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Research Article

Keywords: Prevalence, ANC, utilization, EMDHS, Ethiopia

Posted Date: June 3rd, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-537337/v1>

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Spatial distribution and associated factors of antenatal care utilization in Ethiopia in 2019: Spatial and multilevel analysis

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Abstract

Background: Antenatal care utilization key to reduces pregnant women death and preparing women for birth. In Ethiopian antenatal care utilization was still not meet health sector transformation plan. There was also regional variation of antenatal care services in the country. Therefore, current study was aimed to explore spatial distribution and associated factors of antenatal care utilization in Ethiopia based on the nationally representative EMDHS data.

Methods: Secondary data analysis was done on 2019 Ethiopian mini demographic and health survey (EMDHS) data. ArcGIS 10.7 statistical software were used for spatial analysis. Bernoulli model was fitted by applying Kulldorff methods using the StatsCan 9.6.1 software to analyze the purely spatial clusters of ANC utilization. For associated factor mixed effect multilevel logistic regression was fitted. Inter class correlation (ICC), Median odds ratio (MOR), proportional change variance (PVC) and Deviance used for model comparison and fitness. Adjusted odds ratio (AOR) with 95% confidence interval (CI) was used to declare significant factors of antenatal care utilization.

Results: The prevalence of antenatal care utilization in Ethiopia was 75% [95 CI: 73%, 76%] in this study. The spatial distribution of antenatal car utilization was non-random across the country with Global Moran's Index value of 0.032, and significant P-value($p < 0.05$). For associated factor secondary and higher education were 4.2 and 6 time greater than that of no formal education women with AOR of 4.2(1.99-8.66) and 6 (1.62-22) respectively. The odds of richest households were 4.2 times AOR (1.08-2.3) and the odds of married, windowed, and divorced women were 6, 8 and 4.4 time more that of single women respectively in utilizing ANC. The odd of women utilizing ANC was 4.2 times AOR (6.25-10.62).

Conclusion: The spatial distribution of ANC utilization in Ethiopia is non-random. Maternal education, marital status, wealth index, place of delivery, pregnancy status region and community women education were significant predictor of antenatal care utilization in Ethiopia. Government and non-governmental organization should scale up maternal health services to low-rate area(hotspot) and poorest women.

Keywords: Prevalence, ANC, utilization, EMDHS, Ethiopia

Introduction

According to the World Health Organization (WHO), Antenatal care (ANC) is a service delivered by qualified professionals to pregnant women and adolescent girls for the best of women's and babies health. The first visit is recommended within the 12 weeks of gestation and the next at 20, 26, 30, 34, 36, 38, and 40 weeks of gestation(1). Risk identification; management and prevention of pregnancy-related diseases; health education and health promotion are the activities women served during the ANC(2). Of course, protecting women during pregnancy time remained the single most important activity in maternal health for every country in the world (3). However, the duty of maternal health care is not an easy task for developing countries where essential resources are very limited which made the problem still predominant. Ethiopia shares the big burden of the problem in the African continent. In many parts of the country, less than 50% of the pregnant women followed ANC(4). The coverage has been very well in the area with access, availability, good educational status of the mother, and good wealth indices (6,7). There are other factors that determined ANC in the piece of literature. A study conducted in the Tigray region showed marital status, education, the proximity of health facility to the village, and husband's occupation were all affected the uptake of the ANC(7).

From the Ethiopian demographic health survey(EDHS) 2016, we learned: residence; husband educational status; distance to the health institutions; community-level educational status; community-level service utilization influenced optimal ANC; however, peak ANC was witnessed in Addis Ababa, Tigray, Harari, and Dire Dawa regions, while low ANC utilization was seen in Afar, Amhara, Oromia Benishangul, SNNP, and Somalia regions(8). Another analysis from the same dataset revealed that Islamic religion, mother education, and distance from health institutions, birth order, wealth index, rural residence, and high community media exposure were

indeed deterring utilization. Spatial distribution was also not random. The Northeast Amhara, west Benishangul Gumuz, Somali, Afar, north, and northeast SNNPR had poor utilization spots and good but not optimal utilization in Tigray, Addis Ababa, and Dire Dawa regions(9). The country has a health sector transformation plan (HSTP) of the increasing proportion of women having at least 4 visits of Antenatal Care from 68% to 95%(10). According to the existing kinds of literature, the plan is far from its achievement as there is no study ever presented with such information. The ANC distribution in the country was: ANC 1-3 (45.71%) and ≥ 4 ANCs(54.29%) from EDHS 2016(11); 62.8% overall ANC utilization from EDHS 2016(12); 29.3% in the Northeast Ethiopia in 2016(4); 54% ANC in Tigray in 2013; 42.8% in 2014 in Ambo Town (13); 77.4% in Sidama Zone in South Nation Nationalities people's region (SNNPR) in 2011(14); 72.6% in Gedeo zone in 2020(6); 78.5% ≥ 4 ANCs in Debre Berhan in 2019(15); 66.3% of women not used ANC at first trimester and 22.3% had four and less ANC from EDHS 2011(16); urban women use 34% more ANC than rural women(17); the average ANC between 2000 and 2017(36.2%)(18). This showed exactly the position of the country in achieving the plan.

Although there is an improvement in utilization of ANC from 2011 to the current time, it is still outlying from achieving the HSTP. Since there is no country representative study after EDHS 2016, the current study has enormous value in identifying spatial distribution, magnitude, and associated factors for further planning and interventions at the country level.

Methods

Study design, setting, and period

We employed a cross-sectional data from Ethiopia Interim Demographic Health Survey (EMDHS) 2019. The 2019 EMDHS sample was stratified and selected in two stages. Each region was stratified into urban and rural areas, yielding 21 sampling strata. Samples of EAs were selected

independently in each stratum in two stages. In the first stage, a total of 305 EAs (93 in urban areas and 212 in rural areas) were selected with probability proportional to EA size (based on the 2019 PHC frame) and with independent selection in each sampling stratum. In the second stage of selection, a fixed number of 30 households per cluster were selected with an equal probability systematic selection from the newly created household listing. Ethiopia is the second most populous country in African continent situated at (3o-14oN, 33o – 48°E). EMDHS is the country representative sample survey carried out between EDHSs follows all EDHS protocols mentioned here. The country has nine regions and two city administrations which further categorized in to contextual group as agrarian (Amhara, Benishangul-Gumuz, Gambela, Harari, Oromia, Southern Nations, Nationalities, and People Region (SNNPR), and Tigray), pastoralists (Afar and Somali), and city administrations (Addis Ababa and Dire-Dawa). We retrieved the data for this study from the DHS website (www.dhsprogram.com) when downloading request permitted. The census frame is a complete list of 149,093 EAs created for the 2019 PHC. An EA is a geographic area covering an average of 131 households. The detailed sampling procedure has been presented in the full EMDHS 2019 report(19).

Study variables

The outcome variable for this study is antenatal care utilization. In this study, antenatal care utilization was defined as: Women who visited health facility at least once during their last pregnancy were considered as antenatal care service utilizer, otherwise, not

Individual level variable: Age, education status, household wealth, literacy level, place of delivery, birth order, parity, pregnancy status, age at first birth, religion, marital status,

Community level variable: variable: region, type of place of residence, community level education, and community poverty level.

Data management and analysis

Data was presented as descriptive statistics (weighted frequencies, mean, standard deviations, and percentage or proportions and statistical (STATA 15, ArcGIS 10.7, and SaTscan 9.6.1) soft wares.

Disproportional sampling was corrected by weighting the data before applying analyses.

When the subjects in a study have a linear relationship with the dependent variable, traditional regressions are the possible choice for analysis; however, since data from EMDHS are usually hierarchical in nature, we planned to conducted multilevel analysis. To determine random effect,

Intra-community Correlation (ICC) was estimated as $ICC = \frac{\sigma_a^2}{\sigma_a^2 + \sigma_b^2}$; where, σ_a^2 is the community level variance and σ_b^2 indicates individual level variance. The individual variance (σ_b^2) equal to $\pi^2/3$ that is the fixed value

Model comparison was done using Likelihood Ratio (LR) test and goodness of fit was assessed using deviance (-2LL)). Median Odds Ratio (MOR) was estimated as $MOR = e^{0.95 * \sqrt{Va_{-1}}}$, where, Va_{-1} is the variance in the empty model and Proportional Change in Variance (PCV) was estimated as $PVC = \frac{Va_{-1} - Va_{-2}}{Va_{-1}}$, where, Va_{-1} is variance of the empty model and Va_{-2} is neighborhood variance in the subsequent model).

Statistical analyses

We applied multilevel binary logistic regression for both individual and community-level model building. The first model contained only outcome variable to learn nature of variation and the next analysis choice; the second model included fixed effect variables; the third model included community-level (random effect) variables and the remaining model contained mixed effect. The p-value < 0.25 was used to include variable in model and p-value<0.05 was used to declare association. With AOR and 95% CI also used to describe the results.

Spatial analysis

We cleaned and dropped data with zero Latitudes/longitude and then applied spatial analyses using ArcGIS 10.7 to appraise whether the pattern of data was clustered, dispersed, or random distributed. SaTScan V.9.6 software detected the presence of local cluster. We used a circular window that moves systematically throughout the study area to ascertain a significant clustering of ANC utilization.

Spatial autocorrelation analysis

The spatial autocorrelation (Global Moran's I) was used to know if ANC utilization is dispersed, clustered or random in the country. Moran's, I output varies between (-1 to +1). Values close to -1 indicated ANC utilization is dispersed whereas; value close to +1 is for clustered distribution.

Spatial interpolation

Spatial interpolation technique was applied to predict the unsampled value from sampled measurement. Ordinary Kriging and empirical Bayesian Kriging methods were used to incorporate spatial autocorrelation and statistically optimize the weight. Ordinary Kriging spatial interpolation method was used for predictions of ANC utilization in unobserved areas of the country.

Ethical consideration

Since the study was a secondary data analysis of publicly available survey data from the MEASURE DHS program, ethical approval and participant consent were not necessary for this particular study. We requested DHS Program and permission was granted to download and use the data for this study from <http://www.dhsprogram.com>. During data analyses we kept everything confidential and no households or individual's information were identified. The EMDHS 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. Verbal informed consent for participation was collected after clearing the purpose of the study.

Result

Socio- demographic characteristics of study population

We analyzed a total of 3,340 data of 15-49 age women from EMDHS 2019. Of these, 1259 (37.7%) were from Oromia region and 9 (0.28%) were from Harari region. Majority (37.6%) of the respondents were orthodox Christian followers. Regarding the age, 1895(57%) of them were within age range of 15–29 years. Nearly, half (48%) of respondent were not educated. Majority of the respondents (73%) were rural residents. Nearly, all participants (3178 (95.16%)) were married and greater than half (62.32%) of the women were illiterate (Table.1).

Regional prevalence of antenatal care utilization in Ethiopia, 2019

The overall prevalence of antenatal care utilization in Ethiopia was 75% [95 CI: 73%, 76%], which was significantly varied across regions ranging from 30.1% in the Somali to 97.8% in Addis Ababa (Fig.1).

Spatial autocorrelation analysis

The global spatial autocorrelation analysis showed that the spatial distribution of antenatal care utilization was non-random across the country with Global Moran's Index value of 0.032, and significant P-value($p < 0.05$) (Fig.2). In this finding, areas with a higher prevalence of antenatal care utilization were identified in Addis Ababa, and Tigray regions. In contrast, areas with a lower prevalence of antenatal care utilization were detected in part of SNNRP, Afar, and Somali, regions (Fig.3)

Spatial interpolation

Based on EMDHS 2019 sampled data, ordinary kriging spatial interpolation predict the highest prevalence of antenatal care utilization rates were in Addis Ababa, Dire Dawa, part of Somali, Gambella, and Harari region. In contrast, relatively low ANC utilization areas were predicted in Tigray, Afar, Amhara and some part of Oromia (Fig.4)

Spatial scan statistics analysis

In EMDHS 2019 total of 152 primary clusters were identified in spatial scan analysis detected in Addis Ababa, Amhara, and Tigray region (11.267438 N, 35.292874 E) / 510.34 km radius (LLR=60.56 and $P<0.001$) (Fig.5)

Factors associated with ANC utilization

The random effect analysis result

In the null model, 49.9% (ICC) directed that the total variability for antenatal care utilization was due to changes between clusters and the remained were attributable to within cluster. Additionally, the MOR of 4.6 in the null model showed the variation in antenatal care utilization between clusters. Finally, PCV of the mixed model showed 87% of the variability in antenatal care utilization was explained by the full model. The best fitted model was compared by deviance and the best fitted was model 3, with the lowest deviance (Table.2).

The fixed effect analysis result

In the multilevel logistic regression analysis, individual-level factors (maternal education, wealth index, marital status, place of delivery and pregnancy status), community-level factors (region and community women education) evidence of association with ANC utilization (Table.3).

The odds of utilizing ANC among women with secondary and higher education were 4.2 and 6 times greater than that of no formal education women with AOR of 4.2(1.99-8.66) and 6 (1.62-22) respectively. The odds of richest households were 4.2 times greater than that of poorest households

with AOR of 4.2(1.08-2.3) and the odds of married, windowed, and divorced women were 6, 8 and 4.4 time more that of singe women respectively in utilizing ANC.

The odd of women utilizing ANC was 4.2 times greater among women practiced institutional delivery than that of home delivery with AOR of 4.2(6.25-10.62). The odds of women utilizing ANC was decreased by 21% among pregnant the than that of not/unsure of pregnancy AOR 0.79(0.51-0.95). Regarding regions, women living in Afar (AOR = 0.17; 95% CI, 0.07-0.40)), Oromia (AOR = 0.17; 95% CI, 0.08- 0.38)), Somali (AOR = 0.035; 95% CI, 0.014-0.08), Benishangul (AOR=0.29; 95% CI,0.13-0.64) (AOR=0.18; 95% CI,0.08- 0.38), Gambella (AOR = 0.19; 95% CI 0.08- 0.42), Harari (AOR=0.14; 95% CI ,0.057-0.35), and (AOR=0.19; 95% CI 0.075-0.47) had lower odds of ANC utilization compared to Tigray region. Women living in high community's educational status had more ANC utilization those in low with AOR of 1.5(1.03-2.14).

Discussion

The current study was aimed to explore spatial distribution and associated factors of antenatal care utilization in Ethiopia based on the nationally representative EMDHS data. We analyzed 3,340 data of women ages 15-49 from EMDHS 2019 and the average ANC of the country was 75%; however, the current ANC is less than the target of Ethiopian HSTP which is 95%(10); however, the finding was greater than the ANC utilization of 62.58% of EDHS 2016(15). From this, we saw that there was an increase by 12.2% in ANC utilization.

Despite the increase in utilization of ANC in Ethiopia, the finding is less than the Ayder-Mekelle (88.9%), South African (78.1%), and Zimbabwe (76.2%) ANC utilization which showed there is still a big room for improvement(18,21,22). As evidence by 30.1% utilization in the Somali and

97.8% in Addis, disparities among the regions are very significant. At country level, it might stipulation of considering socio-demographic factors which are extremely very important to deal with in resource limited countries. Almost every studies conducted country level samples support the existence of such disparities and that is the sign for the need of region specific interventions(8,9,22,23). For instance, the current analysis showed 48%, 73%, and 62.32% of respondents were not learned, living in rural residences, and illiterates respectively and this is also supported by a plenty of evidences in literature(11,23-26). The reason might be all efforts made to get women learned, economically empowered, making easy access to service in rural residences, and reducing illiteracy were not good enough as study after study reported similar findings.

The spatial analysis revealed that the antenatal care utilization across the country was varied. In this finding, Addis Ababa, and Tigray regions were identified as high prevalence of antenatal care utilization. In contrast, areas with a lower prevalence of antenatal care utilization were detected in part of SNNRP, Afar, and Somali, regions. This finding supported previous study in Ethiopia(25), Indonesia(26). Might be the disparity in the unavailability of maternal health services, and the inaccessibility of set-up such as road and transportation could be the possible reasons. So, this finding suggests that planner and programmer should design effective intervention to improve antenatal care utilization in this significant low-rate area of the country.

In the multilevel logistic regression analysis; maternal education, wealth index, marital status, place of delivery and pregnancy status, region and community women education were significantly associated with antenatal care utilization. Women level educational statuses of secondary and above were showed correlation with ANC. There is large evidence supporting the current finding(27). The reason might be due increase in awareness in because educational status which their increased service utilization and might deserve further improvement. Wealth status also

affected ANC and evidenced in other studies very well(12). This might also be the influence of access that can be dwindled by the cost of transportations and others that were the global problems of developing problems. Married, widowed, and divorced women had all conveyed history of ANC in their last pregnancies. Other evidences also showed that having any type of marital status was related to ANC(17)(11). Of course, this worthy nothing as no one would expect more ANC from non-formally married women. The positively correlation of institutional delivery, might be due to the increased contact between health professionals and women service takers and that is why health provider should promote service utilization every time they get access to women. Other studies portraits the same finding in many parts of the country(11,28). Women utilizing ANC was decreased among pregnant the than that of not/unsure of pregnancy. This finding inline other study(29). The possible explanation might be women initiated antenatal care late because they wanted to delay making the pregnancy public, because of fear of perceived “enemies” who could harm their pregnancies.

Among the community-level variables, it was revealed that the odds of antenatal care utilization residing in the Afar, Oromia, SNNPR, Benishangul, Gambella, Harari and Dire dawa region were nearly similar as compared to Tigray. Whereas, Somali is found to be the lower in this analysis. This finding supported by previous EDHS survey(30,31). This could be due to an imbalance of demand and supply like poor infrastructure and poor-quality in-service delivery. In places where community level education was very good, ANC utilization was found very well. The finding is consistent with the 2016 EDHS finding. This might be due the linear relationship between ANC and community level education(8).

Strength and limitations of the study

Even though the current study has strong interests in itself, national representatives give strong evidence. It has also some limitations that need consideration while applying the findings. Disproportion of sampling, third party data, inability to for casual relationship, and health institution factors not incorporated were some of the limitations. Eased disproportion of sampling by weighting, obtained complete permission to use data, and dropping records that don't fulfill study definition were some of the attempt solutions.

Conclusion

In Ethiopia ANC utilization was nor meet the HSTP plan. The spatial distribution of ANC utilization in Ethiopia is non-random. The higher prevalence of antenatal care utilization was found in Addis Ababa, Tigray. Whereas, low proportion of ANC utilization found in Somali, Afar. Maternal education, marital status, wealth index, place of delivery, pregnancy status region and community women education were significant predictor of antenatal care utilization in Ethiopia. Government and non-governmental organization should scale up maternal health services to low-rate area(hotspot) and poorest women.

Ethics approval and consent to participate

We were registered, and requested data for analysis from DHS on-line archive. We received an approval to download the dataset(<http://www.measuredhsprogram.com>). The geographic coordinate data were obtained by explaining the purpose of using GPS data, and we receive approval from the Measure DHS program.

312 **Consent for publication**

313 Not applicable.

314 **Availability of data and materials**

315 The data in which the authors used to produce this manuscript are available upon reasonable
316 request

317 **Competing interests**

318 The authors declare that they have no competing interests.

319 **Funding**

320 No-funding

321 **Authors' contributions**

322 Proposal preparation, acquisition of data, analysis, and interpretation of data was done by SH, GG
323 BT, MJH, and AE instruct the study design data cleaning and analysis. SH drafted the manuscript
324 and all authors have a substantial contribution in revising and finalizing the manuscript. All authors
325 read and approved the final manuscript.

326 **Acknowledgements**

327 We would like to express our deepest thankfulness to Measure DHS, for providing the data for the
328 study.

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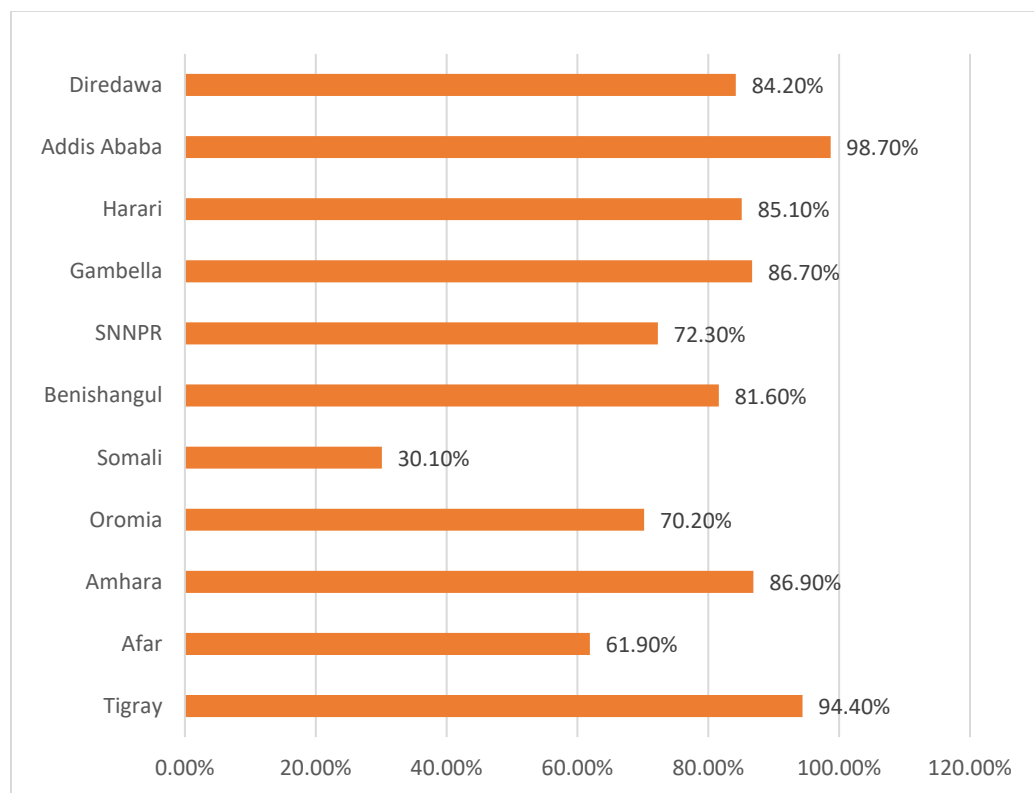


Fig 1. Regional prevalence of antenatal care utilization in Ethiopia, 2019

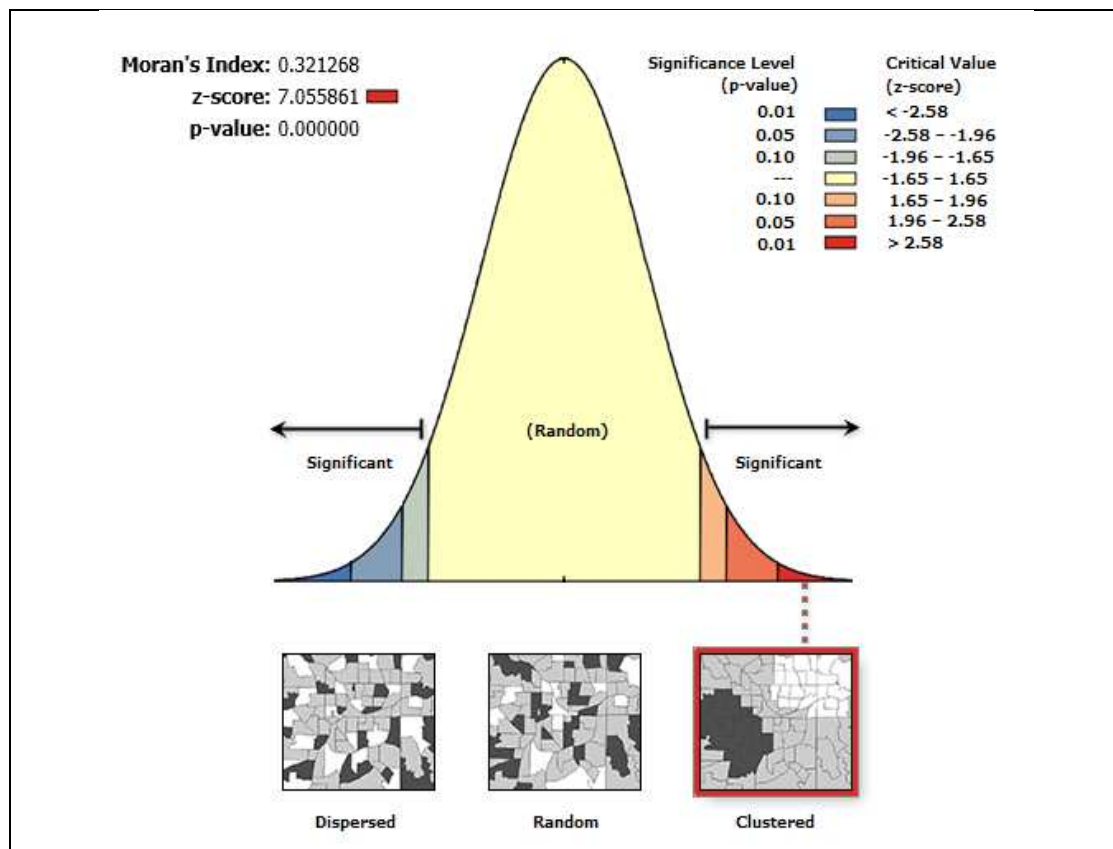


Fig.2 Spatial autocorrelation of ANC utilization in Ethiopia; 2019

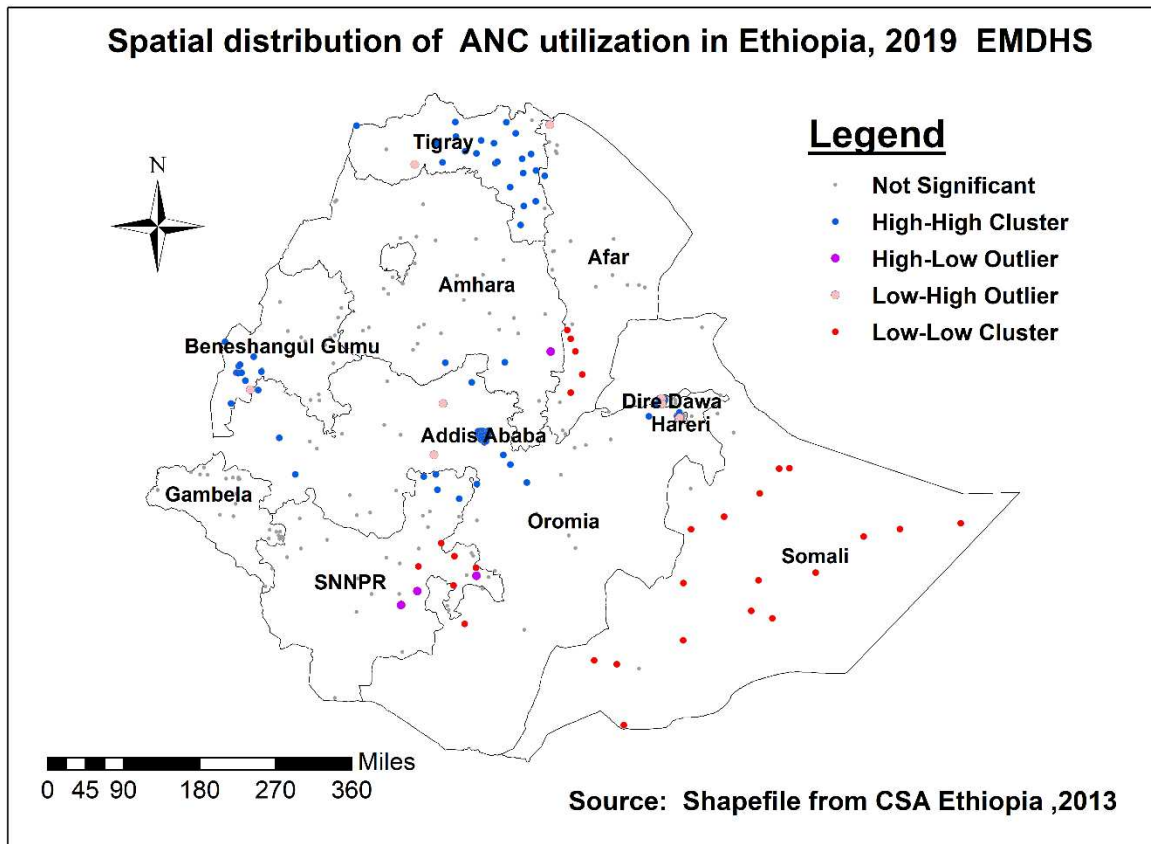


Fig.3 Spatial distribution of ANC utilization in Ethiopia, 2019

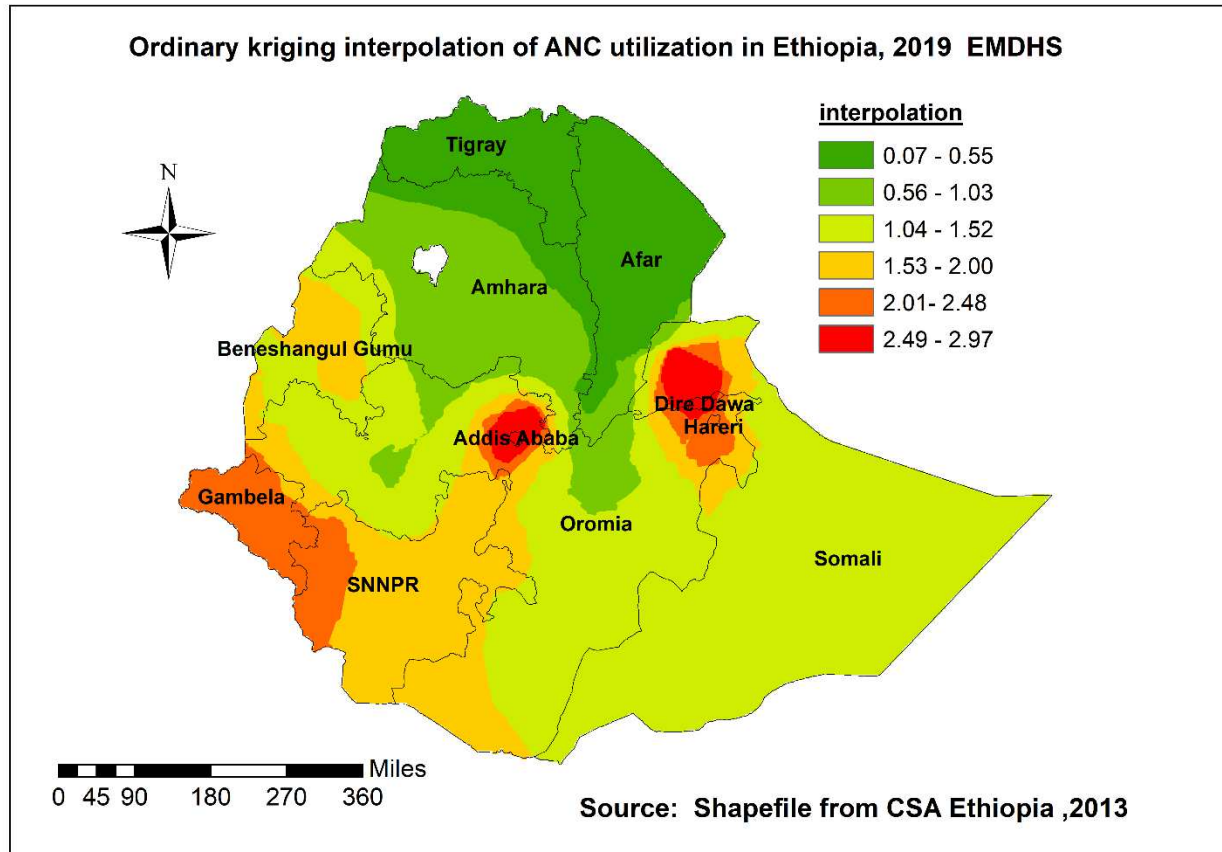


Fig.4 Ordinary kriging spatial interpolation of ANC utilization in Ethiopia ,2019

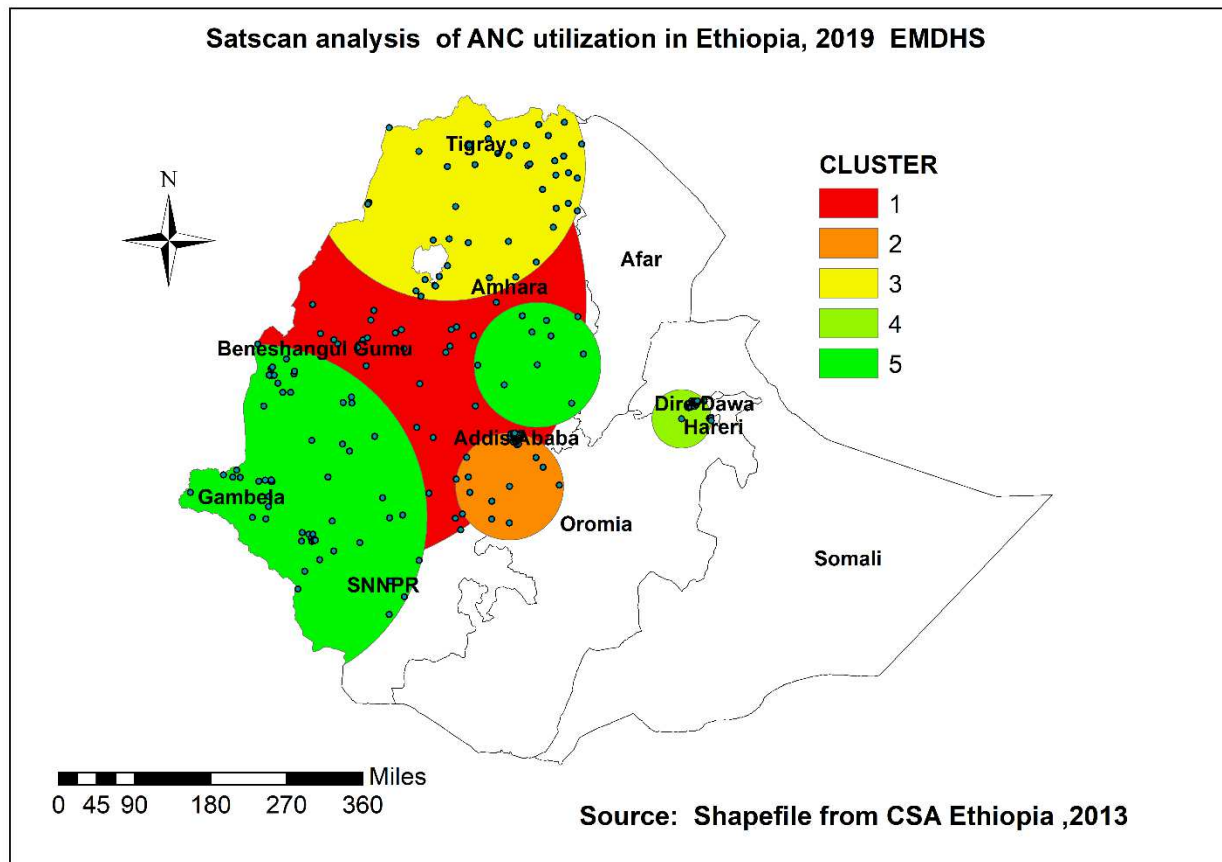


Fig.5 StatsCan analysis of ANC utilization in Ethiopia ,2019

Table 1. Socio- demographic characteristics of study population (Weighted, N=3,340)

	Weighted frequency	Weighted (%)
Region		
Tigray	269	8
Afar	42	1.3
Amhara	716	21.5
Oromia	1259	37.7
Somali	196	5.9
Benishangul	38	1.13
SNNPR	657	19.52
Gambella	15	0.5
Harari	9	0.28
Addis Ababa	120	3.6
Diredawa	19	0.57
Residence		
Rural	2436	73
Urban	904	27
Age		
15-29	1895	57
30-39	1147	34
40-49	298	9
Religion		
Orthodox	1254	37.6
Muslim	1158	34.7
Protestant	884	26.5
Others	44	1.3
Marital status		
Single	21	0.62
Married	3178	95.16
Widowed	34	1.02

Divorced	107	3.2
Educational status		
No-education	1624	48.64
Primary	1250	37.42
Secondary	316	9.46
Higher	150	4.48
Wealth status		
Poor	1387	41.52
Middle	633	18.94
Rich	1320	39.54
Literacy level		
Illiterate	2082	62.32
Literate	1258	37.68

Table.2 Random effect analysis result

Parameter	Null model	Model I	Model II	Model II
Community-level variance	3.23	0.77	0.89	0.41
Loglikelihood	-1595.5	-1297.8	-1472	-1251
Deviance	3191	2595.6	2944	2502
MOR	4.6	2.3	2.4	1.7
PVC	Ref	76%	72%	87%
ICC	0.49	0.19	0.21	0.11

Table.3 individual-level and community-level factors associated with antenatal care use in Ethiopia, EMDHS 2019

Variables	Model 0	Model 1	Model 2	Model 3
Individual- level variables				
Respondent age				
15-29	-	Ref	-	Ref
30-39	-	1.4[1.05-1.97] *	-	1.3[0.93-1.75]
40-49		0.85[0.52-1.36]	-	0.68[0.42-1.0]
Religion				
Orthodox	-	Ref	-	Ref
Muslim	-	0.38[0.26-0.53] **	-	1.1[0.69-1.75]
Protestant	-	0.52[0.34-0.77] **	-	0.90[0.57-1.4]
Others		0.29[0.12-0.64] **		0.48[0.21-1.00]
Marital status				
Single	-	Ref	-	Ref
Married	-	5.9[2-17.7] **	-	6[1.98-17.5] **
Widowed	-	8 [1.9-33.6] **	-	8[1.92-32.9] **
Divorced	-	4.5[1.4-14.9] **	-	4.4[1.32-14] *
Educational status				
No-education	-	Ref	-	Ref
primary	-	1.3[0.96-1.76]	-	1.2[0.90-1.65]
Secondary	-	4 [1.97-8.5] **	-	4.2[1.99-8.66] **
Higher		6 [1.68-23.4] **	-	6 [1.62-22] **
Wealth status				
Poor	-	Ref	-	Ref
Middle	-	1.4 [1.0-1.9] *	-	1.3[0.92-1.79]
Rich	-	2 [1.47-2.7] **	-	1.6[1.08-2.3] *
Literacy level				
Illiterate	-	Ref	-	Ref
Literate	-	1.5 [1.02-2.08] *	-	1.4[0.94-1.92]
Place of delivery				
Home	-	Ref	-	Ref
Institution	-	8 [6.85, 11.65] **	-	8[6.25-10.62] **
Birth order				
1 st	-	Ref	-	Ref
2-3	-	1.32 [0.92-1.89]	-	1.33[0.93-1.90]
4-5	-	0.99[0.59-1.67]	-	1.04[0.62-1.74]
6+	-	0.72[0.46-1.15]	-	0.87[0.54-1.36]
Parity				
≤ 2	-	Ref	-	Ref
3-5	-	1 [0.73-1.55]	-	1.09[0.75-1.59]
≥ 6+	-	Omitted	-	Omitted

Pregnancy status	-		-	
No	-	Ref	-	Ref
Yes	-	0.69[0.51-0.93] *	-	0.79[0.51-0.95] *
Age at first birth				
15-24		Ref		
25-49		0.69[0.45-1.06]		0.73[0.48-1.12]
Community- level variables				
Region				
		-		
Tigray		-	Ref	Ref
Afar		-	0.11[0.049-0.24] **	0.17[0.07-0.40] **
Amhara		-	0.49[0.21-1.10]	0.56[0.27-1.17]
Oromia		-	0.14[0.063-0.30] **	0.17[0.08- 0.38] **
Somali		-	0.025[0.01-0.06] **	0.035[0.014-0.08] **
Benishangul		-	0.35 [0.15-0.80] *	0.29[0.13-0.64] **
SNNPR		-	0.14[0.065- 0.30] **	0.18[0.08- 0.38] **
Gambella		-	0.17 [0.074-0.40] **	0.19[0.08- 0.42] **
Harari		-	0.18[0.074-0.43] **	0.14[0.057-0.35] **
Addis Ababa			0.64 [0.17-2.30]	0.47[0.13-1.69]
Dire dawa		-	0.21 [0.08-0.51] **	0.19[0.075-0.47] **
Residence				
Rural		-	Ref	Ref
Urban		-	0.50[0.29-0.85] *	0.95[0.58-1.54]
Community education				
Low education		-	Ref	Ref
High education		-	2.4 [1.60-3.52] **	1.5[1.03-2.14] *
Community poverty				
Low poverty		-	Ref	Ref
High poverty		-	2.5 [1.61-3.72] **	1.2[0.77-1.78]

Key: Ref: Reference group; p-value 0.05-0.01 *: p-value < 0.01 *