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Women's Bargaining Power and Maternal Healthcare Utilisation in Sierra Leone

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Research Article

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Abstract

This study examines the association between women's household bargaining power and maternal healthcare utilisation in Sierra Leone. Data were obtained from the 2019 Sierra Leone Demographic and Health Survey. The eligible sample comprised 3,341 married or cohabiting women aged 15–49 whose most recent live birth occurred within the two years preceding the survey; complete-case model samples ranged from 2,892 to 3,239 women. Bargaining power was measured through women's participation in decisions concerning their own healthcare, major household purchases and visits to relatives. Separate survey-weighted Probit models were estimated for completing at least four antenatal-care visits, delivering in a health facility and receiving a maternal postnatal check within two days of childbirth. Results were reported as adjusted average marginal effects. A one-point increase in the bargaining-power score was associated with increases of 1.73 percentage points in the probability of completing at least four antenatal-care visits and 1.13 percentage points in facility delivery. No significant association was found for timely maternal postnatal care. Compared with women participating in none of the decisions, women with high bargaining power had probabilities of adequate antenatal care and facility delivery that were 5.06 and 3.15 percentage points higher, respectively. The antenatal-care result remained significant when adequate care was redefined as at least eight contacts. The findings indicate that broad household decision participation is associated with greater utilisation of antenatal and delivery services but not timely postnatal care. Policies should combine accessible maternal-health services with measures promoting women's meaningful participation in household health and financial decisions.

Keywords: women's empowerment; bargaining power; antenatal care; facility delivery; postnatal care; Sierra Leone; SLDHS

1 Introduction

Maternal healthcare remains central to reducing preventable illness and death among women and newborns. Antenatal care allows health workers to identify pregnancy-related risks, provide preventive services and prepare women for childbirth. Facility-based delivery improves access to skilled attendance and emergency care, while timely postnatal care can detect complications during the first days after birth. These services form a connected pathway, but women do not necessarily use every stage of care in the same way. The decision to begin antenatal care, return for repeated visits, travel to a facility for delivery and receive a postnatal check may involve different combinations of information, money, mobility, family support and provider practice.

Sierra Leone has made important efforts to expand maternal and child health services, including the Free Health Care Initiative, improvements in emergency referral systems and continued investment in primary healthcare (Vallières, F et al, 2016). More recent national initiatives have placed renewed attention on preventing maternal and child deaths and strengthening accountability for health outcomes (MoH, 2026). Despite this progress, major challenges remain. Women continue to face difficulties relating to transport, distance, uneven service quality, shortages of health workers and supplies, and delays in deciding to seek care. These barriers are often greater for rural and poorer households. Progress in service availability therefore does not automatically ensure that every woman can obtain appropriate care at the required time.

One factor that may shape maternal healthcare use is women's position within the household. In many settings, decisions about seeking care are not made by women alone. A husband, partner, parent or other relative may control money, approve travel, select the place of treatment or decide whether professional care is necessary. Even when services are formally free, women may still require resources for transport, medicines, food and other related expenses. Their ability to influence household decisions may therefore affect whether they can act on health information and obtain care.

Women's empowerment is broad and includes education, economic resources, freedom of movement, attitudes toward gender roles, control over fertility and participation in household and community decisions. This study focuses on one aspect of empowerment: intra-household bargaining power. Bargaining power refers to a woman's ability to take part in decisions that affect her welfare and the use of household resources. It is measured through her participation in decisions concerning her own healthcare, major household purchases and visits to family members or relatives. These decisions reflect health authority, command over resources and mobility, which may be directly relevant to maternal healthcare utilization.

The effect of bargaining power may differ across maternal health outcomes. Antenatal care usually requires the woman to begin care and return several times during pregnancy. Facility delivery requires planning, transport and the rapid mobilization of household resources when labour begins. Timely postnatal care may depend partly on women's choices, but it may also be provided routinely before discharge from a health facility. Bargaining power may therefore have a stronger association with services that require household negotiation than with care determined mainly by facility procedures.

Existing evidence is not conclusive. Studies from several low and middle-income countries find that women who participate in household decisions are more likely to obtain antenatal care, skilled delivery or postnatal services. Other studies find weak, insignificant or outcome-specific relationships after education, wealth and access factors are considered. The mixed findings partly reflect differences in how empowerment is measured. A single decision item may capture only one part of a woman's position, while a combined measure may better represent the breadth of her household influence. National context also matters because household norms, service availability and health policies can either strengthen or weaken the connection between decision-making power and healthcare use.

Evidence from Sierra Leone remains limited. Research has examined postnatal-care use, economic empowerment and facility childbirth, but fewer studies have assessed the same bargaining-power measure across antenatal care, facility delivery and timely maternal postnatal care. It is therefore unclear whether household decision-making authority has a consistent relationship with the maternal healthcare pathway or whether its importance is concentrated at particular stages.

This study addresses that gap using the 2019 Sierra Leone Demographic and Health Survey. It examines the relationship between women's bargaining power and three outcomes: receiving at least four antenatal-care visits, delivering in a health facility and receiving a maternal postnatal check within two days. Completion of eight antenatal contacts is examined as a robustness outcome. The study uses a three-item bargaining-power score and tests alternative categorical and component measures. By comparing results across the three outcomes, the study provides evidence on whether women's household decision-making authority matters equally throughout the maternal healthcare process.

2 Literature Review

2.1 Women empowerment and intra-household bargaining

Women's empowerment refers to the process through which women acquire the resources, agency and opportunities required to make meaningful choices and translate them into desired outcomes. It is multidimensional: education, employment, asset ownership, control over income, mobility, access to information, gender attitudes and participation in household decisions may reinforce one another, but they are not interchangeable (Kishor & Subaiya, 2008; Duflo, 2012; Ewerling et al., 2017). The Survey-based Women's emPowERment Index (SWPER)1 similarly distinguishes social independence, attitudes towards violence and household decision-making, recognising that these dimensions may

[1] The Survey-based Women's emPowERment Index (SWPER) is a DHS-based measure of women's empowerment covering social independence, household decision-making and attitudes toward violence. The bargaining-power measure used in this study corresponds only to its decision-making dimension and is not the complete SWPER index

have different relationships with health-service utilisation (Ewerling et al., 2017). Evidence from India also demonstrates that measured empowerment varies according to the dimensions and indicators used (Kumar & Mondal, 2024).

The intra-household bargaining framework explains how empowerment may influence maternal healthcare. Unlike unitary household models, which assume that members share common preferences and allocate resources to maximise collective welfare (Strauss & Thomas, 1995), bargaining models recognise that household members may have different preferences concerning consumption, healthcare, fertility and time allocation. Household outcomes therefore reflect negotiations among members with different resources, influence and alternatives outside the household (Doss, 2011). Women's bargaining positions may be strengthened by education, income, assets, information and family support. However, these resources do not automatically transform unequal household relations because gender norms may restrict women's ability to convert them into effective authority (Duflo, 2012).

Bargaining power cannot be directly observed and is commonly approximated through education, employment, asset ownership, control over income, mobility and decision participation. These indicators may perform different roles: education and assets can be sources of bargaining power, decision participation may be an expression of it, and healthcare utilisation may be an outcome of the bargaining process (Doss, 2011). DHS decision-making questions identify who usually participates in selected decisions but do not reveal the intensity of disagreement, the weight given to women's preferences or whether a joint decision reflects equal influence. They should therefore be interpreted as indicators of reported participation rather than complete measures of autonomy.

The resource-allocation channel provides one mechanism linking bargaining power with maternal healthcare. Greater influence over household resources may allow women to direct expenditure towards healthcare, nutrition and transport. Evidence outside health also shows that women's bargaining positions can alter household expenditure and investment in children, although the effects may be nonlinear and dependent on income, social norms and expenditure type (Li & Sun, 2023; Sun et al., 2025). Decision participation is especially relevant to maternal care because women may require permission, information, money, mobility and family cooperation. Decisions about personal healthcare reflect authority over care seeking; major-purchase decisions indicate influence over financial resources; and decisions about visits to relatives reflect mobility and access to social support.

Combining these three DHS indicators captures the breadth of women's household participation, although joint decision-making should not be equated with unrestricted autonomy. Household bargaining must also be distinguished from autonomy within healthcare facilities. Household influence may help a woman reach a facility, but respectful maternity care additionally requires providers to inform women, respect their preferences and involve them in clinical decisions (Vedam et al., 2019).

Bargaining power may operate differently across the maternal-healthcare pathway. ANC requires initiation and repeated attendance, while facility delivery requires planning and rapid mobilisation of money, transport and family support. Timely PNC following a home delivery may require another household decision, but women delivering in facilities may receive checks routinely before discharge. Bargaining power may therefore be more influential where women must negotiate access, while provider practices may become more important after entry into a facility.

2.2 Empirical evidence

Empirical evidence generally associates women's empowerment with maternal healthcare utilisation, but results vary across indicators, outcomes and settings. In Nepal, greater autonomy was associated with maternal-service use (Adhikari, 2016), although education, health knowledge and age at first birth were sometimes more important than financial decision participation (Pandey et al., 2012). In India, women's education and control over money influenced prenatal care and hospital delivery (Maitra, 2004), while another study found positive associations with ANC and PNC but not institutional delivery (Mondal et al., 2020).

Bangladesh evidence demonstrates the importance of distinguishing among empowerment dimensions. Social independence was associated with several maternal-health services, while decision-making empowerment was more clearly related to skilled birth attendance and PNC (Anik et al., 2021). Decision-making, health knowledge and rejection of violence were also positively associated with healthcare use, whereas labour-force participation did not operate uniformly across outcomes (Ahmmed, 2022). Employment may therefore increase resources without necessarily giving

women control over their earnings. Evidence from Pakistan similarly found positive associations between empowerment and ANC, facility delivery and PNC, although distance and transport remained important constraints (Akram et al., 2019).

African evidence is also outcome-specific. In Ghana, autonomy over personal healthcare was positively associated with skilled birth attendance, while participation in purchase and mobility decisions was not equally predictive (Ameyaw et al., 2016). In Ethiopia, individual and community autonomy were related to maternal-service use, although some effects weakened after adjustment (Tiruneh et al., 2017). Decision-making autonomy was also associated with maternal and neonatal healthcare utilisation in northwest Ethiopia (Kebede et al., 2021).

Multi-country evidence shows that decision-making authority is unevenly distributed. Across 27 sub-Saharan African countries, reproductive-health decision participation was lower among rural, less-educated and non-working women and among women whose partners lacked education (Darteh et al., 2019). Wealth-related differences in healthcare decision-making autonomy have also been documented across African DHS surveys (Lee et al., 2017). Education, employment, financial inclusion, assets and access to information are similarly associated with women's bargaining positions in India (Gupta & Bharti, 2026). Because these characteristics may influence both empowerment and healthcare utilisation, they require careful empirical adjustment.

Wider household relationships also matter. In Mali, women's self-efficacy and mothers-in-law's preferences influenced maternal-health practices (White et al., 2013). In Tanzania, partner cooperation, women's resource control and lower exposure to domestic violence increased facility delivery and affected provider choice (Mukong & Burns, 2019), while broader gender-power indicators had different associations across maternal-health outcomes (Garrison-Desany et al., 2021).

Evidence from rural settings further shows that the relevant empowerment domain varies by service. In Nigeria, education, ability to pay and participation in major-purchase decisions were associated with skilled maternity care, but land ownership and some household decisions were not consistently beneficial (Ntoimo et al., 2022). In Uganda, participation in child-health decisions predicted postnatal and infant-care use, whereas the ability to raise money was insignificant (Kadengye et al., 2020). Related reproductive-health evidence is also mixed: health-decision autonomy reduced unmet family-planning need but did not significantly increase modern contraceptive use in Senegal (Sougou et al., 2020), while a composite bargaining score was positively associated with contraceptive use in Cameroon (Tchakounté Tchuimi & Fomba Kamga, 2024).

Overall, the literature does not support a uniform relationship between empowerment and maternal healthcare. Results depend on whether empowerment measures correspond to the resources and decisions required for a particular service, as well as on household gender norms, geographical access and health-system capacity. These differences justify analysing ANC, facility delivery and PNC separately and examining whether the findings are sensitive to alternative measures of bargaining power.

2.3 Sierra Leone evidence and research gap

Evidence from Sierra Leone indicates that economic resources do not automatically translate into health decision-making authority. Women's economic contributions in rural communities may improve household welfare without necessarily displacing men's authority over major health decisions (Cornish et al., 2021). Increasing women's employment or income may therefore be insufficient if they remain unable to control resources or decide when to seek care.

Using the 2019 SLDHS, Sserwanja et al. (2022) found that maternal PNC reflected socioeconomic, geographical and service-related factors. Sserwanja et al. (2023) subsequently found that individual empowerment indicators were not significantly associated with facility childbirth after adjustment, while education and household wealth remained important. However, separate decision items may not capture the cumulative authority required to plan for childbirth, mobilise resources, arrange transport and reach a facility.

Three research gaps remain. First, previous studies often use either individual decision items or broad indices combining conceptually different dimensions, making it difficult to determine whether participation across related household decisions matters more than isolated participation. Second, ANC, facility delivery and PNC require different resources,

decisions and institutional inputs and should therefore not be treated as a single outcome. Third, Sierra Leone evidence has not fully compared one consistent bargaining-power measure across these three stages while accounting for socioeconomic characteristics, access barriers and the DHS survey design.

This study addresses these gaps by constructing a bargaining-power score from women's participation in decisions about their healthcare, major household purchases and visits to relatives. It applies this measure consistently to ANC, facility delivery and timely maternal PNC and examines the sensitivity of the results to alternative measures and the more demanding standard of eight ANC contacts. The literature suggests a likely positive association with ANC and facility delivery, where negotiation and resource mobilisation are important, but a less certain relationship with timely PNC, which may depend more heavily on facility routines and provider practices.

3 Methodology

3.1 Study design and data source

The study used data from the 2019 Sierra Leone Demographic and Health Survey (SLDHS) (Statistics Sierra Leone and ICF, 2020). The SLDHS is a nationally representative household survey that collected information on women's demographic and socioeconomic characteristics, reproductive histories, household decision-making, and use of maternal healthcare services. The survey employed a stratified two-stage sampling design. Enumeration areas were selected during the first stage, followed by the selection of households within each enumeration area.

The analysis was restricted to women aged 15 - 49 years who were married or cohabiting at the time of the survey and whose most recent live birth occurred within the two years preceding the survey. Restricting the analysis to recent births helped reduce errors arising from women's inability to recall the timing and circumstances of maternal healthcare received for births occurring much earlier. The restriction to currently married or cohabiting women was necessary because the household decision-making questions used to construct the measure of bargaining power were primarily administered to women in a union.

The initial analytical sample consisted of 3,341 women. The final estimation samples differed across outcomes because of missing information and the exclusion of observations with incomplete control variables. The ANC model was based on 2,898 women before the removal of a few observations that perfectly predicted the outcome. The facility-delivery and timely-PNC samples each contained 3,254 women before such removals.

3.2 Outcome variables

Three binary indicators of maternal healthcare utilization were used.

The first outcome was adequate antenatal care, defined as receiving at least four ANC visits during the most recent pregnancy. The variable was constructed from SLDHS variable m14_1, which records the number of antenatal visits for the most recent birth. Women reporting four or more visits were coded one, while those reporting between zero and three visits were coded zero. Responses with invalid, unknown or missing values were treated as missing. Although the World Health Organization recommends at least eight ANC contacts (World Health Organization, 2016), the four-visit measure was retained as the primary indicator because it was widely used during the period covered by the survey and remains useful for comparison with earlier studies. Receiving at least eight contacts was however used as a robustness outcome.

The second outcome was facility-based delivery. This was constructed from m15_1, which identifies the place of delivery of the most recent child. Deliveries in public, private and other recognised health facilities were coded one, while home deliveries and deliveries in other non-facility locations were coded zero.

The third outcome was timely maternal postnatal care. It was coded one if the woman received a health check within two days after delivery and zero otherwise. Information on checks received before discharge from the delivery facility and checks received after discharge or following a home delivery was combined using variables m62_1, m63_1, m66_1 and m67_1. This definition follows the emphasis placed on the first two days after childbirth, when the risk of serious maternal complications is particularly high.

3.3 Main explanatory variable

Women's bargaining power was measured using women's reported participation in three household decisions recorded in the 2019 Sierra Leone Demographic and Health Survey (SLDHS):

- decisions concerning the woman's own healthcare (v743a);
- decisions concerning major household purchases (v743b); and
- decisions concerning visits to family members or relatives (v743d).

These indicators capture related but distinct aspects of women's influence within the household. Participation in decisions about personal healthcare reflects a woman's direct involvement in determining whether and where she seeks treatment. Participation in major-purchase decisions indicates influence over the allocation of household financial resources, while participation in decisions about visits to relatives reflects mobility and the ability to maintain family and social connections. Taken together, the three indicators provide a broader measure of household decision participation than any single item considered independently.

For each decision, a woman was classified as participating when she reported making the decision either alone or jointly with her husband or partner. Joint decision-making was included because it indicates that the woman had some involvement in the decision, although it does not necessarily imply that both partners exercised equal influence. A woman was classified as not participating when the decision was made exclusively by her husband or partner, another household member or another person. Responses that were missing, unknown or otherwise invalid were not assigned a participation status.

The three binary indicators were summed to construct a bargaining-power score ranging from zero to three. A score of zero indicated that the woman participated in none of the three decisions, while scores of one and two indicated participation in one and two decisions, respectively. A score of three represented participation in all three decision domains. The index therefore measures the breadth of a woman's reported involvement in household decisions rather than complete autonomy or the intensity of her influence within each decision.

The bargaining-power score was entered as a continuous variable in the principal regression models. Its average marginal effect represents the average change in the predicted probability of using a maternal healthcare service associated with participation in one additional household decision. For example, it estimates the change in the probability of receiving adequate ANC, delivering in a health facility or obtaining timely PNC when the score increases from zero to one, one to two or two to three, under the continuous specification.

Several alternative specifications were estimated to examine whether the findings depended on how bargaining power was represented. First, the score was entered as a categorical variable: no participation (score of zero), low bargaining power (score of one), moderate bargaining power (score of two) and high bargaining power (score of three). This specification allowed the relationship to vary across levels rather than assuming that every one-point increase had the same effect. Second, the three decision indicators were entered separately to determine whether participation in a particular decision domain was more strongly associated with maternal healthcare utilisation. Third, a binary high-bargaining-power indicator distinguished women who participated in all three decisions from women who participated in fewer than three. These alternative specifications provided checks on the robustness and interpretation of the principal bargaining-power measure.

3.4 Control variables

The regression models controlled for demographic, socioeconomic, household and geographical characteristics that could be associated with both women's bargaining power and maternal healthcare utilisation. Including these variables helped reduce the possibility that the estimated relationship between bargaining power and healthcare use merely reflected differences in women's social and economic circumstances.

The demographic controls included the woman's age group and the birth order of her most recent child. Age may influence women's experience, confidence and authority within the household, as well as their perceived need for maternal healthcare. Birth order was included because women with previous births may have different knowledge, risk perceptions and healthcare-seeking behaviour from first-time mothers. The models also controlled for pregnancy wantedness, since the timing and desirability of a pregnancy may affect women's motivation to seek antenatal, delivery and postnatal services.

Socioeconomic characteristics included the woman's educational attainment, her husband's or partner's educational attainment, household wealth quintile, urban residence and current employment status. Education may improve health knowledge, communication with providers and women's ability to participate in household decisions. Partner education may similarly affect household understanding of maternal-health risks and support for professional care. Household wealth was included to capture differences in the capacity to meet transport, medicine and other care-related expenses, even where formal services were provided without direct user fees. Urban residence accounted for differences in the availability and accessibility of healthcare facilities, while current employment captured women's participation in economic activity.

Household characteristics included the sex of the household head and household size. Living in a female-headed household may influence women's authority and the allocation of resources, although female headship does not necessarily imply greater individual autonomy. Household size was included because larger households may provide additional support for childcare, accompaniment and domestic responsibilities, but may also create greater competition for limited household resources. Province of residence was included to account for geographical differences in infrastructure, service availability, cultural practices and the organisation of maternal healthcare.

The models also controlled for women's reported barriers to accessing healthcare. These variables indicated whether obtaining permission to seek treatment, obtaining money for treatment and the distance to a health facility were regarded as major problems. Permission barriers capture restrictions on women's ability to make independent healthcare decisions, while financial and distance barriers reflect the affordability and physical accessibility of services. Religion, ethnic group and health-insurance coverage were also included to account for differences in social norms, cultural practices, financial protection and healthcare-seeking behaviour.

Categorical variables were entered using appropriate reference groups to facilitate interpretation of the estimated effects. Temne women constituted the reference ethnic category because they formed the largest ethnic group in the analytical sample. The other reference categories were women aged 15–19 years, women with no formal education, partners with no formal education, households in the poorest wealth quintile, rural residents, women who were not currently working, first births, male-headed households, Eastern Province, pregnancies wanted at the time they occurred, Christian women and women without health-insurance coverage. Estimated effects for the remaining categories were therefore interpreted relative to these reference groups.

Facility delivery was not included as a control variable in the timely postnatal-care model. Facility delivery may constitute an intermediate pathway through which women's bargaining power affects the receipt of timely PNC. For example, women with greater bargaining power may be more able to arrange transport and mobilise household resources for facility delivery, after which a postnatal check may be provided routinely before discharge. Controlling for facility delivery could therefore block part of the relationship the study sought to estimate and lead to an understatement of the overall association between bargaining power and timely PNC. Table 1 summarises the operational definitions, data sources and analytical coding of the study variables.

Table 1. Operational definitions and measurement of study variables

Variable	Definition	SLDHS source	Analytical coding
ANC4	At least four antenatal-care visits for the most recent birth	m14_1	1 = 4 or more visits; 0 = 0–3 visits
Facility delivery	Most recent birth occurred in a recognised health facility	m15_1	1 = public, private or other recognised facility; 0 = home or non-facility
Timely maternal PNC	Maternal health check within two days after delivery	m62_1, m63_1, m66_1, m67_1	1 = check within two days before or after discharge/home delivery; 0 = otherwise

Variable	Definition	SLDHS source	Analytical coding
ANC8 robustness outcome	At least eight antenatal-care contacts	m14_1	1 = 8 or more contacts; 0 = 0–7 contacts
Bargaining-power score	Participation in own healthcare, major purchases and visits to relatives	v743a, v743b, v743d	Sum of three indicators; range 0–3. Participation means deciding alone or jointly
Bargaining-power categories	Breadth of participation across the three decisions	Constructed score	0 = none; 1 = low; 2 = moderate; 3 = high
Socioeconomic and access controls	Age, education, partner education, wealth, residence, work, parity, household structure, province, barriers, pregnancy wantedness, religion, ethnicity and insurance	Relevant SLDHS variables	Entered as indicator variables or continuous household size, as described in text

Note: All outcomes refer to the most recent live birth in the two years preceding the survey. Invalid, unknown and missing responses were treated as missing.

3.5 Statistical analysis

The analysis began with survey-weighted descriptive statistics to summarise maternal-healthcare utilisation, women's bargaining power and the socioeconomic characteristics of the study population. Percentages were calculated for binary and categorical variables, while weighted means were reported for continuous variables, including the bargaining-power score and household size. The distributions of the three individual decision-making indicators and the four bargaining-power categories were also examined to show the extent and pattern of women's participation in household decisions.

All descriptive and regression estimates incorporated the complex design of the 2019 Sierra Leone Demographic and Health Survey. The woman's individual sampling weight was divided by 1,000,000 before use, while the primary sampling unit and sampling stratum were identified using the relevant DHS variables. Incorporating the weights corrected for unequal probabilities of selection, while accounting for clustering and stratification produced standard errors and statistical tests appropriate to the survey design. Subpopulation estimation was used for eligible women rather than treating the analytical sample as a simple random sample.

3.5.1 Probit model specification

The three maternal-healthcare outcomes (adequate antenatal care, facility-based delivery and timely maternal postnatal care) were binary. Separate survey-weighted Probit models were therefore estimated for each outcome. The models allowed the association between bargaining power and service utilisation to differ across the three stages of the maternal-healthcare pathway. Both unadjusted models, containing the bargaining-power measure alone, and adjusted models, including the complete set of control variables, were estimated. The general probability model was specified as follows:

$$\Pr(Y_{ij} = 1 \mid BP_i, X_i) = \Phi(\alpha_j + \beta_j BP_i + \gamma_j' X_i) \quad \ldots\ldots(1)$$

In Equation (1), Y_{ij} denotes whether woman i utilised maternal-healthcare service j, where j represents adequate ANC, facility delivery or timely maternal PNC. BP_i is the woman's bargaining-power score, X_i is the vector of control variables, α_j is the outcome-specific constant, β_j is the coefficient associated with bargaining power, and γ_j is the vector of coefficients on the controls. The symbol Φ denotes the cumulative standard normal distribution.

To show how Equation (1) was operationalised, the generic adjusted empirical model is presented in expanded form below. The same explanatory structure was applied separately to each of the three outcomes; only the dependent variable and the estimated coefficients differed across the models.

$$\Pr(Y_{ij} = 1) = \Phi[\alpha_j + \beta_j BP_i + \gamma_{1j}Age_i + \gamma_{2j}WEduc_i + \gamma_{3j}PEduc_i + \gamma_{4j}Wealth_i + \gamma_{5j}Urban_i + \gamma_{6j}Working_i + \gamma_{7j}BirthOrder_i + \gamma_{8j}FemaleHead_i + \gamma_{9j}HouseholdSize_i + \gamma_{10j}Province_i + \gamma_{11j}Permission_i + \gamma_{12j}Money_i + \gamma_{13j}Distance_i + \gamma_{14j}PregnancyWanted_i + \gamma_{15j}Religion_i + \gamma_{16j}Ethnicity_i + \gamma_{17j}Insurance_i] \quad \ldots\ldots(2)$$

Equation (2) includes the woman's age group and educational attainment; her partner's educational attainment; household wealth, residence and employment status; birth order; sex of the household head; household size; province; reported permission, financial and distance barriers; pregnancy wantedness; religion; ethnicity; and health-insurance coverage. Categorical controls were entered as sets of indicator variables relative to their stated reference categories. Facility delivery was not included in the timely-PNC model because it may lie on the pathway through which bargaining

power affects postnatal care. Controlling for it could therefore remove part of the association the study sought to estimate.

3.5.2 Average marginal effects

Probit coefficients indicate the direction and statistical significance of an association but do not provide a direct probability interpretation. The results were therefore reported as average marginal effects. For the continuous bargaining-power score, the average marginal effect represents the average change in the predicted probability of using a maternal-healthcare service associated with participation in one additional household decision, holding the other variables at their observed values. For the categorical specification, the marginal effects represent discrete changes in predicted probabilities relative to women who participated in none of the three decisions. Predicted probabilities were also calculated at each value of the bargaining-power score to illustrate differences across the full range from zero to three.

3.5.3 Robustness and sensitivity analysis

The primary ANC outcome defined adequate care as at least four visits. As a robustness check, this outcome was replaced with an indicator of eight or more ANC contacts, using the same survey-adjusted Probit specification and control variables. This test assessed whether the relationship between bargaining power and ANC remained when a more demanding standard of care was applied.

Further sensitivity analyses examined whether the findings depended on the construction of the bargaining-power measure. The continuous score was first replaced by categorical indicators for low, moderate and high bargaining power, with no participation as the reference category. The three decision domains were then entered separately to determine whether participation in personal-healthcare, major-purchase or family-visit decisions was particularly influential. Finally, a binary indicator compared women participating in all three decisions with women participating in fewer than three. Standard errors, hypothesis tests, predicted probabilities and marginal effects were adjusted for the complex survey design. Statistical significance was assessed at the 1%, 5% and 10% levels, with 95% confidence intervals reported. The analysis was conducted using Stata version 17.

3.5.4 Missing observations and model interpretation

The regression analysis used complete observations for all variables included in each model. Consequently, the final estimation samples differed slightly across outcomes: 2,892 women were included in the adjusted ANC4 model, 3,232 in the facility-delivery model and 3,239 in the timely-PNC model. A small number of observations in rare religious and ethnic categories were excluded automatically because those categories perfectly predicted particular outcomes. Perfect prediction occurs when all observations in a category report the same outcome, making it impossible to estimate a finite Probit coefficient. Given the very small number of affected observations, these exclusions were unlikely to materially change the principal findings.

Because the study used cross-sectional data, the estimates are interpreted as adjusted associations rather than causal effects. Household decision-making was measured at the survey interview, whereas maternal-healthcare utilisation referred to the most recent live birth during the preceding two years. Bargaining power may therefore have changed between pregnancy, childbirth and the interview. Although the models adjusted for a broad range of observed characteristics, unobserved factors may remain associated with both bargaining power and service utilisation.

3.5.5 Ethical considerations

The SLDHS data are anonymised and publicly available for approved research. The original survey obtained the required ethical approvals and informed consent from participants. The present study involved secondary analysis of anonymised data, and no attempt was made to identify any respondent.

4 Empirical results and discussion

4.1 Descriptive findings

As shown in Table 2, use of the three principal maternal healthcare outcomes was generally high among the women included in the study. Approximately 89.6% received at least four ANC visits, 84.2% delivered their most recent child in a health facility and 84.8% received a maternal postnatal check within two days. However, only 24.9% completed at least eight ANC contacts. The large difference between ANC4 and ANC8 shows that most women reached the earlier four-visit standard, while considerably fewer achieved the more demanding eight-contact recommendation.

Women's participation in household decision-making was more limited. The weighted mean bargaining-power score was approximately 1.27 out of three. About 46% participated in none of the three decisions, while approximately 32% participated in all three. Participation was reported by about 40% of women for their own healthcare, 43% for major household purchases and 43% for visits to relatives. These findings show that high maternal healthcare coverage coexisted with substantial limits on women's household decision-making authority.

The socioeconomic profile also indicates several possible constraints on maternal healthcare utilization. More than half of the women and their partners had no formal education. Approximately two-thirds lived in rural areas, nearly three-quarters identified obtaining money for treatment as a major problem and about half regarded distance to a facility as a major problem. Only around 3.5% reported health-insurance coverage. These conditions support the inclusion of education, wealth, residence and access barriers in the adjusted models.

Table 2. Survey-weighted descriptive statistics for principal study variables

Measure	Weighted statistic	Unweighted valid N
Received at least four ANC visits	89.63%	2,964
Facility-based delivery	84.21%	3,341
Timely maternal PNC within two days	84.83%	3,341
Received at least eight ANC contacts	24.93%	2,964
Bargaining-power score, mean (0–3)	1.27	3,341
No participation in the three decisions	46.03%	3,341
High bargaining power / all three decisions	31.94%	3,341
Participates in own healthcare decision	40.28%	3,341
Participates in major-purchase decision	43.48%	3,341
Participates in family-visit decision	43.43%	3,341
No formal education, women	about 57%	3,254
Urban residence	32.17%	3,254
Money for treatment is a major problem	73.52%	3,254
Distance is a major problem	50.90%	3,254
Covered by health insurance	3.55%	3,254

Note: Percentages and means incorporate SLDHS weights, clustering and stratification. Valid sample sizes differ because ANC-visit information and some controls are missing for some women. The complete adjusted-model samples were 2,892 for ANC4, 3,232 for facility delivery and 3,239 for timely PNC.

4.2 Overview of the Main Regression Results

Tables 3–5 present the main adjusted results on the relationship between women's bargaining power and maternal healthcare utilisation. Table 3 reports the average marginal effects when bargaining power is measured as a continuous score ranging from zero to three. Each estimate represents the average change in the predicted probability of using a maternal healthcare service associated with participation in one additional household decision. The table also reports the ANC8 result as a robustness check for the main ANC4 outcome. Table 4 presents bargaining power as a categorical variable, distinguishing women with no, low, moderate and high bargaining power. The reported average marginal

effects show the discrete change in the predicted probability of each outcome relative to women who participated in none of the three household decisions. The joint-test p-values indicate whether the bargaining-power categories are collectively associated with each maternal healthcare outcome. Table 5 complements these marginal effects by reporting the adjusted predicted probability of each outcome at every level of bargaining power. Unlike Table 4, which presents differences relative to the reference category, Table 5 shows the estimated level of maternal healthcare utilisation for each group after accounting for the control variables. Presenting both measures makes it possible to assess the size of the differences and the overall level of predicted service use.

Because all three tables cover adequate ANC, facility-based delivery and timely maternal PNC, they are presented together and referenced in the outcome-specific discussions in Sections 4.3–4.5.

Table 3. Adjusted average marginal effects of the continuous bargaining-power score[2]

Outcome	AME	SE	p-value	N
At least four ANC visits	0.0173***	0.0052	0.001	2,892
Facility-based delivery	0.0113**	0.0052	0.030	3,232
Timely maternal PNC	0.0019	0.0059	0.751	3,239
At least eight ANC contacts (robustness)	0.0423***	0.0082	<0.001	2,897

Note: Each AME is the change in predicted probability associated with participation in one additional household decision. Models adjust for the full set of controls in Table 1 and account for the complex DHS design. *** p < 0.01; ** p < 0.05; * p < 0.10.

Table 4. Adjusted average marginal effects of bargaining-power categories

Category	ANC4 AME (SE)	Facility delivery AME (SE)	Timely PNC AME (SE)
Low bargaining power	0.0315* (0.0177)	-0.0408 (0.0249)	0.0046 (0.0247)
Moderate bargaining power	0.0363* (0.0210)	0.0093 (0.0238)	0.0216 (0.0231)
High bargaining power	0.0506*** (0.0147)	0.0315** (0.0155)	0.0036 (0.0182)
Joint test p-value	0.0065	0.0147	0.8407
Control variables	Yes	Yes	Yes
Model observations	2,892	3,232	3,239

Note: The reference category is participation in none of the three household decisions. AMEs for categories are discrete changes from the reference group. All models contain the full control set and apply DHS survey weights and design corrections. *** p < 0.01; ** p < 0.05; * p < 0.10.

Table 5. Adjusted predicted probabilities

Bargaining-power category	ANC4	Facility delivery	Timely PNC
No participation	87.54%	83.51%	84.74%
Low bargaining power	90.69%	79.42%	85.20%
Moderate bargaining power	91.16%	84.44%	86.90%
High bargaining power	92.60%	86.66%	85.10%

Note: Predicted probabilities were estimated from the fully adjusted survey-weighted Probit models, with bargaining power treated as a categorical variable. Estimates account for the control variables listed in Table 1 and the complex DHS survey design.

[2] Detailed regression results are presented in Appendix 2

4.3 Bargaining power and adequate ANC

The ANC results in Tables 3–5 show a positive and statistically significant association between women's bargaining power and adequate antenatal care. In the continuous specification, participation in one additional household decision was associated with a 1.73-percentage-point increase in the predicted probability of receiving at least four ANC visits ($p = 0.001$; Table 3). Although modest for a single decision, the result suggests that participation across several decision-making areas may produce a meaningful cumulative difference. The estimates represent adjusted associations and should not be interpreted as causal effects.

The categorical results support this finding but suggest that the relationship was not completely linear. Relative to women with no decision participation, low and moderate bargaining power increased the probability of ANC4 by 3.15 and 3.63 percentage points, respectively, with both estimates significant at the 10% level. High bargaining power produced the largest increase of 5.06 percentage points and was significant at the 1% level. The categories were also jointly significant (Table 4). Correspondingly, the adjusted probability of ANC4 increased from 87.54% among women with no participation to 92.60% among those with high bargaining power (Table 5). The consistency of the continuous, categorical and predicted-probability results strengthens the main finding.

The result is consistent with evidence from Nepal, Pakistan, Bangladesh and Ethiopia that women's agency and decision participation can support ANC use (Adhikari, 2016; Akram et al., 2019; Ahmmed, 2022; Kebede et al., 2021). It also accords with the intra-household bargaining framework described by Doss (2011). Women who participate in a wider range of household decisions may be better able to act on health information, obtain support for repeated visits and mobilise resources for transport, medicines and related expenses. The stronger result for women participating in all three decisions is also consistent with multidimensional approaches such as SWPER, which recognise that empowerment consists of several related capacities (Ewerling et al., 2017).

The separate decision-domain results, reported in Appendix Table A1, provide further insight into the ANC findings. Participation in decisions about the woman's own healthcare was associated with a 4.05-percentage-point increase in the probability of ANC4, while participation in major-purchase decisions was associated with a 2.96-percentage-point increase. Participation in decisions about visits to relatives was not significant. The three decision indicators were jointly significant, suggesting that healthcare and household-resource decisions were the domains most relevant to adequate ANC. Personal-healthcare and major-purchase decisions may be more directly connected to seeking ANC and meeting its financial and transport requirements than decisions concerning social visits. This interpretation is consistent with studies emphasising women's influence over healthcare and household resources (Beegle et al., 2001; Maitra, 2004).

Overall, the results indicate that broader participation in household decisions is associated with a greater likelihood of receiving adequate ANC, with the clearest advantage found among women participating in all three decision-making areas. Bargaining power does not, however, operate in isolation. Education, household resources, geographical access and service availability also influence whether women can translate their preference for care into repeated ANC attendance.

4.4 Bargaining power and facility delivery

Tables 3–5 show a positive association between women's bargaining power and facility-based delivery. In the continuous specification, participation in one additional household decision was associated with a 1.13 percentage-point increase in the predicted probability of delivering in a health facility (Table 3). The magnitude was broadly comparable to the ANC4 estimate, although smaller than the ANC8 robustness result. As with the other findings, this estimate represents an adjusted association rather than a causal effect.

The categorical results suggest that this relationship was concentrated among women with the broadest decision participation. Compared with women reporting no participation, high bargaining power was associated with a 3.15 percentage-point increase in the probability of facility delivery. The low and moderate categories were not individually significant, although the categories were jointly significant (Table 4). The adjusted probability of facility delivery was 83.51% among women with no participation and 86.66% among those with high bargaining power (Table 5). The lower predicted probability among women in the low category (79.42%) was not statistically different from that of women with no participation and should not be interpreted as evidence that limited participation reduces facility delivery.

These findings suggest that participation in only one or two decision-making areas may not provide sufficient influence over where childbirth occurs. Facility delivery often requires advance planning, transport, expected expenditure, selection of a facility and support from partners or other household members. Participation across all three decision domains may reflect a broader household position that enables women to combine their preference for facility delivery with the financial and practical support required when labour begins. This interpretation is consistent with evidence that cooperation between partners, control over resources and healthcare decision-making can support skilled or facility-based childbirth (Ameyaw et al., 2016; Mukong & Burns, 2019; Ahmmed, 2022).

The separate decision-domain results in Appendix Table A1 provide a more qualified picture. The three indicators were not jointly significant for facility delivery. Participation in major-purchase decisions was associated with a 3.65-percentage-point increase in facility delivery, but the estimate was only borderline significant ($p = 0.100$). Participation in personal-healthcare decisions and decisions about visits to relatives produced estimates close to zero. The cumulative score and high-power category may therefore capture women's overall position within the household more effectively than any single decision item. This also helps explain why the separate decision indicators examined by Sserwanja et al. (2023) were not significant for Sierra Leone.

Overall, the results indicate that broad household decision participation, rather than involvement in one particular decision, was positively associated with facility delivery. This is consistent with evidence from Ghana and rural Nigeria that women's authority over health and household resources can support skilled maternity care (Ameyaw et al., 2016; Ntoimo et al., 2022). Bargaining power alone does not, however, determine where delivery occurs. Even women with substantial household influence may face distance, transport difficulties, limited financial resources and concerns about service availability or quality. Women's bargaining power should therefore be understood as one influence operating alongside household resources and the accessibility and reliability of maternal-health services.

4.5 Bargaining power and timely PNC

Tables 3–5 show no statistically significant association between women's bargaining power and receiving maternal PNC within two days of childbirth. In the continuous specification, participation in one additional household decision was associated with only a 0.19-percentage-point increase in the predicted probability of timely PNC (Table 3). This estimate was close to zero and differed clearly from the positive findings for ANC and facility-based delivery.

The categorical results support the same conclusion. Relative to women with no decision participation, the estimated changes were 0.46, 2.16 and 0.36 percentage points for women with low, moderate and high bargaining power, respectively. None of these estimates was statistically significant, and the categories were not jointly significant ($p = 0.8407$; Table 4). Similarly, the adjusted probability of timely PNC varied only slightly, from 84.74% among women with no participation to 85.10% among those with high bargaining power, with the highest probability of 86.90% observed among women in the moderate category (Table 5). The absence of a clear progression across the categories confirms that broader decision participation was not systematically associated with timely PNC.

The separate decision-domain results in Appendix Table A1 also provide limited evidence of an association. Participation in major-purchase decisions was associated with a 3.23 percentage-point increase in timely PNC, but the estimate was significant only at the 10% level. Participation in personal-healthcare decisions and decisions about visits to relatives was not significant, and the three indicators were not jointly significant. The additional binary measure identifying women who participated in all three decisions also produced an estimate close to zero. The consistency of these findings suggests that the main result was not driven by the way bargaining power was measured.

The result contrasts with evidence of positive relationships between some dimensions of women's empowerment and PNC in Nepal, Pakistan, Bangladesh and Ethiopia (Adhikari, 2016; Akram et al., 2019; Ahmmed, 2022; Kebede et al., 2021). However, these studies used different empowerment measures, definitions of PNC and study populations. The present finding is consistent with wider evidence that empowerment measures do not have uniform relationships with every maternal-health outcome (Ewerling et al., 2017; Sougou et al., 2020). It should therefore be interpreted as a limit of the household decision-participation measure rather than evidence that women's agency is unimportant after childbirth.

Several factors may explain the absence of a significant association. Timely PNC coverage was already about 85%, leaving relatively little variation for bargaining power to explain. In addition, many postnatal checks occur before women are discharged from health facilities and may therefore depend more on routine clinical procedures and provider

behaviour than on a new household decision involving money, transport or permission. Timely PNC may also be closely connected to facility delivery because women can receive a check during the same episode of care. Consistent with Sserwanja et al. (2022), PNC is likely to reflect a combination of individual, household, community and health-system factors.

Collectively, bargaining power appears to be more relevant where women must initiate care, mobilise resources or negotiate household support. Once a woman enters a health facility, clinical routines and provider practices may become more influential. Household bargaining power also remains distinct from autonomy within the healthcare setting, where respectful treatment, adequate information and involvement in clinical decisions remain important (Vedam et al., 2019). The differing results for ANC, facility delivery and timely PNC are therefore not contradictory; rather, they show that women's empowerment operates differently across stages of the maternal-healthcare pathway (Mondal et al., 2020; Anik et al., 2021; Garrison-Desany et al., 2021).

4.6 Socioeconomic, geographical and healthcare-access factors

Table 6 presents selected average marginal effects of the control variables from the fully adjusted models. For concision, it reports variables that were statistically significant at the 10% level or better in at least one model, together with closely related comparison categories. The results show that maternal healthcare utilisation was associated not only with women's bargaining power but also with education, household wealth, geographical location, healthcare-access barriers, pregnancy wantedness and selected household characteristics. However, these estimates represent adjusted associations and should not be interpreted as causal effects.

Table 6. Selected adjusted average marginal effects of control variables

Covariate	ANC4 AME (SE)	Facility delivery AME (SE)	Timely PNC AME (SE)
Woman: secondary education	0.0317* (0.0180)	0.0719*** (0.0179)	0.0314 (0.0211)
Woman: higher education	0.0934*** (0.0181)	0.1005** (0.0489)	0.0549 (0.0555)
Partner: primary education	0.0419** (0.0184)	0.0348 (0.0259)	0.0469** (0.0221)
Partner: higher education	-0.0074 (0.0287)	-0.0094 (0.0333)	0.0574** (0.0252)
Middle wealth quintile	0.0351 (0.0215)	0.0417* (0.0233)	0.0530** (0.0221)
Richer wealth quintile	0.0378 (0.0304)	0.0783** (0.0318)	0.0223 (0.0326)
Richest wealth quintile	-0.0040 (0.0409)	0.1194*** (0.0344)	0.0383 (0.0385)
Woman currently working	-0.0023 (0.0146)	0.0017 (0.0203)	-0.0413** (0.0187)
Female-headed household	0.0061 (0.0154)	-0.0336* (0.0191)	-0.0436** (0.0174)
North Western Province	-0.0589** (0.0270)	-0.1151*** (0.0420)	0.0629 (0.0446)
Western Province	-0.1000*** (0.0296)	-0.0645 (0.0440)	0.1346*** (0.0442)
Permission is a major problem	-0.0213 (0.0147)	0.0438** (0.0173)	-0.0130 (0.0167)
Money is a major problem	-0.0099 (0.0190)	0.0181 (0.0198)	0.0719*** (0.0197)
Distance is a major problem	0.0107 (0.0157)	-0.0948*** (0.0200)	-0.0451** (0.0178)
Pregnancy wanted later	-0.0660*** (0.0236)	-0.0027 (0.0237)	-0.0715*** (0.0265)
Mende ethnicity	0.0017 (0.0243)	0.1334*** (0.0306)	0.1240*** (0.0312)
Sherbro ethnicity	-0.1572** (0.0648)	-0.1202* (0.0694)	-0.0154 (0.0690)
Health insurance	0.0265 (0.0401)	0.0283 (0.0397)	0.1982*** (0.0547)

Note: For concision, the table reports covariates that were statistically significant at $p < 0.10$ in at least one model, plus closely related comparison categories. The models also included age group, all education and wealth categories, residence, birth order, household size, province, pregnancy wantedness, religion, ethnicity and insurance. Reference groups are ages 15–19, no education, poorest quintile, first birth, Eastern Province, wanted then, Christian, Temne and no insurance. Some counterintuitive coefficients may reflect reporting, service targeting or residual confounding and should not be interpreted causally. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

Table 6 shows that maternal healthcare utilisation was associated with a range of socioeconomic, household and access-related factors. Women's education was positively associated with ANC4 and facility delivery, while partner's education was more closely related to ANC4 and timely PNC, possibly through better health knowledge and support for care

seeking (Tiruneh et al., 2017; Sserwanja et al., 2022, 2023). Household wealth was particularly important for facility delivery, suggesting that indirect costs such as transport, medicines and accompaniment remain relevant despite policies aimed at reducing user fees. Important geographical differences were also observed: women in North Western Province had lower probabilities of ANC4 and facility delivery, while those in Western Province had lower ANC4 but higher timely PNC than women in Eastern Province. Distance reduced both facility delivery and timely PNC, confirming the continued importance of physical access. The positive associations of reported permission and money barriers with some outcomes should not be interpreted as beneficial effects, as they may reflect reporting differences, previous experience of seeking care, service targeting or other unmeasured factors. Pregnancies wanted later were associated with lower ANC4 and timely PNC, while employment and female household headship did not consistently improve service use and may reflect time, resource or support constraints. Ethnic differences were also present, although these may capture geographical, social and service-access differences rather than ethnicity itself. Health insurance was strongly associated with timely PNC, but the result requires caution because coverage was uncommon. Overall, the findings indicate that bargaining power operates alongside education, financial resources, pregnancy wantedness, location, household circumstances and health-service accessibility in shaping maternal healthcare utilisation.

4.7 Robustness of the ANC findings

The robustness estimate in Table 3 strengthens the ANC conclusion. A one-point increase in bargaining power was associated with a 4.23 percentage-point increase in ANC8 ($p < 0.001$), and participation in all three decisions raised the probability by 7.65 percentage points. The larger ANC8 effect is plausible because eight contacts require repeated transport, time and household support. It is consistent with the idea that bargaining power matters more for sustained health investments than for a single decision (Beegle et al., 2001; Doss, 2011; Maitra, 2004).

This strengthens the main conclusion in two ways. First, the relationship is not an artefact of using the older four-visit standard. Second, bargaining power appears especially important for completing a more intensive course of care. Reaching four visits may be relatively common and may require fewer repeated decisions. Completing eight contacts requires sustained attendance, repeated transport and continuing household support. Women with greater authority may be better positioned to maintain this pattern throughout pregnancy.

The alternative binary high-power measure produced results consistent with the main score for ANC4 and facility delivery. Participation in all three decisions was associated with a 4.01 percentage-point increase in ANC4 and a 3.79 percentage-point increase in facility delivery. It was again unrelated to timely PNC. The consistency across the continuous score, categorical measure and binary high-power indicator supports the robustness of the central findings.

5 Policy implications

The findings suggest that expanding maternal-health services should be accompanied by measures that strengthen women's ability to use them. Women's bargaining power was positively associated with adequate ANC and facility-based delivery, with the clearest advantages found among women participating in all three household decisions. The Ministry of Health, local councils and development partners should therefore incorporate women's participation in healthcare and household financial decisions into maternal-health communication and community programmes. Joint decision-making should be promoted as cooperation between partners while preserving women's authority over their own healthcare.

Community programmes should also engage husbands, partners, mothers-in-law and other influential relatives because maternal-health decisions may involve several household members. Evidence from Mali and Sierra Leone shows that family relationships and gender norms can shape women's ability to act on their healthcare preferences (White et al., 2013; Cornish et al., 2021). Such programmes could encourage early birth planning, agreement on the intended place of delivery, advance preparation for transport and prompt action when pregnancy or delivery complications arise.

The positive ANC findings, including the stronger ANC8 robustness result, suggest that supporting women's continued attendance is particularly important. Practical measures could include reliable appointment and reminder systems, community follow-up, flexible service hours and transport support. The separate decision-domain results also suggest that participation in personal-healthcare and major-purchase decisions may be especially relevant to adequate ANC. Women's groups, savings programmes and livelihood interventions may help women meet transport and other indirect costs, but economic support should be combined with efforts to address household decision-making norms because income alone may not give women authority over healthcare choices (Cornish et al., 2021).

The results also show that women's bargaining power cannot replace improvements in the accessibility of services. Education and household wealth were positively associated with some outcomes, while distance was negatively associated with facility delivery and timely PNC. Policies should therefore combine empowerment programmes with improved referral arrangements, dependable emergency transport and targeted outreach to geographically underserved and poorer communities. Maternal-health information should also be presented in accessible forms to ensure that women with limited education can understand available services, birth-preparedness guidance and signs of complications.

The absence of a significant association between bargaining power and timely PNC indicates that empowerment programmes alone may not improve every stage of maternal care. Since many postnatal checks occur before discharge, facilities should establish and monitor procedures to ensure that every woman receives and understands a postnatal assessment before leaving. Community health workers should follow up women who deliver at home, leave facilities early or live far from health services. Overall, the findings support a combined approach that strengthens women's household participation while addressing financial, geographical and health-system barriers. Because the results represent adjusted associations rather than causal effects, these recommendations should be introduced with careful monitoring and evaluation.

6 Limitations

This study has some limitations. The cross-sectional design means that the findings represent adjusted associations rather than causal effects. In addition, household decision participation was measured at the time of the survey, while maternal healthcare use related to an earlier birth. Restricting the analysis to the most recent birth within the preceding two years reduced the time between these measurements, although it could not remove it completely.

The bargaining-power score captures participation in three important household decisions but does not represent every dimension of women's empowerment. It also treats decisions made independently and jointly as participation. The findings should therefore be interpreted as evidence about the breadth of household decision participation rather than complete autonomy.

Maternal healthcare utilisation was self-reported and may be affected by recall or reporting errors. The analysis was also limited to married or cohabiting women for whom the relevant decision-making questions were available, so the results should not be extended automatically to women outside unions. Nevertheless, the use of nationally representative survey data, adjustment for the complex DHS design, comparison of three maternal-health outcomes and consistency checks using alternative bargaining-power measures strengthen the analysis. The study therefore provides useful evidence on how household decision participation is associated with different stages of maternal healthcare use in Sierra Leone.

7 Conclusion

Using nationally representative data from the 2019 Sierra Leone Demographic and Health Survey, this study examined the relationship between women's household decision participation and the use of maternal healthcare services among married or cohabiting women with a recent birth. Greater bargaining power was positively associated with completing at least four ANC visits and delivering in a health facility, but it was not significantly associated with receiving timely maternal PNC. The categorical results showed the clearest advantages among women who participated in all three household decisions, suggesting that broad decision participation may be more relevant than involvement in only one area. The positive ANC finding was also maintained when adequate care was defined as at least eight contacts.

The differences across the three outcomes show that women's bargaining power does not operate uniformly throughout the maternal-healthcare pathway. It appears more relevant to services that require women to initiate care, attend repeatedly or mobilise household support. Timely PNC, particularly when provided before discharge, may depend more on facility procedures and provider practices. Sierra Leone's maternal-health policies should therefore combine accessible and reliable services with programmes that promote women's meaningful participation in healthcare and household financial decisions. These findings provide useful national evidence, although they should be interpreted as adjusted associations rather than causal effects.

8 Declarations

Funding

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Clinical trial number

Clinical trial number: not applicable.

Ethics approval

This study used anonymised secondary data from the 2019 Sierra Leone Demographic and Health Survey. The original survey received the required ethical approvals. Permission to access and use the dataset for this study was obtained from the DHS Program. The present study did not involve the direct recruitment of participants, collection of new data or access to personally identifiable information.

Consent to participate

Informed consent was obtained from all participants during the original 2019 Sierra Leone Demographic and Health Survey. The present study involved only the secondary analysis of anonymised survey data.

Consent for publication

Not applicable. The manuscript does not contain identifiable personal information, images or individual case details.

9 References

Adhikari, R. (2016). Effect of women's autonomy on maternal health service utilization in Nepal: A cross-sectional study. BMC Women's Health, 16, 26. https://doi.org/10.1186/s12905-016-0305-7

Ahmmed, F. (2022). Women's empowerment and practice of maternal healthcare facilities in Bangladesh: A trend analysis. Journal of Health Research, 36(6), 1104–1117. https://doi.org/10.1108/JHR-11-2020-0559

Akram, N., Hamid, A., & Akram, M. I. (2019). Role of women empowerment in utilization of maternal healthcare services: Evidence from Pakistan. Pakistan Economic and Social Review, 57(1), 93–116.

Ameyaw, E. K., Tanle, A., Kissah-Korsah, K., & Amo-Adjei, J. (2016). Women's health decision-making autonomy and skilled birth attendance in Ghana. International Journal of Reproductive Medicine, 2016, 6569514. https://doi.org/10.1155/2016/6569514

Anik, A. I., Ghose, B., & Rahman, M. M. (2021). Relationship between maternal healthcare utilisation and empowerment among women in Bangladesh: Evidence from a nationally representative cross-sectional study. BMJ Open, 11, e049167. https://doi.org/10.1136/bmjopen-2021-049167

Beegle, K., Frankenberg, E., & Thomas, D. (2001). Bargaining power within couples and use of prenatal and delivery care in Indonesia. Studies in Family Planning, 32(2), 130–146. https://doi.org/10.1111/j.1728-4465.2001.00130.x

Cornish, H., Walls, H., Ndirangu, R., Ogbureke, N., Bah, O. M., Tom-Kargbo, J. F., Dimoh, M., & Ranganathan, M. (2021). Women's economic empowerment and health related decision-making in rural Sierra Leone. Culture, Health & Sexuality, 23(1), 19–36. https://doi.org/10.1080/13691058.2019.1683229

Darteh, E. K. M., Dickson, K. S., & Doku, D. T. (2019). Women's reproductive health decision-making: A multi-country analysis of demographic and health surveys in sub-Saharan Africa. PLOS ONE, 14(1), e0209985. https://doi.org/10.1371/journal.pone.0209985

Doss, C. (2011). Intrahousehold bargaining and resource allocation in developing countries. World Development Report 2012 background paper. World Bank.

Duflo, E. (2012). Women empowerment and economic development. Journal of Economic Literature, 50(4), 1051–1079. https://doi.org/10.1257/jel.50.4.1051

Ewerling, F., Lynch, J. W., Victora, C. G., van Eerdewijk, A., Tyszler, M., & Barros, A. J. D. (2017). The SWPER index for women's empowerment in Africa: Development and validation of an index based on survey data. The Lancet Global Health, 5(9), e916–e923. https://doi.org/10.1016/S2214-109X(17)30292-9

Garrison-Desany, H. M., Wilson, E., Munos, M., Sawadogo-Lewis, T., Maiga, A., Ako, O., Mkuwa, S., Hobbs, A. J., & Morgan, R. (2021). The role of gender power relations on women's health outcomes: Evidence from a maternal health coverage survey in Simiyu region, Tanzania. BMC Public Health, 21, 909. https://doi.org/10.1186/s12889-021-10972-w

Gupta, P., & Bharti, A. K. (2026). What shapes women's bargaining power within households? Evidence from Jammu and Kashmir, India. Frontiers in Social Sciences Research, 2(6). https://doi.org/10.24113/sxcywf56

Kadengye, D. T., Atahigwa, C., Kampire, P., Mucunguzi, S., Kemigisha, E., Nyakato, V. N., & Kiwuwa-Muyingo, S. (2020). Effect of women's intra-household bargaining power on postnatal and infant healthcare in rural Uganda: Results from a cross-sectional survey in Kyenjojo district. Midwifery, 84, 102665. https://doi.org/10.1016/j.midw.2020.102665

Kebede, A. A., Cherkos, E. A., Taye, E. B., Eriku, G. A., Taye, B. T., & Chanie, W. F. (2021). Married women's decision-making autonomy in the household and maternal and neonatal healthcare utilization and associated factors in Debretabor, northwest Ethiopia. PLOS ONE, 16(9), e0255021. https://doi.org/10.1371/journal.pone.0255021

Kishor, S., & Subaiya, L. (2008). Understanding women's empowerment: A comparative analysis of Demographic and Health Surveys data (DHS Comparative Reports No. 20). Macro International.

Kumar, S., & Mondal, S. (2024). Empowerment of women from the experience of Indian states: A reflection of NFHS-5. GeoJournal, 89, 64. https://doi.org/10.1007/s10708-024-11065-y

Lee, R., Kumar, J., & Al-Nimr, A. (2017). Women's healthcare decision-making autonomy by wealth quintile from Demographic and Health Surveys in sub-Saharan African countries. International Journal of Women's Health and Wellness, 3, 054. https://doi.org/10.23937/2474-1353/1510054

Li, C., & Sun, D. (2023). Women's bargaining power and spending on children's education: Evidence from a natural experiment in China. International Journal of Educational Development, 100, 102787. https://doi.org/10.1016/j.ijedudev.2023.102787

Maitra, P. (2004). Parental bargaining, health inputs and child mortality in India. Journal of Health Economics, 23(2), 259–291. https://doi.org/10.1016/j.jhealeco.2003.09.002

Ministry of Health. (2026). Advocacy and action campaign for ending preventable maternal, infant and child deaths in Sierra Leone.

Mondal, D., Karmakar, S., & Banerjee, A. (2020). Women's autonomy and utilization of maternal healthcare in India: Evidence from a recent national survey. PLOS ONE, 15(12), e0243553. https://doi.org/10.1371/journal.pone.0243553

Mukong, A. K., & Burns, J. (2019). Bargaining power within couples and health care provider choice in Tanzania. African Development Review, 31(3), 380–392. https://doi.org/10.1111/1467-8268.12393

Ntoimo, L. F. C., Okonofua, F. E., Aikpitanyi, J., Yaya, S., Johnson, E., Sombie, I., Aina, O., & Imongan, W. (2022). Influence of women's empowerment indices on the utilization of skilled maternity care: Evidence from rural Nigeria. Journal of Biosocial Science, 54(1), 77–93. https://doi.org/10.1017/S0021932020000681

Pandey, S., Lama, G., & Lee, H. (2012). Effect of women's empowerment on their utilization of health services: A case of Nepal. International Social Work, 55(4), 554–573. https://doi.org/10.1177/0020872811408575

Sougou, N. M., Bassoum, O., Faye, A., & Leye, M. M. M. (2020). Women's autonomy in health decision-making and its effect on access to family planning services in Senegal in 2017: A propensity score analysis. BMC Public Health, 20, 872. https://doi.org/10.1186/s12889-020-09003-x

Sserwanja, Q., Mukunya, D., Musaba, M. W., Mutisya, L. M., Kamara, K., & Ziaei, S. (2023). Women empowerment indices and utilization of health facilities during childbirth: Evidence from the 2019 Sierra Leone Demographic Health Survey. BMC Health Services Research, 23, 109. https://doi.org/10.1186/s12913-023-09122-2

Sserwanja, Q., Nuwabaine, L., Kamara, K., & Musaba, M. W. (2022). Prevalence and factors associated with utilisation of postnatal care in Sierra Leone: A 2019 national survey. BMC Public Health, 22, 102. https://doi.org/10.1186/s12889-022-12494-5

Statistics Sierra Leone, & ICF. (2020). Sierra Leone Demographic and Health Survey 2019. Statistics Sierra Leone and ICF.

Strauss, John and Duncan Thomas. 1995. "Human Resources: Empirical Modeling of Household and Family Decisions," In *Handbook of Development Economics, Volume 3A,* ed. J. Behrman and T.N. Srinivasan, 1883-2023. Amsterdam: Elsevier.

Sun, X., Yang, J., & Liu, H. (2025). Women's bargaining power and household expenditure: Nonlinear effects from Chinese microdata. Economic Analysis and Policy, 88, 775–800. https://doi.org/10.1016/j.eap.2025.09.027

Tchakounté Tchuimi, D., & Fomba Kamga, B. (2024). The effect of women's bargaining power within couples on contraceptive use in Cameroon (Version 3). Gates Open Research, 4, 20. https://doi.org/10.12688/gatesopenres.13100.3

Tiruneh, F. N., Chuang, K.-Y., & Chuang, Y.-C. (2017). Women's autonomy and maternal healthcare service utilization in Ethiopia. BMC Health Services Research, 17, 718. https://doi.org/10.1186/s12913-017-2670-9

Vallières, F., Cassidy, E. L., McAuliffe, E., Gilmore, B., Bangura, A. S., Musa, J., & colleagues. (2016). Can Sierra Leone maintain the equitable delivery of their Free Health Care Initiative? The case for more contextualised interventions: Results of a cross-sectional survey. BMC Health Services Research, 16, 258.

Vedam, S., Stoll, K., McRae, D. N., Korchinski, M., Velasquez, R., Wang, J., Partridge, S., McRae, L., Martin, R. E., Jolicoeur, G., & CCinBC Steering Council. (2019). Patient-led decision making: Measuring autonomy and respect in Canadian maternity care. Patient Education and Counseling, 102(3), 586–594. https://doi.org/10.1016/j.pec.2018.10.023

White, D., Dynes, M., Rubardt, M., Sissoko, K., & Stephenson, R. (2013). The influence of intrafamilial power on maternal health care in Mali: Perspectives of women, men and mothers-in-law. International Perspectives on Sexual and Reproductive Health, 39(2), 58–68. https://doi.org/10.1363/3905813

World Health Organization. (2016). WHO recommendations on antenatal care for a positive pregnancy experience. World Health Organization.

10 Appendices

Table A1. Robustness analysis using separate household decision-making indicators

Decision-making component	ANC4 AME (SE)	Facility delivery AME (SE)	Timely PNC AME (SE)
Own healthcare decisions	0.0405** (0.0205)	−0.0055 (0.0256)	−0.0074 (0.0235)
Major household purchases	0.0296* (0.0158)	0.0365* (0.0222)	0.0323* (0.0192)
Visits to relatives	−0.0209 (0.0196)	0.0031 (0.0241)	−0.0192 (0.0221)
Joint-test p-value	0.0038	0.1112	0.3948
Model observations	2,892	3,232	3,239

Note: Entries are adjusted average marginal effects, with survey-adjusted standard errors in parentheses. Each marginal effect represents the discrete change in the predicted probability of using the relevant service when a woman participates in that decision, compared with not participating. The three decision-making indicators were included simultaneously in each model. All models included the full set of control variables and accounted for the DHS sampling weights, primary sampling units and strata. The joint-test p-value tests whether the coefficients of the three decision indicators are collectively equal to zero. **$p < 0.01$; *$p < 0.05$; $p < 0.10$.

Table A2 Full Adjusted Regression Results

Adjusted average marginal effects from survey-weighted Probit models for adequate antenatal care, facility-based delivery and timely maternal postnatal care

Variable and category	ANC4 AME (SE)	Facility delivery AME (SE)	Timely PNC AME (SE)
Women's bargaining power			
Bargaining-power score (0-3)	0.0173*** (0.0052)	0.0113** (0.0052)	0.0019 (0.0059)
Woman's age group			
15-19	Ref.	Ref.	Ref.
20-24	-0.0230 (0.0285)	-0.0047 (0.0295)	0.0060 (0.0345)
25-29	0.0172 (0.0306)	-0.0197 (0.0314)	0.0061 (0.0367)
30-34	-0.0092 (0.0332)	-0.0072 (0.0352)	0.0193 (0.0389)
35-39	0.0047 (0.0354)	-0.0210 (0.0408)	0.0318 (0.0401)
40-44	0.0128 (0.0435)	-0.0172 (0.0486)	0.0553 (0.0440)
45-49	-0.0581 (0.0598)	-0.0030 (0.0562)	0.0725 (0.0481)
Woman's educational attainment			
No education	Ref.	Ref.	Ref.
Primary	-0.0005 (0.0209)	0.0345* (0.0198)	0.0221 (0.0200)
Secondary	0.0317* (0.0180)	0.0719*** (0.0179)	0.0314 (0.0211)
Higher	0.0934*** (0.0181)	0.1005** (0.0489)	0.0549 (0.0555)
Partner's educational attainment			
No education	Ref.	Ref.	Ref.
Primary	0.0419** (0.0184)	0.0348 (0.0259)	0.0469** (0.0221)
Secondary	0.0007 (0.0166)	0.0090 (0.0181)	0.0164 (0.0177)
Higher	-0.0074 (0.0287)	-0.0094 (0.0333)	0.0574** (0.0252)
Household wealth quintile			
Poorest	Ref.	Ref.	Ref.
Poorer	0.0338* (0.0183)	0.0348* (0.0203)	0.0241 (0.0200)
Middle	0.0351 (0.0215)	0.0417* (0.0233)	0.0530** (0.0221)
Richer	0.0378 (0.0304)	0.0783** (0.0318)	0.0223 (0.0326)

Variable and category	ANC4 AME (SE)	Facility delivery AME (SE)	Timely PNC AME (SE)
Richest	-0.0040 (0.0409)	0.1194*** (0.0344)	0.0383 (0.0385)
Residence and employment			
Urban residence	0.0072 (0.0256)	0.0138 (0.0290)	0.0215 (0.0300)
Woman currently working	-0.0023 (0.0146)	0.0017 (0.0203)	-0.0413** (0.0187)
Birth order			
First birth	Ref.	Ref.	Ref.
Birth order 2-3	-0.0185 (0.0219)	-0.0327 (0.0221)	-0.0257 (0.0211)
Birth order 4-5	0.0023 (0.0233)	-0.0078 (0.0276)	-0.0264 (0.0260)
Birth order 6 or more	-0.0130 (0.0281)	0.0151 (0.0309)	-0.0564* (0.0311)
Household characteristics			
Female-headed household	0.0061 (0.0154)	-0.0336* (0.0191)	-0.0436** (0.0174)
Number of household members	0.0009 (0.0020)	-0.0006 (0.0022)	-0.0016 (0.0025)
Province of residence			
Eastern	Ref.	Ref.	Ref.
Northern	-0.0307 (0.0254)	0.0074 (0.0357)	0.0911** (0.0419)
North Western	-0.0589** (0.0270)	-0.1151*** (0.0420)	0.0629 (0.0446)
Southern	-0.0119 (0.0196)	-0.0231 (0.0303)	0.0680** (0.0329)
Western	-0.1000*** (0.0296)	-0.0645 (0.0440)	0.1346*** (0.0442)
Healthcare-access barriers			
Difficulty obtaining permission for treatment	-0.0213 (0.0147)	0.0438** (0.0173)	-0.0130 (0.0167)
Difficulty obtaining money for treatment	-0.0099 (0.0190)	0.0181 (0.0198)	0.0719*** (0.0197)
Distance to health facility is a big problem	0.0107 (0.0157)	-0.0948*** (0.0200)	-0.0451** (0.0178)
Pregnancy wantedness			
Wanted then	Ref.	Ref.	Ref.
Wanted later	-0.0660*** (0.0236)	-0.0027 (0.0237)	-0.0715*** (0.0265)
Wanted no more	-0.1335** (0.0584)	-0.0270 (0.0408)	-0.0455 (0.0383)
Religion			
Christian	Ref.	Ref.	Ref.
Islam	0.0252 (0.0222)	-0.0017 (0.0226)	0.0221 (0.0223)
None	Omitted	Omitted	Omitted
Ethnic group			
Creole	-0.1283 (0.1451)	Omitted	Omitted
Fullah	0.0395 (0.0312)	0.0647 (0.0611)	0.0016 (0.0521)
Kono	0.0112 (0.0488)	0.0197 (0.0584)	-0.0645 (0.0699)
Limba	-0.0053 (0.0269)	0.0331 (0.0367)	0.0104 (0.0367)

Variable and category	ANC4 AME (SE)	Facility delivery AME (SE)	Timely PNC AME (SE)
Loko	-0.0659 (0.0655)	0.1115*** (0.0428)	-0.0238 (0.0636)
Mandingo	0.0320 (0.0337)	0.0499 (0.0706)	-0.0406 (0.0616)
Mende	0.0017 (0.0243)	0.1334*** (0.0306)	0.1240*** (0.0312)
Sherbro	-0.1572** (0.0648)	-0.1202* (0.0694)	-0.0154 (0.0690)
Temne	Ref.	Ref.	Ref.
Korankoh	-0.0124 (0.0340)	-0.0938 (0.0669)	0.0070 (0.0481)
Other Sierra Leonean	-0.0267 (0.0312)	0.0050 (0.0438)	0.0462 (0.0435)
Other foreign	Omitted	Omitted	0.1293** (0.0648)
Health insurance			
Covered by health insurance	0.0265 (0.0401)	0.0283 (0.0397)	0.1982*** (0.0547)
Model observations	**2892**	**3232**	**3239**

Note: Entries are adjusted average marginal effects (AMEs), with survey-adjusted standard errors in parentheses. The bargaining-power estimate is the change associated with a one-point increase in the 0-3 score; effects for categorical variables are discrete changes relative to the stated reference category. Ref. denotes the reference category. Omitted denotes a rare category excluded because of perfect prediction. All models include the full control set and account for DHS weights, primary sampling units and strata. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.