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Trends, Determinants, Pathways of Contraceptive Use for Birth Spacing among Young Women (15–24 years) in Malawi: Evidence from DHS 2000–2022

Redson Mwandama

redsonmwandama600@gmail.com

University of Malawi

Sylvia David Kachola

The French Institute for Demographic Studies (INED), European Doctoral School of Demography

Gladson Andrew Chipala

University of Malawi

Margubur Rahaman

Govind Ballabh Pant Social Science Institute

Hannah Dunga

University of South Africa

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Abstract

This study examined contraceptive use for birth spacing among young women aged 15–24 years in Malawi using Demographic and Health Survey data from 2000 to 2022. Multinomial logistic regression and generalized structural equation modeling were used to identify key determinants and pathways influencing contraceptive spacing outcomes. Modern contraceptive use for spacing increased substantially over time, rising from 7.4% to 20.8% among adolescents aged 15–19 years and from 25.9% to 57.7% among young women aged 20–24 years. Women aged 20–24 had a lower risk of unmet need for spacing compared with adolescents (IRR = 0.696, $p < 0.001$). Education emerged as a strong protective factor, with secondary and higher education reducing unmet need by 63% and 68%, respectively. Women's decision-making autonomy also played an important mediating role, with joint autonomy associated with a 61% reduction in unmet need, while rural residence increased the risk. Mediation results showed that part of the effect of education operated through improved autonomy. Access to health services significantly reduced both unmet need and reliance on traditional methods. Geographic analysis further showed substantial progress across districts, although disparities persist among adolescents, rural women, and those with low education. Strengthening girls' education, expanding youth-friendly reproductive health services, and improving access to family planning in underserved rural areas are essential to reduce remaining gaps in contraceptive use for birth spacing in Malawi.

INTRODUCTION

Sub-Saharan Africa continues to experience the highest rates of fertility and population growth globally, despite ongoing efforts to expand access to family planning services (Bongaarts, 2020). Contraceptive prevalence rates across the region remain substantially lower than other developing regions, with modern contraceptive use among married women estimated at approximately 22–28% in many countries (Adane et al., 2025; Bolarinwa, 2024; Bolarinwa et al., 2021). Malawi, while recognized for having one of the most successful family planning programs in sub-Saharan Africa with contraceptive prevalence rates rising from 28% in 2000 to 66% among married women by 2024, continues to face persistently high fertility rates, particularly among young women aged 15–24 years (Cardona et al., 2025; Hellwig and Barros, 2023). This paradox, high contraceptive availability alongside sustained fertility, signals critical gaps in meeting the family planning needs of adolescent and young women with spacing intentions.

Birth spacing, defined as delaying subsequent pregnancies by at least 24 months following a live birth, is fundamental to reproductive health with well-documented benefits for maternal and child survival (Daniel et al., 2021). The World Health Organization recommends a birth-to-conception interval of at least two years, while optimal intervals of three to five years are associated with the lowest mortality risks (Cohen et al., 2022). Family planning for birth spacing can reduce child mortality by 10% and maternal mortality by 25–40% (Asresie and Dagnew, 2022). Despite these health benefits, young women aged 15–24 years in Malawi and across sub-Saharan Africa face substantial barriers to accessing effective contraception

for birth spacing (Ahinkorah, 2020). Unmet need for family planning remains particularly elevated among adolescents(Gahungu et al., 2021). Among sexually active unmarried women in Malawi, unmet need stands at 40%, among the highest levels in sub-Saharan Africa (Bankole et al., 2020; Sully et al., 2020). This is especially concerning given that demand for spacing is the primary reason for family planning among younger women (15–29 years), yet contraceptive use for spacing among adolescents aged 15–19 remains disproportionately low compared with young women aged 20–24 (Calhoun, 2024; Michael et al., 2024).

Educational attainment emerges consistently as a strong predictor of modern contraceptive adoption, with women who have attained primary, secondary, or higher education showing progressively greater likelihood of using modern methods (Gebre and Edossa, 2020; Kraft et al., 2022). Women's decision-making autonomy has been identified as a critical mediating factor linking education to contraceptive use (Bhushan et al., 2022; Zegeye et al., 2022). Rural residence is consistently associated with higher unmet need and lower modern method use, driven by limited health facility access, provider bias, stock-outs of contraceptive commodities, and restrictive social norms (Bolarinwa et al., 2021).

Adolescent-specific barriers to contraceptive uptake include stigma, provider attitudes, fear of side effects, and partner disapproval (Engelbert Bain et al., 2021). In Malawi specifically, adolescent girls face constraints including limited knowledge about contraceptive methods, fear of side effects, concerns about future fertility, partner opposition, and lack of confidential youth-friendly services (Chimatiro et al., 2022; Dombola et al., 2021; Hajison et al., 2024). Social norms surrounding sexual activity among unmarried youth create an environment where young women must navigate contraceptive access covertly or face social sanctions (Nash et al., 2019; Wigle et al., 2022).

Existing research on contraceptive use in Malawi has predominantly focused on overall modern contraceptive prevalence among all women of reproductive age, with limited attention to the specific needs of young women with spacing demand (Forty et al., 2021; Mandiwa et al., 2018, 2021). Most studies employ binary logistic regression frameworks, thereby overlooking important distinctions between traditional method reliance and unmet need as discrete outcomes (Hailu et al., 2025). Few studies have examined causal pathways through which education and women's autonomy influence contraceptive behaviors or adequately addressed spatial heterogeneity in contraceptive use patterns (Luster et al., 2017; Moyo and Nkhoma, 2023). Therefore, this study uses multinomial logistic regression to simultaneously examine the determinants of traditional method use and unmet need relative to modern method use, and employs generalized structural equation modeling to estimate how education influences contraceptive outcomes through women's decision-making autonomy. This analytical approach will provide evidence to inform policy and program design for improving contraceptive access and use among young women in Malawi.

Methodology

Study Design and Data Source

This study used pooled cross-sectional data from the Malawi Demographic and Health Surveys (DHS) conducted in 2000, 2005, 2010, 2016, and 2024. The DHS employs a nationally representative, two-stage stratified cluster sampling design in which enumeration areas are selected at the first stage and households at the second stage. All analyses incorporated sampling weights, stratification, and clustering to account for unequal probabilities of selection and survey design.

Study Population and Sample Selection

The target population consisted of adolescent and young women aged 15–24 years. Women who were pregnant at the time of interview were excluded to ensure that contraceptive need and use reflected spacing intentions rather than pregnancy status. The multinomial regression models were estimated using the full eligible sample of women aged 15–24. The generalized structural equation model (GSEM) was restricted to currently married or cohabiting women, as the autonomy indicators are only administered to women in union. A flow diagram summarizing sample selection is presented in Fig. 1.

Outcome Variable: Contraceptive Spacing Status

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The primary outcome was contraceptive spacing status, specified as a three-category nominal variable. Women were classified as using a modern contraceptive method for spacing, using a traditional method for spacing, or having an unmet need for spacing. Modern contraceptive methods were specified as the reference category in all multinomial models.

Exposure Variables

Socio-demographic characteristics included age group (15–19, 20–24), educational attainment, household wealth quintile, place of residence (urban/rural), region, marital status, parity, media exposure, and access to health services.

Women’s Autonomy

Women’s decision-making autonomy was measured using three DHS items: decisions on personal health care, major household purchases, and visits to family or relatives. Autonomy was coded as 1 if the woman decided alone or jointly with a partner and 0 otherwise. The autonomy index was calculated as the mean of the three items, with higher values indicating greater autonomy.

Objective 1: Temporal Trends in Contraceptive Spacing

Temporal trends in contraceptive spacing between 2000 and 2024 were examined using survey-weighted prevalence estimates by survey year and age. These indicators were collapsed to weighted

year means and converted to percentages. Trends were visualized using line graphs with identical y-axis scales to facilitate comparison across outcomes.

Objective 2: Multinomial Logistic Regression Analysis

Associations between socio-demographic characteristics and contraceptive spacing outcomes were estimated using multinomial logistic regression. Let $\mathrm{Y_i}$denote the spacing outcome for woman i, where modern method use is the base category. The model was specified as:

$$\log\left(\frac{\mathrm{P(Y_i = j)}}{\mathrm{P(Y_i = 1)}}\right) = \alpha_{\mathrm{j}} + \varrvec{\beta}_{\mathrm{j}}\mathbf{X}_{\mathrm{i}}, \mathrm{j} = 2{,}3$$

where $\mathbf{X}_{\mathrm{i}}$ includes exposure variables and results are presented as relative risk ratios (RRRs).

Objective 3: Causal Pathways

Generalized Structural Equation Model Specification

A generalized structural equation model was used to assess whether autonomy mediates the relationship between education and contraceptive spacing. The mediator equation was specified as a linear model:

$$\mathrm{M_i} = \gamma_0 + \gamma_1\mathrm{Education_i} + \gamma_2\mathbf{Z}_{\mathrm{i}} + \epsilon_{\mathrm{i}}$$

The outcome equation was specified as a multinomial logit model:

$$\log\left(\frac{\mathrm{P(Y_i = j)}}{\mathrm{P(Y_i = 1)}}\right) = \delta_{0\mathrm{j}} + \delta_{1\mathrm{j}}\mathrm{M_i} + \delta_{2\mathrm{j}}\mathrm{Education_i} + \delta_{3\mathrm{j}}\mathbf{Z}_{\mathrm{i}}, \mathrm{j} = 2{,}3$$

Indirect effects were computed as the product of the education coefficient in the mediator equation and the autonomy coefficient in the outcome equation. Direct and total effects were estimated using nonlinear combinations of coefficients with the delta method.

RESULTS

Temporal Patterns in Contraceptive Spacing Use (2000–2022)

Modern contraceptive use for spacing among young women aged 15–24 increased markedly over the study period. The proportion using modern methods rose from approximately 7.4% in the earliest survey year to 20.8% in the most recent survey among adolescents aged 15–19, while among young women aged 20–24 it increased more substantially from about 25.9% to 57.7%. Although levels remained

consistently higher among women aged 20–24, both age groups experienced steady growth over time, indicating improved access to and uptake of effective spacing methods across successive survey rounds. In contrast, traditional method use remained very low throughout the period, increasing only marginally from about 0.3% to 1.7% among adolescents aged 15–19 and from 0.8% to 3.8% among women aged 20–24. Despite these slight increases, traditional methods accounted for a minimal share of spacing practices compared with modern methods, suggesting that gains in contraceptive spacing were driven primarily by the expansion of modern method use rather than shifts toward traditional contraception (see Fig. 2).

Bivariate Patterns of Contraceptive Spacing by Background Characteristics

The results show clear differences in contraceptive spacing across groups of young women in Malawi. Younger women aged 15 to 19 have a much higher unmet need for spacing at about 68 percent, while women aged 20 to 24 use modern methods more often (see Table 1). Women who make their own decisions about contraception have lower unmet need than those whose partners or others decide for them. Modern method use is more common among women with primary or secondary education and among those from richer households, while unmet need is highest among the poorest and least educated. Regional differences also appear, with the Southern region showing the most modern method use but also high unmet need, and the Northern region showing the most traditional method use. Women who have never had a child have the highest unmet need at about 77 percent. Media exposure and contact with a health worker are linked to higher modern method use. Overall, these patterns show that age, autonomy, education, wealth, region, and access to information all shape whether young women are able to meet their spacing needs.

Table 1
Percentage Distribution of Contraceptive Spacing Method by Background Characteristics (Young Women 15–24, Malawi DHS 2000–2024)

Predictor	Category	Modern (%)	Traditional (%)	Unmet Need (%)	Design-based F	p-value
Age group	15–19	29.1	27.5	67.9	1205.5	0.000
	20–24	70.9	72.5	32.1		
Contraception-use autonomy	High autonomy: respondent	15.0	6.0	33.6	37.6	0.000
	Medium autonomy: joint	74.3	82.6	48.1		
	Low autonomy: husband or others	10.7	11.4	18.3		
Education	No education	4.2	6.6	3.8	8.21	0.000
	Primary	64.8	62.7	60.4		
	Secondary	29.4	27.0	33.7		
	Higher	1.6	3.7	2.1		
Wealth quintile	Poorest	17.9	17.6	15.0	18.91	0.000
	Poorer	19.5	22.1	15.5		
	Middle	19.3	20.9	17.7		
	Richer	19.8	18.0	20.5		
	Richest	23.5	21.3	31.3		
Residence	Urban	20.5	19.7	23.6	10.89	0.000
	Rural	79.5	80.3	76.4		
Region	Northern	19.7	35.7	17.8	17.12	0.000
	Central	31.3	31.6	34.0		
	Southern	49.0	32.8	48.2		
Parity	0	17.1	20.1	77.1	493.08	0.000
	1	51.6	43.4	15.4		
	2	24.1	28.3	5.7		
	3+	7.2	8.2	1.8		

Predictor	Category	Modern (%)	Traditional (%)	Unmet Need (%)	Design-based F	p-value
Media exposure	None	46.1	38.1	46.7	3.73	0.024
	Any	53.9	61.9	53.3		
Health worker contact	No	81.9	90.2	90.8	148.68	0.000
	Yes	18.1	9.8	9.2		

Multinomial Logistic Regression Results for Contraceptive Spacing Outcomes

Table 2 shows the significant predictors of contraceptive spacing outcomes among young women, using modern method use as the reference category. Women aged 20–24 were less likely than adolescents to experience unmet need (IRR = 0.696, $p < 0.001$), representing a 30 percent reduction in risk. Autonomy showed strong effects: joint decision-making lowered the risk of unmet need by 61 percent (IRR = 0.386, $p < 0.001$), while women who decided alone had a much higher risk of unmet need, more than 26 times greater than those with low autonomy (IRR = 26.745, $p < 0.001$).

Education was consistently protective. Compared with women with no education, those with primary (IRR = 0.559, $p < 0.001$), secondary (IRR = 0.374, $p < 0.001$), and higher education (IRR = 0.325, $p < 0.001$) had 44 percent, 63 percent, and 68 percent lower risks of unmet need, respectively. Higher education also increased the likelihood of traditional method use by 180 percent (IRR = 2.797, $p < 0.05$).

Socio-contextual factors further shaped spacing behaviors. Rural residence increased the risk of unmet need by 28 percent (IRR = 1.283, $p < 0.01$). Regional differences were evident for traditional method use, with women in the Central (IRR = 0.493, $p < 0.001$) and Southern (IRR = 0.341, $p < 0.001$) regions being 51 percent and 66 percent less likely than those in the Northern region to rely on traditional methods. Marital status also mattered. Married women had a 34 percent higher risk of unmet need (IRR = 1.338, $p < 0.01$), while formerly partnered women had a 59 percent lower risk (IRR = 0.408, $p < 0.001$) compared with never-married women. Higher parity reduced the likelihood of unmet need by 55 percent (IRR = 0.455, $p < 0.001$). Access to health services significantly lowered the risk of both traditional method use (IRR = 0.479, $p < 0.001$), a 52 percent reduction, and unmet need (IRR = 0.711, $p < 0.001$), a 29 percent reduction.

Table 2

Multinomial Logit Results for Contraceptive Spacing Outcomes (Reference: Modern Methods) Base outcome: Modern Method for Spacing

Variable	RRR Traditional (SE)	RRR Unmet Need (SE)
Age group (ref: 15–19)		
20–24	1.051 (0.188)	0.696 (0.046) ***
Autonomy in contraceptive use (ref: Low autonomy)		
Medium autonomy (joint)	1.055 (0.256)	0.386 (0.055) ***
High autonomy (respondent)	0.366 (0.140) ***	26.745 (3.794) ***
Education (ref: No education)		
Primary	0.661 (0.177)	0.559 (0.067) ***
Secondary	0.709 (0.208)	0.374 (0.049) ***
Higher	2.797 (1.362) **	0.325 (0.068) ***
Wealth quintile (ref: Poorest)		
Poorer	1.063 (0.226)	0.918 (0.076)
Middle	0.950 (0.218)	1.046 (0.081)
Richer	0.683 (0.171)	0.935 (0.074)
Richest	0.605 (0.170) *	1.170 (0.112)
Residence (ref: Urban)		
Rural	0.962 (0.220)	1.283 (0.099) ***
Region (ref: Northern)		
Central	0.493 (0.091) ***	1.098 (0.087)
Southern	0.341 (0.058) ***	1.042 (0.076)
Marital status (ref: Never married)		
Married	0.390 (0.146) **	1.338 (0.125) ***
Separated	0.338 (0.138) ***	0.408 (0.039) ***
Parity	0.974 (0.090)	0.455 (0.021) ***

Note: * indicates marginal significance at the 10 percent level, and **, *** indicate significance at the 5, and 1 percent levels respectively.

Variable	RRR Traditional (SE)	RRR Unmet Need (SE)
Age group (ref: 15–19)		
Media exposure (ref: None)	1.154 (0.179)	1.040 (0.052)
Access to health services (ref: No access)	0.479 (0.051) ***	0.711 (0.028) ***
Statistic	**Value**	
Observations	19,871	
Wald χ^2	4,499.30	
Prob > χ^2	0.000	
Log pseudolikelihood	−7,515.96	
Pseudo R^2	0.401	
Note: * indicates marginal significance at the 10 percent level, and **, *** indicate significance at the 5, and 1 percent levels respectively.		

Determinants of Autonomy and Their Effects on Family Planning Spacing Outcomes

Women's autonomy is strongly shaped by structural factors. Education shows a clear positive gradient, with primary, secondary, and higher schooling significantly increasing autonomy compared with no education, while wealth, rural residence, and living in the Central or Southern regions reduce autonomy. In the outcome model, higher autonomy lowers the likelihood of both traditional method use and unmet need. Education reduces unmet need across all levels, though higher education increases traditional method use. Regional differences persist for traditional methods, and higher parity and access to health services substantially reduce unmet need, reinforcing the importance of reproductive experience and service contact.

Decomposition of Educational Effects on Family Planning Spacing Through Women's Autonomy

Table 3 presents the direct, indirect, and total effects of women's education on family planning spacing outcomes, with modern method use as the reference category and women's autonomy specified as the mediator. The indirect effects show that both secondary and higher education significantly reduce the likelihood of traditional method use and unmet need for spacing through increased autonomy. For secondary education, the indirect effect coefficients indicate meaningful reductions in both traditional method use (coefficient = 0.145) and unmet need (coefficient = 0.104). Similarly, higher education exhibits larger indirect effects, with coefficients of 0.273 for traditional methods and 0.195 for unmet

need, demonstrating that autonomy is an important pathway linking education to improved contraceptive outcomes.

The direct effects indicate that education operates differently across spacing outcomes. Secondary education has no statistically significant direct effect on traditional method use but is associated with a substantial reduction in unmet need, with a coefficient of 1.132. Higher education shows a positive direct association with traditional method use (coefficient = 1.279) while simultaneously reducing unmet need (coefficient = 1.135). When both pathways are combined, the total effects confirm that education, particularly higher education, strongly reduces unmet need for spacing, with total effect coefficients of 1.235 for secondary education and 1.330 for higher education. In contrast, the total effect of education on traditional method use remains weaker, indicating that the primary benefit of education lies in lowering unmet need rather than shifting women away from modern methods.

Table 3
Direct, Indirect, and Total Effects of Education on Family Planning Spacing Mediator: Women's Autonomy | Base outcome: Modern Method for Spacing

Effect Type	Education Level	Traditional [SE]	Unmet [SE]
Indirect Effect (Autonomy)	Secondary Education	-0.145 [0.045] ***	-0.104 [0.018] ***
	Higher Education	-0.273 [0.093] **	-0.195 [0.043] ***
Direct Effect	Secondary Education	-0.526 [0.359]	-1.132 [0.128] ***
	Higher Education	1.279 [0.733] *	-1.135 [0.392] **
Total Effect	Secondary Education	-0.671 [0.360] *	-1.235 [0.129] ***
	Higher Education	1.007 [0.734]	-1.330 [0.394] ***

Notes

- Standard errors in brackets
- *** p < 0.001, ** p < 0.01, * p < 0.05

Geographic Patterns of Progress in Contraceptive Access and Use, 2000–2024

Between 2000 and 2024, Malawi shows a striking transformation in reproductive health indicators, with the most dramatic shifts occurring in the Central and Southern districts. For unmet need, districts such as Lilongwe, Dedza, Ntcheu, Mangochi, Machinga, Zomba, Mulanje, Phalombe, Chiradzulu, Blantyre, Thyolo, Chikwawa, and Nsanje move from the highest unmet-need category (≈ 50–75%) in 2000 to low or moderate levels by 2024, representing roughly two-thirds of all districts transitioning out of high unmet need. Modern contraceptive use shows the opposite pattern: districts including Mzimba, Kasungu, Lilongwe, Dedza, Ntcheu, Mangochi, Zomba, Blantyre, Thyolo, and Mulanje shift from very low use (0–

10%) in 2000 to moderate or high use (≥ 25–50% or more) by 2024, meaning over half of Malawi's districts now fall into higher modern-use categories. Traditional method use remains largely unchanged, with over 90% of districts staying in the 0–10% range, confirming that Malawi's fertility transition is driven almost entirely by modern rather than traditional methods (see Fig. 3).

Modern contraceptive use for spacing shows the opposite geographic pattern across the same period (Fig. 4). Districts including Mzimba, Kasungu, Lilongwe, Dedza, Ntcheu, Mangochi, Zomba, Blantyre, Thyolo, and Mulanje shift from very low use (0–10%) in 2000 to moderate or high use (≥ 25–50% or more) by 2024, meaning over half of Malawi's districts now fall into higher modern-use categories. This expansion of modern method adoption spans all three regions, Northern, Central, and Southern, indicating that access to and uptake of effective spacing contraceptives has become more geographically equitable, though regional disparities in absolute prevalence levels persist. Traditional method use for contraceptive spacing remains largely unchanged across the 24-year period, with over 90% of districts staying in the 0–10% range throughout both 2000 and 2024 (Fig. 5). This consistent pattern across all geographic areas confirms that Malawi's fertility transition is driven almost entirely by modern rather than traditional methods, suggesting that young women's contraceptive choices reflect a preference for clinical methods and that traditional approaches have not gained traction as a spacing strategy despite their low cost and cultural accessibility.

DISCUSION

This study examined contraceptive use for birth spacing among young women aged 15–24 in Malawi, revealing important patterns in determinants, mediation pathways, and age-related disparities. Education significantly reduces unmet need for spacing, with secondary and higher education associated with 68% and 73% lower risk of unmet need respectively, a finding consistent with evidence from Ahinkorah (2020) across 29 sub-Saharan African countries and (Kraft et al., 2022). The protective effect of education likely operates through improved contraceptive knowledge, greater exposure to family planning messaging, and enhanced ability to navigate health services. Interestingly, higher education increased the likelihood of traditional method use by 164%, a finding that diverges from most literature but aligns with studies suggesting that more educated women may make informed choices favoring non-hormonal methods due to side effect concerns (Huber-Krum and Norris, 2020).

Rural residence increased unmet need compared to urban areas, mirroring results from Bolarinwa et al. (2021, 2023) in Nigeria and Blackstone et al. (2017) across sub-Saharan Africa, who attributed rural disparities to limited health facility access, provider bias, frequent stock-outs, and restrictive social norms. Regional variations were also pronounced, with Central and Southern regions showing lower traditional method use compared to Northern region, patterns that align with spatial analyses by Khundi et al.(2024) and Demissie et al.(2025) who documented significant geographic clustering of contraceptive behaviors across sub-Saharan Africa. Married women showed lower unmet need compared to never-married women, consistent with Mandiwa et al. (2018) and Forty et al. (2021) who found that marital status was a key determinant of contraceptive use in Malawi, likely reflecting greater

social acceptability and partner support within marriage. Parity reduced unmet need per additional birth, similar to findings by Gebre and Edossa (2020) in Ethiopia, suggesting that birth experience increases motivation for spacing. Access to health services reduced both unmet need and traditional method use, corroborating evidence from Masiano et al. (2019) who demonstrated that community-based distribution programs significantly improved contraceptive uptake in Malawi.

Education progressively enhances women's decision-making autonomy, with secondary and higher education associated with 0.19 and 0.36 unit increases respectively, findings that align with Yaya et al. (2018) who found in 32 sub-Saharan African countries that women's empowerment was strongly linked to educational attainment. Wealth showed an unexpected inverse relationship with autonomy, with all wealth quintiles showing lower autonomy compared to the poorest, a finding that contradicts some studies but may reflect patriarchal norms in wealthier households where male control over decision-making is more pronounced (Wigle et al., 2022). Rural residence reduced autonomy by 0.06 units, consistent with evidence that urban women have greater participation in household decisions (Nkoka et al., 2020). Women's autonomy directly reduces both traditional method use and unmet need, supporting Bhushan et al.(2022) who found in Malawi that women's decision-making participation mediated the relationship between partner communication and contraceptive use. Each unit increase in autonomy reduced traditional method use and unmet need significantly, confirming autonomy as an enabling factor for modern contraceptive adoption, as documented by Yaya et al.(2018) across sub-Saharan Africa.

The mediation analysis reveals that education operates through both direct and indirect pathways in influencing contraceptive outcomes. For secondary education, the indirect effect through autonomy reduced unmet need by 10%, while the total effect (combining direct and indirect) reduced unmet need by 124%. This mediation pathway has rarely been quantified in Malawi, though conceptual support comes from Yaya et al.(2018) who argued that education empowers women to exercise reproductive autonomy. The substantial indirect effects confirm that autonomy is a critical mechanism linking educational empowerment to improved contraceptive behaviors, extending findings from Bhushan et al. (2022) who examined partner communication as a mediator.

Age-related disparities in contraceptive spacing are striking, with women aged 20–24 showing substantially lower unmet need compared to adolescents aged 15–19. This pattern aligns with Michael et al.(2024) who found across 25 sub-Saharan African countries that contraceptive use for spacing among adolescents aged 15–19 was disproportionately low despite high demand. Similarly, Calhoun (2024) reported that younger adolescents faced greater barriers to accessing spacing methods. The persistent vulnerability of 15–19-year-olds reflects adolescent-specific barriers documented by Dombola et al.(2021), Chimatiro et al.(2022), and Hajison et al.(2024) in Malawi, including stigma, provider bias, fear of side effects, and lack of confidential youth-friendly services.

POLICY IMPLICATIONS

The findings underscore the need for integrated, multi-level interventions to improve contraceptive spacing among young women in Malawi. First, educational policies should prioritize keeping adolescent girls in school beyond primary level and integrate comprehensive sexuality education into curricula, given education's strong protective effects against unmet need. Second, family planning programs must incorporate women's empowerment components that strengthen decision-making autonomy, particularly targeting married women and their partners through community-based interventions. Third, geographic targeting is essential, with intensified outreach, commodity security, and mobile services needed in rural areas and underserved regions where access remains limited. Fourth, adolescent-focused programs must expand youth-friendly service delivery points, train providers to reduce stigma and bias, and ensure confidential access to spacing methods for unmarried young women. Finally, service delivery systems should prioritize access improvements, including community-based distribution, extended clinic hours, and method diversification to reduce both unmet need and reliance on traditional methods. These coordinated efforts across education, empowerment, service delivery, and adolescent programming are essential to closing the spacing gap and achieving reproductive health equity among young women.

CONCLUSION

This study provides evidence on the determinants, mechanisms, and temporal dynamics of contraceptive use for birth spacing among young women aged 15–24 years in Malawi. By employing multinomial logistic regression, mediation analysis, and temporal trend examination, the research offers theoretically informed insights into the complex pathways through which socio-demographic factors influence contraceptive spacing outcomes. Educational attainment emerges as a foundational determinant of improved contraceptive spacing outcomes, operating through both direct effects and indirect pathways mediated by women's decision-making autonomy. This finding underscores the critical importance of education in empowering young women to make informed reproductive choices. Geographic location and marital status also significantly shape contraceptive access and utilization, with rural women and unmarried young women facing disproportionate barriers. Furthermore, access to health services is essential in reducing unmet need and promoting modern method adoption over traditional approaches.

The findings reveal substantial progress in modern contraceptive uptake over the past two decades, yet persistent gaps remain in achieving equitable reproductive health outcomes. Adolescents aged 15–19 years, rural populations, and women with limited educational attainment continue to face significant unmet need for spacing. These disparities signal ongoing challenges in translating contraceptive availability into equitable access and utilization across all population subgroups.

Declarations

Ethics Declaration

This study is based on secondary analysis of publicly available data from the Malawi Demographic and Health Surveys (DHS). The DHS surveys are implemented with full ethical approval and informed consent. As this research involves secondary analysis of anonymized, publicly available data without direct human subject contact, no additional ethics approval was required.

Contributions

R.M. (Redson Mwandama) conceptualized the study, conducted data analysis, and drafted the original manuscript.

S.D.K. (Sylvia David Kachola) contributed to study design, methodology development, and critically reviewed the manuscript.

G.A.C. (Gladson Andrew Chipala) contributed to data interpretation and manuscript revision.

M.R. (Margubur Rahaman) contributed to methodological guidance and manuscript editing.

H.D. (Hannah Dunga) provided supervision, contributed to conceptualization, and reviewed and edited the manuscript.

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Author Contribution

R.M. (Redson Mwandama) conceptualized the study, conducted data analysis, and drafted the original manuscript.S.D.K. (Sylvia David Kachola) contributed to study design, methodology development, and critically reviewed the manuscript.G.A.C. (Gladson Andrew Chipala) contributed to data interpretation and manuscript revision.M.R. (Margubur Rahaman) contributed to methodological guidance and manuscript editing.H.D. (Hannah Dunga) provided supervision, contributed to conceptualization, and reviewed and edited the manuscript.

Data Availability

This study used secondary data from the Demographic and Health Surveys (DHS) Program. The data are available to registered users upon request from the DHS Program (https://dhsprogram.com). No new data were generated, and the authors did not have special access to the data.

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Figures

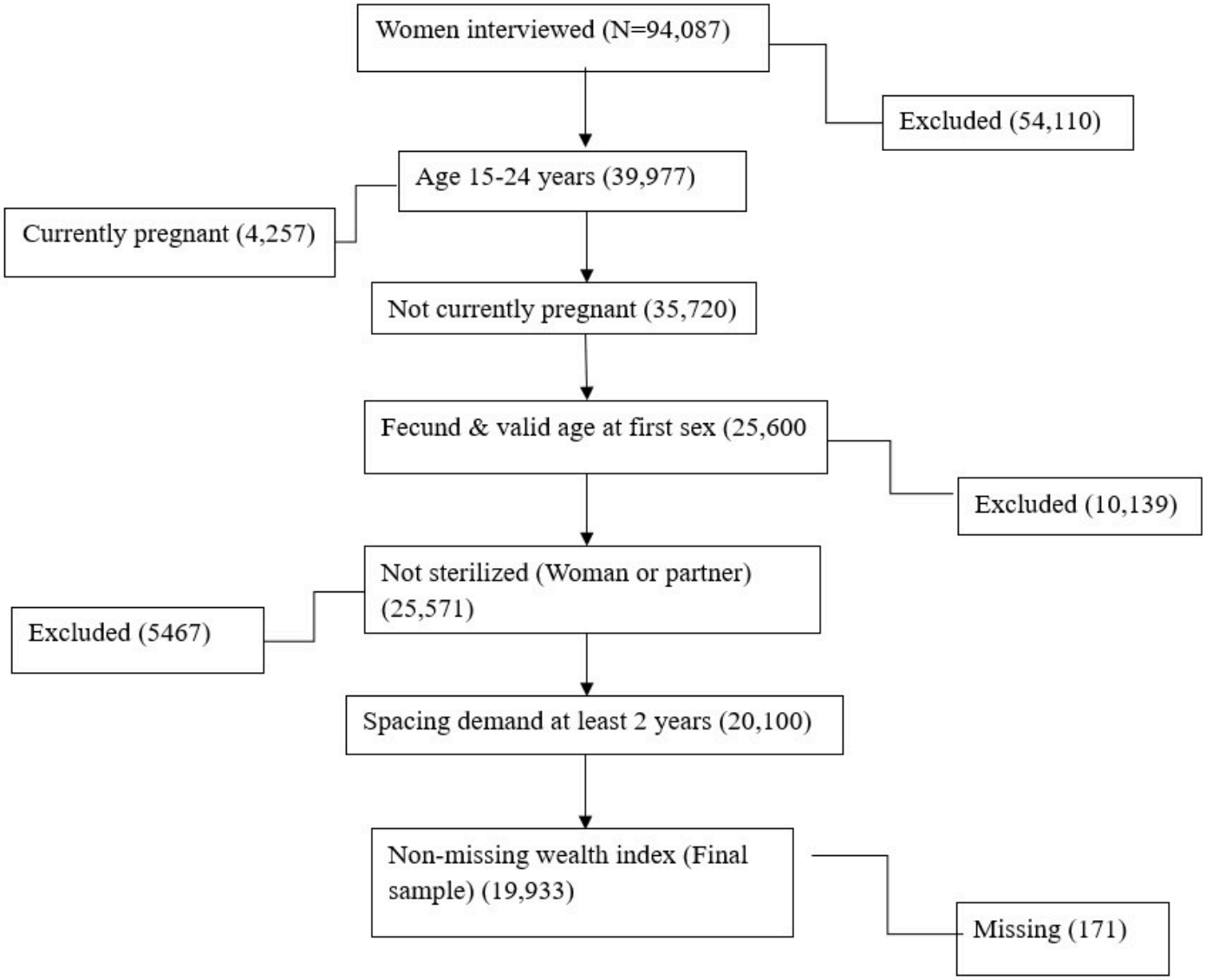


Figure 1

Sample selection flow diagram for the analytic sample

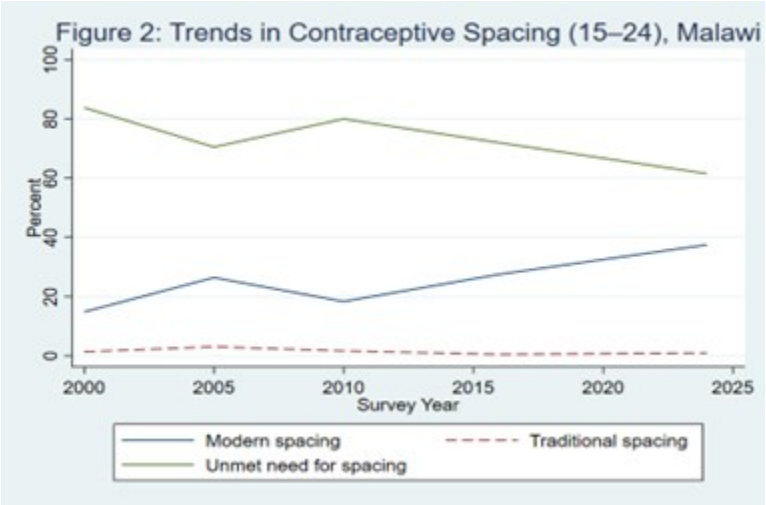


Figure 2

Trends in Contraceptive spacing among women aged 15-24 years in Malawi

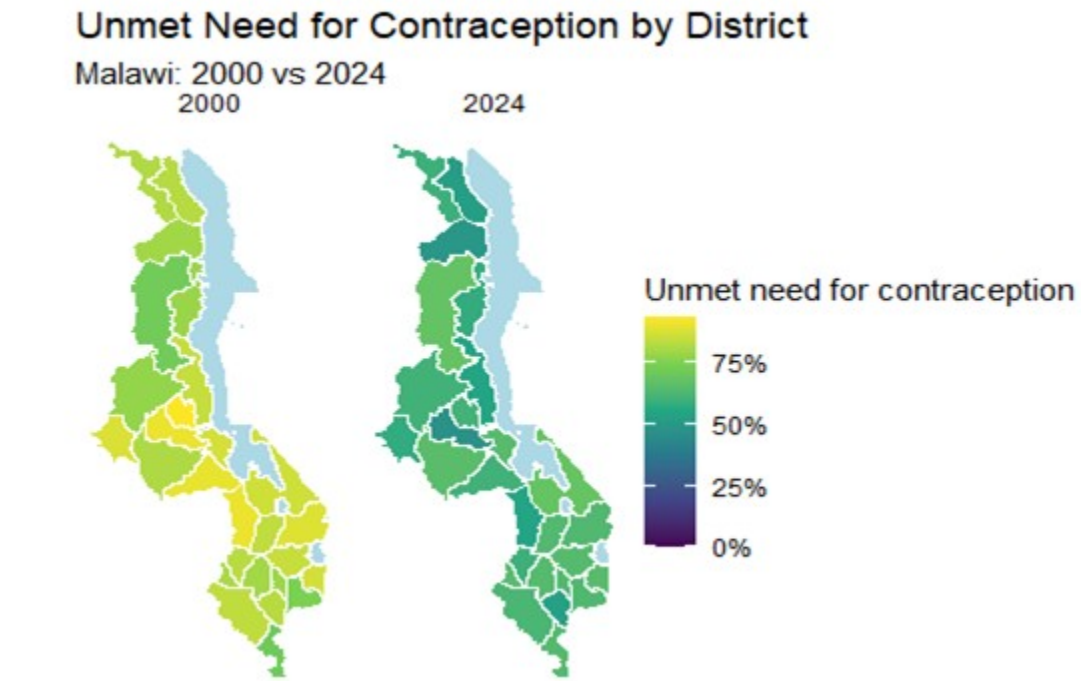


Figure 3

Patterns of Unmet Need for Contraception, Malawi (2000 vs 2024)

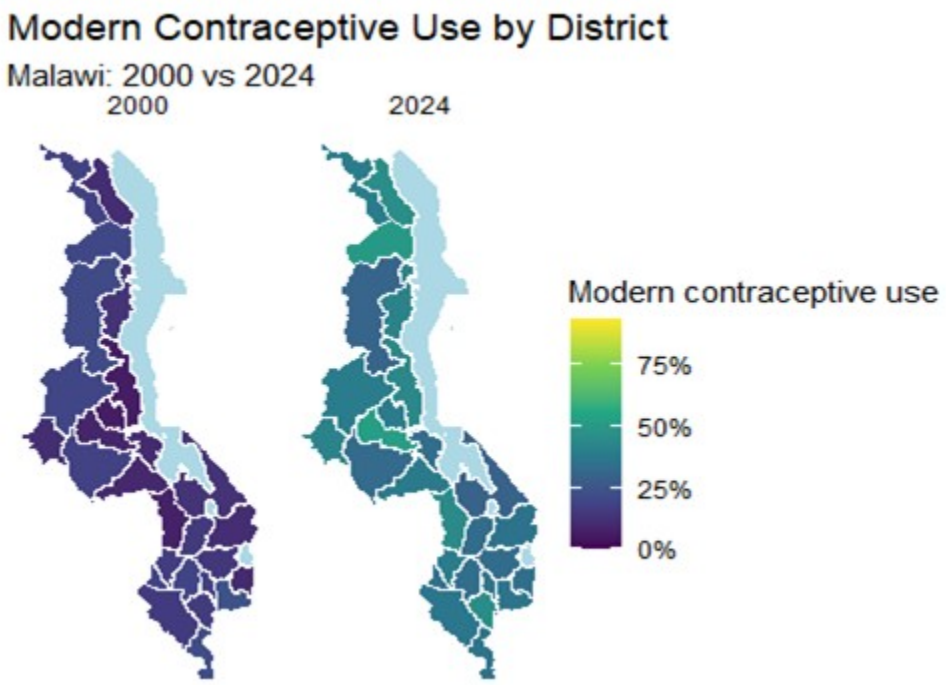


Figure 4

Patterns of Modern Contraceptive Use by District (2000 vs 2024)

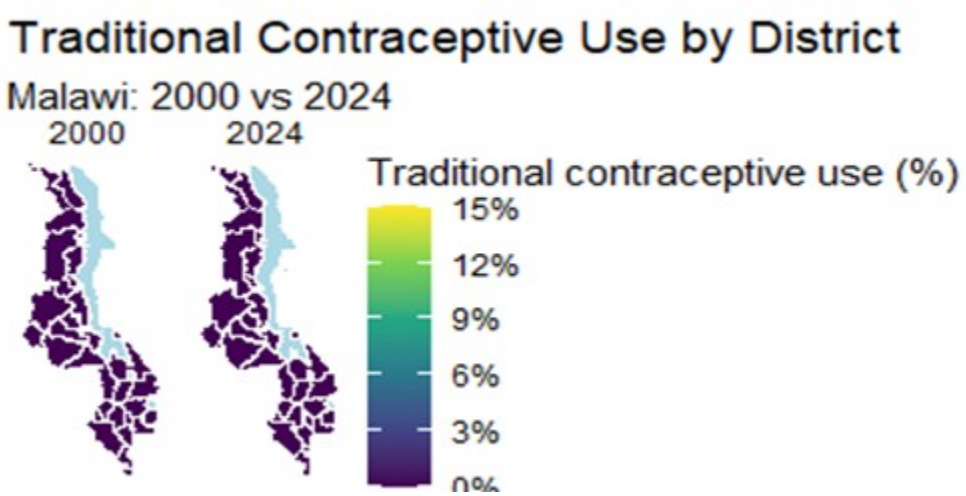


Figure 5

Patterns of Traditional Contraceptive Use by District (2000 vs 2024)

Supplementary Files

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