

# Assessment of Intention to Use Contraceptive Methods With Spatial Distributions and Associated Factors Among Women in Ethiopia: Evidence From EDHS 2016

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## Research

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# Abstract

**Background:** Modern contraceptive methods have immense influences on the health of mothers and their children. Using contraceptive methods is seen to control family size and unnecessary pregnancies. And it leads to peaceful and known family status. Considering different factors like resources and various cultural aspects, assessing the intention to use might bring areas with these problems into the light to act on them.

**Methods:** We used multilevel logistic regression and spatial analysis techniques to the data from the 2016 Ethiopian demographic health survey. We downloaded the data from the EDHS website after the approval of the request for the data. We pooled the data to assess the intention to use contraceptive methods among 15-49 age women. After applying bivariate and multilevel binary logistic regression, we presented the information on Community and Individual level using tables, figures, and spatial distribution. We applied a p-value  $<0.05$  and adjusted odds ratios (AOR) with 95% confidence intervals (CI).

**Result:** the intention to use contraceptive methods was 44.11%. Spatially, we found intention to use contraception highly clustered in North and Western Ethiopia. The average number of children ( $4.5 \pm 2.9$ ), age at first cohabitation ( $16.9 \pm 3.99$ ), and the ideal number of children ( $4.77 \pm 2.0$ ). Some other factors associated with intention to use contraceptive methods were age, education, the information was given by health facility, age at first cohabitation, the ideal number of children, Wealth status, and Regions that were significant.

**Conclusion:** We observed various distributions among regions. Education status and various socio-cultural aspects need serious considerations to increase the intention to use contraceptive methods. Besides the efforts done, policy decisions might need to consider this finding and uphill the intervention against associated factors like socio-cultural and demographic variables in those areas.

## Background

Irrespective of the type of modern contraceptive women intended to use, World Health Organization (WHO) put no restriction on contraceptive methods unless unacceptable health risks outweigh the worth of utilizing (1).

Using modern contraceptive methods has got enormous influences on the health of mothers and children. Using contraceptive methods has been seen to control family size and unnecessary pregnancies. These lead to a safe life for the mother and child and a safer economy for the family size. A woman may incline toward contraceptive methods use even though many factors might make things difficult for her. The intention to use contraceptive methods is associated with some socio-demographic variables in Africa (2). The socio-demographic factor of the women like age, place of residence, marital status, education, religion, work, frequency of visit to health institution, and awareness of the ovulation cycle has affected intention to use contraception methods(3). According to the Studies in East Africa,

contraception use was also correlated to parity and attitude (4). Those socio-demographic factors were common in most African countries to affect contraceptive use intention. It became explicit when marital status, Wealth category, Education level, place of residence, number of children, age, religion, and access to a health facility reported in East, South, and West African countries are influencing factors (4-8)

In Ethiopia, data from EDHS (Ethiopian demographic health survey) 2011 and 2016 indicated clear implications on under-five mortality magnitude (9). There was a variation among regions and city administrations regarding contraceptive use. A piece of information from EDHS 2016 showed that the variation observed was region-based (10). However, studies showed a continuous assessment of contraceptive use and their drawbacks, risks, and increasing societal commitment regarding the expansion of them to reduce the risk of unwanted pregnancy is necessary(11). Educating Women, improving women's awareness, involving males in counseling, and focusing on postpartum contraceptive initiation were advised frequently in developing countries to increase intention (12). Other factors from studies include: sharing information with husband/partner, counseling for contraceptives, education more than primary, the desired number of children correlated to intention to use (13).

Studies found women from educated families use contraceptive methods mostly for emergencies (14). In Ethiopia, postpartum contraceptive use is the strategies to increase contraception use; however, the usage is still small. Reasons like cultural and traditional barriers, low male approval, low antenatal visits, inadequate knowledge, and fertility advice correlated (15). From EDHS 2011, we knew the intention to use was 44.1%. During that time, the number of children alive, age at marriage, media exposure, employment status, education of women and her partner, information obtained from health facilities had positive associations (16). Even though contraceptive usage increased 15 folds in some of the regions in Ethiopia in the last 20years, the level remains below par, and attitude, religion, and less husband involvement took responsibilities for decrements (17-21). There is a policy under implementation that state increasing the use of contraceptive from 42% in 2014 to 55% in 2020(22). And the status of the achievement of this policy with spatially informing studies is very crucial. Some studies applied multilevel analysis to identify related implementations when considering different clusters (10, 23, 24). Despite this, most studies in the country were dealing with contraceptive prevalence, side effects, and socio-demographic factors; regarding the distribution of intention at the country level through spatial mapping as there was little information in this area. In Ethiopia, intention to use contraceptive methods remained limited to picture out the direction for planning and policy decisions. Large-scale studies which picture the contraception intention status might give a piece of representative knowledge for planning and policy decisions. Thus, the current study used country-represented data from EDHS 2016 to discover the unmet to use contraceptives.

## Methods And Materials

We employed a cross-sectional study design using data from Ethiopia Demographic Health Survey (EDHS) 2016. Ethiopia is the country located in Eastern Africa (30-14oN, 33o – 48°E) and is the 2nd most populous country in Africa. EDHS is the country representative sample survey within five years intervals

starting from 2000 in the country. Ethiopia has nine regions (Afar, Amhara, Benishangul-Gumuz, Gambela, Harari, Oromia, Somali, Southern Nations, Nationalities, and People Region (SNNPR), and Tigray), and two town administrations (Addis Ababa and Dire-Dawa). We retrieved the data for this study from the EDHS website [www.dhsprogram.com](http://www.dhsprogram.com) after the request to access approved and downloading allowed. Then 5,651 reproductive age (15-49years) women who never used contraceptive methods pooled from the dataset of EDHS 2016.

The dependent variable for this study is the intention to use contraceptive methods. We measured the variable as use later (1=yes) and unsure about use or not intend(0=no). The independent variable included: region, type of place of residence, pregnancy termination, heard family planning on the radio in the last few months, read family planning in newspapers/magazines in the past few months, heard family planning on television in the past few months, ever terminated pregnancy, visited field worker in the last 12 months, went to a health facility in the past 12 months, told family planning at a health facility, working status, age, highest education achieved, wealth index, religion, total children ever born, the ideal number of children, husband education, and age at first cohabitation.

Data management consisted of descriptive statistics where STATA 15, ArcGIS 10.7, and SaTscan 9.6.1 soft wares were applied accordingly. Since the data showed a hierarchical nature and inter-cluster variation, we assumed multilevel logistic regression to account for the variations. Then the Likelihood Ratio (LR) test, Intra-class Correlation Coefficient (ICC), Median Odds Ratio (MOR), and Proportional Change in Variance (PCV) examined.

We calculated the dis-similarities of the intention to use contraceptive methods among clusters using  $ICC = \frac{\sigma^2}{\sigma^2 + \pi^2/3}$ ,  $MOR = \exp(\sqrt{2 \cdot Va}) \cdot 0.6745 \sim MOR = \exp(0.95 \cdot \sqrt{Va})$ , and the amount of variation of intention to use contraceptive methods at individual and community level is PVC, where  $var(\text{null model}) = \text{initial variance of the model}$ ,  $var(\text{final model}) = \text{variance of the final model}$ ,  $Va$  in MOR indicates areal level variance, Where;  $var(\text{null model}) = \text{variance of the initial model}$ , and  $var(\text{final model}) = \text{variance of the final model}$  (25, 26, 27).

We employed binary logistic regression during the analysis for both individual and community-level variables. We built four models. The first model was an intercept-only model showing only the variation among clusters; the second model included individual-level variables; the third model included community-level variables; the fourth included all individual and community-level variables. Each variable was filtered at a p-value < 0.25 before both level analyses. We maintained the statistical significance at a p-value < 0.05 with an adjusted odds ratio and 95% confidence interval. Comparison of models applied deviance (-2LL); the lower deviance indicated more model fitness.

We cross-tabulated the weighted frequency of dependent variables and cluster number to obtain the case to total proportion ratio. We dropped Latitudes/longitude with zero coordinates and then applied spatial analyses using ArcGIS 10.7. We applied Global Moran's I to evaluate and check if we have clustered, dispersed, or randomly distributed data across the study area. Significant positive and negative Moran's I index value indicated an inclination to clustering and dispersion in sequence. Getis-OrdGi\* statistics

computed and Showed hot/cold spot area using Z-score and acceptable p-value. The Ordinary Kriging interpolation technique was employed to predict un-sampled areas. We used the Bernoulli model to test the statistical significance of clusters by the Kulldorff's Sat Scan version 9.6.1.)(28).

We accessed data for this study from the Demographic Health Survey (DHS) website (<http://www.dhsprogram.com>). The access only requests registration for permission. We used the data only for the research purpose. We kept it confidential; we avoided any effort of identifying households or individuals. The EDHS data collection obtained permission from Ethiopian Health Nutrition and Research Institute (EHNRI) Review Board and the National Research Ethics Review Committee (NRERC) at the Ministry of Science and Technology, approved EDHS credentialed. During data collection, they collected verbal informed consent from participants and explained the purpose as it was published in the 2016 EDHS report (29). Participation in the survey was voluntary.

## Results

From the total of 5,651 reproductive age (15-49years) women population extracted from the EDHS 2016 dataset, 44.11% had an intention to use contraceptive methods. The mean number of children ever born to women in the survey was  $4.5 \pm 2.9$ , while the average age at first cohabitation was  $16.9 \pm 3.99$ , and the mean ideal number of children reported  $4.77 \pm 2.0$ . We used a weighted frequency for the included women at the community level, and the larger numbers were from Oromo (43.78%), Amhara (19.51%), and 19.09% SNNP regions. Greater than three-fourth (88.22%) of women were from rural-based residences. At the individual level, 2/3rd (68%) of women were illiterate (no education), and 1/4th learned at least primary school. Due to this, 18.34%, 11.09%, & 2.36% of them only heard family planning information on radio, TV, and newspaper/magazines in sequence. Their exposure to service providers was 26.14%, and 43.66% were only visited health facilities or met with community health workers respectively in the last 12 months. Indeed only 12.32% of them have ever terminated a pregnancy. We also described women in terms of other socio-demographic variables and found Muslims and Orthodox Christians as larger religions, 27.68% currently working women, 45.61% & 34.48% poor and rich women respectively; 51.61% of women live with illiterate husbands and age group with higher women were 25-29, 30-34, & 35-39 and 19.98%, 19.49%, & 17% respectively; (Table 1).

## Spatial Results

We analyzed the spatial data based on the coordinates captured during the data collection. There we found significant clustering that went well with the statistical analyses we applied. We presented the results in table 2 and fig. 1-4. We applied hotspot and cold spot analysis to show areas with higher and lower future use (fig.1), Ordinary Kriging interpolation applied if these areas are more closely (fig.2), and spatial autocorrelation if the closeness is significant (fig.3). And SaTscan statistics for the number of clusters (fig.4) applied to each of them held significantly. Depending on table 2, there were five most likely clusters observed, among which three (cluster 1-3) showed significant association with intention to use

contraceptive methods. Cluster one included Gambella, Benishangul, Addis Ababa, and some parts of SNNP and Amhara at (10.298371 N, 34.649187 E) coordinates with 588.81 km radius, cluster two contained the whole Tigray, and almost full Amhara regions at (12.669915 N, 36.775082 E) with the radius of 335.28 km, and cluster three contained the whole SNNPR, some part of Oromia, Gambella, Addis, and Benishangule at (6.934084 N, 36.520510 E) with the radius of 308.29 km. and relative risk of clusters(1-3)1.88, 1.83, & 1.50 respectively; (table 2 and fig.4).

## Individual and Group Level Analyses

Since we used the data collected on various clusters, we decided to check for the clustering effect among sampling units. It showed dissimilarities, and a larger ICC confirmed variation among clusters. We handled these variations via multilevel logistic regression analyses. We built four models to account for the inter-cluster differences (Table 3 & 4). The initial (null) model was the model without predictors (intercept only model) followed by the I-III model for individual and community level predictors. At individual level, compared to age group 15-19, women in age group of 25-29,30-34,35-39,40-44, 45-49 had 58%, 72%, 90%, 97%, & 99% reduced intention to use contraceptive methods with AOR of 0.42(0.3-0.7), 0.28(0.17-0.5), 0.1(0.05-0.18), 0.03(0.02-0.06), & (0.010(0.004-0.02) respectively. Reproductive age women with primary education had a 1.4 likelihood contraceptive use intention with an AOR of 1.4(1.04-1.8) relative to none educated women. As the number of ever born children increased, the women showed intention for contraceptive use, which increased with an AOR of 1.1(1-1.2); otherwise, women with a larger ideal number of children had 11% reduced intention to use contraceptive methods with an AOR of 0.89(0.84-0.94). The women who obtained information to use contraceptives at health facilities showed 1.6 times more intention with an AOR of 1.6(1.3-21). As age at first cohabitation increased, intention to use contraceptive methods raised 1.04 times with an AOR of 1.04(1-1.06).

At the community level, compared to the women in Tigray, women in Afar, Oromia, Somali, Benishangul, SNNPR, Harari, Addis Ababa, and Dire Dawa had 89%, 61%, 96%, 58%, 64%, 85%, 66%, & 80% reduced intention to use modern contraceptive methods with AOR of 0.11(0.06-0.2), 0.39(0.23-0.64), 0.04(0.02-0.09), 0.42(0.25-0.72), 0.36(0.2-0.67), 0.15(0.08-0.28), 0.34(0.2-0.62), & 0.2(0.11-0.36) respectively; (Table 3).

Initially, the null model had 28% intention of contraceptive use appeared only due to the variation among clusters and the remaining left for individual. We sequentially developed models to handle such variations, the inter-cluster variation reduced by 1/4th to be only (7%). The PCV for intention to use contraceptive methods in the initial model escalated to 2.9 times more variable due to the clustering effect. We described the full modeling procedures to handle variation in table 4 below. The variance, ICC, media odds ratio, and deviance decreased, while log-likelihood ratio and proportional change in variances increased and showed good fitness.

## Discussion

In this study, we analyzed the EDHS 2016 data to identify the intention of contraceptive methods among reproductive-age women (15-49years). We extracted a total of 5,651 women from the dataset, among which the intention to use contraceptive methods was 44.11%. Compared to the other findings, the intention to use contraceptive was 31.7% in Gahanna (8), 44.7% in Mozambique(30) 42% in Pakistan(31), 18.2% in Wellega Ethiopia(31), 38% in Wolaita Ethiopia(32), and 84.3% in Aksum Town Ethiopia(32). The discrepancies might be due to the comprehensive nature of our study and higher and may be due to the area; (Table 1)

The average age at first cohabitation in the data was  $16.9 \pm 3.99$ . In a study in Wolaita, it was 17.6(33) and also reported in other studies  $<16$ years (34) and  $\leq 19$ years (32). These might indicate the average lies between 16 & 19 years. The average number of children per participant was  $4.5 \pm 2.9$ . It was  $4.9 \pm 1.9$  in Wolaita zone Ethiopia (32), in North West Ethiopia  $>3$ (35). In another study, 38% of women reported  $>5$  children per household (9). The mean looked similar throughout the country, and there was only a little difference among them. It might show the average number of children per household is between these numbers. Increasing family planning-related resources and making the intended women access the service might reduce that. However, the mean ideal number of children reported by the women was  $4.77 \pm 2.0$ , which coincided with the total ever borne number of children. It was also inconsistent compared to the finding in Aksum town ( $2 \pm 1.5$ )(35). In another investigation, 35.5% of women had five-plus ideal plans for the number of children (32). With all efforts to increase family planning in the last 15 years in Ethiopia, many inconsistent reports indicating the average more remained ahead.

More than 2/3rd of the women were illiterates. The number was not shy relative to another study in the country where it was 63%(9). In Wolaita Sodo town, 32% of women in this group were without formal education (16). In the Tigray region, 43.2% of women not educated (18), and 62.1% not educated in another study (33). The discrepancies of the finding indicate education might be the main reason behind the intention.

It was even expressive when only 2.4% of participants used newspapers/magazines for obtaining information. Learning less education deprives women of information access in developing countries. Uneducated women might not be aware as educated ones use services available for reproductive health. Only 43.66% of the women had health facilities visit in the last 12 months. Only 27.68% of the women had formal work. Studies indicated that non-working women don't attend school and had less intention to use contraceptive methods (33), (13). Adequate Socioeconomic status was usually associated with health services utilization and birth planning, while the opposite is also true. In underdeveloped countries, women have no work, are poorly educated (both couples), and economically poor. These concerns need to be managed as the major issues to solve utilization problems (5, 36-38); (Table1).

The significance clustering we have observed was another approach that explained the percentage distribution of intention to use contraceptive methods in the country, and this wasn't happened by chance. The intent to use contraceptives methods has clustered in Northwest Ethiopia(10); (Table 2)

And this sparked some questions about whether the distribution followed some socio-demographic paths (fig. 1, 2, 3, & 4). Evidence indicated the Northern part of the country mostly Orthodox believers, Eastern part Muslims, and southern and western parts protestants (39-40); (table 2).

The intention to use contraceptives was higher in the age group of 15-19 than all other age groups. This finding has support from another study in Ethiopia (32). The possible explanation might be more intention of contraceptive use exists at an early age or before marriage. The current educational motivation due to different international efforts like the Millennium development goal might influence these things. Participants in the study in Gahanna showed the reverse intention compared to our study; the participants with primary education as their highest education had no intent to use contraceptive methods in that study (2). That might indicate an intention to learn and use contraception was correlated. In other words, the finding is consistent with the result in North West Ethiopia. It means primary education influence might be different in different African countries. Women with a higher number of children showed more tendencies to use contraceptive methods, which is more global among many studies (9, 34). Women who obtained information on contraceptive methods in health facilities became the other groups to show intention. It indicates that healthcare availability or accessibility increased counseling by health professionals and affected the intent (41); (Table 3)

Women with increased age at first cohabitation had better intention to use contraceptive methods compared to the earlier. However, in Uganda, age at sexual debut has influenced future contraceptive use than the age at first cohabitation (42, 43). The inconsistent information might be due to the difference in legality concept of sexual intercourse and cut year concerning marriage where most women might report that after marriage for a cultural reason differ. Compared to the Tigray region, less intention was observed almost in all others especially, in the South and Eastern parts. It might indicate, the Tigray region has better contraceptive methods awareness and has good experience to learn from (31, 35, 44); (Table 1). Despite these, the current study has many limitations. Limitations of the sampling distribution and clustering effect from the difference in regions were well handled during analysis using pooled frequencies and multilevel analyses; (Table 4). Although we managed these, other limitations like removing data without coordinates and using third-party data might be some other limitations that need consideration while applying our findings.

## Conclusion

The intent to use contraceptive methods was distributed differently in different regions. Socioeconomic and demographic factors might be the reasons. Education and socio-cultural aspects need serious considerations to increase engagement in the services that include family planning. Tigray had good intentions and contraceptive uses; thus, using the region as the focal for experience sharing for others. Education showed a virtuous correlation with the intent to use contraception. So, Educating women might increase the intention and use of contraceptive methods. Promoting women to start cohabitation at a later age could improve their intent to use contraceptive methods. From the result, we learned high intention among women who have started cohabitation at a later-age. Additionally, employing and

empowering the women might improve the intention and contraception utilization since only less than 1/3rd of the women were currently working during the survey.

## Abbreviations

WHO = World Health Organization

EDHS = Ethiopian Demographic Health survey

AOR = Adjusted Odds Ratio

CI = confidence interval

SNNPR /SNNP = South Nations Nationalities people Region

EHNRI = Ethiopian Health Nutrition and Research Institute

NRERC = Review Board and the National Research Ethics Review Committee

## Declarations

### **Ethics approval and consent to participate**

We accessed data for this study from the Demographic Health Survey (DHS) website (<http://www.dhsprogram.com>). We kept it confidential; we avoided any effort of identifying households or individuals. The EDHS data collection obtained permission from Ethiopian Health Nutrition and Research Institute (EHNRI) Review Board and the National Research Ethics Review Committee (NRERC) at the Ministry of Science and Technology, approved EDHS credentialed. During data collection, they collected verbal informed consent from participants and explained the purpose as it was published in the 2016 EDHS report (29). Participation in the survey was voluntary.

### **Consent for publication**

Not applicable

### **Availability of data and material**

The data used in this study are the third-party data which is Demographic and Health Survey available at (<http://www.dhsprogram.com> ). To access the data, someone needs to follow the steps indicated web address and the protocol in the methods section.

### **Competing interests**

The authors declare that they have no competing interests.

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We received no funds for this work.

## Authors' contributions

GG developed the proposal, writing results, and drafting the manuscript while SH was involved in the conception, analysis, and reviewing of the document.

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## Tables

**Table 1:** the descriptive characteristics of the study participants extracted from EDHS-2016 for reproductive women (15-49years).

Variables	Weighted frequency (%)	Variables	Weighted frequency (%)
<b>Highest educational level</b>		<b>Types of residence</b>	
No education	3,717.96(68.12)	Urban	643.15(11.78)
Primary education	1,370.29(25.10)	Rural	4,815.1(88.22)
Secondary education	220.0(4.03)		
Higher education	150.04(2.75)		
<b>Heard FP on the radio in the last few months</b>		<b>Religion</b>	
No	4,380.84(81.66)	Orthodox	1,916.24(35.41)
Yes	983.67(18.34)	protestant	1,114.6(20.60)
<b>Heard FP on TV in the last few months</b>		Muslim	2,297.38(42.45)
No		Others	83.26(1.54)
Yes	4,769.61(88.91)	<b>Respondent currently working</b>	
Read FP o newspaper/ magazine in the last few months	594.92(11.09)	No	3,879.54(72.32)
No		Yes	1,484(27.68)
Yes	5,237.77(97.64)	<b>Wealth status</b>	
<b>Visited by field workers in the last 12 months</b>	126.76(2.36)	Poor	2,468.02(45.61)
No		Middle	1,077.75(19.92)
Yes	3,962.44(73.86)	Rich	1,865.72(34.48)
	1,402.1(26.14)		
<b>The visited Health facility in the last 12 months</b>		<b>Media exposure</b>	
No	3,022.46(56.34)	<b>No</b>	3,556.4(66.29)
Yes	2,342.1(43.66)	<b>Yes</b>	1,808.2(33.71)
<b>Ever had birth terminated</b>		<b>Age</b>	
No	4,744.78(87.68)	15-19	312.9(5.73)
Yes	666.71(12.32)	20-24	762.1(13.96)
<b>Intention to use contraceptive</b>		25-29	1,090.3(19.98)

no		30-34	1,063.5(19.49)
yes	2,998.45(55.89)	35-39	927.76(17)
<b>Region</b>	2,366.08(44.11)	40-44	665.82(12.2)
Tigray		45-49	635.8(11.65)
Afar	365.5 (6.70)		
Amhara	72.36(1.33)	<b>Husband/partner education</b>	
Oromia	1,064.77(19.51)	No education	2,768.4(51.61)
Somali	2,389(43.78))	Primary education	1,905.26(35.52)
Benishangul	261.2(4.78)	Secondary education	412.7(7.69)
SNNPR	69.7(1.28)	Higher education	278.1(5.18)
Gambela	1,041.8(19.09)		
Harari	16.7(0.31)		
Addis Ababa	13.9(0.26)		
Dire Dawa	132.3(2.42)		
	30.2(0.55)		

**Table 2:** most likely clusters of intention to use contraceptive methods among women of childbearing age based on the EDHS 2016

Clusters	Observed case	Expected cases	RR	LLR	p-value
1	1.31	959.26	1.88	141.8	<0.001
2	1.56	410.86	1.83	120.44	<0.001
3	1.35	436.4	1.5	50.7	<0.001
4	1.6	31.9	1.61	8.5	0.067
5	1.84	8.15	1.85	4.21	0.98

**Table 3:** Multilevel logistic regression on individual and community-level factors associated with the women (15-49) intention of modern contraceptive methods use.

Variables	Model 0	Model I	Model II	Model III
<b>Age</b>				
15-19	-	1		1
20-24	-	0.70(0.45-1.11)		0.71(0.45-1.13)
25-29	-	0.47(0.29-0.76)**		0.42(0.3-0.7)***
30-34	-	0.34(0.2-56)***		0.28(0.17-0.5)***
35-39	-	0.11(0.06-0.21)***		0.1(0.05-0.18)***
40-44	-	0.04(0.02-0.08)***		0.03(0.02-0.06)***
45-49	-	0.012(0.01-0.03)***		0.010(0.004-0.02)***
<b>Highest education level achieved</b>	-			
No education	-	1		1
Primary education	-	1.4(1.1-1.8)**		1.4(1.04-1.8)*
Secondary education	-	1.2(0.8-2)		0.1.3(0.8-2.1)
Higher education	-	1.3(0.74-2.4)		1.4(0.76-2.5)
<b>Total number of children ever born</b>	-	1.2(1.1-1.22)***		1.1(1-1.2)***
<b>Told FP at a health facility(HF)</b>	-			
No	-	1		1
Yes	-	1.7(1.3-2.1)***		1.6(1.3-21)***
<b>Age at first cohabitation</b>	-	1.02(0.99-1.05)		1.04(1-1.06)*
<b>Ideal number of children</b>	-	0.9(0.85-0.95)***		0.89(0.84-0.94)***
<b>Husband education</b>	-		Intention	
No education	-	1		1
Primary education	-	1.4(1.1-1.75)*		1.36(1.1-1.7)
Secondary education	-	1.1(0.78-1.6)		1.2(0.82-1.73)

Higher education	-	0.9(0.57-1.4)	0.96(0.6-1.5)
<b>Religion</b>	-		
Orthodox	-	1	1
Protestant	-	0.62(0.44-0.88)**	0.69(0.48-0.98)
Muslims	-	0.27(0.2-0.35)***	0.29(0.22-0.38)
Others	-	0.6(0.2-1.78)	0.67(0.23-1.98)
<b>Wealth status</b>	-		
Poor	-	1	1
Middle	-	1.4(1.02-1.9)*	1.4(1.04-1.9)
Rich	-	1.4(1.1-1.92)*	1.6(1.2-2.1)
<b>Region</b>	-		
Tigray	-	1	1
Afar	-	0.1(0.07-0.15)***	0.11(0.06-0.2)***
Amhara	-	0.77(0.55-1.1)	1.05(0.66-1.6)
Oromia	-	0.51(0.37-0.69)***	0.39(0.23-0.64)***
Somali	-	0.03(0.02-0.05)***	0.04(0.02-0.09)***
Benishangul	-	0.52(0.36-0.73)***	0.42(0.25-0.72)**
SNNPR	-	0.72(0.51-0.99)*	0.79(0.46-1.36)
Gambela	-	0.34(0.24-0.0.5)***	0.36(0.2-0.67)***
Harari	-	.2(0.13-0.29)***	0.15(0.08-0.28)***
Addis Ababa	-	0.3(0.2-48)***	0.34(0.2-0.62)***
Dire Dawa	-	0.2(0.13-0.31)***	0.2(0.11-0.36)***
<b>Residence</b>	-		
Urban	-	1	
Rural	-	0.69(0.54-0.86)**	0.87(0.52-1.3)

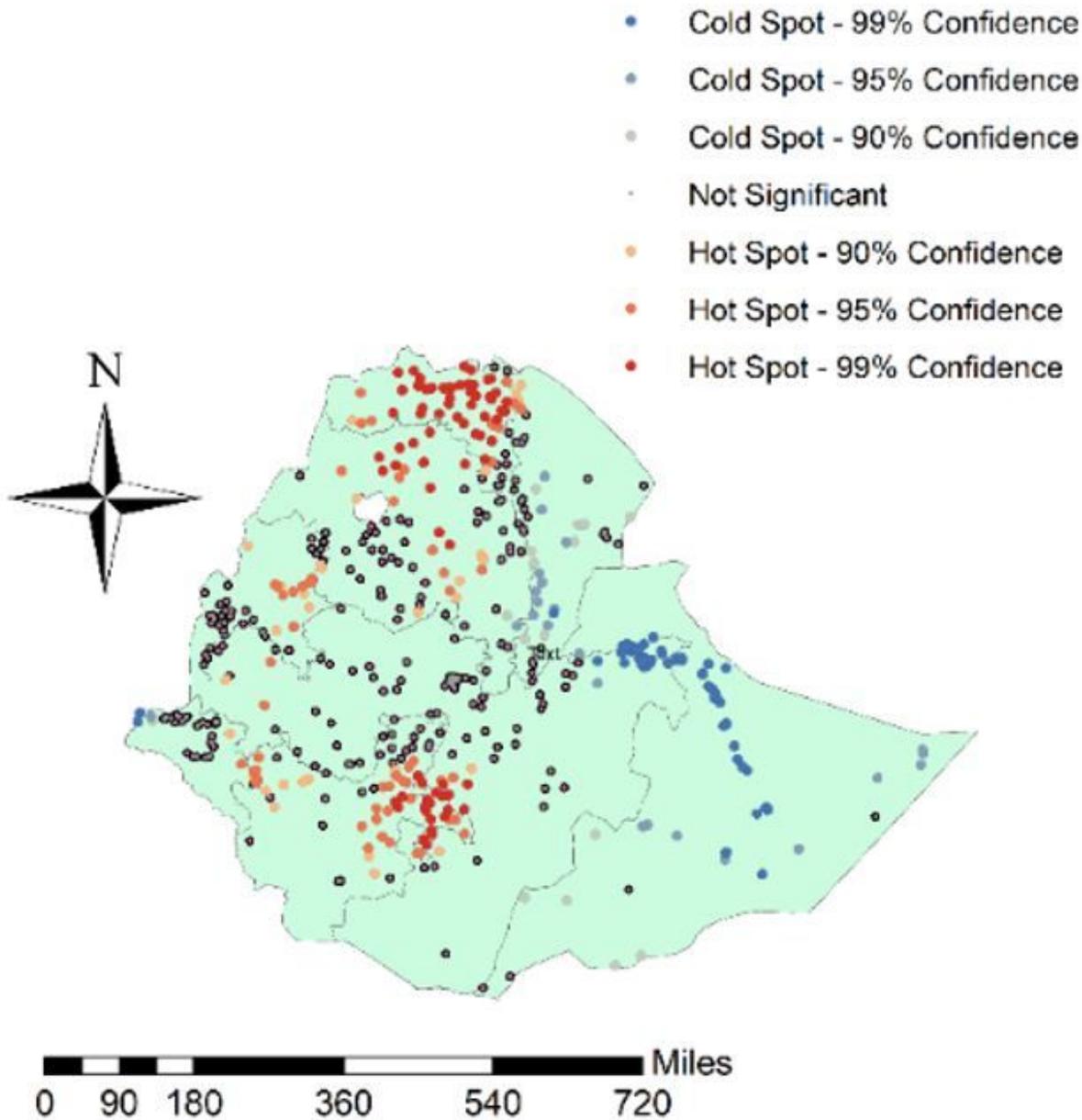
**NB:** \*=p<0.05, \*\*=p<0.01, & \*\*\*=p<0.001; FP= family planning, south nation nationality people

**Table 4:** Multilevel logistic regression model comparison and random effect distribution as examined for intention to use contraceptive methods among reproductive age group from EDHS 2016

Random effect model comparison	Model 0	Model 1	Model 2	Model 3
Variance	1.29	0.51	0.33	0.27
Inter-cluster correlation(ICC)	0.28	0.12	0.09	0.076
Log likelihood ratio(LLR)	-1372	-1405	-3166	-1301
Deviance	2744	2810	6332	2602
Proportional change in variance(PCV)	Ref	0.6	0.74	0.79
Media odds ratio (MOR)	2.9	1.9	1.7	1.6

## Figures

## Hotspot and cold spot analysis of intention to use contraception

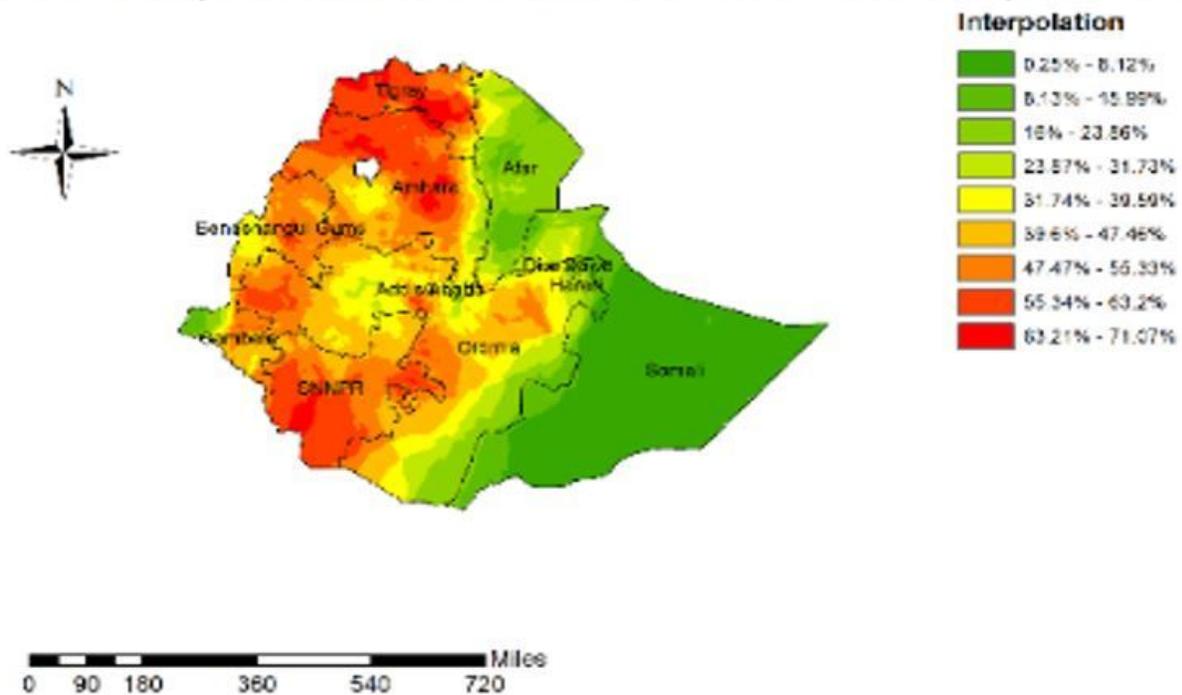


Source: shape file from Ethiopian central statistics agency (CSA), 2013

**Figure 1**

Hot spot and cold spot of intention to use contraceptive in Ethiopian, EDHS 2016 Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.

# Spatial interpolation of intention to use contraception in Ethiopia

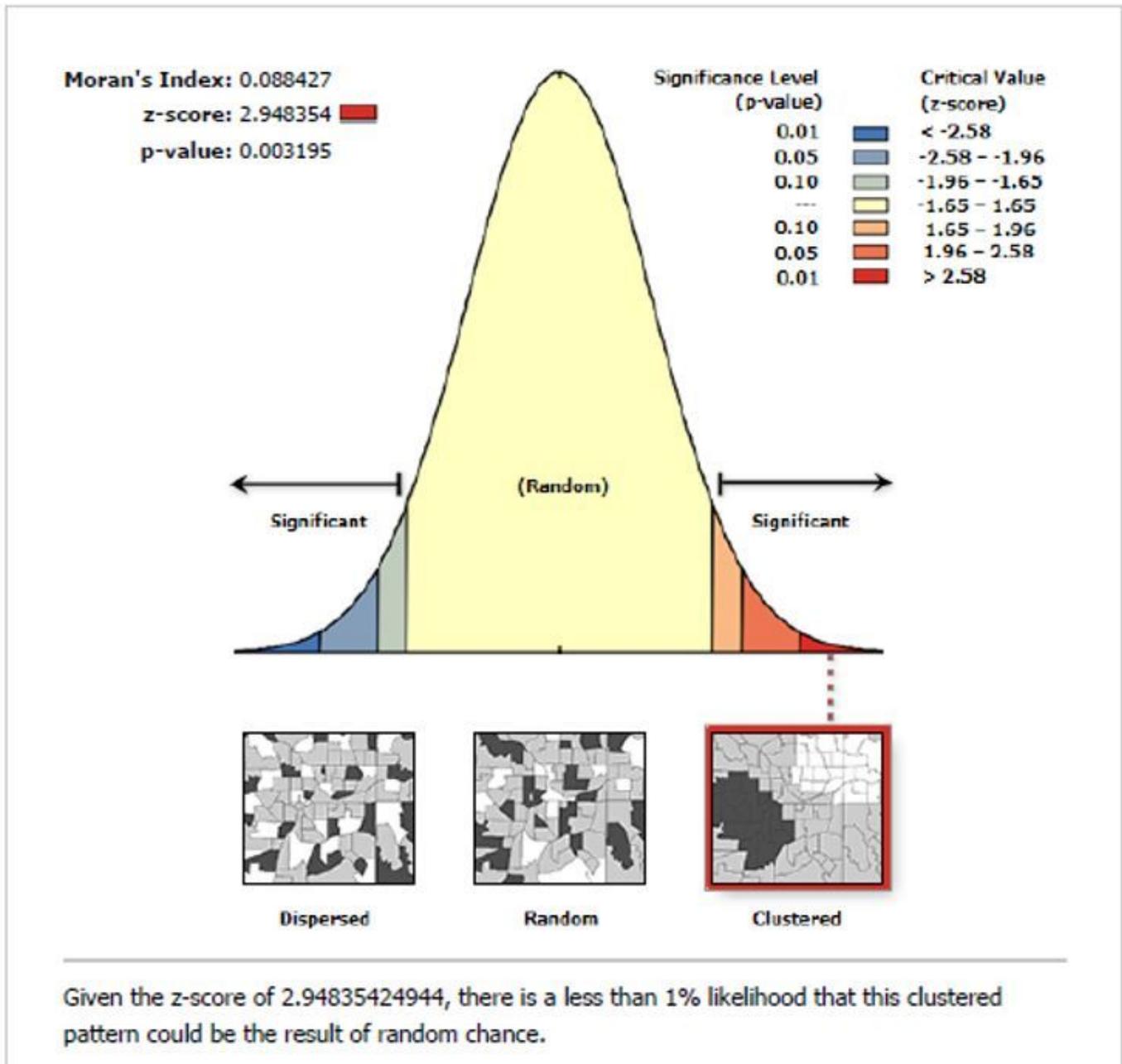


Source: shape file from Ethiopian central statistics agency (CSA), 2013

**Figure 2**

Ordinary Kriging interpolation of intention to use contraceptive in Ethiopia, EDHS 2016 Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.

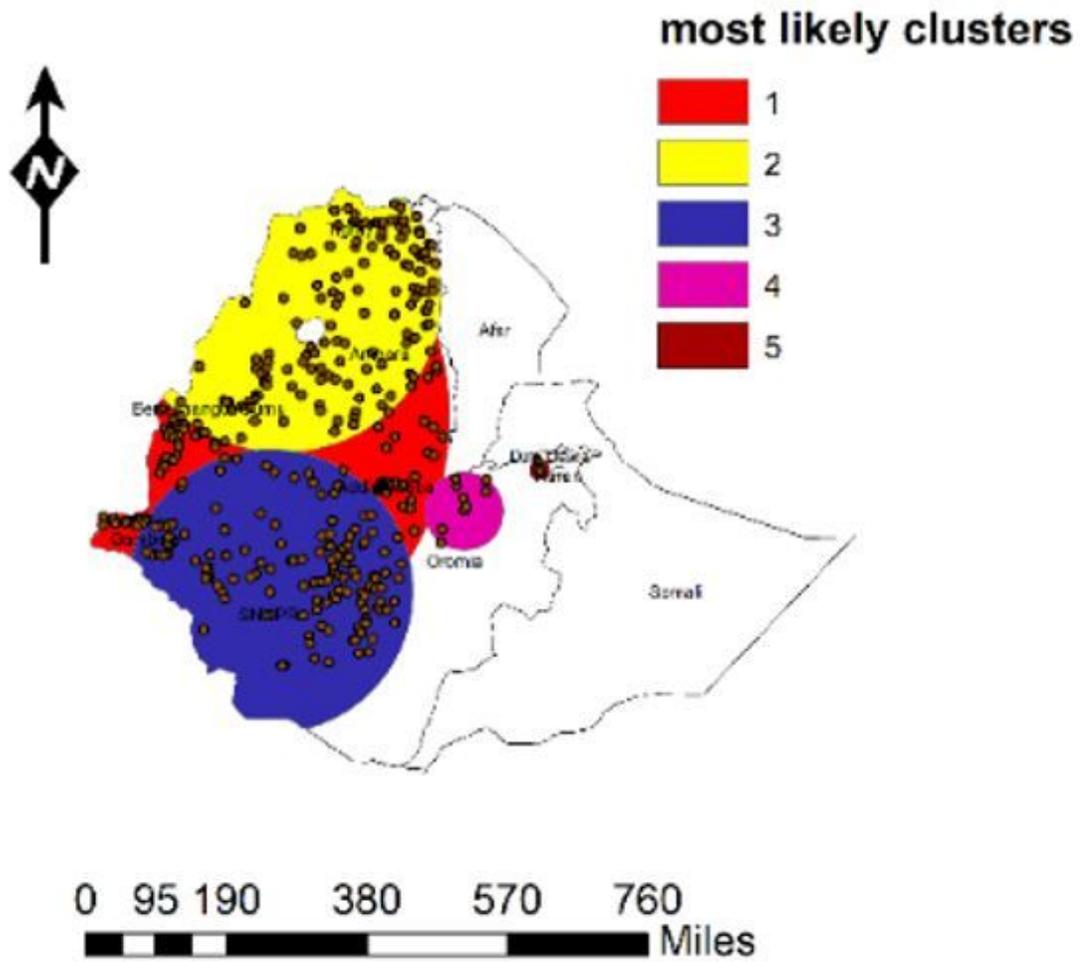
## Spatial Autocorrelation Report



**Figure 3**

spatial autocorrelation intention to use contraceptive in Ethiopia, EDHS 2016

# Cluster analysis of contraceptive use intention in Ethiopia, 2016



Source: shape file from CSA, Ethiopia, 2013

**Figure 4**

SaTScan scan statistics of intention to use contraceptive in Ethiopia, EDHS 2016 Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.