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Digital Connectivity and Antenatal Care Utilisation in Tanzania: Exploring the Role of Internet Use

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ABSTRACT

Antenatal Care (ANC) is essential for improving maternal and child health, yet coverage remains uneven in sub-Saharan Africa, including Tanzania. Guided by Information Asymmetry Theory and the Health Belief Model, this study examines the role of digital connectivity on ANC utilisation in Tanzania, where evidence on information pathways and maternal health-seeking remains limited. Using data from the 2022 Demographic and Health Survey, a nationally representative sample of 5,825 women aged 15-49 years was analysed. Poisson regression was applied to model the count of ANC visits, while logistic regression assessed the binary attainment of the World Health Organisation's recommended visits, allowing analysis of multiple dimensions of ANC utilisation. Findings indicate that digital connectivity, as proxied by internet use, is positively associated with improving ANC visits: women who were digitally connected were 9% more likely to complete four or more visits. Employment and household wealth also increased ANC use, while higher parity and longer travel time to health facilities reduced it. Moreover, the effect of digital access was stronger in urban areas, highlighting persistent inequalities. These results suggest that expanding affordable digital connectivity and integrating digital health communication into maternal health strategies could complement existing interventions and enhance ANC coverage in Tanzania.

1. Introduction

Antenatal care (ANC) is a cornerstone of maternal and child health, offering preventive, diagnostic and educational services that are critical for safe pregnancy and delivery outcomes (Abanga et al., 2025; Kearns et al., 2014; Mchenga et al., 2019; The United Republic of Tanzania, 2018). The World Health Organisation (WHO) currently recommends a minimum of eight ANC contacts to optimise maternal and child health, yet most documentation in low- and middle-income countries (LMICs) still follows the earlier benchmark of at least four visits due to slow policy adoption (The United Republic of Tanzania, 2018; 2023; WHO, 2018). In Sub-Saharan Africa (SSA), ANC coverage has improved over recent decades, but utilisation remains uneven (Tolossa et al., 2024), with large socioeconomic and geographic disparities limiting progress toward maternal health targets.

Tanzania reflects these regional challenges. Despite national efforts to expand reproductive and maternal health services, many women fail to attend at least four visits (The United Republic of Tanzania, 2023). Structural barriers – including long distances to health facilities, inadequate health infrastructure and socioeconomic disadvantages – remain persistent constraints (The United Republic of Tanzania, 2023). At the same time, digital technologies are rapidly expanding in Tanzania, as observed across the SSA (Ogundaini & Mlitwa, 2024), offering new opportunities to influence health-seeking behaviours. Digital connectivity proxied by internet use in particular, has been linked to improved access to information, awareness of health services, and empowerment of women in making healthcare decisions (Mhando et al., 2024; Toffolutti et al., 2020). Yet limited evidence exists on the role of digital connectivity shapes maternal healthcare utilization, especially ANC, in the Tanzanian context.

This gap raises an important question: does digital connectivity translate into higher ANC utilization? Addressing this question is particularly timely, as Tanzania continues to invest in both digital infrastructure and maternal health interventions, but little is known about how these domains intersect. Moreover, while digital tools are often assumed to reduce inequalities, existing disparities in digital connectivity – skewed toward urban populations (Hale et al., 2010; Mwaseba et al., 2025) – may reinforce rather than close gaps in healthcare access if they are not equitably addressed.

This study makes three main contributions. First, it provides one of the first nationally representative analyses of the relationship between digital

connectivity and ANC utilization in Tanzania, using data from the 2022 Demographics and Health Survey (DHS). Unlike previous research, which has largely focused on small geographic areas, thereby limiting the generalizability of findings within the Tanzanian context (Masoi et al., 2023). Second, the study applies both count models (Poisson and negative binomial regressions) and logistic regression, thereby capturing multiple dimensions of ANC utilization. This dual approach allows for a comprehensive assessment – examining not only the frequency of ANC visits but also the likelihood of meeting the WHO-recommended threshold – thus providing a more nuanced understanding of how digital connectivity influences maternal healthcare engagement. By combining these contributions, the study offers new insights into how digital connectivity intersects with maternal health and provides evidence to inform integrated strategies that use digital inclusion to improve ANC coverage.

The remainder of the paper is organized as follows. Section two reviews the relevant literature on maternal healthcare utilization and digital connectivity. Section three presents the data and empirical strategy, while section four reports the descriptive and econometric results. Section five discusses the findings and their implications, and section six concludes.

2. Literature

2.1. Theoretical Literature

This study is guided by Information Asymmetry Theory and the Health Belief Model (HBM). Information Asymmetry Theory posits that accessing timely and reliable information reduces uncertainty and enhances informed decision-making (Akerlof, 1970), suggesting that digital connectivity enables women to overcome informational gaps that typically constrain maternal healthcare utilization. Complementing this, HBM argues that individuals are more likely to engage in preventive health behaviours when they perceive greater benefits, have adequate information, and face fewer barriers (Rosenstock, 1974). Digital connectivity can therefore increase ANC utilization by improving access to health information and strengthening the perceived benefits of early and regular care. Together, these theories provide a conceptual basis for understanding how digital connectivity shapes ANC utilization in Tanzania.

2.2. Empirical Literature

2.2.1. Determinants of Maternal Healthcare Utilisation

The utilization of maternal healthcare services has historically been examined in terms of the influence of socioeconomic, demographic, and health system factors. The determinants include maternal education, household wealth, employment status, parity (number of children ever born) and distance to health facilities, all of which shape women's ability and willingness to seek care (Bintabara & Basinda, 2021; Kinyondo et al., 2022; Mlandu et al., 2022; Selebano & Ataguba, 2022). For instance, wealthier and more educated women are consistently shown to initiate care earlier and attend a greater number of visits, while higher parity, higher distances to health facilities and rural residence reduce the likelihood of achieving the recommended ANC thresholds (Andegiorgish et al., 2022; Biswas et al., 2024; Kinyondo et al., 2022; Ngowi et al., 2023; Selebano & Ataguba, 2022). These patterns underline persistent structural inequalities that hinder progress toward universal maternal healthcare coverage in SSA.

2.2.2. Digital Connectivity and Maternal Health-Seeking Behaviour

More recently, digital access has emerged as a potential enabler for maternal health-seeking behaviour. Internet use, mobile health (mHealth) platforms, and digital communication channels – including social media - provide women with health-related information, reminders, and decision-support tools that may improve knowledge of ANC recommendations and encourage greater utilization (Masoi et al., 2023; Mhando et al., 2024; Toffolutti et al., 2020). This perspective aligns with Information Asymmetry Theory (Akerlof, 1970), which highlights how reducing information asymmetries can shape individual choices. Empirical evidence from diverse LMICs suggests that digital connectivity is positively correlated with healthcare utilization, although the strength of this relationship varies across settings (Hale et al., 2010; Mhando et al., 2024; Toffolutti et al., 2020). For example, studies from Nigeria and Ethiopia report that women exposed to digital or mobile health interventions are more likely to attend the recommended number of ANC visits (Osanyin et al., 2022; Wagnew et al., 2025).

However, the literature also highlights substantial heterogeneity in these effects. Access to digital technologies is uneven, typically concentrated in urban areas and among wealthier, more educated populations (Hale et al., 2010; Mwaseba et al., 2025). This uneven distribution raises concerns that digital health may inadvertently reinforce existing inequities if rural and low-income women remain excluded. Some studies note that while digital interventions can increase knowledge (Masoi et al., 2023), their translation into actual service use is contingent on broader health system capacity, including availability of skilled providers and geographic accessibility of facilities (Kinyondo et al., 2022; Mamdani et al., 2018; Mlandu et al., 2022;

MoHCDGEC, 2021; The United Republic of Tanzania, 2023; Abdalla et al., 2024). Moreover, although digital tools may empower women by reducing information asymmetry, their effect may be moderated by household and gender dynamics, including spousal education (Dalal et al., 2022).

2.2.3. Gaps in the Tanzanian Context

Despite a growing body of research, empirical studies specifically examining digital connectivity as a determinant of ANC utilisation in Tanzania remain limited. Most prior work (Bintabara & Basinda, 2021; Kinyondo et al., 2022; Ngowi et al., 2023) in the country has focused on traditional socioeconomic and structural factors – such as poverty, education and distance – while overlooking the role of digital connectivity. Moreover, a cross-national analysis (Toffolutti et al., 2020) has grouped Tanzania alongside other SSA countries, obscuring country-specific dynamics that unique infrastructural, cultural and policy contexts may shape. Although Masoi et al. (2023) provide valuable insights into the relationship between mobile health technologies and ANC utilisation in Tanzania, their analysis is geographically limited and cannot be generalised nationally. These gaps highlight the need for a nationally representative study that not only quantifies the relationship between digital connectivity and ANC utilization but also examines whether digital connectivity meaningfully complements conventional determinants of maternal healthcare at the national level.

3. Materials and Methods

The study examines the association between women's digital connectivity and utilisation of ANC services in Tanzania, with a specific focus on the number of ANC visits and the probability of completing the WHO-recommended minimum visits; in this study, four visits.

3.1. Data and Variables

The study uses data from the 2022 Tanzania DHS, a nationally representative household survey implemented by the National Bureau of Statistics in collaboration with ICF International. The DHS employs a stratified two-stage cluster sampling design, with enumeration areas as the primary sampling units and households as the second-stage units. The analysis focuses on women aged 15-49 years who had at least one live birth in the three years preceding the survey. After applying standard DHS sample weights and excluding observations with missing values, the final analytic sample consists of 5,825 women.

The key outcome variable was ANC utilization, measured in two ways: (i) the total number of ANC visits during the most recent pregnancy and (ii) a binary indicator of whether a woman completed at least four ANC visits. The main explanatory variable (digital connectivity) was self-reported internet use in the past 12 months, coded as a binary indicator. Based on the literature review, control variables were selected to capture demographic, socioeconomic and geographic determinants of maternal healthcare, including maternal age, maternal employment status, household wealth index factor score, years of maternal education, place of residence (rural or urban), parity (number of children ever born), travel time to the nearest health facility and partner's education. The partner's education had missing values and was therefore excluded from the main model but included in the additional analyses.

3.2. Empirical Strategy

To model the count of ANC visits, a Poisson framework was employed, as it is appropriate for analysing non-negative integer outcomes (Coxe et al., 2009; Hutchinson & Holtman, 2005). The incidence rate ratio (IRR) was used to interpret coefficients, providing a proportional measure of the association between internet use and other covariates and ANC visits. Predictive margins were also estimated to illustrate expected differences in ANC visits between women with and without digital access. Model diagnostics, including the Pearson goodness-of-fit test, were used to assess model adequacy.

Because count data may be subject to overdispersion, a negative binomial regression model was estimated as a robustness check. The dispersion parameter (alpha) was tested to determine whether the Poisson specification was sufficient.

Finally, a logistic regression model was estimated to analyse the likelihood of meeting the minimum requirement of four ANC visits. Marginal effects were calculated to provide an intuitive interpretation of the magnitude of digital access on the probability of adequate ANC utilisation.

3.3. Model Specification

The general Poisson regression model was specified as:

$$\ln\left(E[ANC_i|X_i]\right) = \beta_0 + \beta_1 InternetUse_i + X_i'\beta + \varepsilon_i \quad \text{(i)}$$

Where ANC_i denotes the number of ANC visits for a woman i, $InternetUse_i$ is the binary indicator of digital connectivity and X_i' represents the vector of control variables.

The negative binomial regression assumes:

$$E[ANC_i|X_i] = exp(\beta_0 + \beta_1 InternetUse_i + X_i'\beta + \varepsilon_i) \quad \text{(ii)}$$

With variance

$$Var[ANC_i|X_i] = \mu_i(1 + \alpha\mu_i) \quad \text{(iii)}$$

Where $\alpha \geq 0$ is the overdispersion parameter. When $\alpha = 0$, the model collapses to the Poisson, so as a test $H_0: \alpha = 0$ provides a direct check for overdispersion

For the binary ANC4 outcome, the logistic regression model took the form:

$$\Pr(ANC4_i = 1|X_i) = \frac{e^{\beta_0 + \beta_1 InternetUse_i + X_i'\beta}}{1 + e^{\beta_0 + \beta_1 InternetUse_i + X_i'\beta}} \text{(iv)}$$

All models incorporated cluster weights to account for the DHS's multistage sampling design, ensuring that estimates were representative of the national population. In addition, robust standard errors were clustered at the primary sampling unit level to adjust for within-cluster correlation, an important step given that women residing in the same cluster may share unobserved characteristics that could bias standard errors if ignored. Statistical significance was assessed at a 95% confidence interval, with results reported as IRRs for count models and odds ratios for logistic models.

4. Results

4.1. Descriptive Statistics by Women's Digital Connectivity Status

The descriptive analysis shows that women with digital connectivity attended significantly more ANC on average than their non-connected counterparts (5.3 versus 3.9, p=0.000). Moreover, a higher proportion of digitally connected women achieved the minimum of four visits (87% versus 63%, p=0.000). Women with digital connectivity were socioeconomically advantaged, with higher wealth and education levels, greater employment and more educated partners, while reporting fewer children and shorter travel times to health facilities. Digital connectivity was also strongly urban-biased, with 70.7% of internet users residing in urban areas compared to 29.3% in rural settings (p=0.000). These patterns suggest that digital connectivity is closely linked to socioeconomic privilege and urban residence, highlighting the need to control for these factors in the multivariate analysis.

Table 1: Maternal characteristics and ANC utilisation by digital connectivity

	Without digital connectivity		Digitally connected		p-value
	Coeff.	SE	Coeff.	SE	
ANC visits	3.882	0.041	5.317	0.101	0.000
At least four ANC visits					0.000
No	0.373	0.011	0.129	0.016	
Yes	0.627	0.011	0.871	0.016	
Maternal age in years	28.52	0.116	28.22	0.335	0.390
Maternal years of education	5.882	0.110	11.60	0.183	0.000
Household wealth index	-0.291	0.036	1.344	0.044	0.000
Maternal employment					0.000
No	0.413	0.011	0.282	0.024	
Yes	0.586	0.011	0.718	0.024	
Children ever born	3.531	0.047	2.196	0.075	0.000
Minutes to nearest health facility	3.270	0.033	2.765	0.041	0.000
Place of residence					0.000
Rural	0.766	0.021	0.293	0.037	
Urban	0.234	0.021	0.707	0.037	
Partner's years of education	6.647	0.130	12.18	0.222	0.000

Note: All estimates are survey-weighted. The sample size is n=5,825 for all variables, except for partner's years of education, where n=4,755. SE is the linearised standard error.

4.2. Poisson Regression Results

The Poisson regression results show a significant and positive association between digitally connected women and ANC visits. Specifically, digitally connected women had an IRR of 1.10 (p=0.000), suggesting they attended approximately 10% more ANC visits than their digitally excluded counterparts, controlling for other covariates. The predictive margins confirm this result: digitally excluded women were expected to make an average of 3.98 ANC visits, while those digitally connected made an average of 4.38 visits, indicating a substantive increase of nearly 0.4 visits. The model diagnostics indicated a good fit, with the Pearson goodness-of-fit test yielding a p-value of 0.993, suggesting that the Poisson specification adequately captured the data structure.

Among the control variables, maternal employment was positively associated with ANC utilisation (IRR=1.13, p=0.000), implying that employed women attended about 13% more visits than unemployed women. Wealth status also had a

significant positive effect (IRR=1.08, P<0.001), highlighting that socioeconomic advantage enhances maternal healthcare utilisation. In contrast, the number of children ever born was negatively associated with ANC visits (IRR=0.96, p=0.000), indicating that each additional child reduced ANC visits by approximately 4%. Similarly, longer travel time to the nearest health facility significantly lowered ANC utilization (IRR=0.98, p=0.006).

Table 2: Poisson regression of ANC visits

Number of ANC visits	IRR	SE	p-value	95% Confidence interval	
Digital connectivity (=yes)	1.100 ***	0.029	0.000	1.045	1.159
Maternal age in years	1.001	0.009	0.878	0.984	1.019
ln (maternal age squared)	1.065	0.130	0.605	0.839	1.352
Maternal employment (=yes)	1.128 ***	0.025	0.000	1.081	1.178
Wealth index factor score	1.079 ***	0.014	0.000	1.052	1.108
Maternal years of education	1.001	0.002	0.711	0.996	1.005
Place of residence (=urban)	1.014	0.029	0.627	0.958	1.073
Children ever born	0.956 ***	0.006	0.000	0.945	0.967
Minutes to nearest health facility	0.980 ***	0.007	0.006	0.965	0.994

Note: All estimates are survey-weighted. The sample size is n=5,825. SE is the robust standard error. Asterisks *** *p<0.01.*

As a robustness check, a negative binomial regression was estimated to account for potential overdispersion. The results are identical to the Poisson estimates in Table 2. Importantly, the overdispersion parameter (alpha =2.6e-09) was estimated to be close to zero and statistically indistinguishable from zero, indicating that overdispersion was not a concern and that the Poisson specification was appropriate. These findings reinforce the robustness of the main results and provide strong evidence that digitally connected women are positively associated with increased utilization of ANC services.

Moreover, rather than treating data missingness, including the partner's education as an additional control variable did not change the main findings. The Poisson regression results (Table 2) continue to show that women who reported internet use in the past 12 months attended significantly more ANC visits (IRR=1.11, p=0.000). The goodness-of-fit test (p=0.937) indicated that Poisson specification remained appropriate, further validating the robustness of the estimates.

Table 3: Poisson regression of ANC visits including partner's education as a control

Number of ANC visits	IRR	SE	p-value	95% Confidence interval	
Digital connectivity (=yes)	1.114 ***	0.032	0.000	1.052	1.179
Maternal age in years	1.010	0.009	0.289	0.992	1.029
ln (maternal age squared)	0.921	0.121	0.533	0.712	1.193
Maternal employment (=yes)	1.118 ***	0.027	0.000	1.066	1.173
Wealth index factor score	1.076 ***	0.019	0.000	1.04	1.113
Maternal years of education	1.000	0.003	0.945	0.995	1.005
Place of residence (=urban)	1.028	0.034	0.410	0.963	1.097
Children ever born	0.958 ***	0.006	0.000	0.946	0.971
Minutes to nearest health facility	0.982 **	0.008	0.030	0.965	0.998
Partner's years of education	1.004	0.003	0.169	0.998	1.009

Note: All estimates are survey-weighted. The sample size is n=4,755. SE is the robust standard error. Asterisks *** *P<0.01 and P<0.05.*

To explore the heterogeneity in the association between digital connectivity and ANC utilization, separate Poisson regressions were estimated for rural and urban subsamples. Among urban women, digital connectivity was significantly associated with higher ANC visits, with users attending approximately 13% more visits than non-users (IRR=1.131, p=0.001). In contrast, the effect on internet use in rural areas was smaller in magnitude and statistically insignificant (IRR=1.062, p=0.124), suggesting that the benefits of digital connectivity are more concentrated in urban settings where health service infrastructures are stronger. These findings collectively suggest that while digital connectivity can enhance ANC utilization, its effect is uneven, reflecting broader rural-urban disparities in health and digital infrastructure. The goodness-of-fit tests indicated that the Poisson specification fit the data well in both models (p=0.493 rural; p=0.999 urban), further reinforcing the robustness of the estimates.

Table 4: Poisson regression of ANC visits by rural and urban subpopulations

Number of ANC visits	Urban sample			Rural sample		
	IRR	SE	p-value	IRR	SE	p-value
Digital connectivity (=yes)	1.131 ***	0.043	0.001	1.062	0.042	0.124
Maternal age in years	0.984	0.016	0.319	1.009	0.011	0.385
ln (maternal age squared)	1.451 *	0.323	0.095	0.933	0.133	0.629
Maternal employment (=yes)	1.051	0.037	0.162	1.168 ***	0.032	0.000
Wealth index factor score	1.097 ***	0.020	0.000	1.072 ***	0.020	0.000
Maternal years of education	0.995	0.004	0.265	1.003	0.003	0.260
Children ever born	0.943 ***	0.011	0.000	0.961 ***	0.007	0.000
Minutes to nearest health facility	0.982	0.018	0.319	0.977 ***	0.008	0.005

Note: All estimates are survey-weighted. The sample size is n=5,825 (urban=1,267 and rural=4,186). SE is the robust standard error. Asterisks *** $p<0.01$ and * $p<0.1$

4.3. Logistic Regression Results: Digital Connectivity and the Likelihood of Completing Recommended ANC Visits

The logistic regression model, focusing on the probability of completing at least four ANC visits, reinforces the earlier findings from the count models. Internet use in the past 12 months (digital connectivity) is significantly and positively associated with meeting the recommended ANC threshold. The odds ratio corresponding to the coefficient (0.43, p=0.015) indicates that digitally connected women have higher odds of completing 4 or more ANC visits than non-connected women, holding other factors constant.

Moreover, the marginal effects provide a more intuitive interpretation: digitally connected women have on average, a 9%-point higher probability of achieving the recommended four ANC visits than their counterparts who are not connected. This effect is both statistically significant and substantively meaningful in the Tanzania context, where many women still fall short of the recommended ANC standard.

Table 5: Logistic regression of at least four ANC visits

At least four ANC visits	Coeff.	SE	p-value	95% Confidence interval	
Digital connectivity (=yes)	0.432 **	0.177	0.015	0.084	0.779
Maternal age in years	0.012	0.039	0.765	-0.065	0.088
ln (maternal age squared)	0.211	0.551	0.701	-0.869	1.291
Maternal employment (=yes)	0.292 ***	0.082	0.000	0.131	0.453
Wealth index factor score	0.427 ***	0.076	0.000	0.277	0.577
Maternal years of education	0.009	0.011	0.444	-0.013	0.031
Place of residence (=urban)	-0.129	0.149	0.388	-0.422	0.164
Children ever born	-0.173 ***	0.025	0.000	-0.221	-0.125
Minutes to nearest health facility	-0.107 ***	0.031	0.000	-0.168	-0.047

Note: All estimates are survey-weighted. The sample size is n=5,825. SE is the robust standard error. Asterisks *** $p<0.01$ and $p<0.05$. Average marginal effect = 0.090, p=0.016.

5. Discussion

The study investigates the relationship between digital connectivity, proxied by internet use, and ANC utilization in Tanzania using nationally representative data from the 2022 DHS. The findings confirm that digital connectivity is positively associated with both the number of ANC visits and the likelihood of completing at least four visits. These results are consistent with existing literature that highlights the role of digital technologies in improving maternal health-seeking behaviours by enhancing access to information, reducing knowledge gaps and supporting women's autonomy in decision-making (Hale et al., 2010; Masoi et al., 2023; Mhando et al., 2024; Toffolutti et al., 2020).

Descriptive statistics showed that digitally connected women were socioeconomically advantaged and more concentrated in urban areas, reflecting broader inequalities in digital access. Multivariate analyses were controlled for these socioeconomic and demographic confounders, yet digital connectivity remained significantly and positively associated with ANC utilization. This suggests that digital connectivity provides an additional pathway to improved maternal health outcomes beyond conventional determinants, such as wealth, education and employment. These findings align with evidence from other LMICs, where digital health interventions have been shown to increase ANC attendance (Osanyin et al., 2022; Wagnew et al., 2025).

Tanzania's digital policy landscape provides important context for these findings. National initiatives under the Tanzania Communication Regulatory Authority (TCRA) and the National Information and Communication Technology Policy (2016) emphasize expanding broadband access, improving digital literacy and strengthening the enabling environment for digital public services. These policies aim to reduce digital divides and promote equitable connectivity, which is essential for translating digital access into improved health service utilization. However, implementation remains uneven across geographic areas, mirroring the disparities observed in ANC utilization. The study's results reflect both individual digital access and broader policy-driven differences in infrastructure and digital inclusion (The United Republic of Tanzania, 2016).

Despite the overall positive association, the results highlight persistent structural disparities. Digital connectivity was significantly stronger in urban areas than in rural ones, indicating that digital connectivity alone is insufficient to close maternal health gaps without adequate health system infrastructure. This finding resonates with studies showing that while digital tools can enhance awareness, their translation into service utilization depends on the availability, accessibility and quality of health services (Kinyondo et al., 2022; Mamdani et al., 2018; Mlandu et al., 2022; The United Republic of Tanzania, 2023). Thus, digital expansion without parallel investments in rural health infrastructure risks exacerbating inequalities by disproportionately benefiting urban women.

Other determinants also behaved as expected: employment and household wealth increased ANC utilization, while higher parity and longer travel time to health facilities reduced it. These findings reaffirm longstanding evidence that socioeconomic and geographic barriers remain critical obstacles to equitable maternal healthcare in Tanzania and SSA more broadly (Andegiorgish et al., 2022; Biswas et al., 2024; Hale et al., 2010; Kinyondo et al., 2022; Ngowi et al., 2023; Selebano & Ataguba, 2022; The United Republic of Tanzania, 2023). The robustness of results across different specifications (Poisson, negative binomial and logistic regressions) strengthens confidence in the conclusion that digital connectivity constitutes a significant, though uneven, determinant of ANC utilization.

From a theoretical perspective, these findings align with Information Asymmetry Theory and the HBM, which posit that access to timely information and perceived benefits of care influence health-seeking behaviour (Akerlof, 1970; Rosenstock, 1974). Digital connectivity appears to reduce information gaps, enhance women's knowledge of the importance of ANC, and strengthen confidence in navigating health services. Nevertheless, the heterogeneity of effects across rural and urban populations suggests that digital interventions interact with structural and contextual factors, including facility availability, cultural norms and household decision-making dynamics (Hale et al., 2010; Masoi et al., 2023; Mhando et al., 2024; Toffolutti et al., 2020). These findings highlight the need for integrated approaches that combine digital expansion with health system strengthening – an insight that directly informs the study's conclusion and policy recommendations.

6. Conclusions

This study provides a nationally representative analysis of how digital connectivity influences ANC utilisation in Tanzania. Results demonstrate that digitally connected women are more likely to attend more ANC visits and to meet the recommended minimum of 4 visits. Importantly, the effect is strongest among urban women, highlighting that digital expansion in isolation will not resolve rural-urban disparities in maternal healthcare. Policy implications are twofold. First, strategies to expand affordable and equitable digital connectivity, such as increasing internet penetration in underserved rural areas, can enhance maternal health-seeking behaviours. Second, digital interventions should be integrated with broader health system strengthening efforts, including reducing geographic barriers to facilities and ensuring the availability of skilled providers. The study also advances theoretical understanding by demonstrating how digital connectivity operates through information access and perceived benefits of care, reinforcing and extending the explanatory power of Information Asymmetry Theory and the Health Belief Model in complementary digital contexts. Reframing digital connectivity as a complementary tool within maternal health strategies could accelerate progress toward national and global maternal health targets.

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