

Maternal healthcare services utilization trajectories in four regions of Ethiopia: A Latent Class Analysis

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Abstract

Background: Despite the progress made by the Ethiopian government and the international community to reduce maternal mortality, maternal mortality remains excessively high accompanied with very low levels of maternal health service utilization. This study aimed to assess the trajectories and determinants of maternal healthcare services utilization in four populous regions of Ethiopia.

Method: The study was conducted in the four populous regions of Ethiopia. The study population was mothers who had delivered in the last twelve months of the survey date. Data were extracted from the baseline data gathered via the Dagu project. Accordingly, a total of 590 women who had given birth in the 12 months preceding the survey were included in the final analysis. Seven indicator variables were included in constructing the maternal healthcare utilization variable. Latent class analysis was used to identify subgroups of maternal healthcare utilization along the continuum of care. Further, ordinal logistic regression was utilized to identify the determinants of the trajectories of maternal healthcare utilization. STATA 14 was used for data management and analysis and a 5% level of significance was used to declare statistical significance.

Results: The results of the latent class analysis indicated that about two in five of the mothers (43.9%) did not attempt to visit a health facility during pregnancy, for delivery, or for postnatal checkups. Women who utilized maternal healthcare accounted for 6.1% of the sample. The trajectory of maternal healthcare utilization indicated a significant difference between regions and religious affiliation of women. Educated women, women of higher socioeconomic status, and women with better birth preparedness and complication readiness were found to be in the highest classes of maternal health care service utilization.

Conclusion: The magnitude of good maternal healthcare utilization is low based on postnatal checkups missed from the continuum of care. Women of lower socioeconomic status and below secondary level of education should be targeted to intensify the awareness of the benefits of maternal healthcare services utilization and planed childbirths to deal with complications that arise from pregnancy and childbirth. [*Ethiop. J. Health Dev.* 2021;35(4) 309-319]

Key Words: Continuum of Care, Latent classes, Trajectory Analysis, Maternal Healthcare Utilization

Introduction

Literature suggests that a significant reduction in the global maternal morbidity and mortality rates have been observed as corollary to improvements in access to and delivery of maternal healthcare services. However, pregnancy and child birth still affect the lives of millions of women and families across the world, particularly in middle and low income countries (1). Research indicates that the level of maternal mortality differs greatly across the different regions of the globe. The maternal mortality ratio (MMR) for 2017 ranged from 5 deaths per 100,000 live births for Western Europe to 533 for sub-Saharan Africa (2). Poor maternal health has become key in the achievement of sustainable development goals (SDG) that aim to achieve maternal mortality ratios of less than 70 per 100,000 live births by 2030 (3).

Ethiopia is among the countries with good progress in reducing maternal mortality. However, it is among the countries with an increased estimation of annual maternal deaths (2). The maternal mortality ratio has dropped from 871 in 2000 to 412 in 2016 per 100,000 live births with visible disparity among the various administrative regions (4–6). The level of antenatal care (ANC) from a skilled provider has more than

doubled over the period 2011–2019 from 34% to 74%; however, this amounts to less than half of pregnant women who had the recommended four or more ANC visits (43%). Moreover, half (52%) of the births occur outside health facilities, out of the reach of skilled providers and only 35% of women who delivered recently had a postnatal checkup within 2 days after delivery. In the country, the causes of maternal mortality are direct causes that include obstructed labor, hemorrhage, hypertensive disorders of pregnancy, infection and complication of abortion (7–9).

The provision of life-saving care and utilization of maternal healthcare during pregnancy and after birth is crucial to avert the preventable causes of maternal morbidity and mortality. It is also helpful to create a positive pregnancy and child birth experience that lays a foundation for a healthy motherhood (10). Several factors ranging from individual level through to contextual and community level factors influence maternal healthcare service utilization. Recent evidences indicates that women's education had a positive influence over maternal health service utilization in contrast to uneducated women (11–14). Household wealth was another determinant factor

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reported, which was found to have a positive influence over maternal health service utilization. Women residing in an affluent household were more likely to utilize maternal health services than women residing in poor households (12–15). Moreover, women residing in an affluent neighborhood and a neighborhood with a significant number of literate women were more likely to utilize maternal health service utilization (12).

Demographic factors such as age of the mother and parity were also identified as determinants of maternal health service utilization. Anguwa and colleagues reported that the age of a mother predicted whether a mother would be more inclined to use a delivery service (11). In contrast, a study from Ethiopia using data from the 2011 Demographic and Health Survey reported that maternal age had no influence on maternal health service utilization. In this study, it is rather parity that predicted all three types of maternal health service utilization (14). Tura and colleagues using a prospective cohort study have reported that women that were well prepared for birth and its complications, had a significant likelihood of using skilled care as compared to women who were not well prepared. Furthermore, women with a better knowledge of key obstetric danger signs (know 3-4 danger signs) were better off in utilizing skilled care as compared to women that did not know any key danger signs (16).

While previous studies conducted in Ethiopia and elsewhere focus solely on components of maternal healthcare services utilization, this study however attempts to explore the trajectories of maternal healthcare service utilization of women in their most recent pregnancy. This shift in perspective, from component to trajectory analysis, has an advantage in that it addresses the challenges of maternal healthcare services utilization holistically as compared to the use of a compartmentalized manner. Therefore, this study aimed to explore the trajectories of maternal healthcare services utilization and assess its determinants for recent births in four regions of Ethiopia.

Methods and Materials

Study setting, design and period

Selected districts from four regions of Ethiopia; namely, Oromia, Amhara, Tigray and Southern Nations, Nationalities and Peoples (SNNP) were included in the study. A total of 10 Zones, 4 from Tigray, 2 from Amhara, 2 from Oromia, and 2 from SNNP regional states, were included in the study covering 51 districts. The current work utilized baseline data gathered via the Dagu Project, an intervention project designed to investigate impact of Optimizing Health Extension Project (OHEP) on the health service utilization for mothers and children below the age of five years. The baseline data collected for maternal healthcare practices was utilized for the purposes of the current study. The baseline data was collected during the months of December 2016 to February 2017 (17).

Population

Mothers who had a livebirth in the last 12 months prior to the date of the survey were considered to assess the trajectory of maternal healthcare utilization and its determinants. All women of reproductive age group (15-49 years) who had given birth in the last 12 months and were available at their households during the interview and who agreed to participate were included in the study.

Sampling technique and sample size

A two-stage stratified cluster sampling was applied in the selected districts. In the first stage, 200 enumeration areas (EAs) were selected with a probability proportional to the size of the 51 districts. Each enumeration area forms one cluster, and these clusters form the primary sampling unit. In the second stage, a systematic random sampling technique was employed to select 30 households from within each EA from a listing of households done by enumerators. In each EA, 30 households were selected, and interviews were conducted totaling 6,000 households. All women of age 15 to 49 years were found in the selected households and were included in the study. Data for all the women of reproductive age who had given birth in the last 12 months was extracted from the baseline data and utilized for the present study.

Measurements

Maternal health service utilization is the outcome variable of the present study. Seven indicator variables were used to construct maternal healthcare utilization using latent class analysis described below. The items were at least one antenatal care (ANC) attendance at health facility, antenatal care visit of 4 and above, delivery at health facility, professional assistance at delivery, and attendance of postnatal care measured using visit on first day or first week or late beyond the first week of birth.

Combinations of socio-demographic and socioeconomic variables were utilized as predictor variables for maternal healthcare utilization. In the list of socio-demographic variables, marital status (Currently in union/Not in union), family size (Small [≤ 4]/Medium [5-6]/Large [> 6]), parity ([< 4]/[4-7]/[8+]), and age of the mother at delivery ([15-24]/[25-34]/[35+]) were included. Among potential socioeconomic and other variables, maternal educational achievement (Illiterate/Primary/Secondary+), household relative wealth index, administrative region, and religion of the mother were also considered. Household wealth index was constructed from a list of household asset possession variables adopted from the demographic and health survey questionnaire (5). Furthermore, the wealth index was constructed using an exploratory factor analysis and wealth quintile categories were produced.

Finally, other determinants such as knowledge of obstetric danger signs, birth preparedness and complication readiness were also considered in the analysis. For knowledge of obstetric danger signs, – mothers were given scores based on their awareness of danger signs for the following 10 items: severe

headache, blurry vision, reduced or absent fetal movement, high blood pressure, edema of the face/hands, convulsions, excessive vaginal bleeding, severe lower abdominal pain, fever, and anemia. The minimum and maximum scores were 0 and 6, respectively, and were classified as categories for those having poor knowledge (score less than or equal to 2 and coded as 1) and average level of knowledge (score 3-6 and coded as 0). Birth Preparedness and Complication Readiness (BPCR): scores of mothers based on their response to preparation in terms of finance, transport, food, identification of birth attendant, and identification of facility were used to measure BPCR. Accordingly, mothers who fulfilled at least 3 of the 5 items were considered as 'well prepared' which was coded as 1 and 'not well prepared' was coded as 0.

Data collection and processing

Data was gathered using a structured questionnaire originally designed in the English language and translated to the local languages (Afaan Oromo, Amharic, and Tigrigna). CSPro software was used to design a computer assisted personal interview (CAPI) tool and tablets were used to gather the information on the field. An internet file streaming system (IFSS) was used to sync data from the tablets to a central server using a 3G modem. One advantage of using CAPI is that it saves time in terms data processing as data is entered during the field interview. In addition, by keeping the sequence and checking the logical consistency of the data collected, CAPI has the benefit of ensuring data quality. Finally, the collected data was exported to STATA version 14 for further processing and analysis.

Data quality assurance

Data collectors who had at least a first degree were recruited. Health Officers were trained in integrated community case management and community-based newborn care and were employed as team leaders. The data collection was carried out using 15 data collection teams. Each data collection team had two enumerators, one health examination observer and re-examiner and a team leader. Training for the purposes of the survey and the content of the questionnaire was provided to the data collection team for a duration of 10 days. The questionnaires were pretested; and several training interviews were performed. During fieldwork, the supervisors carried out at least two re-interviews per cluster, and observed each interviewer in his or her team during throughout data collection. These re-interviews and observations were used as a means of providing feedback to interviewers, to ensure consistency between interviewers, and continuously improve the quality of the work. Verbal consent was obtained from all study participants. Ethical approval was sought from Jimma University Faculty of Public

Health. Ethical approval was also secured from the Ethiopian Public Health Institute and Regional Health Bureaus in Amhara, Oromia, SNNP, and Tigray regions.

Data analysis

Latent class analysis (LCA) assists in successfully combining the maternal healthcare utilization indicator variables and producing groups of individuals with similar behavior. The indicators refer to different times of pregnancy and childbirth. This enables the review of service utilization paths which mothers had taken during their most recent pregnancy. A combination of parsimony, statistical criteria and interpretability guided the selection of an appropriate number of classes and evaluations of the model. The log likelihood, degrees of freedom, G^2 , Akaike Information Criteria (AIC), and Bayesian Information Criteria (BIC) were compared to identify the optimal model (18). The model produces class membership for each subject and membership probabilities for the classes as a byproduct of the analysis. The class membership variable was used as an outcome variable for further analysis. Ordinal logistic regression was utilized to determine the determinants of the trajectory of maternal healthcare utilization. The assumption of proportional odds was also checked, and a generalized ordinal logistic regression model was fit to remedy the violation of the assumption. STATA 14 was used for data management and analysis and a 5.0% level of significance was used to declare statistical significance.

Ethical considerations

Verbal consent was obtained from all participants of the study. Ethical approval was obtained from Jimma University Faculty of Public Health. Ethical approval was also secured from the Ethiopian Public Health Institute and Regional Health Bureaus in Amhara, Oromia, SNNP, and Tigray regions.

Results

Household characteristics

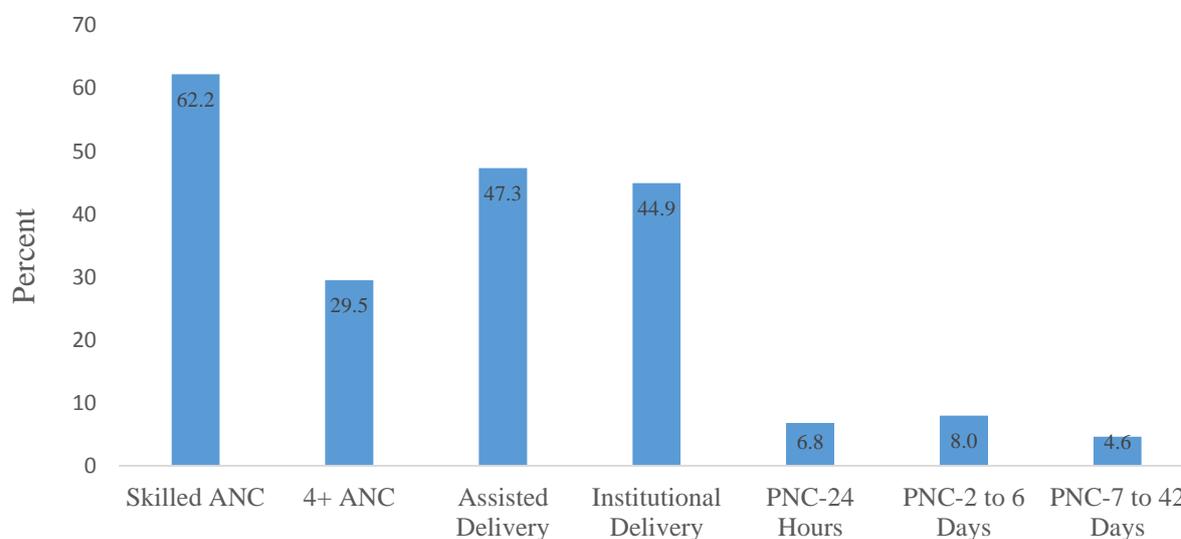
From a total of 590 mothers who delivered in the last 12 months, majority of them were from the Oromia regional state (51.4%). Two in five were Orthodox Christians (40.7%), and 53.0% of the women were in the age range between 25 and 34 years. Majority of the respondents (56.1%) had less than four children whereas 6.6% had more than eight children. 220 respondents constituting of 37.3% lived in small family size households. With respect to marital status, almost all (96.6%) were married during the time of the interview. More than half (55.2%) of the mothers had no formal schooling and only a handful of them had a secondary and above level of education (10.0%). An almost equal proportion of women lived in households having poorest to richest wealth quintiles (Table 1).

Table 1: **Socio-demographic and economic characteristics of the women in four regions of Ethiopia, December 2016 to February 2017**

Variables and categories		No.	Percent
Region	Amhara	153	25.9
	Oromia	303	51.4
	SNNP	77	13.0
	Tigray	57	9.7
Religion	Orthodox	240	40.7
	Protestant	149	25.2
	Muslim	188	31.9
	Other	13	2.2
Age (yrs)	15-24	202	34.2
	25-34	313	53.0
	35+	75	12.7
Parity	<4	330	56.1
	4-7	219	37.2
	8 and above	39	6.6
Family size	Small	220	37.3
	Medium	194	32.9
	large	176	29.8
Maternal education	No education	326	55.2
	Primary	205	34.8
	Secondary and above	59	10.0
Marital status	In union	566	96.6
	Not in union	20	3.4
Socio-economic quintile	Lowest	123	20.8
	Second	112	19.0
	Middle	116	19.7
	Fourth	113	19.2
	Highest	126	21.3
Total		590	100.0

Majority of the respondents (62.2%) had at least one visit at the ANC services health facility (skilled ANC) while 29.5% utilized a minimum of 4 ANC visits. Less than half (47.3%) of the respondents had a delivery care service assisted by health professionals and 44.9%

gave birth at a health facility. On the other hand, only few (6.8%) of the women received postnatal care within the first 24 hours. Women who received PNC services within 2-6 days and 7-42 days were minimal (8.0% and 4.6%, respectively) (Figure 1).

Figure 1: **Maternal healthcare service utilization indicators in four regions of Ethiopia, December 2016 to February 2017**

We found that only one fourth (25.4%) of the mothers had an average awareness regarding the danger signs. Less than a quarter of the mothers (23.2%) were well prepared during their last pregnancy (Table 2).

Table 2: Knowledge of danger signs and birth preparedness and complication readiness of women in four regions of Ethiopia, December 2016 to February 2017

Characteristics and categories	No.	Percent
Knowledge of danger signs		
Average	150	25.4
Poor	440	74.6
BPCR		
Not well prepared	453	76.8
Well prepared	137	23.2
Total	590	100.0

In LCA, to select the number of classes for the model, we specified and ran models of a 2-class, and repeated the procedure with 3 classes, 4 classes, 5 classes and 6 classes. From the results, information about fit including log likelihood, degrees of freedom, G^2 , AIC,

BIC, and CAIC were compared to identify the optimal model. As can be seen in Table 3, the AIC is the least for the models with five classes. For this reason and ease of model interpretation, the model with five classes was selected as an optimal model (Table 3).

Table 3: Summary of information for selecting the number of latent classes for maternal healthcare utilization in the four regions of Ethiopia, December 2016 to February 2017

No. of classes	Log likelihood	df	AIC	BIC	G^2
2	-1565.7	112	157.2	222.8	127.2
3	-1546.8	104	135.5	236.2	89.5
4	-1541.5	96	140.8	276.5	78.8
5	-1519.7	88	113.2	284.0	35.2
6	-1519.3	80	128.5	334.4	34.5

With the five latent class model, the analysis identified five different types of trajectories of maternal healthcare service utilization. The first groups of women [Tr1] had a less than average likelihood of antenatal care utilization. For this group of women, the uptake of the delivery and postnatal care is not entirely absent but very much unlikely (43.9%). The second group of women [Tr2] are antenatal care utilizers but less likely to proceed to delivery and postnatal care utilization (9.5%). Another course of maternal healthcare utilization [Tr3] is an uptake of insufficient

number of ANC and a good level of delivery care; however, they are unlikely to appropriately utilize postnatal care (24.4%). The fourth group of women [Tr4] utilize antenatal and delivery care but the likelihood of utilizing postnatal care is very slim (16.1%). The final group of women [Tr5] are those that utilize all the maternal healthcare services with higher probabilities (6.1%). The trajectories exhibit a fundamental feature of an ordinal measurement ranging from non-utilizers [Tr1] to beneficial utilizers [Tr5] of maternal healthcare services (Figure 2).

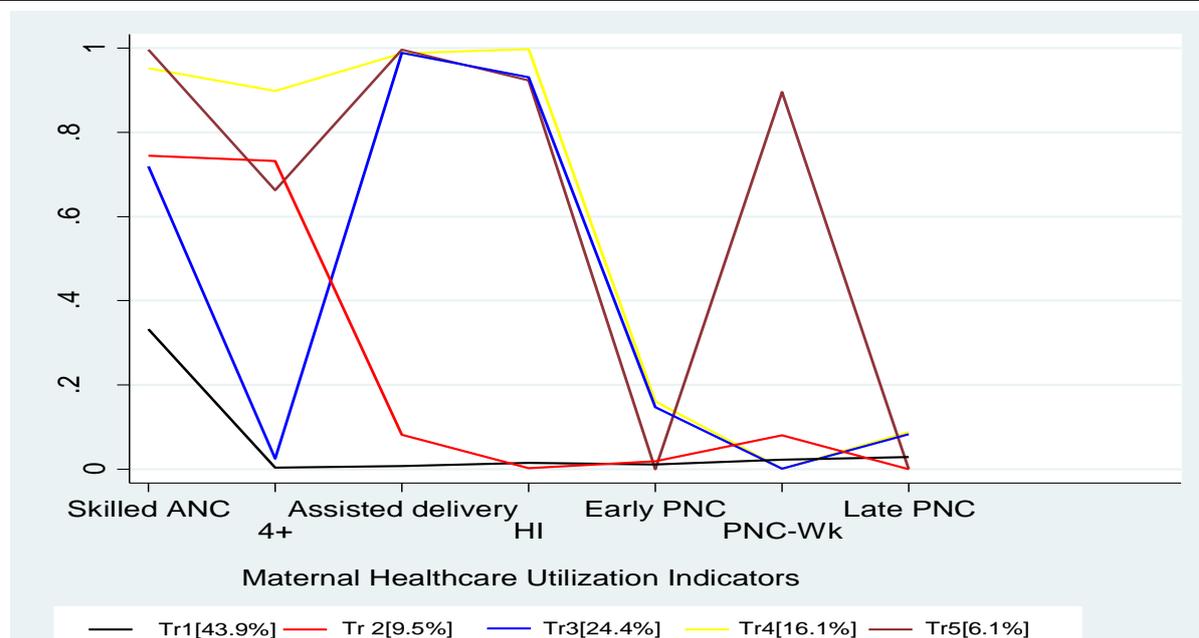


Figure 2: Trajectories of maternal healthcare utilization among mothers who delivered recently in the four regions of Ethiopia, from December 2016 to February 2017

ANC=Antenatal Care HI=Health Institution PNC-Wk=Postnatal Care attended within the first week

Table 4 indicated percent distribution of maternal healthcare utilization across the predictor variables. Women residing in Oromia had an unusually higher rate of non-utilizers (56.4%) and SNNP had the highest rate of beneficial utilizers (15.6%). It is also noted that women of Protestant groups and Muslim women had high rates of not utilizing maternal healthcare utilization as compared to Orthodox Christian women. Similarly, older women (61.3%) and women with high parity had a higher tendency of not utilizing maternal

healthcare services. On the contrary, women of an above secondary level of education had a higher level of beneficial utilization (15.3%) as compared to women with lower degrees of education. Finally, poorer women (68.3%) were characterized as non-utilizers while women with decreased readiness for birth and its complications (49.2%) were highly likely to refrain from utilizing maternal healthcare services (Table 4).

Table 4: Percent distribution of maternal healthcare utilization over potential predictors in four regions of Ethiopia, from December 2016 to February 2017

Characteristics and categories		Tr1	Tr2	Tr3	Tr4	Tr5
Region	Amhara	30.1	4.6	34.0	24.8	6.5
	Oromia	56.4	12.2	18.8	9.2	3.3
	SNNP	32.5	9.1	23.4	19.5	15.6
	Tigray	29.8	8.8	29.8	24.6	7.0
Religion	Orthodox	29.6	5.4	32.9	24.6	7.5
	Protestant	53.0	16.8	10.7	13.4	6.0
	Muslim	53.7	9.0	25.0	8.0	4.3
	Other	61.5	7.7	15.4	7.7	7.7
Age	15-24	41.6	8.9	23.8	20.8	5.0
	25-34	41.2	10.5	26.2	14.4	7.7
	35+	61.3	6.7	18.7	10.7	2.7
Parity	<4	37.0	8.8	25.8	20.9	7.6
	4-7	50.7	11.0	23.7	10.0	4.6
	8+	61.5	7.7	17.9	10.3	2.6
Family size	Small	35.5	8.2	28.6	21.8	5.9
	Medium	45.9	10.3	20.6	15.5	7.7
	large	52.3	10.2	23.3	9.7	4.5
Maternal education	No education	49.1	8.9	24.5	12.9	4.6
	Primary	42.4	12.2	22.9	16.6	5.9
	Secondary+	20.3	3.4	28.8	32.2	15.3
Marital status	In union	44.2	9.5	24.0	16.3	6.0
	Not in union	40.0	10.0	30.0	10.0	10.0
Socio-economic	Lowest	68.3	6.5	12.2	8.9	4.1

Characteristics and categories		Tr1	Tr2	Tr3	Tr4	Tr5
quintile	Fourth	42.5	13.3	23.9	15.9	4.4
	Middle	44.8	15.5	24.1	12.1	3.4
	Second	41.1	6.3	31.3	15.2	6.3
	Highest	23.0	6.3	31.0	27.8	11.9
Knowledge of danger signs	Average	31.3	12.0	30.7	18.7	7.3
	Poor	48.2	8.6	22.3	15.2	5.7
BPCR	Not Well prepared	49.2	9.7	21.6	13.7	5.7
	Well prepared	26.3	8.8	33.6	24.1	7.3
Total		43.9	9.5	24.4	16.1	6.1

Multivariable analysis

In the multivariable analysis, maternal healthcare utilization was modelled as a function of religion, region of residence, knowledge of danger signs and birth preparedness, socio-demographic and economic factors. However, religion and socio-economic status of households violated the assumption of proportional odds, thus a generalized ordinal logistic regression was conducted. The result is shown in Table 5 below.

We have observed that the effect of region, religion, and socio-economic status is asymmetrical and not the same across each of the cumulative logits. The results suggest that maternal healthcare utilization has indicated a significant difference between the different regions. Women residing in Oromia region were extremely disadvantaged even for necessary maternal healthcare utilization as opposed to women residing in Amhara region. Moreover, it was found that non-Christian women were highly likely to utilize at least ANC (AOR=1.87 with a 95% CI (1.17, 2.99)). However, the difference decreases at the higher order beneficial maternal healthcare utilization as attested by the non-significant odds ratio of religion of the mother.

When socio-economic status of women was considered, women residing in the poorest households were disadvantaged (AOR=0.43 with a 95% CI (0.24, 0.74)) as compared to women living in households with a middle level of socioeconomic status in utilizing maternal healthcare services. There was also disparity in maternal healthcare utilization beyond ANC between these groups of women (AOR=0.52 with a 95% CI (0.29, 0.92)). Nonetheless, no difference was observed between the two groups of women in terms of utilization of beneficial maternal health services. On the other hand, women living in wealthy households were more than twice as likely (AOR=2.24 with a 95% CI (1.35,3.72)) to utilize any type of maternal healthcare including beneficial services as compared to women living in households with a middle level socioeconomic status.

Age, parity, and family size were also introduced into the model as predictors. The results indicate that parity and family size did not stimulate maternal healthcare utilization; in contrast, it was found that older women (age 35 years or older) as compared to youths (15-19 years) were 61% less likely (AOR=0.39 with a 95% CI (0.19, 0.80)) to utilize maternal healthcare services of any kind including the beneficial services. While knowledge of danger signs did not encourage women

to utilize maternal healthcare services, birth preparedness and complication readiness of women contributed highly to their actual maternal healthcare use. Well prepared women for birth and its complication were more than three times likely (AOR=3.40 with a 95% CI (1.78, 6.50)) to have utilized maternal healthcare services consisting of ANC and the more beneficial services. It was also observed that women with a secondary level of education and above were most likely to utilize maternal healthcare services and the result is symmetrical across the cumulative logits (AOR=2.09 with a 95% CI (1.14, 3.84)).

Discussion

The study identified five trajectories of maternal healthcare utilization during pregnancy and childbirth. An alarming number of women did not attend any of the maternal healthcare services during their recent pregnancy and childbirth. In the continuum of maternal healthcare service use, it is only a small proportion of women that utilized ANC and did not proceed to utilize delivery care. However, a considerable number of mothers did not attend postnatal care services during their recent delivery. These trajectories were associated with the demographic and socio-economic characteristics of women.

ANC serves as a tool to reduce maternal and perinatal morbidity and mortality by identifying women with an increased risk of pregnancy complications earlier on, during pregnancy and by ensuring referral to an appropriate level of care (10). It is an entry point to maternal healthcare service utilization whereby the subsequent maternal health service utilizations largely depend on (14,19). The findings suggests that a significant number of women (43.9%) had poor utilization of ANC that necessitates the need to induce the demand for ANC utilization in the communities and particularly among women.

There were a few early discrepancies, which (9.5%) included mothers that had a good ANC follow up but opted to deliver outside a health facility unassisted by trained health personnel and neglected the benefits of postnatal care. For these women, somehow ANC is not being translated to delivery and postnatal care utilization. Many factors might contribute to this gap including, a lack of awareness of the signs of labor, deficiency of exposure to information on delivery care, the absence of problems during the current pregnancy, and the absence of complications during previous

births (20,21). Furthermore, do you having had subsequent births, mother may opt to carry out the process without assistance as they feel confident in terms of delivery their babies. Unassisted delivery carries a substantial risk in that unskilled attendants can hardly predict and manage serious complications which will lead to the deaths of mothers during and after child birth (22). Thus, promotion and comprehensive education on the early signs of labor and birth preparedness and complication readiness, need to be provided during the ANC sessions to translate the ANC uptake to delivery care and improve the overall maternal healthcare service utilization.

This analysis also revealed that the magnitude of utilization of all the packages of maternal healthcare services was extremely low (6.1%). It was also noted that in all the five identified trajectories, the utilization of early postnatal care was exceedingly poor. Furthermore, regardless of the route of progression, a large portion (40.5%) of the mothers proceeded up to delivery care efficiently and did not access postnatal care. This finding suggests that an improvement in the utilization of postnatal care alone will greatly increase the uptake of beneficial maternal healthcare services.

The trajectories have indicated spatial variation across regional states. The multivariable analysis indicated that women residing in Oromia regional states were highly likely to follow the least favorable trajectory of maternal healthcare service utilization. The finding is consistent with the demographic and health survey reports of 2016, a period closer to the study's baseline data collection period (5). Spatial specific planning, implementation, and monitoring and evaluation of activities might help reduce the inequalities in maternal healthcare service utilization across regional states.

Religion is considered to have an influence over maternal healthcare utilization in some recent studies (12–14,21). However, the relationship is best understood with the present study as our findings

indicate the point where religion stimulates and fails to stimulate maternal healthcare utilization. Christian women barely attempt to utilize any maternal healthcare services as compared to non-Christian women. However, the two groups of women followed similar trajectories beyond ANC utilization, that is, non-Christian women did not maintain the advantages they had at an early stage of the trajectory beyond antenatal care utilization.

Parity was found to have negatively influenced the uptake of maternal health care services (13,14,21). Contrary to these reports, in this research, the age of the mother that had a significant association with the type of the trajectory. Consistent with a finding reported in a study conducted by Rurangirwa and colleagues (23), older women (35+ years) were highly unlikely to seek maternal healthcare and features in the least ideal trajectory. However, Agunwa *et al.* (11) reported that age positively predicted delivery care. In this study, it was the cumulated experience of older women in pregnancy and childbirth that led them to select an unsatisfactory utilization of maternal healthcare service.

Maternal educational achievement is another factor that dictates the trajectory that mothers had taken during their last pregnancy and childbirth. It serves as a stimulant for an uptake of maternal healthcare services when women have an educational level beyond primary school. The finding is consistent with reports of previous studies conducted in Ethiopia (20,24) and other African countries (11–13). Educated women had a relatively enhanced autonomy over their health seeking behavior as compared to uneducated women. Education may also play a role by providing better access to information that in turn would help expand the choices of women. However, there are studies that are methodologically different from this study and reported a null finding (19,23). These studies considered only a segment from the spectrum of maternal healthcare service utilization while this study looked at the continuum of care.

Table 5: Result of generalized ordered logit model for maternal healthcare utilization in four regions of Ethiopia, December 2016 to February 2017

Characteristics and categories	No.	COR	AOR (95% CI) [†]				
			None (Tr1)	Only ANC (Tr2)	Incomplete ANC and DC (Tr3)	ANC and DC (Tr4)	
Region	Amhara [Ref]	153	1.00	1.00	1.00	1.00	1.00
	Oromia	303	0.31***	0.27*** (0.16,0.46)	0.19*** (0.11,0.31)	0.31*** (0.17,0.56)	0.25*** (0.10,0.64)
	SNNP	77	1.04	1.01 (0.58,1.75)			
	Tigray	57	0.96	0.80 (0.43,1.47)			
Religion	Christian [Ref]	389	1.00	1.00	1.00	1.00	1.00
	Others	201	0.51***	1.61** (1.01,2.56)	1.87*** (1.17,2.99)	0.88 (0.49,1.60)	1.67 (0.65,4.30)
Age	15-24 [Ref]	202	1.00	1.00			
	25-34	313	0.96	1.04 (0.70,1.56)			
	35+	75	0.45***	0.39** (0.19,0.80)			
Parity	<4 [Ref]	330	1.00	1.00			
	4-7	219	0.53***	0.77 (0.47,1.27)			
	8+	39	0.36***	0.91 (0.36,2.31)			
Family size	<=4 [Ref]	220	1.00	1.00			
	5-6	194	0.69**	0.91 (0.58,1.42)			
	7+	176	0.49***	1.03 (0.56,1.87)			
Maternal	None [Ref]	326	1.00	1.00			

Characteristics and categories	No.	COR	None (Tr1)	AOR (95% CI) [†]		
				Only ANC (Tr2)	Incomplete ANC and DC (Tr3)	ANC and DC (Tr4)
Education	Primary	205	1.27	1.06 (0.72,1.56)		
	Secondary+	59	4.10***	2.09** (1.14,3.84)		
Marital status	In Union [Ref]	566	1.00	1.00		
	Not in Union	20	1.12	0.68 (0.28,1.64)		
	Poorest	123	0.46***	0.43*** (0.24,0.74)		
SES	Poor	113	1.18	1.24 (0.75,2.03)		
	Middle [Ref]	116	1.00	1.00		
	Rich	112	1.38	1.12 (0.67,1.85)		
	Richest	126	3.12***	2.24*** (1.35,3.72)		
Knowledge on danger signs	No [Ref]	150	1.00	1.00		
	Yes	440	1.67***	1.28 (0.88,1.85)		
BPCR	No [Ref]	453	1.00	1.00		
	Yes	137	4.20***	3.40*** (1.78,6.50)		

*** P<1%

** P<5%

[†] Only results of region, religion and SES are displayed in 4 different columns as these are the only variables that violated the assumptions of ordinal logistic regression. For the rest of the variables, the assumption is fulfilled, and the estimates are the same across the cumulative logits.

While women residing in the poorer households intended to follow the undesired route, women of the wealthy households tend to seek better utilization of maternal healthcare services. In the study area, the presence of a significant pro-rich inequality in maternal healthcare service utilization had been reported (15). Likewise, studies conducted in Ethiopia and Ghana corroborate with this finding (12,14). This may be since women of the wealthy households had better access to resources that would enable them to purchase the services, even from private health facilities.

Women's recognition of signs of danger during pregnancy, delivery, and postnatal period and BPCR are crucial for timely action, management of complications and childbirth. The level of both knowledge of obstetric danger signs and BPCR are alarmingly low in the present study. However, it was found that women who had a good BPCR had an improved level of maternal healthcare utilization as compared to those who were not. A prior arrangement made on the part of the mother, such as identification of the birth attendant and the facility, afforded expectant mothers an impulse to utilize delivery and postnatal care (25,26). The study findings agrees with previous studies that reported BPCR predicted better use of maternal healthcare services (16,27).

The present study attempted to consider an approach that has not been considered in previous research, in terms of maternal healthcare service utilization. This approach considered combining all the maternal healthcare service utilization indicators to explore the trails of service utilization that mothers had taken during their most recent pregnancy. On the other hand, this study was entirely dependent on retrospective responses of mothers about their most recent pregnancy and events surrounding the pregnancy. Thus, as with all observational studies, the responses are not immune to recall errors that might add due to memory lapses or

event omissions. A follow up study is commendable to study such events with minimized recall errors.

In conclusion, five different trajectories were identified, and the magnitude of a beneficial utilization was minimal. The magnitude of discontinuation after uptake of ANC pales in comparison to the rate of withdrawal towards the end of the continuum of care. Additionally, it has been observed that an equally appalling situation prevails at the start of the continuum of care. A spatial differentiated plan needs to be introduced, to improve the uptake of maternal healthcare services. The less affluent, the uninformed and older women should be provided with a health education. Finally, given its strength of association, women, their families, and communities need to be encouraged to effectively plan their births and learn to deal with complications.

Competing interests

The authors declare no conflict of interest.

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Authors' contributions

AH: Conceptualised and formulated the research idea, aim and design and was the main contributor in drafting the literature review, statistical analysis, writing, interpretation, and discussion as well as conclusion of the study.

GT: Contributed to conceptualising the design of the study and editing of the manuscript.

LS: Contributed to conceptualising the design of the study and editing of the manuscript. All authors read and approved the final manuscript.

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