

Spatial distribution, prevalence, and determinants of unintended pregnancy among youth (15–24) in Ethiopia: Further analysis of Ethiopia Demographic and Health Survey

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Abstract

Objectives: This study aimed to determine the spatial distribution, prevalence, and determinant factors of unintended pregnancy among youth in Ethiopia.

Methods: Using the Ethiopian Demographic and Health Survey 2016, a total of 2446 pregnant women aged 15–24 in the last 5 years, including current pregnancy, were included in the study. The unintended pregnancy data were spatially visualized using coordinates for each respondent in the survey using ArcGIS 10.3. The Bernoulli model was used to identify the presence of purely spatial unintended pregnancy cluster using SaTScan software. Logistic regression analysis was fitted to determine factors associated with unintended pregnancy among youth.

Results: Unintended pregnancy among youth had spatial variation across the country. Among youth, 20.5% (confidence interval: (19.0, 22.2)) of pregnancies were estimated to be unintended. Spatial scan statistics identified 72 primary clusters (log-likelihood ratio of 37.6, at $p < 0.001$) which were located in Addis Ababa, southern part of Amhara, northwest of Oromia and northeast of Southern Nations, Nationalities and Peoples Region. Age, region, marital status, occupation, sex of household head, and number of household members were the determinant factors of unintended pregnancy among youth in Ethiopia.

Conclusion: The distribution of unintended pregnancy among youth in Ethiopia was nonrandom. Unintended pregnancy prevention strategies among youth need to be targeted on the identified factors. Hence, we recommend creating awareness on sexual and reproductive health rights with special priority to the identified hotspot areas (Amhara, Addis Ababa, Gambella, Northern part of Southern Nations, Nationalities and Peoples Region, and northwest of Oromia region) to reduce unintended pregnancy.

Keywords

Unintended pregnancy, youth, Ethiopia, generalized linear model, spatial analysis

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Introduction

Based on the concept of pregnancy desire, unintended pregnancy is defined as either the pregnancy occurred earlier than desired (wanted later pregnancy) or the pregnancy occurred when no children or no more children were desired (unwanted pregnancy).^{1,2} Between 2015 and 2019, there were 121 million unintended pregnancies annually which corresponds to a global rate of 64 per 1000 women aged 15–49 years.^{3,4} In low-income and middle-income countries,

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the average annual unintended pregnancy rate was 93 pregnancies and 66 pregnancies per 1000 women aged 15–49 years, respectively.⁴

In developing countries, there were 10 million unintended pregnancies among adolescent girls aged 15–19 years in 2016.⁵ In sub-Saharan Africa, unintended pregnancy ranged from 10.8% to 54.5% in Nigeria and Namibia, respectively.⁶ The overall prevalence of unintended pregnancy in Ethiopia was 28% with variation among regional states; the highest and lowest prevalence of unintended pregnancy was observed in Oromia and Harar regions, respectively.⁷

The risk of unintended pregnancy was found to be high among women who were aged 15–24 years with a number of causes and consequences.^{2,8} In this age group, pregnancy-related deaths are the leading cause of mortality for young women.⁹ In 2010–2014, more than half of unintended pregnancies ended in abortion in developing regions, approximately 50% of which were likely conducted with unsafe methods.¹⁰ This shows that unintended pregnancy and its consequences remain higher in this region.¹¹ In addition to complications from unsafe abortion, unintended pregnancy has a number of consequences, including maternal depression and stress,¹² inadequate prenatal care,¹³ and maternal complication like preeclampsia, postpartum preeclampsia, and hemorrhage.^{12,14,15} Unintended pregnancy can be both the cause and consequence of dropping out of school.¹⁶ Investment in the health of youth enables them to become healthy adults who are equipped to contribute positively to the society.¹⁷

Currently, Ethiopia is home to the largest and most diverse youth cohort in its history.^{17,18} Prevention of unintended pregnancy among this age group is important to improve their health (Sustainable Development Goal (SDG 3)) and education (SDG 4). It is also important to facilitate more gender-equal relationships (SDG 5 and 10) and reduce poverty (SDG 1).¹⁷ Lack of reproductive health services and education, socioeconomic factors, and lack of access to contraceptive methods contribute to an increase in unintended pregnancy among adolescents in Ethiopia.

Unintended pregnancy among youth is also associated with economic status, partner disagreement on desired number of children, education, religion, place of residence, peers and partners behaviors, family and community attitudes, age, sexual violence, risky health behavior (early onset of sexual activity or unsafe sexual practices), and mass media.^{14,19–22}

The distribution of unintended pregnancy among youth is highly skewed with respect to different socioeconomic and geographical areas. Nevertheless, spatial analyses have not been conducted to identify areas with hotspots of unintended pregnancy among youth in Ethiopia. Moreover, information regarding magnitude and determinant factors of unintended pregnancy among youth remains unclear in Ethiopia. Therefore, we aimed to determine the spatial distribution, prevalence, and determinant factors of unintended pregnancy among youth in Ethiopia using Ethiopian Demographic

and Health Survey (EDHS), 2016. The findings of the current study help to identify areas with high levels of unintended pregnancy and inform decision-making in the identified hotspot areas.

Moreover, this study gives insight into what factors are responsible for unintended pregnancy among youth.

Method and materials

Study design, period, and setting

A population-based cross-sectional study was employed in Ethiopia. The survey was conducted from 18 January 2016 to 27 June 2016, based on a nationally representative sample that provides estimates at the national and regional levels. Ethiopia is situated in the Horn of Africa with nine regional states (Tigray, Afar, Amhara, Oromia, Somalia, Benishangul-Gumuz, Southern Nations, Nationalities and Peoples Region (SNNPR), Gambella, and Harari) and two city administrative councils (Addis Ababa and Dire Dawa) of administrative boundaries.²³ In 2019, the population aged 15–24 years for Ethiopia was 24,215,140.²⁴

Source and study population

All pregnant women aged 15–24 years within 5 years before the survey in Ethiopia was the source population. The study population was all women aged 15–24 years, who reported a pregnancy in the previous 5 years in the selected enumeration areas in Ethiopia.

Sample size and sampling procedure

A total sample of 2446 previously or currently pregnant women aged 15–24 years were included in the study (Figure 1). The EDHS 2016 sample was stratified into urban and rural areas, yielding 21 sampling strata and selected in two stages. A total of 645 enumeration areas (EAs; 202 in urban and 443 in rural areas) and a fixed number of 28 households per cluster were selected in the first and second stages of selection, respectively. The detailed sampling procedure was presented in the full EDHS report.²³

Data collection procedure and variables

After permission was granted through an online request by explaining the objective of our study, the data were accessed from the DHS program official database, www.measuredhs.com. The EDHS 2016 Birth records (BR) or Birth data set was used and the dependent variable with its important predictors was extracted. The geographic coordinate data (latitude and longitude coordinate) were also taken from selected enumeration areas (clusters). The outcome variable was unintended pregnancy among youth (women aged 15–24 years) in their last pregnancy. The dependent

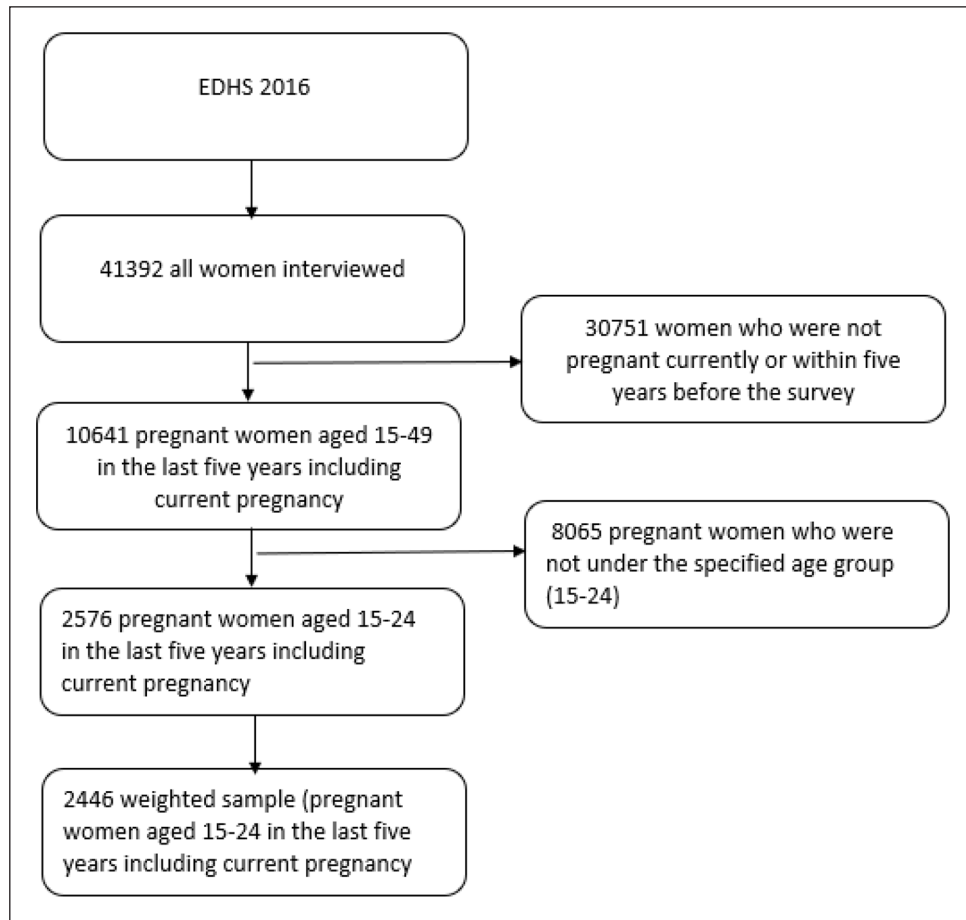


Figure 1. Final sample size and schematic presentation of how the study sample was selected.

variable was dichotomized as “Yes” if women reported whether their most recent pregnancy was mistimed or unwanted, and “No” if the pregnancy was wanted (planned). The independent variables were age, region, place of residence, educational status, religion, wealth index, media exposure, visited health facility, occupation, number of household member, sex of household head, current marital status, and household age.

Operational definition

Unintended pregnancy are defined as pregnancies that are reported to have been either unwanted (i.e. they occurred when no children, or no more children, were desired) or mistimed (i.e. they occurred earlier than desired). By contrast, pregnancies are described as intended if they are reported to have happened at the “right time . . .”²⁵

Youth defined as those persons between the ages of 15 and 24 years.²⁶

EAs were defined as a geographic area covering on average 181 households. In 2016, the EDHS cluster is either an EA or a segment of an EA.²³

Statistical analysis

The analysis was done using Stata 14, ArcGIS 10.3 and SaTScan 9.6 software. Weighted values were used because weights restore the representativeness of sampled data and to take into account the sampling design effect when calculating standard error and in order to get statistics that are representative of the population of women aged 15–24 years, who had a pregnancy in the past 5 years. Both bivariable and multivariable logistic regression analyses were fit to identify factors associated with unintended pregnancy among youth. In bivariable analysis, variables with *p* value < 0.2 were considered for multivariable logistic regression analysis. Finally, adjusted odds ratio (AOR) with 95% confidence interval (CI) were reported and those variables with *p* value < 0.05 were considered as statistically significant factors associated with unintended pregnancy among youth.

Spatial autocorrelation analysis

To evaluate whether unintended pregnancy was dispersed, clustered, or randomly distributed in the study area, spatial autocorrelation (Global Moran’s *I*) statistic measure was

used. Moran's I values close to -1 indicated unintended pregnancy among youth dispersed, whereas I close to $+1$ indicated unintended pregnancy among youth clustered and unintended pregnancy among youth distributed randomly if I value was zero. A statistically significant Moran's I ($p < 0.05$) led to the rejection of the null hypothesis, which states that unintended pregnancy among youth is randomly distributed and indicated the presence of spatial autocorrelation.

Hotspot analysis (Getis-Ord G_i^* statistics)

Hotspot analysis (Getis-Ord G_i^* statistic) was computed by calculating the G_i^* statistic for each area and statistical outputs with high G_i^* indicate "hotspot" areas while low G_i^* indicates "cold spot" areas. The G_i^* statistic is a z -score. A high z score and small p value for a feature indicates a significant hotspot. A low negative z score and small p value indicates a significant cold spot. The higher (or lower) the z score, the more intense the clustering. A z score near zero means no spatial clustering. This analysis was used to identify statistically significant spatial clusters of high values (hotspots) and low values (cold spots) of unintended pregnancy among youth in Ethiopia.

Spatial scan statistical analysis

A Bernoulli-based model was used in which women aged 15–24 years who had an intended pregnancy were taken as the control and those who experienced unintended pregnancy were taken as a case, using a binary variable taking the values of 0 and 1. The scan statistics developed by the Kulldorff and SaTScan™ software version 9.6 were used to identify the presence of purely spatial unintended pregnancy cluster. Scan statistics are used to detect and evaluate clusters of cases (unintended pregnancy).

Scan statistics is done by gradually scanning a window across time and/or space. The window with the maximum likelihood is the primary cluster (most likely cluster), that is, the cluster least likely to be due to chance, and a p value was assigned to this cluster which is obtained through Monte Carlo hypothesis testing, by comparing the rank of the maximum likelihood from the real data set with the maximum likelihoods from the random data sets. The number of replications was 999 to ensure excellent power for all types of data sets. The remaining significant clusters are considered as secondary clusters, which are generated by removing the primary clusters automatically in the SaTScan software and by selecting no geographic overlap during analysis and we ordered them according to their likelihood ratio test statistic. The maximum cluster size was set at 50% of the population at risk.²⁷

Spatial interpolation

Spatial interpolation is a process in which a map surface is created by estimating the values at unsampled points based

on known values of the surrounding sampled points.²⁸ Among the various interpolation methods, inverse distance weighted (IDW) technique was used in this study for predicting unintended pregnancy among youth in unobserved areas in Ethiopia based on the sampled measurements.

Results

Sociodemographic characteristics

The actual number of women aged 15–24 years who have been pregnant in the past 5 years included in this study was 2446. Of the total respondents, 2234 (91.34%) were rural residents and 1064 (43.47%) were Muslim followers. Concerning educational level of the respondents, 1158 (47.35%) of them had primary level of education. Of the total women aged 15–24 years who have been pregnant in the past 5 years, 51.45% of them were in the two poorest wealth quintiles. The majority (64.92%) of the respondents were not employed (Table 1).

Of the total 2446 youth who reported a pregnancy in the past 5 years, 503 (20.5%) experienced an unintended pregnancy during their most recent pregnancy (CI: 19.0, 22.2). Among youth who reported a pregnancy in the past 5 years, 442 (18.0%) were mistimed (wanted later pregnancy) while 61 (2.5) were unwanted (Figure 2).

Spatial distribution of unintended pregnancy among youth

The spatial distribution of unintended pregnancy among youth was found to be nonrandom in Ethiopia. Across the country, unintended pregnancy among youth was spatially clustered with Global Moran's I value of 0.26 ($p < 0.001$) and a z -score of 8.9, which indicate that the less than 1% probability of pattern of cluster could be the result of chance (Figure 3).

The hotspot and cold spot analysis showed that the red color which indicates the significant hotspot areas (high prevalence of unintended pregnancy) was found in Amhara, Addis Ababa, Gambella, Northern part of SNNPR, and northwest of Oromia, whereas the blue color indicates the cold spot area (low prevalence of unintended pregnancy), which was found in Dire Dawa, Harari, Somali, and between the Amhara and Afar border (Figure 4).

Spatial pattern of unintended pregnancy among youth (Bernoulli-based model)

Figure 5 and Table 2 show that of a total of 85 significant clusters, 72 were primary clusters and 13 were secondary clusters. The primary clusters of areas with a high rate of unintended pregnancy were detected in Addis Ababa, southern part of Amhara, northeast of SNNPR, and northwest of Oromia, which was centered at 8.867890N,

Table 1. Sociodemographic characteristics of pregnant women aged 15–24 years participated on EDHS 2016 (N=2446).

Variables	Unintended pregnancy (weighted)		Total	%
	Yes (%)	No (%)		
Age				
15–19	95 (25.18)	283 (74.82)	378	15.45
20–24	408 (19.73)	1660 (80.27)	2068	84.55
Religion				
Orthodox	174 (22.86)	589 (77.14)	763	31.21
Muslim	201 (14.72)	863 (85.28)	1064	43.47
Protestant	120 (23.25)	400 (76.75)	520	21.29
Catholic	4 (18.89)	24 (81.11)	28	1.15
Traditional	1 (0.02)	54 (99.98)	55	2.23
Other	3 (16.49)	13 (83.51)	16	0.66
Region				
Tigray	28 (14.34)	167 (85.66)	195	7.96
Afar	3 (9.54)	33 (90.46)	36	1.50
Amhara	92 (23.91)	294 (76.09)	386	15.81
Oromia	259 (21.67)	937 (78.33)	1196	48.87
Somali	2 (1.71)	113 (98.29)	115	4.71
Benishangul	5 (15.36)	29 (84.64)	34	1.38
SNNPR	98 (23.24)	323 (76.76)	421	17.17
Gambella	2 (23.35)	5 (76.65)	7	0.29
Harari	1 (9.29)	7 (90.71)	8	0.33
Addis Ababa	12 (31.51)	25 (68.49)	37	1.52
Dire Dawa	1 (12.80)	10 (87.20)	11	0.46
Residence				
Urban	44 (20.89)	168 (79.11)	212	8.66
Rural	459 (20.55)	1775 (79.45)	2234	91.34
Education level				
No education	176 (17.06)	858 (82.94)	1034	42.29
Primary	263 (22.74)	895 (77.26)	1158	47.35
Secondary	53 (26.43)	148 (73.57)	201	8.21
Higher	11 (19.63)	42 (80.37)	53	2.14
Wealth index				
Poorest	92 (14.52)	538 (85.48)	630	25.75
Poorer	146 (23.22)	482 (76.78)	628	25.70
Middle	103 (21.27)	382 (78.73)	485	19.82
Richer	99 (25.36)	291 (74.64)	390	15.95
Richest	64 (20.42)	249 (79.58)	313	12.78
Current marital status				
Never married	24 (69.42)	11 (30.58)	35	1.42
Married	479 (19.87)	1932 (80.13)	2411	98.58
Media exposure				
No	308 (19.32)	1289 (80.68)	1597	65.29
Yes	195 (22.94)	654 (77.06)	849	34.71
Employed				
No	298 (18.76)	1290 (81.24)	1588	64.92
Yes	205 (23.93)	653 (76.07)	858	35.08
Sex of household head				
Male	443 (20.82)	1685 (79.18)	2128	87.00
Female	60 (18.93)	258 (81.07)	318	13.00
Number of household members				
1–3	102 (15.20)	572 (84.80)	674	27.53
4–6	312 (21.22)	1157 (78.78)	1468	60.04
>6	89 (29.35)	215 (70.65)	304	12.43

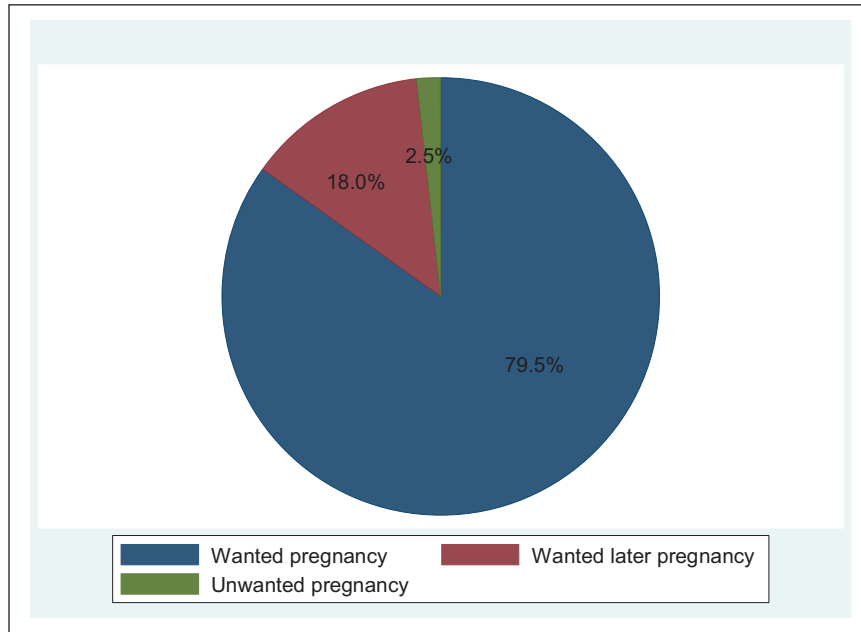


Figure 2. Prevalence of unintended pregnancy among youth in Ethiopia, 2016.

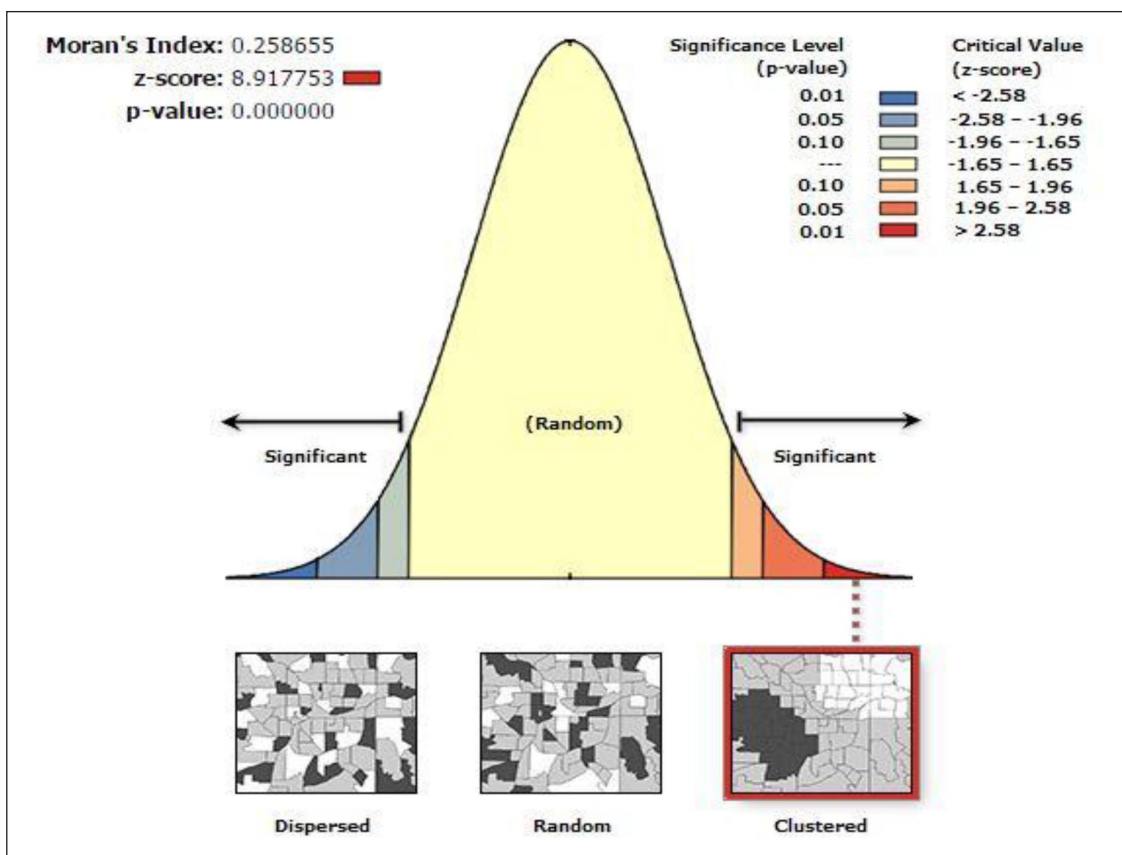


Figure 3. Spatial autocorrelation analysis of unintended pregnancy among youth in Ethiopia, 2016.

38.794280E with a 165.74 km radius, a relative risk (RR) of 2.25, and log-likelihood ratio (LLR) of 37.6, at $p < 0.001$.

It showed that youth within this area with red color spatial window had a 2 times higher risk of unintended pregnancy than youth outside this area. The secondary cluster was also

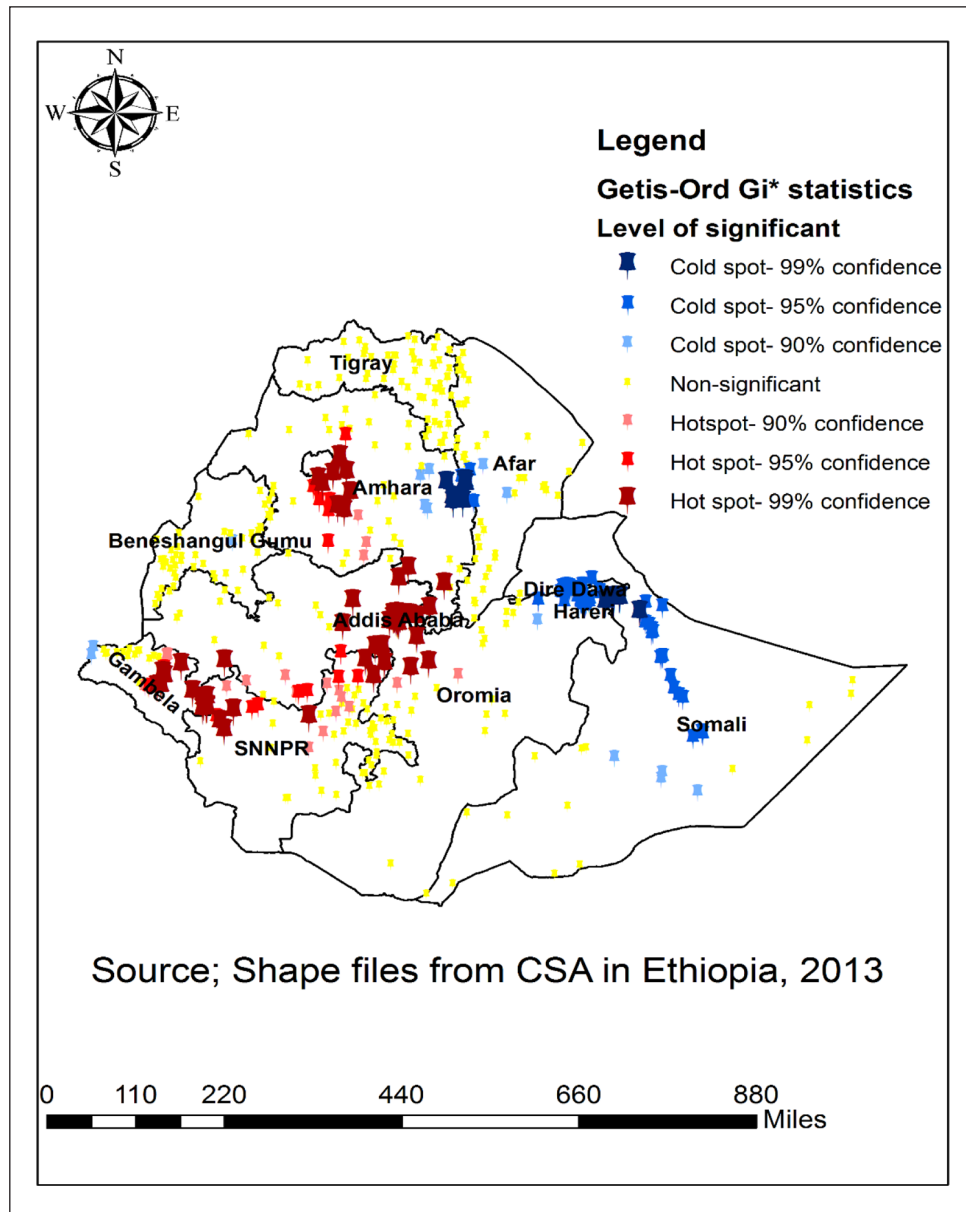


Figure 4. Hotspot and cold spot areas of unintended pregnancy among youth in Ethiopia, 2016.

located on the central part of Amhara which is centered at 11.543149N, 37.220782E with an 18.85 km radius, RR of 4.83, and LLR of 10.9, at $p < 0.01$ and SNNPR which is centered at 7.146476N, 37.651926E with a 47.47 km radius, RR of 2.16, and LLR of 10.5, at $p < 0.01$.

Interpolation using GIS mapping

Spatial interpolation used to estimate the predicted surface of unintended pregnancy at unsampled sites within an area covered by existing observation. Based on the EDHS 2016 sampled data, spatial interpolation predicted the highest rates of unintended pregnancies among youth in the western and

central parts of Amhara, Addis Ababa, southeast Gambella, and northeast SNNPR. By contrast, the lowest unintended pregnancy rates were predicted in the western part of Gambella, eastern part of Amhara, northern part of Afar, Somali, and some parts of Dire Dawa (Figure 6).

Determinants of unintended pregnancy among youth in Ethiopia, 2016

In multivariable logistic regression analysis age, region, current marital status, occupation, sex of household head, and the number of household members were significantly associated with unintended pregnancy among youth.

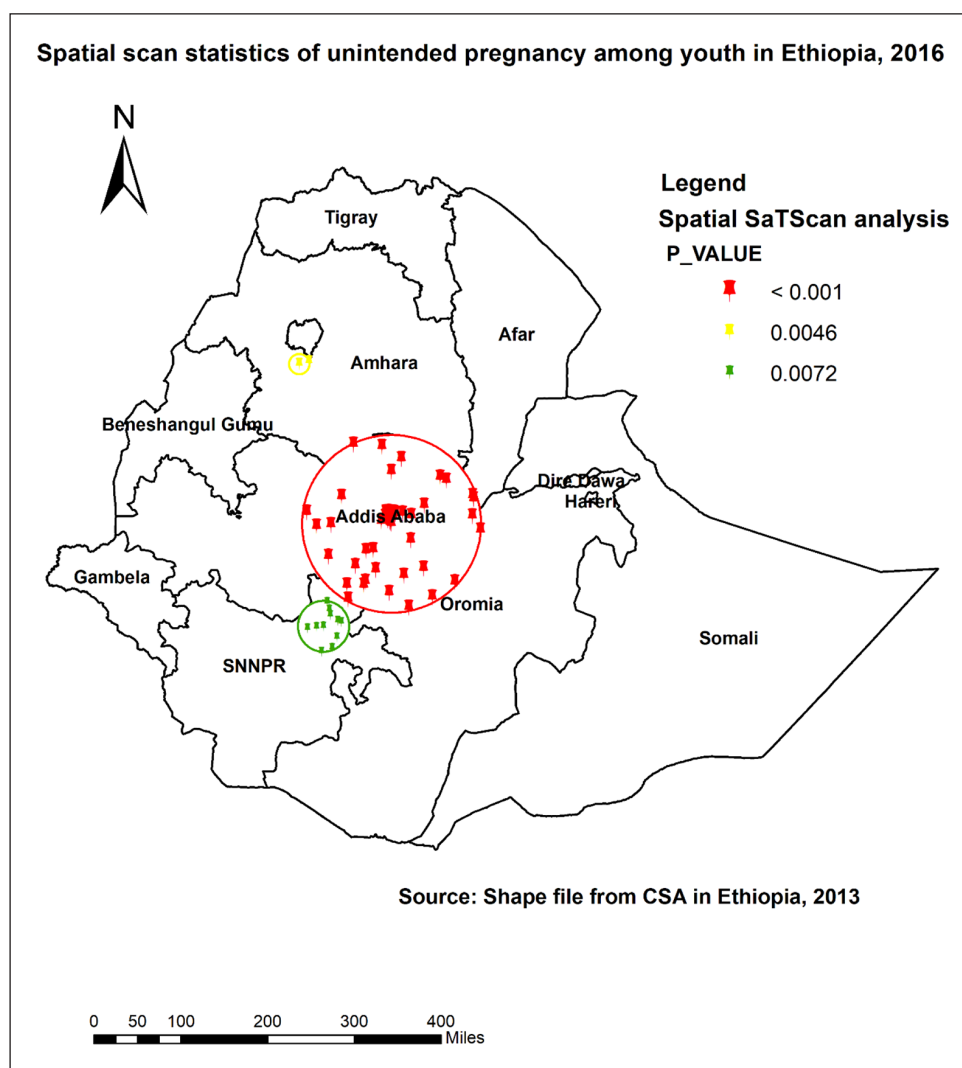


Figure 5. Primary and secondary clusters of unintended pregnancy among youth across region in Ethiopia, 2016.

Table 2. Significant spatial clusters of unintended pregnancy among youth in Ethiopia, 2016.

Clusters	Enumeration areas (EAs) Ethiopia zone	Coordinates/radius	Population	Cases	RR	LLR	<i>p</i> value
1	North Shewa, West Shewa, East Shewa, Gurage, Arsi, Selti, South West Shewa, East Gojam	(8.867890N, 38.794280E)/165.74 km	339	135	2.25	37.6	<0.001
2	West Gojam	(11.543149N, 37.220782E)/18.85 km	7	7	4.83	10.9	<0.01
3	Hadiya, Dawro, Wolayta, KT	(7.146476N, 37.651926E)/47.47 km	78	34	2.16	10.5	<0.01

RR: relative risk; LLR: log likelihood ratio; KT: kembata tembaro.

Women in the 20–24 age group had 28% (AOR=0.72; 95% CI: 0.52–0.98) lower odds of unintended pregnancy compared with women in the age group of 15–19. Youth who were living in Somali (AOR=0.07; 95% CI: 0.03–0.16), Harari (AOR=0.36; 95% CI: 0.20–0.64), and Dire Dawa

(AOR=0.43; 95% CI: 0.23–0.82) had lower odds of unintended pregnancy compared with those living in Oromia region.

The odds of unintended pregnancy among youth who were never married were 6 (AOR=6.30; 95% CI:

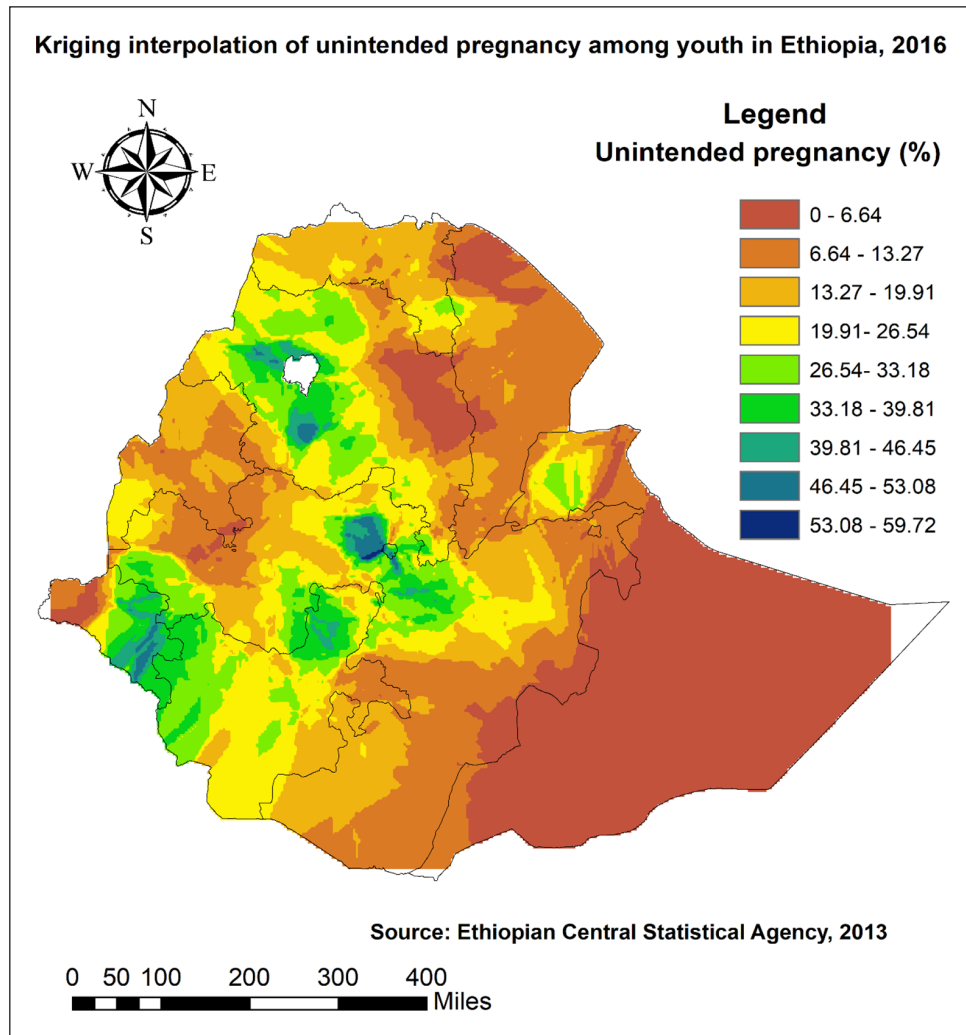


Figure 6. Interpolated spatial distribution of unintended pregnancy among youth in Ethiopia, 2016.

2.84–13.97) times higher compared with those who were married. Compared with youth who have no occupation, the odds of unintended pregnancy among those who have occupation were 1.34 (AOR=1.34; 95% CI: 1.05–1.71) times higher.

The odds of unintended pregnancy among youth from female-headed households was 34% (AOR=0.66; 95% CI: 0.46–0.9) lower compared with those from male headed households. As the number of household members increased, the odds of the occurrence of unintended pregnancy among youth also increased (Table 3).

Discussion

Countries moving toward universal health coverage need to consider how the sexual and reproductive health and rights (SRHR) needs of their population are met throughout their life course, from infancy and childhood through adolescence and into adulthood and old age. SRHR encompass a broad

range of services that ensure people can decide whether and when to have children, experience safe pregnancy and delivery, and have healthy newborn.^{29,30} This study was aimed to investigate the prevalence, spatial distribution, and determinants of unintended pregnancy among youth in Ethiopia.

In this study, 20.5% (95% CI: 19.0%, 22.2%) of pregnancies were estimated to be unintended among youth in Ethiopia, which is in line with the study done in Congo.³¹ However, the prevalence from this study is lower than previous studies done in Ghana³² and Pakistan³³ and higher than the study done in Cambodia.⁸ This may be due to sexual and reproductive health service coverage differences, including differences in family planning services. In addition, the variation might be due to study period difference.

The spatial analysis results revealed that, there is variation in experiencing unintended pregnancy among youth across the regional state of Ethiopia. High prevalence of unintended pregnancy among youth was found in Amhara, Addis Ababa, Gambella, Northern part of SNNPR, and

Table 3. Multivariable logistic regression analysis of factors associated with unintended pregnancy among youth in Ethiopia, 2016 (N=2446).

Variables	Unintended pregnancy (weighted)	AOR (95% CI)
Age		
15–19	378	1
20–24	2,068	0.72 (0.52, 0.98)*
Religion		
Orthodox	763	1
Muslim	1064	0.86 (0.59, 1.26)
Protestant	520	0.79 (0.51, 1.23)
Catholic	28	0.45 (0.09, 2.09)
Traditional	55	0.25 (0.03, 1.98)
Other	16	0.23 (0.03, 1.80)
Region		
Tigray	195	0.49 (0.29, 0.83)
Afar	36	0.51 (0.30, 0.86)
Amhara	386	0.93 (0.57, 1.54)
Oromia	1,196	1
Somali	115	0.07 (0.03, 0.16)***
Benishangul	34	0.57 (0.36, 0.89)
SNNPR	421	1.12 (0.71, 1.77)
Gambella	7	0.91 (0.53, 1.57)
Harari	8	0.36 (0.20, 0.64)***
Addis Ababa	37	0.99 (0.49, 1.97)
Dire Dawa	11	0.43 (0.23, 0.82)**
Residence		
Urban	212	1
Rural	2234	0.62 (0.37, 1.03)
Education level		
No education	1034	1
Primary	1158	1.16 (0.87, 1.55)
Secondary	201	1.45 (0.95, 2.21)
Higher	53	0.69 (0.31, 1.57)
Wealth index		
Poorest	630	1
Poorer	628	1.18 (0.82, 1.71)
Middle	485	1.17 (0.79, 1.73)
Richer	390	1.26 (0.83, 1.94)
Richest	313	0.97 (0.55, 1.71)
Visited health facility in past 12 months		
No	1153	1
Yes	1293	0.90 (0.71, 1.15)
Current marital status		
Never married	35	6.30 (2.84, 13.97)***
Married	2411	1
Media exposure		
No	1597	1
Yes	849	1.11 (0.83, 1.47)
Employed		
No	1588	1
Yes	858	1.34 (1.05, 1.71)*
Sex of household head		
Male	2128	1
Female	318	0.66 (0.46, 0.96)*

(Continued)

Table 3. (Continued)

Variables	Unintended pregnancy (weighted)	AOR (95% CI)
Number of household members		
1–3	674	1
4–6	1468	1.47 (1.10, 1.96)**
>6	304	1.49 (0.96, 2.32)
Current contraceptive method		
Not use	1646	1
Used	800	1.23 (0.94, 1.60)
Household head age		
15–19	29	2.01 (0.85, 4.74)
20–24	459	1.44 (1.00, 2.07)
25–29	866	1
30–34	506	1.14 (0.81, 1.59)
35–39	155	1.01 (0.62, 1.66)
40–44	49	1.06 (0.55, 2.06)
45–49	50	0.94 (0.41, 2.17)
50–54	65	1.44 (0.71, 2.91)
>59	267	1.41 (0.91, 2.18)

AOR: adjusted odds ratio; CI: confidence interval; SNNPR: Southern Nation and Nationality and Peoples Region.

Expressed as **p* value < 0.05, ***p* value < 0.01, ****p* value < 0.001.

northwest of Oromia, whereas low prevalence of unintended pregnancy among youth was found in Dire Dawa, Harari, Somali, and between Amhara and Afar border. The multivariable logistic regression analysis also revealed consistent findings in which Somali, Dire Dawa, and Harari were the places where low prevalence of unintended pregnancy among youth was recorded compared with the Oromia region. This might be due to cultural differences and religious differences among women aged 15–24 years along the lines of region. Furthermore, inequality in contraceptive use and quality of family planning counseling across the region might be the reason for this variation.³⁴

Age of the participants was also associated with unintended pregnancy. The odds of unintended pregnancy were lower among youth aged 20–24 years compared with women aged 15–19 years. Similar studies have also an indirect relationship between age and unintended pregnancy.³⁵ One potential explanation could be that as age increases, misconceptions and fear of side effects related to contraceptives among youth decrease. In addition, parent youth communication on sexuality-related issues has a correlation with age. This communication increases as age increases. So, this decreases the frequency of unintended pregnancy among women aged 20–24 years compared with women aged 15–19 years.

Unintended pregnancy was high among youth who were never married. This finding is consistent with similar studies conducted.^{32,36–38} The possible reason could be that the target group for family planning services is married couples in Ethiopia. The government of Ethiopia has committed to increasing the modern contraceptive prevalence rate to 55%

among married women by 2020.³⁹ In addition to this, youth are affected by family planning stigma due to social pressure, excessive disapproval of contraceptive use, and gender norms.^{40,41}

In the current analysis, employment is another predictor variable reported to have an association with unintended pregnancy among youth. The odds of unintended pregnancy were higher among youth who were employed compared with those who were not employed. This result agrees with another study done in Ghana.³² This could be due to a higher level of empowerment among women who are employed, causing them to be more likely to affirm their pregnancies as unintended.

Sex of household head was significantly associated with the occurrence of unintended pregnancy among youth. The odds of unintended pregnancy were lower among youth from female-headed households compared with those from male-headed households. This finding is consistent with the study done in Nigeria.⁴² The possible reasons could be correct and timely information on sexual and reproductive health risk, including unintended pregnancy being provided more easily for youth by the female household head than the male household head.

Consistent with previous studies,^{38,43} the current study showed that the odds of the occurrence of unintended pregnancy among youth increase as the number of household members increases. The possible explanation could be that due to women having a large number of household members, it decreases the mother's desire to have additional children. They are preoccupied with caring for their families and do not have easy access to family planning and information.

Strength and limitation of the study

This study has several strengths. First, this study used a large sample size, which is representative at the national and regional levels, providing depths for generalization of the target population of Ethiopia. Second, this article builds a body of knowledge on the spatial disparity of unintended pregnancy and identifies hotspot areas by simultaneous use of both ArcGIS and SaTScan statistical tests to design effective public health programs. Third, the study's uses both spatial and nonspatial statistical approaches for a more thorough and accurate analysis. This study is not free from limitations. SaTScan detects only circular clusters and not irregularly shaped clusters. Furthermore, pregnancy in the EDHS 2016 survey was self-reported by the survey participants; while pregnancy is a major event, social desirability bias could lead women to report that their pregnancy was intended, though it was not. This will underestimate the burden of unintended pregnancies. In addition to the self-report, the given respondents' most recent pregnancy may be up to 5 years ago, and reporting on intendedness may also differ by how long ago the pregnancy took place. The sample size/power analysis was not performed for this study.

Conclusion

This study identified spatial clusters of unintended pregnancy among youth in Ethiopia. The prevalence of unintended pregnancy among youth is relatively high. Having an occupation, being unmarried, and having the largest number of household members increased the likelihood of unintended pregnancy among youth. However, youth from female-headed households and who were between 20 and 24 years were less likely to experience an unintended pregnancy. These results provide further insights into identifying the true pictures of unintended pregnancy among youth clusters in Ethiopia and enable implementation of spatially targeted strategies for dealing with the consequence of unintended pregnancy and making informed decisions. We also recommend creating awareness on sexual and reproductive health rights with special priority for Amhara, Addis Ababa, Gambella, Northern part of SNNPR, and northwest of Oromia to reduce unintended pregnancies.

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Author contributions

Conception of the work, design of the work, acquisition of data, and analysis and interpretation of data were done by S.A.K. Data curation, drafting the article, revising it critically for intellectual content, validation, and final approval of the version to be published were done by S.A.K., B.S.T., and A.B.W. All authors read and approved the final manuscript.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethics approval

Ethical clearance was obtained from measure DHS through filling a form requesting for accessing data. We sent a one-page proposal abstract of the study to the DHS program office. They gave permission to access the data with reference number 149633. The data used in this study are publicly available, aggregated secondary data with no personal identifying information that can be linked to study participants. Since we used publicly available data set, ethical approval was not as such required. But we accessed the data set from the DHS website (<http://dhsprogram.com>) through registering or online requesting. Moreover, this study was deemed exempt by the Institutional Review Committee of Institute of Public Health, College of Medicine and Health Sciences, University of Gondar.



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Informed consent

Informed consent was not sought for the present study, because the study does not involve the collection of information from subjects. Consent to participate is not applicable and is waived off with the waiver number EP/2370/13. The confidentiality of the data was maintained anonymously.

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Availability of data and materials

All necessary information was included within the manuscript.

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