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ABSTRACT

Intimate partner violence (IPV) has significant negative consequences for pregnant women and, when considered with other factors, can affect the utilization of antenatal care. The objective of this study is to identify the relationship between the use of antenatal care (ANC) and IPV around the time of the most recent pregnancy among women age 15 to 49. Cross-sectional data from the most recent Demographic and Health Survey of three countries—Malawi, Zambia, and Zimbabwe—were analyzed. Data were obtained from 3,479 women age 15–49 who answered the domestic violence module. The study found the following: Zimbabwe had the highest percentage of women who received the recommended number of ANC visits (70.4%), while Malawi had the lowest percentage (47.6%). The highest percentages of women with the recommended number of visits were found among the 20–24-year-age group in all three countries: Malawi (33.3%), Zambia (28.9%), and Zimbabwe (27.6%). Zimbabwean women with autonomy had 2.5 times the odds of having the recommended ANC visits compared to those without autonomy (OR: 2.5, 95% CI [1.64, 3.91], $p < .001$). Women who reside in rural areas in Malawi had 50% lower odds of having the recommended ANC visits (OR: 0.5, 95% CI [0.32, 0.82], $p < .01$). Women with four or more children had lower odds of having the recommended ANC visits in all countries. In Zambia, women who had experienced IPV in the previous 12 months had lower odds of having the recommended ANC visits (OR: 0.66, 95% CI [0.50, 0.88], $p < .01$). The study concludes that the experience of IPV does not appear to influence the utilization of the recommended ANC visits in two of the three countries. Although number of children ever born seemed to be commonly associated with having the recommended ANC visits in all three countries, all other factors were context specific. It is important to identify context-specific factors such as IPV that may impede ANC utilization and to address unnecessary complications that are directly associated with minimum use of ANC services.

Key words: antenatal care, intimate partner violence, Malawi, Zambia, Zimbabwe

ACRONYMS AND ABBREVIATIONS

ANC	antenatal care
AOR	adjusted odds ratio
CEB	children ever born
DHS	Demographic and Health Survey
IPV	intimate partner violence
WHO	World Health Organization

1 BACKGROUND OF THE REPORT

Utilization of antenatal care (ANC) services remains an important factor in maternal health care services.[1] Given that maternal health problems are a key contributor to ill health and sometimes even death of women of reproductive age, early and consistent ANC can significantly reduce the risks associated with pregnancy.[2] It is estimated that globally, every two minutes a woman dies from difficulties related to pregnancy and childbirth complications, and almost 70% of all maternal deaths worldwide occur in sub-Saharan Africa.[3,4] Complications such as obstetric hemorrhage, hypertensive pregnancy disorder, non-obstetric health problems, and pregnancy-related infections account for most causes of maternal deaths in the region.[5] Utilization of antenatal health care services is essential for the improvement of both maternal and neonatal health outcomes and plays a major part in reducing the frequency of maternal deaths, miscarriages, birth defects, low birth weights, neonatal infections, and other preventable health problems.[6] ANC is a key entry point for pregnant women to receive a broad range of health promotion and preventive health services that include screening and identifying risks and promoting healthy practices during pregnancy, as well as preventing and managing diseases associated with pregnancy or other concurrent conditions.[7] The ANC services are beneficial for both the mother and the unborn child because they can identify, manage, and reduce risk factors and complications that could negatively affect the pregnant woman.[8,9]

Although the importance of ANC visits is widely recognized and ANC services are available, utilization of such services in sub-Saharan African countries remains low.[10] Recent research suggests that the utilization of ANC services in sub-Saharan Africa is affected by several factors[11] such as experiencing intimate partner violence (IPV),[12-14] place of residence and age,[15-17] low educational attainment, and lack of paid employment.[18] Distance to the nearest health facility and a lack of transportation have also been identified as important barriers to the use of ANC services, particularly in rural areas.[19-21] For example, a qualitative study by Nyathi and colleagues found that ANC utilization was perceived to be lower for women who reported transportation as a barrier to use.[21] Women in rural areas are typically less educated and poorer than their urban peers, both of which are associated with lower use of ANC. Educated women are more likely to have a greater awareness of the existence of ANC services and are better able to make use of information about ANC.[22,23] The financial burden of seeking ANC is also a significant barrier to the use of services,[23-26] which potentially drives women to seek assistance from traditional health workers and elderly women in their community before visiting a medical facility.[25]

Use of ANC has also been found to be influenced by the life and family formation stage and is therefore strongly associated with age and marital status. Studies suggest that older women are more likely to use ANC services than younger women,[15-17] partly because awareness of the risks associated with pregnancy increases with age and childbearing experience.[17,27] Younger women may also be reluctant to use health services in response to the judgmental attitudes of health workers, from the fear of humiliation, having to respond to unpleasant questions, procedures during ANC, and a lack of privacy and confidentiality within the health care system.[28,29]

Women's status and empowerment have been found to be important predictors of ANC use. According to Ahmad, "Women's empowerment means empowering women socially, economically, and politically so that they can break away from male domination and claim equality with them."[30] Women who marry at a very early age, which is more common among those in poorer and rural areas, are more likely to be

disempowered in their marital relationships and not to use ANC services. For example, research in sub-Saharan African countries found that women who married before age 18 had significantly lower odds of having the prescribed number of ANC visits compared to those who married at age 18+.[31] Furthermore, early marriage is a driving force for early pregnancy, because girls who marry before age 18 are under pressure to prove their fertility quickly.[32]

A further expression of unequal gender relations, intimate partner violence (IPV), has also been found to have a significant impact on ANC use and birth outcomes.[12-14,33,34] The prevalence of IPV remains high. It is estimated that 30% of women across the world have been exposed to IPV over their lifetime from the age of 15.[35] Women who are in relationships where IPV is present often face restrictions on their ability to make decisions,[36] including decisions about their own health care.[37,38] A significant proportion of women experience IPV during pregnancy, which coincides with the time when they should be using ANC. Estimates of the prevalence of IPV during pregnancy range from as low as 10% in some countries[39] to as high as 44% in others.[40] Although growing evidence suggests that IPV exposure leads to low ANC uptake in high-income countries,[41,42] few studies in sub-Saharan Africa have explored the impact of IPV on the utilization of ANC services. Those studies that have investigated the link between IPV exposure and the timing of ANC use have found that IPV was strongly associated with ANC use. For example, a study in Rwanda found a significant negative relationship between physical IPV, the timing of ANC use, and attendance at the recommended number of ANC sessions.[43] However, as noted by Metheny and Stephenson in 2017, the qualitative research is limited.[44] Furthermore, the existing studies have focused primarily on individual countries and have provided limited understanding of the role of IPV in ANC use at the regional level. The current study is an attempt to fill this gap with a comparative analysis of IPV and ANC use in three countries. Understanding variations among countries on issues that affect ANC use will help direct resources to the relevant determinants of ANC use in each country. Country-specific understanding of issues that influence nonuse of maternal services will help with country-specific policy formulation.

This paper focuses on the relationship between recent experiences of IPV and use of ANC among recently pregnant women in three countries in southern Africa—Malawi, Zambia, and Zimbabwe. All three neighboring countries are located in the southern part of Africa and share similar cultures and values that are embedded by interregional migration from the historical past that dates to the precolonial era. After colonization, all three countries became a federation under British colonial rule known as the Central African Federation of Rhodesia and Nyasaland,[45] through which they share similar cultural and ethnic ties.[46] Although all three countries have relatively high use of ANC services, very significant proportions of pregnant women do not receive the recommended number of ANC visits as recommended in the WHO 2016 guidelines.[47*] We hypothesized that having the recommended ANC visits may be determined by various sociodemographic, empowerment, and environmental factors.

[*] The latest 2016 WHO guidelines upgraded the recommendation from a minimum of four to a minimum of eight contacts between the pregnant woman and the health care provider: starting from the first trimester, followed by two visits in the second trimester and five visits in the third trimester.[57]

2 DATA AND METHODS

2.1 Data

This study uses secondary data from the Demographic and Health Surveys (DHS) from three southern African countries: Malawi (2015–16), Zambia (2018), and Zimbabwe (2015). These countries were selected by their geographic location and similar timeframe within which the surveys were conducted. All datasets come from Phase 7 of the DHS and the data were analyzed with Stata 18. The DHS is a cross-sectional, retrospective, nationally representative household survey that is conducted in many low- to middle-income countries. Participants are recruited using a stratified, two-stage cluster sampling design and selected from both urban and rural areas with population sampling units adapted from the country's censuses. For uniformity across countries, the DHS uses standardized data collection tools with minor variations across countries. Therefore, the DHS data that represent several countries are suitable for comparative analyses across different countries. A subsample of women age 15–49 was selected to answer the domestic violence module. The aim of this paper is to investigate the association between women's utilization of ANC and underlying factors such as experiencing any form of IPV during pregnancy as the main variable of interest. Thus, for purposes of this study, the weighted sample is restricted to currently partnered women age 15–49 who had a pregnancy in the last 12 months that resulted in a live birth or currently pregnant women who had completed the domestic violence module and had complete data on all variables.[*] The samples and year of the survey for the three countries are shown in Table 1.

Table 1 Description of the Demographic Health Surveys included in the analysis

Country and code	Survey year	Number of women age 15–49 selected and interviewed for DV module	Number of women age 15–49 selected for the current analysis
Malawi (MW7)	2015–16	6,379	1,008
Zambia (ZM7)	2018	9,503	1,449
Zimbabwe (ZW7)	2015	7,223	1,022
Total		**23,105**	**3,479**

2.2 Variable Selection and Measurement

2.2.1 Dependent variable

This study investigated the association between ANC utilization and several factors among women age 15–49 who reported a pregnancy that occurred in the last 12 months, with a particular focus on the role of IPV during pregnancy. The outcome variable in the analysis is a binary variable that indicates if the women had at least four ANC visits, which was the minimum number recommended by WHO at the time.[47] This

[*] These restrictions were required primarily due to elements of the design of the DHS surveys, where many questions about partner characteristics are collected only from currently partnered women and questions on domestic violence only from those women who completed the domestic violence module. The restriction to only those who had been pregnant in the 12 months before the survey was made in order to better align with the measurement of experiences with domestic violence, which refer to the prior 12 months.

recommendation for ANC preceded the current standard, which recommends at least eight ANC visits for all expectant mothers.[48]

2.2.2 Independent variables

The key independent variable in the analysis is the experience of the women with IPV, including physical, sexual, or emotional violence perpetrated by their partner, during the 12 months preceding the survey. In the DHS, physical violence by a partner is measured by several variables that seek to ascertain if an informant was ever pushed, shaken, or had something thrown at her in the past 12 months; had ever been slapped by her partner; had ever had an arm twisted or hair pulled; or had ever been punched, kicked, dragged, choked, burnt, threatened with a weapon, or beaten. Sexual violence is measured by a set of questions that seek to ascertain if the informant experienced any sexual violence by a partner, was physically forced by a partner to have sex when she did not want to, or was forced to perform either physical or emotional sexual acts that she did not want in the past 12 months. Emotional violence is assessed with a standardized measurement of whether the informant had ever experienced any emotional violence by a partner, had been humiliated in front of others by a partner, had been threatened by harm to either herself or someone she cares about, or had been insulted or made to feel bad about herself by a partner. A binary variable was constructed based on these three measures, with women who had experienced any of these forms of violence in the prior 12 months coded as 1 and those who did not coded as 0. The main empowerment variable, IPV, was constructed as a dummy variable with not having experienced any form of violence coded as 0 and having experienced any form of physical, emotional, or sexual violence coded as 1.

The remaining independent variables were selected based on prior research on the determinants of ANC utilization and were grouped into three groups: sociodemographic, empowerment, and environmental.

Sociodemographic characteristics: Several sociodemographic characteristics have been found to influence women's utilization of ANC services, including age, marital status, household wealth status, and number of children ever born (CEB).

Empowerment variables: One empowerment variable, as defined by the DHS, was included in the analysis to measure its association with having the recommended ANC visits. The variable decision-making on large household purchases was constructed as a dummy variable in which 0 denoted not involved in decision making and 1 as involved in decision-making either alone or together with the partner. Being involved in household purchases may indicate the autonomy of women in decision-making and is a factor that suggests empowerment. Empowerment can facilitate making independent choices, taking charge of one's destiny, expressing oneself, and being able to financially care for oneself. Therefore, decision-making on large household purchases can be a way of expressing oneself and can also be indicative of the ability to make independent choices. Lack of decision-making freedom can indicate possible power dynamics within the relationship that may influence ANC utilization. The other empowerment variables, such as employment status, spousal age difference, and educational attainment, are indirect proxies that can indicate if a woman is likely to have the autonomy to seek health care services, especially when health care services are not free. Employment status can be used as a proxy to measure economic empowerment, educational attainment for social empowerment. and spousal age difference for male domination.[30] These proxies are central to measuring progress toward Sustainable Development Goals (SDGs) 4 and 8.

Environmental variables: Environmental factors are important when considering general use of health care facilities, and particularly use during pregnancy. Two environmental variables—place of residence and distance to the health facility—were included in the analysis. Place of residence measured the association of residing in either urban or rural areas and completing the recommended ANC visits. The other variable, distance to health facility, measured if distance was a problem in accessing a health facility.

2.3 Statistical Analyses

The first part of the analysis involved the use of summary statistics to describe the data before applying the inferential statistical approaches. This included first compiling frequency tables for each of the variables included in the analyses for the three countries. The relationship between the variables was explored through the correlation matrix, which focused on the relationship between each independent variable and the dependent variables. The bivariate relationships between the outcome variable and individual independent variables was tested with chi-square tests to assess the statistical significance of these relationships. Tests for multicollinearity were done with the variance inflation factor. The final component of the analysis involved applying multivariate logistic regression analysis to estimate the associations between having the recommended number of ANC visits (four or more) and the confounding factors. The regression analyses adjusted for clustering, survey weights, and other survey design elements.

3 RESULTS

3.1 Sample Characteristics

The data for this study were analyzed using descriptive, chi-square tests of association, and logistic regression analysis with adjusted odds ratios (AOR). Table 2 shows the characteristics of women age 15–49 years who answered the domestic violence module in Malawi, Zambia, and Zimbabwe. The results show that low percentages of women had the recommended four ANC visits in all three countries. However, of the three countries, Zimbabwe had the highest percentage of women with four or more ANC visits (at 70.4%), followed by Zambia (at 64.4%). Malawi had the lowest percentage of women with the recommended ANC visits at 47.6%. In each of the countries, many women were between ages 20 and 29, which reflected the greater likelihood of pregnancy in these ages. More than 60% of the women resided in rural areas in the three countries. In many low-income countries, health facilities in rural areas are poorly resourced compared to urban settings, which can have implications for health-seeking behavior among pregnant women. Zimbabwe had the highest percentage of women involved in decision-making at 85.2%, followed by women in Zambia at 64.4%, while Malawi had the lowest percentage of women involved in decision-making at 54.5%. Decision-making shows that autonomy can impact health-seeking behaviors such as ANC use. Malawi had the highest percentage of women who were currently working (60.9%), followed by Zambia, (43.7%), and then Zimbabwe (34.0%). In all three countries, the majority of women had between one and three children ever born.

Table 2 Characteristics of women age 15–49 who had a pregnancy in the previous 12 months with recommended number of ANC visits in Malawi, Zambia, and Zimbabwe

	Malawi			Zambia			Zimbabwe		
	%	Confidence Interval	N	%	Confidence Interval	N	%	Confidence Interval	N
ANC visits during pregnancy									
Less than recommended	52.4	48.5, 56.2	528	35.6	32.3, 39.0	515	29.6	26.0, 33.6	303
Recommended	47.6	43.8, 51.5	480	64.4	61.0, 67.7	933	70.4	66.4, 74.0	719
Background characteristics									
Marital status									
In a union			1,008			1,449			1,022
Children ever born									
1–3	65.1	61.4, 68.7	656	58.0	55.0, 61.0	841	71.2	67.7, 74.3	727
4+	34.9	31.3, 38.6	351	42.0	39.0, 45.0	608	28.8	25.7, 32.3	295
Age category									
15–19	11.1	8.8, 13.8	111	8.4	6.9, 10.2	122	10.7	8.5, 13.4	110
20–24	33.3	29.7, 37.1	336	28.9	26.6, 31.3	419	27.6	24.6, 30.8	282
25–29	23.6	20.2, 27.4	238	25.3	22.7, 28.1	366	27.6	24.3, 31.1	282
30–34	19.4	16.3, 22.9	195	18.5	16.4, 20.9	269	20.6	17.4, 24.2	211
35–49	12.6	10.2, 15.6	127	18.9	16.2, 21.8	273	13.5	11.4, 16.0	138
Household wealth status									
Middle/rich	50.1	46.7, 53.5	505	49.0	45.1, 53.0	710	56.1	51.6, 60.5	573
Poor	49.9	46.5, 53.3	503	51.0	47.0, 54.9	738	43.9	39.5, 48.4	449
Empowerment variables									
Household decision-making									
No	45.5	41.9, 49.1	458	35.6	32.1, 39.2	515	14.8	12.4, 17.5	151
Yes	54.5	50.9, 58.1	550	64.4	60.8, 67.9	933	85.2	82.5, 87.6	871
Currently working									
No	39.1	35.1, 43.3	394	56.3	52.5, 60.0	815	66.0	62.3, 69.5	675
Yes	60.9	56.7, 64.9	614	43.7	40.0, 47.5	633	34.0	30.5, 37.7	347
Spousal age difference									
Wife older or same age	6.5	4.9, 8.5	65	5.1	3.9, 6.8	74	6.4	4.9, 8.3	65
Wife 1–4 years younger	42.4	38.5, 46.4	427	39.8	37.0, 42.8	577	33.1	29.9, 36.4	338
Wife 5–9 years younger	37.5	34.1, 41.0	378	39.9	37.1, 42.9	579	38.3	34.8, 41.8	391
Wife 10+ years younger	13.6	11.1, 16.6	137	15.1	13.1, 17.2	218	22.3	19.2, 25.7	228
Educational attainment									
No or primary level	79.3	75.7, 82.4	799	62.1	58.6, 65.5	900	33.5	29.6, 37.6	343
Secondary or higher	20.7	17.6, 24.3	209	37.9	34.5, 41.4	548	66.5	62.4, 70.4	680
Experienced any IPV									
No	68.9	65.0, 72.5	694	69.5	66.1, 72.7	1,007	66.8	63.3, 70.2	683
Yes	31.1	27.5, 35.0	314	30.5	27.3, 33.9	442	33.2	29.8, 36.7	339
Environmental variables									
Place of residence									
Urban	13.5	11.2, 16.2	136	31.3	27.3, 35.6	453	30.5	26.8, 34.5	312
Rural	86.5	83.8, 88.8	871	68.7	64.4, 72.7	996	69.5	65.5, 73.2	710
Distance to health facility									
Big problem	58.1	53.2, 62.8	585	36.2	32.6, 40.0	525	39.3	35.0, 43.9	402
Not a big problem	41.9	37.2, 46.8	423	63.8	60.0, 67.4	924	60.7	56.1, 65.0	620
Total	**100.0**		**1,008**			**1,449**			**1,022**

3.2 Bivariate Analysis

The results of the chi-square test of independence are presented in Table 3. Three variables—woman's age, employment status, and place of residence—were statistically significantly associated with having the recommended number of ANC visits in Malawi. All other variables had no significant associations with receiving four or more ANC visits in Malawi. In Zambia, only two variables—the number of children ever born (CEB) and having experienced any IPV in the 12 months prior to the survey—were associated with completing the recommended number of ANC visits. In Zimbabwe, only CEB and women's autonomy were associated with having the recommended number of ANC visits. Overall, no variable had a statistically significant association with completing the recommended number of ANC visits in all three countries, with only CEB having a statistically significant relationship in more than one country—Zambia and Zimbabwe. The primary variable of interest to this study, the experience of IPV in the 12 months prior to the survey, was statistically associated with the measure of ANC use only in Zambia.

Table 3 **Sociodemographic variables associated with 4+ ANC visits among women who had a pregnancy 12 months prior to the DHS in Malawi, Zambia, and Zimbabwe**

	Malawi 1,008					Zambia 1,449					Zimbabwe 1,022				
	% no	Confidence Interval	% yes	Confidence Interval	N	% no	Confidence Interval	% yes	Confidence Interval	N	% no	Confidence Interval	% yes	Confidence Interval	N
Background characteristics															
Marital status															
In a union	52.4	48.5, 56.2	47.6	43.8, 51.5	1,008	35.6	32.3, 39.0	64.4	61.0, 67.7	1,449	29.6	26.0, 33.6	70.4	66.4, 74.0	1,022
Children ever born															
1–3	50.3	45.4, 55.2	49.7	44.8, 54.6	656	32.8	28.8, 37.1	67.2	62.9, 71.2	841	24.9	21.1, 29.1	75.1	70.9, 78.9	727
4 or more	56.3	50.2, 62.1	43.7	37.9, 49.8	351	39.4	35.0, 44.0	60.6	56.0, 65.0	608	41.4	34.0, 49.1	58.6	50.9, 66.0	295
p ***value***				**.134**					**.020***					**.000*****	
Age category															
15–19	61.6	49.8, 72.1	38.4	27.9, 50.2	111	30.9	22.4, 41.0	69.1	59.0, 77.6	122	27.8	17.9, 40.7	72.2	59.3, 82.1	110
20–24	52.4	46.2, 58.5	47.6	41.5, 53.8	336	32.6	27.7, 37.8	67.4	62.2, 72.3	419	28.6	22.2, 35.9	71.4	64.1, 77.8	282
25–29	51.3	43.8, 58.8	48.7	41.2, 56.2	238	39.4	34.1, 45.0	60.6	55.0, 65.9	366	28.7	22.3, 36.0	71.3	64.0, 77.7	282
30–34	43.4	35.0, 52.2	56.6	47.8, 65.0	195	38.9	33.0, 45.2	61.1	54.8, 67.0	269	29.7	23.2, 37.2	70.3	62.8, 76.8	211
35–49	60.2	48.0, 71.2	39.8	28.8, 52.0	127	33.7	26.5, 41.9	66.3	58.1, 73.5	273	35.1	26.2, 45.2	64.9	54.8, 73.8	138
p value				**.078**					**.242**					**.805**	
Household wealth status															
Middle/rich	51.9	46.3, 57.6	48.1	42.4, 53.7	505	36.4	31.1, 42.2	63.6	57.8, 68.9	710	28.6	23.9, 33.9	71.4	66.1, 76.1	573
Poor	52.9	47.7, 57.9	47.1	42.1, 52.3	503	34.7	31.1, 38.5	65.3	61.5, 68.9	738	30.9	25.8, 36.6	69.1	63.4, 74.2	449
p value				**.810**					**.605**					**.529**	
Empowerment variables															
Educational attainment															
No or primary level	53.6	49.2, 57.9	46.4	42.1, 50.8	799	36.6	33.0, 40.3	63.4	59.7, 67.0	900	34.1	27.3, 41.6	65.9	58.4, 72.7	343
Secondary or higher	47.9	39.1, 56.8	52.1	43.2, 60.9	209	33.9	28.8, 39.5	66.1	60.5, 71.2	548	27.4	23.4, 31.9	72.6	68.1, 76.6	680
p value				**.270**					**.377**					**.102**	
Currently working															
No	57.3	50.8, 63.6	42.7	36.4, 49.2	394	37.5	33.9, 41.3	62.5	58.7, 66.1	815	29.5	25.4, 34.1	70.5	65.9, 74.6	675
Yes	49.2	44.4, 54.1	50.8	45.9, 55.6	614	33.0	28.0, 38.5	67.0	61.5, 72.0	633	29.8	23.5, 37.0	70.2	63.0, 76.5	347
p value				**.048***					**.155**					**.943**	
Household decision-making															
No	55.0	49.1, 60.7	45.0	39.3, 50.9	458	36.6	32.1, 41.3	63.4	58.7, 67.9	515	49.9	40.5, 59.3	50.1	40.7, 59.5	151
Yes	50.2	44.9, 55.6	49.8	44.4, 55.1	550	35.0	30.8, 39.4	65.0	60.6, 69.2	933	26.1	22.6, 30.0	73.9	70.0, 77.4	871
p value				**.252**					**.602**					**.000*****	
Spousal age difference															
Wife older or same age	61.6	48.1, 73.6	38.4	26.4, 51.9	65	32.8	22.1, 45.6	67.2	54.4, 77.9	74	27.2	16.5, 41.3	72.8	58.7, 83.5	65
Wife 1–4 years younger	47.8	42.3, 53.3	52.2	46.7, 57.7	427	35.3	30.8, 40.2	64.7	59.8, 69.2	577	28.8	23.1, 35.3	71.2	64.7, 76.9	338
Wife 5–9 years younger	55.0	48.2, 61.6	45.0	38.4, 51.8	378	36.2	31.3, 41.4	63.8	58.6, 68.7	576	26.8	21.8, 32.6	73.2	67.4, 78.2	391
Wife 10+ years younger	55.3	45.4, 64.7	44.7	35.3, 54.6	137	35.5	28.7, 42.8	64.5	57.2, 71.3	218	36.4	28.6, 44.9	63.6	55.1, 71.4	228
p value				**.159**					**.962**					**.201**	
Experienced any IPV															
No	52.5	48.0, 57.0	47.5	43.0, 52.0	694	32.7	28.8, 36.7	67.3	63.3, 71.2	1,007	27.5	23.4, 32.1	72.5	67.9, 76.6	683
Yes	52.2	44.2, 60.1	47.8	39.9, 55.8	314	42.2	36.6, 47.9	57.8	52.1, 63.4	442	33.9	27.8, 40.6	66.1	59.4, 72.2	339
p value				**.950**					**.006****					**.078**	

Continued...

Table 3—*Continued*

	Malawi 1,008					Zambia 1,449					Zimbabwe 1,022				
	% no	Confidence Interval	% yes	Confidence Interval	N	% no	Confidence Interval	% yes	Confidence Interval	N	% no	Confidence Interval	% yes	Confidence Interval	N
Environmental variables															
Place of residence															
Urban	39.3	29.8, 49.7	60.7	50.3, 70.2	136	37.4	29.6, 45.8	62.6	54.2, 70.4	453	28.7	22.0, 36.4	71.3	63.6, 78.0	312
Rural	54.4	50.3, 58.5	45.6	41.5, 49.7	871	34.7	31.6, 38.0	65.3	62.0, 68.4	966	30.1	25.8, 34.7	69.9	65.3, 74.2	710
p value				**0.007****					**0.550**					**0.745**	
Distance to health facility															
Big problem	55.4	50.9, 59.9	44.6	40.1, 49.1	585	35.6	30.8, 40.6	64.4	59.4, 69.2	525	29.4	24.0, 35.4	70.6	64.6, 76.0	402
Not a big problem	48.2	41.3, 55.1	51.8	44.9, 58.7	423	35.6	31.3, 40.1	64.4	59.9, 68.7	924	29.8	25.0, 35.2	70.2	64.8, 75.0	620
p value				**.083**					**1.000**					**.0272***	

***$p < .001$; **$p < .01$; *$p < .05$

3.3 Logistic Regression Analysis

The results of the multivariate logistic regression models are shown in Table 4. As with the bivariate analyses, the results did not show consistent relationships between the independent variables and women having participated in the recommended number of ANC visits. The primary variable of interest in this study—women's experience with IPV in the past 12 months during which they were pregnant—is statistically significantly associated with the outcome only in Zambia. In Zambia, the odds of having attended the recommended number of visits is 0.7 (AOR: 0.664, 95% CI [0.502, 0.879], $p < .01$) for those who had experienced IPV. In Zimbabwe, the direction of the relationship between IPV and having the recommended ANC visits was positive, which suggested that those who had experienced violence were less likely to have the recommended number of ANC visits. However, the result was not statistically significant.

The association of the other control variables with ANC use is broadly consistent with expectations based on prior research, although few statistically significant relationships for individual variables were observed across all three countries. Women's age was statistically significant only in Malawi, where women in the 25–29 (AOR: 1.964, 95% CI [1.080, 3.571], $p < .05$) and 30–34 (AOR: 3.235, 95% CI [1.586, 6.598], $p < .001$) age groups had greater odds of having the recommended ANC visits compared to women in the 15–19 age group. Women with more than four children had significantly lower odds of having the recommended number of ANC visits compared to those who had between one and three births. In Malawi, these women had half the odds of recommended ANC use (AOR: 0.533, 95% CI [0.323, 0.879], $p < .05$); in Zambia, the odds were 0.7 (OR: 0.688, 95% CI [0.489, 0.968], $p < .05$), and in Zimbabwe, the odds were 0.4 (AOR: 0.361, 95% CI [0.220, 0.594], $p < .05$). Living in a rural area reduced the odds of having the recommended number of ANC visits in Malawi (AOR: 0.511, 95% CI [0.312, 0.823], $p < .01$).

The variables related to women's empowerment had an inconsistent relationship with ANC use. Involvement in decisions about major household purchases was statistically significantly associated with receiving four or more ANC visits only in Zimbabwe, where women involved in such decisions had over twice the odds of having the recommended number of ANC visits (AOR: 2.531, 95% CI [1.637, 3.914], $p < .01$). Women's employment status was associated with greater odds of recommended levels of ANC use only in Malawi, where working women had 1.5 times the odds of those who were not employed (AOR: 1.534, 95% CI [1.120, 2.100], $p < .01$).

Table 4 **Multiple logistic regression of recommended ANC and selected variables among women age 15–49 from Malawi, Zambia, and Zimbabwe who reported a pregnancy 12 months prior to the DHS**

	ANC visits Malawi			ANC visits Zambia			ANC visits Zimbabwe		
Variables	**Coefficient**	**Confidence Interval**	***p* value**	**Coefficient**	**Confidence Interval**	***p* value**	**Coefficient**	**Confidence Interval**	***p* value**
Background characteristics									
Marital status	-	-	-	-	-	-	-	-	-
Children ever born									
1–3	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
4 or more	0.533*	0.323, 0.879	.0138	0.688*	0.489, 0.968	.0321	0.361***	0.220, 0.594	7.05e-05
Age category									
15–19	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
20–24	1.518	0.904, 2.549	.114	0.969	0.600, 1.565	.896	1.092	0.539, 2.210	.807
25–29	1.964*	1.080, 3.571	.027	0.810	0.470, 1.397	.448	1.225	0.624, 2.406	.555
30–34	3.235**	1.586, 6.598	.001	0.952	0.522, 1.734	.871	1.725	0.790, 3.765	.171
35–49	1.975	0.882, 4.423	.097	1.210	0.663, 2.207	.533	1.842	0.823, 4.122	.137
Household wealth status									
Rich	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Poor	1.156	0.818, 1.635	.411	1.096	0.798, 1.505	.571	0.942	0.635, 1.399	.767
Empowerment variables									
Educational attainment									
No or primary	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Secondary or higher	0.845	0.567, 1.260	.409	1.185	0.878, 1.601	.266	1.063	0.715, 1.580	.762
Employment status									
Not working	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Working	1.534**	1.120, 2.100	.007	1.238	0.949, 1.617	.116	1.034	0.701, 1.526	.864
Household decision making									
No	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Yes	1.133	0.818, 1.570	.451	1.024	0.793, 1.322	.856	2.531***	1.637, 3.914	3.58e-05
Spousal age difference									
Wife older or same age	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Wife 1–4 years younger	1.677	0.889, 3.160	.110	0.899	0.522, 1.547	.700	0.982	0.467, 2.068	.962
Wife 5–9 years younger	1.330	0.705, 2.511	.378	0.875	0.503, 1.524	.637	1.135	0.541, 2.380	.737
Wife 10+ years younger	1.301	0.630, 2.687	.477	0.908	0.495, 1.667	.755	0.784	0.372, 1.649	.520
Experienced any IPV									
No	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Yes	1.085	0.756, 1.557	.658	0.664**	0.502, 0.879	.004	0.880	0.614, 1.260	.483
Environment variables									
Place of residence									
Urban	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Rural	0.511**	0.318, 0.823	.005	1.238	0.808, 1.897	.327	1.275	0.770, 2.112	.344

Continued…

Table 4—*Continued*

Variables	ANC visits Malawi			ANC visits Zambia			ANC visits Zimbabwe		
	Coefficient	Confidence Interval	*p* value	Coefficient	Confidence Interval	*p* value	Coefficient	Confidence Interval	*p* value
Distance to health facility									
Big problem	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Not a big problem	1.230	0.896, 1.690	.200	0.990	0.742, 1.321	.946	0.918	0.623, 1.353	.664
Observations	1,123			1,764			1,078		

***p < .001; **p < .01; *p < .05

Notes: The dash (–) in the marital status row shows that there was on reference group as only married women were included in the analysis. In Zimbabwe the *p* values of 7.05e-05 (CEB) and 3.58e-05(Household decision making) indicates very strong statistical significance for the predictor variables in the model.

4 DISCUSSION

Antenatal care utilization is important for the well-being of both the mother and the child. However, this important intervention is impeded by many factors. It is evident that there are differential factors that are associated with ANC utilization in the southern Africa region. The current study identified some factors associated with ANC utilization. This will be helpful for governments, researchers, and funders who focus on ANC utilization and have targeted interventions that address barriers to utilization in developing countries. Such barriers have negative impacts on efforts to reach the SDGs by 2030. Programming needs to be carefully designed to consider country-specific factors that are barriers to ANC use. This can contribute significantly to the universal utilization of ANC services.

Despite southern African countries sharing historical and cultural similarities, each country is unique when considering factors associated with ANC utilization among women age 15–49 who answered the domestic violence module. The study had anticipated the results to be similar for all three countries because the countries shared a similar historical past and cultural practices. Nevertheless, there were noted differences in the factors that are associated with ANC use in the three countries. For example, the main independent variable was hypothesized to be strongly associated with having the recommended ANC visits in all three countries. Previously, studies have shown a strong correlation between IPV and negative physical and mental health outcomes including interference with ANC use.[14,43,44,49,50] Studies by Bahati and colleagues have shown that women who experience IPV were less likely to register early or to have the recommended visits.[43] Although experiencing IPV was associated with lower odds of having the recommended ANC visits in Zambia, the results of this study indicate that in some contexts, IPV can prevent some women from accessing the important ANC visits, and in others, IPV is not an important predictor of ANC utilization. Although the relationship between IPV and ANC utilization was not statistically significant in Zimbabwe and Malawi, the direction of the association was positive in Zimbabwe. The association between IPV and ANC in Malawi was not statistically significant. These results suggest that other variables may be more influential in the utilization of the recommended ANC visits among women in Zimbabwe and Malawi. The results could be attributed to the small sample size because the study focused on women who had experienced a pregnancy 12 months prior to the surveys and had also answered the domestic violence module. Thus, many women including those who had experienced IPV but had no birth in the 12 months before the survey were automatically excluded.

Maternal age, another important factor in ANC use, was significantly associated with receiving four or more ANC visits only in two countries: Malawi and Zimbabwe. Importantly, these results agreed with previous studies that have identified maternal age as a factor associated with ANC use.[51-53] In both countries, women age 25 and above had greater odds of having the recommended ANC visits compared to younger women age 15 to 19. Therefore, efforts to improve ANC use should concentrate on younger mothers.

Woman's empowerment as measured by decision-making on large household purchases has been closely associated with ANC use. In general, empowered women are more likely to use health care services when compared to women who are less empowered.[54,55] In the current study, only in the Zimbabwean context was women's empowerment significantly associated with having the recommended ANC visits. In the other two countries, Malawi and Zambia, ANC's association with empowerment was not statistically significant.

These results suggest that empowerment is context specific and that women's empowerment may help women to use ANC services in one context and not in other contexts.

Other underlying factors that are usually associated with low use of ANC services in many contexts were found not to be statistically significant in the current study. For example, level of education and household wealth status are usually associated with ANC utilization. Education of women often leads to higher use of maternal health services. However, education was not statistically significant in all three countries in this study. While studies have identified poverty as a major obstacle to health care utilization in sub-Saharan Africa, with lower income women unable to afford the costs of using ANC,[49,51] our data failed to show that association. The results can be a positive reflection of how ANC services in the countries involved in the study are no longer confined to women from wealthy households only but are being equally accessed by women, irrespective of wealth or education status.

There was a statistically significant association between children ever born and having the recommended number of ANC visits. Women with four or more children have reduced odds of having at least four ANC visits in all countries. These women may feel that there is no need to have the recommended ANC visits because they are more experienced with childbearing, and this may act as a barrier to uptake. Other studies have found that women with more children tend to believe that they are better equipped to handle their pregnancy[56,57] and this might explain their lower odds of having the recommended visits. Programming should target women with more children and encourage them to continue accessing ANC services.

5 CONCLUSION

Despite its importance for the health of mothers and their children in many developing countries such as Malawi, Zambia, and Zimbabwe, there remains high variability in utilization of ANC services. Low utilization of ANC services as measured by the proportion of women not having the four recommended visits in all three countries is worrisome. The authors acknowledge that the quantitative focus of this study is not without limitations. Some factors that were being investigated—such as IPV—are sensitive and may require qualitative or mixed methods to explore issues, views, and experiences of women in the three countries on factors that affect ANC use. It is recommended that future studies use different methodologies to ascertain the extent of ANC utilization and the factors associated with use or nonuse.

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