnant women attending antenatal clinics of Addis Zemen hospital; l. PLOS ONE 14(1): e0210206. https://doi.org/10.1371/journal. pone.02102062019. p. 1–12.
27. Yaya S, Amouzou A, Uthman OA, Ekholuenetale M, Bishwajit G, Udenigwe O, et al. Prevalence and determinants of terminated and unintended pregnancies among married women: analysis of pooled cross-sectional surveys in Nigeria. 2018. BMJ Glob Health 2018;3: e000707. doi:10.1136/ bmjgh-2018-000707.
28. Palamuleni Martin E and Adebowale Stephen Ayo. 2014. Prevalence and Determinants of Unintended Pregnancies in Malawi. African Population Studies, Vol. 28, No. 1, April 2014
29. Ameyaw EK. Prevalence and correlates of unintended pregnancy in Ghana: Analysis of 2014 Ghana Demographic and Health Survey, BMC Maternal Health, Neonatology, and Perinatology (2018) 4:17 https://doi.org/10.1186/s40748-018-0085-1.
30. Ahinkorah, Bright Opoku. Individual and contextual factors associated with mistimed and unwanted pregnancies among adolescent girls and young women in selected high fertility countries in sub-Saharan Africa: A multilevel Mixed effects analysis. PLOS ONE.15(10): e0241050.https://doi.org/10.1371/journal.pone.0241050.
31. Gottschalk LB and Ortayli. Interventions to improve adolescents' contraceptive behaviours in low and middle-income countries: a review of the evidence base. Contraception. 2014; 90(3): 211-25. http://doi.org/10.1016/j.contraception.2014.04.017 PMID:2416724.

32. Santhya KG, Jejeebhoy SJ. Sexual and reproductive health and rights of adolescent girls: Evidence from low -and middle-income countries. Global Public Health. 2015; 10(2): 189-221. https://doi.org/10.1080/17441692.2014.986169 PMID: 25554828.
33. Grindlay K. Dako-Gyeke P.Ngo TD. Eva G, Gobah L., Reiger ST et al. Contraceptive use and unintended pregnancy among young women in and men in Acrra, Ghana. PLOS One. 2018; 13(8).
34. Calvert C, Baisley K, Doyle AM, Maganja K, Changalucha J, Watson-Jones D, Hayes RJ, Ross DA: Risk factors for unplanned pregnancy among young women in Tanzania. Journal of Family Planning and Reproductive Health Care 2013, 39(4): e2.
35. Solanke Lukman Bola, Joseph Ayode Kupoluyi, Joshua Odunayo Akinyemi and Olufunmilayo Olufunmilola Banjo. Do Community Characteristics Influence Unintended pregnancies in Kenya? Malawi Medical Journal., 31 (1): 56-64 March 2019. https: //dx.doi.org/10.4314/mmj.v311.10.