Original article

Assessing the role of women's autonomy and acceptability of intimate-partner violence in maternal health-care utilization in 63 low- and middle-income countries

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Abstract

Background: Our study investigates the associations between women's autonomy and attitudes toward the acceptability of intimate-partner violence against women (IPVAW) and maternal health-care utilization outcomes.

Methods: We combine data from 113 Demographic and Health Surveys conducted between 2003 and 2016, which give us a pooled sample of 765 169 mothers and 777 352 births from 63 countries. We generate composite scores of women's autonomy (six-point scale with reference: no contribution) and acceptability of IPVAW (five-point scale with reference: no acceptance) and assess the associations between these measures and women's use of antenatal care services and facility delivery in pooled and unique country samples.

Results: A change in a woman's autonomy score from 'no contribution to any decision-making domain' (a composite autonomy score of 0) to 'contribution to all decision-making domains' (a score of 6) is associated with a 31.2% increase in her odds of delivering in a facility and a 42.4% increase in her odds of receiving at least eight antenatal care visits over the course of her pregnancy. In contrast, a change in a woman's attitude towards acceptability of IPVAW from 'IPVAW is not acceptable under any scenario' (a score of 0) to 'IPVAW is acceptable in all scenarios' (a score of 5) is associated with an 8.9% decrease in her odds of delivering in a facility and a 20.3% decrease in her odds of receiving eight antenatal care visits.

Conclusions: Our findings suggest that strong and significant associations exist between autonomy, acceptability of IPVAW and utilization of maternal health-care services.

Key words: Maternal health, antenatal care, facility delivery, women's autonomy, intimate partner violence, Demographic and Health Surveys, low- and middle-income countries

Key Messages

- Women's decision-making capacity and perceptions of intimate-partner violence against women (IPVAW) are, at a global level, integral to their care-seeking behaviour and health-service use.
- Increased women's autonomy is positively associated with the use of antenatal care and facility delivery, both globally and disaggregated by subgroups.
- Increase in acceptable attitudes towards IPVAW is inversely associated with the use of antenatal care and facility delivery, both globally and disaggregated by subgroups.
- There is a need to take maternal autonomy and empowerment into consideration when designing programmes and policies that aim to improve health services for women.

Introduction

In spite of the recent global progress that has been made to reduce maternal morbidity and mortality, nearly 830 women continue to die each day from preventable causes related to pregnancy and childbirth, with most of these deaths occurring in low- and middle-income countries.[1] The use of antenatal and skilled delivery care is associated with both improved maternal health and reduced maternal deaths related to childbirth, including pre-eclampsia and postpartum haemorrhage; however, utilization of these and other basic maternal health services in such settings remains low.[2–6]

A large body of literature has investigated the determinants of poor care-seeking behaviour by women, including physical barriers to access (distance to care, lack of transport, etc.), health-system constraints, as well as key demographic and socio-economic risk factors for low utilization of reproductive health services. In contrast, fewer studies have examined the extent to which socio-cultural dimensions that shape women's status and autonomy are related to their use of health services.[7] In contexts where inequitable gender norms and practices restrict women's freedom to act in their own interests, it is important to understand how women's relative lack of decision-making power impact their potential to seek and receive care, particularly while they are pregnant.[8,9] Discriminatory gendered practices are likely to directly disempower women relative to men—this constraint on women's autonomy is reflected in their observed behaviour and limits their interpersonal control over decision-making relative to men. Over time, these gendered practices may become institutionalized and reinforced through the social fabric such that they begin to shape and dictate gender attitudes—as a result, the subordination of women through these practices is subsequently normalized. The acceptability of intimate-partner violence against women (IPVAW) is one example of a general attitude in many societies; e.g. in many Sub-Saharan African and South Asian contexts, a husband beating his wife is often accepted and may even be considered a right by both men *and* women.[10]

The definition of 'empowerment' has varied in the literature but is generally described as the 'expansion in people's ability to make strategic life choices in a context where this ability was previously denied to them'[11]; similarly, terms such as women's autonomy, agency and status have been interchangeably defined, measured and analysed.[9,12] Empirical studies using Demographic and Health Survey (DHS) data have previously investigated the role of women's empowerment and autonomy in maternal health-care use[9,13–15] as well as on fertility and family-planning outcomes.[14,16] These studies have varied in their country and sample coverage, and in the types of proxies that have been used to measure autonomy and empowerment, although most of the proxies did include some indicators of women's involvement in household decision-making with respect to control over household purchases for daily needs, access to health care and visitation of family and friends. In reviewing the DHS analyses, we have identified several single-country studies[13,15–17] as well as a few multi-country studies, which have ranged from analysing data from 8–31 countries across sub-Saharan Africa, South Asia and Latin America.[14,18,19] However, no analysis, to our knowledge, has investigated the role of women's autonomy and empowerment in maternal health-care utilization on a global level.

Empowerment also comprises a conceptual link to interpersonal gender dynamics in the household, particularly around norms as to the acceptability of violence in spousal interactions. The acceptability of IPVAW, which reinforces a collective attitude of sanctioning women emotionally, physically or sexually for deviating from contextually specified gender roles, is a global public health concern that has direct implications for maternal health-service utilization. To date, empirical studies have found limited and mixed evidence on the relationship between women's acceptability of IPVAW and care-seeking behaviours,

particularly with respect to age, marital status, place of residence and decision-making power.[10,20] These studies, which either focused on single or selected multi-country samples, propose that the acceptability of IPVAW may be context-dependent and highlight the cross-country variation in how these attitudes relate to actual experience of IPVAW.[21,22] At a global level, it is likely that the role of gender dynamics in shaping women's well-being extend well beyond their decision-making autonomy around health-service utilization. A more comprehensive exploration of these dynamics, particularly as they relate to global attitudes towards IPVAW, may therefore speak to understanding the deeper normative constraints to women's agency, which include their decision to seek and receive care. Whereas DHS surveys may not provide ideal measures of women's autonomy and acceptability of IPVAW, both of which are multidimensional latent constructs that are inherently difficult to conceptualize and even more difficult to measure,[10,14,18] they offer a foundation for undertaking a global analysis from which first-stage inferences across countries and within specific subgroups can be drawn.

Figure 1 presents our analytic framework that describes the relationship between women's autonomy and acceptability of IPVAW, as key components of women's empowerment, and maternal health-care utilization. Our theory of change relies on the notion that a woman's ability to seek and utilize health care is, in part, a function of her decision-making autonomy.[23] Our framework theorizes empowerment as a latent construct that is reflected by women's capacity for decision-making, normative attitudes around the treatment of women (including IPVAW) and socio-demographic characteristics that shape women's experiences and interactions with the service-provision environment.[24] We particularly recognize the role of improved access to care, through physical (geographic), financial and social means, as both a socio-demographic determinant of empowerment as well as a potential mediator on the causal pathway between empowerment and maternal health-care utilization.[25,26] On the one hand, physical proximity and improved access to care may be a source of empowerment for women; however, it is also likely that a woman's increased autonomy and decision-making capacity may result in her receiving greater access to resources and services, which in turn would allow her to better seek care. Finally, we acknowledge the role of the quality of care in women's utilization of maternal health services.[4]

In this study, we investigate the role of women's autonomy and acceptability of IPVAW in maternal health-care utilization outcomes [antenatal care (ANC) use and facility delivery]. Our study draws on all available recent DHS data from 63 low- and middle-income countries to investigate how gender dynamics are related to women's care-seeking behaviour at a global level. Pooling data provides us with sufficient power and sample size to estimate global associations in low- and middle-income countries. We also conduct several disaggregated analyses by country and present results that are stratified by key subgroups of interest.
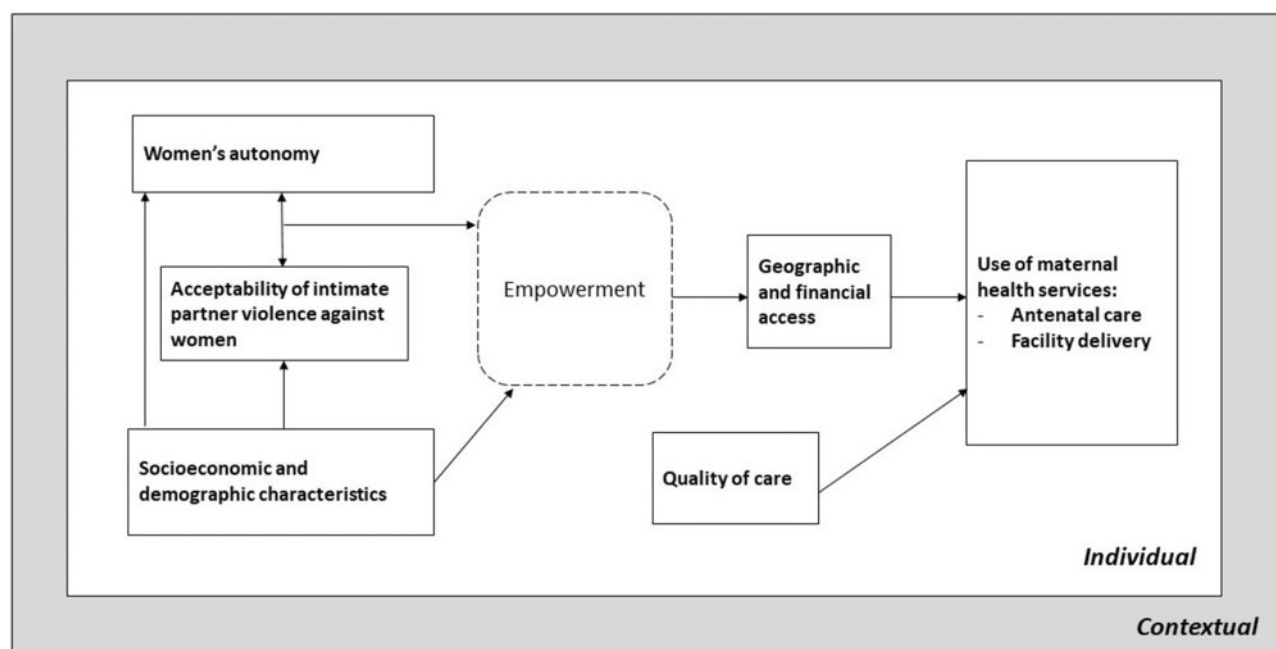

Figure 1. Conceptual framework.

Methods

This proposed analysis was exempt according to guidelines issued by the Population Council Institutional Review Board.

Study population

We combine data from all available DHS surveys conducted between 2003 and 2016. The DHS surveys are nationally representative cross-sectional surveys that cover a range of health topics.[27] All surveys employ a two-stage cluster sampling design, stratifying by region and urban/rural residence and interviewing about 20–30 women aged 15–49 per primary sampling unit, each of which generally corresponds to a census enumeration area and which is randomly selected within each strata. Data merged across 113 DHS surveys from 63 low- and middle-income countries resulted in a pooled sample of 1 119 455 women and 1 136 033 births. After dropping observations with missing information on our key outcomes and covariates, we are left with our analytic sample of 765 159 women and 777 352 births from 47 low- and middle-income countries. Figure 1 shows the geographical distribution of the 63 countries that are covered in our sample; Supplementary Table A2, available as Supplementary data at *IJE* online, presents a list of the countries that contributed observations to the final analytic sample; and Supplementary Table A3, available as Supplementary data at *IJE* online, presents the process by which the final analytic sample was obtained.

Outcome variables

We analyse women's use of ANC services and delivery in a health facility as primary outcomes. A woman was coded to have received appropriate ANC for a given birth if she reported receiving at least eight visits during pregnancy, as previously recommended as the minimum number requirement by the World Health Organization (WHO) and considered standard in previous DHS analyses.[28] Both variables were coded as binary outcomes for the analysis.

Explanatory variables

We constructed two scores of women's autonomy and acceptability of IPVAW. A woman's decision-making autonomy was assessed based on the extent to which she contributed to making decisions over a series of response items, including decisions over household finances, healthcare seeking, household purchases, visiting relatives and friends, and cooking food. For each of these items, a

woman's response was coded as 1 if she answered 'yes' to making the decision alone or jointly with a partner or someone else and 0 otherwise. In this regard, as long as a woman expressed that she was contributing to the decision-making process in any capacity, her response was coded as 1. A woman's composite autonomy score (a value between 0 and 6) was derived by aggregating her six autonomy responses and an autonomy percentage score (a value between 0 and 1) for each woman was calculated by dividing her composite autonomy score by six. A similar coding structure was applied to generate our measures for women's attitudes towards IPVAW. A woman's composite acceptability of IPVAW score (a value between 0 and 5) as well as her acceptability of IPVAW percentage score was calculated over a series of five response items that captured her attitudes towards whether or not a husband beating his wife is justified if she were to: 'go out without telling her husband'; 'neglect her children'; 'argue with her husband'; 'refuse sex'; and 'burn food'. A higher acceptable IPVAW score indicates that a woman is more accepting of a husband beating his wife across these domains.

Statistical analysis

We use multivariable logistic regressions to estimate the associations between our generated autonomy and acceptability of IPVAW attitudes scores and our binary outcomes of interest. Our regressions include mother-, birth- and cluster-level controls. At the mother level, we control for wealth index of the household (in quintiles), mother's educational attainment group (no education, primary, secondary, higher), maternal age (in 5-year age groups), marital status, and place of residence (urban/rural). At the birth level, we control for birth order and child sex. To control for spatial differences in socio-economic characteristics, we include average cluster wealth and average cluster educational attainment. For regressions with women's use of ANC as the dependent variable, we include a percentage score of quality of care, which, in a similar fashion to the autonomy and acceptability of IPVAW composite scores, is calculated by taking the average score across a list of seven response items that capture the level and quality of care that was provided to the woman during her pregnancy. The list of response items include: whether a woman's weight was checked, whether her height was checked, whether her blood pressure was checked, whether a urine sample was taken, whether a blood sample was taken, whether she was told about possible pregnancy-related complications, and whether she was told where to go in the event that she experienced complications. Supplementary Table A1, available as Supplementary data at *IJE* online, presents additional information for each

Table 1. Descriptive statistics, mother-level outcomes and covariates

	Mean	SD	No. cases	Min.	Max.
Mother-level outcomes					
Delivery in a health facility (1 = yes)	0.598		457 571		
WHO recommended 8 ANC visits (1 = yes)	0.169		131 373		
Mother-level covariates					
Wealth, quintiles	2.887	1.400		1	5
Maternal education, none (1 = yes)	0.333		254 801		
Maternal education, primary (1 = yes)	0.319		244 089		
Maternal education, secondary (1 = yes)	0.284		217 308		
Maternal education, higher (1 = yes)	0.064		48 971		
Maternal age, years	28.607	6.979		13	49
Marital status (1 = married)	0.755		577 703		
Urban (1 = yes)	0.345		263 983		
Cluster-level covariates					
Average wealth, quintiles	2.873	1.135		1	5
Average education, highest level	1.068	0.719		0	3.8
N	765 169				

Each observation corresponds to a woman.

variable used in the analysis. Lastly, we include survey and year-of-birth fixed effects in all of our models to control for country and temporal trends. Standard errors are clustered at the primary sampling unit (DHS-cluster) level. We interpret regression coefficients as odds ratios of the outcome, and we conduct regression analyses separately for the full sample and for each survey. All analyses were performed using Stata, version 13.[29]

Results

Tables 1 and 2 present descriptive statistics on the final analytic sample of 765 169 mothers and 777 352 births, respectively. Globally, 16.9% of mothers received at least eight ANC visits for their last birth and 59.8% of mothers delivered their last birth in a health facility. The mean age for women in our sample is 28.6 years and 65% of women in our sample had only a primary level of education or less. As shown in Table 3, we find large variation in the extent to which women received services during ANC for their last birth; whereas 72% of women reported having received blood-pressure checks during their pregnancy, only 43.1% were informed about the types of complications that may occur during pregnancy and only 20.2% of women were informed on what do to when danger signs arise.

Table 4 presents the response items to the autonomy and the acceptable IPVAW measures that were calculated for our analysis. Over half of women in our sample (54.7%) reported that they were involved in decisions around their own health care and in visiting their relatives. Between 30 and 49% of women reported being involved in

Table 2. Descriptive statistics, child-level covariates

	Mean	SD	No. cases	Min.	Max.
Child-level covariates					
Birth order	3.364	2.349		1	19
Multiple birth (1 = yes)	0.017		13 215		
Child sex (1 = male)	0.512		398 004		
N	777 352				

Notes: Each observation corresponds to a birth.

Table 3. Descriptive statistics, prenatal and postnatal quality covariates

	Mean	No. cases
Quality covariates		
Checked weight at pregnancy (1 = yes)	0.544	422 879
Checked height at pregnancy (1 = yes)	0.209	162 467
Checked blood pressure at pregnancy (1 = yes)	0.720	559 693
Took urine sample at pregnancy (1 = yes)	0.525	408 110
Took blood sample at pregnancy (1 = yes)	0.564	438 427
Told about pregnancy complications (1 = yes)	0.431	335 039
Told where to go for complications (1 = yes)	0.202	157 025
Health professional checked after delivery (1 = yes)	0.293	227 764
Quality score (0–1, percentage out of 8)	0.436	338 925
Quality score, prenatal (0–1, percentage out of 7)	0.456	354 473
N	777 352	

Each observation corresponds to a birth.

decisions over household finances and purchases, including making decisions over money and household and daily purchases. Only 17.4% of women reported being involved

Table 4. Distribution of autonomy and acceptability of IPVAW covariates

	Mean	No. cases
Autonomy		
Respondent involved in decisions over money (1 = yes)	0.303	231 846
Respondent involved in decisions over own health care (1 = yes)	0.547	418 547
Respondent involved in decisions over household purchases (1 = yes)	0.486	371 872
Respondent involved in decisions over daily purchases (1 = yes)	0.308	235 672
Respondent involved in decisions over visiting relatives (1 = yes)	0.586	448 389
Respondent involved in decisions over cooking food (1 = yes)	0.174	133 139
Woman autonomy score (0–1, percentage out of 6)	0.401	306 833
Acceptability of IPVAW		
Beating justified if wife goes out without telling husband (1 = yes)	0.297	227 255
Beating justified if wife neglects children (1 = yes)	0.319	244 089
Beating justified if wife argues with husband (1 = yes)	0.262	200 474
Beating justified if wife refuses sex (1 = yes)	0.213	162 981
Beating justified if wife burns food (1 = yes)	0.149	114 010
Women's acceptability of IPVAW score (0–1, percentage out of 5)	0.248	189 762
N		765 169

Each observation corresponds to a woman.

Table 5. Odds ratios of facility delivery and antenatal care use

Variables	(1) Facility delivery	(2) Antenatal care (WHO recommended 8 visits)
Main exposures		
Woman's autonomy score	1.312***	1.424***
	(1.274–1.352)	(1.374–1.475)
Women's acceptability of IPVAW score	0.911***	0.797***
	(0.888–0.934)	(0.769–0.827)
Covariates		
Wealth Quintile 2	1.307***	1.116***
	(1.280–1.333)	(1.085–1.148)
Wealth Quintile 3	1.520***	1.223***
	(1.487–1.555)	(1.185–1.262)
Wealth Quintile 4	1.868***	1.397***
	(1.822–1.915)	(1.348–1.448)
Wealth Quintile 5	2.858***	1.933***
	(2.761–2.958)	(1.853–2.016)
Education, primary	1.427***	1.254***
	(1.401–1.455)	(1.216–1.292)
Education, secondary	2.081***	1.396***
	(2.035–2.128)	(1.353–1.440)
Education, higher	4.049***	1.740***
	(3.857–4.250)	(1.670–1.813)
Marital status (1 = yes)	1.001	1.191***
	(0.979–1.023)	(1.160–1.222)
Birth order	0.840***	0.876***
	(0.836–0.844)	(0.870–0.881)
Child sex (1 = male)	1.069***	0.998
	(1.057–1.082)	(0.983–1.013)
Urban (1 = yes)	1.389***	0.978
	(1.345–1.435)	(0.950–1.007)
Average wealth score	1.422***	1.143***
	(1.397–1.448)	(1.123–1.164)
Average schooling	1.811***	1.309***
	(1.752–1.872)	(1.271–1.348)
Quality score		8.934***
		(8.586–9.297)
Constant	0.206***	0.00318***
	(0.0820–0.515)	(0.00134–0.00752)
Observations	765 169	760 871

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.
The unit of observation is the birth. Odds ratios are presented with 95% confidence intervals in the parentheses below. Delivery in a facility (column 1) reports whether the mother delivered the birth in a health facility or not. ANC visits (column 2) reports whether the mother received at least eight ANC visits for the birth. Results are from logistic regressions that include cluster mother, birth and quality-of-care controls. Cluster-level covariates are the average wealth index value of mothers in the cluster and the average educational attainment of mothers in the cluster. Mother controls include the household wealth index (in quintiles), educational attainment of the mother (no education, primary, secondary, higher), age of the mother (in 5-year age groups), mother's marital status and mother's place of residence (urban/rural). Birth-level controls include birth order and sex of the child. For column 2, quality-of-care controls include the seven-point average quality score that was generated for the birth. Survey and year-of-birth fixed effects are included, and standard errors are clustered at the primary sampling unit (DHS-cluster) level.

in decisions over cooking food. When assessing women's attitudes towards IPVAW, we find that 24.8% of women in our sample reported that it was acceptable for a husband to beat his wife if she went out without telling him, if she neglected her children, if she argued with him, if she refused sex or if she burned food. Relative to other factors, women's attitudes towards the acceptability of IPVAW is slightly higher if a woman were to neglect her children (31.9%) or were to leave the home without informing her husband (29.7%).

Results from the pooled analysis for our primary outcomes of interest are presented in Table 5. A change in a woman's autonomy score from 'no contribution to any decision-making domain' (a composite average autonomy score of 0) to 'contribution to all decision-making domains' (a score of 6) is associated with a 31.2% increase in the odds of delivering in a facility and a 42.4% increase in the odds of receiving at least eight ANC visits. In contrast, a change in a woman's acceptability of IPVAW score from 'IPVAW is not acceptable under any scenario' (a

composite average IPVAW score of 0) to 'IPVAW is acceptable in all scenarios' (a score of 5) is associated with an 8.9% decrease in the odds of delivering in a facility and a 20.3% decrease in the odds of receiving eight ANC visits.

Table 6 assesses the associations between increases in the autonomy and acceptability of IPVAW aggregate score scales and the primary outcomes of interest under both linear (top section) and non-linear (bottom section) assumptions. When assuming that the association between our score scales and our outcomes increases constantly (linearly), we find that a one-point increase in the aggregate autonomy score (e.g. an increase in the autonomy score scale from an aggregate score of 4 to 5 or from 0 to 1) is associated with a 4.6% increase in the odds of delivering in a facility and a 6.1% increase in the odds of receiving eight ANC visits. By the same token, a one-point increase in the acceptability of IPVAW aggregate score is associated with a 1.9 and 4.4% decrease in the odds of delivering in a facility and of receiving eight ANC visits, respectively. These results are confirmed in our assessment of the associations between increases in aggregate autonomy and acceptability of IPVAW scores and outcomes using non-linear (categorical) specifications of the score exposures. When we graph the point estimates and confidence intervals from Table 6 under the categorical specifications for the exposures (see Figures 4 and 5), we find evidence for a significant nonlinear association, given that the largest increases in the odds of facility delivery and women's use of ANC are found at the highest end of the scale (i.e. at the points where the aggregate autonomy score increases from 5 to 6 and where the acceptable IPVAW score increases from 4 to 5). These findings imply that, whereas we are likely to see increased health-service utilization as women's decision-making power and autonomy increase, this increased utilization is highest when women are most empowered, i.e. when they move from a score of 5 to 6 on the aggregate autonomy score and from a 1 to 0 on the aggregate acceptability of IPVAW score.

A series of robustness checks and stratified analyses are presented in Tables 7 and 8. We show that our estimated results continue to hold under alternative specifications, such as: (i) when we include partner's educational attainment and measures of the wantedness of the birth in the empirical specification; (ii) when we stratify the global sample by a variety of subgroups, including women's educational attainment, women's age (adolescents vs non-adolescents), marital status and place of residence; and (iii) when we stratify the global sample into regions (Africa, Asia) and run the analysis for these regional sub-samples.

Missing autonomy and acceptability of IPVAW indicator data affected our composite scores. To account for missingness, we conducted sensitivity analyses to assess the

Table 6. Odds ratios of facility delivery and antenatal care use, summed autonomy and acceptability of IPVAW scores, categorical

Variables	(1) Facility delivery	(2) Antenatal care (WHO recommended 8 visits)
Main exposures, summed		
Woman's autonomy score	1.046***	1.061***
	(1.041–1.051)	(1.054–1.067)
Women's acceptability of IPVAW score	0.981***	0.956***
	(0.977–0.986)	(0.949–0.963)
Main exposures, categorical		
Woman's autonomy score of 1	1.022*	1.062***
	(0.998–1.048)	(1.024–1.101)
Woman's autonomy score of 2	1.084***	1.187***
	(1.057–1.112)	(1.147–1.228)
Woman's autonomy score of 3	1.156***	1.195***
	(1.129–1.184)	(1.160–1.232)
Woman's autonomy score of 4	1.164***	1.302***
	(1.135–1.194)	(1.263–1.343)
Woman's autonomy score of 5	1.194***	1.300***
	(1.157–1.233)	(1.254–1.349)
Woman's autonomy score of 6	1.489***	1.451***
	(1.421–1.560)	(1.386–1.520)
Women's acceptability of IPVAW score of 1	0.941***	0.935***
	(0.919–0.962)	(0.908–0.963)
Women's acceptability of IPVAW score of 2	0.947***	0.878***
	(0.925–0.970)	(0.851–0.906)
Women's acceptability of IPVAW score of 3	0.955***	0.862***
	(0.931–0.980)	(0.830–0.896)
Women's acceptability of IPVAW score of 4	0.934***	0.854***
	(0.908–0.962)	(0.816–0.894)
Women's acceptability of IPVAW score of 5	0.900***	0.806***
	(0.874–0.927)	(0.768–0.845)
Observations	765 169	760 871

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

The unit of observation is the birth. Odds ratios are presented with 95% confidence intervals in the parentheses below. Delivery in a facility (column 1) reports whether the mother delivered the birth in a health facility or not. ANC visits (column 2) reports whether the mother received at least eight ANC visits for the birth. Results are from logistic regressions that include cluster, mother, birth and quality-of-care controls. Cluster-level covariates are the average wealth index value of mothers in the cluster, and the average educational attainment of mothers in the cluster. Mother controls include the household wealth index (in quintiles), educational attainment of the mother (no education, primary, secondary, higher), age of the mother (in 5-year age groups), mother's marital status and mother's place of residence (urban/rural). Birth-level controls include birth order and sex of the child. For column 2, quality-of-care controls include the seven-point average quality score that was generated for the birth. Survey and year-of-birth fixed effects are included, and standard errors are clustered at the primary sampling unit (DHS-cluster) level.

robustness of our coefficients. We first ran the full set of regressions by dropping all observations with missing data. In doing so, we found similar results, but our sample size dropped to 8.2% (63 481 observations) and 8.1% (63 002

Table 7. Odds ratios of facility delivery: adjusted and stratified results

Variables	(1) Women's autonomy score OR (95% CI)	(2) Women's acceptability of IPVAW score OR (95% CI)	(3) Observations N
Adjustments			
Partner's educational attainment	1.321*** (1.280–1.364)	0.921*** (0.897–0.945)	693 917
Wantedness of birth	1.313*** (1.274–1.353)	0.913*** (0.891–0.937)	753 874
Women's work	1.319*** (1.279–1.360)	0.911*** (0.889–0.935)	756 996
Lack of access (too far, transport)	0.791 (0.591–1.060)	0.831** (0.695–0.993)	17 523
Prohibitive cost	0.962 (0.749–1.236)	0.900 (0.768–1.055)	17 523
Stratified analyses			
Women under 19 years	1.189*** (1.085–1.303)	0.959 (0.892–1.030)	55 515
Women 20+ years	1.325*** (1.285–1.366)	0.908*** (0.884–0.931)	709 424
Women with none or primary education	1.356*** (1.310–1.403)	0.933*** (0.907–0.959)	498 374
Women with secondary or higher education	1.150*** (1.090–1.214)	0.784*** (0.747–0.824)	266 723
Unmarried sample	1.229*** (1.168–1.294)	0.853*** (0.813–0.896)	191 065
Married sample	1.352*** (1.303–1.403)	0.923*** (0.897–0.949)	573 127
Urban sample	1.256*** (1.190–1.326)	0.791*** (0.753–0.832)	268 915
Rural sample	1.312*** (1.266–1.359)	0.948*** (0.921–0.976)	495 000
Unmarried adolescents	1.248*** (1.080–1.442)	0.903 (0.799–1.021)	24 966
Married adolescents	1.083 (0.956–1.226)	0.980 (0.896–1.071)	30 473
Urban adolescents	1.159 (0.961–1.397)	0.974 (0.832–1.140)	17 891
Rural adolescents	1.192*** (1.071–1.326)	0.948 (0.873–1.029)	37 565
Africa sample	1.304*** (1.258–1.353)	0.890*** (0.865–0.916)	467 935
Asia sample	1.154*** (1.083–1.228)	0.968 (0.915–1.024)	189 189
Africa (WHO) sample	1.315*** (1.266–1.366)	0.871*** (0.845–0.898)	423 896
Eastern Mediterranean (WHO) sample	1.517*** (1.366–1.684)	1.019 (0.950–1.093)	89 106
Europe (WHO) sample	1.113 (0.814–1.522)	0.629*** (0.514–0.769)	17 316
Americas (WHO) sample	1.525*** (1.402–1.658)	0.794*** (0.705–0.893)	96 418
South-East Asia (WHO) sample	0.882*** (0.816–0.953)	0.920** (0.856–0.989)	104 630
Western Pacific (WHO) sample	1.186** (1.033–1.360)	0.959 (0.836–1.100)	32 887
Sample of women who have not moved in past 2 years	1.220*** (1.173–1.270)	0.958** (0.924–0.993)	364 681

The unit of observation is the birth. Odds ratios are presented with 95% confidence intervals (CIs) in the parentheses below. Delivery in a facility reports whether the mother delivered the birth in a health facility or not. Results are from logistic regressions that include cluster, mother and birth controls. Cluster-level covariates are the average wealth index value of mothers in the cluster and the average educational attainment of mothers in the cluster. Mother controls include the household wealth index (in quintiles), educational attainment of the mother (no education, primary, secondary, higher), age of the mother (in 5-year age groups), mother's marital status and mother's place of residence (urban/rural). Birth-level controls include birth order and sex of the child. Survey and year-of-birth fixed effects are included, and standard errors are clustered at the primary sampling unit (DHS-cluster) level.

observations) of the analytic samples for the facility delivery and ANC analyses, respectively. We then conducted a bounds analysis by re-running the full set of regressions, first setting all missing data to 0 (as a lower bound) and subsequently setting missing data to 1 (as an upper bound). Under the lower-bound scenario, a woman who had missing data on a given autonomy indicator is assumed to report 'no decision-making capacity' for that indicator; in contrast, women who had missing data on a given acceptability of IPVAW indicator is assumed to report violence against women by husbands is 'unacceptable'. The upper bound scenario assumes the (opposite) counterfactual of both sets of indicators. We find that our estimates from our bounds analysis, presented in Supplementary Table A4, available as Supplementary data at *IJE* online, are qualitatively consistent with the analysis where missing

autonomy and acceptability of IPVAW indicator data are dropped. Given the consistency in our estimates across our bounds analysis, we present the results from the lower-bound scenario, which are the most conservative, and this allows us to retain the largest sample for the pooled and disaggregated analyses.

Supplementary Figures A1 to A4, available as Supplementary data at *IJE* online, present the results from a disaggregated estimation of the main empirical specification by country (Figures 2–5). As these figures show, there is considerably more variation in the country-specific point estimates, in terms of both their magnitudes as well as their statistical significance; whereas some country-specific estimates concur with the global results, other country-specific estimates present associations that go in the opposite direction of the global findings, and many of the country-specific

Table 8. Odds ratios of antenatal care use: adjusted and stratified results

Variables	(1) Women's autonomy score OR (95% CI)	(2) Women's acceptability of IPVAW score OR (95% CI)	(3) Observations N
Adjustments			
Partner's educational attainment	1.401*** (1.348–1.457)	0.815*** (0.785–0.846)	690 271
Wantedness of birth	1.425*** (1.375–1.477)	0.802*** (0.773–0.832)	749 580
Women's work	1.265*** (1.230–1.300)	0.968*** (0.946–0.990)	752 707
Lack of access (too far, transport)	1.255*** (1.174–1.342)	1.030 (0.977–1.086)	116 498
Prohibitive cost	1.256*** (1.175–1.343)	1.034 (0.980–1.090)	116 498
Stratified analyses			
Women under 19 years	1.377*** (1.217–1.558)	0.794*** (0.698–0.904)	53 816
Women 20+ years	1.417*** (1.365–1.470)	0.797*** (0.768–0.827)	705 458
Women with none or primary education	1.475*** (1.398–1.557)	0.832*** (0.792–0.874)	495 422
Women with secondary or higher education	1.356*** (1.295–1.419)	0.770*** (0.732–0.809)	265 445
Unmarried sample	1.344*** (1.275–1.417)	0.814*** (0.754–0.880)	189 410
Married sample	1.435*** (1.367–1.507)	0.807*** (0.776–0.840)	571 040
Urban sample	1.418*** (1.352–1.489)	0.752*** (0.710–0.795)	268 562
Rural sample	1.401*** (1.329–1.477)	0.847*** (0.808–0.888)	492 309
Unmarried adolescents	1.276*** (1.094–1.487)	0.765** (0.622–0.941)	23 951
Married adolescents	1.497*** (1.207–1.857)	0.824** (0.699–0.971)	28 613
Urban adolescents	1.480*** (1.243–1.762)	0.747*** (0.603–0.926)	17 244
Rural adolescents	1.220** (1.023–1.456)	0.826** (0.701–0.973)	35 066
Africa sample	1.102*** (1.068–1.137)	0.919*** (0.897–0.943)	465 927
Asia sample	1.425*** (1.336–1.519)	0.974 (0.921–1.029)	187 909
Africa (WHO) sample	1.076*** (1.041–1.111)	0.953*** (0.929–0.978)	422 008
Eastern Mediterranean (WHO) sample	1.552*** (1.397–1.724)	0.822*** (0.765–0.883)	88 184
Europe (WHO) sample	1.015 (0.791–1.303)	0.663*** (0.563–0.781)	17 088
Americas (WHO) sample	1.592*** (1.466–1.729)	0.896* (0.788–1.018)	95 483
South-East Asia (WHO) sample	1.198*** (1.105–1.300)	1.031 (0.957–1.111)	104 402
Western Pacific (WHO) sample	1.388*** (1.209–1.593)	0.847** (0.745–0.964)	32 785
Sample of women who have not moved in past 2 years	1.189*** (1.149–1.231)	0.954*** (0.925–0.985)	363 159

The unit of observation is the birth. Odds ratios are presented with 95% confidence intervals (CIs) in the parentheses below. The outcome variable reports whether the mother received at least eight ANC visits for the birth. Results are from logistic regressions that include cluster, mother, birth and quality-of-care controls. Cluster-level covariates are the average wealth index value of mothers in the cluster and the average educational attainment of mothers in the cluster. Mother controls include the household wealth index (in quintiles), educational attainment of the mother (no education, primary, secondary, higher), age of the mother (in 5-year age groups), mother's marital status and mother's place of residence (urban/rural). Birth-level controls include birth order and sex of the child. Quality-of-care controls include the seven-point average quality score that was generated for the birth. Survey and year-of-birth fixed effects are included and standard errors are clustered at the primary sampling unit (DHS-cluster) level.

estimates also show null associations between the autonomy and IPVAW scores and the key utilization outcomes. We note that the confidence intervals around the country-specific estimates are quite large, thereby suggesting that the lack of statistical significance in the country-specific analyses is likely due to the small sample size rather than to a real null effect.

Discussion

We find strong and significant associations between women's reported autonomy and decision-making capacity, women's reported attitudes towards IPVAW and their utilization of maternal health-care services. These relationships persist even after having controlled for confounding factors such as age, education, marital status, parity, place of residence and wealth at the individual level and education and wealth at the cluster level. Moreover, our results support the hypothesis that women's decision-making capacity and perceptions of IPVAW are, at a global level, integral to their health utilization and care-seeking behaviour. The estimates from our global analysis are further confirmed by the findings from our stratified analyses, which demonstrate considerable qualitative and quantitative consistency across a wide range of subgroups.

With this said, the heterogeneity that we observe in some of our region- and country-specific analyses suggests that the role of women's autonomy and acceptability of IPVAW in shaping health-seeking behaviour may, to various degrees, differ by context and should be explored further. Stratified regional analyses based on the WHO
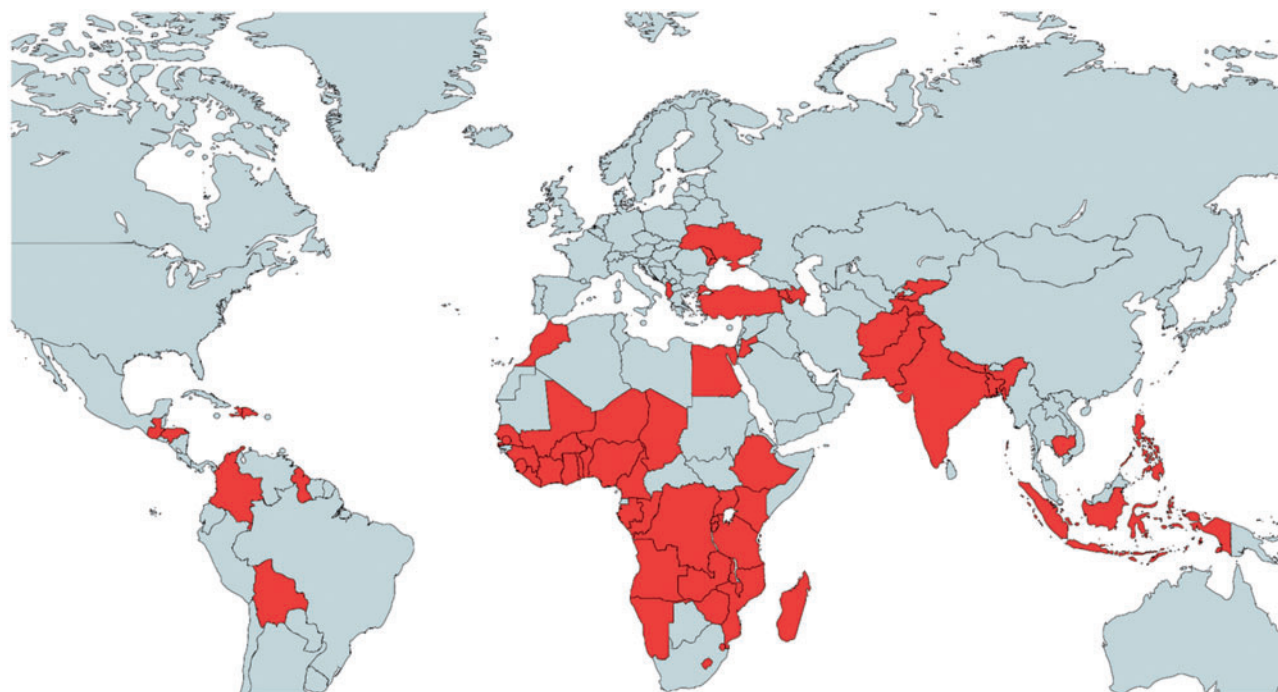
Figure 2. Geographic distribution of countries used in the analysis.
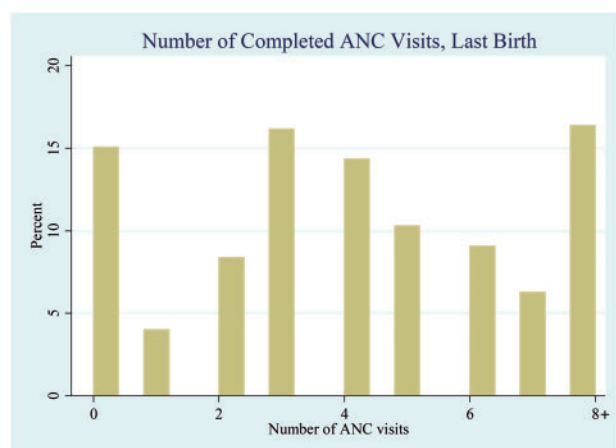
Figure 3. Distribution of ANC visits for last birth.

regions show that the strength of the associations of autonomy and acceptability of IPVAW are highest in the Eastern Mediterranean and American regions, followed by the African region and finally in Asia, with significant variability in the IPVAW association in South-East Asian and Western Pacific samples. These differences may be attributable to variation in sample sizes across these regions but may also reflect regional diversity in empowerment and norms. Country-specific estimates, which are presented in Supplementary Figures A1–A4, available as Supplementary data at *IJE* online, can be used to further explore empowerment processes and develop related policy and programmes to address local needs.

Our stratified results suggest that the generally positive relationship between women's reported autonomy and facility delivery is stronger among non-adolescents, women with lower education levels, married women and women who reside in rural areas. In contrast, the inverse relationship between acceptability of IPVAW and facility delivery is found to be stronger among non-adolescent women, women with secondary or higher education, unmarried women and women residing in urban areas. Similar trends within subgroups are found in our estimates of the relationships between autonomy, women's acceptability of IPVAW and women's use of ANC services. These findings suggest that contextual norms that govern women's decision-making potential may vary for women of different age groups (adolescents vs older women), places of residence (urban vs rural) and marital status (unmarried vs married women).

Our analysis faces the following limitations. Although we include several individual, temporal and spatial controls in our analysis, our estimates may still suffer from residual confounding. For example, we are unable to adequately control for measures of access to care, including distance to care and cost of services, which are likely to be correlated with autonomy and receipt of care.[30] Beyond the data limitations that we face in identifying unconditional distance and cost proxies, we are also concerned that these factors may mediate the relationship between empowerment and utilization, particularly if empowered women are more likely to utilize services as a result of
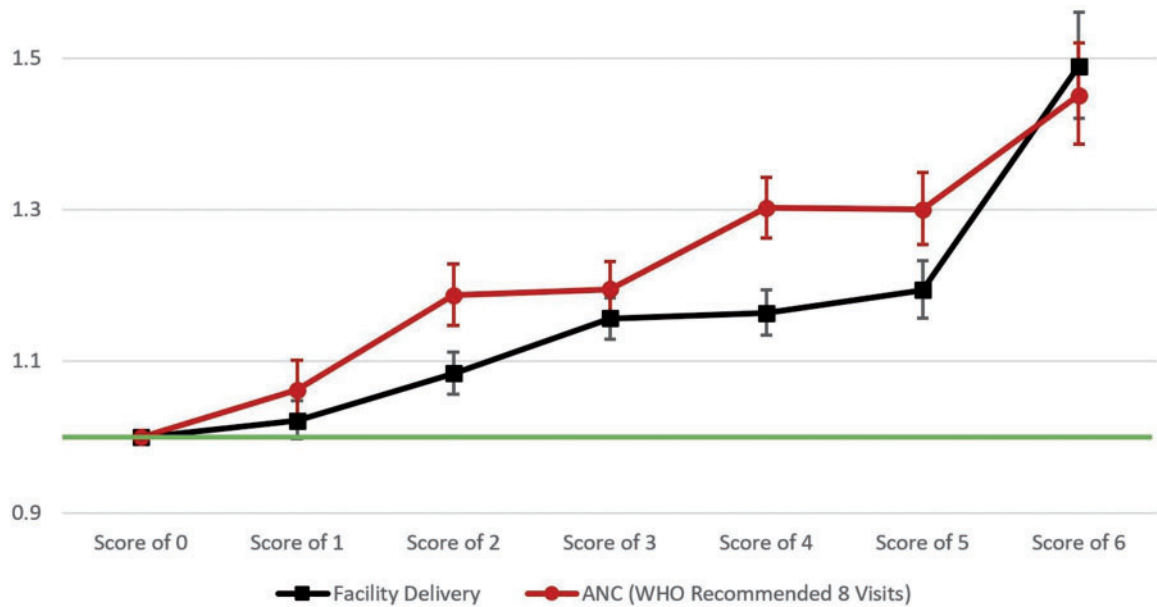
Notes: The results are based on the logistic regression results that are reported in Table 6. The odds ratios are for each aggregate autonomy score category, compared with the reference group of having an aggregate autonomy score of 0. The error bars indicate the 95% confidence interval. The horizontal line at 1 represents the odds ratio value under the null hypothesis.

Figure 4. Association between women's decision-making autonomy and maternal health outcomes: pooled analysis.
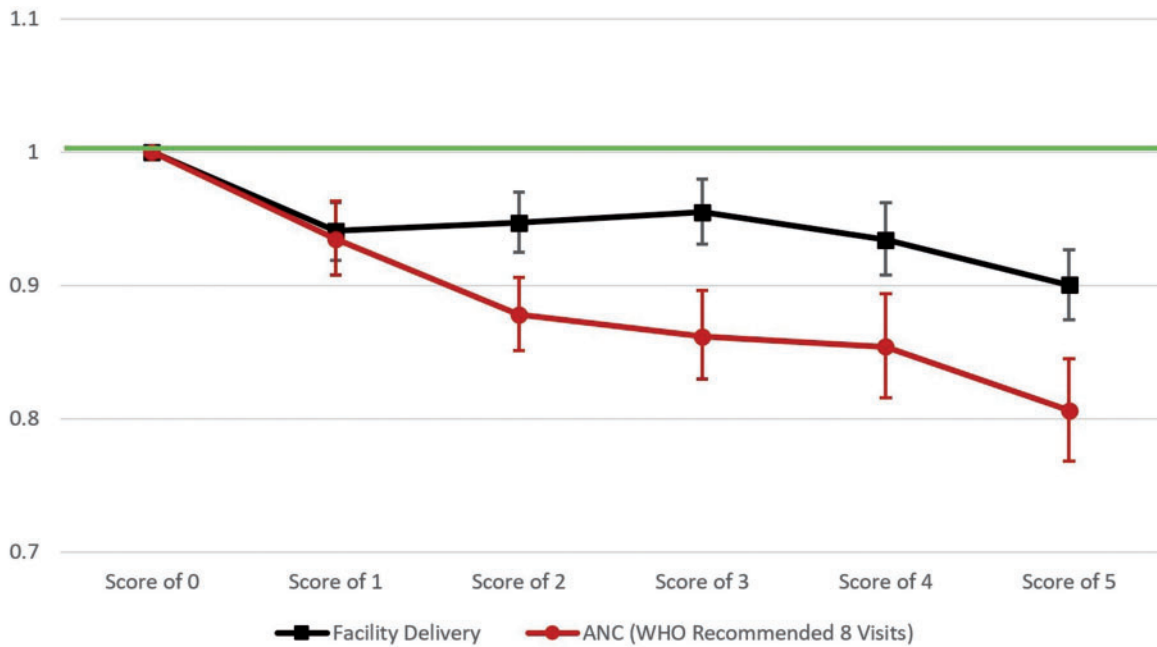
Notes: The results are based on the logistic regression results that are reported in Table 6. The odds ratios are for each aggregate normalized IPVAW score category, compared with the reference group of having an aggregate normalized IPVAW score of 0. The error bars indicate the 95% confidence interval. The horizontal line at 1 represents the odds ratio value under the null hypothesis.

Figure 5. Association between women's attitudes towards IPVAW and maternal health outcomes: pooled analysis.

having greater access to care. If this is the case, then including proxies of access in our empirical specification would introduce bias into our estimated coefficients of interest. In addition, we are unable to rule out reverse causality between our autonomy and empowerment exposures and our outcomes of interest; it may be that women who seek ANC services or who deliver in a facility may be more empowered as a result of having received care. To this end, we run a robustness check where we re-do the main analysis for the sample of women who have not moved in the past 2 years and therefore would not have moved to seek care for their pregnancy; results from this analysis are presented in Supplementary Table A5, available as Supplementary data at *IJE* online. Results from this analysis are consistent with our main findings and do not suggest that women who are planning to become pregnant move residences to seek care. Whereas we conduct several other robustness checks and stratification tests across a wide variety of samples, we are unable to fully account for potential self-selection and composition effects, whereby women who are more autonomous and who are less accepting of IPVAW may be more likely to select into care because they are different in unobservable ways. If this is the case, then we may not be able to attribute differences in health-seeking behaviour to autonomy or lack of acceptability of IPVAW. Although we run a bounds analysis to account for concerns over missing data, we also cannot completely eliminate the possibility that there may exist unobservable factors that are correlated with missingness in both our exposure variables and our outcomes of interest. Finally, it is possible that the extent to which women's responses to the questions around autonomy and acceptability of IPVAW in the DHS surveys are comparable may be limited due to differential survey designs across countries and years.[31] To account for this concern, we select the questions related to autonomy and IPVAW that are identical across survey rounds and countries and use responses from these comparable questions for our analysis.

Despite these limitations, our findings make two important contributions. First, we are able to provide a robust set of global and disaggregated estimates on the role of women's empowerment in health-service utilization and we discuss how these estimates can be further explored conceptually and can be better contextualized through improved measurement. Our findings also underline the need for improved measures that can better document the processes and mechanisms through which women's empowerment, autonomy and attitudes contribute to health-seeking behaviours and outcomes. Second, our disaggregated results provide countries with an evidence-based platform for catalysing investment in gender-equity-promoting policy and programmes. For example, countries with higher levels of women's empowerment may consider diversifying maternal health education and birth preparedness programmes to more community-wide empowerment strategies that locally emphasize decision-making equity, whereas countries with lower levels of women's empowerment may seek to reinforce policies and programmes that promote gender equity and empowerment more generally.

Conclusion

In this study, we investigate the relationships between women's reported autonomy and decision-making, attitudes toward IPVAW and health-care utilization in low- and middle-income countries. Our findings reinforce the need to take maternal autonomy and empowerment into consideration when designing programmes and policies that aim to improve health services for women. Given the robustness of our results, we propose that our global findings may be generalizable to a wide range of settings where women's autonomy and capacity for decision-making are limited. Our work also highlights the need for further study on the relationships between women's health, autonomy and empowerment, which in turn will serve to promote the development of effective interventions that improve maternal health and well-being.

Supplementary data

Supplementary data are available at *IJE* online.

Conflict of interest: All authors declare that no competing interests exist.

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