Prevalence, Trends, and Determinants of at Least Four Antenatal Visits in Malawi: Analyses of the Malawi Demographic and Health Surveys 1992–2016

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Abstract

This study aims to determine the prevalence, trends, and determinants of at least four antenatal visits in Malawi. The study used Demographic and Health Surveys from 1992 to 2016. The study population consisted of women who gave birth to at least one child within 60 months before the survey. Chi-square test and logistic regression analyses were used to establish the relationships between dependent and independent variables. The percentage of pregnant women who had at least four antenatal visits was 63.8% in 1992, 56.7% in 2000, 57.7% in 2004, 44.5% in 2010, and 50.6% in 2016. In 2016, the pregnant women less likely to have four or more antenatal visits were aged 15–19 years (OR = 0.51, 95% CI = 0.38–0.69), not using family planning (OR = 0.89, 95% CI = 0.80–0.98), not working (OR = 0.81, 95% CI = 0.76–0.88) and had no education (OR = 0.75, 95% CI = 0.65–0.87). Women residing in urban areas (OR = 1.28, 95% CI = 1.14–1.44), having 1–2 children ever born (OR = 1.30, 95% CI = 1.12–1.50), were more likely to have four or more antenatal visits. In 2010, women residing in the Northern Region (OR = 1.26, 95% CI = 1.05–1.52) were more likely to have four or more antenatal visits, whereas poor women (OR = 0.78, 95% CI = 0.69–0.88) were less likely. The study recommends that poor, uneducated, rural women with high parity should be encouraged to utilize antenatal care services through social and behavior change communication campaigns.

Keywords

Antenatal care; communication campaigns; determinants; Malawi; service utilization

Introduction

Women are expected to use antenatal care (ANC) services when they discover that they are pregnant. The use of ANC services offers the beginning of integrated care, encouraging healthy practices during and after pregnancy, influencing care-seeking behaviors, and identifying and connecting women with pregnancy complications to a referral system (Girum & Wasie, 2017).

In developed countries, ANC involves a large number of frequent antenatal care visits—approximately 7–16 visits for the duration of the entire pregnancy. Pregnant women start ANC from early during pregnancy until delivery (Say & Raine, 2007). Furthermore, pregnant women have access to adequate ANC services, which include regular tests and ultrasound assessments. However, owing to the high cost of ANC services, this approach does not work in developing countries (Gajate-Garrido, 2013). As such, in 2001, the World Health Organization (WHO) developed a new model of ANC, Focused Antenatal Care (FANC), and recommended a minimum of four visits for women with an uncomplicated pregnancy (WHO, 2002). Focused Antenatal Care focuses on goal-oriented and targeted care to better detect and manage complications during pregnancy (WHO, 2002). According to FANC, the first visit should occur by week 16, the second at weeks 24–28, the third at week 32, and the final visit by weeks 36–38 (WHO, 2002).

Malawi, a landlocked country in southeastern Africa, adopted FANC in 2003. This program is the antenatal care model currently in use (Ministry of Health & ICF International, 2014). Studies on the effectiveness of FANC have been inconclusive. Some researchers reported that FANC was a safe, sustainable, comprehensive, and cost-effective antenatal care model (Birungi et al., 2006; Birungi & Onyango-Ouma, 2006; Villar et al., 2001). In contrast, a systematic review in 2015 found that the reduced model of visits with the FANC was associated with increased perinatal deaths compared to models that recommended at least eight visits (Dowswell et al., 2015). This finding prompted the WHO to revise the ANC policy in 2016, suggesting an increase in the number of ANC visits to a minimum of eight (WHO, 2016). In the revised model, the first ANC visit is recommended in the first trimester within 12 weeks of gestation. During the third trimester, which is the highest risk for pre-eclampsia and eclampsia, five ANC visits should be scheduled as follows: at 30, 34, 36, 38, and 40 weeks. Furthermore, the new ANC guidelines include 49 extensive recommendations covering a wide range of interventions (WHO, 2016).

Globally, in 2014, it was estimated that 60% of pregnant women had at least four ANC visits (UNICEF, 2021). Pregnant women who had at least four ANC visits ranged from 90% in the Americans, 70% in South-East Asia, and 40% in the Eastern Mediterranean and Africa (UNICEF, 2021). Within sub-Saharan Africa (SSA), pregnant women who had at least four ANC visits were highest in Liberia and Ghana with 87%, and lowest in Djibouti with 23%. Malawi ranked 14th among countries with the lowest percentage of ANC visits in SSA, with an estimated 51% of women who had at least four ANC visits.

Several studies have been conducted to identify and understand factors influencing ANC services in developing countries (Birungi et al., 2006; Birungi & Onyango-Ouma, 2006; Dowswell et al., 2015; Villar et al., 2001). These studies have shown that utilization of ANC services is influenced by individual, community, and societal factors. At the individual level, ANC utilization is influenced by characteristics such as age (Abosse et al., 2010; Awusi et al.,

2009), education (Awusi et al., 2009; Bbaale, 2011), work status (Awusi et al., 2009), wealth status (Basha, 2019; Bbaale, 2011; Joshi et al., 2014; Tsawe et al., 2015), region of residence (Basha, 2019; Kitui et al., 2013; Ochako & Gichuhi, 2016; Ousman et al., 2019), residence in rural versus urban areas, knowledge of ANC (Mrisho et al., 2009), beliefs, risk perceptions, and perceived benefits and disadvantages (Manda-Taylor et al., 2017; Mrisho et al., 2009). Factors that influence utilization of ANC services at the household level include household size and composition (Akowuah et al., 2018), the number of children under five years of age in the household, household structure and space (Guliani et al., 2014), household decision-making processes, and power structures including supportive husband (Akowuah et al., 2018). At the community level, social norms and values, cultural beliefs and practices (Chimatiro et al., 2018), negative rumors about ANC (Mrisho et al., 2009), social support and pressure, availability and accessibility (Ahuru & Omon, 2019; Nghargbu & Olaniyan, 2019), and quality and cost of services (Ahuru & Omon, 2019; Manda-Taylor et al., 2017) have the potential to influence ANC service utilization by individuals and households.

Several studies on ANC services have been carried out in Malawi (Chanza et al., 2012; Chimatiro et al., 2018; Kuuire et al., 2017; Mamba et al., 2017; Manda-Taylor et al., 2017; Mchenga et al., 2019). Most of these are qualitative, hospital-based, and small-scale (Chanza et al., 2012; Manda-Taylor et al., 2017). Among the studies that covered small areas include a study by Lungu et al. (2011), who looked at the quality of care in Lilongwe, Mamba et al. (2017) explored facility-based barriers to early use of ANC in Mangochi, while the studies of others focused on delayed ANC attendance in Blantyre and Lilongwe (Kazanga et al., 2019; Manda-Taylor et al., 2017). Furthermore, of the above ten studies that investigated ANC in Malawi, only three used Demographic and Health Surveys (DHS) data (Kazanga et al., 2019; Machira, 2017; Mchenga et al., 2019). Of these, two looked at skilled delivery during delivery (Kazanga et al., 2019; Mchenga et al., 2019). One of these studies explored skilled delivery during delivery in the Lilongwe district, the country's capital city (Kazanga et al., 2019). This study supported the argument that the adoption of international goals and targets for a country like Malawi should not be determined unintentionally but should be based on a close examination of what it can achieve based on the available resources.

In order to realize the new WHO recommendation of at least eight antenatal visits (WHO, 2016), there is a need to reassess progress towards the original recommendation of a minimum of four antenatal visits (WHO, 2002). It is anticipated that this study will contribute to the ever-increasing corpus of literature on the maternal health services in Malawi, and aid in drafting appropriate programs that will improve the quality of life of Malawians. This focus is particularly important for a country like Malawi where the majority of its population are underprivileged and live in rural areas. The objectives of this study are two-fold: to determine the prevalence and trends in the use of ANC services, and identify the factors associated with the utilization of ANC services in Malawi.

Methods

Data sources

The study used data from the 1992, 2000, 2004, 2010, and 2015–2016 Malawi Demographic and Health Surveys (MDHSs) conducted by the National Statistical Office on behalf of the Ministry of Health, with financial and technical assistance from the United States Agency for

International Development (USAID). These MDHSs are large-scale, national, and cross-sectional community-based efforts to collect data through a two-stage stratified cluster sampling technique.

The first stage involved the selection of clusters or enumeration areas (EAs) from appropriate census frames (1987 census for 1992 MDHS, 1998 for 2000 and 2004 MDHSs, and the 2008 census for 2010 and 2015–2016 MDHSs). The second stage consisted of the survey of a selection of households. Detailed descriptions of the methodologies employed in each survey can be found in the final survey reports (e.g., National Statistical Office, 1994; National Statistical Office & ICF, 2017; National Statistical Office & ICF Macro, 2011; National Statistical Office & ORC Macro, 2001, 2005).

The analyses in this study only used data from individual women who responded to the questionnaires. The number of women of reproductive age interviewed in each of the surveys were 4,849 in 1992; 13,220 in 2000; 23,320 in 2004; 23,020 in 2010; and 24,562 in 2015–2016 (National Statistical Office, 1994; National Statistical Office & ICF, 2017; National Statistical Office & ICF Macro, 2011; National Statistical Office & ORC Macro, 2001, 2005).

Study population

This study's population comprised women who gave birth to at least one child within 60 months prior to the survey. All women who had not given birth in the five years prior to the survey were excluded from the analysis. Based on this criterion, the study population comprised of weighted samples of women as follows: 2,380 in 1992; 7,942 in 2000; 7,256 in 2004; 13,663 in 2010; and 13,516 in 2015–2016.

Description of variables

Dependent variable

The dependent variable in this study was the number of antenatal visits during pregnancy. This variable was derived from a series of questions. First, women were asked to indicate whether or not they had seen anyone for antenatal care (ANC) for this pregnancy. Those who answered yes to this question were further requested to indicate, in months, when they had seen a skilled provider and how many times. Based on the 2001 WHO recommendation that pregnant women should have a minimum of four antenatal visits (WHO, 2002), the number of antenatal visits during pregnancy was dichotomized into two categories: women with 0 to 3 visits (Coded as 0), and women with four visits and more (Coded as 1).

Independent variables

The independent variables included in this study were based on their significance in previous studies of maternal health services or on their hypothesized association with the number of antenatal visits (Bbaale, 2011; Zakar et al., 2017). Individual-level variables included in this analysis are age, region of residence, type of place of residence, education, ethnicity, work status, wealth status, children ever born (CEB), knowledge of family planning, ever use of family planning, and media exposure.

The 1992, 2000, and 2004 MDHSs did not have a separate variable on wealth status. For this reason, the variable wealth status for these years was constructed based on ownership of the following household assets data: electricity, radio, TV, bicycle, motorbike, and car. A detailed description of how the variable was constructed as described by Palamuleni (2011), but re-categorized wealth status into poor, middle, and rich. The 1992 MDHS did not collect information on ethnicity and religious affiliation. The variable media exposure was constructed from the responses to the questions on whether or not a woman listens to the radio, watches television, or reads newspapers and magazines with some frequency. The responses were 0 = not at all, 1 = less than once a week, 2 = at least once a week, and 3 = almost every day. These responses were summed, and the total score ranged from 0 to 9. Media exposure was derived from the total score as follows: no exposure if the total score is zero, and media exposure if the total score ranged from 1 to 9.

Methods of analysis

Three statistical approaches were used in the analysis. Firstly, frequency distributions of all variables were performed. Secondly, the relationship between the dependent and independent variables was carried out, and the chi-square tests were conducted. The *p* values were calculated using the chi-square test. Thirdly, multivariate logistic regression was used to examine the influence of social and economic factors on the number of antenatal visits in Malawi. The use of logistic regression is based on the fact that the dependent variable is dichotomous.

The logistic regression model is given by:

$$y = \ln\left[\frac{p_i}{1-p_i}\right] = \alpha + \beta_1 \mathrm{X}_{1i} + \beta_2 \mathrm{X}_{2i} + \beta_3 \mathrm{X}_{3i} \cdots \beta_m \mathrm{X}_{mi}$$

where *pi* is the probability of having at least four antenatal visits, 1-*pi* is the probability of not having four antenatal visits, α is the constant and β's are the coefficients associated with independent variables, X's in the study. The regression coefficients were exponentiated to obtain odds ratios (OR). Associations were reported using adjusted odds ratios with their respective 95% confidence intervals (CIs).

Ethical consideration

Permission to use the MDHS data set was obtained from the Measure DHS website, where registration was required. The registration process required personal details (email address, names, country of residence, contact number, etc.), institution type, and most importantly, the research topic and objectives of the study. Both national and international standards for biomedical research involving human subjects were adhered to as the survey protocols were ratified by the National Health Sciences Research Committee in Malawi and the ICF Institutional Review Board (National Statistical Office & ICF, 2017; National Statistical Office & ICF Macro, 2011).

Results

Characteristics of the study population

Table 1 presents the background characteristics of the study population. The percentage distribution of respondents in each age group increased from age group 15–19 to a maximum value in the age group 20–24, then declined thereafter as age increased, reaching a minimum in the age group 45–49. In 2010 the maximum was reached in the age group 25–29. The mean age of women was 28.0 years in 1992, 26.8 years in 2000, 26.6 in 2004, 27.5 in 2010, and 27.1 years in 2015–2016.

The majority of the study population was in the Southern Region (45.3% in 1992, 47.7% in 2000, 50.4% in 2004, 48.0% in 2010, and 46.0% in 2015–2016), followed by the Central Region (35.3% in 1992, 35.9% in 2000, 36.8% in 2004, 34.1% in 2010, and 42.3% in 2015–2016) and least in the Northern Region (29.6% in 1992, 16.4% in 2000, 12.8% in 2004, 17.9% in 2010, and 11.7% in 2015–2016).

Table 1 indicates that the majority of the study population belonged to the Chewa ethnic group (27.3% in 2000, 32.3% in 2004, 30.0% in 2010, and 34.8% in 2015–2016). The Chewa are followed by the Lomwe (18.8% in 2000 and 2004, 16.0% in 2010, and 18.2% in 2015–2016), then the Yao (14.5% in 2000, 16.2% in 2004, 11.1% in 2010, and 14.7% in 2015–2016), the Ngoni (11.1% in 2000, 9.5% in 2004, 12.9% in 2010, and 11.4% in 2015–2016) and the Tumbuka ethnic group (9.8% in 2000, 9.5% in 2004, 10.4% in 2010, and 9.0 in 2015–2016).

The majority of the study population resided in rural areas (74.5% in 1992, 81.4% in 2000, 88.6% in 2004, 89.5% in 2010, and 85.6% in 2015–2016), were currently married (86.6% in 1992, 86.7% in 2000, 86.2% in 2004, 85.2% in 2010, and 85.6% in 2015–2016) and had primary education (52.6% in 1992, 62.7% in 2000, 63.4% in 2004, 68.7% in 2010, and 65.6% in 2015–2016). The economic characteristics of the study population indicated that in 1992 most of the study population were not working (70.6%). In contrast, in the remaining datasets, the majority of the study population was working. The study population not working was 41.3% in 2000, 40.6% in 2004, 42.1% in 2010, and 33.9% in 2015–2016. The proportion of the study population classified as poor was 48.1% in 1992, 59.1% in 2000, 49.7% in 2004, 43.6% in 2010, and 45.3% in 2015–2016.

Table 1 indicates that knowledge and use of family planning (FP) increased during the period under review. Knowledge of family planning increased from 96.2% in 1992, 98.9% in 2000, 99.1% in 2004, 99.8% in 2010, to 99.7% in 2015–2016, whereas ever use of family planning increased from 48.4% in 1992, 57.0% in 2000, 63.2% in 2004, 81.1% in 2010, to 85.9% in 2015–2016. In 1992, 33.2% of the women had one or two children, 25.0% had three or four children, and 41.0% had five children or more. In the remaining four datasets, the majority of the study population had one or two children, followed by five or more children and then three or four children.

Table 1: Background Characteristics, Malawi 1992, 2000, 2004, 2010, and 2015–2016.

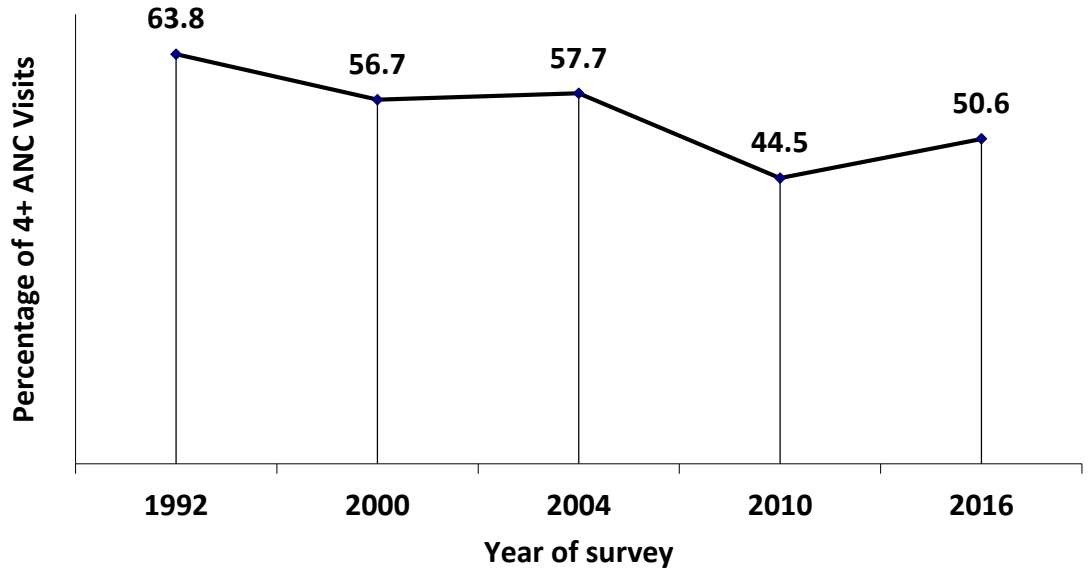
Independent variables	1992 (n = 2,385)	2000 (n = 7,942)	2004 (n = 7,256)	2010 (n = 13,663)	2015–2016 (n = 13,516)
Age of respondent					
15–19	9.7%	9.5%	8.4%	7.6%	8.6%
20–24	25.7%	30.5%	31.9%	26.1%	28.7%
25–29	22.4%	25.3%	25.0%	27.1%	23.7%
30–34	18.5%	14.9%	15.8%	18.6%	19.7%
35–39	11.8%	11.3%	10.2%	12.4%	12.1%
40–44	8.4%	5.7%	5.9%	5.5%	5.2%
45–49	3.5%	2.8%	2.7%	2.6%	2.0%
Region					
Northern Region	29.6%	16.4%	12.8%	17.9%	11.7%
Central Region	35.1%	35.9%	36.8%	34.1%	42.3%
Southern Region	35.3%	47.7%	50.4%	48.0%	46.0%
Type of residence					
Urban	25.5%	18.6%	11.4%	10.5%	14.4%
Rural	74.5%	81.4%	88.6%	89.5%	85.6%
Education					
No education	41.6%	28.6%	25.3%	16.1%	12.5%
Primary	52.6%	62.7%	63.4%	68.7%	65.6%
Secondary+	5.8%	8.8%	11.3%	15.2%	21.9%
Ethnic groups					
Chewa		27.3%	32.3%	30.0%	34.8%
Tumbuka		9.8%	9.5%	10.4%	9.0%
Lomwe		18.8%	18.8%	16.0%	18.2%
Tonga		2.0%	2.0%	2.9%	1.7%
Yao		14.5%	16.2%	11.1%	14.7%
Sena		3.8%	3.5%	6.0%	4.0%
Nkonde		3.3%	0.8%	1.7%	0.8%
Ngoni		11.1%	9.5%	12.9%	11.4%
Amang'anja/Anyanja		6.0%	0.0%	3.1%	2.5%
Other		3.5%	7.3%	6.0%	1.1%
Knowledge of family planning					
Knows no method	3.8%	1.1%	0.9%	0.2%	0.3%
Knows a method	96.2%	98.9%	99.1%	99.8%	99.7%
Ever used family planning					
Used no method	51.6%	43.0%	36.8%	18.9%	14.1%
Ever used a method	48.4%	57.0%	63.2%	81.1%	85.9%
Children ever born					
1–2	33.2%	41.4%	39.9%	35.9%	44.7%
3–4	25.8%	27.1%	29.6%	31.4%	30.1%
5+	41.0%	31.5%	30.5%	32.7%	25.2%

Independent variables	1992 (n = 2,385)	2000 (n = 7,942)	2004 (n = 7,256)	2010 (n = 13,663)	2015–2016 (n = 13,516)
Wealth index					
Poor	48.1%	59.1%	49.7%	43.6%	45.3%
Medium	48.7%	36.1%	45.8%	22.2%	19.2%
Rich	2.9%	1.5%	2.6%	34.2%	35.5%
Work status					
Not Working	70.6%	41.3%	40.6%	42.1%	33.9%
Working	29.4%	58.7%	59.4%	57.9%	66.1%
Media					
No	41.5%	21.9%	19.1%	22.1%	46.5%
Yes	58.5%	78.1%	81.9%	77.9%	53.5%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Use of prenatal services and number of visits

Although ANC services are almost universal, available statistics indicated that not all women adhere to the WHO standard of a minimum of four antenatal visits. Table 2 and Figure 1 indicate that the percentage of women who had the recommended number of at least four ANC visits declined from 63.8% in 1992 to 56.7% in 2000, 57.7%% in 2004 to 44.5% in 2010, and 50.6% in 2015–2016, respectively. The decline is noticeable in all independent variables considered in this study.

Figure 1: Number of Prenatal Visits, Malawi 1992, 2000, 2004, 2010, and 2015–2016.



Relationship between antenatal visits and background variables

Table 2 also shows that the number of women having at least four antenatal visits varied by background variables. The percentage of women who had at least four antenatal visits was low in the group of young women (15–19), increased to a local maximum, and reached the

lowest value in the age group 45–49. The relationship between the dependent variable and age was statistically significant in 2000, 2010, and 2015–2016.

Having at least four antenatal visits was significantly associated with the region. In 1992, having at least four antenatal visits was highest in the Central Region, followed by the Southern Region, and lowest in the Northern Region. In 2000 and 2004, having at least four antenatal visits was highest in the Northern Region, followed by the Central Region and lowest in the Southern Region. In 2010 and 2015–2016, having at least four antenatal visits was highest in the Central Region, followed by the Northern Region and lowest in the Southern Region.

The percentage of women having at least four antenatal visits was higher in urban than rural areas and statistically significant in all the years. In 2015–2016, 58.9% of urban women had at least four antenatal visits compared to 49.2% of rural women.

The percentage of women with at least four antenatal visits also varied by ethnic group, and the relationship was statistically significant for 2000, 2004, 2010, and 2015–2016 ($p < 0.000$). In 2015–2016, the ethnic groups can be ranked from highest to lowest: Tonga, Ngoni, Tumbuka, Chewa, Other, Lomwe, Yao, Amang'anja/Anyanja, Nkonde, and Sena.

Furthermore, the percentage of women who had at least four antenatal visits was the lowest among the women who never married, followed by formerly married women, and highest among the currently married women. The results were statistically significant for 2015–2016. In 2015–2016, 38.6% of women who were never married had at least four antenatal visits, 51.0% among currently married women, and 51.5% among formerly married women.

Having at least four antenatal visits was also associated with the number of children ever born, and the relationship was statistically significant in 2004 and 2015–2016. In 2004, 36.6% among women with one or two children ever born (CEB) had at least four antenatal visits, 40.1% among women with three or four CEB, and 38.1% among women with five or more CEB ($p < 0.001$). In 2015–2016, 50.5% among women with one or two CEB had at least four antenatal visits, 49.8% among women with three of four CEB, and 51.6% among women with five or more CEB ($p < 0.000$).

Having at least four antenatal visits was also associated with knowledge and use of family planning. In all the years, except 2004, having at least four antenatal visits was higher among women who knew about family planning than those who did not know about family planning. The association was statistically significant in 1992, 2000, and 2004. Similarly, in all the years apart from 2004, having at least four antenatal visits was higher among women who used family planning than those who did not. The association is statistically significant in 2000, 2004, 2010, and 2015–2016.

Table 2 also indicates that having at least four antenatal visits was significantly related to work status, wealth status, education, and access to media. The percentage of women who had at least four antenatal visits was higher among working women than non-working women. The relationship was statistically significant in 2000, 2004, 2010, and 2015–2016. In all the survey years, the percentage of women who had at least four antenatal visits was highest among women in the high-status category, followed by those in the middle category, and lowest among poor women. For instance, in 2015–2016, women who had at least four antenatal visits were 48.1% among poor women, 48.7% among women in the middle wealth status category, and 54.7% among the rich women. In terms of education, the percentage of women who had

at least four antenatal visits was highest among women with secondary and higher education, followed by those with primary education and lowest among women with no education. In 2015–2016, the percentage of women who had at least four antenatal visits was 46.3% among women with no education, 49.2% among women with primary education, and 57.1% among women with secondary and higher education. In all the survey years, women who had exposure to media had a higher percentage of having at least four antenatal visits than those who did not have exposure to media. In 2015–2016, those who had at least four antenatal visits were 48.3% among women with no media exposure, and 53.0% among women with media exposure ($p < 0.000$).

Table 2: Percentage of Women with At Least Four Antenatal Visits by Selected Background Variables, Malawi 1992, 2000, 2004, 2010, and 2015–2016

Independent Variables	1992			2000			2004			2010			2015–2016		
	< 4	≥ 4	*p* value	< 4	≥ 4	*p* value	< 4	≥ 4	*p* value	< 4	≥ 4	*p* value	< 4	≥ 4	*p* value
Age of respondent			0.616			0.001			0.866			0.005			0.000
15–19	38.3%	61.7%		45.3%	54.7%		59.9%	40.1%		58.9%	41.1%		56.8%	43.2%	
20–24	34.6%	65.4%		43.6%	56.4%		61.0%	39.0%		58.2%	41.8%		51.5%	48.5%	
25–29	35.6%	64.4%		41.6%	58.4%		62.7%	37.3%		54.2%	45.8%		49.5%	50.5%	
30–34	35.2%	64.8%		43.3%	56.7%		61.1%	38.9%		55.3%	44.7%		45.2%	54.8%	
35–39	36.7%	63.3%		42.1%	57.9%		62.7%	37.3%		52.7%	47.3%		47.9%	52.1%	
40–44	38.4%	61.6%		43.8%	56.2%		66.0%	34.0%		51.8%	48.2%		46.0%	54.0%	
45–49	43.8%	56.3%		52.7%	47.3%		65.2%	34.8%		53.6%	46.4%		46.1%	53.9%	
Region			0.000			0.000			0.000			0.000			0.000
Northern Region	42.8%	57.2%		38.4%	61.6%		58.8%	41.2%		53.4%	46.6%		48.4%	51.6%	
Central Region	31.7%	68.3%		43.1%	56.9%		60.5%	39.5%		52.3%	47.7%		47.1%	52.9%	
Southern Region	35.2%	64.8%		45.1%	54.9%		63.7%	36.3%		58.5%	41.5%		51.8%	48.2%	
Type of residence			0.000			0.000			0.000			0.001			0.000
Urban	27.3%	72.7%		34.1%	65.9%		68.8%	31.2%		51.2%	48.8%		41.1%	58.9%	
Rural	39.2%	60.8%		45.4%	54.6%		61.0%	39.0%		56.0%	44.0%		50.8%	49.2%	
Ethnic groups						0.000			0.000			0.000			0.000
Chewa				43.4%	56.6%		60.3%	39.7%		54.0%	46.0%		48.4%	51.6%	
Tumbuka				36.6%	63.4%		58.0%	42.0%		50.5%	49.5%		47.5%	52.5%	
Lomwe				42.5%	57.5%		62.4%	37.6%		57.3%	42.7%		50.2%	49.8%	
Tonga				35.6%	64.4%		64.2%	35.8%		55.7%	44.3%		41.3%	58.7%	
Yao				48.4%	51.6%		63.0%	37.0%		53.2%	46.8%		51.2%	48.8%	
Sena				47.1%	52.9%		70.2%	29.8%		61.6%	38.4%		60.4%	39.6%	

Independent Variables	1992			2000			2004			2010			2015–2016		
	< 4	≥ 4	*p* value	< 4	≥ 4	*p* value	< 4	≥ 4	*p* value	< 4	≥ 4	*p* value	< 4	≥ 4	*p* value
Nkonde				45.9%	54.1%		50.8%	49.2%		64.5%	35.5%		55.9%	44.1%	
Ngoni				41.7%	58.3%		63.8%	36.2%		56.8%	43.2%		46.9%	53.1%	
Amanganja/Anyanja				44.1%	55.9%		64.7%	35.3%		59.9%	40.1%		51.2%	48.8%	
Other				46.1%	53.9%		100,0%	0.0%		56.4%	43.6%		49.1%	50.9%	
Children ever born			0.213			0.866			0.005			0.616			0.005
1–2	34.0%	66.0%		41.6%	58.4%		63.4%	36.6%		55.2%	44.8%		49.5%	50.5%	
3–4	35.4%	64.6%		43.8%	56.2%		59.9%	40.1%		55.5%	44.5%		50.2%	49.8%	
5+	38.4%	61.6%		45.2%	54.8%		61.9%	38.1%		55.7%	44.3%		48.4%	51.6%	
Knowledge of FP			0.001			0.000			0.023			0.091			0.142
Knows no FP	51.9%	48.1%		66.7%	33.3%		56.2%	43.8%		66.7%	33.3%		66.7%	33.3%	
Knows FP	35.6%	64.4%		43.1%	56.9%		62.0%	38.0%		55.4%	44.6%		49.4%	50.6%	
Ever used FP			0.261			0.000			0.000			0.001			0.001
Never used FP	37.2%	62.8%		48.3%	51.7%		59.7%	40.3%		58.3%	41.7%		55.0%	45.0%	
Ever used FP	35.1%	64.9%		39.6%	60.4%		63.2%	36.8%		54.8%	45.2%		48.5%	51.5%	
Wealth status			0.000			0.000			0.002			0.000			0.000
Low	42.6%	57.4%		45.6%	54.4		60.3%	39.7%		57.9%	42.1%		51.9%	48.1%	
Medium	31.1%	68.9%		40.4%	59.6%%		62.9%	37.1%		55.1%	44.9%		51.3%	48.7%	
High	13.8%	86.3%		33.0%	67.0%		74.5%	25.5%		52.6%	47.4%		45.3%	54.7%	
Education			0.000			0.000			0.000			0.000			0.000
None	38.1%	61.9%		50.2%	49.8%		60.8%	39.2%		55.9%	44.1%		53.7%	46.3%	
Primary	36.7%	63.3%		42.0%	58.0%		61.2%	38.8%		56.7%	43.3%		50.8%	49.2%	
Secondary+	18.0%	82.0%		30.0%	70.0%		68.2%	31.8%		49.3%	50.7%		42.9%	57.1%	

Note: The p values are based on the chi-square test; all p values are significant at p ≤ 0.05.

Determinants of at least four antenatal visits

All the variables used in the bivariate analyses were further subjected to multivariate modeling based on logistic regression. The results of this exercise are presented in Table 3. The results indicated the only variable that was significant in all five data sets was children ever born (CEB). In contrast, the variables, region, and type of residence were significant in four data sets: 1992, 2000, 2004, and 2010 for region, and 1992, 2000, 2004, and 2015–2016 for type of residence. The variables of age (2000, 2004, and 2015–2016), education (1992, 2000, 2015–2016), media (1992, 2000, 2004), wealth status (1992, 2004, 2010), work status (2000, 2004, 2015–2016), ever use of family planning (2000, 2004, 2015–2016) and ethnicity (2000, 2004, 2015–2016) were significant in three surveys indicated in brackets. Knowledge of family planning (1992, 2000) was significant in two data sets.

Table 3 indicates that having at least four antenatal visits was significantly associated with the number of CEB in all the surveys. The number of women who had at least four antenatal visits declined as parity increased. For example, in 2015–2016, women who had one or two children were 1.30 times more likely to have at least four antenatal visits (OR = 1.30, 95% CI = 1.12–1.50, $p < 0.5$) than women who had five or more children. Women who had three or four children were 1.01 times more likely to have at least four antenatal visits (OR = 1.01, 95% CI = 0.91–1.14, $p < 0.5$) than women who had five or more children. The odds ratio declined with the increasing number of children ever born, indicating the decrease in having four or more antenatal visits as the number of CEB increased.

The region was another variable that was significantly associated with at least four antenatal visits. In 2010 women who resided in the Central Region were 1.29 times more likely to have at least four antenatal visits (OR = 1.29, 95% CI = 1.16–1.43, $p < 0.5$) than women in the Southern Region. Women in the Northern Region were 1.26 times more likely to have at least four ANC (OR = 1.26, 95% CI = 1.05–1.52, $p < 0.5$) than women in the Southern Region.

Table 3 also indicates that type of place of residence was significantly related to having at least four antenatal visits. In all the surveys, women who resided in urban areas were more likely to have at least four antenatal visits than those who resided in rural areas. The results were not statistically significant in 2010, whereas the results were statistically significant in all the remaining four surveys. For instance, in 2015–2016, women who resided in urban areas were 1.28 times more likely to have at least four antenatal visits (OR = 1.28, 95% CI = 1.14–1.44, $p < 0.5$) than rural women.

The results in Table 3 suggest that having at least four antenatal visits was higher among older women than younger women. In 2015–2016, women in the age group 15–19 were 0.51 times less likely to have at least four antenatal visits (OR = 0.51, 95% CI = 0.38–0.69, $p < 0.5$) than women aged 45–49, whereas women in the 20–24 age group were 0.58 times less likely to have at least four antenatal visits (OR = 0.58, 95% CI = 0.43–0.76, $p < 0.5$) than women in the reference category. Women in the 30–34 age group were 0.67 times less likely to have at least four antenatal visits (OR = 0.67, 95% CI = 0.51–0.88, $p < 0.5$) than women aged 45–49. The odds ratio increasing with increasing age indicated that the younger the age group, the less likely they would have four antenatal visits. The odds ratio for age groups 15–19, 20–24, and 25–29 were statistically significant. The same picture was observed in 1992, 2000, 2004, and 2010 MDHS data, although in 1992 and 2000, the age group was statistically significant, whereas, in 2004, only age groups 15–19 and 20–24 were statistically significant.

The educational level of the women was also significantly related to having at least four antenatal visits. The results were not statistically significant in 2004. In 2015–2016, women who had no formal education were 0.75 times less likely to have at least four antenatal visits (OR = 0.75, 95% CI = 0.65–0.87, $p < 0.5$) compared to women who had attained a secondary or higher level of education, whereas women who had primary education were 0.84 times less likely to have at least four antenatal visits (OR = 0.84, 95% CI = 0.76–0.93, $p < 0.5$) compared to those who had attained a secondary or higher level of education. In all three data sets, the odds ratios increased with increasing levels of education, indicating that the higher the level of education, the more likely women used antenatal services.

The number of women who had at least four antenatal visits was significantly related to ever used family planning. Women who did not ever use family planning were 0.89 times less likely to have at least four antenatal visits (OR = 0.89, 95% CI = 0.80–0.98, $p < 0.5$) than women who have never used family planning.

Having at least four antenatal visits was significantly influenced by media exposure. Women who were exposed to media were more likely to have at least four antenatal visits. In 2004, women who were not exposed to media were 0.72 times less likely to have at least four antenatal visits (OR = 0.72, 95% CI = 0.64–0.83, $p < 0.5$) than women exposed to media.

The number of women who had at least four antenatal visits was significantly related to knowledge of family planning. Results showed that women who knew about family planning were more likely to have at least four antenatal visits. For instance, in 2010, women who did not know about family planning were 0.44 times less likely to have at least four antenatal visits (OR = 0.44, 95% CI = 0.19–0.98, $p < 0.5$) than women who knew about family planning.

Having at least four antenatal visits was also influenced by the wealth status of the individual. Wealth status was statistically significant in 1992, 2004, and 2010. In 2010, women who were poor were 0.78 times less likely to undertake at least four antenatal visits (OR = 0.78, 95% CI = 0.69–0.88, $p < 0.5$) than rich women, whereas women whose wealth status was medium were 0.86 times less likely to undertake at least four antenatal visits (OR = 0.86, 95% CI = 0.77–0.96, $p < 0.5$) than women in the reference category. However, only the results of poor women were statistically significant.

Table 3 also indicates that work status was significantly related to having at least four antenatal visits. In all the surveys (except for 1992 MDHS), working women were more likely to have at least four antenatal visits than non-working women. The results were not statistically significant in 1992 and 2010. In 2015–2016, non-working women were 0.81 times less likely to have at least four antenatal visits (OR = 0.81, 95% CI = 0.76–0.88, $p < 0.5$) than rural women.

Ethnicity also influenced whether or not women had at least four antenatal visits. In 2000, all ethnic groups, except for the Tumbuka, Yao, and Sena groups, were significantly associated with at least four antenatal visits than women in the reference category. In 2000, the Chewa, Lomwe, Tonga, Nkonde, and Ngoni ethnic groups were 1.45, 1.56, 1.66, 1.44, and 1.50 times, respectively, more likely to undertake at least four antenatal visits than women in the reference category. In 2010 and 2015–2016, only the Yao had a significant relationship with at least four antenatal visits.

Table 3: Determinants of Number of visits, Malawi 1992, 2000, 2004, 2010, and 2015–2016

Independent variables	1992			2000			2004			2010			2015–2016		
		95% CI			95% CI			95% CI			95% CI			95% CI	
	OR	LB	UB	OR	LB	UB	OR	LB	UB	OR	LB	UB	OR	LB	UB
Age respondents															
15–19	0.88	0.49	1.58	0.89	0.62	1.27	0.57*	0.39	0.85	0.78	0.58	1.04	0.51***	0.38	0.69
20–24	1.03	0.61	1.74	0.99	0.72	1.36	0.57*	0.39	0.85	0.78	0.60	1.01	0.58***	0.43	0.76
25–29	1.02	0.63	1.65	1.28	0.95	1.73	0.60***	0.42	0.85	0.95	0.74	1.22	0.67***	0.51	0.88
30–34	1.21	0.77	1.92	1.26	0.94	1.68	0.73	0.52	1.02	1.02	0.80	1.30	0.86	0.66	1.11
35–39	1.20	0.75	1.94	1.33	0.99	1.78	0.80	0.58	1.11	1.21	0.95	1.54	0.82	0.63	1.06
40–44	1.19	0.73	1.95	1.39*	1.01	1.91	0.83	0.60	1.15	1.31*	1.01	1.71	0.91	0.68	1.21
45–49 (RC)															
Region															
Northern Region	0.68***	0.55	0.83	1.43***	1.12	1.83	0.73*	0.58	0.92	1.26*	1.05	1.52	1.03	0.87	1.23
Central Region	1.16	0.95	1.41	1.08	0.93	1.25	0.87	0.75	1.01	1.29***	1.16	1.43	1.07	0.97	1.19
Southern Region (RC)															
Type of residence															
Urban	1.30*	1.06	1.60	1.55***	1.33	1.80	1.31***	1.11	1.55	0.96	0.86	1.08	1.28***	1.14	1.44
Rural (RC)															
Education															
No education	0.53*	0.32	0.86	0.58***	0.46	0.73	0.69***	0.56	0.84	0.87	0.76	1.01	0.75***	0.65	0.87
Primary	0.52*	0.33	0.83	0.74***	0.60	0.91	0.77***	0.65	0.92	0.84***	0.75	0.93	0.84***	0.76	0.93
Secondary + (RC)															
Ethnicity															
Chewa				1.45*	1.01	2.07	0.79*	0.63	0.98	1.19	0.91	1.56	1.02	0.85	1.22
Tumbuka				1.39	0.98	1.97	0.84	0.64	1.11	1.15	0.87	1.52	0.98	0.86	1.12
Lomwe				1.56*	1.07	2.26	0.86	0.70	1.07	1.15	0.87	1.50	1.33	0.99	1.78
Tonga				1.66*	1.02	2.70	0.92	0.61	1.37	1.16	0.80	1.66	1.01	0.89	1.14

Independent variables	1992			2000			2004			2010			2015–2016		
	95% CI			95% CI			95% CI			95% CI			95% CI		
	OR	LB	UB	OR	LB	UB	OR	LB	UB	OR	LB	UB	OR	LB	UB
Yao				1.27	0.88	1.84	0.91	0.73	1.13	1.31*	1.00	1.73	0.66***	0.54	0.81
Sena				1.44	0.95	2.19	1.13	0.82	1.57	1.02	0.75	1.37	0.69	0.46	1.04
Nkonde				1.44*	1.01	2.06	0.57	0.32	1.01*	0.77	0.50	1.19	1.05	0.93	1.19
Ngoni				1.50*	1.00	2.24	0.84	0.66	1.08	1.15	0.87	1.51	0.94	0.74	1.19
Other (RC)															
Knowledge of FP															
Knows no method	0.63*	0.42	0.95	0.46***	0.28	0.78	0.70	0.42	1.18	0.44*	0.19	0.98	0.69	0.33	1.43
Knows a method (RC)															
Current use of FP															
No Use	1.04	0.88	1.24	0.79***	0.72	0.87	0.83***	0.75	0.92	0.90*	0.83	0.99	0.89*	0.80	0.98
Used a method (RC)															
Children ever born															
1–2	1.44*	1.04	1.99	1.33***	1.10	1.61	1.47***	1.20	1.79	1.45***	1.26	1.67	1.30***	1.12	1.50
3–4	1.19	0.92	1.53	1.10	0.95	1.29	1.07	0.91	1.26	1.22***	1.09	1.37	1.01	0.91	1.14
5+ (RC)															
Wealth status															
Low	0.36***	0.18	0.71	1.36	0.86	2.13	0.68*	0.46	1.00	0.78***	0.69	0.88	0.92	0.84	1.01
Medium	0.49*	0.25	0.96	1.53	0.97	2.40	0.75	0.51	1.11	0.86*	0.77	0.96	0.90	0.81	1.01
High (RC)															
Work status															
Not working	1.02	0.85	1.23	0.88*	0.80	0.96	0.85***	0.77	0.94	0.96	0.89	1.03	0.81***	0.76	0.88
Working (RC)															
Media															
No	0.77*	0.63	0.93	0.85	0.75	0.95	0.72***	0.64	0.83	0.95	0.87	1.03	0.95	0.88	1.02
Yes (RC)															

*Note: LB = lower bound of CI; OR= odds ratio; RC= Reference Category; UB = upper bound of CI; *p < 0.05, ** p < 0.01, and *** p < 0.001.*

Discussion

The findings of this study indicate that women in Malawi utilize antenatal care (ANC) services during pregnancy. This finding stems from the fact that the percentage of women who do not use ANC services during pregnancy increased from 3.8% in 2000 to 4.2% in 2004, and declined to 1.4% in 2010, then increased slightly to 1.8% in 2015–2016. In addition, based on the 2015–2016 MDHS, it can be said that using ANC services during pregnancy is almost universal in Malawi.

Although the study has shown that the majority of women use ANC services, it is concerning to note that women start using ANC services late and not all women had at least four antenatal visits as recommended by WHO. The average month of the first antenatal visit was the fifth month in 1992, 2000, 2004, and 2010, and declined to the fourth month in 2015–2016. These statistics are comparable with findings from Gebremeskel et al. (2015), in their study of Ethiopia, which indicated a mean gestational age at first antenatal care attendance was 5 ± 1.5 months. The percentage of women who had at least four antenatal visits declined from 64.4% in 1992 to 38.8% in 2004 and increased to 44.5% in 2010, then reached 50.5% in 2015–2016. These statistics indicate that according to the last DHS, slightly over half of the women had at least four antenatal visits.

The percentage of women who reported at least four antenatal visits with any skilled provider is low by international standards, even though the percentage is higher than in other countries. A study in Bangladesh in 2017 established that nearly 36.6% of women had four or more antenatal visits (Zakar et al., 2017). Similarly, a study in Ethiopia revealed that 32% of women had at least four antenatal visits in 2016 (Ousman et al., 2019). An earlier comparative study of seven countries reported that the percentage of women who had four or more antenatal visits was 48.0% in Uganda in 2011, 51.2% in Senegal in 2010, 62.9% in Cameron in 2011, 23.9% in Bangladesh in 2011, 59.6% in Cambodia in 2010, and 94.4% in Peru in 2012 (Saad–Haddad et al., 2016).

With regards to the determinants of at least four antenatal visits, this study revealed that age, region, type of residence, education, wealth, children ever born, and contraceptive use were critical factors. The results of this study indicate that the age of the mothers is significantly related to ANC. In general, young mothers were less likely to have at least four antenatal visits than older women. This finding is consistent with the findings of similar previous studies (Abosse et al., 2010; Adow et al., 2020).

The findings of the study confirmed that the region of residence is one of the factors influencing four or more antenatal visits. Women residing in the Central and Northern Regions were more likely to use ANC services than their counterparts in the Southern Region. Regional differences in the use of antenatal care are also observed in other countries: Colombia (Osorio et al., 2014), Ethiopia (Basha, 2019), Uganda (Bbaale, 2011), and Kenya (Ochako & Gichuhi, 2016). This could be attributed to the distribution of health facilities and the characteristics of the population residing in each region. Studies indicate regional disparities in medical and health facilities distribution in most developing countries. In Malawi, in the 1970s and 1980s, the distribution of health facilities was better in the Northern Region, followed by the Central Region, and worst in the Southern Region (Palamuleni, 1993). The regions that are better served with medical and health facilities tend to have higher use of ANC services than their counterparts. In addition, other characteristics of the region of

residence may help to increase the use of antenatal services. In the case of Malawi, studies have shown that the population of the Northern Region tends to have better socio-economic characteristics, which may encourage women to seek ANC services (Palamuleni, 2014).

This study has shown that having at least four antenatal visits increases with the level of education of women. Women who had higher education were more likely to use ANC services. This is consistent with studies in Bangladesh (Hossain & Hoque, 2015; Pulok et al., 2016; Zakar et al., 2017), Kenya (Adow et al., 2020), Nigeria (Bawa et al., 2004), Ghana (Akowuak, et al., 2018; Arthur, 2012), and Uganda (Bbaale, 2011), Ethiopia (Abosse et al., 2010; Ousman et al., 2019), and India (Ram & Singh, 2006). There are a number of factors associated with the observed positive relationship between women's education and antenatal visits. Firstly, educated women are more knowledgeable about the benefits of ANC services and the dangers associated with the non-use of such services. Secondly, educated women are more likely to travel outside the home to seek care. Thirdly, educated women have greater decision-making power at home; they can challenge existing sociocultural obstacles that may threaten their opportunity to utilize ANC services.

Women residing in rural areas were less likely to use antenatal services than their urban counterparts. Similar findings are also observed in other countries (Basha, 2019; Kurniati et al., 2018; Mekonnen & Mekonnen, 2003; Ousman et al., 2019). Studies indicate that in most developing countries, medical and health facilities as well as medical personnel tend to be more concentrated in urban areas than in rural areas (Mekonnen & Mekonnen, 2003; Mrisho et al., 2009; Tuladhar, 2009). Also, other characteristics of urban areas may help to increase use of antenatal services. For instance, urban areas tend to have a higher concentration of educated as well as rich people and decent infrastructures such as better roads, communication facilities, and transport systems, which help in accessing health amenities.

Another factor associated with four or more antenatal visits is wealth status. The study established that women in the low wealth status category were less likely to have four or more antenatal visits than their counterparts in the high wealth status category. This finding concurs with results from other studies in Africa and Asia: Bangladesh (Hossain & Hoque, 2015; et al., 2016), Ghana (Arthur, 2012), Uganda (Bbaale, 2011), Ethiopia (Abosse et al., 2010; Basha, 2019; Mulat et al., 2015; Ousman et al., 2019), Kenya (Adow et al., 2020), Nigeria (Okeshola & Sadiq, 2013), Swaziland (Tsawe et al., 2015), Nepal (Joshi et al., 2014; Pandey & Karki, 2014), and Indonesia (Efendi et al., 2017; Kurniati et al., 2018). A number of factors may be responsible for the limited utilization of antenatal services by poor women. Firstly, limited resources such as money for transport may prevent women from visiting antenatal clinics (Chanza et al., 2012; Kitui et al., 2013; Mrisho et al., 2009; Tuladhar, 2009). Wealthier women wield power to challenge existing sociocultural practices that may prevent them from utilizing ANC services. Secondly, rich women have good clothes that can be worn when attending antenatal clinics. Some studies have shown that women are reluctant to use maternal and child health services because they do not have 'good' clothes to wear in order to visit a health facility. In addition, wealthier women can afford medical insurance and may better understand the benefits of ANC services.

Another factor that influences having four or more antenatal visits is the number of children ever born. It was discovered that use of the antenatal services decreased as parity increased. This is similar to other studies that confirmed that a higher birth order decreases the use of maternal healthcare services (Arthur, 2012; Joshi et al., 2014; Ousman et al., 2019). There are two possible explanations for this finding. Firstly, with each successive pregnancy and childbirth, women gain experience, which may assure them that all will be well and

discourage them from utilizing ANC services. Secondly, because of pressures associated with large families, women with many children may not have the time or the resources to make the desired number of antenatal visits.

The number of antenatal visits is also associated with contraceptive use. The results show that women who use contraceptives are more likely to have four or more antenatal visits. This finding is consistent with studies from Pakistan (Zakar et al., 2017) and Afghanistan (Osmani et al., 2015) that revealed contraceptive use increased as the number of antenatal visits increased. One possible explanation is that both family planning and ANC services tend to be provided in the same section of health facilities. In addition, women are taught about contraceptives, and those who attend repeated antenatal visits listen to these messages and start using contraceptives.

The findings of this study indicate that women who are exposed to the media are more likely to have at least four antenatal visits than those who are not. This finding suggests that media plays an important role in the utilization of ANC services. The plausible explanation for this phenomenon is that both print media and radio carry adverts encouraging women to utilize ANC services and have stories highlighting the dangers of not using ANC services. This corroborates findings from other countries such as Ethiopia (Ousman et al., 2019), Uganda (Edward, 2011), Nepal (Acharya et al., 2015), and Bangladesh (Pulok et al., 2016).

This study also indicates a significant relationship between having at least four antenatal visits and ethnicity. This finding concurs with results from other countries (Nghargbu & Olaniyan, 2019; Umar, 2017). This finding suggests differences in the use of ANC services between women of different cultural and geographic backgrounds. However, since the mechanisms through which cultural practices hinder or encourage the utilization of ANC services are not fully understood, there is a need for further in-depth qualitative studies to interrogate beliefs, norms, and practices related to pregnancy and childbearing. This finding and the results of further studies may guide regional and local initiatives to increase utilization of ANC services and other pregnancy preventive services.

Conclusion

The study shows that the number of women not using antenatal care services has declined and that almost all women use ANC services at one point in time. However, the majority of women start using ANC late in the second trimester, and a declining number of women are managing at least four antenatal visits as recommended by WHO. This calls for more studies to establish why women start using ANC services later in their pregnancy and make fewer than four antenatal visits when they are young. Understanding these factors is critical for governments to generate strategies to increase the use of ANC services in order to meet the revised WHO standards of a minimum of eight antenatal visits.

The study has identified that a mother's age, education, wealth status, region, type of place of residence, number of CEB, and ever use of family planning are significant predictors of the use of ANC services. Mothers who are educated, rich, residing in the Central Region, living in urban areas, with low parity, and using contraceptives are more likely to use ANC services. These factors should be considered in order to achieve the Sustainable Development Goals (SDGs) and modified WHO goals. In this regard, women should reduce the number of

children they bear, and efforts should empower women through increased education and poverty-reduction programs.

Recommendation

Based on the findings of this study, it is recommended that to achieve the new WHO standard of a minimum of eight antenatal visits and SDGs, young women, poor, uneducated women with high birth order, and women residing in rural areas should be targeted with messages and programs that would encourage them to use ANC services. These programs should integrate both maternal and child health and family planning programs. In addition, women's status through education and economic empowerment should be enhanced. Also, there is a need to improve the accessibility of antenatal care in rural areas and underserved regions. In the case of regions, the government should explore region-specific initiatives. Finally, more studies are required to comprehend health-seeking behavior and the decision-making processes and how these affect accessibility and utilization of ANC services.

References

Abosse, Z., Woldie, M., & Ololo, S. (2010). Factors influencing antenatal care service utilization in Hadiya Zone. *Ethiopian Journal of Health Sciences*, *20*(2), 75–82. https://dx.doi.org/10.4314%2Fejhs.v20i2.69432

Acharya, D., Khanal, V., Singh, J. K., Adhikari, M., & Gautam, S. (2015). Impact of mass media on the utilization of antenatal care services among women of rural community in Nepal. *BMC Research Notes*, *8*, Article 345. https://doi.org/10.1186/s13104-015-1312-8

Adow, I., Mwanzo, I., Agina, O., Wanzala, P., & Kariuki, J. (2020). Uptake of antenatal care services among women of reproductive age in Mandera County, Kenya. *African Journal of Health Sciences*, *33*(1), 56–69. https://www.ajol.info/index.php/ajhs/article/view/197770

Ahuru, R. R., & Omon, I. J. (2019). Predictors of antenatal care utilization in primary healthcare centers in eight rural communities in Delta State, Nigeria. *African Journal of Health Economics*, *8*(1), 1–22. http://doi.org/10.35202/AJHE.2019.810122

Akowuah, J. A., Agyei-Baffour, P., & Awunyo-Vitor, D. (2018). Determinants of antenatal healthcare utilisation by pregnant women in third trimester in peri-urban Ghana. *Journal of Tropical Medicine*, *2018*, Article 1673517. https://doi.org/10.1155/2018/1673517

Arthur, E. (2012). Wealth and antenatal care use: Implications for maternal health care utilisation in Ghana. *Health Economics Review*, *2*(1), Article 14. https://dx.doi.org/10.1186%2F2191-1991-2-14

Awusi, V. O., Anyanwu, E. B., & Okeleke, V. (2009). Determinants of antenatal care services utilization in Emevor Village, Nigeria. *Benin Journal of Postgraduate Medicine*, *11*(1), 21–26. https://doi.org/10.4314/bjpm.v11i1.48847

Basha, G. W. (2019). Factors affecting the utilization of a minimum of four antenatal care services in Ethiopia. *Obstetrics and Gynecology International*, *2019*, Article 5036783. https://doi.org/10.1155/2019/5036783

Bawa, S. B., Umar, U. S., & Onadeko, M. (2004). Utilization of obstetric care services in a rural community in southwestern Nigeria. *African Journal of Medicine and Medical Sciences*, *33*(3), 239–244. https://pubmed.ncbi.nlm.nih.gov/15819471/

Bbaale, E. (2011). Factors influencing timing and frequency of antenatal care in Uganda. *The Australasian Medical Journal*, *4*(8), 431–438. https://doi.org/10.4066/amj.2011.729

Birungi, H., Nyarko, P., Armar-Klemesu, M., Arhinful, D., Deganus, S., Odoi-Agyarko, H., & Brew, G. (2006). *Acceptability and feasibility of introducing the WHO focused antenatal care package in Ghana*. (FRONTIERS Final Report). Population Council. https://doi.org/10.31899/rh4.1147

Birungi, H., & Onyango-Ouma, W. (2006). *Acceptability and sustainability of the WHO Focused Antenatal Care package in Kenya.* (FRONTIERS Final Report). Population Council. https://doi.org/10.31899/rh4.1177

Chanza, D., Chirwa, E., Maluwa, A., Malata, A., & Masache, G. (2012). Factors affecting the choice for home deliveries in Malawi. *African Journal of Midwifery and Women's Health*, *6*(3), 125–130. https://doi.org/10.12968/ajmw.2012.6.3.125

Chimatiro, C. S., Hajison, P., Chipeta, E., & Muula, A. S. (2018). Understanding barriers preventing pregnant women from starting antenatal clinic in the first trimester of pregnancy in Ntcheu District-Malawi. *Reproductive Health*, *15*, Article 158. https://doi.org/10.1186/s12978-018-0605-5

Dowswell, T., Carroli, G., Duley, L., Gates, S., Gülmezoglu, A. M., Khan-Neelofur, D., & Piaggio, G. (2015). Alternative versus standard packages of antenatal care for low-risk pregnancy. *Cochrane Database of Systematic Reviews*, *2015*(7), Article CD000934. https://doi.org/10.1002/14651858.cd000934.pub3

Edward, B. (2011). Factors influencing the utilisation of antenatal care content in Uganda. *The Australasian Medical Journal*, *4*(9), 516–526. https://dx.doi.org/10.4066%2FAMJ.2011.849

Efendi, F., Chen, C.-M., Kurniati, A., & Berliana, S. M. (2017). Determinants of utilization of antenatal care services among adolescent girls and young women in Indonesia. *Women & Health, 57*(5), 614–629. https://doi.org/10.1080/03630242.2016.1181136

Gajate-Garrido, G. (2013). The impact of adequate prenatal care on urban birth outcomes: An analysis in a developing country context. *Economic Development and Cultural Change*, *62*(1), 95–130. https://doi.org/10.1086/671716

Gebremeskel, F., Dibaba, Y., & Admassu, B. (2015). Timing of first antenatal care attendance and associated factors among pregnant women in Arba Minch Town and Arba Minch District, Gamo Gofa Zone, South Ethiopia. *Journal of Environmental and Public Health*, *2015*, Article 971506. https://doi.org/10.1155/2015/971506

Girum, T., & Wasie, A. (2017). Correlates of maternal mortality in developing countries: An ecological study in 82 countries. *Maternal Health, Neonatology and Perinatology*, *3*, Article 19. https://doi.org/10.1186/s40748-017-0059-8

Guliani, H., Sepehri, A., & Serieux, J. (2014). Determinants of prenatal care use: Evidence from 32 low-income countries across Asia, Sub-Saharan Africa and Latin America. *Health Policy and Planning, 29*(5), 589–602. https://doi.org/10.1093/heapol/czt045

Hossain, B., & Hoque, A. A. (2015). Women empowerment and antenatal care utilization in Bangladesh. *The Journal of Developing Areas*, *49*(2), 109–124. https://doi.org/10.1353/jda.2015.0045

Joshi, C., Torvaldsen, S., Hodgson, R., & Hayen, A. (2014). Factors associated with the use and quality of antenatal care in Nepal: A population-based study using the demographic and health survey data. *BMC Pregnancy and Childbirth*, *14*, Article 94. https://doi.org/10.1186/1471-2393-14-94.

Kazanga, I., Munthali, A. C., McVeigh, J., Mannan, H., & MacLachlan, M. (2019). Predictors of utilisation of skilled maternal healthcare in Lilongwe District, Malawi. *International Journal of Health Policy and Management*, *8*(12), 700–710. https://dx.doi.org/10.15171%2Fijhpm.2019.67

Kitui, J., Lewis, S., & Davey, G. (2013). Factors influencing place of delivery for women in Kenya: An analysis of the Kenya demographic and health survey, 2008/2009. *BMC Pregnancy and Childbirth*, *13*, Article 40. https://doi.org/10.1186/1471-2393-13-40

Kurniati, A., Chen, C. M., Efendi, F., & Berliana, S. M. (2018). Factors influencing Indonesian women's use of maternal health care services. *Health Care for Women International*, *39*(1), 3–18. https://doi.org/10.1080/07399332.2017.1393077

Kuuire, V. Z., Kangmennaang, J., Atuoye, K. N., Antabe, R., Boamah, S. A., Vercillo, S., Amoyaw, J. A., & Luginaah, I. (2017). Timing and utilisation of antenatal care service in Nigeria and Malawi. *Global Public Health*, *12*(6), 711–727. https://doi.org/10.1080/17441692.2017.1316413

Lungu, F., Malata, A., Chirwa, E., & Mbendera, I. (2011). Quality assessment of focused antenatal care services in Malawi. *African Journal of Midwifery and Women's Health*, *5*(4), 169–175. https://doi.org/10.12968/ajmw.2011.5.4.169

Machira, K. (2017). *Determinants of maternal health care services utilization in Malawi*. [Unpublished doctoral dissertation]. North-West University. http://hdl.handle.net/10394/25397

Mamba, K. C., Muula, A. S., & Stones, W. (2017). Facility-imposed barriers to early utilization of focused antenatal care services in Mangochi District, Malawi – A mixed methods assessment. *BMC Pregnancy and Childbirth*, *17*, Article 444. https://doi.org/10.1186/s12884-017-1631-y

Manda-Taylor, L., Sealy, D. A., & Roberts, J. (2017). Factors associated with delayed antenatal care attendance in Malawi: Results from a qualitative study. *Medical Journal of Zambia*, *44*(1), 17–25. https://www.ajol.info/index.php/mjz/article/view/157392

Mchenga, M., Burger, R., & von Fintel, D. (2019). Examining the impact of WHO's Focused Antenatal Care policy on early access, underutilisation and quality of antenatal care services in Malawi: A retrospective study. *BMC Health Services Research*, *19*, Article 295. https://doi.org/10.1186/s12913-019-4130-1

Mekonnen, Y., & Mekonnen, A. (2003). Factors influencing the use of maternal healthcare services in Ethiopia. *Journal of Health, Population, and Nutrition*, *21*(4), 374–382. https://pubmed.ncbi.nlm.nih.gov/15038593/

Ministry of Health, & ICF International. (2014). *Malawi Service Provision Assessment (SPA) 2013–14.* Ministry of Health and ICF International. https://dhsprogram.com/pubs/pdf/SPA20/SPA20[Oct-7-2015].pdf

Mrisho, M., Obrist, B., Schellenberg, J. A., Haws, R. A., Mushi, A. K., Mshinda, H., Tanner, M., & Schellenberg, D. (2009). The use of antenatal and postnatal care: Perspectives and experiences of women and health care providers in rural southern Tanzania. *BMC Pregnancy and Childbirth*, *9,* Article 10. https://doi.org/10.1186/1471-2393-9-10

Mulat, G., Kassaw, T., & Aychiluhim, M. (2015). Antenatal care service utilization and its associated factors among mothers who gave live birth in the past one year in Womberma Woreda, North West Ethiopia. *Epidemiology S2,* Article 003. https://doi.org/10.4172/2161-1165.S2-003

National Statistical Office. (1994). *Malawi Demographic and Health Survey 1992.* National Statistical Office. https://dhsprogram.com/pubs/pdf/FR49/FR49.pdf

National Statistical Office, & ICF. (2017). *Malawi Demographic and Health Survey 2015–16.* National Statistical Office and ICF. https://dhsprogram.com/pubs/pdf/FR319/FR319.pdf

National Statistical Office, & ICF Macro. (2011). *Malawi Demographic and Health Survey 2010.* National Statistical Office and ICF Macro. https://dhsprogram.com/pubs/pdf/fr247/fr247.pdf

National Statistical Office, & ORC Macro. (2001). *Malawi Demographic and Health Survey 2000.* National Statistical Office and ORC Macro. https://dhsprogram.com/pubs/pdf/FR123/FR123.pdf

National Statistical Office, & ORC Macro. (2005). *Malawi Demographic and Health Survey 2004.* National Statistical Office and ORC Macro. https://dhsprogram.com/pubs/pdf/FR175/FR-175-MW04.pdf

Nghargbu, R., & Olaniyan, O. (2019). *Determinants of antenatal care utilization in Nigeria.* (Working Paper No. 321). African Development Bank. https://www.afdb.org/sites/default/files/documents/publications/wps_no._321_determinant_of_antenatal_care_utilization_in_nigeria_final_correction.pdf

Ochako, R., & Gichuhi, W. (2016). Pregnancy wantedness, frequency and timing of antenatal care visit among women of childbearing age in Kenya. *Reproductive Health*, *13*, Article 51. https://doi.org/10.1186/s12978-016-0168-2

Okeshola, F. B., & Sadiq, I. T. (2013). Determinants of home delivery among Hausa in Kaduna South local government area of Kaduna State, Nigeria. *American International Journal of Contemporary Research*, *3*(5), 78–85. http://www.aijcrnet.com/journals/Vol_3_No_5_May_2013/10.pdf

Osmani, A. K., Reyer, J. A., Osmani, A. R., & Hamajima, N. (2015). Factors influencing contraceptive use among women in Afghanistan: secondary analysis of Afghanistan Health Survey 2012. *Nagoya Journal of Medical Science*, *77*(4), 551–561. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4664587/

Osorio, A. M., Tovar, L. M., & Rathmann, K. (2014). Individual and local level factors and antenatal care use in Colombia: A multilevel analysis. *Cadernos de Saúde Pública*, *30*(5), 1079–1092. https://doi.org/10.1590/0102-311X00073513

Ousman, S. K., Mdala, I., Thorsen, V. C., Sundby, J., & Magnus, J. H. (2019). Social determinants of antenatal care service use in Ethiopia: Changes over a 15-year span. *Frontiers in Public Health*, *7*, Article 161. https://doi.org/10.3389/fpubh.2019.00161

Palamuleni, M. E. (1993). *Population Dynamics in Malawi: A Re-examination of Existing Demographic Data.* [Unpublished doctoral dissertation]. The University of London. http://etheses.lse.ac.uk/id/eprint/1232

Palamuleni, M. E. (2011). Determinants of non-institutional deliveries in Malawi. *Malawi Medical Journal*, *23*(4), 104–108. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3588574/

Palamuleni, M. E. (2014). Social and economic factors affecting ethnic fertility differentials in Malawi. *International Journal of Development and Sustainability*, *3*(1–2), 70–88. https://isdsnet.com/ijds-v3n1-5.pdf

Pandey, S., & Karki, S. (2014). Socio-economic and demographic determinants of antenatal care services utilization in Central Nepal. *International Journal of MCH and AIDS*, 2(2), 212–219. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4948147/

Pulok, M. H., Sabah, M. N. U., Uddin, J., & Enemark, U. (2016). Progress in the utilization of antenatal and delivery care services in Bangladesh: where does the equity gap lie? *BMC Pregnancy and Childbirth*, *16*, Article 200. https://doi.org/10.1186/s12884-016-0970-4

Ram, F., & Singh, A. (2006). Is antenatal care effective in improving maternal health in rural Uttar Pradesh? Evidence from a district level household survey. *Journal of Biosocial Science*, *38*(4), 433–448. https://doi.org/10.1017/s0021932005026453

Saad–Haddad, G., DeJong, J., Terreri, N., Restrepo–Méndez, M. C., Perin, J., Vaz, L., Newby, H., Amouzou, A., & Barros, A. J. (2016). Patterns and determinants of antenatal care utilization: analysis of national survey data in seven countdown countries. *Journal of Global Health*, *6*(1), Article 010404. https://doi.org/10.7189/jogh.06.010404

Say, L., & Raine, R. (2007). A systematic review of inequalities in the use of maternal health care in developing countries: examining the scale of the problem and the importance of context. *Bulletin of the World Health Organization*, *85*(10), 812–819. https://doi.org/10.2471/blt.06.035659

Tsawe, M., Moto, A., Netshivhera, T., Ralesego, L., Nyathi, C., & Susuman, A. S. (2015). Factors influencing the use of maternal healthcare services and childhood immunization in Swaziland. *International Journal for Equity in Health*, *14,* Article 32. https://doi.org/10.1186/s12939-015-0162-2

Tuladhar, H. (2009). Determinants of home delivery in a semi urban setting of Nepal. *Nepal Journal of Obstetrics and Gynecology*, *4*(1), 30–37. https://doi.org/10.3126/njog.v4i1.3329

Umar, A. S. (2017). The use of maternal health services in Nigeria: Does ethnicity and religious beliefs matter? *MOJ Public Health*, *6*(6), 442–447. https://doi.org/10.15406/mojph.2017.06.00190

UNICEF. (April 2021). *Antenatal care.* [Data set]. UNICEF. https://data.unicef.org/topic/maternal-health/antenatal-care/

Villar, J., Ba'aqeel, H., Piaggio, G., Lumbiganon, P., Miguel Belizán, J., Farnot, U., Al-Mazrou, Y., Carroli, G., Pinol, A., Donner, A., Langer, A., Nigenda, G., Mugford, M., Fox-Rushby, J., Hutton, G., Bergsjø, P., Bakketeig, L., Berendes, H., Garcia, J., & WHO Antenatal Care Trial Research Group. (2001). WHO antenatal care randomised trial for the evaluation of a new model of routine antenatal care. *Lancet*, *357*(9268), 1551–1564. https://doi.org/10.1016/s0140-6736(00)04722-x

World Health Organization (WHO). (2002). *WHO antenatal care randomized trial: manual for the implementation of the new model*. World Health Organization. https://apps.who.int/iris/handle/10665/42513

World Health Organization (WHO). (2016). *WHO recommendations on antenatal care for a positive pregnancy experience.* World Health Organization. https://www.who.int/publications/i/item/9789241549912

Zakar, R., Zakar, M. Z., Aqil, N., Chaudhry, A., & Nasrullah, M. (2017). Determinants of maternal health care services utilization in Pakistan: evidence from Pakistan Demographic and Health Survey, 2012–13. *Journal of Obstetrics and Gynecology*, *37*(3), 330–337. https://doi.org/10.1080/01443615.2016.1250728