Abortion decision-making trajectories and their determinants in low- and middle-income countries

Paul Lokubal

Green Templeton College



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National Perinatal Epidemiology Unit

Nuffield Department of Population Health

University of Oxford

ABSTRACT

Background: Induced abortion is a global health issue, especially in low- and middle-income countries (LMICs) where it remains largely regulated by laws as well as the prevailing sociocultural and political contexts. Women in LMICs and those from vulnerable and marginalised communities face barriers accessing safe abortion compelling them to access unskilled abortion providers. This thesis sought to map out abortion decision-making trajectories and their determinants exploring the role of women's empowerment for women in LMICs to inform policy, practice, and research to address the high burden of unsafe abortion in LMICs.

Methods: A mixed methods systematic review and meta-analysis was conducted to map out the abortion decision-making trajectories and their determinants. Using the most recent (2014 – 2019) Demographic and Health Surveys (DHS) datasets from 30 countries, two women empowerment indices were generated and validated through a psychometric analysis. Further analysis involved logistic regression and meta-analysis of the pooled data from the 30 LMICs to examine the relationship between women's empowerment and modern contraceptive use and abortion.

Results: Abortion decision-making occurs over three phases: pre-abortion, abortion and post-abortion involving nine cyclic trajectories. There were eight themes related to the determinants of the abortion decision-making trajectories which included empowerment. Two women's empowerment indices – a woman-alone empowerment index and a joint empowerment index were generated and validated. The woman-alone index and the joint empowerment index had strong invariance and explained 54% and 58% of the variance in women's empowerment, respectively. The two indices were strongly associated with use of

modern contraceptives in LMICs, the woman-alone empowerment index was associated with a 30% higher odds of modern contraceptive while the joint empowerment index was associated with a 33% higher odds of modern contraceptive use. However, there was considerable between country heterogeneity and subgroup analysis suggested that gender disparity moderated the association between women's empowerment and modern contraceptive use with lower odds of modern contraceptive use associated with gender parity. The domains reproductive health decision-making and the woman-alone and joint household domains were associated with modern contraceptive use. The association between women's empowerment and abortion was mixed with the woman-alone empowerment index showing no association while the joint empowerment index was associated with an 8% lower odds of abortion.

Conclusions: The definition of safe abortion needs to be broadened to include women's perceptions about what constitutes safe abortion, i.e., social safety. Women's empowerment which can be achieved individually or jointly with their male partners has the potential to lower the need for abortion by increasing access to and use of modern contraceptives in LMICs. However, the relationship between women's empowerment and modern contraceptive use and abortion is complex and highly heterogeneous between countries, even within the same region.

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STATEMENT OF THE COVID-19 PANDEMIC'S IMPACT ON THE DPHIL STUDY

I started my DPhil amidst the COVID-19 outbreak which was declared a global pandemic in March 2020 and as a result, it disrupted my DPhil studies. Due to the impact of COVID-19, it became difficult to conduct primary data collection; hence together with the supervisors, it was agreed to change the topic to that which would minimise the impact of COVID-19. The original thesis topic "Investigating the determinants of unsafe abortion in India and Uganda using mixed methods" involved primary data collection through an unmatched case-control study and in-depth interviews and focus group discussions in India and Uganda. After extensive reading in Michaelmas term and exploring available data sources, the topic was changed to "Investigating abortion decision-making trajectories and their determinants in low- and middle-income countries". Thus, in lieu of the case-control study and qualitative study, I analysed the DHS data from multiple countries.

From March to July 2021, I suffered from clinical depression which I initially thought was work-related burnout which I occasionally experience. But the symptoms persisted beyond two weeks that my burnout usually takes to resolve and in June, I sought help from the supervisors who linked me to online support services. This affected about 3-4 months of my work.

From June to early September 2022, famine ravaged Karamoja, where I come from. Overcome by pictures of children and the elderly starving to death, I temporarily stopped working on my DPhil thesis and instead embarked on a fundraising drive that raised over £23,000 and enabled us to provide food to nearly 10,000 children including malnourished children in hospitals, schools and feeding centres as well as adults.

STATEMENT OF CONTRIBUTION TO WORK

I, Paul Lokubal, confirm that the work presented in this thesis is my own. I conceptualised the systematic review and meta-analysis, access and cleaned the DHS datasets from the DHS Program, conducted all the analyses, and wrote the thesis. I am the first author of the publications arising from the studies described in chapters 2 and 3. My supervisors, Associate Professor Manisha Nair, Associate Professor Charles Opondo, Senior Lecturer Dr Christine C Nalwadda and Professor Jennifer Kurinczuk supervised the research, advised and agreed on the thesis conceptualisation, analyses and interpretation of the thesis findings. They also provided invaluable comments and suggestions on the published manuscripts. The co-authors of the publications arising from the thesis have all given their permission to include relevant materials from these publications in this thesis.

LIST OF PUBLICATIONS

Peer-reviewed publications arising from this thesis research

- **Lokubal P,** Corcuera I, Balil M, *et al.* Abortion decision-making process trajectories and determinants in low- and middle-income countries: A mixed-methods systematic review and meta-analysis. *EClinicalMedicine* 2022; 54: 101694[1].

- **Lokubal P**, Frischer SR, Corcuera I, *et al*. Abortion decision-making trajectories and factors influencing such trajectories in low- and middle-income countries: a protocol for mixed-methods systematic review *BMJ Open* 2021;11: e049507. doi: 10.1136/bmjopen-2021-049507[2].

Submitted manuscripts arising from this thesis research

- Developing and validating women's empowerment index for low- and middle-income countries through psychometric analysis of cross-sectional data from 30 low- and middle-income countries, submitted to **Social Science and Medicine – Public Health.** Prepint: **https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4405692**

Other publications during the DPhil

- **Lokubal P,** Calvert C, Cousens S, *et al*. Investigating the effect of relationship satisfaction on postpartum women's health-related quality of life in Burkina Faso: a cross-sectional analysis *BMJ Open* 2021;11: e048230. doi: 10.1136/bmjopen-2020-048230[3].

LIST OF ABBREVIATIONS USED IN THE THESIS

AOR	Adjusted odds ratio
CASP	Critical appraisal skills programme
CFA	Confirmatory factor analysis
CFI	Comparative Fit Index
CI	Confidence interval(s)
Covid-19	Coronavirus disease 2019
DAG	Directed acyclic graph
df	Degrees of freedom
DHS	Demographic and Health Survey(s)
EFA	Exploratory factor analysis
FGDs	Focus-group discussions
FP	Family planning
GBD	Global Burden of Diseases, Injuries and Risk Factors Study
GDI	Gender development index
GEM	Gender Empowerment Measure
GRADE-CERQUal	Grades of Recommendation, Assessment, and Evaluation - Confidence in Evidence from Reviews of Qualitative Research
HDI	Human development index
HHDM	Household decision-making domain
HICs	High-income countries
I^2	I-square statistic
IDIs	In-depth interviews
IPF	Interated principal factor
IPV	Intimate partner violence
IQR	Interquartile range
IUD	Intrauterine contraceptive device
JBI	Joanna Briggs Institute
KIIs	Key informant interviews
KMO	Kaiser-Meyer-Olkin measure of sampling adequacy

LAM	Lactational amenorrhea method
LICs	Low-income countries
LMICs	Low- and middle-income countries
LRT	Likelihood ratio test
MAP	Minimum average partials
MDGs	Millennium development goals
MeSH	Medical subject headings
MICs	Middle-income countries
MIMIC	Multiple indicators and multiple causes (model)
MVA	Manual vacuum aspiration
NGOs	Non-governmental organizations
PCA	Principal component analysis
PI	Prediction intervals
PRISMA	The preferred reporting items for systematic review and meta-analysis protocol
PROSPERO	International prospective register of systematic reviews
RHDM	Reproductive health decision-making
RMSEA	Root Mean Square Error of Approximation
SBA	Skilled birth attendant/skilled birth attendance
SD	Standard deviation
SDG	Sustainable development goal(s)
SDM	Standard days method
SRH	Sexual and reproductive health
SRMR	Standardized Root Mean Square Residual
SSA	sub-Saharan Africa
STIs	Sexually transmitted infections
TLI	Tucker-Lewis Index
UNDP	United Nations Development Programme
UOR	Unadjusted odds ratio
WLSMV	Diagonally weighted least squares
YLDs	Years lived with disability

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DEFINITION OF KEY TERMS USED IN THE THESIS

For ease of understanding and consistency, the list below is how key terms and concepts are used throughout the thesis, unless otherwise stated.

Abortion: Termination of a pregnancy before foetal viability[4]. In this thesis, unless otherwise specified, abortion is termination of a pregnancy that is 20 weeks of gestational age or less.

Abortion decision-making trajectories: The processes and transitions occurring overtime for a pregnancy that ends in abortion[5]

Abortion regulation: All formalized laws, policies and other instruments (e.g., facility-level protocol) that regulate pregnancy and abortion[4].

Confirmatory factor analysis: A multivariate statistical procedure that is used to test how well the measured variables represent the number of constructs[6].

Exploratory factor analysis: A statistical technique that is used to reduce data to a smaller set of summary variables and to explore the underlying theoretical structure of the phenomena[6].

Factor analysis: A technique that examines and identifies the internal structure of the relationship (correlations) among a set of variables[7].

Induced abortion: The deliberate termination of pregnancy through either a medical or surgical procedure[4].

Joint empowerment index: An empowerment index in which a woman making decisions alone is considered more empowered than the one who makes decisions jointly with her male partner/husband or with other people such as family members, friends or health workers.

Liberal abortion laws: Laws that permit abortion on socioeconomic grounds or on request (although with varying gestational age limits)[8].

Measurement invariance: Measurement invariance assesses the psychometric equivalence of a construct across groups or across time[9]. It implies that a measure has the same meaning across different groups of people[10].

Partner(s): Used in this thesis to refer to male partners of married or cohabiting women.

Policy: A law, regulation, procedure, administrative action, incentive or voluntary practice of governments and other institutions[11].

Restrictive abortion laws: Laws in which abortion is either prohibited altogether or permitted only to save a woman's life or on health grounds[8].

Safe abortion: Abortion carried out by a person possessing the necessary skills in an environment conforming to minimum hygienic standards using methods appropriate for the gestational age[4].

Sexual and reproductive health: A state of complete physical, mental and social well-being in all matters relating to the reproductive system[12]. It implies that people are able to have a satisfying and safe sex life, the capability to reproduce and the freedom to decide if, when, and how often to do so[12].

Spontaneous abortion or miscarriage: The loss of pregnancy naturally before 24 weeks of gestation[4].

Stillbirth: A baby who dies after 28 weeks of pregnancy, but before or during birth, is classified as a stillbirth[13].

Third-party authorisation: A requirement imposed by law or policy, or in practice, that a party other than the woman, girl or other pregnant person (typically a parent, guardian, spouse, male partner, health worker, health authority or judicial authority) must authorize an abortion where other applicable legal requirements for lawful abortion have been met[4].

Unintended pregnancy: Unintended pregnancies are pregnancies that are reported to have been either unwanted (i.e., they occurred when no children, or no more children, were desired) or mistimed (i.e., they occurred earlier than desired)[14].

Unsafe abortion: Abortion carried out by a person lacking the necessary skills or in an environment that does not conform to minimal medical standards, or both[4].

Woman-alone empowerment index: An empowerment index in which a woman who makes decisions jointly with her male partner/husband is considered to be more empowered than the one who makes decisions alone or jointly with other people other than her male partner/husband.

Chapter 1: INTRODUCTION

1.1 Abortion rates by World Bank Groups, SDG Regions, and Abortion Laws

Abortion[1] is a common procedure. Globally, each year between 2015 – 2019, six in ten of all unintended pregnancies and three in ten of all pregnancies were terminated[8, 14]. This translated to a global abortion rate of 39 per 1000 women of reproductive age[14]. Globally, the highest overall abortion rates were reported in middle-income countries (MICs) and the lowest in high-income countries (HICs); the rates per 1,000 women aged 15-49 were 44 in MICs, 38 in low-income countries (LICs) and 15 in HICs[8, 14, 15]. In terms of geographical distribution, among the Sustainable Development Goals (SDG) regions, from 2015 – 2019, the highest abortion rates were observed in West and North Africa (53 per 1000), followed by Central and South Asia (46 per 1000), East and South East Asia (43 per1000) while the lowest were observed in Australia and New Zealand (15 per 1000) Europe and North America (17 per 1000)[14].The rates for the same period were 27 per 1000 and 35 per 1000 respectively for sub-Saharan Africa (SSA) and Latin America respectively[14]. When grouped by legal status, abortion rates were similar in both liberal and restrictive settings[8, 14]. The abortion rates from 2015 – 2019 were 40 per 1000 women and 36 per 1000 women aged 15-49 in countries where abortion was broadly legal and restricted respectively[14]. However, when China and India were excluded due to their large population which disproportionately raises the abortion rates, the abortion rates were lower (26 per 1000) in countries where abortion is broadly legal[14]. Across countries, in the period 2015 – 2019, the lowest abortion rates were observed in Singapore (5 per 1000) while the highest were observed in Georgia

[1] Abortion refers to the termination of a pregnancy before foetal viability. In Chapter 5, abortion refers to a pregnancy termination before 20 weeks of gestation.

(80 per 1000)[16]. In addition to these differences by the World Bank and SDG region groups, there were variations in abortion rates between countries even within the same region[16].

1.2 Unintended pregnancy rates and abortion rates

Unintended pregnancies[2] are a common indication for abortions globally. In the year 2015 – 2019, 61% of all unintended pregnancies ended in abortion[14]. There is no global study that shows the proportion of abortions that are due to unintended pregnancies and/or from other causes. The proportion of unintended pregnancies that ended in induced abortion was similar between LICs and HICs (40% and 43% respectively) but were higher in MICs (66%)[14]. While the global unintended pregnancy rates have reduced from 79 per 1000 women aged 15 – 49 in 1990 – 1994 to 64 per 1000 women aged 15 – 49 over 2015 – 2019, the abortion rates have remained more or less the same over the same period (40 per 1000 and 39 per 1000 respectively). Comparing these two periods, the highest percentage change of unintended pregnancies ending in abortion were observed in Central and Southern Asia with a relative change of 59%, followed by Oceania (excluding Australia and New Zealand) at 54%, and SSA at 41%[14]. An increase in the proportion of unintended pregnancies that ended in induced abortion was observed in all the SDG regions except North America and Europe and Australia and New Zealand where abortion rates decreased by 29% and 11% respectively[14]. By legal status, there was a net increase in the proportion of unintended pregnancies ending in abortion by 39% in countries where abortion was restricted while there was a net decrease of 13% in countries where abortion was broadly legal between 1990-1994 and 2015 – 2019[14].

[2] Unintended pregnancies are pregnancies that are reported to have been either unwanted (i.e., they occurred when no children, or no more children, were desired) or mistimed (i.e., they occurred earlier than desired).

While many abortions result from unintended pregnancies from failure or non-use of modern contraceptives, even planned pregnancies can become unwanted due to changes in circumstances during pregnancy including health concerns if the pregnancy is continued to term[8]. Other reasons for abortion include financial hardships to support continuing the pregnancy, parenting readiness, rape, incest, foetal abnormalities, maternal health, sex selection, influence from significant others (such as male partners and family), lack of support for the pregnancy from male partners or family members, career and education goals, and stigmatised pregnancies such as teenage or out of wedlock pregnancies[17–19]. The prevalence of abortions carried out for different reasons varies substantially between nations and/or regions. For example, most abortions in Albania are due to sex selection[20]. However, unintended pregnancy is one of the most common reasons for abortion in nearly all regions[8]. Because of its high prevalence and amenability to modern contraceptive use, this thesis specifically focused on abortion in unintended pregnancies.

1.3 The burden of unsafe abortion

Unsafe[3] abortion is a global health concern, but particularly in LMICs where restrictive abortion laws and stigma continue to impede women's access to safe[4] abortion[4]. Women from LMICs and those from vulnerable and marginalised communities bear the greatest burden of unsafe abortion and its complications[4]. Between 2010 and 2014, 45% of all abortions globally were estimated to be unsafe with 97% occurring in LMICs[15]. The proportion of all abortions that were unsafe was about four times higher (49.5%) in LMICs

[3] Unintended pregnancies are pregnancies that are reported to have been either unwanted (i.e., they occurred when no children, or no more children, were desired) or mistimed (i.e., they occurred earlier than desired).
[4] Abortion is said to be safe when it is carried out by a person possessing the necessary skills in an environment conforming to minimum hygienic standards using methods appropriate for the gestational age.

compared with HICs (12.5%)[15]. The proportion of unsafe abortions over this period was 0.9% in North America, 2.1% in Northern Europe, 37.8% in Asia, 75.6% in Africa, and 76.4% in Latin America[15]. Between 2003 and 2009, unsafe abortion and its complications were estimated to be a major cause of avoidable maternal deaths and morbidity globally, accounting for 4.7-13.2% of all maternal deaths[21]. The 2017 Global Burden of Disease (GBD)[5] study estimated that unsafe abortion and its complications was responsible for 18,100 years lived with disability (YLDs)[22]. In 2012, about 7 million women in LMICs were treated for abortion-related complications[23]. Between 2003 and 2009, in HICs, the maternal mortality rate was 30 women per 100,000 unsafe abortions and 220 deaths per 100,000 unsafe abortions in LMICs but highest in SSA, where an estimated 520 women died per 100,000 unsafe abortions[24]. Despite accounting for only 29% of all unsafe abortions globally[15], 70% of all abortion-related deaths occur in Africa[21]. Unsafe abortion and its complications also place social and financial burden on women, their families, communities, health systems and countries[24]. Vlassoff *et al*. (2008) estimated that in 2006, it cost $375 – 838 million to treat unsafe abortion and its complications with a further $375 million required to meet the unmet need for women with untreated complications arising from unsafe abortion[25].

1.4 Abortion and regulation

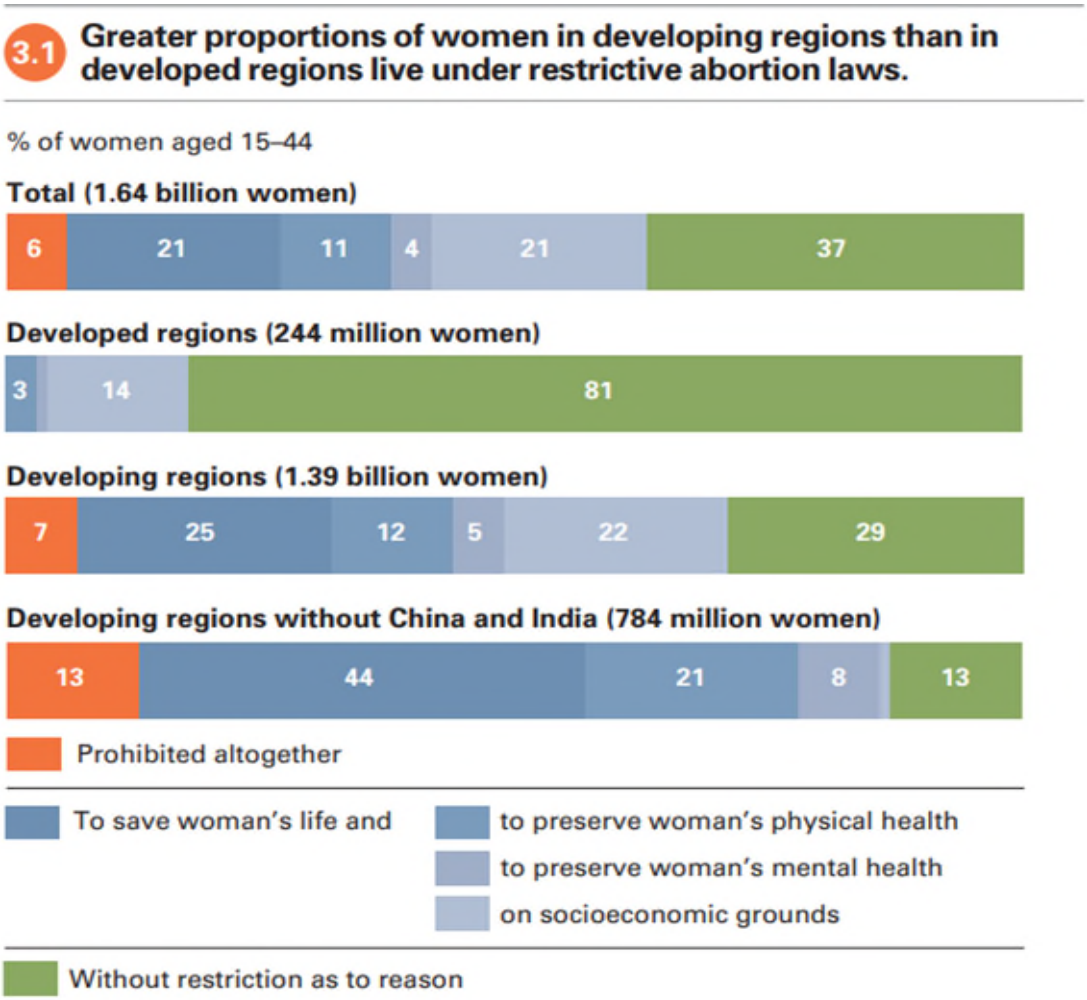
Despite the high prevalence of abortion and the public health implications of unsafe abortion, especially in LMICs, abortion remains a sensitive and controversial issue with sociocultural and political dimensions[26]. Unlike most health services, abortion is regulated in many

[5] The Global Burden of Disease (GBD) study provides a comprehensive picture of mortality and disability across countries, time, age, and sex. It quantifies health loss from hundreds of diseases, injuries, and risk factors, so that health systems can be improved and disparities eliminated.

countries through various laws and policies[4]. Abortion regulation[6] is nearly universal with the range of restrictions falling under the following five categories of decreasing restrictiveness: category I: prohibited altogether; category II: to save the woman's life; category III: to preserve health (physical or mental); category IV: on socioeconomic grounds; and category V: on request (but with various gestational age limits)[8]. Categories I – III are considered restrictive and categories IV -V are considered broadly liberal[8]. Additionally, categories I – II are generally considered the most or highly restrictive[8]. In 2017, 27% of women aged 15-44 lived in countries where abortion was prohibited altogether or permitted only to save the woman's life while 37% lived in countries without restrictions as shown in **Figure 1.1**[8]. When India and China were excluded, about 57% of women in LMICS lived in highly restrictive settings compared with 17% in HICs in 2017[8, 15]. However, over the same period, the proportion of women living in highly restrictive settings in LMICs was nearly twice that in HICs while those living in countries where abortion was obtained on request was about 3 times respectively (**Figure 1.1**[8]. In 2017, about 93% of countries with highly restrictive abortion laws were in LMICs[8].

[6] Abortion regulation refers to all formalized laws, policies and other instruments (e.g., facility-level protocol) that regulate pregnancy and abortion.

Figure 1.1 The proportion of women living under different levels of restriction of abortion laws



Taken from the Guttmacher Institute 2017 Report, Singh et al.[8]*, published by CC-BY 4.0*

Abortion laws influence women's access to affordable, timely and safe abortion[4]. While abortion rates are similar in both restrictive and liberal settings, there is an inverse relationship between abortion safety and restrictions, with the highest unsafe abortion rates seen in countries with the most restrictive laws and vice versa[15]. The proportion of all abortions that are unsafe is 13%, 58% and 75% in the least restrictive, moderately restrictive, and most restrictive countries respectively[15]. While the availability and ease of use of medical abortion with misoprostol has increased the number of women accessing safe abortion even in the presence of such restrictions, women still encounter challenges

accessing it and/or getting the right instructions on its usage[4]. As a consequence, women seek clandestine and often unsafe abortion with associated complications[8, 27].

1.5 Abortion decision-making trajectories[7] and their determinants[8]

The decision to terminate a pregnancy is not always an easy one, even for an unwanted pregnancy[8]. In addition to having to circumvent restrictive abortion laws, women in LMICs have to navigate the sociocultural dynamics in which gender imbalances and power are tipped in favour of male partners[28, 29]. Moreover, the need for abortion may reflect women's unmet need for family planning with highly effective modern contraceptives[8]. It may also reflect a woman's lack of or limited autonomy over their reproductive health, including the decision to use modern contraception[30]. Thus, a woman's decision to terminate an abortion is influenced by several factors including individual, interpersonal, societal, health system and national laws and policies[31, 32]. Consequently, the particular pathway or trajectory taken by a woman terminating her pregnancy is varied and complex[5]. According to Coast et al. (2018), abortion decision-making trajectories are "*the processes and transitions occurring overtime for a pregnancy that ends in abortion*"[5]. In this thesis, determinants of abortion decision-making trajectories are factors that can affect, either positively or negatively, i.e., may expedite or delay/alter respectively, the particular processes and transitions occurring over time for the pregnancy that ends in abortion. The particular trajectory is time-dependent and has direct consequences on whether or not the woman will obtain a timely and safe abortion[5]. These interactions may even act to alter the woman's

[7] The processes and transitions occurring over time for a pregnancy that ends in abortion.

[8] Factors that influence the different processes and transitions occurring over time for a pregnancy that ends in abortion.

trajectories. For example, in some contexts, mandatory waiting times or third-party authorisations by the male partner or parents may lead to exceeding gestational age limits making a previously legal abortion illegal[33, 34]. In this case, the woman may then obtain a 'clandestine' or 'backdoor'[9] abortion which is often unsafe[4]. Similarly, such delays may preclude the use of the safe and easy to administer medication abortion further exposing the woman to potential abortion complications[4].

1.6 Rationale for the study

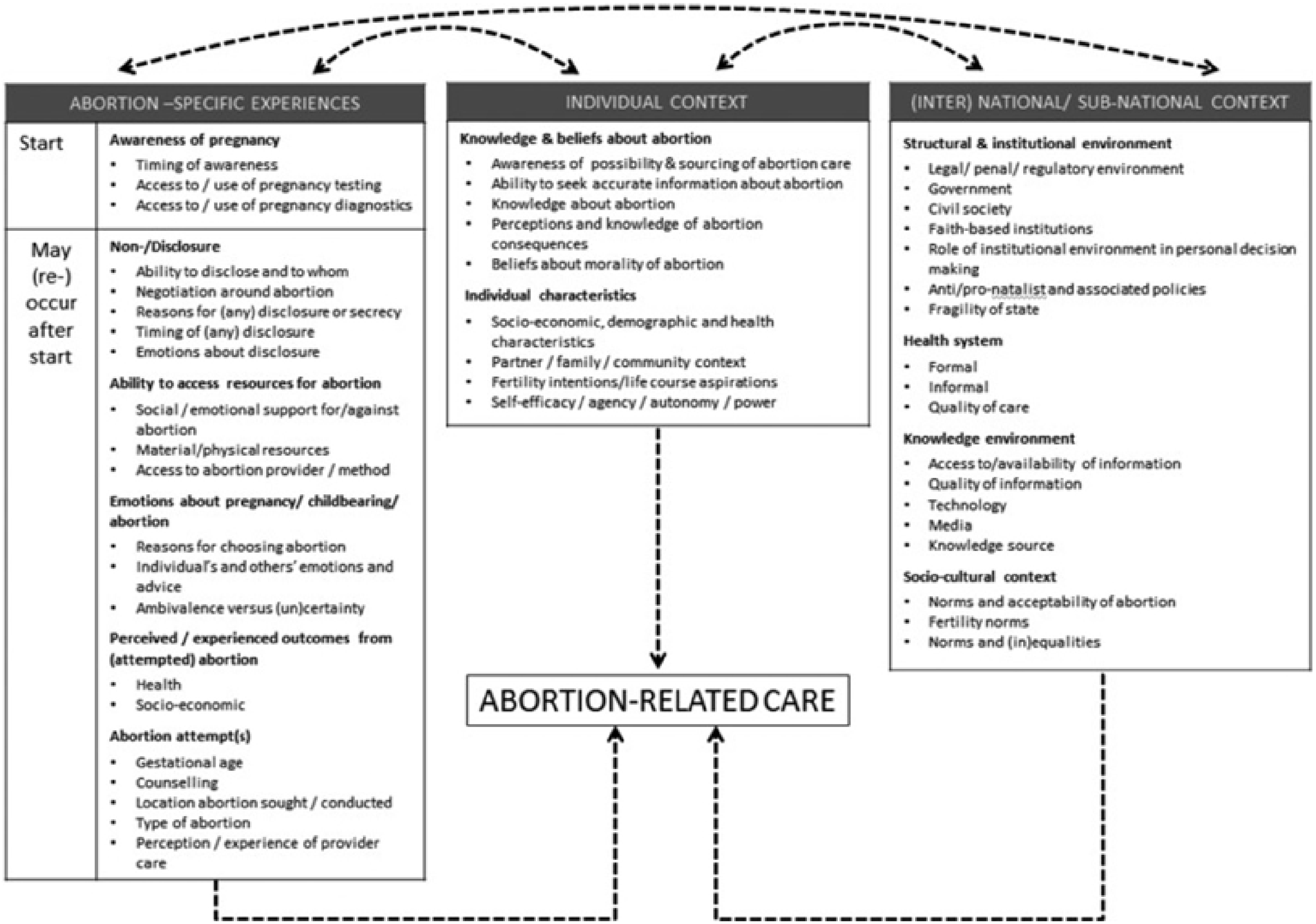
LMICs bear the greatest burden of unsafe abortion and its complications including increased maternal mortality and morbidity, loss of productivity and enormous economic costs arising from managing complications of unsafe abortions[21–23, 25]. Additionally, 57% of women in LMICs live in countries with restrictive abortion laws which place an additional burden on women seeking abortion[8, 15]. With nearly all unsafe abortions occurring in LMICs, it is important to explore abortion decision-making pathways or trajectories and the determinants that are likely to contribute to this high burden.

Many abortion decision-making theories and models such as the conflict theory model of decision-making in abortion[35], the feminist theory[36, 37], or the autonomy and public health models[38] have shed light on the complexity of abortion decision-making processes. However, these models have tended to focus on specific aspects of the abortion decision-making process such as the influence of circumstances preceding the pregnancy or locus of control on the decision to terminate pregnancy[35–38]. However, abortion is such a complex, dynamic and iterative process influenced by various legal, socioeconomic, political and health

[9] Clandestine or backdoor abortions occur in contexts in which abortion laws limit or restrict access to abortion services compelling women to seek unsafe abortion services from biomedically unsafe sources including traditional abortion providers or in environments which do not conform to basic hygiene, for fear of legal reprisals. Such abortions are often unsafe.

system factors[5, 17, 34, 39]. Coast *et al.* (2018) developed a conceptual framework for understanding women's trajectories to abortion care that encompasses time-dependent abortion-specific experiences, and context-dependent individual and region-based experiences[5]. While its development involved consultative meetings with experts and review of studies published in English between 2011 and 2017, it was neither a comprehensive nor a systematic review of available knowledge and evidence[5]. The framework, as shown in **Figure 1.2**, also focused on global abortion decision-making trajectories, yet as discussed above, the contexts in LMICs are fundamentally different from HICs. Additionally, there is a dearth of studies to empirically quantify the association between these determinants and abortion in LMICs. Therefore, this thesis sought to delineate abortion decision-making trajectories and their determinants in LMICs in order to develop recommendations to inform policy, practice, and research to reduce unsafe abortions in LMICs.

Figure 1.2: A conceptual framework for understanding women's trajectories in seeking abortion-related care



Source: Coast et al. (2018): A conceptual framework for understanding women's trajectories in seeking abortion-related care[5]*, published by CC-BY 4.0.*

1.7 Research aim and objectives

The overall aim of the thesis was to synthesise and generate the evidence about abortion decision-making trajectories and their determinants in LMICs to inform policy, practice, and research on reducing abortions in these settings. To answer the thesis' aim, a mixed methods systematic review and meta-analysis was conducted to synthesise the evidence on abortion decision-making trajectories and their determinants in LMICs. The findings from the mixed-methods systematic review and meta-analysis were then used to refine three other specific objectives, based upon the availability of data and in light of the Covid-19 pandemic that restricted primary data collection.

The specific objectives were:

(i) To synthesise existing evidence about abortion decision-making trajectories and their determinants in LMICs

(ii) To generate and validate a women's empowerment index for women in LMICs

(iii) To investigate the association between women's empowerment and modern contraceptive use in LMICs

(iv) To investigate the association between women's empowerment and abortion in LMICs

1.8 Thesis outline

The thesis is presented in six chapters, including this introduction.

Chapter 2: Abortion decision-making trajectories and their determinants in low- and middle-income countries: a mixed-methods systematic review and meta-analysis. This chapter, corresponding to objective (i), describes the systematic review and meta-analysis that was carried out to provide a background of the current evidence and as a context to the

quantitative analyses presented in chapters 3 – 5. The findings from the systematic review were used to refine the specific research objectives (ii) – (iv).

Chapter 3: Generating a women's empowerment index for low- and middle-income countries. This chapter, corresponding to objective (ii), describes the development and validation of two-related women's empowerment indices (the woman-alone and the joint empowerment indices) through a psychometric analysis of the Demographics and Health Survey (DHS) data from 30 low- and middle-income countries. The indices and the three domains generated and validated were subsequently used in chapters 4 and 5 to study the association between women's empowerment and modern contraceptive use and abortion in the countries where the indices were validated.

Chapter 4: Investigating the association between women's empowerment and modern contraceptive use in low- and middle-income countries. In this chapter, corresponding to objective (iii), the women's empowerment indices generated and validated in chapter 3 were used to empirically assess the association between women's empowerment and modern contraceptive use in the 30 LMICs using the DHS datasets for which the indices had been validated.

Chapter 5: Investigating the association between women's empowerment and abortion in low- and middle-income countries. In this chapter, which corresponds to objective (iv) above, the women's empowerment indices generated and validated in chapter 3 above were used to empirically assess the association between women's empowerment and abortion in 29 LMICs using the DHS datasets for which the indices had been validated. One country was excluded because it lacked the variable to ascertain the outcome (abortion).

Chapter 6: Discussion and recommendations. This chapter provides a summary of the thesis' key findings, a discussion of the main findings and recommendations.

Chapter 2: ABORTION DECISION-MAKING PROCESS TRAJECTORIES AND DETERMINANTS IN LOW- AND MIDDLE-INCOME COUNTRIES: A MIXED-METHODS SYSTEMATIC REVIEW AND META-ANALYSIS

2.1 Introduction

The circumstances surrounding a woman's decision to seek an abortion can be time-specific and variable[5]. Due to the socioeconomic and power dynamics involved in abortion[30], abortion decision-making trajectories are often complex, iterative, multiphasic, dynamic, context-specific, and may involve periods of intense negotiations between the woman and significant others[5, 31, 32, 34, 40, 41]. According to Coast *et al. (2018)*, abortion decision-making trajectories are "*the processes and transitions occurring overtime for a pregnancy that ends in abortion"*[5]. Women may "suffer in silence" due to the uncertainty about the decision to terminate a pregnancy and other people's reaction to the decision[42]. The abortion trajectories chosen may influence abortion outcome and access to post-abortion care[31, 42]. The particular trajectory taken by individual women is influenced by various legal, socioeconomic, demographic, and cultural factors such as financial stability, relationship stability, the influence of significant others, risk perceptions, stigma, knowledge of abortion laws, and availability and access to abortion services including misoprostol[5, 31, 32, 34, 40, 41]. While there is some understanding of women's decision-making processes for seeking abortion care, to date there has been no critical appraisal of such evidence through a systematic review and meta-analysis to map out these complex abortion decision-making trajectories and their determinants in LMICs, which have a high burden of unsafe abortions and their associated complications.

2.1.1 Rationale for the systematic review

The first objective of this systematic review was to synthesise the existing evidence on the abortion decision-making processes in the LMIC settings where about 97% of all unsafe abortions occur[15]. The findings of the systematic review were then used to refine the research questions for the secondary data analyses designed to address the subsequent research objectives.

2.1.2 Review questions

The questions address by this systematic review are:

1. What are the trajectories for women seeking abortion in LMICs?

2. For women in LMICs, what factors influence the choice of these abortion trajectories?

2.2 Methods

2.2.1 Search strategy

The preferred reporting items for systematic review and meta-analysis protocol (PRISMA-P) 2015 statement[43] was followed in developing the protocol[2]. The protocol was registered with the international prospective register of systematic reviews (PROSPERO), registration number CRD42021224719. The PRISMA chart 2020 is provided in **Appendix A.1**.

The following electronic bibliographic databases, registers and grey literature sources were searched: Ovid Medline, Ovid EMBASE, Ovid PsycINFO, Ovid Global Health, Web of Science (including Social Science Citation Index), Scopus, IBSS, CINAHL via EBSCO, WHO Global Index Medicus, the Cochrane Library ProQuest, Google Scholar, and the WHO website. The Library Manager helped with identifying relevant search terms which comprised the following three key concepts and their synonyms: “abortion,” “decision-making”, and “developing countries” which were combined with Boolean operators. The search terms were modified depending upon the database and used both keywords and medical subject headings (MeSH) in the search process. The search filters for LMICs from the Cochrane filter (https://epoD.cochrane.org/lmic-filters) were used. Reference lists of all included studies for possible relevant studies that may have been missed in the earlier searches were manually searched. The full search strategy for Ovid Medline is in **Appendix A.2**.

2.2.2 Eligibility criteria

All published and unpublished primary observational, intervention, and qualitative studies and reports that reported on either the women’s or male partners’ decision-making trajectories or their determinants or both for induced abortions in LMICs were included. Trial registrations,

systematic review protocols, systematic reviews, case series, conference abstracts, case reports, policy analyses, commentaries, conceptual frameworks, and editorials from the review, were excluded. Studies that focused on spontaneous abortion were excluded. The search was restricted to studies published between January 1, 2000, and February 16, 2021, with no language restrictions. The searches were updated on June 06, 2022. The period from 2000 was chosen because it marked the start of the millennium development goals (MDGs) in which the MDG 5 target 5.A aimed to reduce maternal mortality ratio by three quarters between 1990 and 2015[44]. This period would also capture contemporary studies on abortion decision-making in LMICs.

2.2.3 Study screening and selection

I screened and selected all articles based on titles and abstracts while three other colleagues were the second independent reviewers, with Ines Corcuera being a second reviewer for about 50% of the articles, Jessica Macias Balil 35% and Sandrena Ruth Frischer 15%. Discrepancies were resolved through discussion and/or by involving the thesis supervisors. Selected articles for full text review were screened in a similar manner and included only those mentioning either of the key outcomes including trajectories of abortion decision-making or determinants of such trajectories. The PRISMA flowchart was used to display the screening and selection process.

2.2.4 Data extraction

The following information was extracted for all studies: authors, aim(s); setting (including location(s) and year(s) of publication); inclusion/exclusion criteria and participant characteristics; methodology including study design, sample size, data collection, and analytical methods; results; strengths and limitations; and all information needed to assess

the risk of bias. Separate data extraction templates were created for qualitative and quantitative findings. For qualitative studies, the data extracted comprised themes, first order quotes (study participants' quotes verbatim) and second order quotes (author interpretations/explanations). For quantitative studies, data were extracted about the number and proportion of different final decision-makers about abortion. Further data from quantitative studies, e.g. about costs of abortion, were extracted where this could be used qualitatively in the synthesis of the decision-making trajectories and their determinants. I extracted data from each included article while the other reviewers were the second independent data extractors.

2.2.5 Quality assessment

Risk of bias for quantitative studies was assessed using the Joanna Briggs Institute (JBI) assessment tool[45, 46] and the critical appraisal skills programme (CASP) appraisal checklist for qualitative studies[47]. Disagreements were resolved in the quality assessment findings through consensus. Articles were graded into "high", "medium" and "low" quality based on their risk of bias. While no consensus exists on these rankings, the first two questions on the CASP checklist are concerned with validity of the findings and thus any study that did not have a "Yes" to any of the two questions was ranked low regardless of how the rest of the questions were scored[47]. In general, studies meeting all but a minimum of two quality assessments were rated "high quality", those missing 2-4 items (either with no/unknown/can't tell responses but excluding not applicable responses) were rated "medium quality" while studies missing at least 5 items were rated "low quality". No study was excluded based on quality assessment alone[48]. I assessed risk of bias from each included article while the other reviewers were the second independent risk of bias assessors.

2.2.6 Data analysis

There is no widely accepted approach for synthesising data in a mixed methods systematic review, and any approach chosen depends upon the type of studies (qualitative, quantitative or mixed methods), the purpose of the research and the extracted data[49]. Qualitative and quantitative findings were combined at both the data analysis and the discussion stages using the convergent synthesis approach at the discussion stage using the approach suggested by Hong *et al.*[50]. Convergent synthesis involves “gradual, successive, and constant refinements of synthesis and interpretation of the qualitative and quantitative evidence”[51]. The analysis of the qualitative and the quantitative evidence is mostly independent and non-linear[51]. Based upon the systematic review research question(s) and the extracted data, the qualitative and qualitative findings may be combined at the data-analysis stage, the results stage or at the discussion stage (parallel-results convergent synthesis)[50].In this thesis, some of the quantitative findings were used qualitatively to synthesise abortion decision-making trajectories and their determinants. However, other quantitative data (meta-analysed) were analysed and presented separately, only combining the findings with qualitative findings at the discussion stage, using a parallel convergent design[50].

2.2.6.1 Analysis of qualitative studies: abortion decision-making trajectories and their determinants

The “best fit” framework synthesis[52] using “the trajectories of women’s abortion-related care” conceptual framework developed by Coast *et al. (2018)* was adopted[5]. Extracted information was compared and mapped onto Coast’s framework, adding or modifying the trajectories based on the extracted data. To analyse the determinants of abortion decision-

making trajectories, the thematic synthesis approach proposed by Thomas and Harden[53] was used. The synthesis involved three overlapping stages: developing coding schemes; developing descriptive themes from the coding schemes; and generating analytical themes from the descriptive themes[53].

2.2.6.2 Analysis of quantitative studies: meta-analysis

For the quantitative synthesis, which focused on abortion decision-making, data were categorised into decisions made by the woman alone (solely or primarily – depending upon how this had been ascertained in the primary study), male partner (solely or primarily), jointly (woman and male partner), and others (solely or primarily). Additional two categorical variables were created: an “overall woman involvement” category was generated by summing woman alone and joint decision-making and an “overall male partner involvement” category was created by summing male partner alone and joint decision-making. Meta-analyses of proportions were conducted using the random-effects model that assumed between-study heterogeneity for the variables ‘woman alone’, ‘overall woman involvement’, and ‘overall (male) partner involvement’.

2.2.6.3 Assessing heterogeneity: subgroup analysis

Heterogeneity was tested using the I^2, Tau square, and the Q-statistic. To investigate potential sources of heterogeneity, subgroup analyses were conducted by study setting’s abortion laws (restrictive or liberal), income status (low income, lower-middle income, or upper middle income), and geographical regions (South-East Asia, India, or SSA). A high proportion of included quantitative studies were from India, hence India was considered separately from the rest of the rest of Asia in the subgroup analysis by regions.

2.2.6.4 Assessing publication bias

As recommended by Barker *et al*. (2021), publication bias was not tested as the tests would not be appropriate for meta-analysis of proportions[54]. Tests for publication bias are primarily for comparative data and assumes that studies with positive results are more likely to be published than those with negative results. Therefore, for single proportions, with no comparator, such as incidence/prevalence studies[54], and in this case the proportion of involvement of various actors in the abortion decision-making process, the tests for publication bias were not appropriate.

2.2.6.4.1 Sensitivity analyses

For the qualitative component, sensitivity analyses were conducted to examine whether the trajectories delineated and the determinants synthesised from the qualitative studies varied by the graded quality of the included papers[53]. The trajectories and determinants were compared when studies with low and then medium quality were sequentially excluded.

For the quantitative component, the leave-one-out meta-analysis was conducted to assess the influence of outlier or highly influential studies. The leave-one-out meta-analysis involves conducting multiple meta-analyses while excluding one study at a time[55]. Forest plots in which the displayed effect for each study corresponds to the overall effect size computed by the meta-analysis when that study is excluded from the analysis were generated. The vertical line through the leave-one-out forest plot shows the overall effect size based on the complete set of studies (with no omission) to help detect influential studies. For a study to be considered an outlier or to have a significant effect on the original pooled prevalence estimate, the new pooled prevalence estimate excluding that study must lie outside the 95% CI of the original pooled prevalence estimate, i.e., the 95% CIs should not overlap[55].

2.2.7 Grading evidence of quality of evidence of recommendations

Following recommendations from the Cochrane Qualitative and Implementation Methods Group[56], the confidence in the evidence of the recommendations generated from the evidence were assessed using the Grades of Recommendation, Assessment, and Evaluation – Confidence in Evidence from Reviews of Qualitative Research (GRADE-CERQUal) approach[57]. Each CERQUal component was assessed separately, namely, methodological limitations, coherence, adequacy and relevance of the qualitative evidence synthesis to assign a level of confidence to each recommendation: no or very minor concerns for those that were unlikely to reduce confidence in the findings, minor concerns for those that may reduce confidence, moderate concerns for those that would probably reduce confidence and serious concerns for those that were likely to reduce confidence[57]. Due to the heterogeneity of the quantitative findings, the GRADE approach was not used to assess the level of confidence in the findings[58].

2.2.8 Ethics Approval

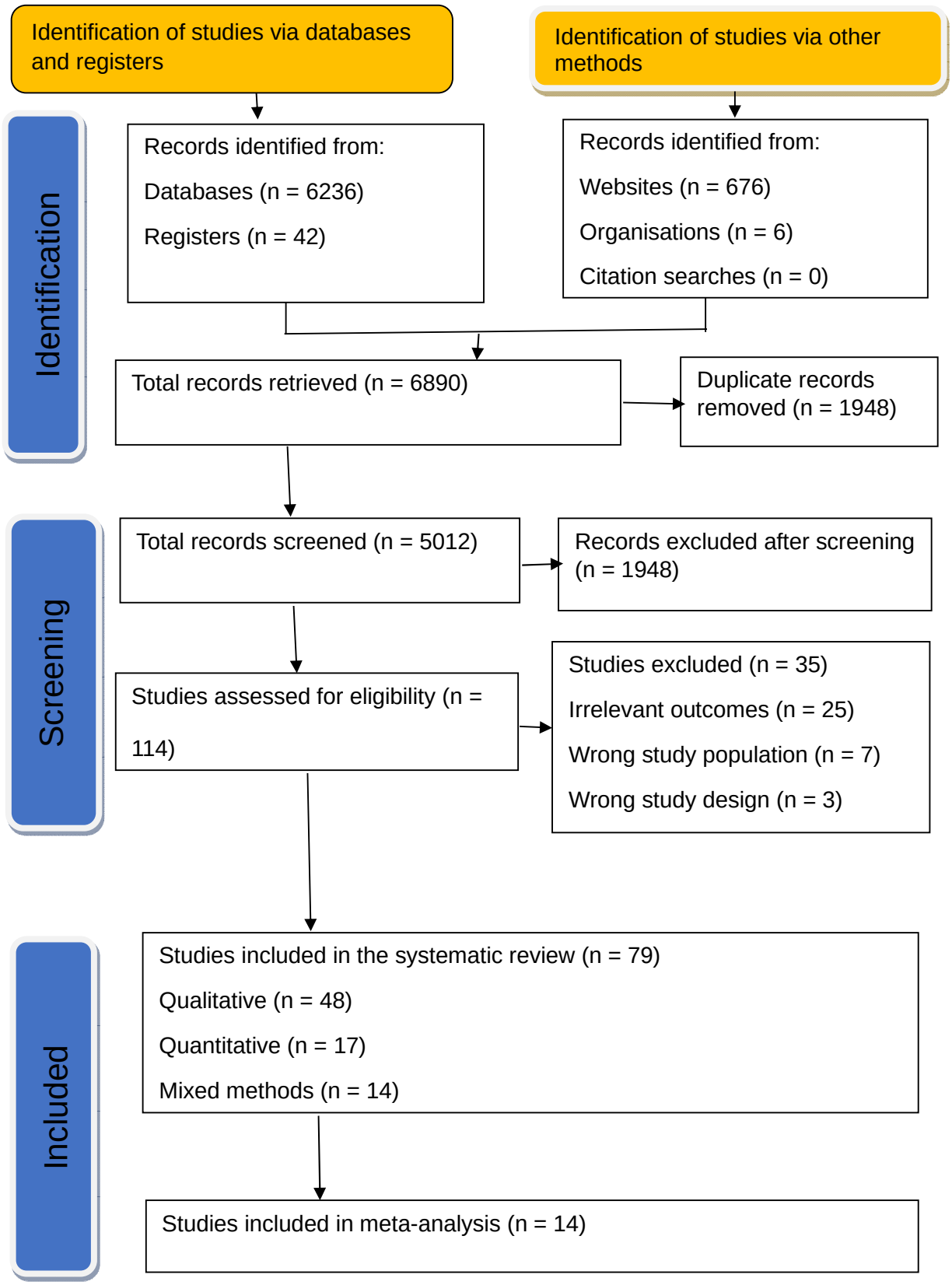
Ethics committee approval was not required for this systematic review and meta-analysis.

2.3 Results

2.3.1 Characteristics of included studies

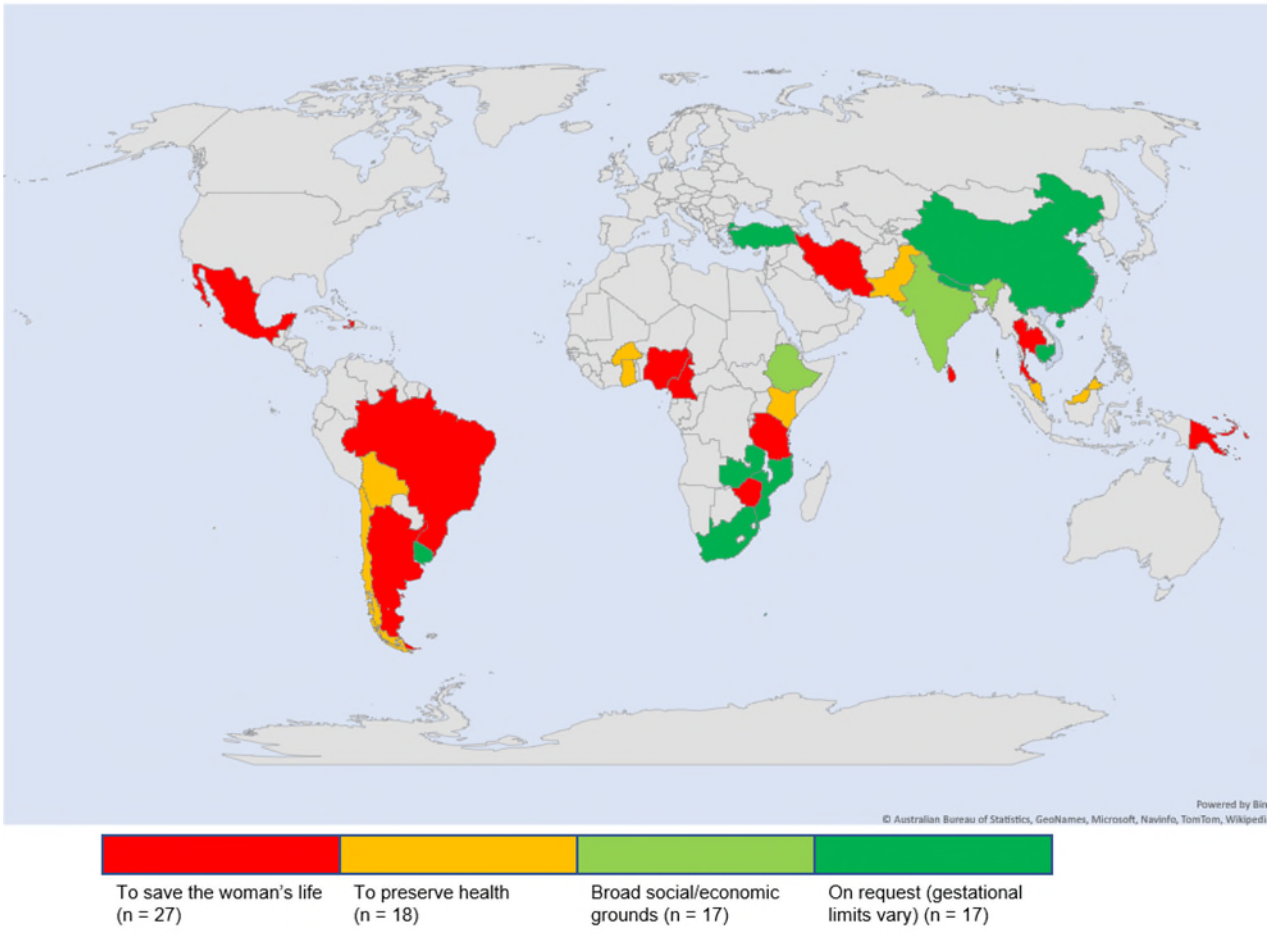
The final search yielded a total of 6960 studies. After deduplication, title and abstract of 4269 studies were screened and 114 studies were included for full text screening. Thirty-five studies were excluded following full text review. The reasons for the rejected studies included irrelevant outcomes such as studies focusing on reasons for abortion only or cost analyses, ineligible target populations like women who did not have an abortion, or ineligible study design such as systematic reviews. The details of excluded articles are in **Appendix A.3**. Data from the remaining 79 studies were extracted and analysed as shown in **Figure 2.1** below. Of the 79 studies included in the systematic review, 14 cross-sectional studies provided quantitative information on who made the final decision to terminate the pregnancy and were therefore included in the meta-analysis. A total of 7737 women from these 14 studies were included in the meta-analysis.

Figure 2.1 The PRISMA chart showing inclusion and exclusion of studies



The study settings and their abortion laws are shown in **Figure 2.2**. Thirty-three of the studies were from sub-Saharan Africa (SSA), 28 from Southern and Eastern Asia, 13 from Latin America, two from Eastern Europe, one each from the Pacific and Caribbean Islands while one study included countries from both SSA and Latin America.

Figure 2.2: Map showing the settings of abortion laws of the 79 studies included in the review



The included studies are summarised in **Tables 2.1 – 2.3**. Forty-eight studies used qualitative methods, 17 used quantitative methods (15 cross-sectional, one partially randomised controlled trial and one pre-post survey), and 14 used mixed methods. The study population ranged from 31 to 2543 for surveys/cross-sectional studies, 8 to 112 women for in-depth

interviews while the focus group discussions ranged from 2 to 30 groups. The majority of the interviewed population were women who had induced abortion both married and unmarried, their male partners, health care providers, and social workers. Various data collection methods were used including semi-structured and structured questionnaires for the quantitative studies, and interview and/or topic guides, and ethnographic notes for the qualitative studies.

Table 2.1 Summary of included qualitative studies (n = 48)

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
Herrera *et al* (2002)[59]	Mexico	Qualitative: Unclear	Unclear; but 12 women who had sought abortion; 1 priest, 2 doctors, gynaecologists and nurses, and a social worker	Women who had sought abortion; priests; doctors; gynaecologists; nurses; social workers	Unclear but in private places	Not clear	Low
Ramachandar *et al* (2004)[60]	India	Qualitative: key informant; in-depth interviews	97 women who had abortions and 18 village health nurses as KIIs	Married women who had abortions in the previous six months; village health nurses as key informants	Clinics; Remote to peri-urban	Semi-structured questionnaires	Low
Schuster (2005)[61]	Cameroon	Qualitative: in-depth interviews	65	Women treated for complications at hospitals; or history of abortion	Hospital; Urban	Semi-structured questionnaires	Low

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
Peres *et al* (2006)[62]	Brazil	Qualitative: retrospective narrative biographies; key informant interviews	123	Youth; key informants	Urban	Semi-structured interviews	Low
Ganatra *et al* (2010)[63]	India	Qualitative: in-depth interviews	63	women attending two clinics for medical abortion; consented	Clinics; urban and rural	In-depth open-ended questions	High
Koster (2010)[64]	Nigeria	Qualitative: ethnography	652	Yoruba women in Lagos State	Clinics and community; Rural and urban	participant observation, in-depth interview questionnaires, focus groups topic guides	High
Bui *et al* (2011)[65]	Vietnam	Qualitative: ethnography	20	HIV positive woman with unwanted pregnancy, either	Urban	Ethnographic notes	Moderate

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
				carried to term (7) or terminated (13)			
Dijk *et al* (2011)[66]	Mexico	Qualitative: in-depth interviews	25	Women aged 18+; had safe abortion	Clinic; Urban	Interview guide	High
Juarez *et al* (2011)[67]	Mexico	Qualitative: in-depth interviews	26	Aged 18-35; had at least one pregnancy; consented	Clinic: Urban	semi-structured guide	High
Azmat *et al* (2012)[68]	Pakistan	Qualitative: exploratory, in-depth interviews, focus group discussions, questionnaires	8 FGDs, 15 IDIs, 76 exit interviews	women with complications related to miscarriage and unsafe or incomplete abortions, and cases referred by reproductive health volunteers	Clinic	Semi-structured, topic guides, exit structured questionnaires	Moderate
Heilborn *et al* (2012)[69]	Brazil	Qualitative: ethnography and in-depth interviews	28 (13 men, 15 women)	Young people, aged 18-27, living in Rio de Janeiro, and had experiences of	Urban	Interview guides	Low

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
				contraception, unforeseen pregnancies and abortion			
Tatum *et al* (2012)[33]	Mexico	Qualitative: in-depth interviews and focus group discussions	24	Adolescents; 13-17 years at time of pregnancy; became pregnant after the April 2007 law change; resident of Mexico City during the first 12 weeks of pregnancy; belonged to middle, lower-middle, or lower socioeconomic class; terminate or did not terminate pregnancy	Private secure rooms; urban	Semi-structured question guides	High
Tong *et al* (2012)[70]	Malaysia	Qualitative: in-depth interviews	31 women	Women attending an urban family planning clinic, aged 21 and above and having had an induced abortion	Clinic; Urban	Structured and Semi-structured questionnaires	Low

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
Gresh *et al* (2014)[71]	South Africa	Qualitative: In-depth interviews	20	female university students aged less than 30 years	University; Urban	In-depth open-ended questions	Low
Marlow *et al* (2014)[72]	Kenya	Qualitative: focus group discussions	10 FGDs	Married and unmarried women; whether in school or not	Urban; rural	Topic guides	Low
Izugbara *et al* (2015)[73]	Kenya	Qualitative: in-depth interviews	50	Women who had induced or attempted to induce abortion; gave consent	Clinic; Urban and rural	Interview guide	High
Pilecco *et al* (2015)[74]	Brazil	Qualitative reconstruction of quantitative data	18	women living with HIV aged between 18 and 49 years old and seen in public health services in Porto Alegre, Brazil who reported an abortion after the diagnosis of HIV	Clinic - HIV positive women from specialised services; HIV negative women from primary health services	reconstruction of quantitative information collected in the primary study	High

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
Ramos *et al* (2015)[75]	Argentina	Qualitative: in-depth interviews	24	Women who had had abortion with misoprostol at home; sought counselling or presented with symptoms of incomplete abortion at a public hospital in the city of Buenos Aires.	Hospital; urban	in-depth interview schedule	High
Sri C. *et al* (2015)[76]	India	Qualitative: in-depth interviews	15 women	women receiving medical abortion at the clinic	Rural/urban; clinic	Semi-structured questionnaires	High
Vallely *et al* (2015)[77]	Papua New Guinea	Qualitative: in-depth and key informant interviews	28 IDIs, 8 KIIs	IDIs - women managed for complications of induced/incomplete abortion; Key informants - extensive experience working in both the government and church health services and non-governmental organisations (NGOs)	Hospital, Urban	Interview guides	High

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
Arnott *et al* (2017)[78]	Thailand	Qualitative: in-depth interviews	14	Women seeking abortion	Clinic; Urban	Semi-structured interview guides	High
Chahal *et al* (2017)[79]	Pakistan	Qualitative: ethnography	37 women	Abortion seeking women; abortion providers	Urban; Clinic	Semi-structured interviews; topic guides; participant observation	High
Freeman *et al* (2017)[34]	Zambia	Qualitative: in-depth interviews	112	Women who received a safe abortion or care following an incomplete (unsafe) abortion	Hospital; Urban	open-ended and supplementary closed-ended questionnaires	High
John Lekan *et al* (2017)[80]	Nigeria	Qualitative: in-depth interviews	40 male and female participants	Female and male; had abortion or procured services	University; Urban	interview guides	Low

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
				by male partner; University students			
MacFarlane *et al* (2017)[81]	Turkey	Qualitative: in-depth interviews	14	Aged 18 years or older; obtained abortion services in Istanbul on/after January 1, 2009; fluent in Turkish or English	City; Urban	Interview guide	High
Rominski *et al* (2017)[82]	Ghana	Qualitative: in-depth interviews and focus group discussions	29 - in-depth interviews; 8 focus groups of community members	Women receiving treatment for complications from a self-induced abortion or coming for an elective induced abortion; community members; consented	Hospital for IDIs; community/markets for FGDs	Topic guides for focus group discussions	High
Frederico *et al* (2018)[83]	Mozambique	Qualitative: in-depth interviews	14	women aged 15-24; had had abortion	Community; Urban Centres	Semi-structured interview guideline	Low
Kebede *et al* (2018)[84]	Ethiopia	Qualitative: ethnography, individual	25 young women - 68 IDIs; 34 KIs;	Age 18 -24 years; residing in Addis Ababa; never been married; had undergone	Clinic, community; Urban	Semi-structured	High

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
		interviews, focus group discussions, analysis of cultural and social context	144 persons for 12 FGDs	medically unsafe abortions that had led to serious complications		questionnaires	
Loi *et al* (2018)[42]	Kenya	Qualitative: in-depth interviews	9	women over 18 years; had induced abortion; received post-abortion care; gave consent	Hospital; Public	Semi-structured interview questionnaires	High
Penfold *et al* (2018)[85]	Kenya	Qualitative: in-depth interviews	22	Women who had received an abortion or post-abortion care service at selected clinics	Private Clinics: rural and urban	Structured and semi-structured interview questionnaires	Medium

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
Bain *et al* (2019)[41]	Ghana	Qualitative: in-depth interviews	53	Female adolescents: had either continued a pregnancy to term, or had past experience of at least one self-induced abortion; additional interviews were conducted with purposively selected stakeholders	Clinic; Urban	Semi-structured	High
Oyeniran *et al* (2019)[86]	Nigeria	Qualitative: in-depth interviews	31 women	Had induced abortion; admitted to hospital	Hospital; Urban	Semi-structured guides	High
Rogers *et al* (2019)[87]	Nepal	Qualitative: exploratory - Assets Focused Rapid Participatory Appraisal (AFRPA)	20	Women aged 15-49 years; obtained medical abortion pills for the termination of a pregnancy.	Clinic/pharmacy	Semi-structured questionnaires	High

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
Srivastava *et al* (2019)[88]	India	Qualitative: in-depth interviews	40	Medical abortion users and their male partners	Clinic	Semi-structured questionnaires	High
Baum *et al* (2020)[89]	Poland, Brazil, Nigeria	Qualitative: in-depth interviews	30	Aged 18 or older; speak English, Polish, or Portuguese	Online	Interview guide	High
Ferrari *et al* (2020)[90]	Brazil	Qualitative: in-depth interviews	10	Adolescents between 15 and 17 years, live in a favela (slum), had illegal abortion between ages 12 and 17.	Slum, urban	Interview guide	High
Lima *et al* (2020)[91]	Brazil	Qualitative: in-depth interviews	8 adolescent girls	Adolescent girls going to school; seeking abortion	Urban, schools	semi-structured questionnaires	Low
Masuda *et al* (2020)[92]	Cambodia	Qualitative: ground-up exploratory study	29: 16 women and 13 providers	Women: factory workers, aged 18 and above, seeking abortion services (medical abortion pills or surgical abortion); Providers: three	clinics	semi-structured questionnaires	High

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
				providers were working at facilities where women were recruited, other providers were purposefully selected to involve a variety of types of facilities and providers.			
Nourizadeh *et al* (2020)[93]	Iran	Qualitative: in-depth interviews	29	women aged 15-48 with an unwanted pregnancy; husbands of women who had unwanted pregnancy; midwives; gynaecologists	Clinic patients	semi-structured questions	High
Ouedraogo *et al* (2020)[32]	Burkina Faso	Qualitative: ethnography	31 women and 5 men	women seeking abortion; women whose male partners had got abortion	clinic	in-depth interview questionnaires	High
Ouedraogo *et al* (2020)[94]	Burkina Faso	Qualitative: ethnography - participant observation	52 (39 patients, 13 health care providers)	Women seeking post-abortion care; abortion providers in the study facilities.	Clinics/hospitals; Urban	Participant observation; semi-structured	High

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
		and in-depth interviews				questionnaires	
Solheim *et al* (2020)[95]	Tanzania	Qualitative: ethnography, focus groups, in-depth interviews	198	Women with medical abortion after unwanted pregnancy; health workers; drug providers; college and university students; representatives from NGOs, district authorities and ministry; and drugstores	Clinic; drugstores; health facilities; urban	Interview guides	High
Chareka *et al* (2021)[96]	Zimbabwe	Qualitative: in-depth interviews	198; 30 FGDs, 41 IDIs	being female, self-identifying as selling sex and being between the ages 16–24 years	Urban and peri-urban	Interview guides; Semi-structured questionnaires	High
Chiweshe *et al* (2021)[97]	Ethiopia, Malawi, Zambia	Qualitative: in-depth interviews	133	adolescents aged 10–19 years, either seeking a safe abortion or had come for post-abortion care	Clinics	Interview guides	High

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
Harries *et al* (2021)[98]	South Africa	Qualitative: in-depth interviews	15	Women who had accessed abortion outside the formal system	Urban, various private places	Interview guide	High
Ituarte *et al* (2021)[99]	Uruguay	Qualitative: in-depth interviews	14	adolescents between 17 and 19 years of age who voluntarily terminated a pregnancy in public health services	Urban, health facilities	Interview guide	Moderate
Larrea *et al* (2021)[100]	Chile	Qualitative: in-depth interviews	11	Women who had accessed abortion services	Urban	Interview guide	High
Katz *et al* (2022)[101]	Nigeria	Qualitative: in-depth interviews	25	Clients at least 15 years old, had had abortion within the preceding 3 months	Clinic, urban	Semi-structured questionnaires	High

IDIs – In-depth interviews

KIIs- key informant interviews

FGDs – focus group discussions

Table 2.2 Summary of included quantitative studies (n = 17)

Study ID	**Country of setting**	**Study Designs**	**Sample size**	**Participant characteristics**	**Study setting (place, rural/urban)**	**Data collection methods**	**Quality assessment**
Calves *et al* (2002)[102]	Cameroon	Cross-sectional survey	384	Young women and men	Urban	Survey registers	High
Korejo *et al* (2003)[103]	Pakistan	Cross-sectional survey	57	Women with history of attempted induced abortion admitted to hospital	Hospital, urban	Structured questionnaires; hospital records	Low
Dhillon *et al* (2004)[104]	India	Cross-sectional survey	1851	married women, aged 15-45	households	survey/structured questionnaires	Medium
Akin *et al* (2005)[105]	Turkey	Partially randomized controlled trial	470	Women aged 18-49; enrolled over an eight-month period if they had an intrauterine pregnancy up to 56 days last normal period	Clinic; Urban	Medical and home records	High

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
Munjial *et al* (2006)[106]	India	Cross-sectional survey	31	Women who obtained abortion in the 5 years preceding the survey in the study area	Community	Structured questionnaire	Low
Rachana *et al* (2007)[107]	Nepal	Cross-sectional study	100	Patients attending hospital for comprehensive abortion services	Hospital; Urban	Structured questionnaires; patient files	Low
Ekanem *et al* (2009)[108]	Nigeria	Cross-sectional study	492	Patients admitted to the ward for management of induced abortion and had complete information at 6-weeks follow up.	Hospital; Urban	Structured interviews; patients' case files, ward, and operation theatre records	Low
Bui *et al* (2010)[109]	Vietnam	Cross-sectional survey	707	HIV positive women accessing services through community health centres in the study areas	Clinic; rural	structured interview questionnaires	Low

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
Chunuan *et al* (2012)[110]	Sri Lanka	Cross-sectional survey	402	Women of any age who had an abortion, regardless of chronological age, gestational age, or type; and admitted to one of the study site hospitals.	Hospital	Structured self-report questionnaire	High
Tamang *et al* (2012)[111]	Nepal	Cross-sectional study	1041	Clinically verified uterine gestation of 63 days or less; had undergone abortions at study clinics	Clinic	Structured questionnaires	High
Thapa *et al* (2013)[112]	Nepal	Cross-sectional survey	1172	Women receiving abortion services at the clinic;	Clinics; Urban and rural	Structured questionnaires	Low
Banerjee *et al* (2014)[113]	India	Pre-post survey	2543	Married women between the ages of 15 and 45 and married men between the ages of 18 and 49	Health facilities	Semi-structured questionnaires, health registers	High

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
Zuo *et al* (2015)[114]	China	Cross-sectional survey	1271	Unmarried women, aged 15-24 years.	Clinic	Structured questionnaires	High
Biney *et al* (2017)[115]	Ghana	Cross-sectional study	552	Women aged 15-49 years; terminated pregnancy and gave reasons for the abortion in the 5 years preceding the survey	Households; countrywide	Structured Women's questionnaire	High
Palak *et al* (2019)[116]	India	Cross-sectional study	6876	Women aged 15-49 years, irrespective of their marital status; history of abortion in five years preceding the survey	Household	Survey questionnaires	High
Zavier *et al* (2020)[117]	India	Secondary data from community-based	166	Women who had induced abortion in the two years preceding the survey	Urban and rural	Survey questionnaires	Medium

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
		survey/cross-sectional survey					
Byrne *et al* (2021)[118]	Nigeria	Cross-sectional, national survey	1144	Women who had reported abortion in the national survey	National	Survey Questionnaires	High

Table 2.3: Summary of included mixed-methods studies (n = 14)

Study ID	**Country of setting**	**Study Designs**	**Sample size**	**Participant characteristics**	**Study setting (place, rural/urban)**	**Data collection methods**	**Quality assessment**
Ganatra *et al* (2002)[119]	India	Mixed methods: focus group discussions; Key informant interviews; cross-sectional surveys	1717 married women; 197 adolescents; 159 abortion providers	women who had induced abortion during the study period (18 months) from 1996 to 1998 whether married or not; abortion providers in the study area and nearby towns	Clinic	structured and semi-structured questionnaires	Medium
Dahlbäck *et al* (2007)[120]	Zambia	Mixed methods: in-depth interviews and cross-sectional surveys	34 adolescent girls	Girls who had undergone unsafe abortion; received manual vacuum aspiration (MVA) at hospital; hemodynamically stable; given informed consent	University teaching hospital; urban/city	Semi-structured and structured questionnaires	High

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
Puri *et al* (2007)[40]	Nepal	Mixed methods: cross-sectional surveys; in-depth interviews	1496 - for quantitative; 30 for qualitative	Household survey of married women, 15-24 years; and married men, 15-27 years	households	structured questionnaires	High
Dahlbäck *et al* (2010)[121]	Zambia	Mixed methods: cross-sectional and in-depth interviews	87 women	Admitted with a diagnosis of incomplete abortion; had undergone an MVA; hemodynamically stable; given informed consent	University Teaching Hospital, Lusaka, city	semi-structured and structured questionnaires	Low
Geressu *et al* (2010)[122]	Ethiopia	Mixed methods: in-depth interviews and cross-sectional surveys	27 - women who had abortion; 512 health care providers	Women who had second trimester abortion in the public hospitals	29 hospitals countrywide	semi-structured questionnaires	High

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
Jejeebhoy *et al* (2010)[123]	India	Mixed methods: in-depth interviews; cross-sectional survey	795 (26 IDIs)	Consenting; aged 24 or younger; not had a previous live birth, irrespective of marital status	Clinic	Interview guide	Low
Mitchell *et al* (2010)[124]	Mozambique	Mixed methods: in-depth interviews; focus group discussions; cross-sectional survey	1661	Pregnant women 18-49 years of age (and adolescents 13-17 with parental consent); confirmed gestations of 6-11 weeks of pregnancy; requesting voluntary termination of pregnancy.	Hospital; Urban	Semi-structured questionnaires; exit interview questionnaires	High
Bury *et al* (2012)[125]	Bolivia	Mixed methods: in-depth interviews;	1386 for the survey; 115 for FGDs, 50 IDIs	For the survey: women aged 15-49 from Demographic and health Survey; For IDIs:	low-income peri-urban areas of 5 Bolivian cities	focus group discussions, in-depth interviews and	Low

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
		focus group discussions; cross-sectional survey		women who accessed PAC in five public hospitals.		structured survey questionnaires, semi-structured questionnaires	
Arambepola *et al* (2014)[126]	Sri Lanka	Mixed methods: in-depth interviews; unmatched case-control	671 women (171 cases; 600 controls)	Cases were women in the selected hospitals with complications following an unsafe abortion; Controls were mothers in postnatal wards following the delivery of an unintended pregnancy carried to term.	Hospital Patients	Structured and semi-structured questionnaires	High
Kumi-Kyereme *et al* (2014)[127]	Ghana	Mixed methods: in-depth interviews; Cross-	401 for cross-sectional; 35 for IDI	Accredited abortion providers; women who had undergone an abortion between January and December 2010.	Hospital; Urban	structured and semi-structured questions	High

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
		sectional surveys					
Osur *et al* (2015)[128]	Kenya	Mixed methods: focus group discussions; key informant interviews; cross-sectional surveys	320 for cross-sectional; 21 KIIs; 2 FGDs	Women with unsafe abortion treated for complications; community health workers; pharmacists; community representatives (teachers and women leaders)	Clinic	structured questionnaires and interview guides	High
Coast *et al* (2016)[31]	Zambia	Mixed methods: in-depth interviews; cross-sectional study	112	Adolescents and women aged 15-43 presenting for care at emergency ward following unsafe abortion	City Hospital; Urban	semi-structured and structured questionnaires	High

Study ID	Country of setting	Study Designs	Sample size	Participant characteristics	Study setting (place, rural/urban)	Data collection methods	Quality assessment
Berry-Bibee *et al* (2018)[129]	Haiti	Mixed methods: in-depth interviews; focus group discussions; cross-sectional survey	8 FGDs (n=62); 13 IDIs; 255 = cross-sectional	Women seeking abortion; at least 18 years old; current or recent (6 weeks or less post-pregnancy) pregnancy at 20 or less weeks gestation (via self-report); Haitian Creole speakers; women's health care informants - community health workers, herbalists, traditional birth attendants, nurses, and physicians	University Hospital; Urban	semi-structured and structured questionnaires	High
Gbagbo (2020)[130]	Ghana	Mixed methods: in-depth interviews and cross-sectional	401 questionnaires; 21 IDIs	All women who had induced abortion in Accra from January to December 2018; willing to be part of the study.	City; clinics	structured and semi-structured questionnaires	High

IDIs – In-depth interviews

KIIs- key informant interviews

FGDs – focus group discussions

2.3.2 Risk of bias (quality) assessment

Tables 2.2 – 2.4 show results of quality assessment for the qualitative and quantitative components of the included studies. Overall, 52 of the articles were high quality, eight medium quality, and 19 were of low quality. Of the 52 studies with a qualitative component, 40 had high overall quality, six had medium and another six were low quality. Only 10/52 studies assessed using CASP qualitative appraisal tool included information on the relationship between researcher and participants (reflexivity). Of the cross-sectional studies, 17 were of high quality, seven medium and four low quality.

Table 2.4: Quality assessment for the qualitative studies using the CASP appraisal tool for qualitative studies

	CASP qualitative assessment questions										
Study ID	1	2	3	4	5	6	7	8	9	10	Overall Quality
Sri B *et al* 2014	Y	Y	Y	Y	Y	CT	Y	Y	Y	Y	H
Chahal *et al* 2017	Y	Y	Y	CT	Y	Y	Y	Y	Y	Y	H
Gbagbo *et al* 2020	Y	Y	Y	Y	Y	CT	Y	Y	Y	Y	H
Dahlback *et al* 2007	Y	Y	Y	Y	Y	CT	Y	CT	Y	Y	H
Dahlback *et al* 2010	Y	Y	Y	CT	Y	Y	Y	CT	Y	Y	H
Geressu *et al* 2010	Y	Y	Y	Y	Y	CT	Y	Y	Y	Y	H
Masuda *et al* 2020	Y	Y	Y	Y	Y	N	CT	Y	Y	Y	H
Lima *et al* 2020	Y	Y	CT	N	CT	N	Y	CT	Y	Y	L
Marlow *et al* 2014	Y	Y	Y	CT	Y	CT	Y	Y	Y	Y	H
Oyefara *et al* 2017	Y	Y	CT	Y	Y	CT	CT	Y	Y	Y	M
Oyeniran *et al* 2019	Y	Y	Y	Y	Y	CT	Y	Y	Y	Y	H
Rominski *et al* 2017	Y	Y	Y	Y	CT	CT	Y	Y	Y	Y	H
Vallely *et al* 2015	Y	Y	Y	Y	Y	CT	Y	Y	Y	Y	H
Solheim *et al* 2020	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	H
Tong *et al* 2012	Y	Y	Y	N	Y	N	Y	Y	Y	Y	H
Coast *et al* 2016	Y	Y	Y	Y	Y	CT	Y	Y	Y	Y	H
Nourizadeh *et al* 2020	Y	Y	Y	Y	Y	Y	CT	Y	Y	Y	H
Arambepola *et al* 2014	Y	Y	Y	Y	Y	CT	Y	CT	Y	Y	H
Arnott *et al* 2017	Y	Y	Y	Y	CT	CT	Y	Y	Y	Y	H
Bain *et al* 2019	Y	Y	Y	Y	Y	CT	Y	Y	Y	Y	H
Baum *et al* 2020	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	H

Berry-Bibee 2018	Y	Y	Y	Y	Y	CT	Y	CT	Y	Y	H
Azmat *et al* 2012	Y	Y	Y	Y	Y	N	N	CT	Y	Y	M
Banerjee *et al*	Y	Y	Y	CT	CT	N	CT	Y	Y	Y	M
Bui *et al* 2011	Y	Y	Y	Y	Y	N	CT	Y	Y	Y	M
Bury 2012 *et al*	Y	Y	CT	CT	CT	N	CT	Y	Y	Y	L
Chareka *et al* 2021	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	H
Chiweshe *et al* 2021	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	H
Dijk *et al* 2011	Y	Y	CT	Y	Y	CT	Y	Y	Y	Y	H
Ferrari *et al* 2020	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	H
Frederico *et al* 2017	Y	Y	CT	Y	Y	Y	Y	Y	Y	Y	H
Freeman *et al* 2019	Y	Y	Y	Y	Y	CT	Y	Y	Y	Y	H
Ganatra *et al* 2002	Y	Y	Y	Y	Y	N	CT	CT	Y	Y	M
Ganatra *et al* 2010	Y	Y	Y	Y	Y	N	Y	CT	Y	Y	H
Gresh *et al* 2014	Y	Y	Y	N	Y	CT	Y	Y	Y	Y	H
Harries *et al* 2021	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	H
Herrera *et al* 2002	Y	Y	Y	Y	CT	N	CT	N	CT	Y	L
Ituarte *et al* 2021	Y	Y	Y	Y	Y	N	Y	CT	Y	Y	H
Izugbara *et al* 2015	Y	Y	Y	Y	Y	N	Y	CT	Y	Y	H
Jejeebhoy *et al* 2010	Y	Y	N	CT	N	N	CT	N	N	Y	L
Juarez *et al* 2011	Y	Y	Y	Y	Y	CT	Y	Y	Y	Y	H
Katz *et al* 2022	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	H
Kebede *et al* 2018	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	H
Koster *et al* 2010	Y	Y	Y	Y	Y	CT	Y	CT	Y	Y	H
Kumi-Kyereme *et al* 2014	Y	Y	Y	Y	Y	CT	Y	Y	Y	Y	H

Larrea *et al* 2021	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	H
Loi *et al* 2018	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	H
MacFarlane *et al* 2016	Y	Y	Y	Y	Y	CT	Y	Y	Y	Y	H
Mitchell *et al* 2010	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	H
Osur *et al* 2015	Y	Y	Y	Y	Y	N	CT	CT	Y	Y	M
Ouedraogo *et al* 2020	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	H
Ouedraogo *et al* 2020	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	H
Penfold *et al* 2018	Y	Y	N	Y	Y	N	Y	N	Y	Y	M
Peres *et al* 2006	Y	Y	CT	Y	Y	CT	CT	CT	Y	Y	M
Puri *et al* 2007	Y	Y	Y	Y	Y	CT	Y	Y	Y	Y	H
Ramachandar *et al* 2004	Y	CT	N	Y	CT	N	N	N	Y	Y	L
Ramos *et al* 2015	Y	Y	Y	Y	Y	CT	Y	Y	Y	Y	H
Rogers *et al* 2019	Y	Y	Y	Y	Y	CT	Y	Y	Y	Y	H
Schuster *et al* 2005	N	Y	CT	N	CT	Y	N	N	CT	Y	L
Srivastava *et al* 2019	Y	Y	Y	Y	Y	CT	Y	Y	Y	Y	H
Tatum *et al* 2012	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	H

Y= yes; CT = cannot tell; N = no; H =high; M = medium; L = low. CASP questionnaire for qualitative studies: 1. Was there a clear statement of the aims of the research? 2. Is a qualitative methodology appropriate? 3. Was the research design appropriate to address the aims of the research? 4. Was the recruitment strategy appropriate to the aims of the research? 5. Was the data collected in a way that addressed the research issue? 6. Has the relationship between researcher and participants been adequately considered? 7. Have ethical issues been taken into consideration? 8. Was the data analysis sufficiently rigorous? 9. Is there a clear statement of findings? 10. How valuable is the research?

Table 2.5: Quality assessment for descriptive cross-sectional studies using the JBI tool

	JBI assessment questions										
Study ID	1	2	3	4	5	6	7	8	9	Overall appraisal:	Overall quality
Abdella *et al* 2011	Y	Y	Y	Y	Y	U	Y	Y	Y	Include	H
Berry-Bibee *et al* 2018	Y	Y	U	Y	Y	N	Y	Y	Y	Include	H
Bui K *et al* 2010	Y	Y	U	Y	Y	U	U	Y	N	Include	M
Calves *et al* 2002	Y	Y	U	Y	Y	N	Y	Y	Y	Include	H
Coast *et al* 2016	U	N	U	Y	Y	Y	Y	Y	NA	Include	M
Chunuan *et al* 2012	Y	Y	Y	Y	Y	Y	U	Y	Y	Include	H
Dahlback *et al* 2007	Y	Y	U	Y	U	Y	Y	Y	NA	Include	H
Dahlback *et al* 2010	Y	Y	U	Y	Y	Y	U	Y	N	Include	M
Dhillon *et al* 2004	Y	Y	Y	Y	U	N	Y	Y	U	Include	M
Ekanem *et al* 2007	U	U	U	Y	Y	Y	Y	Y	U	Include	M
Ganatra *et al* 2002	Y	Y	U	Y	Y	N	Y	Y	Y	Include	H
Gbagbo *et al* 2020	Y	Y	Y	Y	Y	Y	Y	Y	Y	Include	H
Korejo *et al* 2003	Y	N	NA	Y	Y	N	U	Y	NA	Include	M
Pilecco *et al* 2015	Y	Y	Y	Y	U	Y	U	Y	Y	Include	H
Rachana *et al* 2007	U	U	U	U	U	Y	Y	Y	U	Include	L
Thapa *et al* 2013	U	N	Y	N	Y	N	N	Y	Y	Include	L

Y = yes; U = unknown; NA = not applicable; N = no; H = high; L = low; 1. Was the sample frame appropriate to address the target population? 2. Were study participants sampled in an appropriate way? 3. Was the sample size adequate? 4. Were the study subjects and the setting described in detail? 5. Was the data analysis conducted with sufficient coverage of the identified sample? 6. Were valid methods used for the identification of the condition? 7. Was the condition measured in a standard, reliable way for all participants? 8. Was there appropriate statistical analysis? 9. Was the response rate adequate, and if not, was the low response rate managed appropriately?

Table 2.6: Quality assessment for analytical cross-sectional studies using the JBI tool

	JBI assessment questions									
Study ID	1	2	3	4	5	6	7	8	Overall appraisal:	Overall quality
Biney *et al* 2016	Y	Y	N	Y	Y	Y	Y	Y	Include	H
Bury *et al* 2012	U	U	NA	N	NA	NA	U	Y	Include	L
Byrne *et al* 2021	Y	Y	Y	Y	Y	Y	Y	Y	Include	H
Jejeebhoy *et al* 2010	Y	Y	U	Y	U	U	U	U	Include	L
Klu *et al* 2020	Y	Y	Y	Y	Y	Y	Y	Y	Include	H
Kumi-Kyereme *et al* 2014	Y	Y	Y	Y	Y	Y	U	Y	Include	H
Mitchell *et al* 2010	Y	Y	Y	Y	Y	Y	Y	Y	Include	H
Osur *et al* 2015	Y	U	NA	Y	Y	Y	Y	Y	Include	H
Puri *et al* 2007	Y	N	Y	Y	NA	Y	N	Y	Include	M
Sharma *et al* 2019	Y	Y	N	Y	Y	Y	U	Y	Include	H
Tamang *et al* 2012	Y	Y	Y	U	Y	Y	Y	Y	Include	H
Zavier *et al* 2019	Y	Y	Y	Y	NA	NA	Y	Y	Include	H
Zuo *et al* 2012	Y	Y	NA	Y	Y	Y	U	Y	Include	H

Y = yes, U = unknown; NA = not applicable; N = no; H = high; L = low; 1. Were the criteria for inclusion in the sample clearly defined? 2. Were the study subjects and the setting described in detail? 3. Was the exposure measured in a valid and reliable way?

4. Were objective, standard criteria used for measurement of the condition? 5. Were confounding factors identified? 6. Were strategies to deal with confounding factors stated? 7. Were the outcomes measured in a valid and reliable way? 8. Was appropriate statistical analysis used?

Table 2.7: Quality assessment for unmatched case control studies using the JBI

Study ID	JBI assessment questions											
	1	2	3	4	5	6	7	8	9	10	Overall appraisal	Overall quality
Arambepola *et al.* (2014)	Y	Y	Y	Y	NA	Y	U	Y	NA	Y	Include	H

Y = yes, U = unknown; NA = not applicable; H = high

1. Were the groups comparable other than the presence of disease in cases or the absence of disease in controls? 2. Were cases and controls matched appropriately? 3. Were the same criteria used for identification of cases and controls? 4. Was exposure measured in a standard, valid and reliable way? 5. Was exposure measured in the same way for cases and controls? 6. Were confounding factors identified? 7. Were strategies to deal with confounding factors stated? 8. Were outcomes assessed in a standard, valid and reliable way for cases and controls? 9. Was the exposure period of interest long enough to be meaningful? 10. Was appropriate statistical analysis used?

Table 2.8: Quality assessment for quasi-experimental (non-randomised experimental) studies using the JBI

Study ID	JBI assessment questions										
	1	2	3	4	5	6	7	8	9	Overall appraisal	Overall quality
Akin *et al.* (2015)	NA	Y	Y	Y	NA	Y	Y	Y	Y	Include	H

Y = yes, NA = not applicable; H = high

1. Is it clear in the study what is the 'cause' and what is the 'effect' (i.e., there is no confusion about which variable comes first)? 2. Were the participants included in any comparisons similar? 3. Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?

4. Was there a control group? 5. Were there multiple measurements of the outcome both pre and post the intervention/exposure? 6. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analysed? 7. Were the outcomes of participants included in any comparisons measured in the same way? 8. Were outcomes measured in a reliable way? 9. Was appropriate statistical analysis used?

2.3.3 Abortion decision-making trajectories

Synthesising evidence from the included studies showed that abortion process occurs in three phases, namely, the pre-abortion phase, abortion phase and the post-abortion phase. The abortion decision-making occurs over five distinct but cyclical processes, namely, pregnancy discovery, initial decision, final decision, abortion experience and post-abortion experience.

Nine abortion decision-making trajectories were identified from the synthesis of included studies as shown in Figure 2.3:

(i) pregnancy recognition or awareness

(ii) self-reflection

(iii) abortion contemplation or initial decision

(iv) disclosure and seeking support

(v) negotiations

(vi) making a final decision

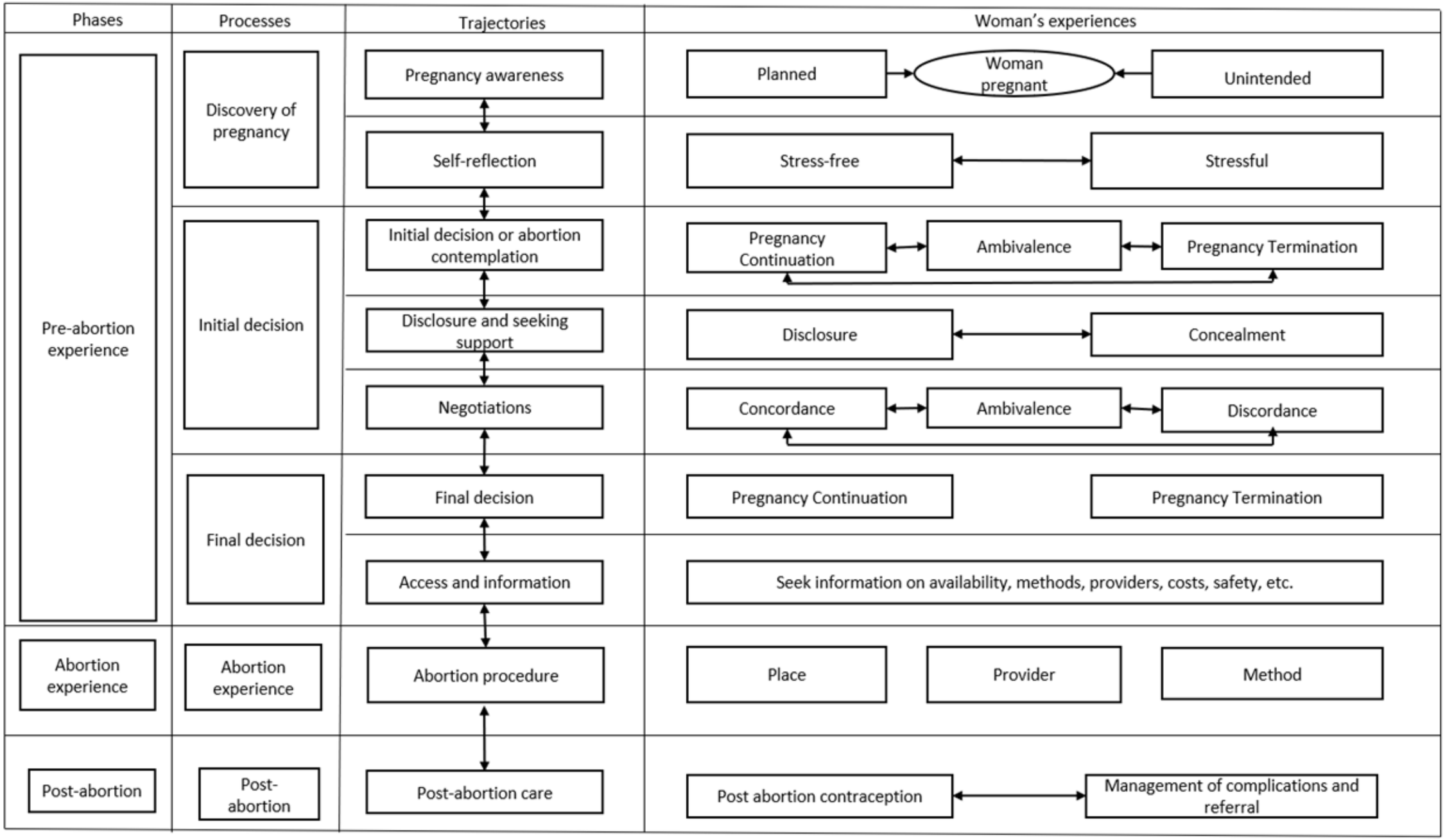
(vii) accessing abortion services and seeking information

(viii) the abortion procedure

(ix) post-abortion experience and care

These nine trajectories involve complex permutations of cyclical and repetitive steps that influence the temporal relationship from the time the woman discovers the pregnancy to the post-abortion period.

Figure 2.3 Conceptual framework showing nine abortion decision-making trajectories identified from the evidence synthesis



(i) The pre-abortion abortion phase

The abortion decision-making process starts with the discovery of a pregnancy which may be expected or unexpected, planned or unplanned[32, 33, 62, 67, 77, 86, 88–90, 95, 99, 100].

"When I opened the test and saw that it was positive, I called him, he came at the same time. I was upset, he told me not to worry that everything was going to be fine, that he doesn't earn much money, but what he earns will allow us to manage the pregnancy [...]. When I left him, I went straight to my friends to say that it is positive, that my boyfriend wants me to keep but I want to have an abortion. She agreed that I should have an abortion and she already knew a good method to have a safe abortion [...] When I explained to him [her boyfriend] that I was going to have an abortion, he didn't want it. [...] But then, as we were talking, he calmed down a bit, he changed his mind."(Female, 23 years old, Burkina Faso)[32].

This is followed by self-reflection where the woman weighs the risks of continuing or terminating the pregnancy which may be stressful or stress-free for different women[32, 40, 42, 65, 85, 90, 100, 119].

“I was still deciding what to do; I was still doubting. So many things run into my mind until I come with the decision to do [---] to [---] to [---] end the pregnancy. At that time [---] [I] even think I lost [---][weight] cause [because of the] stress I have [---]having so many stress [---] losing weight cause of the stress.”(Female, 22 years old, Kenya)[42].

The woman then contemplates whether to terminate or continue the pregnancy which may involve periods of ambivalence, weighing the pros and cons of each choice[32, 33, 42, 62, 65, 67, 76, 83, 86, 88, 100, 119, 127].

“At first, I didn't dare talk about it with anyone, even my boyfriend, I didn't want to tell him because I was thinking he would abandon me. I've been thinking for several days, how am I going to do that [tell him]? Finally, I decided that I had to talk to my boyfriend about it since he is also affected. (Female, 20 years old, Burkina Faso)[32].

The woman may then disclose or conceal the pregnancy or her initial decision to her close networks including male partner, parents, siblings, teachers and other close friends

depending upon the level of trust, perceived reaction to the woman's decision and expected support[32, 33, 42, 60, 62, 65, 69, 85, 90, 92, 97, 100].

"I was doubting what to do and on the other hand afraid of sharing with anybody. I believed if I share it with so many people some people will give me other advice, some will give me this; that's why I ended up sharing with my sister that I'm staying with because I trusted her" (Female, 22 years old, Kenya)[42].

Upon pregnancy disclosure, the woman may receive support (concordance), opposition (discordance) or indecision (ambivalence) to her initial abortion decision[32, 33, 62, 65, 69, 86, 90, 100, 128]. The woman and the actors to whom the abortion decision has been disclosed may then enter into a stage of negotiation in cases of discordance and indecision where the woman tries to convince her social networks to agree with her initial decision[32–34, 62, 86, 97]. The negotiation process in concordant cases can hasten the decision-making process, but in discordant and ambivalent cases, it can complicate and lengthen the decision-making process[32, 34, 42, 62, 90].

"She is the one who at first told me it was not the baby's fault and that it was me who had been irresponsible.... My friend was basically against the idea of my getting an abortion.... She said, "And what if you do not make it through? What will I do without you?" I said, "Nothing is going to happen. I am going to be fine." [Female, 16-year-old, Mexico][33].

The final abortion decision may be made solely or primarily by the woman herself, jointly with her male partner or others, or by others without or with minimal involvement of the woman[32–34, 41, 42, 61, 63, 65, 67, 68, 70–72, 76–78, 83, 85, 86, 88–93, 96–103, 109, 110, 112–114, 119, 121, 123, 125–129]. However, even cases in which the majority of the decisions are made by woman, male partners and/or parents may still influence her decision[34, 65, 68, 97, 100]. Thus, decisions made by woman may either be passive in which the woman simply agrees to the decision imposed on her by others[32, 61, 63, 65, 67, 68, 70, 78, 85, 88, 92, 97, 100, 102, 103, 110, 112, 119] or active in which she actively participates in the decision-making

processes[65, 76, 88–90, 98, 102, 109, 110, 112, 119, 121, 126, 127]. Where the woman is excluded or plays a very limited role in decision-making, threats, coercion, violence, or trickery may be used by her male partner and/or parents to coerce her accept their decision[32, 33, 42, 83, 88, 97, 119, 125, 129] reflecting varying autonomy in women's abortion decision-making[33, 93].

"I wanted to keep it but he said, "Why are you so eager to keep it? It must be someone else's. If it is mine, you will do as I say. After that what could I do?" (Female, 19-year-old, India)[119].

"It was great, he said, "stop it, what you decided, it's decided. If you want to have it, then you will have it. If you want to have an abortion, I'm with you, don't worry." Still, he is so friendly and supportive of me." [Female, 23 years old, Brazil][91].

"My dad told me he would disown me if I don't get an abortion" [Female, 17 years old, Ghana][41].

Once the final decision has been made, women and their social networks such as parents or male partners may consult multiple sources to obtain information about availability, affordability, safety, or accessibility to abortion services. Various sources of information include skilled abortion providers, chemists or unskilled abortion providers, intermediaries or brokers, male partners, social networks such as friends, parents, teachers, and relatives, the media and internet or school[42, 63, 66, 68, 69, 72, 77, 78, 84–86, 88–92, 95, 96, 99–101, 114, 126].

"Once you get pregnant you will know all of those places and the ones who are selling those drugs. You will have their contacts as well as doctor's contacts. You can even find students who are agents for these doctors, and they will direct you to them as they know who are good at this job." (Female, 21 years, Tanzania)[95].

(ii) The abortion phase

This phase includes the woman's encounter with the abortion providers using safe or unsafe abortion methods in places that may be medically safe or unsafe. The abortion procedure includes the actual pregnancy termination which may be carried out clandestinely or overtly, and may involve safe or unsafe procedures or methods[31, 41, 42, 60–65, 68, 69, 71–73, 75, 77, 83, 86, 88–92, 95–103, 110, 118–126, 129], place of abortion[31, 34, 60, 61, 65, 68, 69, 72, 75, 79, 83, 86, 89–91, 96–101, 103, 104, 110, 118, 120, 121, 125, 126] and/or provider[60, 61, 65, 68, 69, 72, 73, 77–79, 86, 90, 91, 95–102, 108, 110, 118–121, 124, 126, 129].

"She asked me to wait and said that the abortion would definitely occur. But my family members started shouting and saying nothing is happening with the tablet and the days (gestational age) are increasing, so I decided to get admitted for a surgical abortion". (Female, 35 years old, India)[63].

"I never knew one could stay in the comfort of your house. I think I really never knew about all that before, all my mind was that abortion must be done in the Health Care for Women International hospital or you start to use all those local concoctions that you don't even know what the future holds." (Female, 29 years old, Nigeria)[89].

"This chemist is one of my friends. Hence, I had already decided to consult and buy the medical abortion kit from him. I knew that he, being my friend, would advise me better than other chemists. He would be more reliable and accurate for buying the kit. He could also explain in detail about MA: "he was the ultimate option for me. Therefore, I planned to buy medical abortion kit from this chemist." (Male partner, 32 years old, India)[88]

The process may also be legal or illegal as per the country's law. The abortion procedure may result in a safe or unsafe abortion. Safety is understood by women to include not only medical safety (outcome) but also social safety (confidentiality, privacy, secrecy, and reputational safeguarding of the woman and/or her family), legal safety (protection from the law), and financial safety (protection from catastrophic expenditures)[31, 40, 42, 61, 69–71, 73, 76, 79, 81–85, 88, 90, 92, 95–98, 100, 101, 118, 119, 121–125].

(iii) The post-abortion phase

Depending upon the outcome of the abortion procedure, the woman may develop complications which are managed at different referral points including hospital and by skilled trained abortion providers such as gynaecologists[31, 33, 61, 68, 69, 75–77, 79, 82, 85, 86, 88, 90, 91, 96–98, 121, 124, 129].

"I came because my bleeding wouldn't stop. It continued for 20 days. I felt weak and was really scared. I told my neighbour about my condition, and she suggested that I consult this doctor. She had consulted her previously. She said the doctor was very good." (Female, 23 years old, India)[88].

Adolescents, women living with HIV, and commercial sex workers face additional barriers to access to post abortion care including requirements for consent from parents or male partners, or stigma[65, 90, 96–98].

In only two of the included studies were women given post-abortion family planning[85, 92].

Not all women received contraceptive counselling after abortion. Some said they were informed about pills, injection, and intrauterine device (IUD), and a few women reported being advised to use traditional methods such as the calendar method (Cambodia)[92].

The details of the trajectories and women's experiences, supported by accompanying quotes, are given in **Appendix A.4.**

Quantitative findings of final decision-making

A meta-analysis of data from 14 studies of 7737 women showed that the proportion where women had primary or sole involvement in the decision-making was 0.53 (95% CI: 0.34 to 0.73; prediction intervals (PI): 0.20 to 0.99, I^2=99.7%) as shown in **Figure 2.4.** The proportion of overall women's involvement in the abortion decision-making was 0.86 (95% CI: 0.73 to 0. 95; PI: 0.38 to 1.00, I^2=99.5%) and the proportion of the male partner's overall involvement was 0.48 (95% CI: 0.29 to 0.68; 95% PI: 0.13 to 0.98, I^2=99.6%). Hence, in 14% and 52% of

instances, women and male partners respectively were excluded from the abortion decision-making process.

The considerable heterogeneity in the final decision-making was not explained by sub-group analysis whether by abortion laws (**Figure 2.5**), income status (**Figure 2.6**), geographical region (**Figure 2.7**). The leave-one-out sensitivity (**Figure 2.8**) analysis did not reveal any outlier or overly influential studies. Therefore, the analysis was conducted without removing any study.

Figure 2.4 Proportion of abortion decision-making involvement by the woman alone, overall woman's involvement and overall male partner's involvement

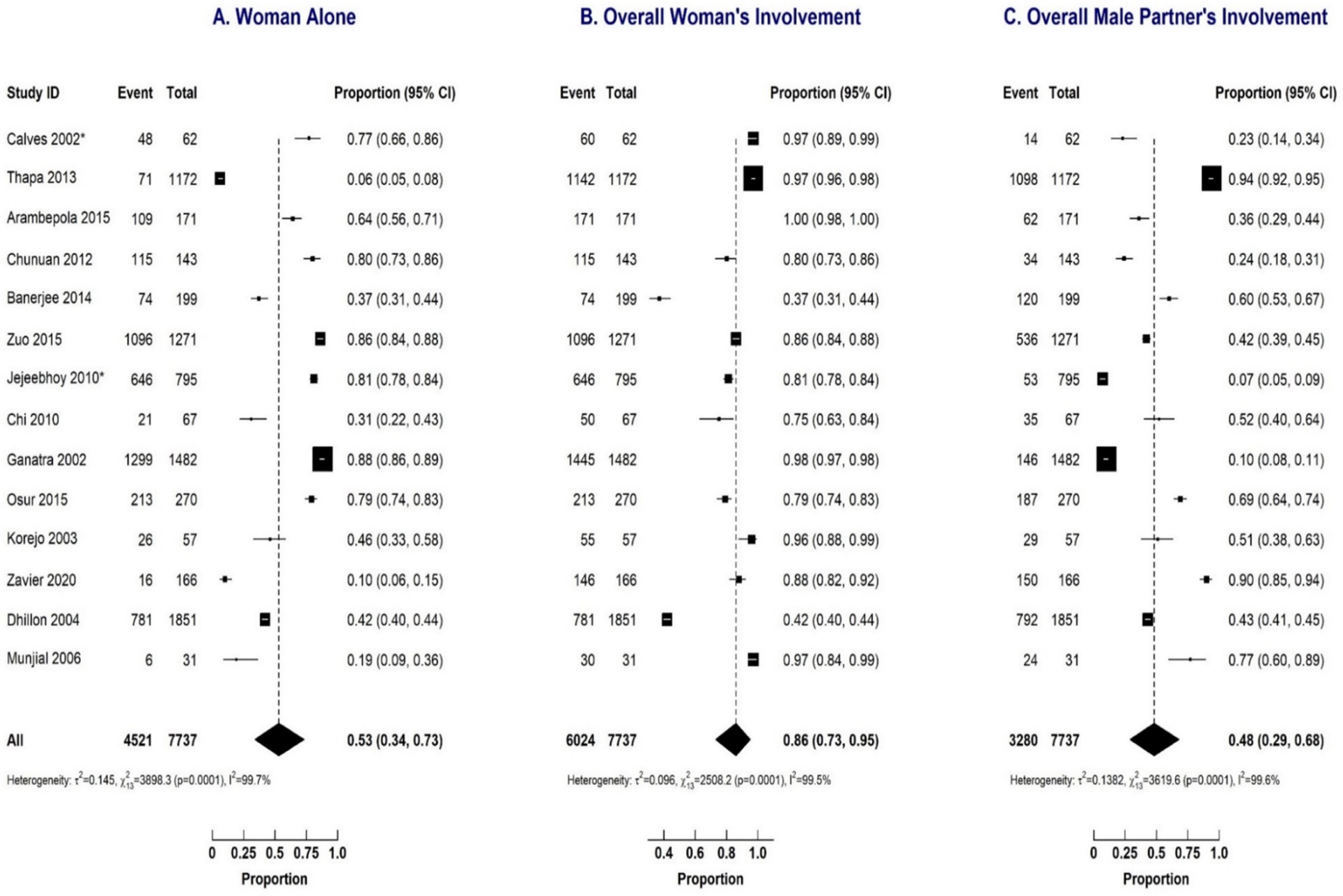


Figure 2.5 Impact of a country's abortion laws on the proportion of abortion decision-making involvement by the woman alone, overall woman's involvement and overall male partner's involvement

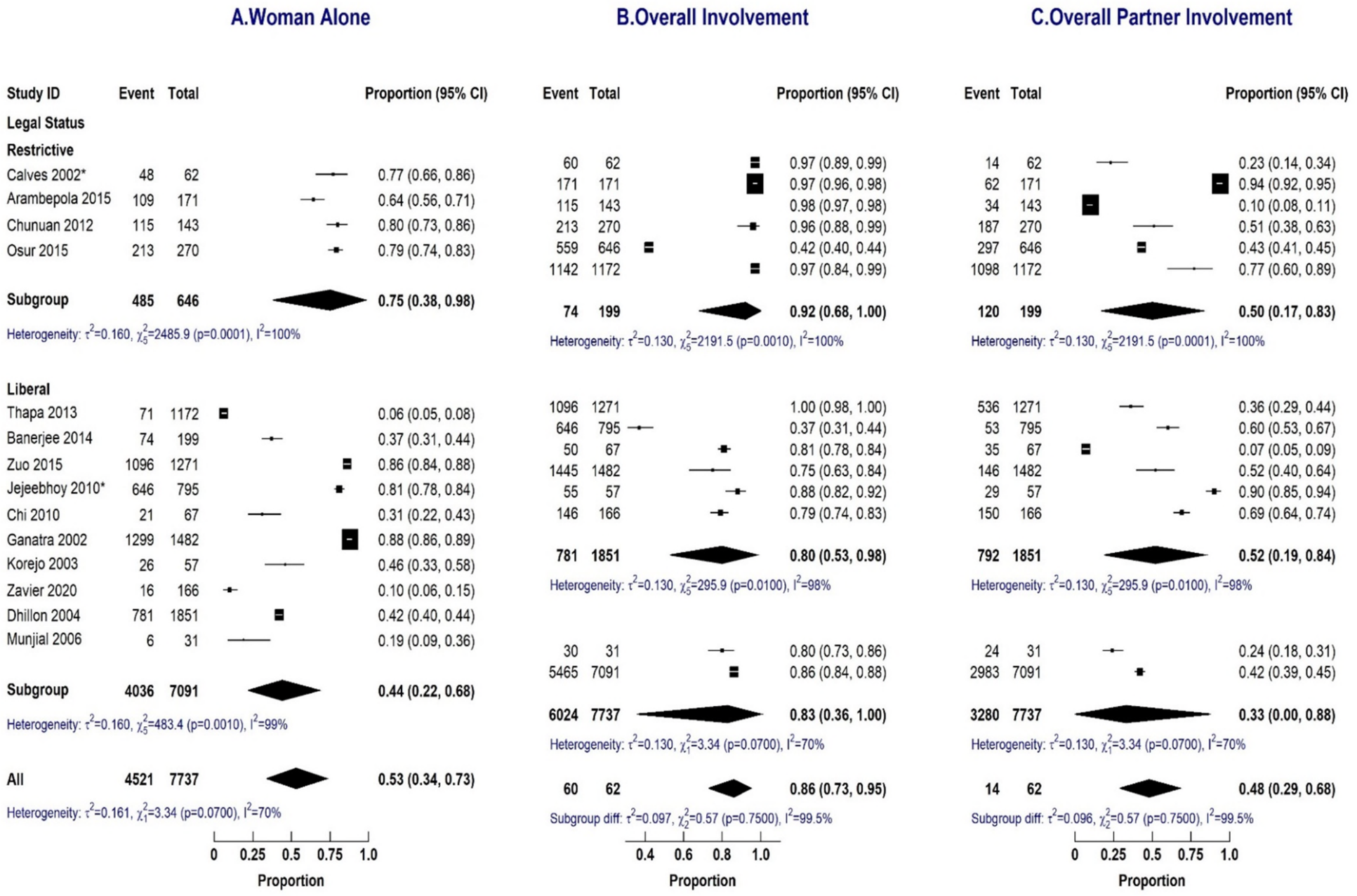


Figure 2.6 Impact of a country's income status on the proportion of abortion decision-making involvement by the woman alone, overall woman's involvement and overall male partner's involvement

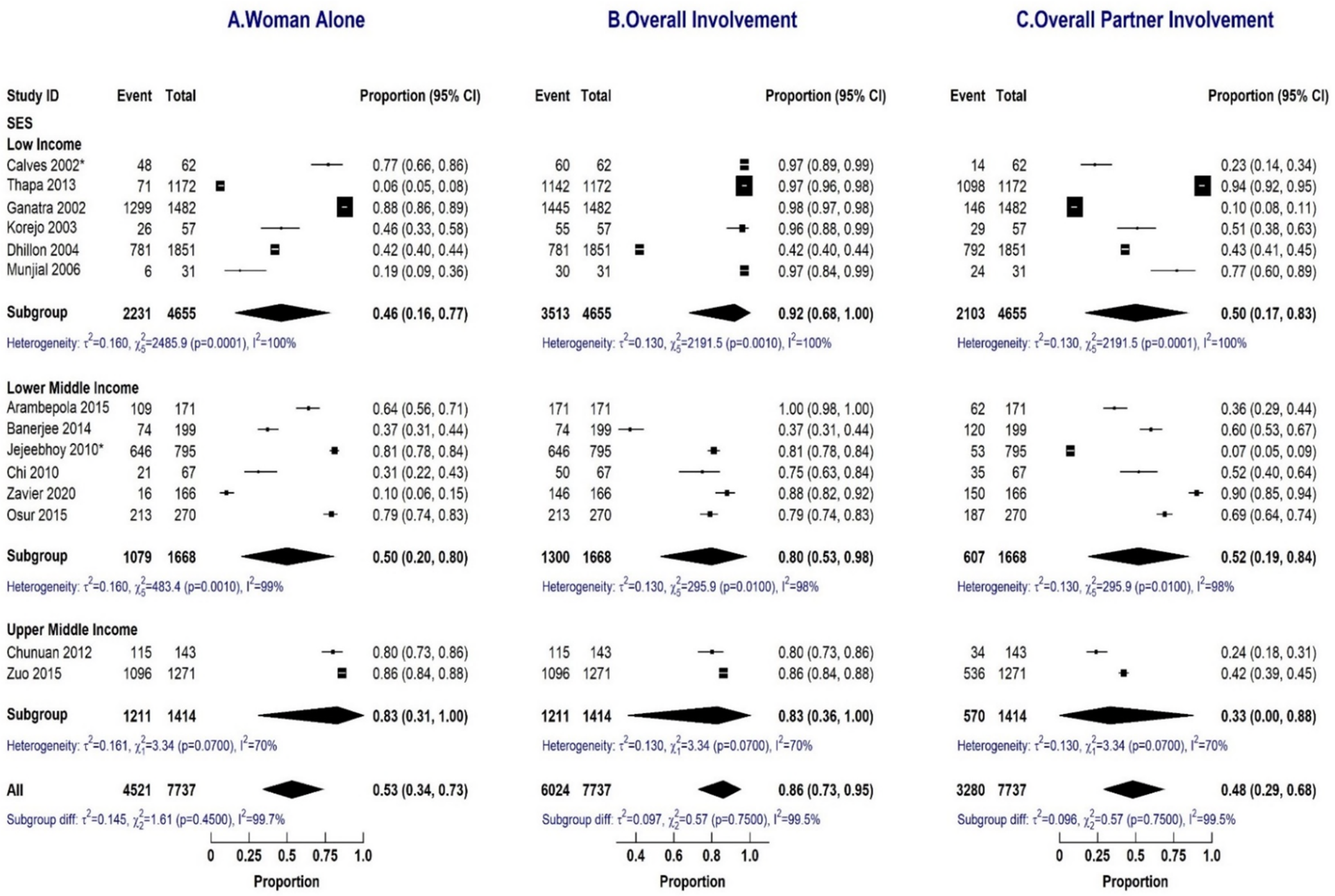


Figure 2.7 Impact of geographical regions on the proportion of abortion decision-making involvement by the woman alone, overall woman's involvement and overall male partner's involvement

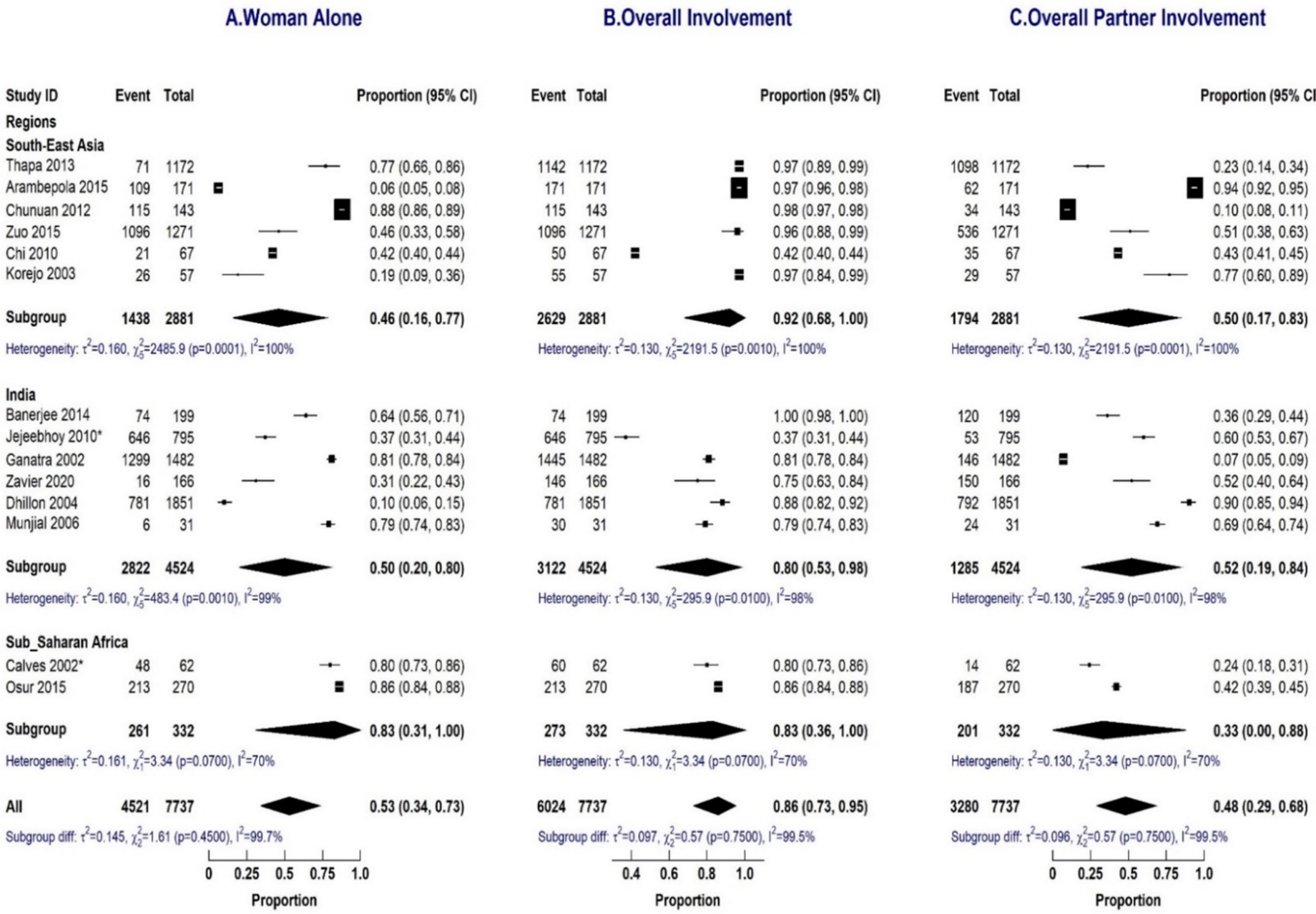
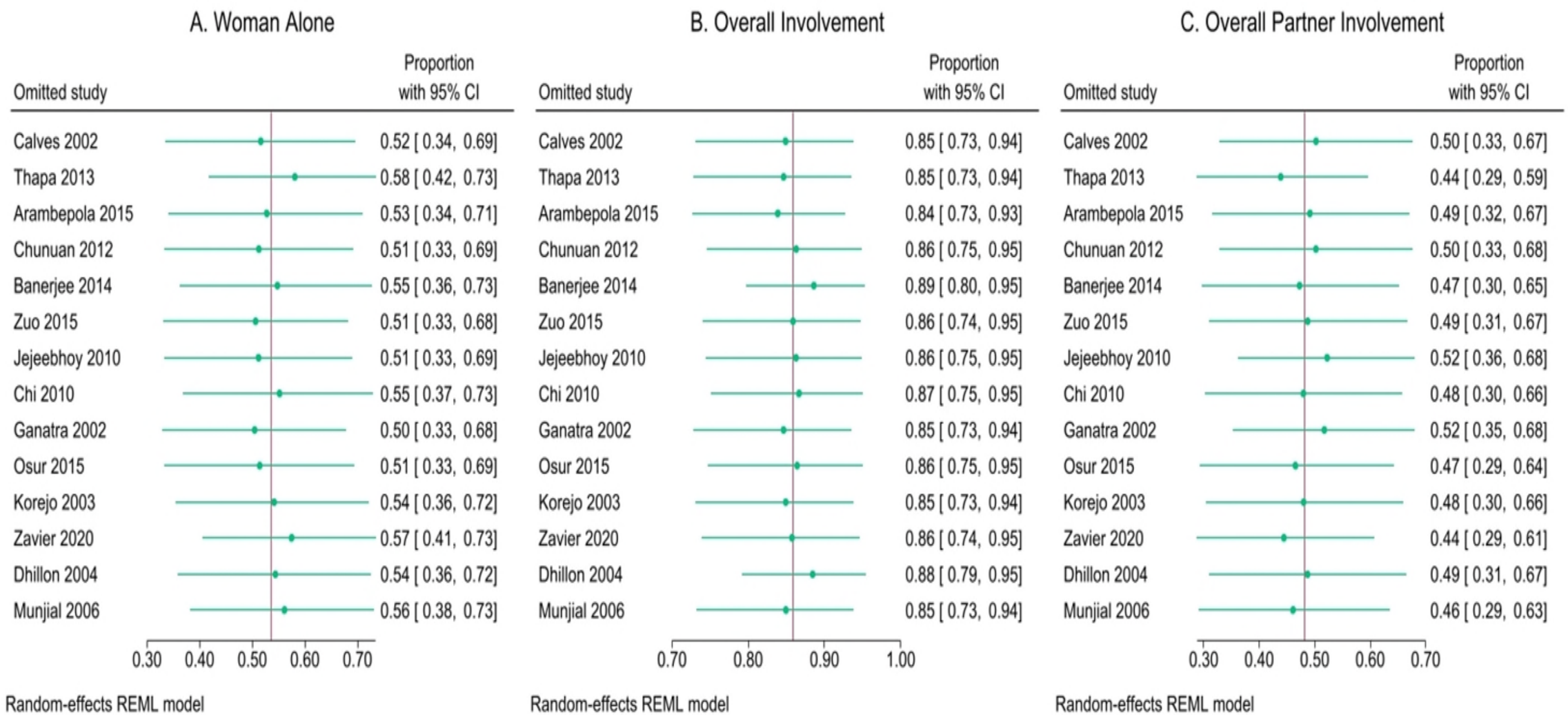


Figure 2.8: Sensitivity analysis omitting one study at a time



Determinants of abortion trajectories

Three major themes relating to abortion decision-making trajectories' determinants from the synthesis of the studies were synthesised and generated: (a) autonomy in decision-making, (b) access, and (c) choices. There were eight sub-themes. Sensitivity analysis by quality of included studies did not reveal any differences in the themes generated.

(a) Women's autonomy in decision-making

(i) Women's autonomy in decision-making: empowerment and coercion

Most women had limited personal agency or power and often involuntarily devolved abortion decision-making to their male partners or parents who used threats, coercion, force, and blackmail to get the women to terminate the pregnancy even against their own will. Women exercised varying degrees of involvement in the abortion decision-making processes including the decision to continue or terminate the pregnancy and the choice for the place, method, and provider for abortion[33, 62, 67, 69, 72, 86, 90–92, 102, 109, 110, 112, 113]. Some women passively participated in the abortion decisions by being bystanders[32, 61, 63, 65, 67, 68, 70, 78, 85, 88, 92, 97, 102, 103, 110, 112, 113, 119]. Others participated actively by being involved directly in the decision-making processes[67, 76, 83, 88, 89, 99, 102, 103, 109, 110, 112, 119, 121, 123, 126–128].

"I talked to him, and he said okay we are going to have an abortion and I accepted". (Female, 22 years old, Mozambique) [83].

"They decided while I was at school. If (it) was my decision I would keep it because I wanted it". (Female, 18 years old, Mozambique)[83].

In cases where women were excluded or played very limited roles, threats, coercion, violence, or trickery were often employed by male partners or parents to get the woman to terminate the pregnancy[32, 33, 42, 83, 88, 119, 125, 129].

“My boyfriend started threatening me, he sent his friends to talk to me, they cajoled me, threatened me, and tried other things. I didn’t change my position. Then, his friends stopped talking to me, even my friend stopped talking to me.” (Female, 23 years old, Burkina Faso)[32].

(ii) Role and influence of male partners and other social networks in decision-making

Male partners and members of other social networks (friends, parents, relatives, teachers, abortion providers) played important roles in the abortion decision-making processes including the decision to terminate or continue the pregnancy, and choice of the place, the method or provider for the abortion[31, 32, 34, 59, 63–66, 68, 70, 71, 73, 75, 76, 80, 82, 83, 87, 88, 90, 91, 93, 98, 100, 101, 118, 119, 123, 124]. Men either supported or opposed women’s actions and directly influenced the abortion decision-making trajectories.

“I wanted to keep it but he said, "Why are you so eager to keep it? It must be someone else’s. If it is mine, you will do as I say. After that what could I do?" (Female, 19 years old, India)[119].

Concordant partner involvement in abortion was associated with seeking and obtaining safe abortion[34].

"He asked if I could keep it and if I could face that, and then we talked about it. Then we decided it's better [if] we don't bring problems to the [family members paying for our education] ... He came to see me so that we [could] talk about it and decide what we were going to do. We talked about it for like two weeks, then we decided to have a termination.” (Female, 19 years old, Zambia)[34].

(b) Access

(i) Abortion laws and policies

Restrictive laws compelled women to seek clandestine and backdoor or backstreet abortion services which leaves them perilous to any post-abortion complications for which the providers will not be held accountable[69, 72, 82, 89, 90, 93, 96].

“[Abortion] services are not legal. If you go to a health centre for abortion, they will tell you: "We don't do that". And if they have to do it for you, it's just back door. And the blame is on you. They will give you the medicine and tell you to go and sort yourself, or they will do it for you, and in case of any risk, they will say they were not part of it. And also in the health facility, they don't offer safe abortion.” (Female, unknown age, Kenya)[72].

Abortion laws affected access to information about abortion services including availability of prescription or type of facilities offering services[42, 72, 73, 75, 78, 81, 90, 91, 95, 101, 125, 126].

“The hardest part was getting the prescription ... in the end I got it through a friend of a friend who was a doctor ... but before that I made several appointments with gynaecologists trying to find a friendly doctor who would give me a prescription.” (Female, 25 years old, Argentina)[75].

Even where abortion was legal, limited knowledge of existing abortion laws and policies by abortion providers and seekers hindered access to safe and prompt abortion services[31, 41, 70, 82, 88, 125].

"Abortion is legal ... most women don't know. I had information from a druggist who is a nurse.” [female, 27 years old, Ghana][82]. *Note: Abortion is not legal in Ghana, but the abortion policy allows abortion in some cases.*

In addition, policies that placed onerous requirements for abortion services such as waiting periods, signoffs or consent forms, third party consent, and varying limits on gestational age compelled women to seek clandestine abortions[31, 83, 119].

“I heard that to induce abortion at the hospital it is necessary for an adult to sign a consent form. I was afraid because I did not know who could accompany me. Because at that time I only wanted to hide it from others.” (Female, 22 years old, Mozambique)[83].

(ii) Knowledge and information

Knowledge and access to correct information regarding the abortion procedures and recognition of pregnancy were important in the decision to either keep the pregnancy or to terminate[31, 33, 41, 42, 66, 68, 69, 71, 83, 88, 93, 96, 122, 123, 126]. Lack of information led to delays in seeking abortion services[122] with many women being charged higher fees due to advanced pregnancy and clandestine abortion[71, 93].

"I did not have a clear idea about abortion ... and besides that, [I had seen] awful videos about abortion ... in school. I thought it would be like I had seen, where the baby is torn apart". [Female, 16 years old, terminated pregnancy, Mexico][33].

(iii) Cost

Women and other actors considered cost as an important factor when choosing the method, place or provider for abortion services[31, 60, 64, 68–70, 72, 76, 77, 79, 81, 83–85, 90, 92, 95, 96, 119, 120, 122, 124, 130]. In terms of cost, women preferred medical abortion (misoprostol) over surgical abortion as it was considered cheaper and more affordable[70, 76, 79, 92, 95, 120, 130]. For clandestine abortions obtained cheaply which resulted in complications[60, 72, 76, 77, 79, 119], post abortion care resulted in extra costs[31, 122, 130]. Moreover, clandestine abortions at more advanced gestational age were more expensive than those at earlier gestational ages[64, 130]. However, in contexts where public facilities offered free abortion services, other indirect costs resulting from distance[76, 119], need for hospital fee[124] or illicit fees[60] were reported to be prohibitive for women seeking abortion services. However, costs did not preclude women's need for abortion[70, 72, 85].

"I did not consider things to do with price. I just wanted it to be terminated." (Female, 29 years old, Kenya)[85]

(c) Choices

(i) Women's perceptions of safe abortion

While women acknowledged the need for medical safety in seeking abortion, to them abortion safety encompassed not just medical safety but also social, legal, reputational, relationship and economic security[31, 40, 42, 61, 69–71, 73, 76, 79, 81–85, 88, 92, 95, 96, 98, 100, 101, 118, 119, 121–125].

"You may have the best doctors and equipment there, but it is not safe because they will keep your file and everybody will know what you came to do...they also make you pay heavily even when you say you don't have money. That's why those places are not safe for abortion." (Female, 29 years old, Kenya)[73].

Social safety influenced the decision to terminate pregnancy, especially where a pregnancy was associated with stigma[65, 90, 96, 99, 101, 119, 122, 123], and to whom it was disclosed[42, 61, 65, 90, 97, 99, 123]. Social safety also influenced choosing medical abortion or telemedicine as it allowed women to terminate the pregnancy privately and secretly[68, 71, 73, 76, 79, 84, 88–90, 100, 101, 125].

Adolescent and unmarried girls sought abortion far away from home and from providers they did not know[92, 123], others preferred pharmacies or community shops over hospitals because pharmacies were thought to keep women's requests for abortion drugs a secret compared with doctors at hospitals[73, 95].

Furthermore, some hospitals were known to involve long waiting times, required signing consent forms and some did not provide privacy which risked exposing women[81, 83, 84, 95]. Women also shunned separate and isolated abortion clinics as it made women going there for abortion easily identifiable[84]. To minimise risk of exposure, some women sent male friends or their boyfriends to buy misoprostol on their behalf[95], and repeat abortions were sought from different providers for fear that *"they will say this girl has come again"*[70]. Traditional herbalists had a reputation for secrecy and confidentiality[73] while physicians permitted by law to provide abortion under certain conditions in restrictive settings were shunned because they did not need to keep the abortion a secret unlike backstreet abortionists[61, 98]. These backstreet abortionists also allowed women to self-induce thereby protecting confidentiality and their "image"[31, 82, 83, 119, 121–123].

(ii) Availability of preferred abortion methods and providers

In choosing abortion services, women considered access and availability as key determinants[31, 40, 60, 64, 66, 68–71, 75, 76, 78, 79, 81, 84, 85, 87–90, 92, 93, 95, 98, 100, 119, 120, 122, 123, 125]. These included the proximity of services including the number of providers and distance to facilities offering abortion[71, 76, 78, 87, 118, 119, 122, 123], availability of services and providers and quality of services[60, 66, 71, 81, 85, 88, 92]. Other key considerations included the convenience and comfort at the facility including the presence of female abortion providers[71, 76, 92, 98, 101], reputation of the facility[60, 66, 75, 79, 81, 84, 88, 89, 119, 123], and ease of use of the available services[40, 66, 81, 85, 119].

"When my pregnancy was confirmed I knew I had to get abortion. I was considering visiting a doctor, so I asked my friend about it. She said I could do it myself by medication and did not need to visit a doctor. She said MA kits are easily available at medical stores and I don't even need a prescription for it. So, I went and bought MA kit from the medical store." (Female, 23 years old, India)[88].

(iii) Attitudes of abortion providers

Women reported that trust and confidence in the healthcare providers influenced their decision to go to them for abortion services[59, 66, 81, 87, 92, 98, 101, 118, 119].

"[The doctor] told me at the beginning that she believed it was a woman's choice to have children or not, that she was actually one of the doctors who defended women before the law because she performed abortions. That made me feel very good." (Female, 29 years old, Mexico)[59].

However, in most cases, the women reported that the health workers were rude, judgemental, abusive, and some tried to impose their own views on the women regarding the abortion decision and made them feel "guilty" which compelled many women to seek clandestine abortion services from elsewhere[71, 72, 82, 85, 89, 90, 95–98, 119].

"They do insult patients. You can go to the hospital and then the doctors start talking ill about you, so this discourages you so much, and you decide to leave." (Female, unknown age, Kenya)[72].

Judgemental attitudes, conscientious objection and outright rejection to provide abortion services on moral, social or religious views[66, 70, 82, 89, 122], extortion when providing illegal abortion or taking advantage of women with stigmatised abortion[31, 59, 60, 71, 90] and lack of provider's skills or training in providing abortion services[82, 122] compelled women to seek abortion services away from the formal abortion providers.

"Even for me it [rude treatment by health-care providers] is the reason why I stayed away from the hospital." (Female, 28 years old, Ghana)[82]

By contrast, women preferred traditional herbalists and private practitioners and some private facilities where providers were known to be supportive and understanding[33, 59, 61, 63, 66, 77, 81, 89].

Key recommendations

Based on the key determinants of abortion decision-making trajectories, eight key recommendations were generated from the included studies:

(i) Empower women to make independent, autonomous decisions

(ii) Where appropriate, involve male partners in conversations about abortion

(iii) Provide policy for legalisation and decriminalisation of abortion and accompany this with pragmatic policies Improve access to information and knowledge

(iv) Provide low cost or free abortion services as permitted by law

(v) Broaden the definition of safe abortion to include social safety

(vi) Ensure availability of acceptable and preferred abortion methods

(vii) Train and build capacity for health workers to improve their interpersonal and communication skills and to improve their attitude towards women seeking abortion services in legally liberal settings

A summary of the GRADE-CERQUal assessing the confidence in the evidence related to each recommendation is provided in **Table 2.7**. There was high confidence in the evidence used to develop seven of the eight major recommendations with the evidence relating to abortion laws and policies having moderate confidence (recommendation iii). There were moderate or minor methodological limitations for all the major determinants, but no minor or major concerns about the evidence for coherence, adequacy, or relevance for the seven recommendations.

Table 2.9 GRADE-CERQUal summary of findings and recommendations generated from included studies

Summary of findings and recommendations	**ID numbers of studies contributing to the review finding**	**CERQUAL assessment of confidence in the evidence**	**Explanation of CERQUal assessment**
1. Empower women to make independent, autonomous decisions: Empowering women to make independent decisions without undue reliance on their male partners, especially where women's choices are not supported by their male partners.	[32, 33, 42, 61–63, 65, 67–70, 72, 76, 78, 83, 85, 86, 88–92, 97, 99, 102, 103, 109, 110, 112, 113, 119, 121, 123, 125–129]	High confidence	Thirty-seven studies with moderate methodological limitations, no or minor concerns about coherence, adequacy or relevance
2. Where appropriate, involve male partners in conversations about abortion: Men play important roles in abortion decision-making processes. Support of male partners in the decision-making processes diminishes clandestine and unsafe abortions.	[31, 32, 34, 59, 63–66, 68–71, 73, 75, 76, 80, 82, 83, 87, 88, 90, 91, 93, 98, 100, 101, 118, 119, 123, 124]	High confidence	Thirty-one studies with moderate methodological limitations, no or minor concerns about coherence, adequacy or relevance
3. Provide policy for legalisation and decriminalisation of abortion and accompany this with pragmatic policies:	[31, 41, 42, 69, 70, 72, 73, 75, 78, 81–83, 88–91, 93,	Moderate confidence	Twenty-three studies with moderate methodological limitations, moderate concerns

Summary of findings and recommendations	ID numbers of studies contributing to the review finding	CERQUAL assessment of confidence in the evidence	Explanation of CERQUal assessment
Removing restrictions on abortion does not necessarily result in all abortions being safe. This must be accompanied by changes in policies including expanding the scope of the facilities, providers, and conditions for obtaining safe abortion. Onerous additional requirements such as parental or male partner consent, paperwork or permissions lead to delays in obtaining abortion services and often lead to unsafe abortion trajectories. At best, these must be minimised or eliminated altogether. Policies to address conscientious objection (such as timely referral) need to be enacted.	95, 96, 101, 119, 125, 126]		about adequacy and no or minor concerns about coherence or relevance
4. Improve access to information and knowledge: Where abortion is recently legalised, deliberate efforts must be made to ensure that information on the legality of abortion and any requirements/limitations including eligibility, places and providers for abortion are widely disseminated.	[31, 33, 41, 42, 66, 68, 69, 71, 83, 88, 93, 96, 122, 123, 126]	High confidence	Fifteen studies with moderate methodological limitations, no or minor concerns about coherence, adequacy or relevance
5. Provide low-cost or free abortion services as permitted by law: In communities in which abortion is legal, they should be made free for all women. Adolescent women are at a particular risk of	[31, 60, 64, 68–70, 72, 76, 77, 79, 81, 83–85, 90, 92,	High confidence	Twenty-four studies with moderate methodological limitations, no or minor

Summary of findings and recommendations	ID numbers of studies contributing to the review finding	CERQUAL assessment of confidence in the evidence	Explanation of CERQUal assessment
following abortion trajectories that result in unsafe abortion due to unaffordable costs in obtaining abortion services.	95, 96, 118–120, 122, 124, 130]		concerns about coherence, adequacy or relevance
6. Broaden the definition of safe abortion to include social safety: There is a need to ensure abortion services are provided in a socially safe environment that ensures confidentiality, privacy and secrecy for women obtaining abortion. There is need for integration of abortion services into the broader sexual and reproductive health services in facilities providing them.	[31, 40, 42, 61, 65, 68–71, 73, 76, 79, 81–85, 88, 90, 92, 95–98, 100, 101, 118, 119, 121–125]	High confidence	Thirty-four studies with moderate methodological limitations, no or minor concerns about coherence, adequacy or relevance
7. Ensure availability of acceptable methods for abortion services: Different women preferred different methods and in situations where abortion is legally provided, all the safe and effective methods must be available to allow women to make informed choices.	[31, 40, 60, 64, 66, 68–71, 75, 76, 78, 79, 81, 84, 85, 87–90, 92, 93, 95, 98, 100, 101, 118–120, 122, 123, 125]	High confidence	Thirty-two studies with moderate methodological limitations, no or minor concerns about coherence, adequacy or relevance

Summary of findings and recommendations	ID numbers of studies contributing to the review finding	CERQUAL assessment of confidence in the evidence	Explanation of CERQUal assessment
8. Train and build capacity for health workers to improve their interpersonal and communication skills and to improve their attitude towards women seeking abortion services in legally liberal settings: In addition to expanding the scope of abortion providers, they should have refresher trainings on any newer methodological advances in abortion services. Additionally, continued training in interpersonal and communications skills of providers are important to address negative and judgemental attitude towards women seeking abortion services.	[31, 33, 59–61, 63, 66, 70–72, 77, 81, 82, 85, 87, 89, 90, 92, 95–98, 101, 118, 119, 122]	High confidence	Twenty-seven studies with moderate methodological limitations, no or minor concerns about coherence, adequacy or relevance

2.4 Discussion

This systematic review mapped out nine interlinked abortion decision-making trajectories that highlight the complexity and uncertainty of women's experiences with abortion decision-making process. The main determinants of abortion trajectories include autonomy, access and choice. The meta-analysis further demonstrated the complexity and heterogeneity of abortion decision-making with overall male partner involvement approximating women's involvement in final abortion decision-making.

These trajectories are similar to "the trajectories of women's abortion-related care" developed by Coast *et al*[5]. However, there are important differences. First, the review reported here focused on LMICs where nearly all unsafe abortion-related morbidity and mortality occurs[15]. Second, it has demonstrated the important role of male partners, parents, other social networks, and abortion providers, making these actors potential targets for interventions focused on safe abortion in LMICs. Finally, the review has also incorporated post-abortion care and experiences as a continuum of abortion decision-making trajectories, although this is limited by the limited number of studies dealing with these topics, which were not the specific focus of the searches for this review.

While an attempt was made to visualise the abortion decision-making processes for women in LMICs in a simplified model, the women's actual experiences are much more complex than what the framework in this thesis illustrates. This is because abortion decision-making occurs in a fluid environment[38], with varying degrees of conflicting rationalisation and emotions[32, 42, 131]. Added to this unpredictability is the fact that abortion decisions do not occur in isolation but are a product, not only of women's autonomy, but are also influenced by her male partner, family, social networks, and the environment in which the abortion takes place including abortion laws and policies and health system factors including availability of and access to abortion services[32, 62, 85, 132, 133]. While the abortion laws impact access to abortion services, the abortion

decision-making process followed a nearly identical trajectory in both liberal and restrictive settings. This is consistent with the findings of the pooled estimates from the subgroup analysis which showed that abortion decision-making does not vary by abortion laws in LMICs. Other studies have also found that the prevalence of overall and unsafe abortion is similar in LMIC setting irrespective of abortion laws[134, 135]. There was considerable heterogeneity in the abortion decision-making. Although heterogeneity is ubiquitous in prevalence studies[54], in this review it is likely due to differential measurement or ascertainment of "decision-making" used by the different studies. However, it may also reflect the reality of the variability within the abortion decision-making processes even in similar contexts[104, 106, 117, 119].

The review has shown that women's perceptions of safety including social, economic, and legal safety were as important, if not more important than concerns about the outcome of the procedure such as death in the abortion decision-making. The WHO has historically defined abortion safety in terms of the environment, skills(medical) of the person performing it and the appropriateness of the method[136]. However, some women held the opposite view in which skilled abortion providers legally permitted to provide abortion, and well-equipped abortion facilities were considered unsafe while traditional and other unskilled abortion providers providing clandestine abortion were considered safe because of the importance they place on social safety[61, 73, 95]. It has also shown that in the context of social, economic and legal safety including minimising unnecessary contact between abortion seekers and abortion providers, medical abortion and telemedicine is an acceptable and preferred service for the majority of women[63, 71, 73, 75, 76, 84, 88, 125]. This perception of abortion safety was similar in both legally restrictive and liberal settings and may be amplified by judgemental communities and abortion providers even where abortion is legal[137, 138]. Confidentiality remains a core tenet of medical ethics and governs the doctor-patient relationships to ensure mutual trust and confidence in the

health system[139] and this review underscores its importance in the context of providing abortion.

A previous systematic review showed that majority of male partners play an important role in improving access to and utilisation of sexual and reproductive health services such as antenatal care, skilled birth attendance, institutional birth, postpartum visits, mother's knowledge and recognition of danger signs, and modern contraceptive use[140]. This review showed that male partners also play an important role in abortion decision-making trajectories, including making it easier for women to seek and access safe abortion promptly[34].

Women's empowerment including autonomous decision-making is associated with mixed findings with regards to uptake of sexual and reproductive health services including modern contraceptive, safe abortion, antenatal care, institutional birth, antenatal and postnatal care[141, 142]. This may be due to varying degrees to which a woman can make autonomous decisions with regards to sexual and reproductive health services which may depend upon their relationship with her male partner, as demonstrated by this review.

2.4.1 Strengths and limitations

This review has a number of strengths. First, an extensive and comprehensive search was conducted including multiple databases and the grey literature without language restrictions. Secondly, this review is one of the first to explore abortion decision-making trajectories and their determinants in LMICs where most unsafe abortions occur thus ensuring that factors influencing abortion trajectories in these settings are collated to aid policymakers and programme managers. Finally, this is the first review, according to the author of this thesis to quantify abortion decision-making by women and their male partners and other members of the women's social network. This review was then able to

demonstrate that abortion decision-making does not significantly differ by national abortion laws or policies, national income status or geographical regions.

The main limitation of the review is related to the methodological limitations of the included studies which may affect the confidence in our findings. Even though many of the included studies were rated high to medium quality, the majority of individual studies had various methodological limitations. For example, only one in five of the mixed methods and qualitative studies included information on reflexivity. Secondly, the studies about abortion decision-making displayed considerable statistical and methodological heterogeneity[143]. While statistical heterogeneity is ubiquitous with meta-analyses of proportions[54], methodological heterogeneity in this review is likely due to operational definitions and measurement of the ’decision’. While some studies provided information about sole decision-maker, others provided information about primary decision-maker, allowing multiple responses for the decision-maker. However, sub-group analysis could not be conducted by operational definitions as some studies were unclear about what definition they had used. While subgroup analysis by national abortion laws, income status or geographical region did not explain any of the heterogeneity reported in the review, subgroup analysis is inherently underpowered to detect group differences, especially in the presence of significant heterogeneity, fewer countries in each group and the imbalance between the number of countries in each group[144–148], as was the case in this review. Thus, the pooled and the subgroup analysis estimates should be interpreted with caution. Finally, while attempts were made to delineate the abortion decision-making trajectories through a simplified yet broad conceptual framework, the author acknowledges that it may not wholly apply to different circumstances surrounding the abortion decision-making process for different women groups such as rape victims, commercial sex workers, refugees, and women living with HIV for which abortion is not medically indicated. However, from the four studies on rape victims included in the review, it was observed that they went through the same decision-making trajectories[34, 84, 119,

122]. Importantly, individual women's experiences, vary by context and circumstances, and thus may not be fully captured by this broad conceptual framework.

2.4.2 Conclusion

In conclusion, this review mapped complex abortion decision-making trajectories and determinants in LMICs leading to the following key recommendations: (i) Empower women to make independent, autonomous decisions; (ii) Engage, where appropriate, male partners in abortion discourses; (iii) Legalise abortions and accompany this with pragmatic policies; (iv) Improve access to information and knowledge; (v) Provide low cost or free abortion services as permitted by law; (vi) Broaden the definition of safe abortion to include social safety; (vii) Ensure availability of acceptable and preferred methods for abortion services; and (viii) Train and build capacity for health workers to improve their interpersonal and communication skills and their attitude towards women seeking abortion services in legally liberal settings.

Employing these could help address unsafe abortion-related morbidity and mortality by targeting specific steps and determinants in the abortion decision-making process. In addition, further research is required about the role of men and other social networks in abortion decision-making in LMICs. Although this review focused on women who had abortions, it is acknowledged that many women who wanted to have an abortion did not have one. Future research is needed to delineate the trajectories for these women. Also, the conceptual framework may not aptly capture the abortion decision-making of certain groups of women such as commercial sex workers, women living with HIV for which medical abortion is not indicated, refugees and adolescents. Further research is needed to understand how the broad trajectories framework developed through this review apply to these specific groups of women.

Finally, there is a need to explore ways by which women's empowerment influences the abortion decision-making trajectories including women's use of modern contraception and abortion in LMICs. The rest of the thesis aims to answer this last research objective.

Chapter 3: GENERATING A WOMEN'S EMPOWERMENT INDEX FOR LOW- AND MIDDLE-INCOME COUNTRIES

3.1 Introduction

3.1.1 Why is women's empowerment important?

The 5th SDG aims to "achieve gender equality and empower all women and girls"[149]. The goal is linked with other SDGs such as poverty reduction (SDG 1), zero hunger (SDG2), good health and well-being (SDG3), and education (SDG 4)[149]. Women's empowerment is important for the attainment of gender equality, ending all forms of discrimination against all women and girls everywhere, elimination of all of forms of violence against women and girls, and elimination of harmful practices such as child, early and forced marriages[149].

In the global health realm, women's empowerment is associated with mixed results with regards to access to and uptake of reproductive, maternal, newborn, and child health services including contraceptive use, abortion, antenatal care, skilled childbirth attendance, and postnatal care services[141, 142, 150–158]. For example, Ahmed *et al*. (2010) analysed demographic and health survey (DHS) data of 31 LMICs and showed that more empowered women were more likely to use modern contraception, attend four or more antenatal care visits and have a skilled attendant at birth compared with those with low empowerment[141]. Gipson and Shimamoto (2015) showed that women who did not approve of domestic violence and had high reproductive health decision-making power were more likely to use a skilled childbirth attendant (SBA) in Senegal and Tanzania compared with those who approve of domestic violence and had lower reproductive health decision-making power while household decision-making was not associated with increased SBA in either country[142]. However, Upadhyay *et al*. (2012), analysing DHS data from four sub-Saharan African (SSA) countries (Guinea, Mali,

Zambia, and Namibia), found mixed results associating women's empowerment and ideal family size[150]. They found that negative attitudes towards domestic violence were associated with ideal number of children in only Guinea and Zambia while greater household decision-making was associated with ideal family size in only Guinea. Results also showed that both household decision-making and reproductive health decision-making were associated with having more than the desired number of children in Namibia and Zambia[150]. Similarly, Jenning *et al.* (2014) also found mixed results between women's empowerment and male attendance at antenatal care (ANC) when they analysed the DHS data from eight SSA[157]. Women's empowerment was associated with increased male ANC attendance in Uganda and Burkina Faso only while a negative association was observed in Malawi. No association was observed in the rest of countries: Burundi, Mozambique, Rwanda, Senegal, or Zimbabwe[157]. However, most of these studies used different empowerment measures and definition, and this may partly explain the variability in their findings.

3.1.2 Defining women's empowerment

Although women's empowerment has received considerable global attention, there has been little to no consensus on its operational definition and its measurement. In its broadest terms, empowerment may be defined as a multidimensional and multicultural concept that encapsulates resources, agency, achievement, options, choice, control, and power[159, 160]. The World Bank defines empowerment as "the expansion of assets and capabilities of poor people to participate in, negotiate with, influence, control, and hold accountable institutions that affect their lives"[161]. One of the most widely used and accepted definition of women's empowerment is from Kabeer who defines it as "… the process by which those who have been denied the ability to make strategic life choices acquire such an ability"[160]. According to Kabeer, women's empowerment includes three inter-related dimensions: resources (access and/or future claims to both material and human and social resources); agency (autonomy); and achievements (well-being

outcomes)[160]. Thus, women's empowerment includes women's participation in household decision-making, access to and control over household resources, and attitudes towards gender relationships.

3.1.3 Measuring women's empowerment

In addition to the lack of consensus in the definition of women's empowerment, the mixed results associating women's empowerment and social and health outcomes may also be a result of lack of a common and validated tool for measuring women's empowerment in LMICs[142]. For example, Jennings *et al*. (2014) used an unvalidated composite score for women's empowerment for the analysis of DHS data from eight SSA countries[157] whereas Ewerling *et al.* (2017) used principal component analysis (PCA) to develop the Survey-based Women's Empowerment Index (SWPER)[162]. However, PCA only summarises the data using a linear combination of the variables without explaining the underlying latent constructs or structure of the data including any correlations between variables and is thus not appropriate for a multidimensional and multicultural construct such as empowerment[163]. Also, its external validity was determined by correlating it with gender-related development index (GDI). However, GDI has been criticised for being limited in scope and does not include many important indicators of women's empowerment such as participation in household decision-making[164]. Its convergent validity was established by assessing its association with modern contraceptive use, institutional birth, and stunting. However, for convergent validity, any new scale must be compared with an older scale measuring the same items[165]. Thus, although the development of the SWPER index covered a large number of SSA countries, it lacked psychometric properties to enable its replicability. Moreover, lack of measurement invariance limits its use between countries and/or times [166–170].

Phan (2016) used only exploratory factor analysis to develop a 4-domain empowerment index for four Southeast Asian countries[171]. However, the relationship between the

observed variables and underlying latent constructs was not verified or confirmed by standard statistical methods such as confirmatory factor analysis (CFA)[172]. In addition, the study was limited to only four countries and thus cannot be generalised to other settings. Asaolu *et al.* (2018) used both exploratory and confirmatory factor analysis to measure and validate women's empowerment index in 19 SSA countries which showed regional variations in the latent domains[173]. However, this tool is limited by its lack of measurement equivalence/variance[166–170] which prevents comparisons across groups and time. Miedema *et al*. (2018) used both EFA and CFA and multigroup invariance measurement to measure women's empowerment index in 5 East African nations[174]. Although they attempted to develop a comparable tool, it was limited to only the East African region while it is not also clear what type of measurement invariance they tested.

Thus, measuring women's empowerment has been beset by a number of challenges including inconsistencies and ambiguity of definition of indicators of women's empowerment[157, 162, 171, 173, 174], lack of validated tools[157, 162, 171], lack of uniform and accurate data sources, and lack of generalisability owing to studies being conducted in a few countries[157, 171, 174]. Moreover, other objective indicators of women's empowerment such as Gender Empowerment Measure (GEM) – which measures relative female representation in economic and political power – are often too limited to capture the multidimensionality and multi-culturalism of empowerment even though they are useful for tracking changes and comparisons across countries[175, 176]. They have also been accused of being Western-centric and failing to capture important facets of women's empowerment such as household decision-making and other sociocultural dimensions of women's empowerment that are important in LMICs[164].

3.1.4 Indicators and dimensions of women's empowerment: formative vs reflective indicators

Several indicators or variables have been identified to measure or determine women's empowerment[157, 158, 162, 173]. Broadly, these are spread over four important dimensions or domains at the individual-level: economic, socio-cultural, education and health [157, 158, 162, 173]. While some of these result from empowerment, e.g., attitudes towards domestic violence and household decision-making, others are thought to result in or to cause empowerment, e.g., women's education level and labour force participation. The former are called effective or reflective indicators while the latter are called formative or causal indicators and they are psychometrically and conceptually different[177].

Formative indicators are not amenable to conventional validity and reliability tests that are used for reflective indicators such as factor analysis and assessment of internal consistency[178]. This is because formative indicators are fundamentally different from reflective indicators in a number of important ways. For example, while for reflective indicators adding or dropping an item does not change the conceptual domains of the construct, doing so for formative indicators may change the underlying conceptual domain of the construct[177–180]. Also, variation in item measures does not cause variation in the construct for reflective indicators but variation in item measures will cause variation in the construct [177–180]. Therefore, care must always be taken to include as many formative indicators as possible in order to conceptually represent the domain of interest[177, 178, 180]. The multiple indicators and multiple causes (MIMIC) model is an appropriate statistical method for assessing the psychometric properties (validity) of a multidimensional construct such as women's empowerment that has both formative and reflective indicators[181]. However, the application of such models is often limited by the paucity of formative indicators captured in the DHS, which is the commonest database used for measuring women's empowerment in LMICs[157, 162, 171, 173, 174].

The key challenge of measuring multidimensional concepts has been the use of inappropriate statistical methods to validate the indices[157, 162, 171, 173, 174]. For example, Ewerling *et al*. (2017) used a set of 15 variables to generate the SWPER index that included attitudes towards domestic violence and household decision-making while the rest included the frequency of reading a newspaper or magazine, the woman's education and working status in the previous year, differences in education and age between wife and husband, and the woman's age at first cohabitation and at first birth[162]. They retained three components related to attitudes towards domestic violence, social independence, and household decision-making[162]. As pointed out previously, this index lacked robust statistical and psychometric properties and thus cannot thus be used across groups and time. Additionally, in PCA, the conceptual causal relationship between the variables and the principal components is that the variables "cause" the component unlike in factor analysis where the factors are the directly unobservable causes which manifest themselves in the variables[163]. Thus, analysing reflective indicators such as attitudes towards domestic violence and household decision-making together with formative indicators such as women's education and employment status using conventional factor analysis methods may produce grossly biased results[180, 182].

Asaolu *et al*. (2018) also used a set of 26 items identified from the DHS to measure women's empowerment across 19 SSA countries which were spread over economic, sociocultural, education and health domains[173]. Miedema *et al*. (2018) used 22 items related to human and social assets, gender attitudes and beliefs, and influence in household decisions[174]. Phan (2016) used 12 items across four aspects of women's empowerment related to labour force participation, household decision-making, family planning and education[171] whereas Lee-Rife (2010) used 16 variables related to decision-making over spending money, physical mobility, and threats to well-being[183]. Just as with the generation of the SWPER index, these too mixed reflective and formative

indictors of women's empowerment, which may explain the variability in their final domains or dimensions identified.

Furthermore, most of these studies, while focusing on married women or women in a relationship, ignored the role of men in decision-making. Thus, it is always implied that women who make decisions alone are more empowered than those who make joint decisions with their male partners. Yet male partners can play an important role in women's decision- making[34]. In addition, joint decision-making is essential for marital harmony and uptake of sexual and reproductive health services among women in LMICs[184–187] as well as better health-related quality of life in the postpartum period[3]. The systematic review in the previous chapter also showed that women who take decisions alone are not necessarily more empowered and may make such decisions out of their fear of the male partner's reaction while joint decision-making may make women feel more empowered and active in their own reproductive health[1].

3.1.5 Principles of Factor Analysis as relevant to the construction of a women's empowerment index

3.1.5.1 Construct validity: Exploratory and Confirmatory Factor Analysis

Validity, in general, refers to the extent to which an instrument or measurement measures what it claims to measure[188]. Construct validity, one of the types of validity, refers to the extent to which the measurement or instrument actually measures what it intends to measure[189]. Construct validity has two aspects: convergent construct validity and discriminant construct validity[188, 189]. Convergent construct validity tests the relationship between the construct and a similar measure with which it should show a strong relationship[189] whereas discriminant construct validity tests the relationship between the construct and an unrelated measure and with which there is no relationship[189]. Discriminant construct validity is demonstrated by low factor covariances (<0.35) between the retained factors while convergent construct validity is

demonstrated by high factor loadings (>0.50) for items loading onto specific domains or factors with the CFA[190]. Factor analysis – both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) – is a common method used to assess construct validity of instruments or measurements[6, 191]. Factor analysis examines and identifies the internal structure of the relationship (correlations) among a set of variables[7]. Hence, it provides useful information about what the instrument measures or does not measure by identifying the internal structure of the underlying latent constructs/dimensions/factors from a given set of variables[6]. In EFA, the relationship among the variables is unknown and the aim is to establish whether or not a relationship, if any, exists between the variables[6]. On the other hand, CFA confirms or refutes the *a priori* defined underlying latent constructs[6, 191].

3.1.5.2 Multigroup Confirmatory Factor Analysis: Measurement Invariance

For subjective multicultural and multidimensional constructs such as women's empowerment, the construct used should have the same psychometric properties across different groups, places and/or times[9, 192]. This is called measurement invariance or measurement equivalence and its purpose is to ensure that an instrument is interpreted or understood the same way across different settings[9]. Thus, any differences in means or correlations across different groups will be due to the differences in the latent construct itself and not due to systematic differences in the measure[193]. Measurement invariance follows a hierarchical stepwise analysis in which increasingly restricted models are nested in less restrictive models to "identify the extent to which measurement can be established"[192]. In multigroup confirmatory factor analysis, all parameters such as factor loadings, intercepts, residual variances, factor means, and factor variances are examined for invariance[166, 192], in which constraints or equivalences are hierarchically placed on the parameters across groups.

There are generally four types of measurement invariances in hierarchical order of testing: configural, metric (weak), scalar (strong), and strict (conservative) as shown in **Table 3.1**, with further variants of the strict model.

Table 3.1[10] Measurement invariance models

Invariance tested	**Parameters constrained**	**Meaning**
Configural invariance	All parameters free	Latent constructs can be meaningfully discussed in all groups; no latent bias
Weak Model: Metric (Pattern) invariance	Loadings constrained/invariant	Unstandardised regression coefficients and covariances similar across groups
Strong Model (Scalar) invariance	Loadings and intercepts constrained	Factor scales are the same across all groups, meaningful comparison of latent means across groups
Strict invariance	Loadings, intercepts and residuals constrained	All group differences on items only due to group differences in the common factors
Strict + Means	Model 4 + factor means constrained	Same as above
Strict + Means + Variances	Model 5 + factor variances constrained	Same as above

Before proceeding from one model to the next, the constrained[11] (also known as nested, complex or restricted model) should not be worse than the unconstrained[12] (also known as the simpler or relaxed model)[166, 192]. A comparison between the models is

[10] In table 3.1 above, the configural model is unconstrained in which all parameters are allowed to vary. The subsequent models are constrained hierarchically with increasing restrictiveness, i.e., more parameters are not allowed to vary.
[11] A model is said to be constrained/restricted/nested if some parameters are not allowed to vary freely across cutpoint equations for one subset of variables.
[12] In an unconstrained model, the parameters are “unconstrained” i.e., they are allowed to vary freely across cutpoint equations for a subset of variables.

conducted using the likelihood ratio test (LRT)[13] rejecting the null hypothesis that the nested model is not worse than the less restrictive model. However, because this test is highly sensitive to sample sizes and not appropriate with complex survey data due to clustering, absolute changes in goodness of fit indices are used instead[9, 194]. These are the Comparative Fit Index (CFI) of Δ0.02, the Root Mean Square Error of Approximation (RMSEA) of Δ0.015, and the Standardized Root Mean Square Residual (SRMR) of Δ0.030[194, 195]. The testing stops when the nested model is no better than the more relaxed model[166, 192].

Configural invariance: This is the first and least restrictive type of measurement invariance in which all parameters are free, i.e., no parameters are constrained to be equal across groups[166, 167, 192, 196]. In configural invariance, the number of latent variables and loading patterns is the same across all groups but the loadings can be allowed to vary[166, 167, 192, 196]. Configural invariance implies that the latent construct can be meaningfully discussed across groups, i.e., there is no construct bias[166, 167, 170, 192]. However, this type of invariance does not guarantee comparability across groups as participants across different groups may respond to items differently[9, 192, 197].

Metric (weak) invariance: This is also known as the pattern invariance in which the factor loadings are constrained to be equal in all the groups, in other words, weak invariance is achieved when the magnitude of the factor loadings is equal across all groups[9, 166, 167, 192]. Metric invariance is required to meaningfully compare the relationship between latent variables across the different groups[9, 192, 193, 197]. While some researchers argue that only metric invariance is needed in order to compare groups, others are of the view that because the intercepts are free to vary across groups, the factor means of the

[13] The LRT assesses the goodness of fit of two competing statistical models, specifically one found by maximization over the entire parameter space and another found after imposing some constraint, based on the ratio of their likelihoods.

scales cannot be compared across groups[192, 197]. Thus, metric invariance is not in itself sufficient to suggest the scale is comparable across groups or time.

Scalar or strong invariance: In scalar invariance, the factor loadings and intercepts are constrained to be equal across groups[9, 192, 193, 197]. The presence of scalar invariance means that there are no systematic response biases and means of latent variables can be meaningfully compared across different groups[192, 193, 197]. Thus, a latent construct with scalar invariance can be compared across groups without risk of bias.

Strict or conservative invariance: Here, the factor loadings, intercepts, and residuals or measurement errors are constrained to be equal across different groups [9, 192, 193, 197], implying that any group differences are due to group differences only on the common factors[192]. As shown in the **Table 3.1**, variants of strict invariance may be conducted in which factor means, factor variances and factor covariances are sequentially constrained. However, due to the strictness of constrained parameters, it is often difficult to obtain strict invariance and its variants and is thus rarely tested[192].

3.1.6 Research objectives

Due to the variability in defining and measuring women's empowerment and lack of validated tools using robust methods for women's empowerment measurement generalisable to LMICs, the objective of the study reported here was to generate a valid empowerment index for married or cohabiting women which can be used across multiple LMIC settings. This tool could be used across various LMICs to study the relationship between women's empowerment, as measured by their decision-making, and other important reproductive, maternal, newborn, child and adolescent health outcomes. In addition, due to the important role male partners play in reproductive health decision-making, a second objective was to develop a comparative empowerment index where

women making joint decisions with their male partners were considered more empowered than those making decisions alone.

3.2 Methods

3.2.1 Dataset and study design

This was a secondary analysis of the DHS data from 30 countries from Africa (19), Latin and Central America (2), Asia (6), Eastern Europe (2), and Oceania (1). The DHS are nationally representative household surveys conducted in over 90 LMICs to “improve the collection, analysis, and dissemination of population, health, and nutrition data and to facilitate use of these data for planning, policymaking and programme management”[198]. Implemented in overlapping five-year phases, the DHS programme collects key population, health and nutrition data for the five years preceding the survey[198]. The surveys collect data using four main questionnaires: the household, biomarker, women’s and men’s questionnaires[198]. The Women’s Questionnaire collects information from a nationally representative sample of women of reproductive age, 15-49 years, about their sociodemographic, and key sexual and reproductive health characteristics such as fertility preferences and family planning[198]. The DHS sampling follows a stratified two-stage cluster design: the first stage involves enumeration areas (EAs) which are usually drawn from national census files using probability proportional to size while the second stage involves random sampling of households listed under each EA[198].

Initially, data from a total of 86 countries – 85 from The DHS Program (https://dhsprogram.com) and one (Peru) from Google was accessed.

3.2.2 Inclusion and exclusion criteria

To be included in the final analysis, the dataset (i) must have been the most recent survey in each included country, (ii) must have been cycle seven or later (from 2014 onwards), (iii) must have had all the variables identified for developing and validating the

empowerment indices, and (iv) the variables must include reflective indicators. Additionally, the analysis was restricted to only married women or those in a relationship because the variables used to generate the empowerment index questions are only asked to these women during the DHS data collection.

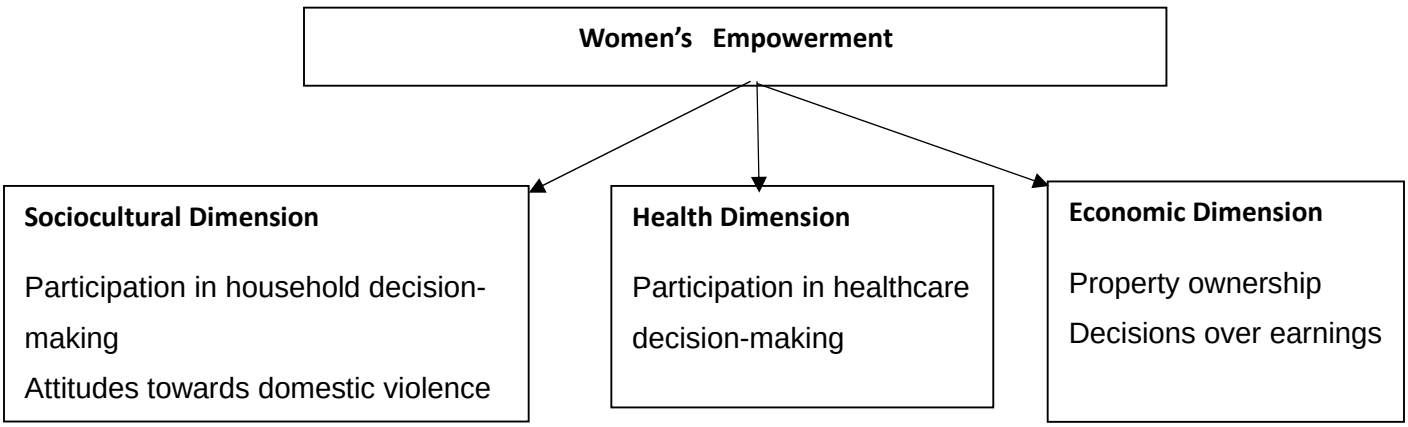
The DHS datasets were then scanned for all potential variables related to women's empowerment. A total of 32 variables were identified from the DHS. An additional three (3) variables, based on literature reading were constructed from the primary DHS variables identified: differences in spousal age, differences in spousal education level, and differences in spousal earnings. The details of these variables are given in **Appendix B.1.**

After applying the inclusion and exclusion criteria, a total of 30 countries and 16 reflective variables were retained and included in the final analysis.

3.2.3 Conceptual framework

The 16 reflective items identified from 3.2.2 above after applying the inclusion and exclusion criteria were then mapped onto the four (economic, sociocultural, education and health) dimensions of women's empowerment described in **3.1.4**. The mapping resulted in three dimensions of women's empowerment as shown in Figure 3.1, with none of the 16 items mapping onto the education dimension. [157, 162, 171, 173, 174, 199–202]

Figure 3.1: Conceptual Framework for Measuring Women's Empowerment Index for married/cohabiting women in LMICs



The 16 items identified for generating the empowerment indices have been studied extensively for their psychometric properties and relevance for measuring women's empowerment in LMICs[157, 162, 171, 173, 174, 199–202] from the existing evidence. The items were ordered categorical variables, with higher scores reflecting greater women's empowerment. The scoring was adopted from previous studies that measured women's empowerment using the DHS datasets[142, 157, 171, 173]. The scoring details for questions from the women's questionnaire used for both indices are given in **Table 3.2**. In the woman-alone empowerment index, decisions made by the woman alone were given higher ranking scores while in the joint empowerment index, joint decisions were given higher ranking scores.

3.2.3.1 Items related to sociocultural dimension

There were two domains or sub-dimensions related to the sociocultural dimension, namely (i) participation in household decision-making and (ii) attitudes towards domestic violence.

3.2.3.1.1 Participation in household decision-making

There were three items related to the domain participation in household decision-making, namely:

- Women's health. This item established from the woman the person who usually decides on her healthcare. The DHS responses are respondent alone, respondent and husband/male partner, husband/male partner alone, and someone else.
- Large household purchases. This item established from the woman the person who usually decides on large household purchases. The DHS responses are respondent alone, respondent and husband/male partner, husband/male partner alone, and someone else.

- Visiting family/relatives. This item established from the woman the person who usually decides on her visits to family or relatives. The DHS responses are respondent alone, respondent and husband/male partner, husband/male partner alone, and someone else.

For the woman-alone empowerment index, the response “respondent alone” was scored the highest score (3), followed by “respondent and husband/male partner” (2), and “husband/male partner alone” or “someone else” (1).

For the joint empowerment index, the response “respondent and husband/male partner” was scored highest score value (3), followed by “respondent alone” (2), and “husband/male partner alone” or “someone else” (1).

Because some women were not employed at the time of the survey, a categorical variable (not working) was generated for them. For both indices, women who reported they were not working at the time of the interview were scored the least (0). Higher scores reflected greater empowerment.

3.2.3.1.2 Attitudes towards domestic violence

There were five items related to women’s attitudes towards domestic violence, namely:

- Goes out without telling husband: This item established from the woman if wife beating is justified if the wife goes out without telling the husband
- Neglects children: This item established from the woman if wife beating is justified if the wife neglects the children
- Argues with husband: This item established from the woman if wife beating is justified if the wife argues with the husband.
- Refuses sex: This item established from the woman if wife beating is justified if the wife refuses to have sex with the husband.

- Burns food: This item established from the woman if wife beating is justified if the wife burns the food.

The DHS responses for all these five items are “Yes”, “No”, or “Don’t know”. For both empowerment indices, women who responded “No” were scored higher (1) than those who responded “Yes” or “Don’t know” (0) with the higher scores reflecting more empowerment.

3.2.3.2 Items related to the healthcare dimension

There was one domain related to the healthcare dimension: participation in reproductive health decision-making.

3.2.3.2.1 Participation in reproductive decision-making

There were four items related the domain reproductive household decision-making, namely:

- Can ask husband/(male) partner to use condom: This item established from the woman if the woman can ask the husband/male partner to use a condom.
- Can say no to sex: This item established from the woman if the woman can, for no reason, refuse to have sex with the husband/male partner.
- Can refuse sex if male partner has multiple partners: This item established from the woman if the woman can refuse to have sex with the husband/male partner if he has other women.
- Can ask male partner to use condom if he has an STI: This item established from the woman if the wife is justified asking husband/male partner to use condoms if he has a sexually transmitted infection (STI).

The responses to the above questions were “Yes”, “No”, or “Don’t know/Not sure/Depends”. For both empowerment indices, women who responded “Yes” were

scored higher (1) than those who responded “No” or “Don’t know/Not sure/Depends” (0) with the higher scores reflecting greater empowerment.

3.2.3.3 Items related to the economic dimension

There were two domains related to the economic dimension (i) asset ownership and (ii) decisions over spousal earnings.

3.2.3.3.1 Asset ownership

There were two items related to asset ownership.

- House ownership: This item established from the woman if she owns a house alone or jointly.
- Land ownership: This item established from the woman if she owns land alone or jointly.

The DHS responses were “Does not own”, “Owns alone only”, “Owns jointly only”, and “Owns both alone and jointly”.

For the woman-alone empowerment index, women who responded that they owned any asset “alone” or “alone and jointly” were scored highest (2) followed by those who said that they owned “jointly only” (1). For the joint empowerment index, women who responded that they owned any asset “jointly only” were scored highest (2) followed by those who responded that they owned “alone” or “alone and jointly” (1). For both indices women who did not own any asset were scored the least (0). Higher scores reflected greater empowerment.

3.2.3.3.2 Decisions over spousal earnings

There were two domains related to the dimension decisions over spousal earnings.

- Respondent's earnings: This item established from the woman the person who usually decides how to spend the respondent's (her) earnings.
- Husband's/male partner's earnings: This item established from the woman the person who usually decides how to spend the husband's/male partner's earnings.

The DHS responses to the above items were "Respondent alone", "Respondent and husband/male partner", "Husband/male partner alone", and "Someone else".

For the woman-alone empowerment index, the scoring was respondent alone = 3, respondent and husband/male partner = 2, and husband/male partner alone or someone else = 1. For the joint empowerment index, the scoring was respondent and husband/male partner = 3, respondent alone = 2, and husband/male partner alone or someone else = 1. For both indices, if the respondent or the male partner did not work, they were scored the least (0). Higher scores reflected greater empowerment.

Table 3.2: Domains, indicators and aggregate codes of variables used in describing women's empowerment in LMICs derived from women's questions

Dimensions	Domains	Indicator label	Questions	DHS response categories[1]	Woman-alone empowerment index	Joint empowerment index
Economic	Asset ownership	House ownership	Respondent owns a house alone or jointly	0 Does not own 1 Alone only 2 Jointly only 3 Both alone and jointly	0 Does not own 1 Jointly only 2 Alone only	0 Does not own 1 Alone only and 2 Jointly only
		Land ownership	Respondent owns land alone or jointly			
	Earnings decision-making	Respondent's earnings	Person who usually decides how to spend respondent's earnings	1 Respondent alone 2 Respondent and husband/male partner 4 Husband/male Partner alone 5 Someone else	0 Respondent does not work 1 Husband/male partner alone or someone else 2 Respondent and husband/male partner 3 Respondent alone	0 Respondent does not work 1 Husband/male partner alone or someone else 2 Respondent alone 3 Respondent and husband/male partner
		Husband/partner earnings	Person who usually decides how to spend respondent's earnings	1 Respondent alone 2 Respondent and husband/male partner 4 Husband/male Partner alone 5 Someone else	0 Husband/male partner not working 1 Husband/male partner alone or someone else 2 Respondent and husband/male partner 3 Respondent alone	0 Husband/male partner does not work 1 Husband/male partner alone or someone else 2 Respondent alone 3 Respondent and husband/male partner
Socio-Cultural	Household decision-making	Women's health	Person who usually decides on respondent's healthcare	1 Respondent alone 2 Respondent and husband/male partner 4 Husband/male partner alone	0 Respondent does not work 1 Husband/male partner alone or someone else	0 Respondent does not work 1 Husband/male partner alone or someone else 2 Respondent alone
		Large household purchases	Person who usually decides on large household purchases			

Dimensions	Domains	Indicator label	Questions	DHS response categories[1]	Woman-alone empowerment index	Joint empowerment index
		Visiting relatives/family	Person who usually decides on visits to family or relatives	5 Someone else 6 Other	2 Respondent and husband/male partner 3 Respondent alone	3 Respondent and husband/male partner
	Attitudes towards domestic violence	Goes out without telling husband	Beating justified if wife goes out without telling husband	0 No 1 Yes 8 Don't know	0 Yes or don't know 1 No	0 Yes or don't know 1 No
		Neglects children	Beating justified if wife neglects the children			
		Argues with husband	Beating justified if wife argues with husband			
		Refuses sex	Beating justified if wife refuses to have sex with husband			
		Burns food	Beating justified if wife burns the food			
Health	Health care decision-making	Can ask male partner to use condom	Respondent can ask male partner to use a condom	0 No 1 Yes 8 Don't know/not sure/depends	0 No or don't know/not sure/depends 1 Yes	0 No or don't know/not sure/depends 1 Yes
		Can say no to sex	Respondent can refuse sex			
		Reason for refusing sex	Reason for not having sex: husband has other women			
		Use condom if male partner has STI	Wife justified asking husband to use condom if he has STI			

[1] DHS codes are variable and not necessarily numbered serially

3.2.4 Data cleaning and assessing data for factorability

The data from the 30 included countries were appended and equal weights were applied as recommended by the DHS for multi-group and multilevel analysis of DHS data[203]. Descriptive statistics were conducted and tests for univariate normality for each of the 16 variables were assessed by inspecting skewness (>2.0) and kurtosis (>7.0)[7]. Mahalanobis distance (D^2) test was conducted to detect any unusual or unreasonable responses (outliers) to the questions[204]. No observations were excluded based on this[205]. Multivariate normality was assessed using Mardia's test and inspected for multicollinearity by assessing the correlation matrix for correlations above 0.90. Since the data was ordered categorical with fewer than six ordered categories[206], a polychoric matrix rather than Pearson's correlation matrix was obtained and used in the analysis. The polychoric matrix makes assumptions of an underlying joint continuous distribution of the association for ordinal variables[207].

The sphericity of the matrix was assessed using Bartlett's test of sphericity and the sampling adequacy using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. Bartlett's test of sphericity tests the null hypothesis that the correlation matrix is an identity matrix, i.e., the variables are highly related and thus not ideal for factor analysis while the KMO assesses the strength of the correlation between the variables[208]. The null hypothesis based on Bartlett's test must be rejected i.e., $p>0.05$ while the KMO values must be at least 0.5[208]. KMO values above ≥0.90 are considered marvellous, 0.80 – < 0.90 are considered meritorious, 0.70 - <0.80 are considered average, 0.60 - <0.70 are considered mediocre, 0.50 - <0.60 are considered terrible while values <0.50 are considered unacceptable[208]. However, Bartlett's test of sphericity is sensitive to and dependent upon sample size and Tabachnick and Fidell recommend that it should not be relied on with larger sample sizes (more than, say 5 cases per item)[7]. Instead, they recommend that the correlation matrix should be inspected for correlations above 0.30, and "if none is found, reconsider use of factor analysis"[7]. Therefore, as an adjunct, the

polychoric matrix was inspected to ensure there were enough correlations >0.30. Once it was determined that the data was appropriate for EFA, the data was randomly split into two equal parts balanced by country: one half for exploratory factor analysis and the other half for confirmatory factor analysis[209].

3.2.5 Exploratory factor analysis (EFA)

Due to the ordinal nature of the items and the violation of multivariate normality, the polychoric correlation matrix of the 16 variables was generated[210]. It was then entered into an EFA using iterated principal factor (IPF) extraction due to its “robustness and reduced sensitivity to nonnormality”[211] which estimates initial communalities by squared multiple correlations[7]. As recommended by Watkins (2018), parallel analysis and minimum average partials to determine the number of factors to retain, with the scree-plot as an adjunct was used[212]. Factors were extracted using oblique promax rotation due to the observed correlations between the variables in polychoric matrix[210]. To achieve practical and statistical significance (at least 10% variance explained by an item), only factor loadings |≥0.32| were retained, eliminating those that loaded weakly (<.32) or cross-loaded significantly (≥.32 in more than one factor)[213, 214] while aiming to explain at least 50% of the total variance in the index by the retained factors[215]. The internal consistency of the overall retained variables and each factor (domain) was assessed using Cronbach’s alpha considering values ≥0.70 acceptable[216, 217]. Each of the extracted factors were inspected for signs of over-extraction and under-extraction. Signs of over-extraction included less than three items loading saliently on one factor while signs of under-extraction included complex patterns in which many unrelated items loaded onto one factor[218]. Alternative models were assessed and compared for fit and reliability and theoretical assumptions. Factors showing a Heywood case were included in the sensitivity analysis. A Heywood case is a unique factor variance that is either zero or negative, i.e., invalid boundaries[219]. A factor variance that is zero is psychometrically implausible while that with negative variance is mathematically senseless[219]. This is

because in factor analysis, the observed variable's variance is a result of both common variance (communalities) and unique variance[219]. In proper factor solutions with standardised data, both variance factors are positive and add up to 1.00[219]. Unique variance is only influenced by a single observed variable (i.e., unique to that variable) and accounts for the unreliable variance due to measurement error and the reliable variance specific to that variable[219]. In a Heywood case, the estimated communality (common variance) is equal to or exceeds 1.00, implying that the unique factor variance is either zero or negative, respectively[219].

The analysis was repeated for the joint empowerment index.

3.2.6 Confirmatory Factor Analysis (CFA)

To validate the hypothesised domains or factors retained by the EFA, a confirmatory factor analysis was conducted on the second sample using the diagonally weighted least squares (WLSMV) with the lavaan package in R. The WLSMV is the most appropriate method for analysis of categorical data since it does not assume multivariate normality[220]. The model fit was examined using the goodness of fit statistics and the following cut-off values were considered as indications of a good/an acceptable fit: Comparative Fit Index (CFI, ≥0.95); Tucker-Lewis Index (TLI, ≥0.95); Root Mean Square Error of Approximation (RMSEA, ≤0.08); and Standardised Root Mean Residual (SRMR, ≤0.08)[221, 222]. CFA was conducted on the pooled data and individual country-level data.

The same analysis was conducted for the joint empowerment index.

3.2.7 Measurement invariance

Having established the dimensionality of the indices using CFA, measurement invariance was assessed by testing for configural, metric and scalar invariances using the theta parameterisation [168]. Because theta parameterisation fixes the residual term of the latent variable to one, it is not possible to test for strict invariance.

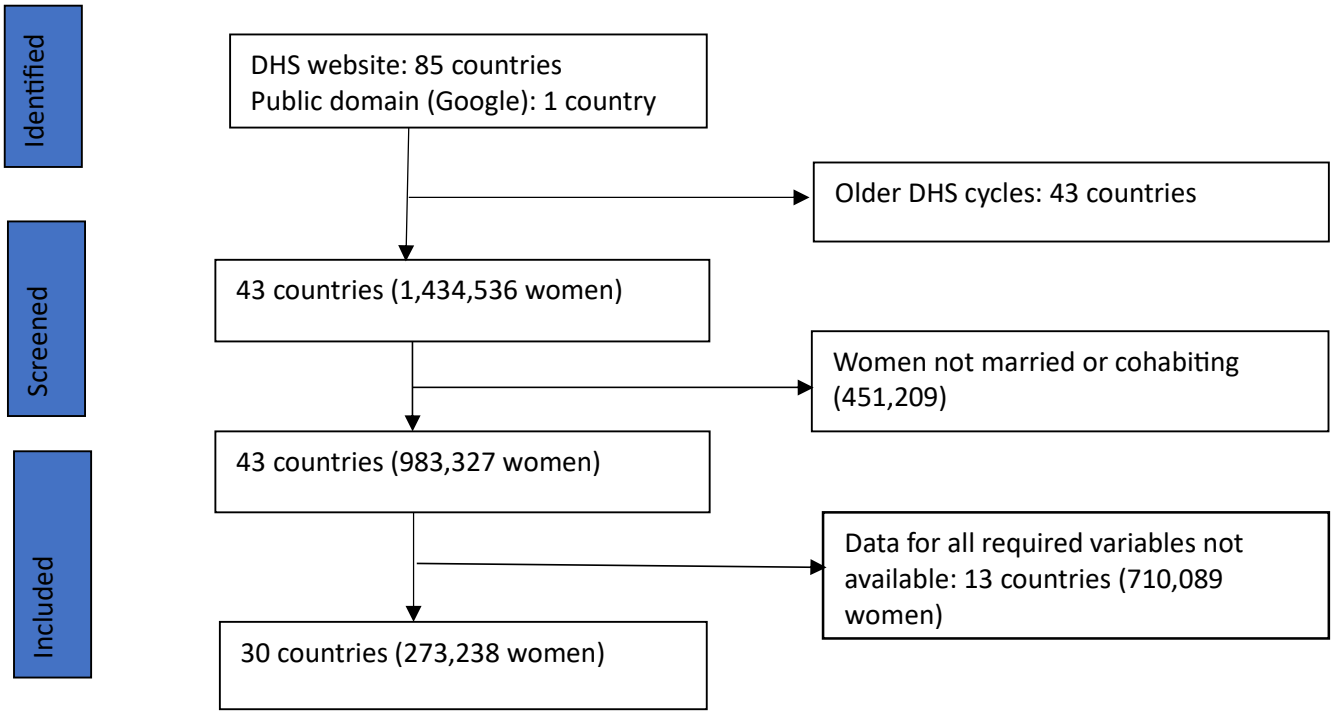
Measurement invariance was assessed using the combined dataset as recommended by Kyriazos[223].

3.3 Results

3.3.1 Characteristics of the study sample

DHS data from a total of 86 countries were accessed. After screening, 43 countries that had data prior to DHS cycle 7 were excluded, a further 13 countries that did not have the relevant data for generating the indices were also excluded. A total of 30 countries with 273,238 women were included in the final analysis as shown in **Figure 3.2.**

Figure 3.2 Flowchart of study sample from the DHS dataset for married/cohabiting women in LMICs



The weighted sample size for each country is presented in **Table 3.3** below. Nigeria contributed the largest proportion of all included samples at 10.6% (28,888) while Timor-Leste contributed the least proportion at only 1% (2,623). The mean age of all women

included in the combined dataset was 32.1 years (standard deviation (SD) +8.5) while the median was 31 years (interquartile range (IQR) = 14.0). The age range was 15-49 years in all countries except Armenia in which the lower age limit was 16.

Table 3.3 Weighted sample size from included countries

Country	Frequency	Percent	Age			
			Mean	SD	Median	IQR
Albania	7,554	2.8	36.3	8.5	37.0	15.0
Armenia	3,986	1.5	34.7	8.0	34.0	13.0
Benin	5,406	2.0	31.2	8.3	30.0	12.0
Burundi	9,559	3.5	32.4	7.9	32.0	12.0
Cambodia	11,660	4.3	33.0	8.6	32.0	14.0
Cameroon	7,463	2.7	31.1	8.5	30.0	13.0
Chad	4,543	1.7	29.8	8.6	29.0	13.0
Ethiopia	9,824	3.6	30.6	8.1	30.0	12.0
Gambia	8,083	3.0	31.2	8.5	30.0	13.0
Ghana	5,445	2.0	33.6	8.0	33.0	13.0
Guatemala	14,936	5.5	32.0	8.9	31.0	14.0
Guinea	7,812	2.9	31.4	8.9	30.0	13.0
Haiti	5,086	1.9	33.3	8.4	33.0	13.0
Kenya	8,956	3.3	31.8	8.1	30.0	13.0
Lesotho	3,609	1.3	31.0	8.6	30.0	13.0
Liberia	4,654	1.7	33.1	8.6	33.0	14.0
Malawi	15,952	5.8	30.4	8.3	30.0	13.0
Mali	8,332	3.1	30.1	8.5	29.0	13.0
Myanmar	7,865	2.9	34.6	8.4	35.0	14.0
Nepal	9,904	3.6	31.7	8.8	31.0	14.5
Nigeria	28,888	10.6	31.9	8.6	31.0	14.0
Pakistan	14,480	5.3	32.1	8.3	32.0	13.0
Papua New Guinea	9,550	3.5	32.7	8.2	32.0	13.0
Philippines	15,445	5.7	34.5	8.5	35.0	14.0
Rwanda	6,799	2.5	32.9	7.4	32.0	11.0
Sierra Leone	9,837	3.6	32.5	8.3	32.0	13.0
Timor-Leste	2,623	1.0	33.5	8.4	33.0	14.0
Uganda	11,377	4.2	30.5	8.4	30.0	13.0
Zambia	7,597	2.8	31.6	8.5	31.0	13.0
Zimbabwe	6,013	2.2	31.2	8.1	31.0	12.0
Total	**273,238**	**100**	**32.1**	**8.5**	**31.0**	**14.0**

SD = standard deviation
IQR = interquartile range

The descriptive statistics of the 16 variables including the mean and standard deviation, the median and interquartile ranges, the minimum and maximum scores, and the skew and kurtosis are given in **Appendix B.2.**

3.3.2 Factorability of the data

The polychoric correlation matrix of the items showed several correlations above 0.30 while no correlation exceeded 0.90. The determinant test rejected the null hypothesis that the matrix was an identity matrix, and the Bartlett test of sphericity rejected the null hypothesis that the variables were not intercorrelated while the KMO was meritorious at 0.803. Only 0.67% of the data observations were outliers and thus these were not excluded from the final analysis. The patterns of correlations were similar for both indices as shown in **Figure 3.3** and **Figure 3.4**.

The following four distinct patterns of correlation were observed for both indices: (i) related to household decision-making with three items – large household purchases (hhpdec), woman's health (hcdec), and visiting family/relatives (visit); (ii) related to attitudes towards domestic violence with five items - going out without informing the husband (dv1), neglects children (dv2), argues with husband (dv3), refuses sex (dv4), and burns food (dv5); (iii) related to reproductive health decision-making with three items - can refuse sex if male partner has multiple women (sexrefuse), can refuse sex without need for any reason (refsex), can ask male partner to use condom if he has an STI (askcd) and can ask male partner to use condom (cdask); and (iv) related to asset ownership – owns land (ownland) and owns house (ownhouse)

Other unclear patterns of correlations observed were observed between refuses sex (dv4), can refuse sex without need for any reason (refsex), and can ask male partner to use condom if he has an STI (askcd); and between can ask male partner to use condom if he has an STI (askcd) and can refuse sex without need for any reason (refsex).

Figure 3.3: Correlation matrix for items related to the woman-alone empowerment index

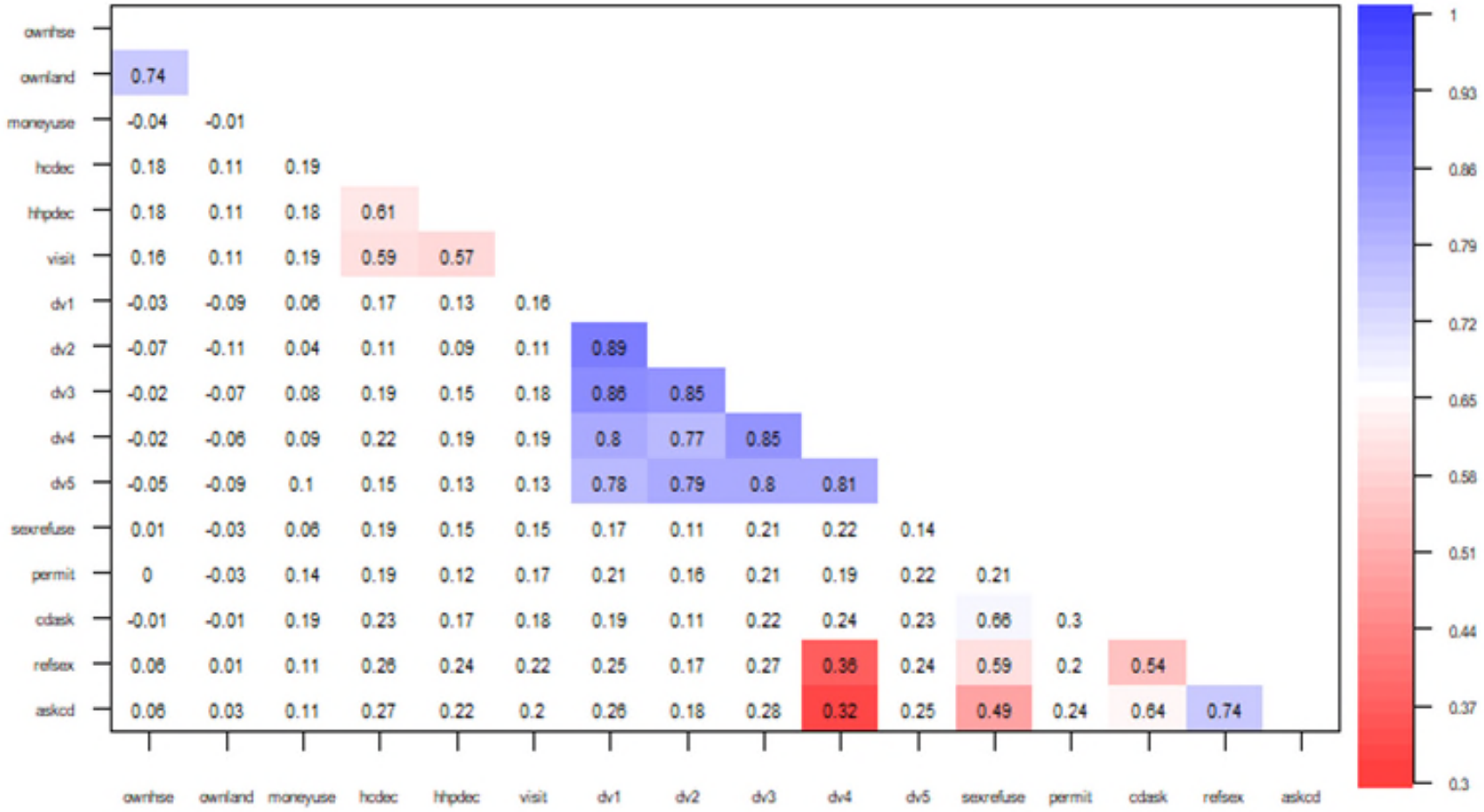
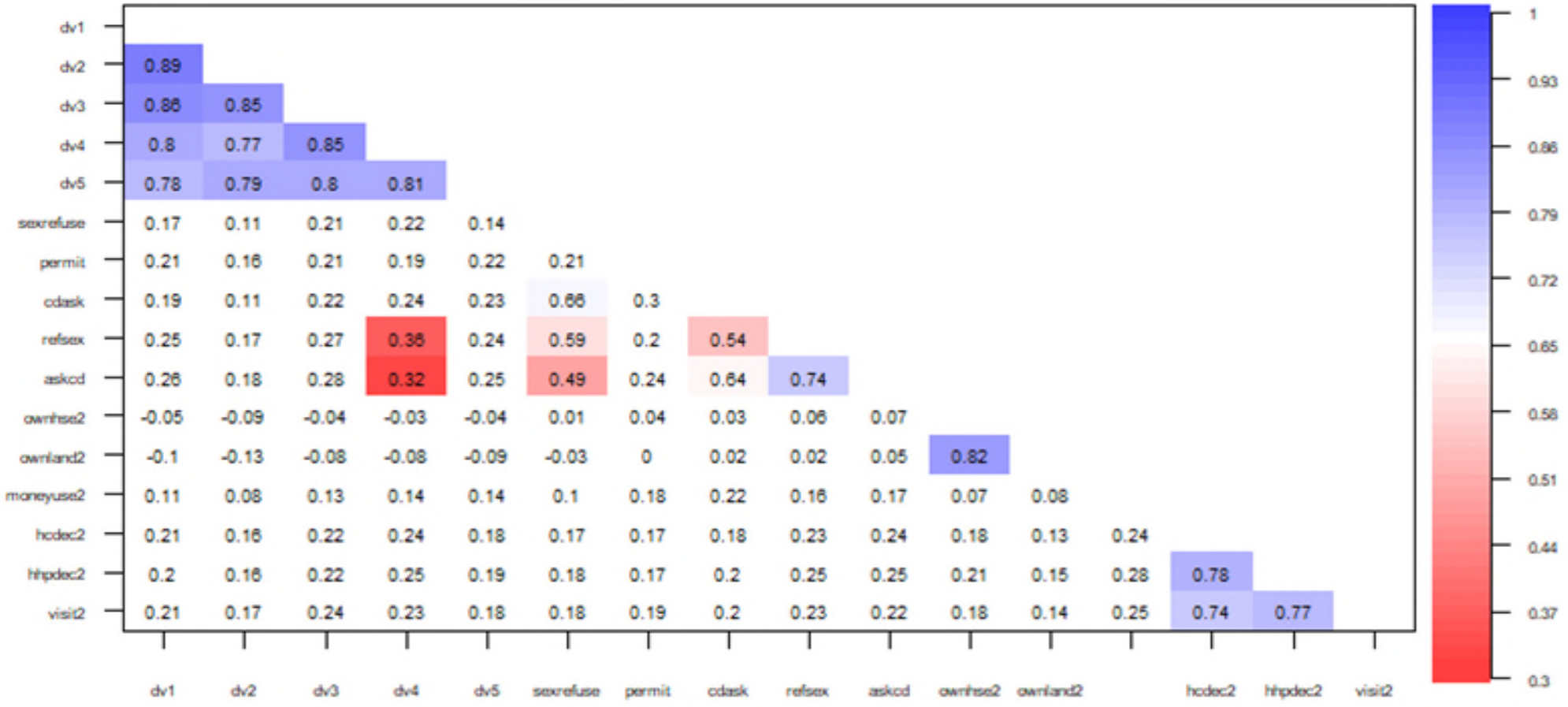


Figure 3.4: Correlation matrix for items related to the joint empowerment index



visit = if woman requires permission to own parents or relatives
hhpdec = who decides large household purchases
hcdec = who decides on woman's own health
cdask = woman can ask husband/male partner to use condoms
refsex = woman can refuse to have sex with husband/male partner for no reason
askcd = woman can ask husband/male partner to use condoms if he has STI
sexrefuse = woman can refuse to have sex with husband/male partner if he has multiple women
dv1 = wife beating justified if wife goes out without telling husband
dv2 = wife beating justified if wife neglects children
dv3 = wife beating justified if wife argues with husband
dv4 = wife beating justified if wife refuses sex
dv5 = wife beating justified if wife burns food
ownse = if woman owns house
ownland = if woman owns land
permit = person who decides on how to use man's own earnings
moneyuse = person who decides on how to use woman' own earnings
****visit2, hhpdec2, hcdec2, ownland2, ownhse2 correspond to the joint empowerment index.*

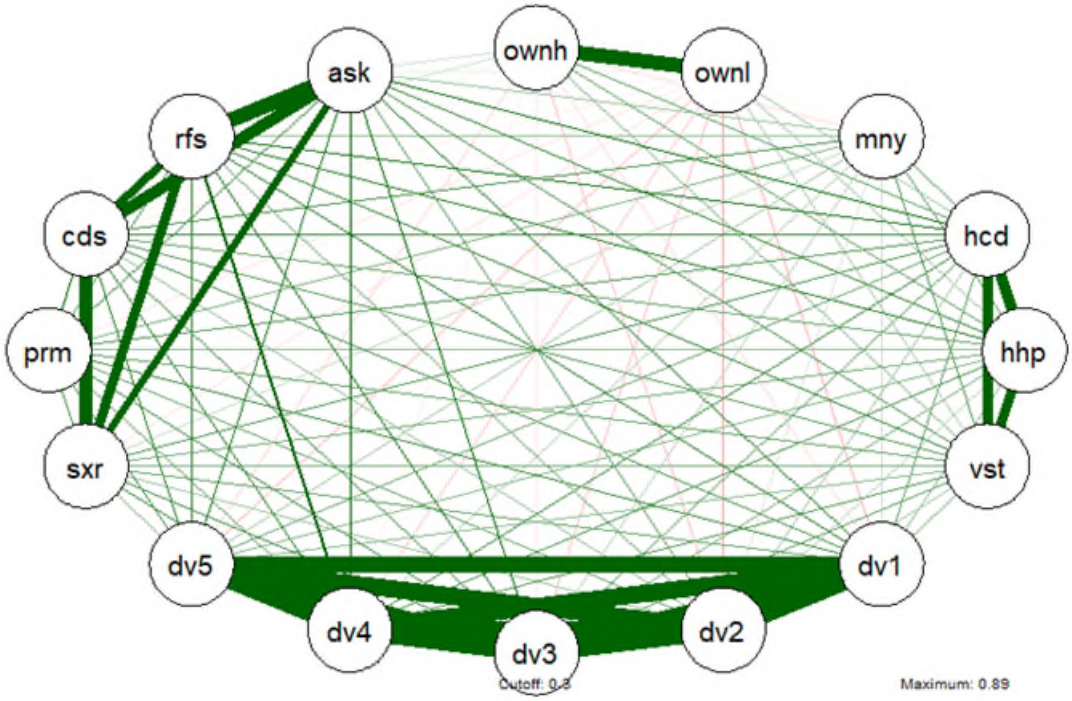
The Q-graphs in **Figure 3.5** and **Figure 3.6** for the woman-alone empowerment index and the joint empowerment index respectively show the patterns of correlations among items measuring women's empowerment. The thickness of the joining lines is proportional to the strength of the pairwise correlations.

Four patterns were observed for the Q-graphs for both empowerment indices which were

related to: (i) attitudes towards domestic violence; (ii) reproductive health decision-

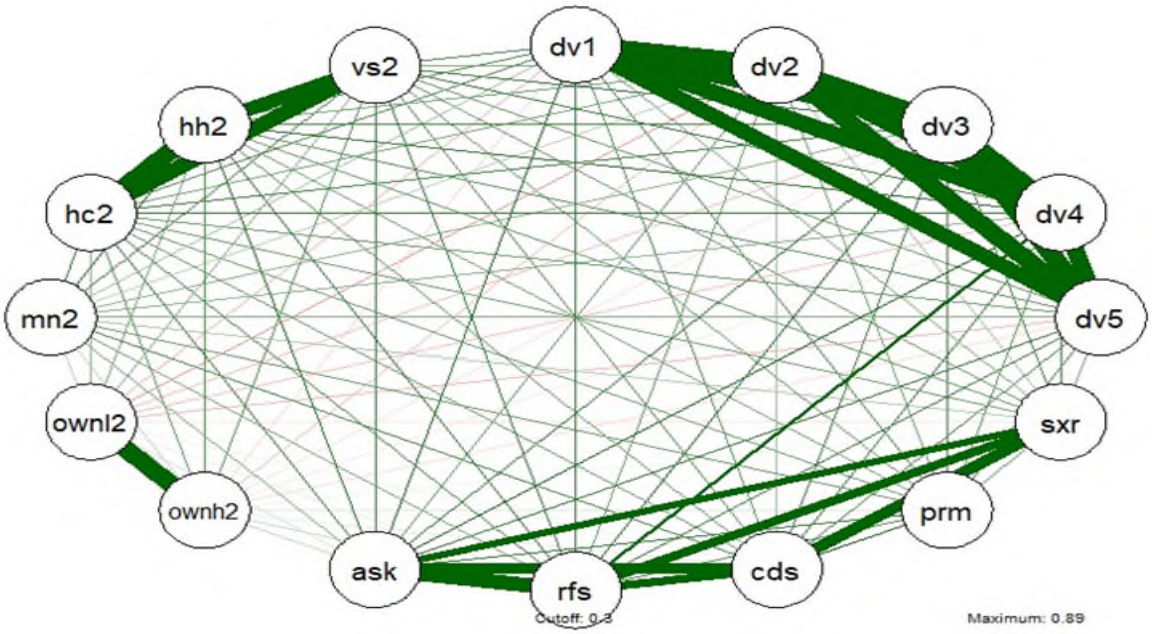
making; (iii) household decision-making; and (iv) asset ownership.

Figure 3.5: Q-graph showing network of polychoric correlations above 0.30 for the woman-alone empowerment index



vst = if woman requires permission to own parents or relatives
hhp = who decides large household purchases
hcd = who decides on woman's own health
cds = woman can ask husband/male partner to use condoms
rfs = woman can refuse to have sex with husband/male partner for no reason
ask = woman can ask husband/male partner to use condoms if he has STI
sxr = woman can refuse to have sex with husband/male partner if he has multiple women
dv1 = wife beating justified if wife goes out without telling husband
dv2 = wife beating justified if wife neglects children
dv3 = wife beating justified if wife argues with husband
dv4 = wife beating justified if wife refuses sex
dv5 = wife beating justified if wife burns food
mny = person who decides on how to use woman' own earnings
ownh = if woman owns house
ownl = if woman owns land

Figure 3.6: Q-graph showing network of polychoric correlations above 0.30 for the joint empowerment index



vs2 = if woman requires permission to own parents or relatives
hh2 = who decides large household purchases
hc2 = who decides on woman's own health
cds = woman can ask husband/male partner to use condoms
rfs = woman can refuse to have sex with husband/male partner for no reason
ask = woman can ask husband/male partner to use condoms if he has STI
sxr = woman can refuse to have sex with husband/male partner if he has multiple women
dv1 = wife beating justified if wife goes out without telling husband
dv2 = wife beating justified if wife neglects children
dv3 = wife beating justified if wife argues with husband
dv4 = wife beating justified if wife refuses sex
dv5 = wife beating justified if wife burns food
ownh2 = if woman owns house
ownl2 = if woman owns land
prm = person who decides on how to use man's own earnings
mny2 = person who decides on how to use woman' own earnings

3.3.3 Domains/ constructs for the indices

For both indices, parallel analysis, minimum average partials (MAP) and the Kaiser criterion (eigenvalues >1) suggested a four-factor extraction was desirable. The parallel analysis plot and the Scree plot for the woman-alone empowerment index are shown in **Figure 3.7** and **Figure 3.8**; the plots were similar for the joint empowerment index (results not shown).

Figure 3.7: Parallel analysis plot for the woman-alone empowerment index

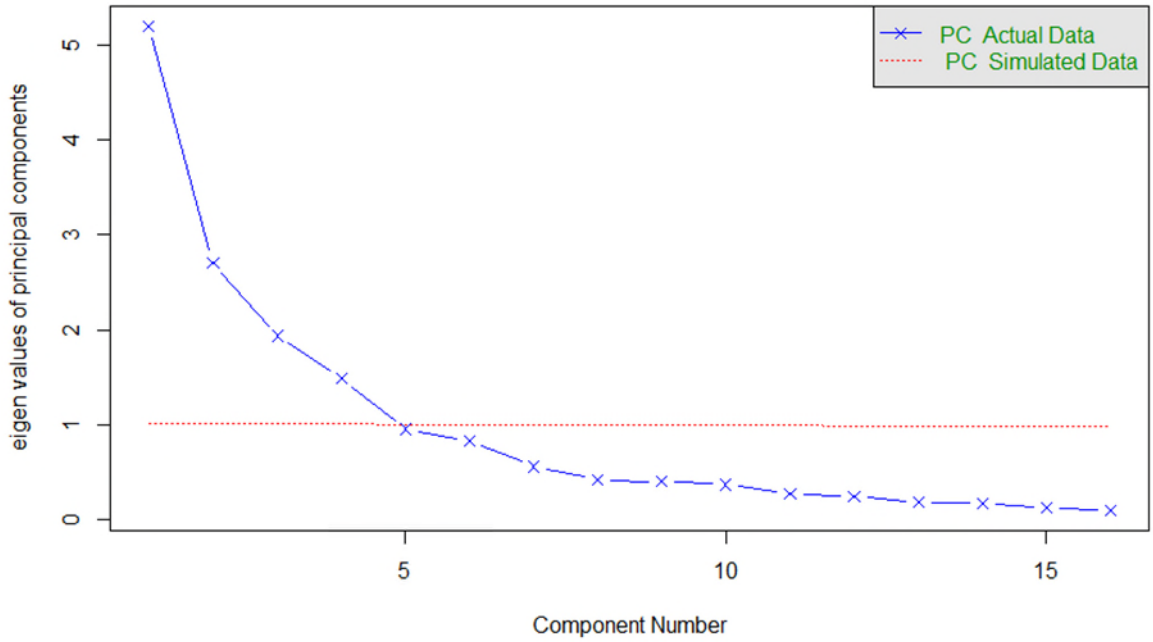
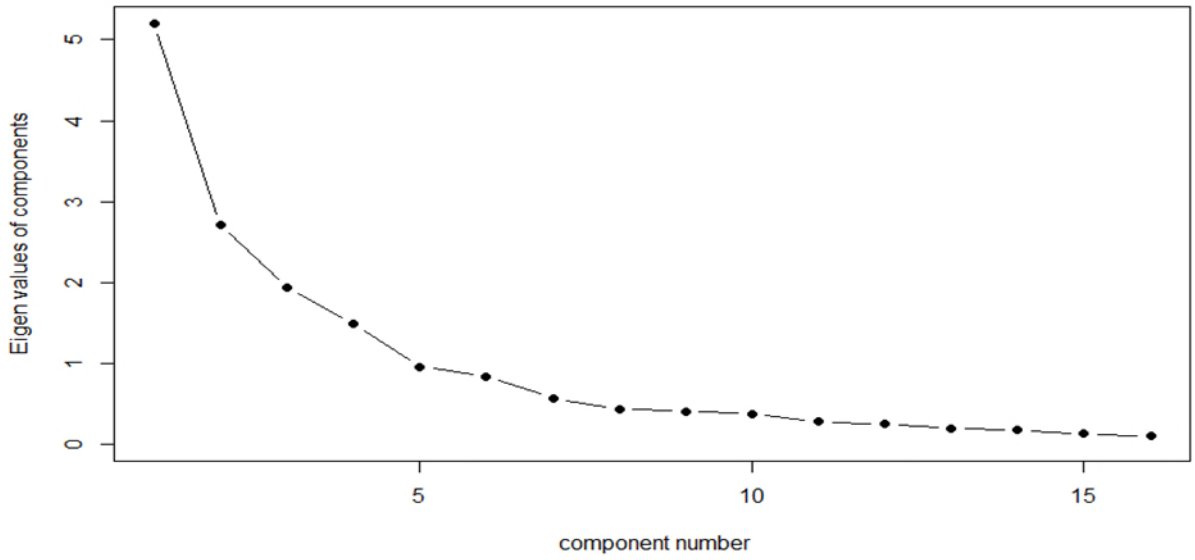


Figure 3.8: Scree Plot for the woman-alone empowerment index



For the parallel analysis (PA) and Scree plot, the rule is to retain factors above 1.

The network graphs (**Figure 3.9** and **3.10**) also suggested that four factors should be extracted for both indices. The four patterns were (i) household decision-making, (ii) reproductive health decision-making, (iii) attitudes towards domestic violence, and (iv) asset ownership.

Figure 3.9: Network graph for the woman-alone empowerment index

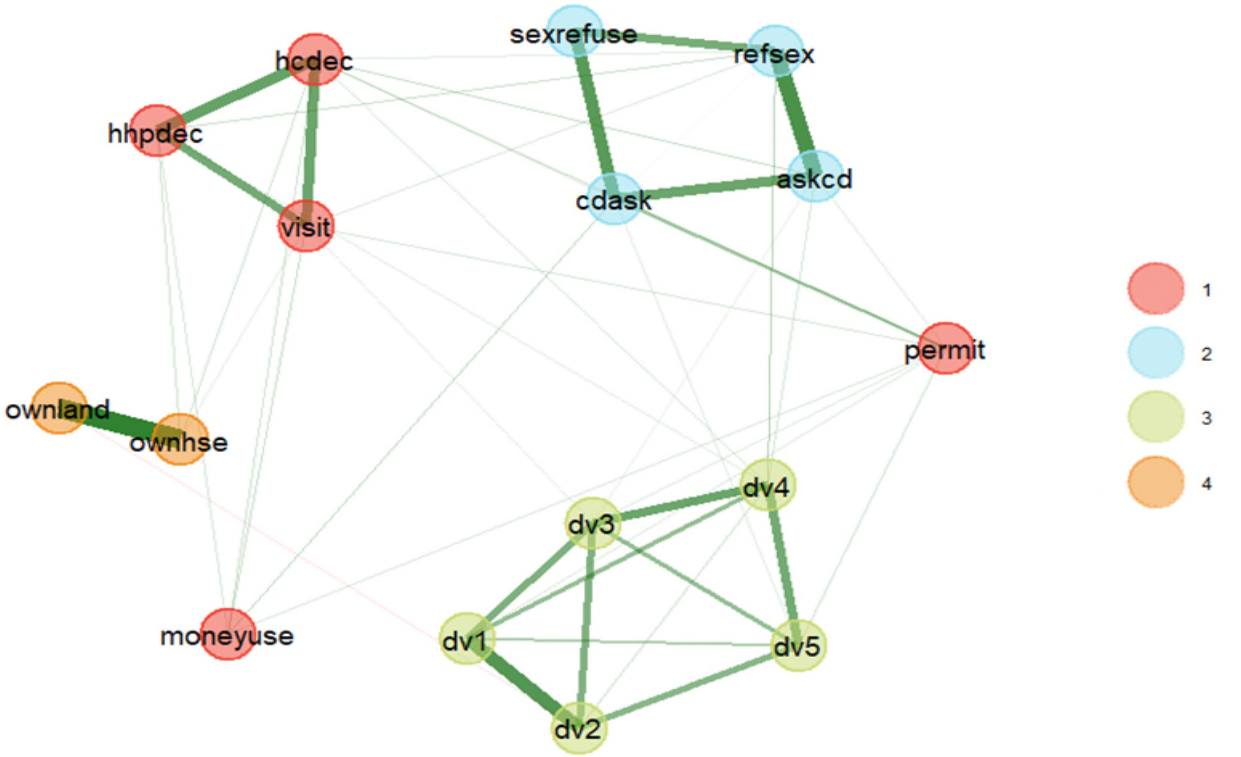
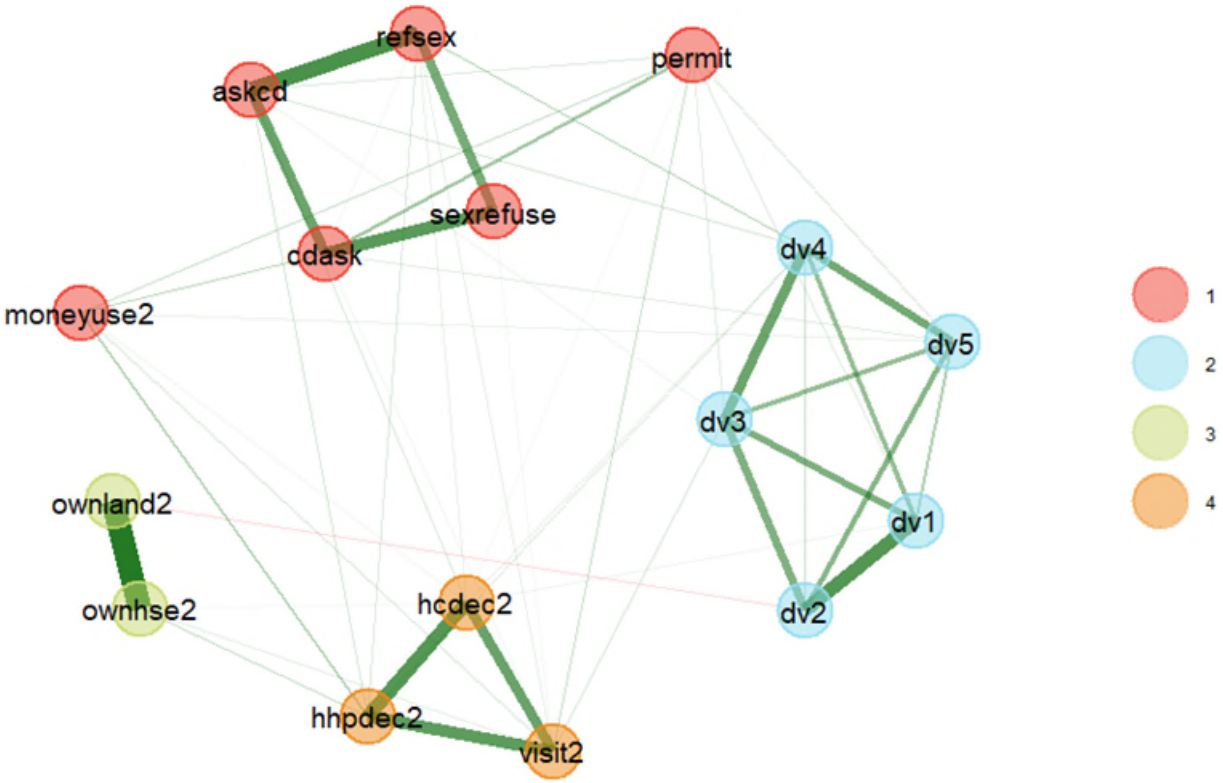


Figure 3.10: Network graph for the joint-empowerment index



visit = if woman requires permission to own parents or relatives
hhpdec = who decides large household purchases
hcdec = who decides on woman's own health
cdask = woman can ask husband/male partner to use condoms
refsex = woman can refuse to have sex with husband/male partner for no reason
askcd = woman can ask husband/male partner to use condoms if he has STI
sexrefuse = woman can refuse to have sex with husband/male partner if he has multiple women
dv1 = wife beating justified if wife goes out without telling husband
dv2 = wife beating justified if wife neglects children
dv3 = wife beating justified if wife argues with husband
dv4 = wife beating justified if wife refuses sex
dv5 = wife beating justified if wife burns food
ownse = if woman owns house
ownland = if woman owns land
permit = person who decides on how to use man's own earnings
moneyuse = person who decides on how to use woman' own earnings
****visit2, hhpdec2, hcdec2, ownland2, ownhse2 correspond to the joint empowerment index.*

3.3.4 Exploratory factor analysis

Table 3.4 shows the resulting assessment of these models for the two empowerment indices. The four-factor extraction model showed signs of over-extraction with the fourth factor having only two items (house and land ownership) loading saliently on it. The three-factor model was theoretically plausible; however, two items (house and land ownership) while loading significantly on one factor showed very low communalities (16% and 14% respectively) in both indices. Also, there was a clear break in the factor loadings and the Cronbach's alpha score of 0.64 suggested inadequate reliability. Furthermore, the overall three-factor model with the two items had inadequate internal consistency of 0.67. The internal consistency improved to 0.71 and 0.76 for the single factor and the overall three-factor model respectively when the two items were excluded from the factor model. The two-factor model had acceptable internal consistency for individual factors and the overall two-factor model for both indices, but the RMSR suggested a poor fit while showing signs of under-extraction with items related to household decision-making and reproductive health decision-making loaded on the second factor.

Table 3.4: Assessing the four-, three-, and two-factor models for the two empowerment indices

index		Model	Factor	RMSR	RMSEA	TLI	Cronbach's alpha	% Variance explained
1.	Woman-alone	4-Factors	Attitudes towards domestic violence	0.024	0.0995	0.885	0.87	26.0
			Reproductive health decision-making				0.73	15.9
			Household decision-making				0.74	11.6
			Asset ownership				0.73	9.3
			Overall				0.67	62.9
		3-Factors	Attitudes towards domestic violence	0.066	0.1375	0.781	0.87	26.4
			Reproductive health decision-making				0.73	16.5
			Household decision-making[1]				0.64 (0.74[1])	11.2
			Overall[2]				0.67 (0.76[2])	54.2
		2-Factors	Attitudes towards domestic violence	0.107	0.167	0.677	0.87	25.4
			Decision-making				0.71	19.0
			Overall				0.76	44.4
2.	Joint	4-Factors	Attitudes towards domestic violence	0.024	0.0991	0.899	0.87	25.9
			Reproductive health decision-making				0.73	16.0
			Household decision-making				0.82	15.1
			Asset ownership				0.77	10.3
			Overall				0.66	67.3
		3-Factors	Attitudes towards domestic violence	0.072	0.1538	0.757	0.87	26.8
			Reproductive health decision-making				0.73	16.1
			Household decision-making[1]				0.70 (0.77[1])	14.9
			Overall[2]				0.67 (0.77[2])	57.8
		2-Factors	Attitudes towards domestic violence	0.123	0.2057	0.565	0.87	26.0
			Decision-making				0.73	19.8
			Overall				0.77	45.8

[1]*Combined items for both household decision-making and asset ownership; brackets are excluding asset ownership (house and land ownership)*
[2]*Excluding asset ownership (house and land ownership)*

Therefore, a three-factor extraction model excluding house and land ownership items was adopted for both indices. The identified three-factor extraction had good psychometric

properties with an acceptable SRMR of 0.066 and 0.072 for the woman-alone index and the joint empowerment index respectively.

Table 3.5 below shows the EFA of the three-factor model together with the communalities for both indices. Five items related to women's attitudes towards domestic violence loaded saliently on the first factor with very high communalities and low uniqueness, three items related to reproductive health decision-making loaded saliently on the second factor with very high communalities and low uniqueness; and three items related to household decision-making loaded saliently on the third factor, again with very high communalities and low uniqueness.

Table 3.5: Factor analysis results for the woman-alone and joint empowerment indices with loadings and communalities

	Woman-alone					**Joint empowerment**				
Item	**F1**	**F2**	**F3**	**Com**	**Uniq**	**F1**	**F2**	**F3**	**Com**	**Uniq**
Child neglect	**0.997**	-0.166	-0.067	0.87	0.13	**0.984**	-0.153	-0.043	0.86	0.14
No information	**0.952**	-0.068	-0.021	0.85	0.15	**0.942**	-0.053	-0.008	0.85	0.15
Argues with husband	**0.946**	-0.033	-0.001	0.87	0.13	**0.936**	-0.017	-0.007	0.86	0.14
Burns food	**0.885**	-0.028	-0.030	0.76	0.24	**0.875**	-0.013	-0.026	0.75	0.25
Refuses sex	**0.871**	0.039	0.023	0.80	0.20	**0.861**	0.058	0.014	0.79	0.21
Ask use condom	-0.111	**0.874**	-0.085	0.65	0.35	-0.095	**0.859**	-0.068	0.64	0.36
Use condom if STI	-0.031	**0.811**	-0.014	0.63	0.37	-0.024	**0.817**	-0.012	0.64	0.36
Can refuse sex	-0.033	**0.807**	-0.004	0.63	0.37	-0.020	**0.814**	-0.021	0.64	0.36
No sex if other partners	-0.119	**0.803**	-0.009	0.53	0.47	-0.096	**0.785**	-0.080	0.53	0.47
Healthcare permission	0.118	0.248	0.065	0.12	0.88	0.119	0.238	0.088	0.12	0.88
Healthcare decisions	0.087	0.097	**0.703**	0.58	0.42	0.143	-0.033	**0.860**	0.77	0.23
House purchases	0.072	0.045	**0.701**	0.54	0.46	0.147	-0.036	**0.813**	0.69	0.31
Visiting parents	0.090	0.042	**0.674**	0.50	0.50	0.149	-0.030	**0.805**	0.69	0.31
House ownership	-0.074	-0.094	**0.422**	0.16	0.84	-0.130	-0.029	**0.399**	0.16	0.84
Land ownership	-0.110	-0.101	**0.375**	0.14	0.86	-0.169	-0.039	**0.365**	0.04	0.86
Using money	0.025	0.123	**0.162**	0.06	0.94	0.061	0.122	0.240	0.11	0.89

F1, F2, F3 – factors 1, 2 and 3
F1 relates to attitudes towards domestic violence
F2 relates to reproductive health decision-making
F3 relates to household decision-making
Com = communality
Uniq = uniqueness

The three-factor model adopted explained 54% and 57.8% of the total variance in women's empowerment in the woman-alone empowerment index and the joint empowerment index respectively (**Table 3.6** and **Table 3.7**). All the retained factors explained at least 10% of the total variance in women's empowerment in both indices. In both indices, attitudes towards domestic violence was the most dominant factor, explaining 26.4% and 26.8% of the total variance in women's empowerment in the woman-alone empowerment index and the joint empowerment index respectively. The second factor was reproductive health decision-making which explained 16.5% and 16.1% of the total variance in women's empowerment in the woman-alone empowerment index and the joint empowerment index respectively while household decision-making was the least factor, explaining just 11.2% and 14.9% of the total variance in women's empowerment in the woman-alone empowerment index and the joint empowerment index respectively.

Table 3.6: Factor analysis results showing eigenvalues, variance explained and factor correlation for rotated factors for the woman-alone empowerment index

Factor	Extracted sums of squared loadings					Correlations for rotated factors		
	Sum of squared loadings	Proportion of variance	Cumulative variance	Proportion explained	Cumulative proportion explained	1	2	3
1	4.232	0.264	0.264	0.488	0.488	1.000	0.446	0.136
2	2.646	0.165	0.430	0.305	0.793	0.446	1.000	0.328
3	1.797	0.112	0.542	0.207	1.000	0.136	0.328	1.000

Table 3.7: Factor analysis results showing eigenvalues, variance explained and factor correlation for rotated factors for the joint empowerment index

Factor	Extracted sums of squared loadings					Correlations for rotated factors		
	Sum of squared loadings	Proportion of variance	Cumulative variance	Proportion explained	Cumulative proportion explained	1	2	3
1	4.282	0.268	0.268	0.463	0.463	1.000	0.414	0.148
2	2.580	0.161	0.429	0.279	0.742	0.414	1.000	0.358
3	2.386	0.149	0.578	0.258	1.000	0.148	0.358	1.000

Factor 1= attitudes towards domestic violence
Factor 2 = reproductive health decision-making
Factor 3 = household decision-making

3.3.5 Confirmatory factor analysis

The CFA confirmed a three-factor model for each index. For the woman-alone empowerment index, the three factors retained were related to attitudes towards domestic violence, reproductive health decision-making and the woman-alone household decision-making. The three factors retained for the joint empowerment index were related to attitudes towards domestic violence, reproductive health decision-making and the joint household decision-making. The two factors, attitudes towards domestic violence and reproductive health decision-making were similar for both empowerment indices except for the household decision-making factor for which the woman-alone empowerment household decision-making was used to construct the woman-alone empowerment index while the joint household decision-making was used to construct the joint empowerment index. The details of the items for each retained factor including the scoring under each index are given in **Table 3.2**.

The overall fit of the three-factor model was good for both indices with both RMSEA and SRMR less than 0.05 and CFI and TLI both above 0.95. The RMSEA was 0.037 for the woman-alone empowerment index and 0.036 for the joint empowerment index while the CFI was 0.996 for the woman-alone empowerment index and 0.997 for the joint empowerment index. These values of the goodness of fit statistics suggested good fit. All the item loadings were adequate (>0.70) as shown in **Figure 3.11** and **Figure 3.12** for the woman-alone index and the joint empowerment index respectively demonstrating convergent of the construct. The factor covariances between the three retained factors were low (<0.35) suggesting that the instrument had high discriminant validity, that is, there is low correlation between the retained factors and thus each retained factor measures a distinct concept or construct. The factor covariance between household decision-making (HHDM) and reproductive health decision-making (RHDM) was 0.34, that between RHDM and attitudes towards domestic violence was 0.32 and that between domestic violence and household decision-making was 0.22.

Figure 3.11: Final CFA model for the woman-alone empowerment index

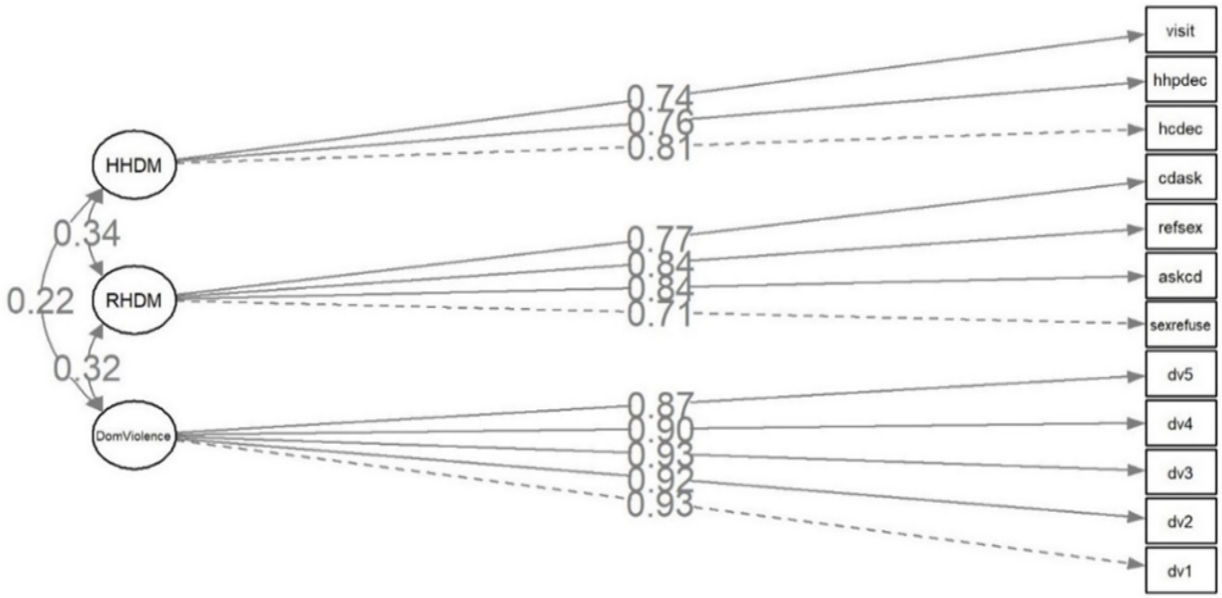
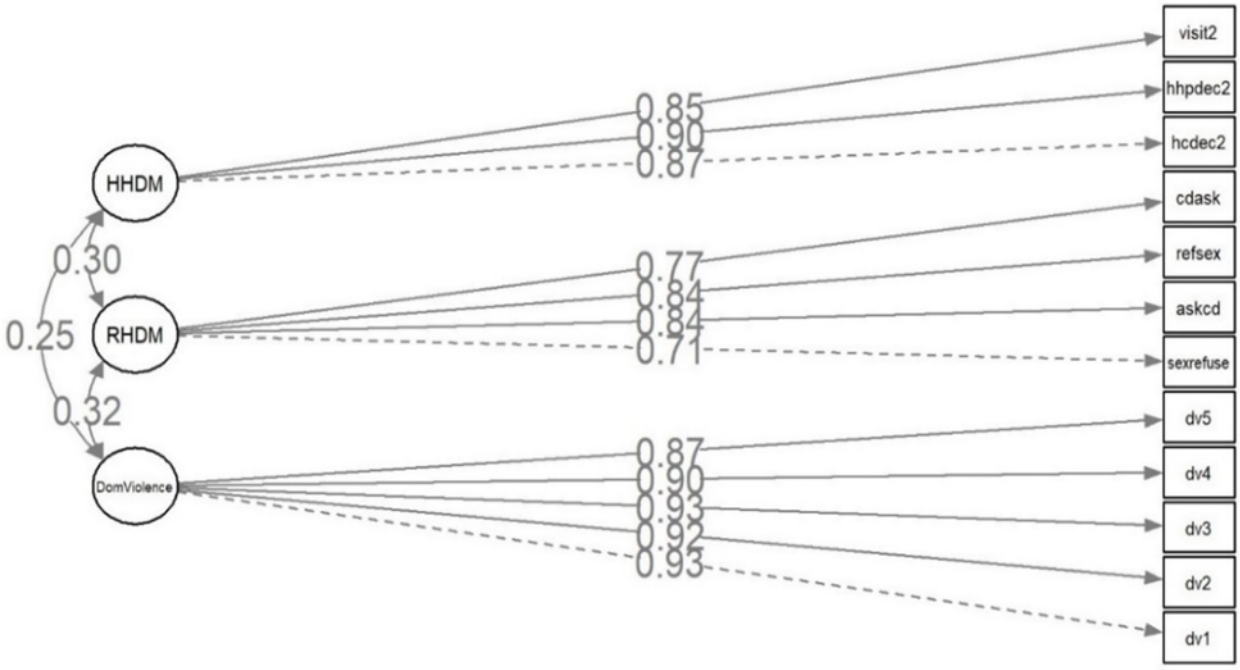


Figure 3.12: Final CFA model for the joint empowerment index



HHDM = household decision-making
RHDM = reproductive health decision-making
DomViolence = attitudes towards domestic violence
visit = if woman requires permission to own parents or relatives
hhpdec = who decides large household purchases
hcdec = who decides on woman's own health
cdask = woman can ask husband/male partner to use condoms
refsex = woman can refuse to have sex with husband/male partner for no reason

askcd = woman can ask husband/male partner to use condoms if he has STI
sexrefuse = woman can refuse sex with husband/male partner if he has multiple women
dv1 = wife beating justified if wife goes out without telling husband
dv2 = wife beating justified if wife neglects children
dv3 = wife beating justified if wife argues with husband
dv4 = wife beating justified if wife refuses sex
dv5 = wife beating justified if wife burns food
****visit2, hhpdec2, hcdec2 correspond to the joint empowerment index*

For country-specific indices as shown in **Table 3.8,** the fit of the model was moderate to good in all countries with all CFI and TLI above 0.95 and RMSEA less than 0.08 for both indices.

Table 3.8: Results for a 3-factor confirmatory factor analysis for each country model fitted separately

Country	X^2	Woman-alone empowerment index				Joint empowerment index			
	p-value	RMSEA	CFI	TLI	SRMR	RMSEA	CFI	TLWE	SRMR
Albania	<0.001	0.055	0.983	0.978	0.070	0.058	0.986	0.982	0.074
Armenia	<0.001	0.048	0.989	0.986	0.085	0.050	0.988	0.984	0.092
Benin	<0.001	0.059	0.991	0.988	0.074	0.042	0.996	0.994	0.061
Burundi	<0.001	0.033	0.995	0.993	0.041	0.032	0.995	0.994	0.041
Cambodia	<0.001	0.042	0.988	0.985	0.067	0.040	0.989	0.986	0.065
Cameroon	<0.001	0.070	0.987	0.983	0.079	0.069	0.991	0.988	0.081
Chad	<0.001	0.034	0.996	0.995	0.048	0.034	0.996	0.995	0.049
Ethiopia	<0.001	0.045	0.994	0.993	0.054	0.044	0.995	0.994	0.053
Gambia	<0.001	0.048	0.989	0.986	0.062	0.051	0.989	0.985	0.067
Ghana	<0.001	0.033	0.995	0.993	0.051	0.027	0.997	0.997	0.046
Guatemala	<0.001	0.018	0.996	0.995	0.034	0.015	0.997	0.997	0.032
Guinea	<0.001	0.043	0.995	0.993	0.054	0.044	0.995	0.993	0.055
Haiti	<0.001	0.020	0.997	0.996	0.049	0.019	0.998	0.997	0.050
Kenya	<0.001	0.032	0.993	0.990	0.045	0.032	0.994	0.992	0.045
Lesotho	<0.001	0.022	0.995	0.993	0.048	0.020	0.996	0.995	0.047
Liberia	<0.001	0.046	0.990	0.987	0.070	0.044	0.993	0.990	0.069
Malawi	<0.001	0.019	0.997	0.996	0.029	0.020	0.997	0.997	0.030
Mali	<0.001	0.039	0.992	0.990	0.051	0.040	0.994	0.992	0.051
Myanmar	<0.001	0.038	0.979	0.973	0.055	0.038	0.983	0.979	0.054
Nepal	<0.001	0.032	0.990	0.988	0.066	0.033	0.989	0.986	0.066
Nigeria	<0.001	0.071	0.996	0.994	0.088	0.069	0.996	0.995	0.088
Pakistan	<0.001	0.037	0.998	0.998	0.032	0.038	0.998	0.998	0.034
PNG	<0.001	0.054	0.986	0.982	0.061	0.053	0.989	0.986	0.061
Philippines	<0.001	0.026	0.988	0.984	0.048	0.026	0.990	0.987	0.048
Rwanda	<0.001	0.025	0.996	0.995	0.054	0.023	0.997	0.996	0.052
Sierra-Leone	<0.001	0.052	0.994	0.993	0.063	0.049	0.996	0.995	0.060
Timor-Leste	<0.001	0.053	0.991	0.988	0.071	0.050	0.993	0.990	0.067
Uganda	<0.001	0.032	0.992	0.990	0.047	0.026	0.996	0.994	0.041
Zambia	<0.001	0.028	0.998	0.998	0.036	0.030	0.998	0.998	0.038
Zimbabwe	<0.001	0.027	0.989	0.986	0.046	0.023	0.994	0.992	0.043
Overall	<0.001	0.037	0.996	0.994	0.042	0.036	0.997	0.996	0.040

X^2=chi-square test
RMSEA=root mean square of approximation
CFI=comparative fit index
TLI=Tucker-Lewis Index
SRMR=standardised mean residual square
PNG=Papua New Guinea

3.3.6 Measurement Invariance: multigroup analysis

In both indices, the tests for measurement invariance showed that strong invariance model was not worse than the weak invariance model. The absolute difference in CFI between configural and weak models was 0.004 in both indices while that between weak and strong models was 0.009 and 0.008 in index-1 and 2, respectively. In all the models, the RMSEA was less than 0.08 and the CFI and TLI were both above 0.95. **Table 3.9** shows the results of measurement invariance for the two empowerment indices.

Table 3.9: Test of measurement invariance for the woman-alone index and joint empowerment index

Empowerment index	Model	X^2 p-value	RMSEA	CFI	TLI	SRMR	Diff
Woman-alone	Baseline		0.042	0.996	0.994	0.042	
	Configural	<0.001	0.047	0.989	0.986	0.056	1530
	Weak	<0.001	0.052	0.985	0.983	0.063	1791
	Weak vs Configural		0.005	-0.004	-0.003	0.008	261
	Strong	<0.001	0.066	0.975	0.973	0.060	1791
	Strong vs weak		0.014	-0.009	-0.01	-0.003	0
Joint	Baseline		0.036	0.997	0.992	0.040	NA
	Configural	<0.001	0.047	0.991	0.988	0.055	1530
	Weak	<0.001	0.051	0.987	0.985	0.063	1791
	Weak vs Configural		0.004	-0.004	-0.002	0.007	261
	Strong	<0.001	0.065	0.978	0.976	0.060	1791
	Strong vs weak		0.014	-0.008	-0.009	-0.003	0

X^2=chi-square test
RMSEA=root mean square of approximation
CFI=comparative fit index
TLI=Tucker-Lewis Index
SRMR=standardised mean residual square
Diff=degrees of freedom

3.4 Discussion

The analyses identified three domains which describe women's empowerment namely: women's attitudes towards domestic violence; reproductive health decision-making; and household decision-making. Measurement invariance showed that there were no systematic differences in the interpretations of items and that the means of latent variables can be meaningfully compared across different groups[192, 193, 197]. The three latent constructs/ domains explained 54% and 58% of the variance in women's empowerment for the woman-alone empowerment index and the joint empowerment index respectively in the 30 LMICs. The retained factors had discriminant validity with low factor covariances (<0.35) between the retained factors. The items retained for each individual factor showed convergent validity with the factor loadings for all items being above 0.70, which is higher than the recommended minimum of 0.50[206, 224]. The indices, together with the constituent domains or factors also showed good reliability.

The two indices generated suggest two different ways in which women's empowerment may be achieved and/or exercised[29]. The woman-alone empowerment index gives greater agency to the woman and may thus reflect true women's empowerment[28]. However, the systematic review in Chapter 2 showed that a woman may take sole decisions without informing her male partner/husband out of fear of his perceived reaction to a woman's decision. In other cases, the more empowered women were more likely to discuss and agree with their male partners/husbands on major decisions related to abortion. However, it is also possible that joint women's empowerment does not necessarily mean that both the woman and her male partner/husband participate equally in the decision-making process. The two indices reflect the varying degrees to which gender norms and power dynamics influence women's empowerment in some contexts[28, 86].

These domains are consistent with findings from other studies that have utilised the DHS in LMICs to measure women's empowerment[162, 173, 174]. Attitudes towards domestic violence is a consistent theme in almost all the domains identified during the generation of measures women's empowerment[162, 173, 174]. It was the most dominant domain in this analysis, explaining 26.4% and 26.8% of the total variance in women's empowerment in the woman-alone empowerment index and the joint empowerment index respectively. Negative attitudes towards domestic violence, i.e., justification of domestic violence is disempowering and reflects societal gender power imbalances[225].The process of empowerment begins at the personal level in which the woman sees herself and perceives her role in society and acts against what is relevant to her including changing perceptions towards domestic violence and/or intimate partner violence[226]. Domestic violence is prevalent in LMICs, ranging from 15% to 71%[227] and is inherently linked to low status of women in these contexts[225, 228, 229]. However, other forms of gender-based violence such as intimate partner violence (IPV) which encompasses physical, psychological and sexual violence are also prevalent in LMICs. In LMICs, IPV ranges from 5 – 40% although the actual figures could be higher, with one study showing that only about 2.5 – 15% of IPV cases are reported due to stigma and risk of further IPV from reporting it[230]. Domestic violence has been shown to be associated with women's poor mental and psychological wellbeing[231–233] and poor uptake of reproductive, maternal, newborn and child health services including low levels of antenatal care attendance, poor pregnancy outcomes including preterm birth and low-birthweight babies, and low levels of postnatal care utilisation[234, 235] whereas improved women's status such as freedom from violence has been associated with improvements in child health indicators including nutrition[236].

The second domain identified was related to women's reproductive health decision-making (RHDM) which included items concerning a woman's participation in sex negotiations with her husband or male partner. In the context of LMICs where there is low

contraceptive prevalence and high unmet need for modern contraception[237–239], high unsafe abortion rates[135, 240], higher unwanted pregnancies[14, 15, 241], low skilled birth attendance[242–244], and high prevalence of HIV/AIDS[245, 246], it is imperative that women have control over their reproductive health and are free from coercion and forced sex. This domain underscores the important role of greater communication and mutual respect between spouses with respect to initiating and negotiating sex as well as other reproductive health outcomes. Moreover, there is evidence that increased women's involvement in their reproductive health decision-making leads to greater control over their sexual and reproductive health choices including pregnancy termination, modern contraceptive use and timing of pregnancy[247]. Surprisingly, other studies measuring women's empowerment did not include items related to RHDM despite using DHS data[157, 162, 171, 173, 174].

The third and final domain was household decision-making (HHDM) that included items related to who makes decisions in the household regarding the woman's health, large household purchases and visiting woman's own parents or relatives. This was one of the key domains in indices developed by Phan[171], Ewerling *et al.*[162], and Miedema *et al.*[174]. However, Asaolu *et al*.[173] did not identify it as one of the domains of women's empowerment despite including the items related to the domain in their analysis. Their failure to include it in the final model could be attributed to the injudicious use of the modification indices in their analysis in which items with lower EFA loadings were removed from the model whenever the covariance was >100[173]. It is known that overzealous use of modification indices may lead to removal of important items in the index and capitalisation by chance when modification indices are used to improve model fit[248–250]. Acock recommends that two conditions should be met before changing the model when using modification indices: the modification index is substantial and there is theoretical justification for changing parameters in the model[248]. In the analysis

reported here, modification indices were not used to alter parameter terms as it was not necessary based on model fit statistics.

3.4.1 Study strengths and limitations

This work builds on other studies of women's empowerment measurement indices in LMICs. In particular, in this study, a multinational dataset from Sub-Saharan Africa, Eastern Europe, Asia, Oceania and the Americas was used to generate and validate a women's empowerment index. Furthermore, in addition to using both exploratory and confirmatory factor analyses, measurement invariance was conducted to minimise measurement bias thus ensuring the indices are comparable across different countries. Finally, the study is novel in that it generated and validated two indices. The second index gives more importance to the couples' joint decision-making and could be useful in assessing couple's joint decision-making and its association with different sexual and reproductive health outcomes in LMICs. The study focused solely on reflective or effective indicators and avoided formative indicators as such indicators tend to produce very biased results[182]. Therefore, the study did not include items such as labour force participation and education level or differences which are more likely to be determinants of empowerment rather than effects of empowerment. Also, some items included in other studies such as age difference and education difference between woman and her male partner were not included in this study. Assumptions could not be made that a woman older than a man was more empowered or that a 10-age gap between couples imply empowerment or disempowerment. For example, suggesting that a 49-year-old woman married to a 59-year-old man is less empowered than a 16-year-old girl married to a 15-year-old boy did not make theoretical sense.

Despite the strengths, this study had a number of limitations. First, while the data were accessed data from 85 countries, it was only possible to obtain complete cases from 30 countries and thus only 273, 238 women were included in the final analysis. Whilst it

seems unlikely that this affected the validity of the results, the inability to include two-thirds of the countries potentially limits the generalisability to only the 30 countries. Measurement of women's empowerment using commonly available DHS tools could be improved if the DHS questionnaires are standardised, and all questions related to women's empowerment are asked in all countries where the DHS programme runs. Second, this analysis was limited to only the questions that are widely available in the DHS. Thus, other sociocultural indicators of women's empowerment such as political participation, participation in savings groups, or meetings in the household and society that are not captured in the DHS could not be analysed which may explain why the extracted domains explained only 54% and 58% variance in women's empowerment for the woman-alone and the joint empowerment index respectively. Finally, the indices generated here are limited to women who are married or cohabiting and cannot be generalised to other categories of women such as adolescents, the unmarried, the divorced, the separated, or the widowed.

3.4.2 Public Health Implications and Conclusion

This is the first study to generate and validate two women's empowerment indices that can be used across 30 LMICs. The tools can be used for studying women's empowerment and its association with health outcomes and healthcare utilisation such as pregnancy termination and use of modern contraceptives. The joint empowerment which gives more weight to joint decision making is a starting point for gaining insights into male partners' role in women's sexual and reproductive health outcomes which are highly likely to be influenced by gender and empowerment.

Chapter 4: : INVESTIGATING THE ASSOCIATION BETWEEN WOMEN'S EMPOWERMENT AND MODERN CONTRACEPTIVE USE IN LOW- AND MIDDLE-INCOME COUNTRIES

4.1 Introduction

The sustainable development goal (SDG) target 3.7 aims to achieve "universal access to sexual and reproductive health-care services, including for family planning"[149]. Contraception "enables people to make informed choices about their sexual and reproductive health"[251]. To achieve this, the World Health Organization (WHO) promotes availability of and access to "effective" and preferred modern contraceptives[251].

Family planning is a recognised cost-effective investment that confers enabling benefits to countries, communities, families, and women such as economic development, maternal and child health, education, and women's empowerment[251–255]. It promotes and enhances human rights, gender equality; improves maternal, new-born, child and adolescent health; and shapes environmental and political futures of countries[252]. The Global Investment Framework for Women's and Children's Health modelling data from 74 high burden countries estimates that greater access to effective family planning led to the greatest reductions in maternal (53%) and child deaths (47%) compared to other investment packages such as HIV/AIDS, malaria, or immunisation[255]. It has been estimated that access to modern contraceptives could prevent 79 million unplanned births, 256 million abortions, 100 million unsafe abortions, 39 million miscarriages, and 2 million stillbirths per year[254]. Male and female condoms also protect against sexually transmitted infections (STIs) such as HIV[251], and mother-to-child transmission of HIV could be reduced annually by 93% by meeting women's needs for access to use of condoms and HIV treatment[256].

However, despite these well documented advantages of family planning, the prevalence of modern contraceptive use is still low in LMICs with high unmet contraceptive needs[257]. In 2019, of the 163 million women with unmet need for contraception, 29.3% were in sub-Saharan Africa and 27.2% were in south Asia[257]. In 2019, an estimated 49% of the 228 million pregnancies in LMICs were unintended, with about 77% of these occurring among women with unmet need for modern contraceptives[254].

The factors affecting access to, and uptake of modern contraceptives in LMICs are multifactorial, complex and include several sexual and reproductive health, demographic, social, and economic factors[247, 258–266]. One such important factor is the effect of women's empowerment on modern contraceptive use among women who are married or cohabiting[1]. Several studies exploring multiple aspects of women's empowerment in LMICs have reported mixed findings showing positive[141, 261, 266–274], negative[270, 275, 276], no[268, 275, 277, 278] or inconsistent[150, 268, 279] evidence of the relationship between women's empowerment and modern contraceptive use. However, some of these findings may be attributed to use of unvalidated measures of women's empowerment. For example, Yaya *et al*. (2018) showed that women with a higher empowerment score had 23% increased odds of using modern contraceptives compared with women with low empowerment score[261]. However, they used an unvalidated tool to measure women's empowerment which included employment status, attitudes towards domestic violence, household decision-making and knowledge level[261]. Some studies have defined women's empowerment using single variables or items to try to represent this multidimensional construct[279] and others have focused on single domains of women's empowerment. For example, Macquarrie and Aziz (2022) used household and contraceptive decision-making to measure women's empowerment[268].

These studies have largely focused on single or select few LMICs. Studies that combined multiple country datasets showed inconsistent findings for the association between

women's empowerment and modern contraceptive use[141, 261]. These studies also employed different analytical techniques and women's empowerment definitions. For example, Yaya *et al.* (2018) used pooled data from 32 sub-Saharan African countries and did not give country-specific effect sizes[261]. Ahmed *et al.* (2010) on the other hand obtained country-specific estimates and used meta-analysis to calculate the overall or pooled estimate[141] but they too relied on a single and unvalidated dimension of women's empowerment related to women's autonomy in decision-making about their own health care, large household purchases, daily household needs purchases, visits to their family or relatives and daily meal preparation[141]. Two of these variables – daily household needs purchases and daily meal preparations – have since been dropped from the DHS questionnaire[198, 280].

The lack of a validated and reproducible tool to measure women's empowerment, with easily accessible information about variables, means that most studies used unvalidated and inconsistent tools. This probably explains in part the variability in the association between women's empowerment and modern contraceptive use among the different studies[279]. There is thus a need to use a validated tool to explore the relationship between women's empowerment and modern contraceptive use in LMICs.

4.1.1 Aim

The aim of this study was to investigate the relationship between women's empowerment and modern contraceptive use using a validated tool for measuring women's empowerment. It was hypothesised that women's empowerment would be associated with higher use of modern contraceptives among married or cohabiting women in LMICs.

4.2 Methods

4.2.1 Study Population

The study population was restricted to non-pregnant married or cohabiting women aged 15-49 in 30 countries used to generate the empowerment indices (Chapter 3) using the DHS datasets. The methodological details including the study design, inclusion and exclusion criteria and the generation and validation of the empowerment indices and their domains including the dataset are described in Chapter 3.

4.2.2 Primary exposures

The primary exposure was women's empowerment measured using two indices: woman-alone and joint decision-making indices with four domains (three domains for each index): women's attitudes towards domestic violence, reproductive health decision-making, and woman-alone household decision-making and joint household decision-making. The details of the generation and validation of the indices and the domains are described in Chapter 3 while the details of the questions asked for the items under each domain are given in **Table 3.2**. The scores of the empowerment indices and their domains were generated by summing up the factor scores of the items under each index and domain[249].

Women's attitude towards domestic violence, one of the domains of women's empowerment generated in **Chapter 3.3.5**, was analysed as a binary variable into whether domestic violence was justified or unjustified. Women who responded "yes" to any of the five questions were classed into the "justified" category while only those who responded "no" to all the questions were classed into the unjustified category. Women in the "unjustified" category were considered more empowered than those in the "justified" category. The domain reproductive health decision-making was dichotomised into "consent not required" and "consent required". Women who responded "yes" to all the four

questions about women's participation in reproductive health decision-making were classed into the "consent required" category while those who responded "no" to any of the questions were classed into the "consent not required" category. Women in the "consent required" category were considered more empowered than women in the "consent not required" category. For the household decision-making domains, they were dichotomised into "high empowerment" and "low empowerment" based on the median scores. Factor scores were used in the analysis[281].

4.2.3 Outcome

The outcome was modern contraceptive use among married or cohabiting and non-pregnant women. The DHS dataset categorises contraceptive use into no method, modern, traditional and/or folkloric methods[198]. Modern contraceptive use provides a more direct measure for the proportion of women actively using the most effective, modern contraceptive methods and thus provides a clearer picture of the prevalence of the different contraceptive methods used by women[51, 282]. It also captures women's and (their male partners') preferences and intentions around family planning unlike unmet need for family planning which does not include questions about whether women (and/or their male partners) want or intend to use contraception[283]. In fact, due to the inability of the unmet need for family planning to capture women's (and their male partners') intentions and preferences, there are growing calls to drop it as a measure of women's fertility preferences[283]. For example, the FP2020 Performance, Monitoring and Evidence Working Group recommends dropping using "need"-based measures such as unmet need and demand met in measuring women's (and their male partners') intentions and preferences about fertility[283]. Finally, because family planning is provided in every country globally, this metric can aid in monitoring the performance of the Family Planning 2020 (FP2020) effort and the "120 by 20" objective of increasing the number of women and teenage girls using modern contraception in the world's poorest nations by 120 million by the year 2020[282, 284].

The modern methods are as described by the WHO and used by the DHS[198, 285] are listed in **Box 4.1** below.

Box 4.1: List of WHO approved modern contraceptive methods

- female sterilization (tubal ligation, laparectomy, voluntary surgical contraception for women)
- male sterilization (vasectomy, voluntary surgical contraception for men)
- the contraceptive pill (oral contraceptives)
- intrauterine contraceptive device (IUD)
- injectables (Depo-Provera), implants (Norplant)
- female condom
- male condom (prophylactic, rubber)
- diaphragm
- contraceptive foam and contraceptive jelly
- lactational amenorrhea method (LAM)
- standard days method (SDM)
- and country-specific modern methods and respondent-mentioned other modern contraceptive methods (including cervical cap, contraceptive sponge, and others), but does NOT include abortions and menstrual regulation.

Traditional and folkloric methods are listed in box 4.2.

Box 4.2: List of WHO approved traditional and folkloric contraceptive methods

- periodic abstinence (rhythm, calendar method)
- withdrawal (coitus interruptus)
- country-specific traditional methods of proven effectiveness, folk methods (locally described methods and spiritual methods of unproven effectiveness, such as herbs, amulets, gris-gris, etc.).

The variable ‘modern contraceptive use’ was analysed as a binary variable coded as ‘yes’ and ‘no’, where ‘no’ included non-use and traditional and/or folkloric methods.

4.2.4 Potential confounders, mediators, and moderators

Potential confounders, mediators and moderators were selected from the existing literature[247, 258–266, 286, 287], their availability in the dataset and theoretical relevance. A variable was considered a potential confounder if existing evidence suggested that it was associated with both the outcomes and the exposure but was not on the causal pathway. On the other hand, if a variable was on the causal pathway between the exposure and the outcome, it was considered a mediator. A variable was considered a moderator if the effect of the exposure on the outcomes varied by that particular variable.

Individual-level confounders included sociodemographic, economic/employment, healthcare system, and reproductive health factors as shown in boxes **4.3 – 4.6.**

Box 4.3: Sociodemographic confounders

- Woman's age: analysed as categorical with five-age group categories.
- Woman's place of residence: analysed as a binary variable either urban or rural.
- Woman's education level: analysed as four categories: no education, primary, secondary, and higher.
- Type of marriage: analysed as a binary variable: either monogamy or polygamy.
- Living together: analysed as a binary variable: whether partner stays together with the woman or living elsewhere.
- Male partner's age: analysed as a continuous variable.
- Male partner's education level: defined as the current or most recent husband's or male partner's (in case of polygamy) highest level of education. This was analysed as a categorical variable: no education, primary, secondary, or higher.
- Household's socioeconomic status: this was measured using the wealth index for each household in the DHS data and analysed as a categorical variable as five quintiles.
- Spousal differences in education. This was obtained by subtracting male partner's education level from the woman's education level and analysed as a categorical variable: woman less educated than male partner or husband, couple has same education level, and woman is more educated than husband or male partner.

Box 4.4: Economic/employment confounders

- Employment in the last 12 months: defined as woman's employment history over the last 12 months and was analysed as a categorical variable: not working, worked in the past year, and currently working.
- Earnings: defined as the type of earnings from woman's work and was analysed as a categorical variable: not working, in-kind only, cash and in-kind, and cash only.
- Seasonality: enquired whether the woman was employed all year or seasonally and was categorised into not working, seasonally or occasionally, and all year.
- Differences in earnings: enquired whether woman earned more than the male partner or husband and was categorised into not working, husband or male partner has no income, less than him, about same, more than him.

Box 4.5: Healthcare confounders

- Access to mass media for healthcare information: This is a composite score obtained from the following three questions: frequency of reading newspaper or magazine; frequency of listening to radio; frequency of watching television. The composite score ranged from 0 (no access at all to any media type) to 6 (access at least once a week to all the media types). It was analysed as an ordinal variable.
- Access to health care services: This is a composite score generated from four questions about getting medical help for self: getting money needed for treatment; distance to health facility; not wanting to go alone. The composite score ranged from four (answered as 'big problem' to all the four questions) to eight ('not a big problem' to all the four questions). It was analysed as an ordinal variable.
- Exposure to family planning (FP) messages: This was a composite score generated from three questions: heard about FP on the radio in the last few months; heard about FP on the TV in the last few months; and heard about FP from a newspaper or magazine in the last few months. The composite score ranged from 0 (never heard at all) to 3 (heard from all three). It was analysed as an ordinal variable.
- Informed consent about contraception: This was a composite variable generated from the following three questions: told about side effects or problems the

respondent might have when she first obtained the contraceptive method that she is currently using; told how to deal with side effects; and told about the availability of other FP methods other than the one she is using. The composite score ranged from 0 (never told at all) to 3 (told about all three). It was analysed as an ordinal variable.

Box 4.6: Reproductive health-related confounders

- Age at first marriage: This was analysed as a continuous variable for women.
- Age at first birth: This was analysed as a continuous variable for women. Knowledge of the fertile period: This was derived from the question “when during her monthly cycle the respondent (woman) thinks a woman has the greatest chance of becoming pregnant”. It was analysed as binary variable as either ‘does not know’ or ‘knows’.
- Fertility preference: “This variable records the original response to the question "How long would you like to wait from now before the birth of another child?" Women who respond that they want another child, but when asked when they would like the next child, responded that they cannot get pregnant, were classified in the "declared infecund category", and not in the "wants another child" category”[280]. It was analysed as a categorical variable: no more children, undecided, and yes (wanted more children).

Country-level variables listed in **Box 4.7** were considered potential moderators and used to investigate the sources of heterogeneity in the pooled estimates.

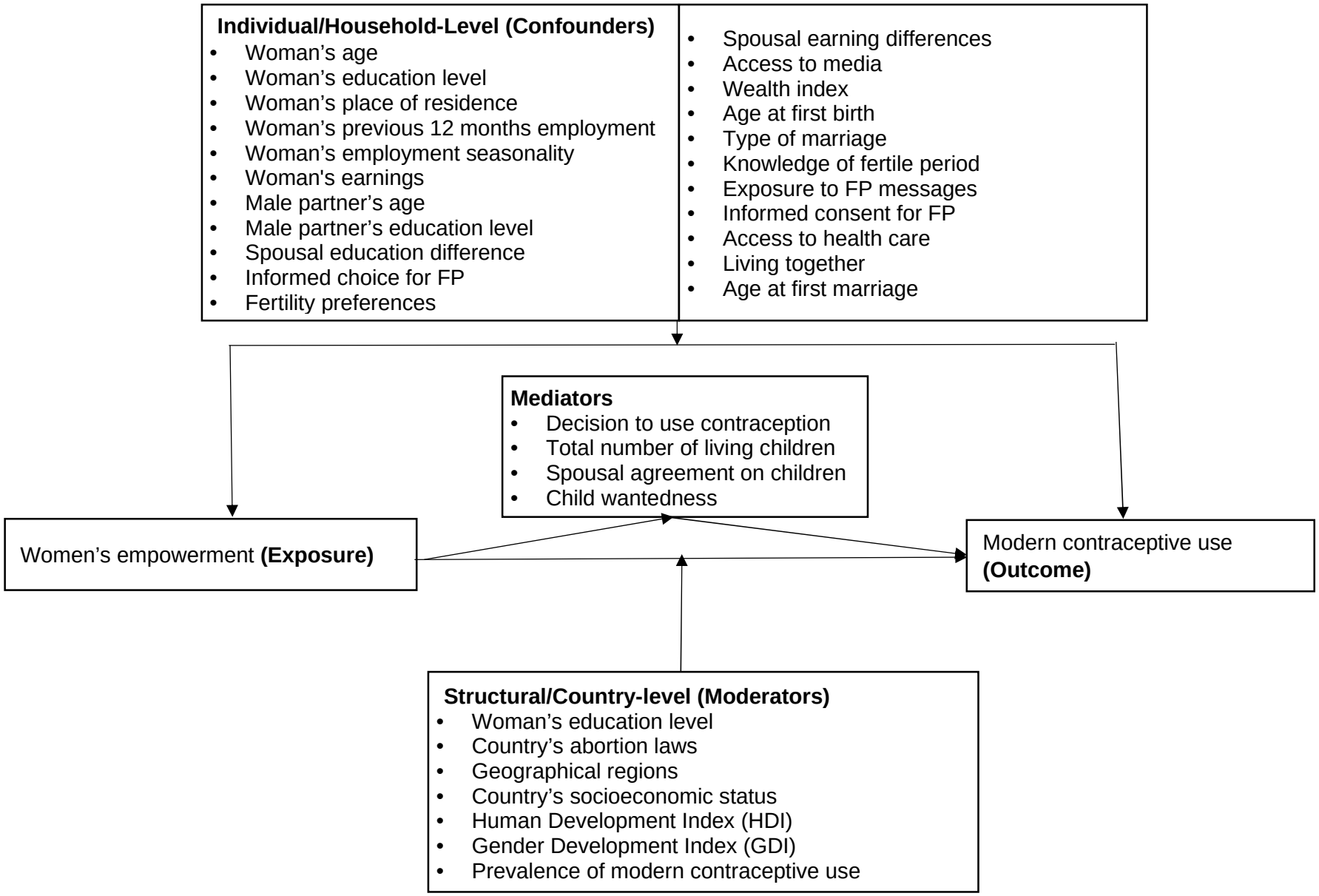
Box 4.7: Country-level variables

- Country's abortion law: analysed as three categories: Very Restrictive (prohibited altogether or to save woman's life), Moderately Restrictive (to preserve health), and Broadly Liberal (broad socioeconomic grounds and on request).
- Geographical regions: analysed as categorical variable: Sub-Saharan Africa, Asia, and "rest of LMICs".
- Country's socioeconomic status: Analysed as a binary variable: low-income countries and middle-income countries based on the World Bank Economic grouping.
- Human Development Index (HDI): The World Bank defines HDI as "a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living"[288]. HDI was analysed as a categorical variable following the United Nations Development Programme (UNDP) classification into low human development (HDI <0.550), medium human development (HDI 0.550 – 0.699), high human development (HDI 0.700 – 0.799) and very high human development (HDI 0.800 and greater)[288].
- Gender Development Index (GDI): GDI measures gender inequalities in the three basic dimensions of human development: health, education, and command over economic resources, comparing males and females. Higher GDI scores reflect gender parity"[288–290]. GDI was analysed as a categorical variable from a modified UNDP classification into three groups based on absolute deviation from gender parity in HDI values: Group 1: high equality (absolute deviation of 2.5% or less), Group 2: medium equality (absolute deviation of 2.5 – 10%) and Group 3: low equality (absolute deviation of more than 10%)[288].
- Modern contraceptive use prevalence: dichotomised into low and high prevalence using the mean score of modern contraceptive use in the 30 countries as the cut-off. The mean prevalence was 35%, therefore countries below 17.5% were considered low prevalence and those 17.5% and above considered high prevalence.

The details of the definitions and coding of these variables are given in **Appendix C.1 – C.2.** The details of the geographical regions are given in **Appendix C3.**

The above potential confounders, moderators, and mediators are represented diagrammatically using a Directed Acyclic Graph (DAG) in **Figure 4.1** together with the primary exposure and the outcome.

Figure 4.1 Directed acyclic graph for the evaluation of women's empowerment index and modern contraceptive use



4.2.5 Statistical analysis

4.2.5.1 Data cleaning

All the variables postulated as moderators and confounders were checked for availability and distribution in the dataset for each individual country. Due to the cross-sectional nature of the data and the associated risk of reverse causality, mediation analysis was not conducted and therefore all postulated mediators were not used in the analysis. All values were checked for implausible responses such as extreme ages at first birth and unexpected or unreasonable responses were dropped.

4.2.5.2 Descriptive statistics

Checks for normality of continuous variables were undertaken. A weighted sample size based on sampling for each included country was generated and the weighted prevalence of modern contraceptive use in each country was estimated. Frequencies and percentages of categorical variables, means and standard deviations, medians and interquartile ranges for continuous variables were generated. Statistical analysis accounted for clustering, stratification and the weighting used in the DHS survey design. The weights applied were based on the DHS sample for each country.

4.2.5.3 Univariable analysis

Quintiles were generated for the two indices and the highest and lowest quintiles of empowerment were compared, the lowest being the baseline[162]. The middle quintiles 2-4 were not used in the analysis. However, in five countries, namely; Albania, Armenia, Guatemala, the Philippines and Rwanda, the highest quintile was the 4th which was compared with the lowest and quintiles 2-3 were not used.

Categorisation of continuous data [162][291–294][292, 293][294][292, 293]makes interpretability easier and is particularly useful when there are non-linear patterns in the data[295]. The dataset used in this analysis was large which helped to minimise the loss of power, even though 60% of the data were not used in the final analysis[291].

Country-specific associations between each exposure (i) woman-alone and (ii) joint decision-making indices and the outcome modern contraceptive use were investigated for each of the 30 countries using univariable logistic regression analysis with odds ratios then pooled to generate the overall crude associations for the 30 countries combined.

4.2.5.4 Multivariable analysis

The presence of multicollinearity between the confounders variables as well as the primary exposure was examined using the variance inflation factor (VIF) and all variables with low tolerance (i.e., 1/VIF <0.1) were excluded from the multivariable analysis. Such variables are likely to be linear combinations of some other exposure variables[296] which if included in the model would cause inflated regression variance, unstable parameter estimates, and inflated standard errors leading to biased model inferences[297]. A correlation matrix of the confounder variables was used as an adjunct to assess correlation.

The two-step meta-analytical approach proposed by Liefbroer *et al.*[298] and used by Ahmed *et al.*[141] was adopted for multivariable analysis using a causal modelling approach in which all potential confounders, as defined in the DAG, and not found to be highly correlated, together with the primary exposure were included in the multivariable logistic regression modelling[299]. In the first step, separate logit regression models were fitted for each of the 30 countries[298]. A logit regression coefficient was obtained for each of the associations between the outcome and the two empowerment indices and their domains adjusting for all potential confounders[298].

Model specification was assessed using the linear predicted value and the linear predicted value squared. The model was considered correctly specified if the linear predicted value was statistically significant (as defined by p-value <0.05) and the linear predicted value squared was statistically nonsignificant (as defined by p-value >0.05). In the second step, the country-specific regression coefficients with their standard errors and confidence intervals were merged into one dataset for meta-analysis using a random effects model. In this analysis, a single country was equivalent to a single study in a meta-analysis[298]. The random effects model assumes that studies come from different populations and that the difference in observed effects is not due to chance alone[300, 301]. Also, the random effects model is recommended for a larger number of studies and when the goal is to generalise the findings beyond the included studies or countries[300, 301]. Forest plots were generated showing the country-specific and the pooled odds ratios (OR) with 95% confidence intervals (CI), weights and the year in which the DHS was conducted for each individual country. This analysis was conducted for the two indices and the four domains separately.

4.2.5.5 Assessing heterogeneity

The heterogeneity of the pooled estimates was assessed using the Q statistic, the tau squared (T^2) and the I^2 statistic[302]. The Q statistic and its p-value assesses the viability of dispersion from the null hypothesis, i.e., test the null hypothesis that all studies share a common effect. P-values less than 0.05 suggest significant heterogeneity. However, the Q statistic only shows presence of heterogeneity but does not quantify it[302]. Therefore, the I^2 statistic was used to quantify the proportion of observed variance that reflects real differences in effect sizes[302]. Heterogeneity using the I^2 was classified as insignificant, moderate, and considerable for values less than 40%, between 40% and 75%, and above 75%, respectively[303].

4.2.5.6 Investigating sources of heterogeneity: sub-group analysis

For pooled estimates with moderate to considerable heterogeneity as quantified by the I^2 above, subgroup analyses by a country's abortion law, geographical location, country's socioeconomic status, HDI, GDI and modern contraceptive use prevalence were conducted. To minimise chance of false positive results associated with multiple subgroups, the analysis was restricted to fewer subgroups (maximum three) for each covariate assessed[144–147, 304]. Stratum-specific ORs were presented for the different categories and the test for subgroup differences (common effect model) was used to investigate if true differences existed between the subgroups[301–303]. However, due to the low power of subgroup analyses in detecting true group differences, confidence intervals of the groups were also compared[144–148]. P-values <0.05 were considered statistically significant.

4.2.5.7 Missing data

The data was investigated for missingness using summaries and patterns for all the variables used in the analysis. The included variables had <10% missing data and therefore complete case analysis using listwise deletion was conducted. Importantly, sample size was sufficiently large for each country [305].

4.2.5.8 Sensitivity analyses

To assess the influence of outlier or influential countries, a leave-one-out meta-analysis was conducted in which multiple meta-analyses were performed by excluding one study at a time[55]. Forest plots in which the displayed effect for each study corresponds to the overall effect size computed by the meta-analysis when that study is excluded from the analysis were generated. The vertical line through the leave-one-out forest plot showed the overall effect size based on the complete set of studies (with no omission) to help detect influential studies. For a country to be considered an outlier or have a significant effect on the original

pooled OR, the new pooled OR excluding that country must lie outside the 95% CI of the original OR, i.e., the 95% CIs should not overlap[55].

4.3 Results

4.3.1 Descriptive statistics

Table 4.1 shows the weighted sample size for all the included countries with the mean age and standard deviation (SD) of the women whose data were used as per exclusion criteria. A total of 228,081 women aged 15-49, excluding currently pregnant women were included in the final analysis. The overall mean age was 33.0 years (SD =8.7). Malawi and Chad had the youngest population with a mean age of 30.8 (SD =10.3) years and 30.9 (SD =8.6) years respectively while Albania had the oldest mean age at 42.4 (SD = 12.3). The effective population used in the regression analysis, when comparing the highest with the lowest quintiles was 33.5% of the total sample size (81,000) for the woman-alone index and 38.0% (92,104) of the total sample size for the joint empowerment index. The details for each quintile are given in **Appendix C.4 – C.5.**

Table 4.1 Included sample size with mean age for the 30 countries (N= 242,081)

Country	Number	Percentage of study population	Mean age	Standard Deviation (age)	Effective sample size used in the regression analysis for the two indices	
					Woman-alone	Joint
Albania[1]	10,401	4.3	42.4	12.3	2151	3986
Armenia[1]	3,811	1.6	35.1	5.4	1500	2036
Benin	7,985	3.3	32.0	8.4	1551	1618
Burundi	7,928	3.3	32.9	7.9	3175	3092
Cambodia	10,155	4.2	33.5	9.5	4120	4088
Cameroon	5,823	2.4	33.7	8.6	1568	2135
Chad	7,292	3.0	30.9	8.3	970	972
Ethiopia	6,570	2.7	31.0	7.4	2564	2630
Gambia	6,095	2.5	32.0	7.2	2482	2434
Ghana	4,333	1.8	34.2	5.8	1621	1685
Guatemala[1]	12,176	5.0	32.7	10.6	4735	7363
Guinea	5,365	2.2	32.4	7.1	2135	2088
Haiti	6,542	2.7	33.7	7.4	1758	1751
Kenya	15,287	6.3	32.2	11.0	2902	2895
Lesotho	3,260	1.4	31.5	5.4	1293	1299
Liberia	3,443	1.4	33.2	5.4	1237	1343
Malawi	12,381	5.1	30.8	10.3	4092	5176
Mali	5,633	2.3	31.1	7.1	2254	2253
Myanmar	7,049	2.9	35.0	7.8	2814	2802

Country	Number	Percentage of study population	Mean age	Standard Deviation (age)	Effective sample size used in the regression analysis for the two indices	
					Woman-alone	Joint
Nepal	8,090	3.3	32.2	8.7	3317	3216
Nigeria	19,304	8.0	32.7	13.1	7515	7577
Pakistan	11,501	4.8	32.7	8.9	4591	4504
Papua New Guinea	8,345	3.5	32.9	8.4	3230	3144
Philippines[1]	13,978	5.8	35.1	11.0	4786	6847
Rwanda[1]	5,975	2.5	33.4	6.5	2029	3505
Sierra Leone	7,384	3.1	33.0	7.9	2954	2948
Timor-Leste	6,609	2.7	34.1	7.5	882	877
Uganda	8,251	3.4	31.0	8.6	2920	3260
Zambia	5,932	2.5	32.1	7.2	2071	2372
Zimbabwe	5,183	2.1	31.6	6.4	2074	2026
Total	**242,081**	**100**	**33.0**	**8.7**	81000	92104

[1] Country in which the highest quintile was the 4th with no numbers in the 5th

4.3.2 Prevalence of modern contraceptive rate

Figure 4.2 shows the prevalence of modern contraceptive use in each of the 30 countries. The overall prevalence of modern contraceptive use was 35% (not shown in the Figure). The highest prevalence was observed in Zimbabwe at 73% while Albania and Chad had the lowest prevalence at 6% and 4%, respectively. Eight countries namely: Zimbabwe (73%), Malawi (65%), Lesotho (64%), Kenya (60%), Myanmar (54%), Zambia (54%), Rwanda (54%), and Guatemala (54%) had a prevalence above 50%. Two countries had prevalence below 10: Albania (4%) and Chad (6%). Six countries, mainly from western and central Africa: Guinea (12%), Benin (14%), Nigeria (16%), Cameroon (19%), Gambia (19%) and Mali (19%) had a prevalence less than 20%.

Figure 4.2 Weighted modern contraceptive use prevalence among 30 low- and middle-income countries

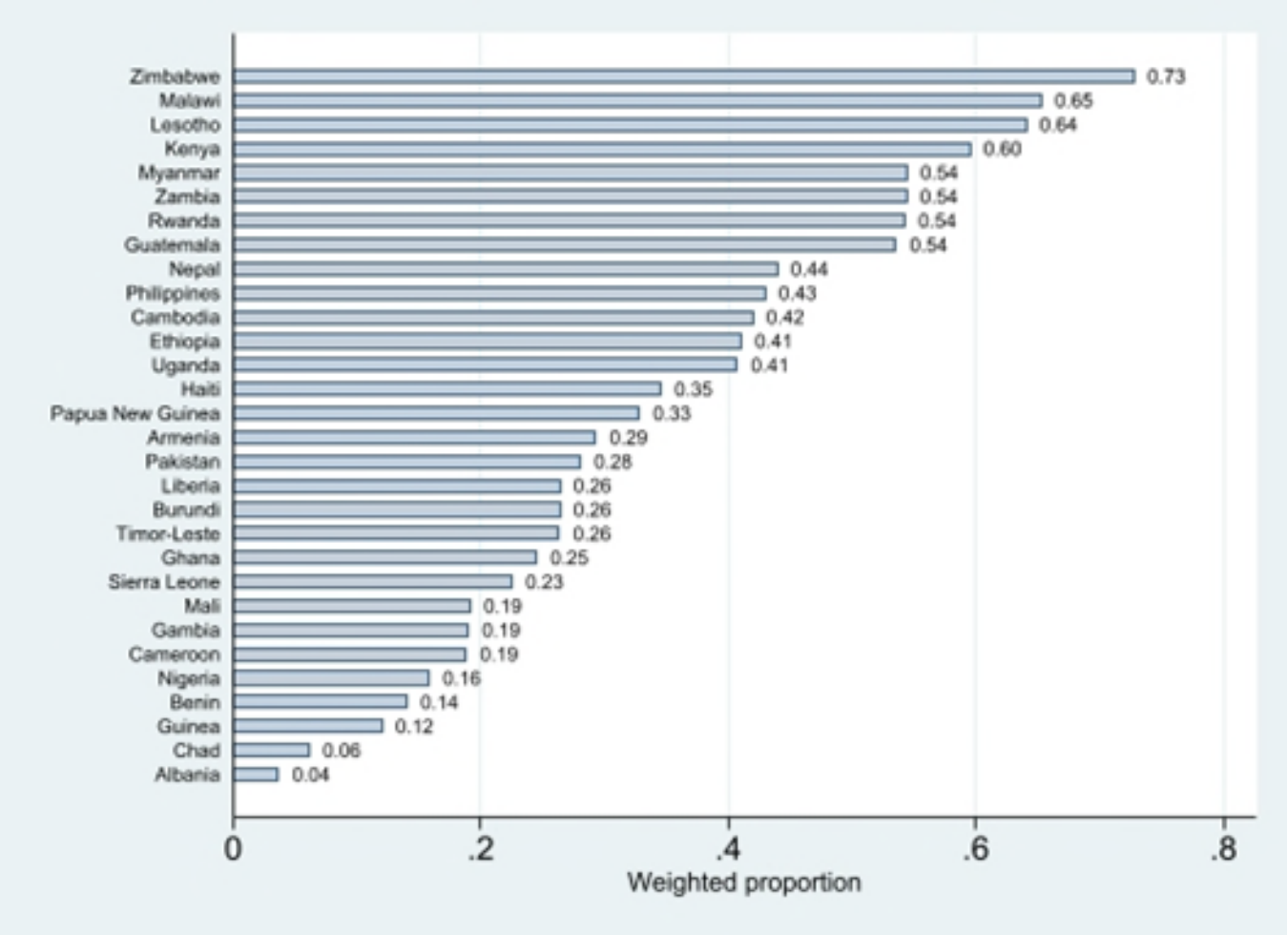


Table 4.2 shows the different types of modern contraceptives used in each of the 30 countries. Injectable contraceptives were the most commonly used type with 38.3% of all women in the included countries using this method, followed by the pill at 19.3%, implants 14.8% and female sterilisation 10.1%. Male condoms were used by 9.6%, IUD use was 5% while only 2.9% used other methods such as female condoms and emergency contraception. Among modern contraceptive users, 65.4% of Haitian, 64.1% of Ethiopian and 57% of Liberian women used injectables with at least nine countries recording more than 50% use. Only 0.6% of the Armenian and 4.6% of the Albanian study populations used the pill whereas 52.5% of Armenian and 39.9% of Albanian women reported use of male condoms and Timor-Leste (0.1%), Ethiopia (0.2%), Mali (0.4%) and Sierra Leone (0.7%) reported less than 1% use of male condoms. The highest reported use of the pill

was in Zimbabwe at 62.3%, followed by the Philippines at 52.1% and Cambodia at 45.2%. No other country recorded 30% and above for use of the pill.

The distribution of the empowerment indices, their subdomains and the confounders are provided in the **Appendix C.4 – C.13.**

Table 4.2 Use of different types of modern contraceptives by country

Country	Pill		IUD		Injectables		Male condoms		Female sterilisation		Implants		Others		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Albania	45	16.9	26	9.6	9	4.6	113	39.9	91	26.7	2	0.9	3	1.5	289	100
Armenia	92	9.4	332	31.8	3	0.6	522	52.5	27	2.5	0	0.0	32	3.1	1008	100
Benin	149	12.3	141	12.9	187	17.2	94	8.3	14	1.4	484	42.7	63	5.1	1132	100
Burundi	164	7.6	86	4.1	1009	50.7	125	5.4	53	2.2	524	26.0	85	3.9	2046	100
Cambodia	1904	45.2	493	11.5	973	23.6	265	5.5	341	7.6	260	5.6	42	1.1	4278	100
Cameroon	68	6.9	60	5.3	259	23.6	348	36.2	20	1.9	188	16.5	98	9.7	1041	100
Chad	30	7.8	6	0.9	144	41.7	16	5.6	10	3.7	57	19.5	60	20.8	323	100
Ethiopia	187	5.9	138	6.0	1330	64.1	17	0.2	20	1.0	523	22.1	26	0.7	2241	100
Gambia	141	12.5	28	3.5	478	46.4	19	2.2	38	2.5	362	31.9	12	1.1	1078	100
Ghana	225	21.8	27	3.6	429	34.5	61	5.6	80	8.7	244	23.0	18	2.8	1084	100
Guatemala	468	6.6	183	3.3	2111	32.8	539	8.4	2756	43.1	225	3.9	118	1.9	6400	100
Guinea	90	16.0	24	4.2	98	18.0	26	4.3	9	1.5	91	16.6	230	39.4	568	100
Haiti	161	7.4	9	0.3	1517	65.4	243	12.7	104	3.8	174	7.8	54	2.5	2262	100
Kenya	1200	15.6	530	6.8	4170	48.8	319	4.2	490	5.9	1483	18.4	25	0.2	8217	100
Lesotho	506	24.2	46	2.3	858	39.9	544	28.2	57	2.8	49	2.1	7	0.4	2067	100
Liberia	161	16.1	2	0.6	654	57.0	26	4.1	10	1.0	228	20.0	7	1.3	1088	100
Malawi	328	4.0	147	2.0	4109	51.6	307	3.3	1370	18.3	1748	20.3	47	0.5	8056	100
Mali	157	14.4	73	7.4	331	35.1	7	0.4	19	2.0	380	40.1	6	0.6	973	100
Myanmar	976	27.3	189	5.4	1836	53.5	81	2.1	396	9.3	84	1.8	36	0.6	3598	100
Nepal	399	11.3	123	3.5	795	21.8	405	10.9	1092	32.4	283	7.6	467	12.6	3564	100
Nigeria	335	11.8	199	7.1	814	26.4	385	14.2	51	1.6	825	27.5	319	11.4	2928	100
Pakistan	253	6.4	285	8.8	382	9.6	1250	39.2	820	33.4	53	1.7	28	1.0	3071	100
Papua New Guinea	205	7.9	51	2.4	905	30.5	69	2.1	824	25.1	859	29.1	61	2.9	2974	100
Philippines	3158	52.1	573	8.6	844	12.2	231	4.2	1029	18.6	172	2.8	77	1.6	6084	100
Rwanda	558	17.6	87	2.3	1628	50.7	259	8.1	86	2.6	530	16.0	93	2.7	3241	100
Sierra Leone	313	20.0	31	1.7	647	42.6	13	0.7	24	1.3	530	32.0	29	1.8	1587	100
Timor-Leste	178	9.4	126	8.4	936	48.1	2	0.1	90	5.8	399	25.7	30	2.6	1761	100
Uganda	175	5.6	139	4.4	1746	53.2	225	7.4	252	7.4	605	17.8	129	4.3	3271	100
Zambia	520	16.3	41	1.6	1721	53.6	206	6.6	104	3.1	515	16.5	66	2.3	3173	100
Zimbabwe	2295	62.3	37	0.9	572	14.5	225	5.7	61	1.2	579	14.8	23	0.6	3792	100
Total	15000	19.3	4232	5.0	31000	38.3	6942	9.6	10000	10.1	12000	14.8	2291	2.9	83000	100

No. = Number; % = percent

4.3.3 The unadjusted and adjusted association between women's empowerment and modern contraceptive use

Table 4.3 shows the unadjusted odds ratios (UOR) and adjusted odds ratios (AOR) for the association between the two empowerment indices and modern contraceptive use.

Table 4.3 Association between women's empowerment indices and modern contraception use in 30 low- and middle-income countries[1]

Country	Woman-alone empowerment index								Joint empowerment index							
	Unadjusted				Adjusted				Unadjusted				Adjusted			
	OR[2]	95% CI		p-value	OR[2]	95% CI		p-value	OR[2]	95% CI		p-value	OR[2]	95% CI		p-value
Albania	**2.18**	**1.19**	**3.99**	**0.011**	**2.18**	**1.22**	**3.90**	**0.008**	1.26	0.81	1.97	0.310	**1.64**	**1.04**	**2.57**	**0.033**
Armenia	**1.66**	**1.25**	**2.22**	**0.001**	1.30	0.92	1.82	0.135	1.16	0.93	1.44	0.184	0.88	0.68	1.14	0.321
Benin	**2.14**	**1.49**	**3.07**	**<0.001**	1.51	0.97	2.33	0.065	**2.26**	**1.58**	**3.21**	**<0.001**	1.40	0.91	2.16	0.123
Burundi	1.10	0.91	1.33	0.302	1.04	0.84	1.28	0.731	1.04	0.86	1.25	0.716	0.91	0.74	1.12	0.381
Cambodia	0.90	0.78	1.05	0.182	**0.82**	**0.68**	**0.98**	**0.033**	1.02	0.87	1.18	0.844	1.03	0.86	1.22	0.763
Cameroon	**3.34**	**2.34**	**4.76**	**<0.001**	1.24	0.82	1.88	0.308	**3.42**	**2.57**	**4.55**	**<0.001**	**1.75**	**1.22**	**2.51**	**0.002**
Chad	**5.77**	**2.28**	**14.61**	**<0.001**	**4.56**	**1.42**	**14.69**	**0.011**	**13.09**	**4.02**	**42.65**	**<0.001**	**5.02**	**1.18**	**21.34**	**0.029**
Ethiopia	**2.08**	**1.57**	**2.74**	**<0.001**	**1.49**	**1.04**	**2.14**	**0.031**	**2.52**	**1.92**	**3.31**	**<0.001**	**1.54**	**1.13**	**2.11**	**0.007**
Gambia	**1.86**	**1.37**	**2.53**	**<0.001**	**1.69**	**1.14**	**2.50**	**0.009**	**1.98**	**1.47**	**2.67**	**<0.001**	**1.71**	**1.21**	**2.41**	**0.002**
Ghana	0.99	0.73	1.35	0.953	0.98	0.67	1.42	0.900	**1.69**	**1.26**	**2.26**	**0.001**	**1.37**	**1.03**	**1.82**	**0.031**
Guatemala	**3.53**	**3.02**	**4.13**	**<0.001**	**2.62**	**2.14**	**3.22**	**<0.001**	**2.30**	**2.02**	**2.63**	**<0.001**	**1.52**	**1.30**	**1.78**	**<0.001**
Guinea	**3.56**	**2.31**	**5.48**	**<0.001**	**2.25**	**1.40**	**3.62**	**0.001**	**3.21**	**2.15**	**4.80**	**<0.001**	**2.53**	**1.66**	**3.85**	**<0.001**
Haiti	0.97	0.76	1.22	0.781	0.91	0.69	1.19	0.490	**1.36**	**1.07**	**1.72**	**<0.001**	1.16	0.88	1.51	0.292
Kenya	**2.18**	**1.78**	**2.66**	**<0.001**	**1.69**	**1.31**	**2.16**	**<0.001**	**1.81**	**1.45**	**2.27**	**<0.001**	1.11	0.83	1.47	0.490
Lesotho	**1.75**	**1.35**	**2.28**	**<0.001**	1.25	0.91	1.72	0.173	**1.53**	**1.18**	**1.97**	**0.001**	1.12	0.82	1.55	0.470
Liberia	**1.77**	**1.28**	**2.45**	**0.001**	**1.72**	**1.20**	**2.47**	**0.003**	**1.90**	**1.34**	**2.69**	**<0.001**	**1.64**	**1.08**	**2.48**	**0.020**
Malawi	1.06	0.88	1.29	0.533	1.18	0.95	1.47	0.128	**1.44**	**1.22**	**1.71**	**<0.001**	**1.24**	**1.04**	**1.47**	**0.016**
Mali	**1.66**	**1.25**	**2.22**	**0.001**	1.20	0.84	1.70	0.310	**1.87**	**1.45**	**2.43**	**<0.001**	**1.41**	**1.04**	**1.91**	**0.027**
Myanmar	**1.35**	**1.10**	**1.64**	**0.004**	1.26	0.98	1.62	0.069	**1.65**	**1.36**	**2.00**	**<0.001**	1.24	0.98	1.56	0.072
Nepal	**0.80**	**0.66**	**0.98**	**0.032**	**0.70**	**0.55**	**0.90**	**0.005**	**1.92**	**1.60**	**2.30**	**<0.001**	**1.28**	**1.04**	**1.56**	**0.019**
Nigeria	**5.28**	**4.10**	**6.80**	**<0.001**	**1.97**	**1.49**	**2.60**	**<0.001**	**5.23**	**4.11**	**6.67**	**<0.001**	**2.18**	**1.60**	**2.97**	**<0.001**
Pakistan	**2.69**	**2.19**	**3.31**	**<0.001**	**1.77**	**1.30**	**2.41**	**<0.001**	**2.60**	**2.10**	**3.22**	**<0.001**	**1.56**	**1.15**	**2.13**	**0.005**
Papua New Guinea	**1.71**	**1.31**	**2.23**	**<0.001**	1.05	0.78	1.40	0.756	**1.77**	**1.41**	**2.21**	**<0.001**	1.12	0.86	1.46	0.384
Philippines	0.90	0.76	1.07	0.236	0.88	0.73	1.06	0.186	1.00	0.84	1.19	0.964	1.07	0.90	1.28	0.449
Rwanda	0.97	0.80	1.17	0.727	1.04	0.83	1.29	0.741	1.14	0.97	1.33	0.102	1.07	0.90	1.27	0.455
Sierra Leone	**2.30**	**1.74**	**3.04**	**<0.001**	**1.81**	**1.35**	**2.42**	**<0.001**	**2.00**	**1.52**	**2.62**	**<0.001**	**1.60**	**1.19**	**2.15**	**0.002**
Timor-Leste	0.97	0.68	1.38	0.865	0.95	0.63	1.42	0.791	1.11	0.76	1.63	0.580	1.03	0.69	1.52	0.899
Uganda	**1.44**	**1.20**	**1.72**	**<0.001**	**1.41**	**1.14**	**1.75**	**0.002**	**1.77**	**1.49**	**2.11**	**<0.001**	**1.41**	**1.16**	**1.72**	**<0.001**
Zambia	1.19	0.95	1.50	0.132	0.88	0.66	1.16	0.355	**1.74**	**1.43**	**2.11**	**<0.001**	**1.45**	**1.16**	**1.80**	**0.001**
Zimbabwe	**1.35**	**1.04**	**1.74**	**0.023**	1.16	0.88	1.54	0.296	**2.12**	**1.65**	**2.72**	**<0.001**	**1.61**	**1.21**	**2.13**	**0.001**

[1] *Baseline group less empowered women*

[2] *OR = odds ratios*

*Highlighted in **bold** are countries with statistically significant associations between empowerment and modern contraceptive use*

For the woman-alone empowerment index, the unadjusted univariable analysis showed that there was evidence of positive associations between women's empowerment and modern contraceptive use in 22 of the 30 countries, evidence of weak association in two countries (Chad and Ghana) and no evidence of association in the remaining five countries (Burundi, Cambodia, Haiti, Rwanda, and Timor-Leste). After adjusting for potential confounding, evidence of positive associations between women's empowerment and modern contraceptive use was observed in 13 of the 30 countries, evidence of a weak association in two countries (Benin and Myanmar), no evidence of association in 14 countries and evidence of a negative association in two countries (Cambodia and Nepal).

For the joint empowerment index, unadjusted univariable analysis showed that there was evidence of positive associations between women's empowerment and modern contraceptive use in 23 of the 30 countries and no evidence of association was observed in seven countries (Albania, Burundi, Ghana, Haiti, the Philippines, Rwanda, and Timor-Leste). After adjusting for potential confounding, evidence of positive associations between women's empowerment and modern contraceptive use was observed in 18 of the 30 countries, weak association in one (Myanmar) and no evidence of association was observed in the rest of the countries.

There were varying degrees to which confounding influenced the direction and/or strength of the relationship between women's empowerment and modern contraceptive use. While for some countries, the UOR and AOR showed little changes, there were huge differences in others. The most common confounders identified for the different countries were age, the woman's and male partner's education level, the male partner's education level, household socioeconomic status, access to healthcare and the media, and fertility preferences. These confounders exerted varying degrees of confounding for the different countries on the association between exposures and the outcome, suggesting that in some countries, some confounders were more important than in others. For example, while in the majority of countries, adjusting for potential confounders attenuated the OR

towards the null, in a few countries such as Cambodia and Nepal, there was stronger evidence of association in the AORs for the woman-alone empowerment index than the UOR, suggesting negative confounding. For Cambodia, the UOR showed that women's empowerment was associated with a 10% decrease in the odds of modern contraceptive use among the more empowered compared with the less empowered women (95% CI: 0.78 – 1.05, p = 0.182) but this association was not statistically significant. The fully adjusted model showed that the more empowered women had an 18% lower odds for modern contraceptive use compared with the less empowered women with an improvement in the precision of the estimates (95% CI: 0.68 – 0.98). The negative confounders were education level, fertility preferences and household socioeconomic status. For Nepal, the UOR was 0.80 (95% CI: 0.66 – 0.98) compared with the AOR of 0.70 (95% CI: 0.55 – 0.90) with the negative confounders being male partner's education level, access to healthcare and access to media. For the joint empowerment index, negative confounding was observed in Albania with the UOR showing that the more empowered had 26% increase in odds to use modern contraceptives compared with the less empowered women (95% CI: 0.81 – 1.97) although the estimates were imprecise. The fully adjusted model showed that empowerment was associated with a 64% increase in odds of using modern contraceptives (95% CI: 1.04 – 2.57). The confounders were education level, male partner's education level, access to healthcare and media access.

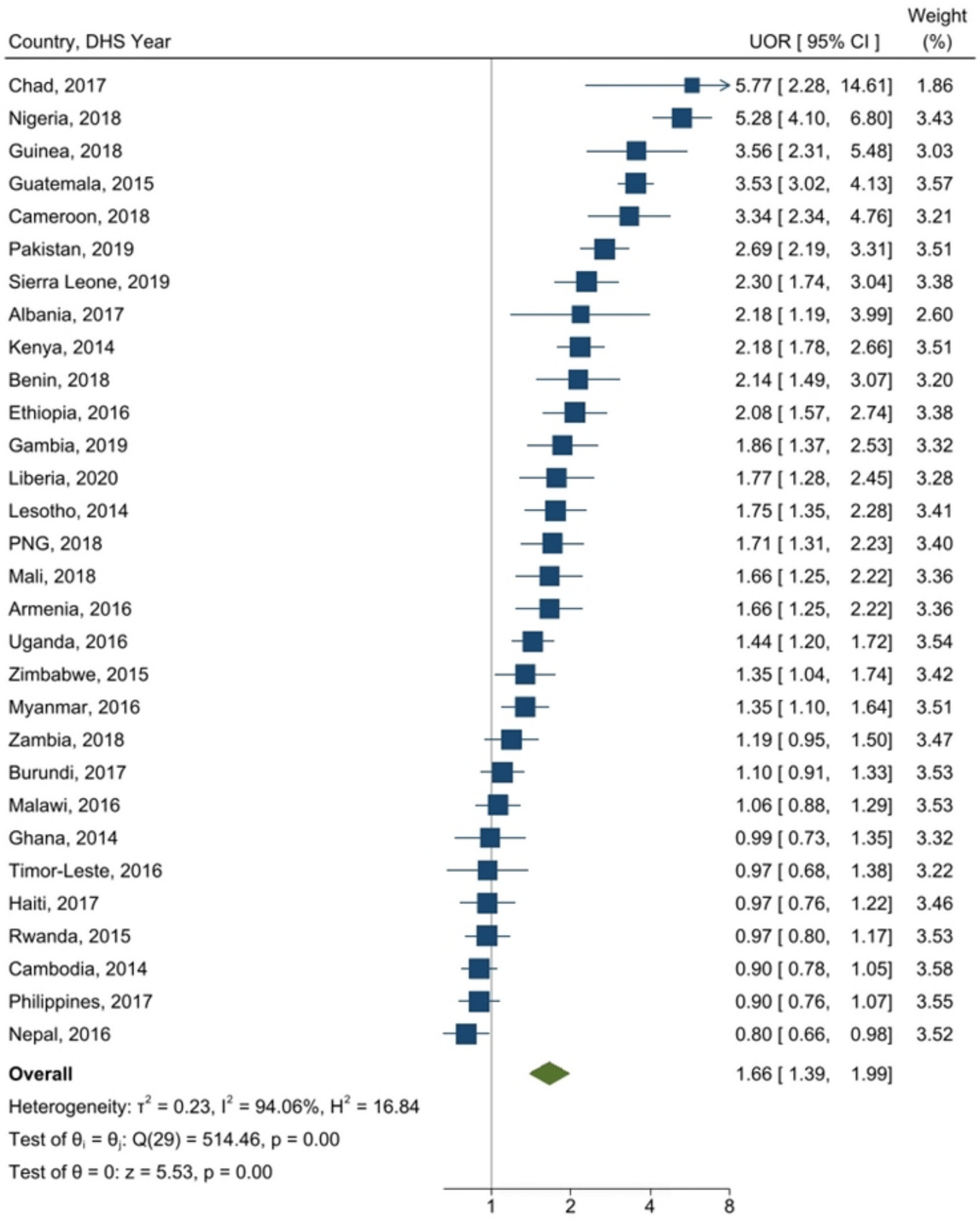
The tables showing the UOR and AOR for the domains are in **Appendix C.14** and **C.15**.

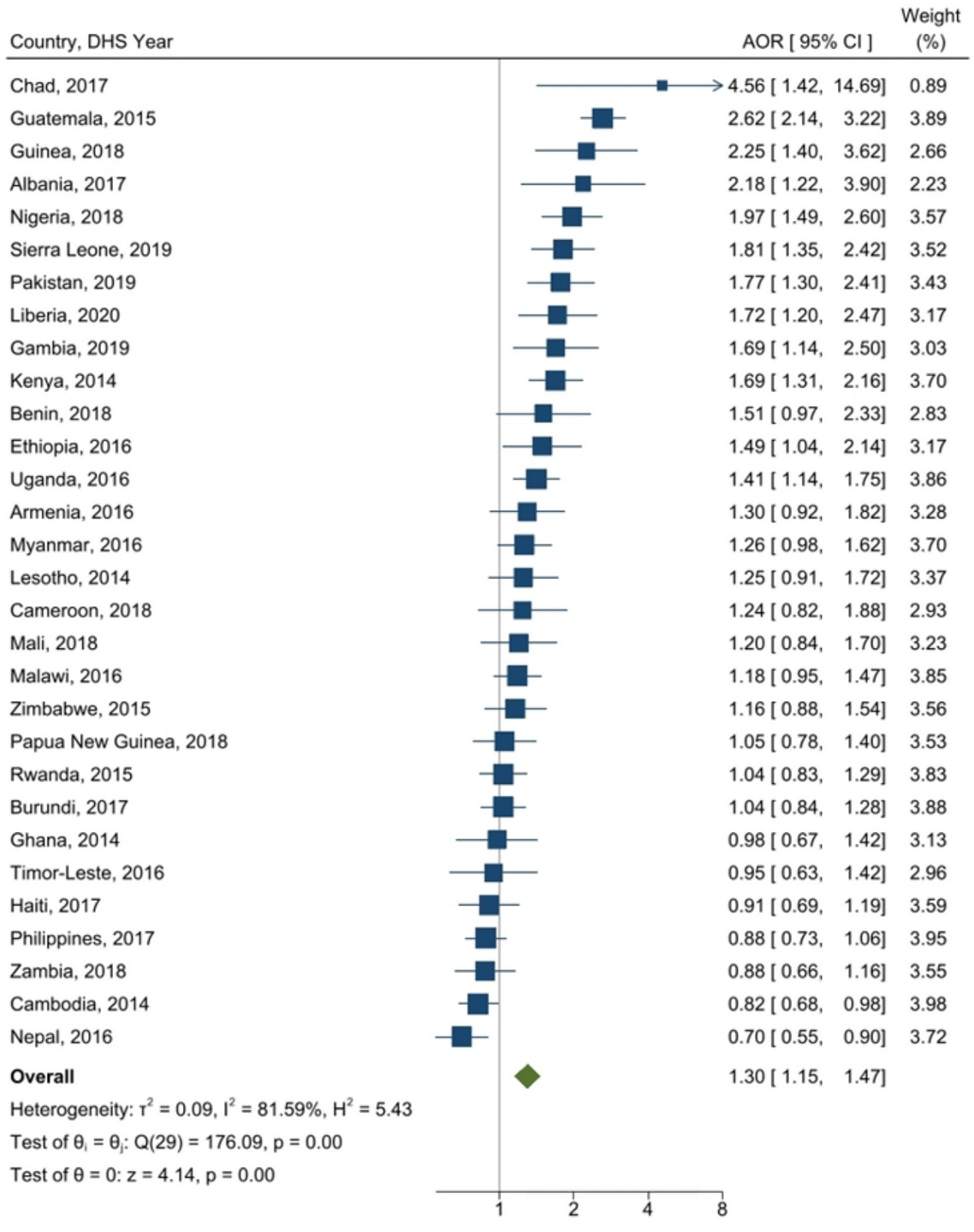
4.3.4 The woman-alone empowerment index

Figure 4. 3 is a forest plot displaying the results of the meta-analysis of country-country variation and the pooled OR for the association between woman-alone empowerment index and modern contraceptive use. In the pooled UOR, women in the highest quintile of the woman-alone empowerment index (highest empowerment) had 1.66 times the odds of modern contraceptive use compared with women in the lowest quintile but there was

considerable heterogeneity (95% CI: 1.39 – 1.99, I^2= 94.1%). For the AOR, women in the highest quintile had 30% increased odds of modern contraceptive use compared with women in the lowest quintile and heterogeneity was considerable (95% CI: 1.15 – 1.47, I^2= 81.6%).

Figure 4.3 Meta-analysis of cross-national variation in the association between woman-alone empowerment index and modern contraceptive use[1]



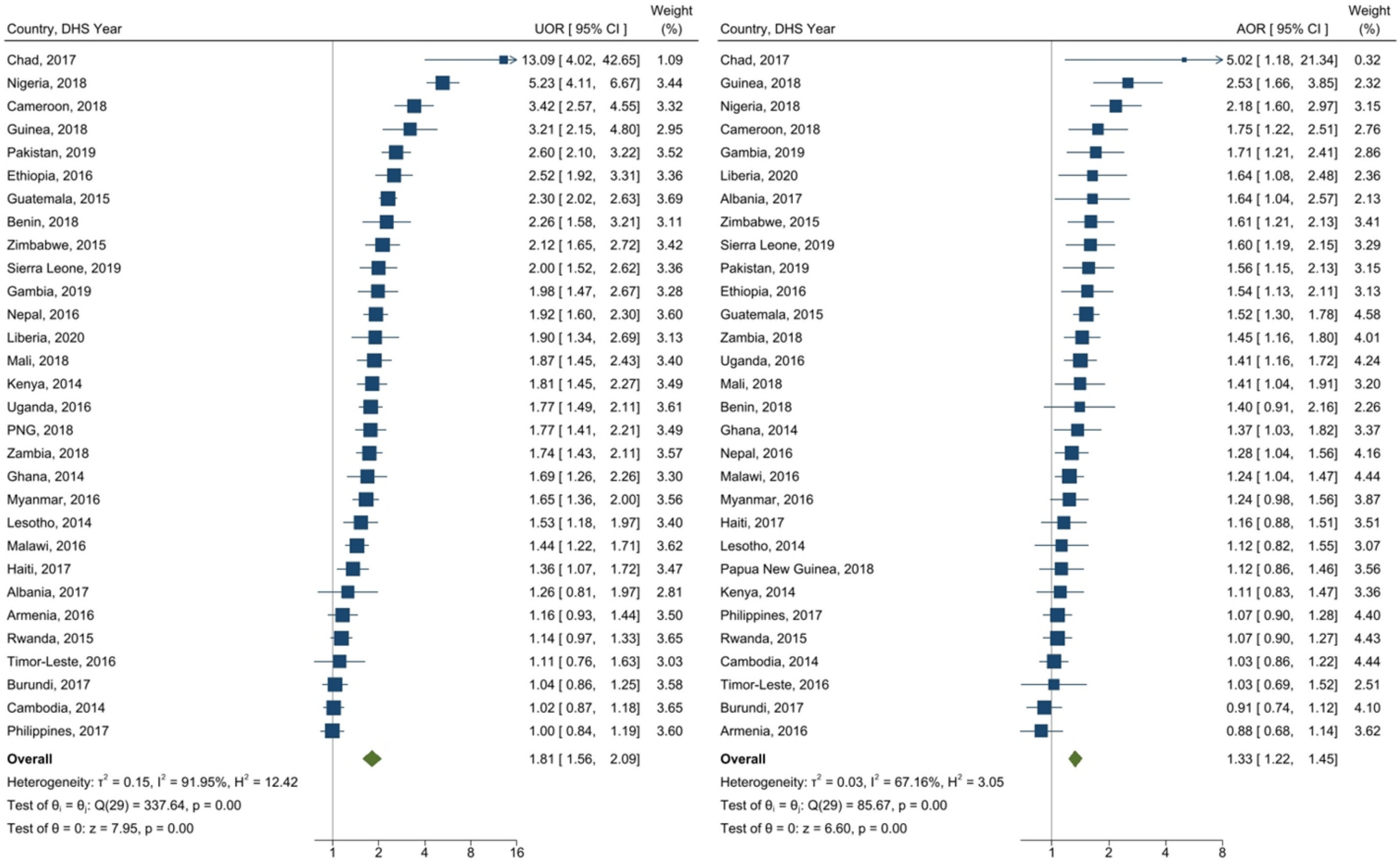


[1]*UOR = unadjusted odds ratios; AOR = adjusted odds ratios*

4.3.5 The joint empowerment index

Figure 4. 4 is a forest plot displaying the results of the meta-analysis of cross-national variation and the pooled OR for the association between the joint empowerment index and modern contraceptive use. The odds ratios were marginally larger for the association between the joint empowerment index and modern contraceptive use than the woman-alone empowerment index. In the pooled UOR, women in the highest quintile of joint empowerment index had 1.81 times the odds of modern contraceptive use compared with women in the lowest quintile but again with considerable heterogeneity (95% CI: 1.56 – 2.09, I^2= 92%). For the pooled AOR, women in the highest quintile of joint empowerment index had a 33% increase in the odds of modern contraceptive use compared with women in the lowest quintile (AOR 1.33, 95% CI: 1.22 – 1.45, I^2= 67.2%).

Figure 4.4 Meta-analysis of cross-national variation in the association between joint empowerment index and modern contraceptive use[1]

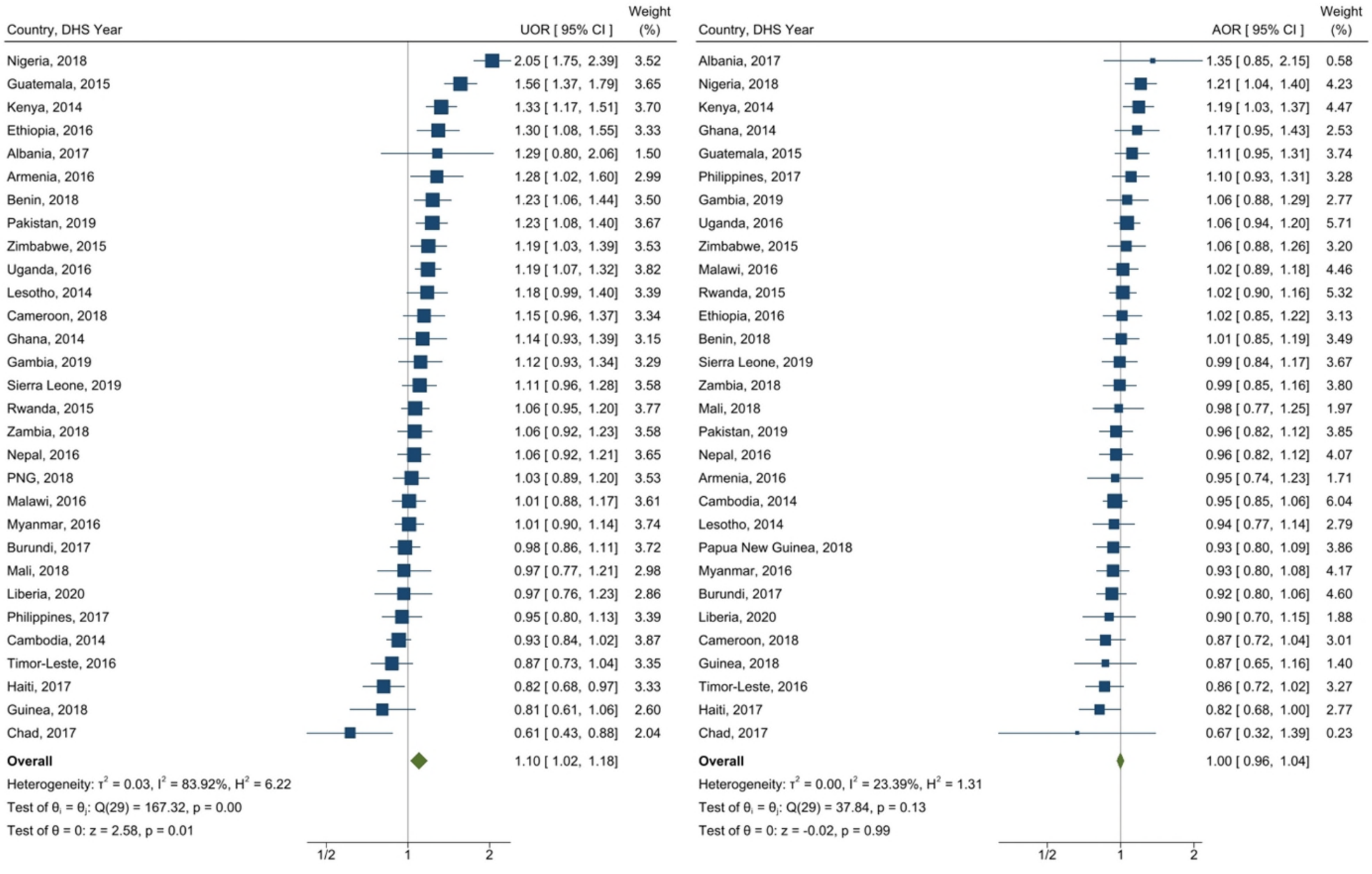


[1]*UOR = unadjusted odds ratios; AOR = adjusted odds ratios*

4.3.6 The attitudes towards domestic violence domain

Figure 4. 5 is a forest plot displaying the results of the meta-analysis of cross-national variation and the pooled estimates of the OR for the association between attitudes towards domestic violence and modern contraceptive use. In the pooled UOR, women who did not justify domestic violence had a 10% higher odds of modern contraceptive use compared with those who justified it and there was considerable heterogeneity (95% CI: 1.02 – 1.18, I^2= 83.9%). However, for the pooled AOR there was no evidence of association with modern contraceptive use and there was insignificant heterogeneity (95% CI: 0.96 – 1.04, I^2 = 23.4%).

Figure 4.5 Meta-analysis of cross-national variation in the association between women's attitudes towards domestic violence and modern contraceptive use[1]

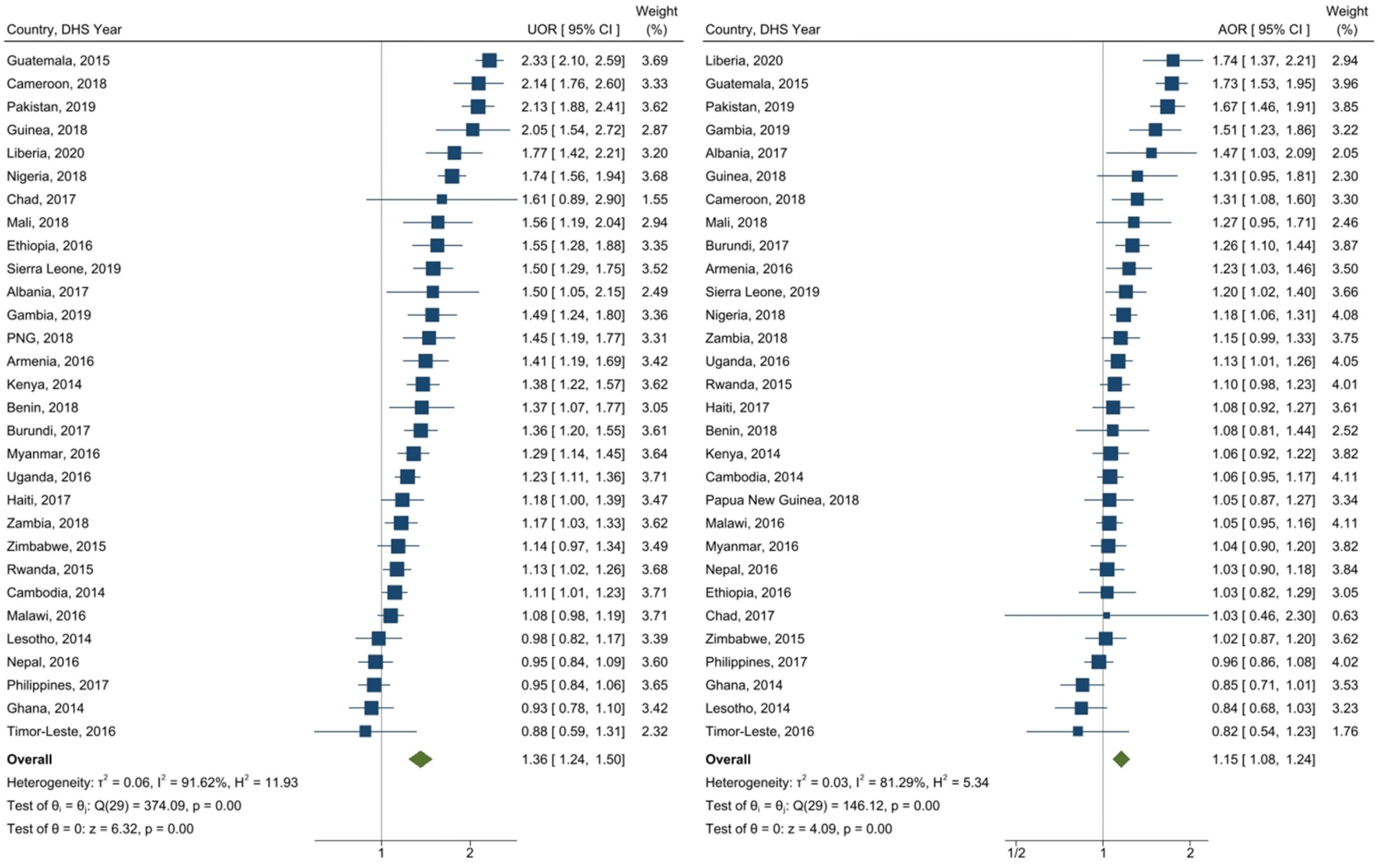


[1] *UOR = unadjusted odds ratios; AOR = adjusted odds ratios*

4.3.7 The reproductive health decision-making domain

Figure 4. 6 shows the results of the meta-analysis of cross-sectional variation and the pooled estimated of OR for the association between reproductive health decision-making and modern contraceptive use. In the pooled UOR, women who required their consent on important sexual and reproductive health issues (the more empowered) had a 36% higher odds of modern contraceptive use compared with those who did not require their consent (the less empowered) but heterogeneity was considerable (95% CI: 1.24 – 1.50, I^2= 91.6%). For the pooled AOR, empowerment was associated with a 15% increase in the odds of using modern contraceptives, but heterogeneity was still considerable (AOR = 1.15, 95% CI: 1.08 – 1.24, I^2= 81.3%).

Figure 4.6 Meta-analysis of cross-national variation in the association between women's reproductive health decision-making and modern contraceptive use[1]

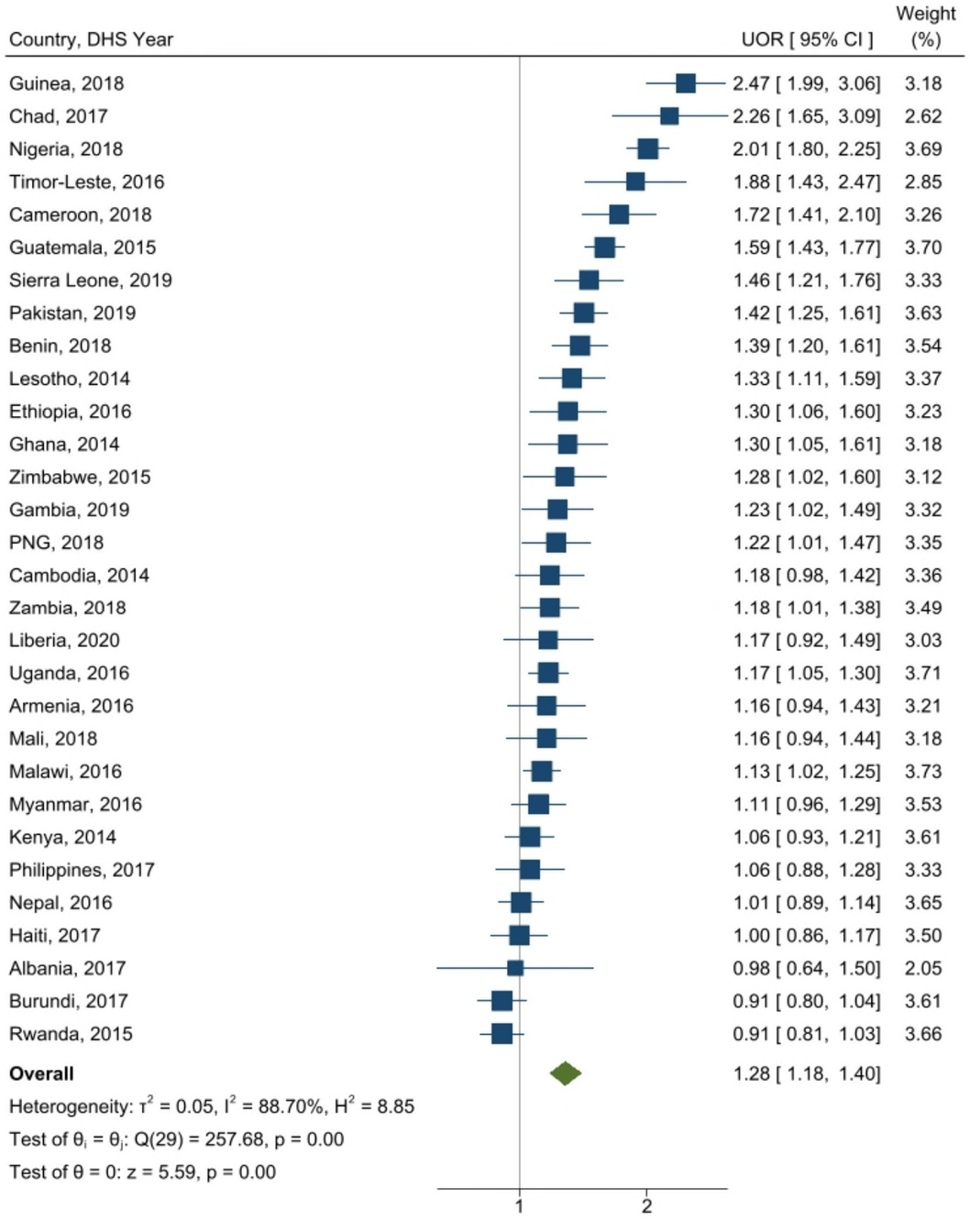


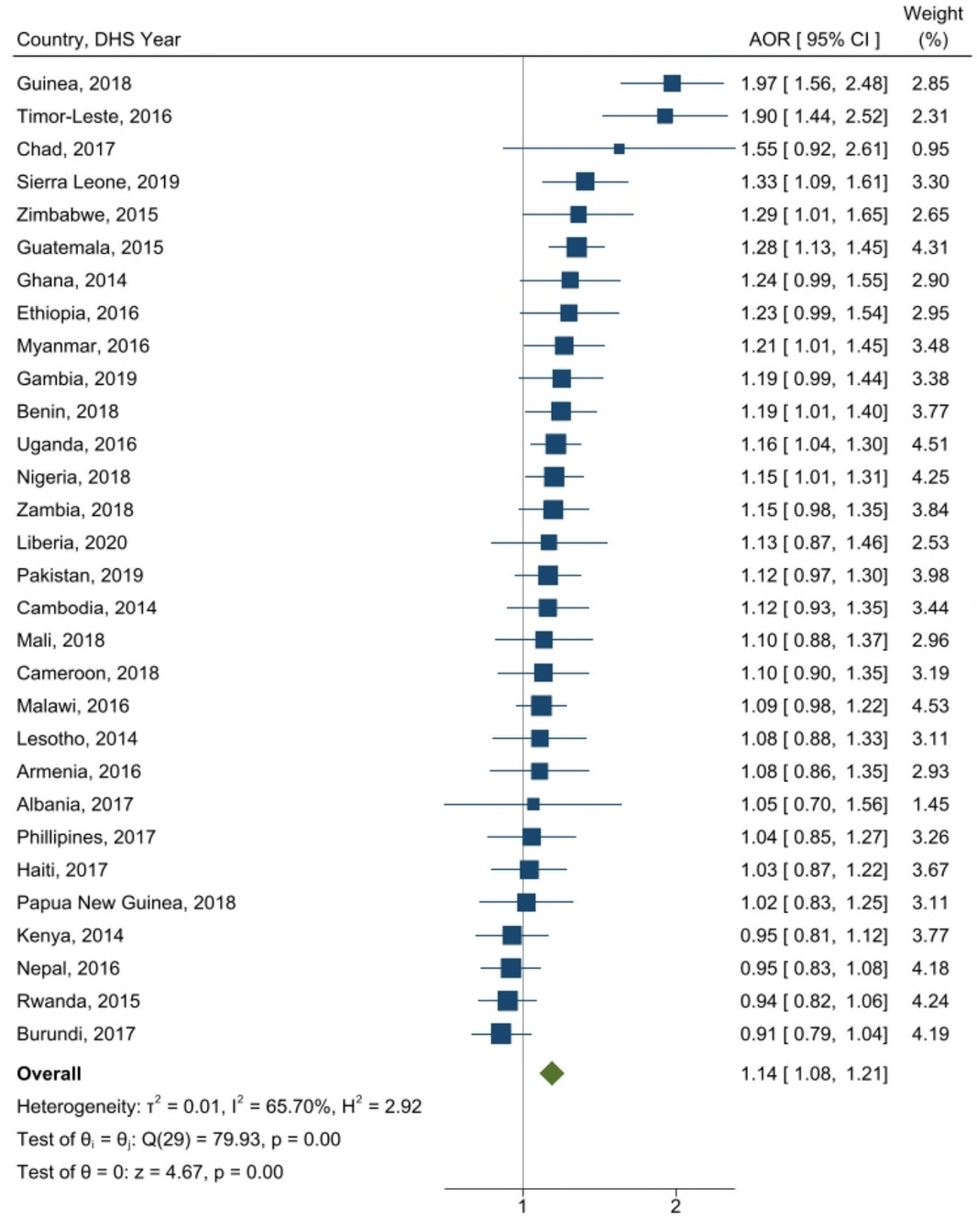
[1]*UOR = unadjusted odds ratios; AOR = adjusted odds ratios*

4.3.8 The woman-alone household decision-making domain

Figure 4. 7 gives the results of the meta-analysis of country-country variation and the pooled estimated of OR for the association between woman-alone household decision-making and modern contraceptive use. In the pooled UOR, women who made most of the household decisions alone (considered more empowered) had a 28% increased odds of using modern contraceptives compared with those who did not (the less empowered) but heterogeneity was considerable (95% CI: 1.18 – 1.40, I^2= 88.7%). For the pooled AOR, higher empowerment in this domain was associated with a 14% increase in the odds of using modern contraceptives compared to the less empowered women and there was moderate heterogeneity (AOR = 1.14, 95% CI: 1.08 – 1.21, I^2= 65.7%).

Figure 4.7 Meta-analysis of cross-national variation in the association between the domain woman-alone household decision-making and modern contraceptive use[1]



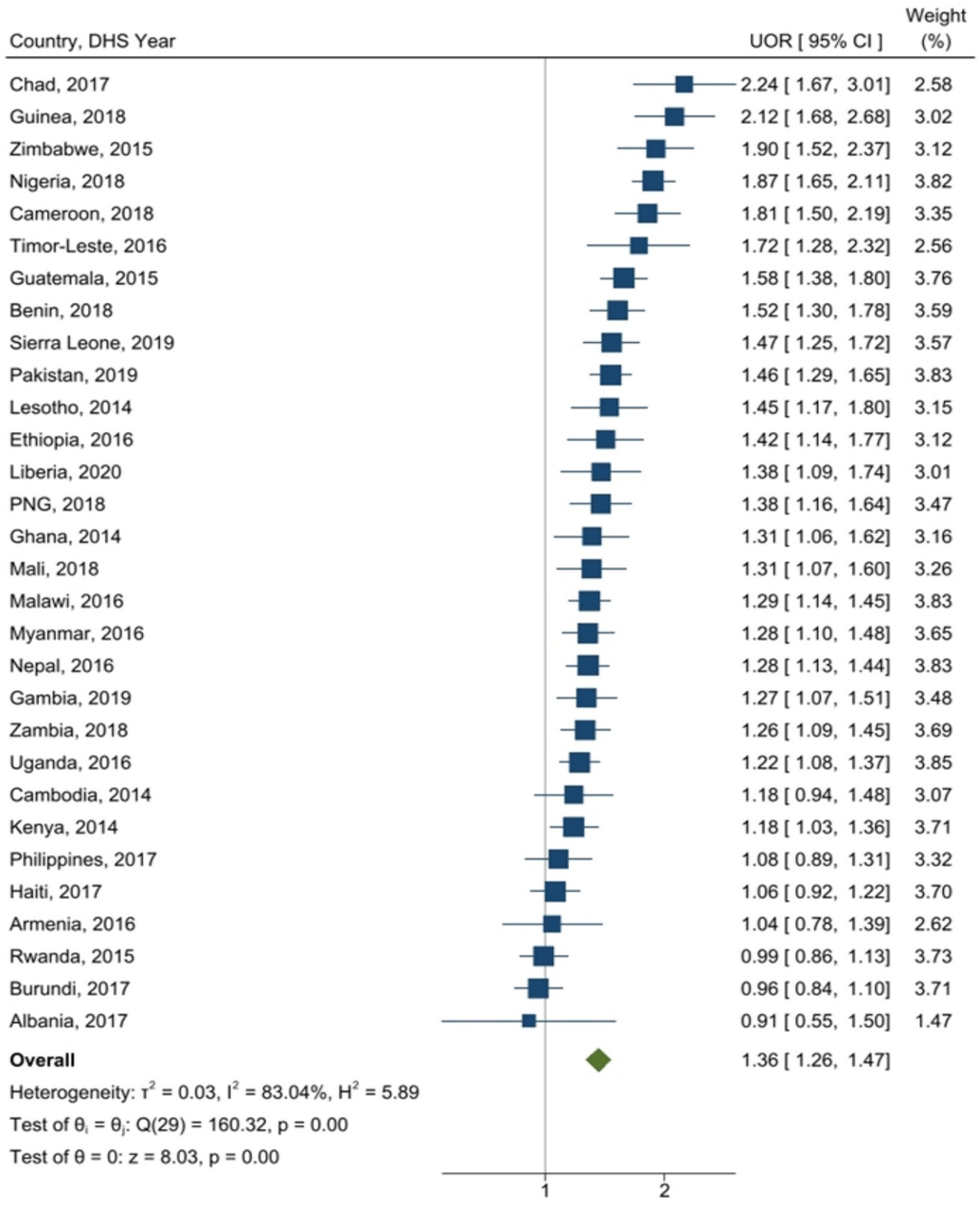


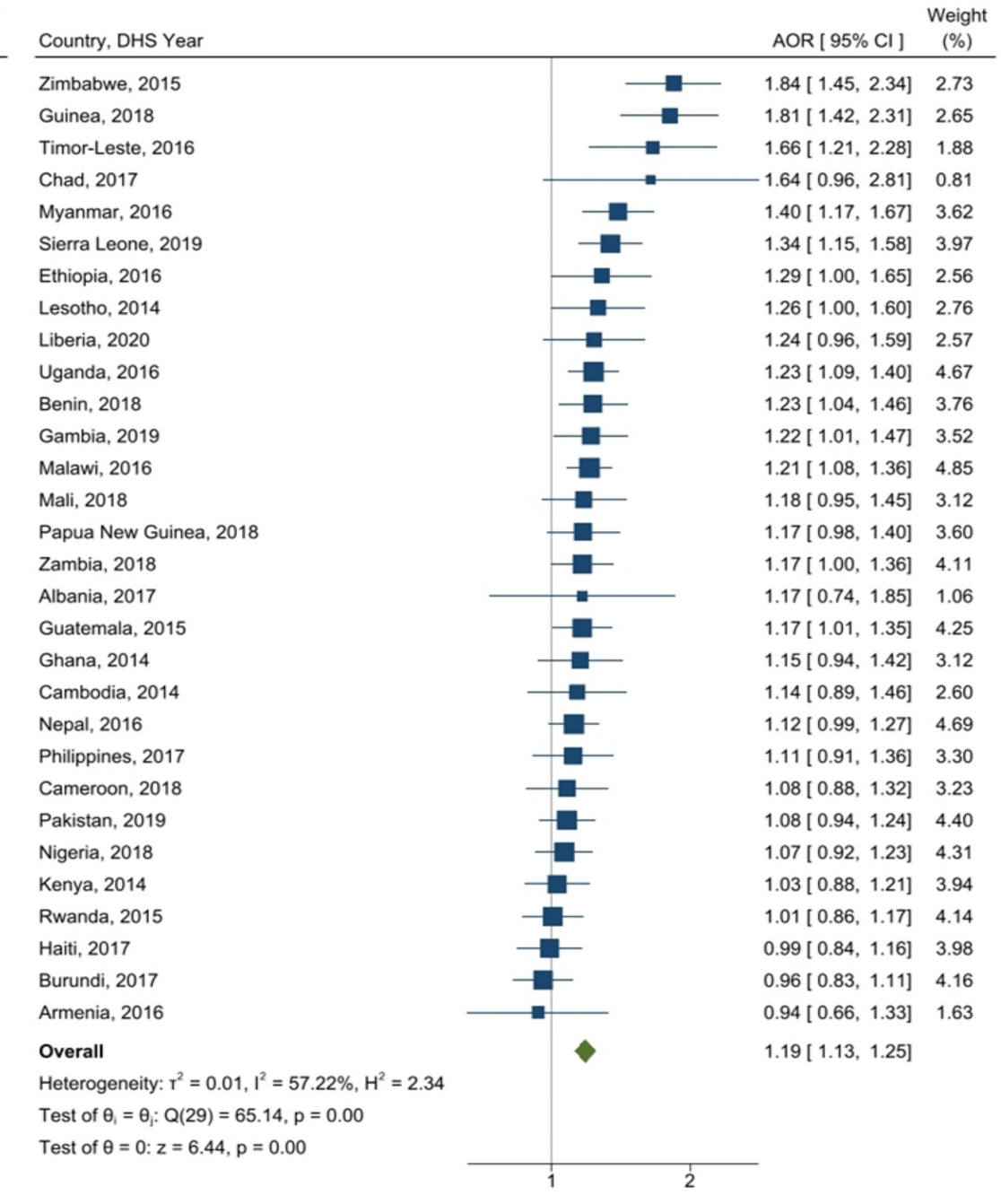
[1]*UOR = unadjusted odds ratios; AOR = adjusted odds ratios*

4.3.9 The joint household decision-making domain

Figure 4. 8 shows the results of the meta-analysis of cross-national variation and the pooled estimates of OR for the association between joint household decision-making domain and modern contraceptive use. Women who made decisions jointly had slightly increased odds of using modern contraceptives compared with those who made decisions alone. In the pooled UOR, women who made household decisions jointly with their male partners (considered more empowered) had a 36% higher odds of using modern contraceptives compared with those who did not (less empowered) and heterogeneity was considerable (95% CI: 1.28 – 1.40, I^2= 83.0%). For the pooled AOR, women's empowerment on this domain was associated with a 19% increase in the odds of using modern contraceptives and there was moderate heterogeneity (AOR = 1.19, 95% CI: 1.13 – 1.25, I^2= 57.2%).

Figure 4.8 Meta-analysis of cross-national variation in the association between joint household decision-making and modern contraceptive use[1]





[1]*UOR = unadjusted odds ratios; AOR = adjusted odds ratios*

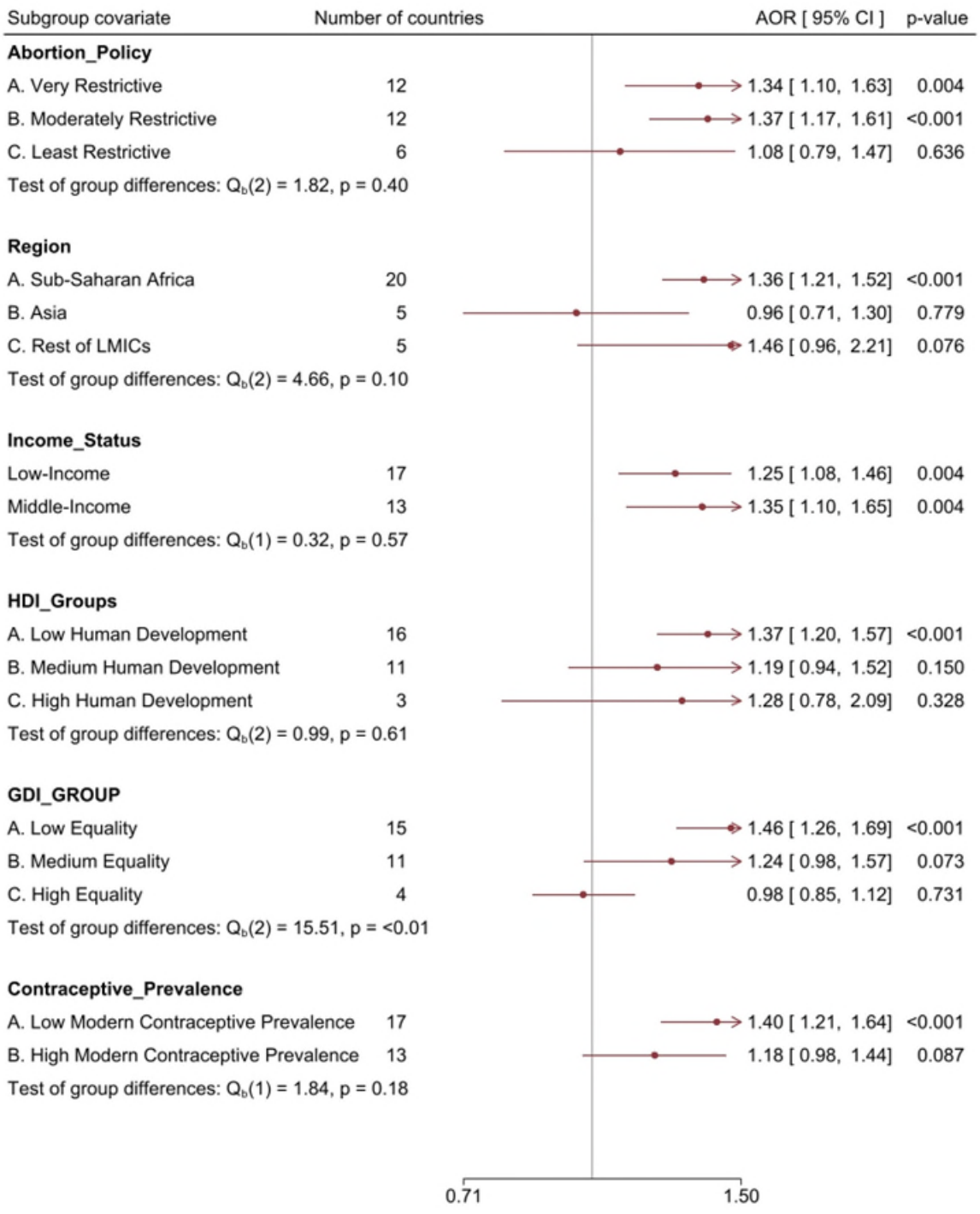
4.3.10 Subgroup analysis

4.3.10.1 Woman-alone empowerment index

Figure 4. 9 shows the results of the analysis for the association between the woman-alone empowerment index and modern contraceptive use for the subgroups: national abortion policy, the geographical region, income status, HDI, GDI, and modern contraception prevalence. There was evidence that modern contraceptive use differed by GDI groups (p-value < 0.01) with the association between women's empowerment and modern contraceptive use being stronger in countries with greater gender disparity (lower GDI). Compared with women in the lowest quintile, the AOR among women in the highest quintile in countries with the low equality group was 1.46 (95% CI: 1.26 – 1.69) while the corresponding AOR for medium and high equality groups was 1.24 (95% CI: 0.98 – 1.57) and 0.98 (95% CI: 0.85 – 1.12).

There was no evidence that modern contraceptive use between women in the highest and lowest quintiles of women's empowerment differed significantly by the country's abortion policies, geographical region, socioeconomic status, HDI groups or modern contraceptive use prevalence.

Figure 4.9 Subgroup analysis for the association between the woman-alone empowerment index and modern contraceptive use



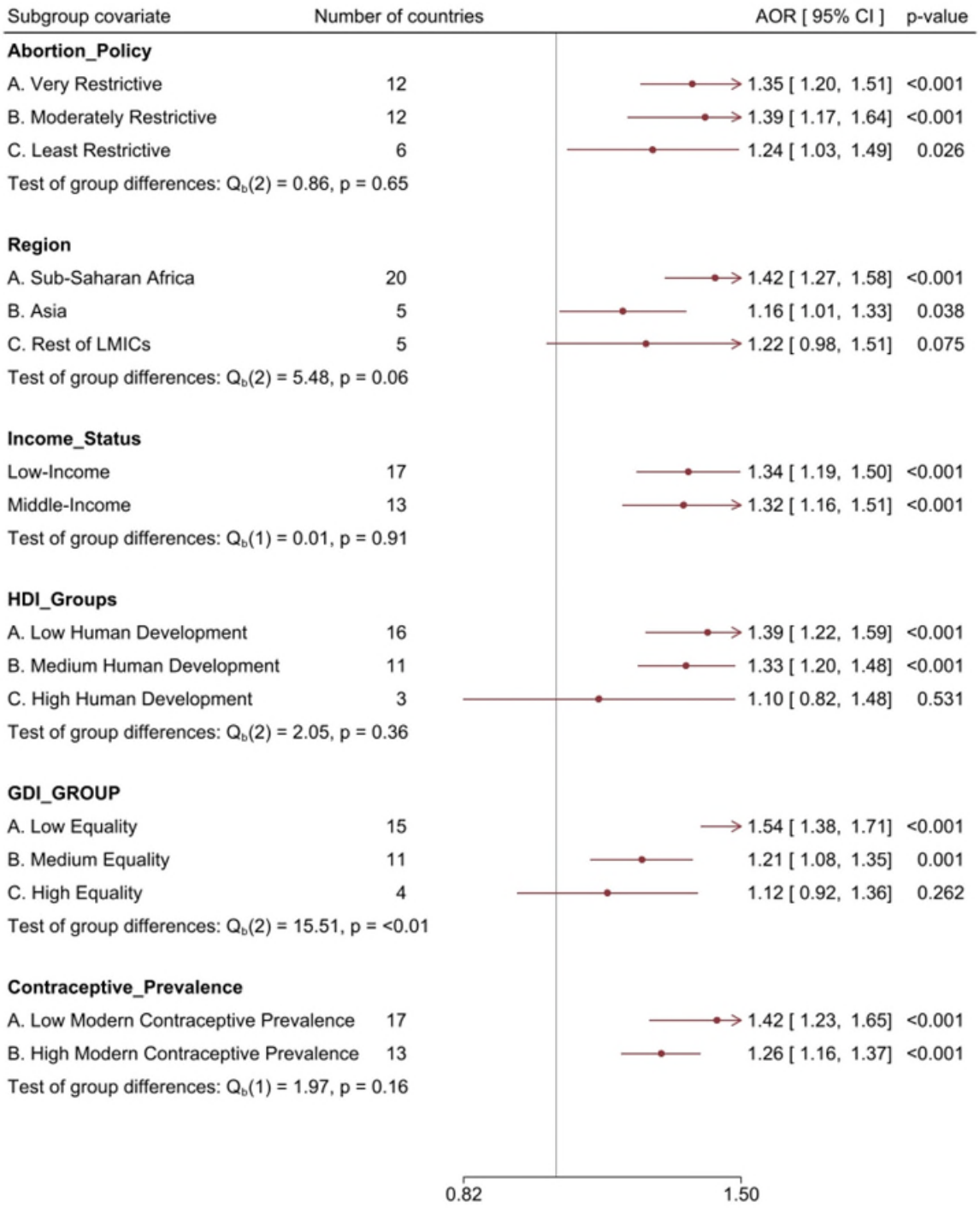
4.3.10.2 Joint empowerment index

Figure 4. 10 shows the results of the analysis for the association between the joint empowerment index and modern contraceptive use for the subgroups: national abortion policy, the geographical region, income status, HDI, GDI, and modern contraception prevalence. Similar to the woman-alone empowerment index, there was evidence that modern contraceptive use differed by GDI groups (p-value <0.01) with the association between women's empowerment and modern contraceptive use being stronger in countries with greater gender disparity (lower GDI). Compared with women in the lowest quintile of the joint empowerment index, the AOR among women in the highest quintile in countries with low equality was 1.54 (95% CI: 1.38 – 1.71) whereas the corresponding AOR for medium and high equality groups was 1.21 (95% CI: 1.08 – 1.35) and 1.12 (95% CI: 0.92 – 1.36).

There was weak evidence that modern contraceptive use between the two empowerment quintiles differed by geographical regions (p = 0.06). The highest AOR were observed in SSA (AOR = 1.42, 95% CI: 1.27 – 1.58) followed by rest of LMICs (AOR = 1.22, 95% CI: 0.98 – 1.51) with the lowest AORs observed in Asia (95% CI: 1.01 – 1.33). The AORs for the rest of the LMICs were not statistically significant.

There was no evidence that modern contraceptive use between women in the highest and lowest quintiles of empowerment differed by the country's abortion policies, socioeconomic status, HDI groups or modern contraceptive use prevalence.

Figure 4.10 Subgroup analysis for the association between the joint empowerment index and modern contraceptive use



The details of individual subgroup analysis for each covariate and the indices and the domains including the individual countries included and subgroups with level of heterogeneity (I^2) are included in **Appendix C.16 – C.51.**

4.3.11 Results of sensitivity analysis

The leave-one-out sensitivity analysis did not reveal any outlier or overly influential countries. Therefore, the analysis was conducted without removing any country. The details of the sensitivity analysis are in **Appendix C.52 – C.57.**

4.4 Discussion

The analysis showed that women's empowerment was associated with modern contraceptive use among a sub-sample of married or cohabiting women in the DHS study population from the 30 LMICs. There was evidence that both indices of women's empowerment and three of their domains (reproductive health decision-making, and the household decision-making domains) were positively associated with using modern contraceptive use. There was no observed association with the domain attitudes towards domestic violence. However, while the pooled results showed an overall positive association between the empowerment indices and modern contraceptive use, there was marked heterogeneity among the 30 countries for the effect of both indices and the individual domains. Subgroup analysis suggested that the association between both women's empowerment indices and using modern contraceptives differ by GDI with gender parity, suggesting that empowerment is important for modern contraceptive use in countries with a lower gender parity.

The findings in this study show that the association between women's empowerment is variable between countries and the different domains of women's empowerment, consistent with previous studies examining the association between women's empowerment and modern contraceptive that also found the association to be mixed. For example, while several studies have shown that empowered women are more like to use modern contraceptive for family planning [261, 267–273], others have found no evidence of such an association[268, 275, 277, 278]. In contrast, some studies have shown that there was decreased use of modern contraceptives among the more empowered women

compared with less empowered women[270, 275, 276]. The inconsistency in the findings was also shown by Prata *et al* (2017) whose systematic review showed that the association between women's empowerment and family planning in LMICs was complex and inconsistent[279]. For example, their study showed that more than 50% (122) of the 223 analyses in the included articles reported a null association between current use of modern contraceptives and women's empowerment, 96 analyses reported positive associations while five analyses reported negative associations[279]. However, they also found that different studies and analyses used different variables to measure women's empowerment including single proxy variables such as age, employment status, education, or socioeconomic status while others used different domains such as mobility, sexual and reproductive health decision-making, household decision-making or composite domains[279]. Moreover, such tools were not validated. Thus, the variability in the findings may in part be a result of use of varying and unvalidated tools to measure women's empowerment. While the analysis reported here employed a well-validated tool for the DHS data from the 30 countries included in the analysis, there was marked heterogeneity for both indices and their domains which was not fully explained by the subgroup or sensitivity analyses. However, subgroup analyses are usually underpowered and as a consequence, risk failing to detect any group differences when such do in fact exist[144–148]. It is also possible that some unmeasured factors such as religion or cultural beliefs could explain the heterogeneity[306]. For example, while modern contraceptive prevalence was less than 10% in both Chad and Albania, women's empowerment was more important in Chad than in Albania.

The pooled AOR for the woman-alone and joint empowerment indices were similar: 1.30 for woman-alone empowerment index and 1.33 for the joint empowerment index. Some studies, using the DHS data, have found evidence that joint decision-making was more strongly associated with uptake of modern contraceptive use and other sexual and reproductive health services than woman-only decision-making[265, 268, 274, 276, 307].

For example, a study in Pakistan using the DHS showed that women who made joint decisions (with the male partner) were 1.84 times more likely to use modern contraceptives compared with women who made decisions alone[268]. Similarly, in Zambia, women-alone decisions were associated with a 28% decrease in the odds of using modern contraceptives compared with households in which decisions were made jointly[307]. The increased odds of the association between women's empowerment and modern contraceptive use for joint decision-making compared with woman-alone decisions may indicate increased economic, social, and psychological support from male partners[1]. In some societies where male partner's consent may be required before a woman can access and use contraception, support of the male partner could make access easier[34]. Studies show that support from male partners leads to better communication and greater involvement of women in sexual and reproductive health services including modern contraceptive use[308, 309]. These findings suggest that male partner involvement in family planning may lead to increased uptake of modern contraceptives[310]. Some modern contraceptives such as the standard days methods, male condoms and sterilisation necessarily require male partners cooperation and participation[285]. However, it is also possible that some joint decisions are as a result of coercion, threats, force, intimidation, or blackmail[1].In this study, gender parity was found to moderate the effect of women's empowerment and contraceptive use, which indirectly suggests perhaps that overall gender equality is more important than joint decision-making.

The analysis reported here found no overall evidence of association between women's attitudes towards domestic violence and modern contraceptive use in the 30 countries, with insignificant heterogeneity. These findings are consistent with other studies that show no evidence of an association between attitudes towards domestic violence and modern contraceptive use[268, 275, 277, 278]. In the analysis here, the distribution of women's attitudes towards domestic violence was skewed, with the distribution centred on the

extreme upper scores of non-approval of domestic violence. This is unsurprising given that most women in this analysis did not approve of domestic violence. This lack of population heterogeneity is likely to explain the lack of the association between contraceptive use and this domain. The other domains were all associated with modern contraceptive use with varying degrees of heterogeneity, again highlighting the complex relationship between women's empowerment and other potential determinants of modern contraceptive use in different settings[279].

The subgroup analysis showed that only GDI could explain some of the heterogeneity between empowerment and modern contraceptive use for both indices but not the domains. As mentioned above, the results show that increased gender parity was associated with decreased modern contraceptive use for the same level of women's empowerment. Thus, in countries with very high gender parity, women's empowerment as a factor determining modern contraceptive use appears less relevant, possibly because the majority of the women in such countries are already empowered as evidenced by gender parity. In this analysis, the association between women's empowerment and modern contraceptive use was not significant for the "high equality group" for both indices for the same level of women's empowerment. While results need to be interpreted with caution because the high equality group had only four countries which could result in spurious or chance findings[145, 147], gender equality and women's empowerment are intrinsically linked and are components of SDG 5[149, 311]. There was no moderation effect observed with other structural factors such as abortion policies, regional differences, socioeconomic status, HDI and country-level prevalence of modern contraceptive use in the study population. However, these findings should also be interpreted with caution as subgroup analysis is usually underpowered to detect subgroup differences in the presence of considerable heterogeneity and low subgroup numbers even if in reality such differences exist[145–148].

The relationship between women's empowerment and modern contraceptive use was confounded by other factors such as the woman's age, her education level education, household socioeconomic status, place of residence, male partner's age and education level to varying degrees in different countries. While in the majority of countries, there was evidence of positive confounding, negative confounding was observed in Nepal and Cambodia with the woman-alone empowerment index and in Albania with the joint empowerment index suggesting that the presence of other factors such as education may mean that women's empowerment is less necessary in accessing modern contraception[312]. Conversely, low educational attainment and low socioeconomic status may hinder women's access to modern contraceptives even if they are empowered. Thus, the relationship between women's empowerment and modern contraceptive use is complex and multifactorial and varies from country to country suggesting there are other factors at play which may be important, for example education as explained above. These findings are consistent with other studies that have shown that factors other than empowerment, for example, several sexual and reproductive health, demographic, social, and economic factors influence women's need for and use of modern contraceptives in LMICs[247, 258–266].

4.4.1 Strengths and limitations

The analysis has several strengths. First, it employed two unique empowerment indices that have been validated premised on the understanding that women's decisions taken alone may not necessarily imply that the woman is more empowered than those women who make decisions are jointly with their male partner. Second, data was used from multiple countries in which the indices and their domains have been validated. Third, the analysis used a two-level analytical method involving analysis of empowerment at the individual-level and country-level. This ensured that the associations between each empowerment index and modern contraceptive use at the individual level for each country was not masked by merging all countries together.

Despite these strengths, the analysis has some limitations. First, due to the cross-sectional nature of the DHS data, the findings cannot necessarily be considered causal. Moreover, the DHS asks questions covering the preceding five years, increasing the possibility of recall and reporting bias. For example, “socially undesirable” responses to questions about attitudes towards domestic violence and reproductive health decision-making – that are seen to justify domestic violence or non-consensual sex – are likely to be underreported by women in the DHS either because they cannot recall accurately or because of social desirability bias as the data are directly collected by data collectors. This underreporting leads to a misclassification with a left- or negatively skewed distribution, with more women scoring higher on these domains and hence “more empowered” than they really are, according to the empowerment indices used here. The resulting misclassification attenuates the observed association between the exposure and the outcome[313, 314]. As observed with the attitudes towards domestic violence, such skewed data results in a lack of within-group heterogeneity, which is likely to lead to an attenuation or lack of observed association between the exposure and the outcome. Because of the cross-sectional nature of the data, it was inappropriate to conduct mediation analysis to explore mechanisms or pathways through which women’s empowerment may influence abortion. Second, categorising the exposure variable (into quintiles for the indices) may have resulted in loss of power and within group variability which might have masked some of the real differences between the different empowerment scores for women[291].Third, the marked heterogeneity observed with the indices and the domains means that the results need to be interpreted with caution as the subgroup analyses did not explain much of the variation. However, the subgroup analysis is inherently underpowered to detect group differences, especially in the presence of significant heterogeneity, fewer countries in each group and the imbalance between the number of countries in each group. Furthermore, several countries showed a lack of evidence of association between women’s empowerment and modern contraceptive use. Thus, it may not be possible to extrapolate the positive associations to these settings

although a random-effects model was fitted in which enables the findings to be generalised to other settings although to confirm the generalisability, it is important to replicate the analysis in countries not included in this analysis.

4.4.2 Recommendations and conclusion

This study suggested that despite a complex relationship between women's empowerment and modern contraceptive use, women's empowerment was positively associated with modern contraceptive use. Joint decision-making has the potential to improve modern contraceptive use, although the effects of joint decision-making were only marginally higher than woman-alone decision-making. The results also demonstrated that GDI, a society-level index of gender equality moderated the effect of women's empowerment on modern contraceptive use. In societies where women have opportunities equal with those of men, the effects of women's empowerment may be attenuated. However, in societies where women still have limited opportunities compared with men, women's empowerment at an individual level appears to be an important factor in enabling modern contraceptive use.

The findings suggest that there is need to empower women to increase their autonomy in decision-making with regards to modern contraceptive use and other SRH services in LMICs as well as achieving gender parity at a societal level, which is a target of the specific SDGs[149]. There is also a need to increase male partner's participation in family planning campaigns to improve their knowledge, and thus acceptance of modern contraceptives to facilitate joint decision making. Further research is needed to understand the mechanisms or pathways through which women's empowerment leads to increase the use of modern contraceptives in LMICs.

Chapter 5: : INVESTIGATING THE ASSOCIATION BETWEEN WOMEN'S EMPOWERMENT AND ABORTION IN LOW- AND MIDDLE-INCOME COUNTRIES

5.1 Introduction

The WHO defines induced abortion as "termination of pregnancy prior to 20 weeks of gestation"[4]. An abortion may be spontaneous (also called a miscarriage) or induced[4]. The latter is the focus of this chapter. Unintended pregnancy is the single biggest risk factor for induced abortion[8, 14]. While a third of all pregnancies globally end in abortion, this increases to 61% for unintended pregnancies[8, 14]. Abortion rates are higher in low- and middle-income countries (LMICs) compared with high income countries[14]. However, there are also cross-national differences between countries within similar regions[14, 16].

Access to abortion is a fundamental human right[4]. However, women still face barriers to accessing safe abortion services, especially in LMICs[8]. Several sociodemographic, economic, individual, and societal factors influence the need for and access to abortion[1, 5, 31, 34, 40, 41, 315–321]. These include national abortion legal frameworks and policies, socioeconomic status, access to modern contraceptives, knowledge of and access to information about abortion services, woman's age, employment, religion, place of birth, intimate partner violence (IPV), number of children, marital status, fertility preferences, history and number of previous abortions, education level and male partner's factors such as age and education level[1, 5, 31, 34, 40, 41, 315–323]. The legal framework of a country may facilitate or hamper access to abortion services compelling women to seek clandestine and unsafe abortion services from unskilled providers which may result in complications including maternal death[1]. Wealthier and older women are likely to have the resources to access and use modern contraceptives which reduces the need for abortion[323] while abortion rates are generally higher among married or cohabiting

women compared with unmarried women again suggesting they have the necessary resources to access abortion services[322].

The systematic review (Chapter 2) showed that women's empowerment is an important factor in a woman's decision to terminate or keep a pregnancy[1]. A few studies have empirically explored the association between women's empowerment and abortion with mixed findings[183, 247, 275, 321, 324, 325]. Four cross-sectional studies exploring women's empowerment and abortion in LMICs showed that empowerment was associated with increased odds of abortion[183, 247, 321, 324]. However, Lee-Rife (2010) using a randomised controlled trial showed that only the domain violence was associated with an increased odds of abortion while no association was observed with the domains: mobility, financial discretion and threats with abandonment/homelessness[183]. Mobility was defined in terms of whether the woman required permission to travel to the nearby market, access healthcare, access a religious venue, visit friends or relatives, to an entertainment venue or out of town or the village[183]. Financial discretion was defined in terms of whether the woman required permission to spend money on household items, child's healthcare, own healthcare, gifts, or jewellery for herself[183]. Threatened with abandonment/homelessness was constructed from whether the husband had threatened to abandon or throw the woman out of the house in the preceding 12 months while women's experience with violence was based on whether the woman had been slapped or beaten by the husband in the previous year[183]. Similarly, Heera *et al.* (2021) examining the relationship between women's empowerment and abortion among marginalised women in Nepal did not find any association between women's empowerment and abortion[275]. However, such studies used a variable set of measures and definitions for women's empowerment.

Another drawback of these studies is the measurement of the outcome, abortion. While it is widely known that abortion is underreported in many contexts, especially in LMICs with restrictive abortion laws[326, 327], only Lee-Rife (2010) used induced abortion

information from a randomised controlled trial while ascertaining the outcome but Seidu *et al.* (2018) and Agrawal (2012) used survey data that included self-reported stillbirths, miscarriages and abortions to define abortion[183, 247, 321, 324] introducing measurement bias. Additionally, these studies considered empowerment in terms of the woman alone whereas other studies have highlighted the important role of male partners in improving access to and uptake of sexual and reproductive health services including abortion, contraceptive use, antenatal care, skilled and institutional births, and postpartum care[1, 140, 184, 187, 328–330]. Finally, the aforementioned studies focused on limited settings. Lee-Rife (2010) and Agrawal (2012) focused on India alone, Heera *et al.* (2021) focused on Nepal while Seidu *et al*. (2018) focused on 27 sub-Saharan African (SSA) countries[183, 247, 321, 324] with none involving Latin America, Eastern Europe and Oceania or multiple countries across regions.

Thus, there is a need to use a validated tool that captures both woman-alone and couples' joint decision-making in multiple countries spanning many LMIC regions while minimising the risk of including stillbirths and miscarriages in the measure of abortion. While the direction of any potential association between women's empowerment and abortion is not clear, there is a possibility that this association might be mediated by contraceptive use. However, this was not possible to investigate in this thesis due to the cross-sectional nature of our dataset.

5.1.1 Aim

The aim of this study was to investigate the relationship between women's empowerment and abortion among women in LMICs using a validated tool for measuring women's empowerment.

5.2 Methods

5.2.1 Dataset and study population

The data used came from the DHS surveys in 29 LMICs. The Philippines was dropped from the analysis because data for the outcome variable, abortion, was not available. The study population was restricted to married or cohabiting women aged 15-49 years in 29 LMICs. The details including the study design, inclusion and exclusion criteria and the generation and validation of the empowerment indices and their domains including the dataset are described in Chapter 3.

5.2.2 Primary exposures

The primary exposure was women's empowerment measured using two indices: (i) woman-alone and (ii) joint decision-making indices and their four domains: women's attitudes towards domestic violence, reproductive health decision-making, and household decision-making domains one and two. The exposures were dichotomised using the median score with women in the 50th and above percentile considered more empowered and those in the lower (0-49th) percentile considered less empowered. Dichotomising, rather than using the scores as continuous data, was chosen for ease of interpretation. The relatively small number of outcomes for this measure in some countries meant that categorising in any other way (e.g., using quintiles) was not possible. The details of the construction of the validated indices and the domains are described in **Chapter 4.2.2**.

5.2.3 Outcome

The outcome was abortion. In the DHS survey, women are asked whether they have had a pregnancy that ended in a miscarriage, abortion, or stillbirth, that is, did not result in a live birth[198]. According to the DHS, abortion is defined as women who have ever had a pregnancy that ended in a miscarriage, abortion or stillbirth in the five years preceding the survey[198]. In this analysis, the analysis was restricted to pregnancies that terminated at

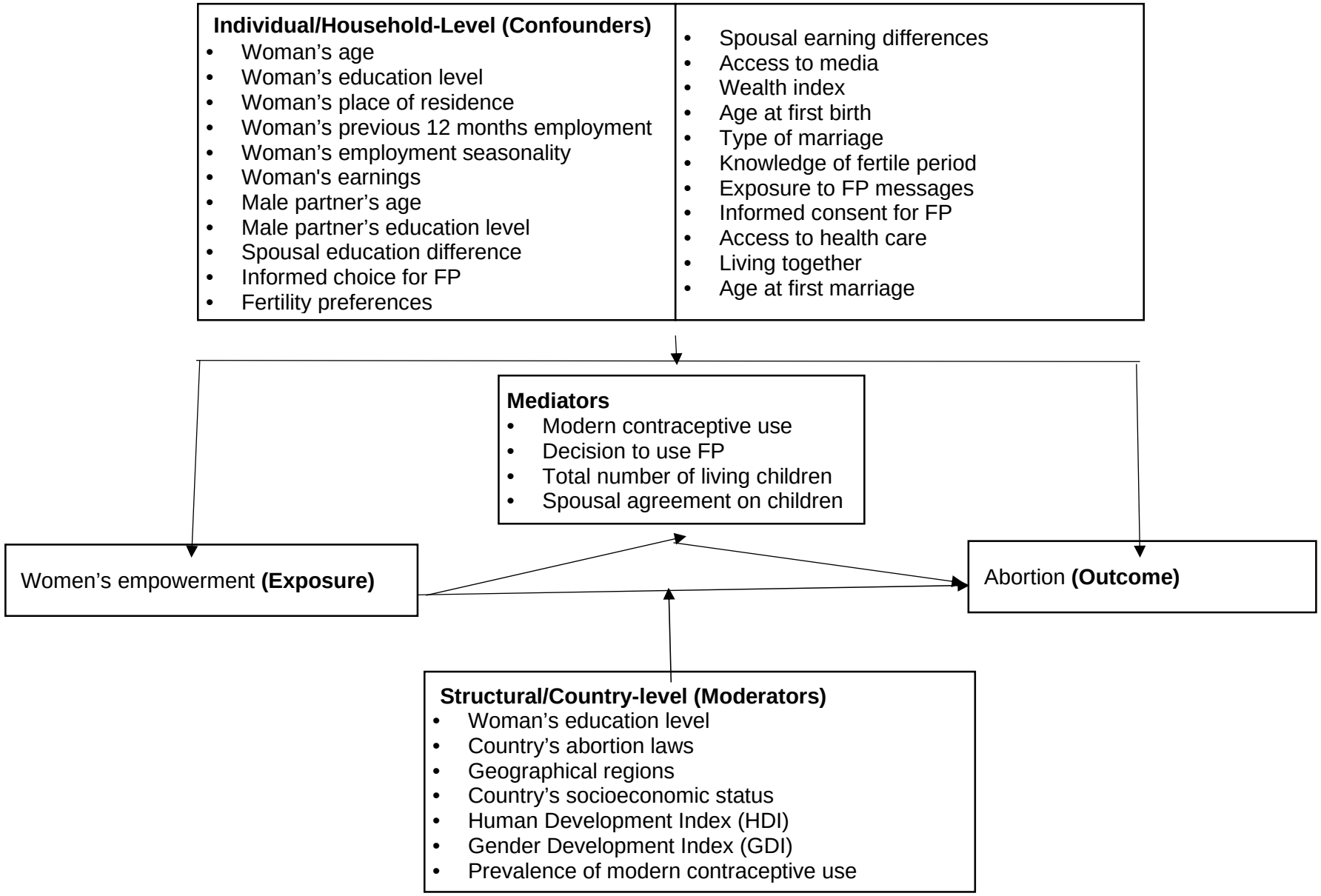
five months or less (as per WHO definition) to exclude potential stillbirths[4]. While this could include miscarriages, there is evidence that abortions are under-reported, and women are more likely to report abortions in early pregnancy as spontaneous pregnancy loss[326, 327]. The systematic review also showed that married women often report induced abortions as miscarriages for fear of their spouses[1].

5.2.4 Potential confounders, mediators, and moderators

Potential confounders, mediators and moderators were selected from the existing literature[1, 5, 31, 34, 40, 41, 315–321], and based on their availability in the dataset and theoretical relevance and represented diagrammatically using a Directed Acyclic Graph (DAG) in **Figure 5.1**. A variable was considered a potential confounder if existing evidence suggested that it was independently associated with both the outcomes and the exposure and thus was not on the causal pathway. If a variable was likely on the causal pathway between the exposure and the outcome, it was considered a mediator. A variable was considered a moderator if the effect of the exposure on the outcomes likely varied by that particular variable.

The details of the definitions and coding of these variables are described in **Chapter 4.2.4** and further details on coding are given in **Appendix C.1 – C.2.** The details of the regions by country are given in **Appendix C3.**

Figure 5.1 Directed acyclic graph for investigation of the relationship between women's empowerment index and abortion



5.2.5 Approach to the statistical analysis

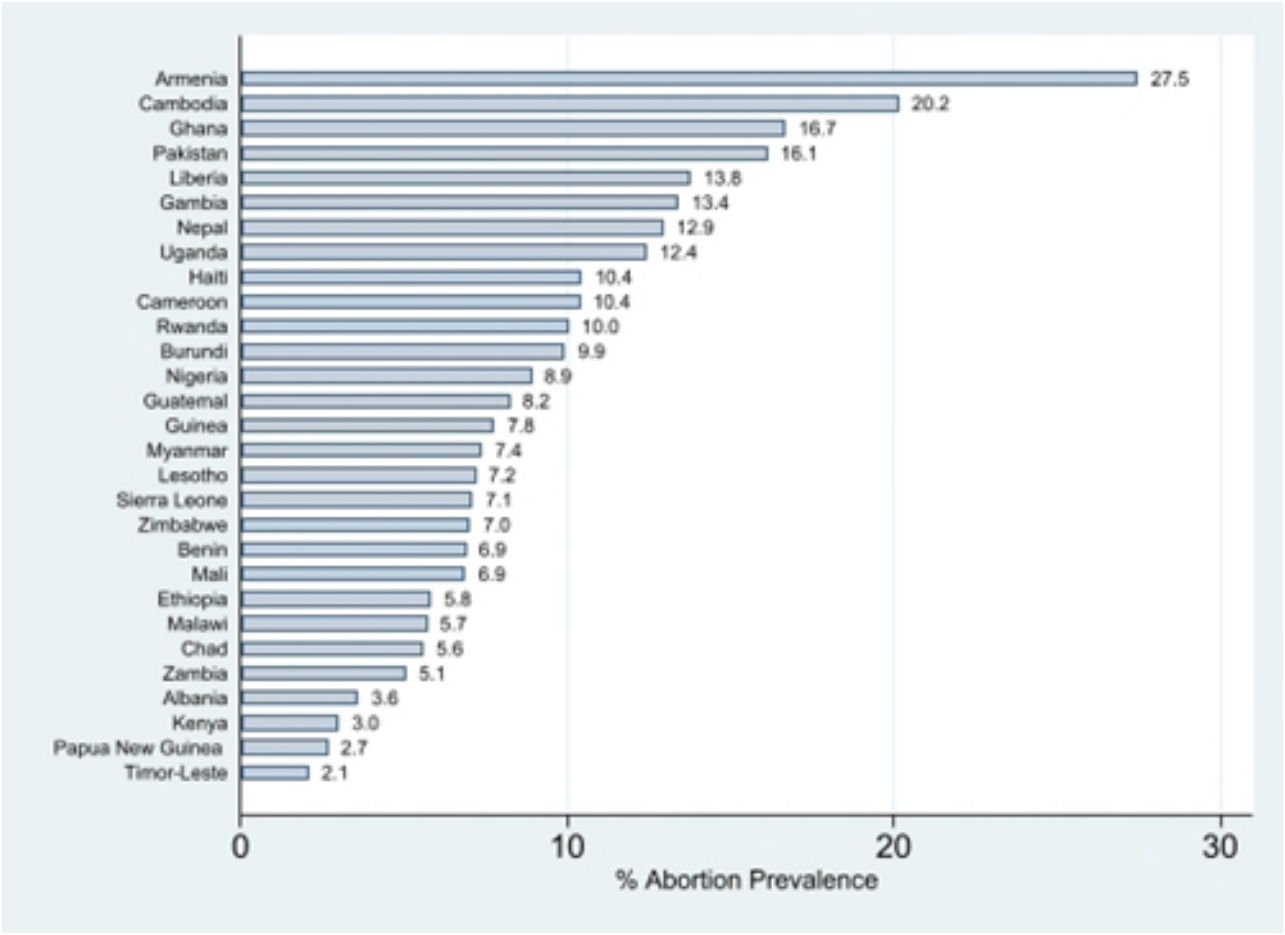
The data cleaning, descriptive statistics, logistic regression, investigating sources of heterogeneity, handling of missing data and sensitivity analyses are described in detail in **Chapter 4.2.5**. This analysis was conducted for the two indices and the four domains separately.

5.3 Results

5.3.1 Descriptive statistics

Figure 5.2 shows prevalence of abortion, as defined in this analysis, for each of the 29 countries. The overall prevalence was 9.2% (not shown in the Figure). The highest prevalence was observed in Armenia (27.5%) and Cambodia (20.2%) while Timor-Leste (2.1%), Papua New Guinea (2.7%), Kenya (3.0%) and Albania (3.6%) had the lowest prevalence. The other countries with a high prevalence were Ghana (16.7%) and Pakistan (16.1%).

Figure 5.2 Weighted abortion prevalence among 29 low- and middle-income countries



The distribution of the empowerment indices, their subdomains and the confounders are given in **Appendix C.4 – C.13.**

5.3.2 The unadjusted and adjusted association between women's empowerment and abortion

Table 5.1 shows the unadjusted odds ratios (UOR) and adjusted odds ratios (AOR) for the association between the two empowerment indices and abortion.

Table 5.1: Relationship between women's empowerment indices and abortion in 29 low- and middle-income countries[1]

Country	Woman-alone empowerment index								Joint empowerment index							
	Unadjusted				Adjusted				Unadjusted				Adjusted			
	OR[2]	95% CI		p-value	OR[2]	95% CI		p-value	OR[2]	95% CI		p-value	OR[2]	95% CI		p-value
Albania	1.31	0.98	1.74	0.066	**1.40**	**1.03**	**1.90**	**0.031**	1.00	0.75	1.33	0.975	1.13	0.83	1.53	0.457
Armenia	1.01	0.83	1.23	0.920	1.01	0.81	1.26	0.903	0.84	0.70	1.00	0.054	0.84	0.68	1.03	0.088
Benin	1.12	0.96	1.32	0.156	1.02	0.86	1.21	0.817	0.93	0.81	1.06	0.275	0.87	0.74	1.02	0.085
Burundi	0.93	0.78	1.11	0.417	0.94	0.78	1.13	0.511	0.90	0.76	1.07	0.231	0.93	0.77	1.11	0.398
Cambodia	**0.87**	**0.77**	**0.98**	**0.023**	**0.85**	**0.75**	**0.97**	**0.018**	**0.78**	**0.68**	**0.88**	**<0.001**	**0.78**	**0.68**	**0.89**	**<0.001**
Cameroon	**1.55**	**1.28**	**1.87**	**<0.001**	1.05	0.85	1.29	0.663	**1.44**	**1.20**	**1.72**	**<0.001**	1.01	0.81	1.26	0.933
Chad	**1.50**	**1.02**	**2.20**	**0.040**	1.21	0.81	1.80	0.350	1.32	0.89	1.95	0.161	1.13	0.74	1.71	0.575
Ethiopia	0.90	0.67	1.23	0.515	0.77	0.54	1.11	0.161	0.88	0.64	1.21	0.426	0.83	0.58	1.19	0.309
Gambia	1.03	0.85	1.25	0.768	0.93	0.74	1.16	0.499	1.05	0.87	1.27	0.626	0.97	0.78	1.21	0.774
Ghana	1.16	0.91	1.48	0.227	1.00	0.76	1.31	0.996	**1.27**	**1.01**	**1.59**	**0.037**	1.09	0.86	1.36	0.487
Guatemala	1.01	0.85	1.20	0.891	0.94	0.79	1.12	0.492	**0.73**	**0.62**	**0.87**	**<0.001**	**0.70**	**0.59**	**0.84**	**<0.001**
Guinea	1.20	0.95	1.50	0.121	1.02	0.79	1.32	0.870	1.19	0.94	1.51	0.148	1.01	0.79	1.30	0.949
Haiti	1.09	0.86	1.37	0.478	0.90	0.71	1.15	0.403	0.87	0.69	1.12	0.283	0.78	0.59	1.03	0.082
Kenya	1.13	0.87	1.45	0.357	1.13	0.84	1.51	0.423	0.98	0.75	1.27	0.856	0.99	0.75	1.31	0.968
Lesotho	1.15	0.80	1.65	0.455	1.16	0.77	1.73	0.480	1.03	0.73	1.46	0.874	0.93	0.63	1.37	0.705
Liberia	0.99	0.73	1.35	0.955	0.93	0.68	1.28	0.668	1.02	0.75	1.40	0.884	0.88	0.64	1.22	0.456
Malawi	1.08	0.89	1.31	0.454	1.04	0.84	1.28	0.725	1.11	0.91	1.35	0.299	1.07	0.87	1.32	0.515
Mali	**1.37**	**1.08**	**1.75**	**0.011**	1.26	0.97	1.63	0.084	**1.56**	**1.22**	**2.00**	**<0.001**	**1.42**	**1.09**	**1.85**	**0.011**
Myanmar	0.88	0.71	1.09	0.235	0.95	0.76	1.20	0.666	**0.75**	**0.60**	**0.93**	**0.009**	0.79	0.62	1.00	0.050
Nepal	1.00	0.85	1.18	0.978	0.91	0.76	1.08	0.274	1.00	0.87	1.16	0.969	0.86	0.73	1.02	0.092
Nigeria	1.00	0.88	1.13	0.984	**0.83**	**0.71**	**0.96**	**0.014**	0.96	0.84	1.08	0.483	**0.78**	**0.67**	**0.91**	**0.001**
Pakistan	**1.22**	**1.05**	**1.42**	**0.008**	1.04	0.88	1.23	0.610	**1.22**	**1.04**	**1.43**	**0.013**	1.02	0.86	1.21	0.843
Papua New Guinea	1.04	0.61	1.79	0.881	**0.63**	**0.41**	**0.97**	**0.038**	1.07	0.62	1.84	0.812	0.76	0.50	1.15	0.191
Rwanda	**0.82**	**0.68**	**0.98**	**0.026**	0.84	0.70	1.01	0.062	0.88	0.73	1.07	0.204	0.94	0.77	1.14	0.534
Sierra Leone	1.08	0.86	1.36	0.515	0.93	0.74	1.17	0.536	1.02	0.81	1.29	0.884	0.88	0.70	1.10	0.252
Timor-Leste	0.52	0.23	1.20	0.124	0.49	0.20	1.20	0.119	0.75	0.29	1.90	0.538	0.75	0.35	1.62	0.465
Uganda	1.12	0.96	1.32	0.156	0.99	0.84	1.17	0.884	0.93	0.81	1.06	0.275	**0.84**	**0.72**	**0.98**	**0.027**
Zambia	1.28	0.99	1.67	0.061	**1.33**	**1.01**	**1.75**	**0.046**	1.16	0.91	1.49	0.222	1.24	0.96	1.60	0.107
Zimbabwe	1.00	0.77	1.30	0.996	0.98	0.75	1.29	0.885	0.99	0.76	1.27	0.911	1.00	0.76	1.31	0.975

[1]*Baseline group less empowered women*

[2]*OR = odds ratios*

*Highlighted in **bold** are countries with statistically significant associations between empowerment and modern contraceptive use*

For the woman-alone empowerment index, univariable analysis demonstrated a positive association between empowerment and abortion in four countries (Cameroon, Chad, Mali, and Pakistan), that is, the odds of abortion were higher in the more empowered compared with less empowered group, and a negative association in two countries (Cambodia and Rwanda), i.e., the odds of abortion was lower in the more empowered compared with the less empowered group. However, after adjusting for confounders, a positive association was also observed in Albania and negative associations were observed in Cambodia, Nigeria, Papua New Guinea, and Zambia. For Albania, the woman's and male partner's education level and access to health care were found to be important confounders; the effect size and the level of significance of the AOR increased after adjusting for these factors suggesting negative confounding bias by these factors. Similarly, access to health care was a positive confounder in Mali, while in Pakistan, age and women's fertility preferences were positive confounders. Adjusting for confounders did not materially change the negative associations observed for Cambodia and Rwanda. However, a significantly lower odds of abortion in the more empowered compared with less empowered group was observed for Nigeria after adjusting for woman's age, education level and fertility preference, again suggesting negative confounding by these factors. A similarly lower AOR was observed for Papua New Guinea after accounting for woman's and male partner's education level, access to media, household socioeconomic status and access to health care.

For the joint empowerment index, unadjusted analysis showed a positive association with abortion in four countries (Cameroon, Ghana, Mali and Pakistan) while negative associations were observed in two countries (Cambodia and Guatemala). After adjusting for known confounders, the odds of abortion were observed to be higher in the more empowered compared with less empowered group in Mali alone. For Cameroon and Ghana, the confounders were women's education level, male partner's education level, and household socioeconomic status, while in Pakistan age and fertility preferences were

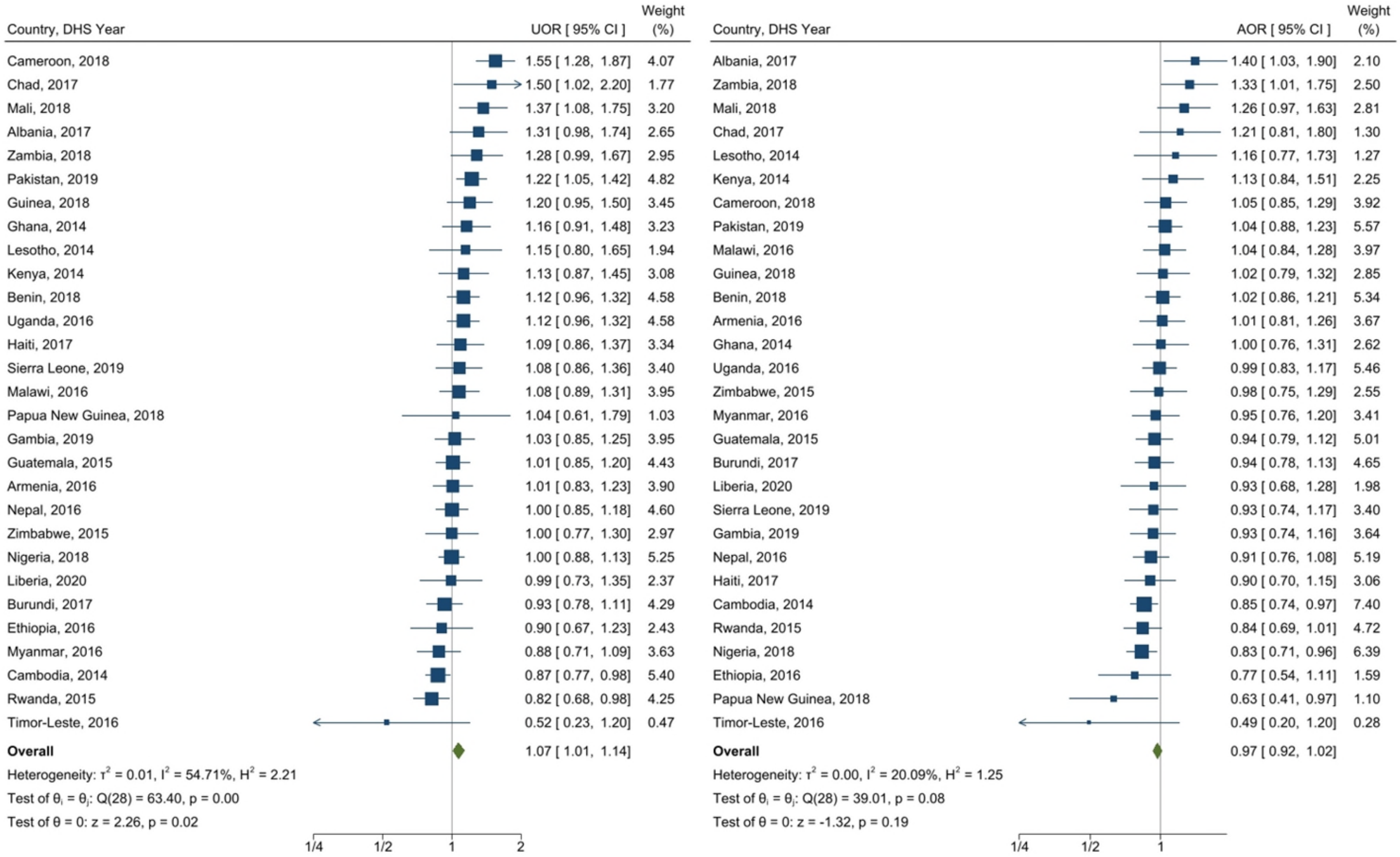
identified as the major confounders. In addition to Cambodia and Guatemala, lower odds of abortion in the more empowered group were also observed in Nigeria and Uganda after adjusting for known confounders including women's age and education level, male partner's education level, and household socioeconomic status, which thus appeared to have a negative confounding bias.

The tables showing the UOR and AOR for the four domains are given in **Appendix D.1** and **D.2.**

5.3.2.1 The woman-alone empowerment index

Figure 5. 3 displays the results of the meta-analysis of cross-national variation and the pooled OR for the association between woman-alone empowerment index and abortion. In the pooled UOR, women's empowerment was associated with a 7% increase in the odds of abortion with moderate heterogeneity (95% CI: 1.01 – 1.14, I^2 = 54.7%). However, after adjusting for confounders there was no evidence of an overall significant association between the woman-alone empowerment index and abortion and heterogeneity was insignificant (pooled AOR 0.97, 95% CI: 0.92 – 1.02, I^2 = 20.1%).

Figure 5.3 Meta-analysis of cross-national variation in the association between woman-alone empowerment index and abortion[1]

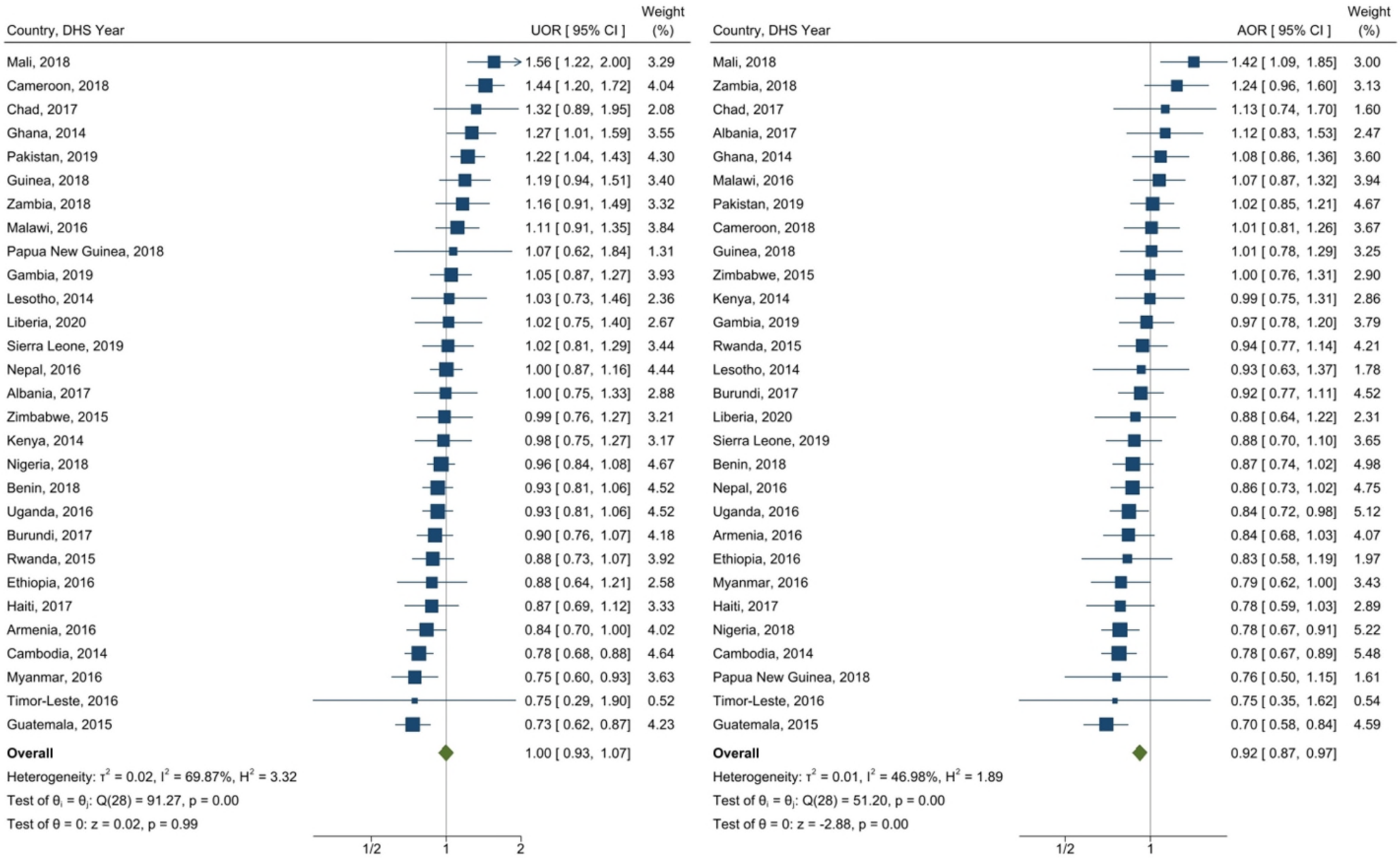


[1]*UOR = unadjusted odds ratios; AOR = adjusted odds ratios*

5.3.2.2 The joint empowerment index

Figure 4. 4 shows the results of the meta-analysis of cross-national variation and the pooled OR for the association between the joint empowerment index and abortion. There was no evidence that the joint empowerment index was associated with abortion from the meta-analysis of the unadjusted ORs and heterogeneity was moderate (UOR 1.00, 95% CI: 0.97 – 1.07, I^2= 70%) whereas in the pooled analysis there was evidence of an overall negative association between empowerment index two and abortion. The more empowered women had a statistically significant 8% decrease in the odds of abortion compared with the less empowered women and there was moderate heterogeneity (AOR 0.92, 95% CI: 0.87 – 0.97, I^2= 47%).

Figure 5.4 Meta-analysis of cross-national variation in the association between joint empowerment index and abortion[1]

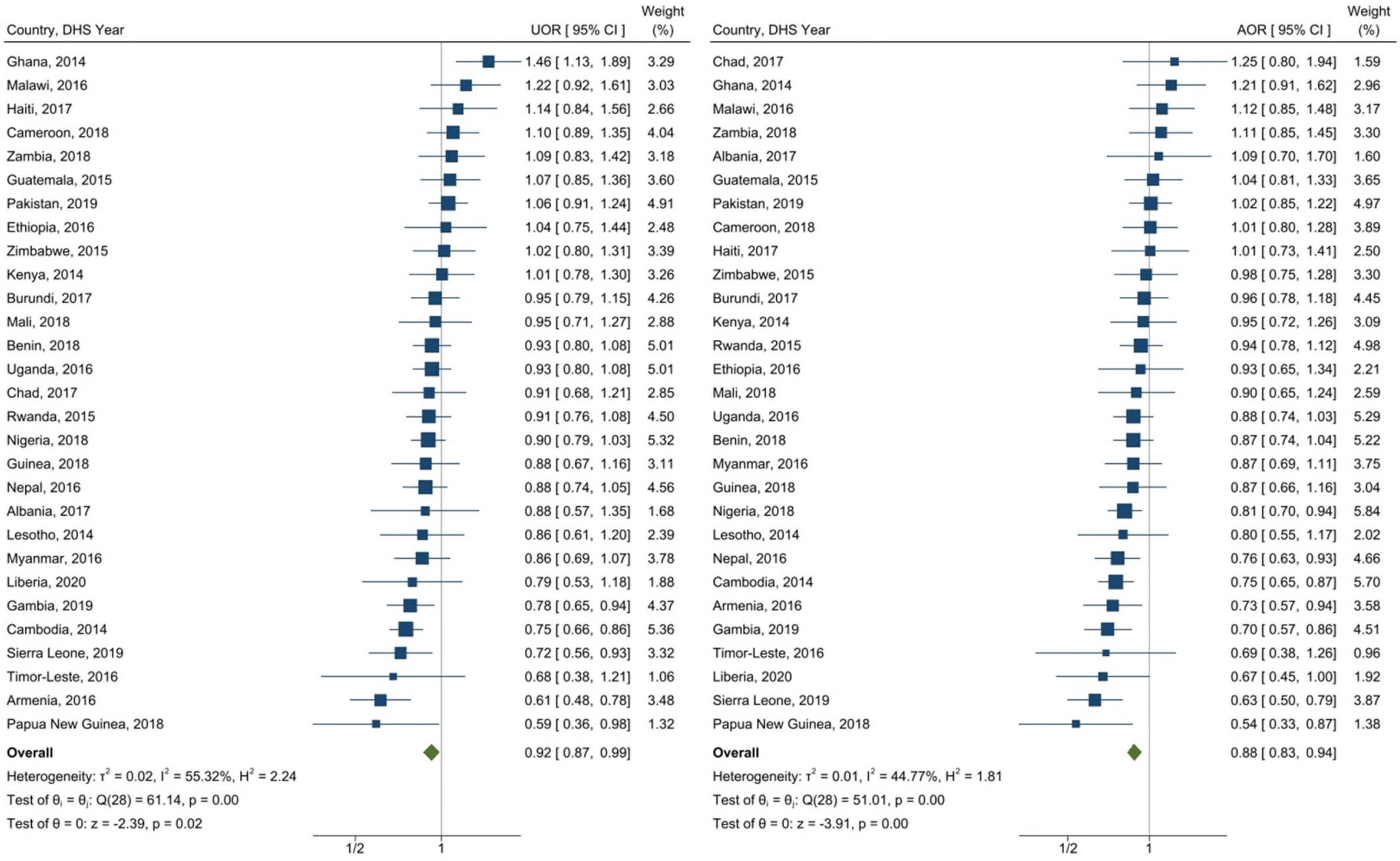


[1]*UOR = unadjusted odds ratios; AOR = adjusted odds ratios*

5.3.2.3 The attitudes towards domestic violence domain

Figure 5. 5 gives the results of the meta-analysis of country-country variation and the pooled OR for the association between attitudes towards domestic violence and abortion. Women who did not justify domestic violence were considered to be more empowered and were found to have lower odds of abortion compared with women who justified domestic violence with moderate heterogeneity (UOR 0.92, 95% CI: 0.87 – 0.99, I^2= 55.3%). The association was found to be even stronger having adjusted for confounders; a 12% decrease in the odds of abortion in the group that did not support domestic violence compared with those who found it justifiable in any of the questions and the heterogeneity was moderate (AOR 0.88, 95% CI: 0.83 – 0.94, I^2= 44.8%).

Figure 5.5 Meta-analysis of cross-national variation in the association between the domain women's attitudes towards domestic violence and abortion[1]

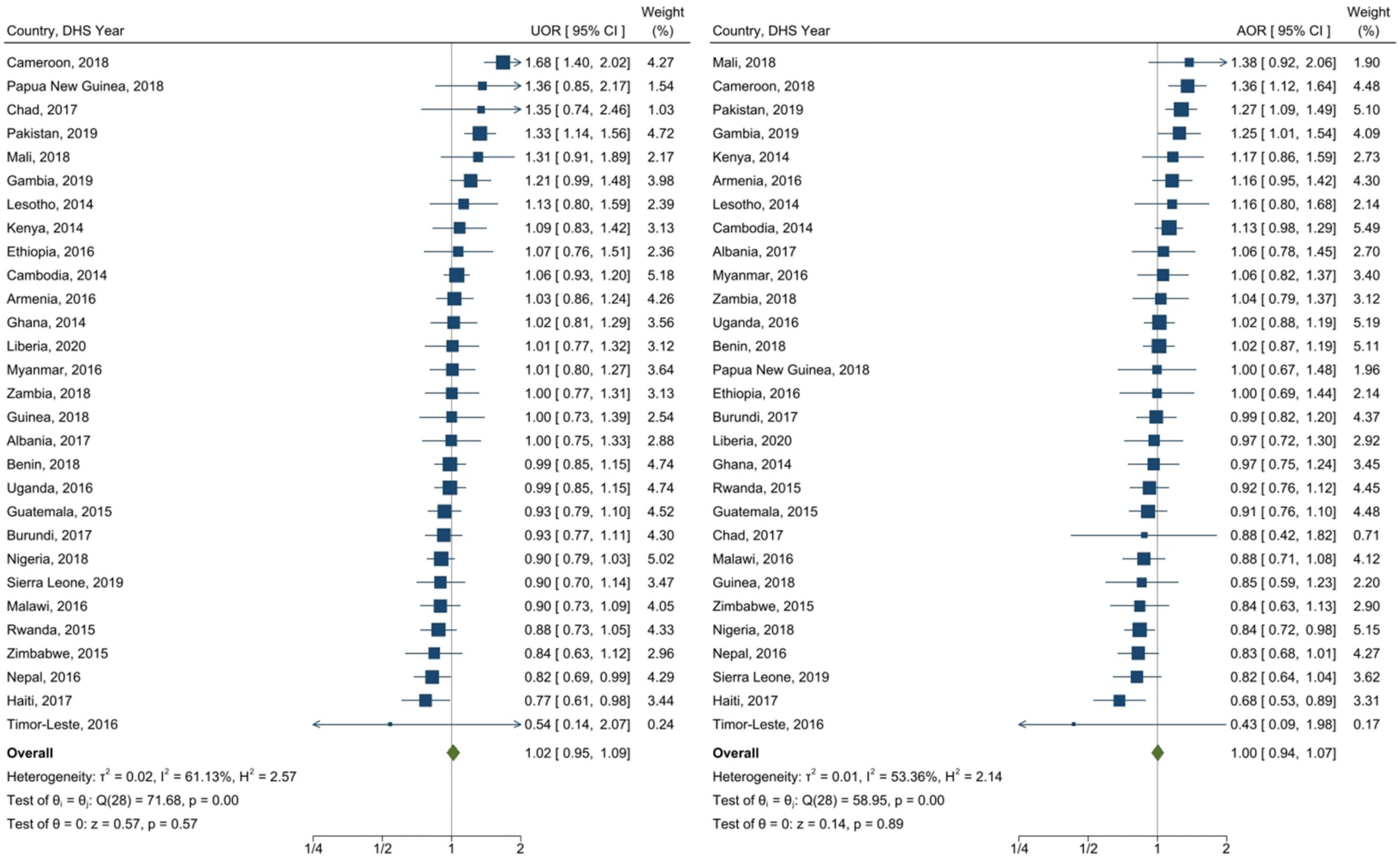


[1]*UOR = unadjusted odds ratios; AOR = adjusted odds ratios*

5.3.2.4 The reproductive health decision-making domain

Figure 5. 6 gives the results of the meta-analysis of cross-national variation and the pooled OR of the association between attitudes towards reproductive health decision-making and abortion. There was no evidence of overall statistically significant association between attitudes towards reproductive health decision-making and pregnancy termination for both the unadjusted odds ratios (UOR 1.02, 95% CI: 0.95 – 1.09, I^2 = 61.3%) and adjusted odds ratios (AOR 1.00, 95% CI: 0.94 – 1.07, I^2 = 53.4%). Heterogeneity was moderate for both the pooled UOR and the pooled AOR.

Figure 5.6 Meta-analysis of cross-national variation in the association between the domain women's reproductive health decision-making and abortion[1]

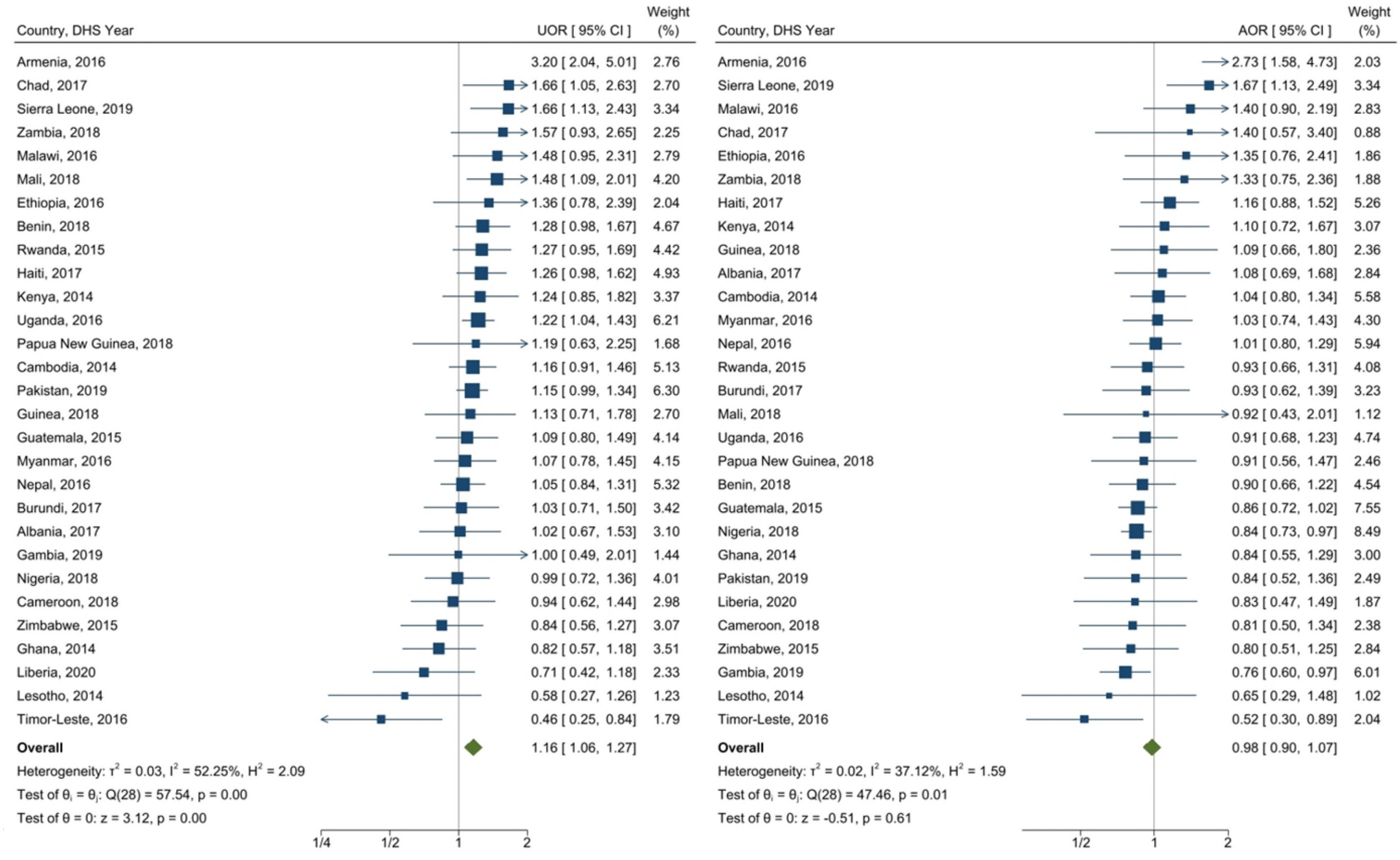


[1]*UOR = unadjusted odds ratios; AOR = adjusted odds ratios*

5.3.2.5 The woman-alone household decision-making domain

Figure 5.7 shows the results of the meta-analysis of cross-national variation and the pooled OR for the association between the domain woman-alone household health decision-making and abortion. In the pooled UOR, women's empowerment was associated with a 16% increase in the odds of abortion with moderate heterogeneity (UOR 1.16, 95% CI: 1.06 – 1.27, I^2 = 52.3%). However, after adjusting for confounding, there was no evidence of overall statistically significant association between women's empowerment woman-alone household decision-making domain and abortion with insignificant heterogeneity (AOR 0.98, 95% CI: 0.90 – 1.07, I^2 = 37.1%).

Figure 5.7 Meta-analysis of cross-national variation in the association between the domain woman-alone household decision-making and abortion[1]

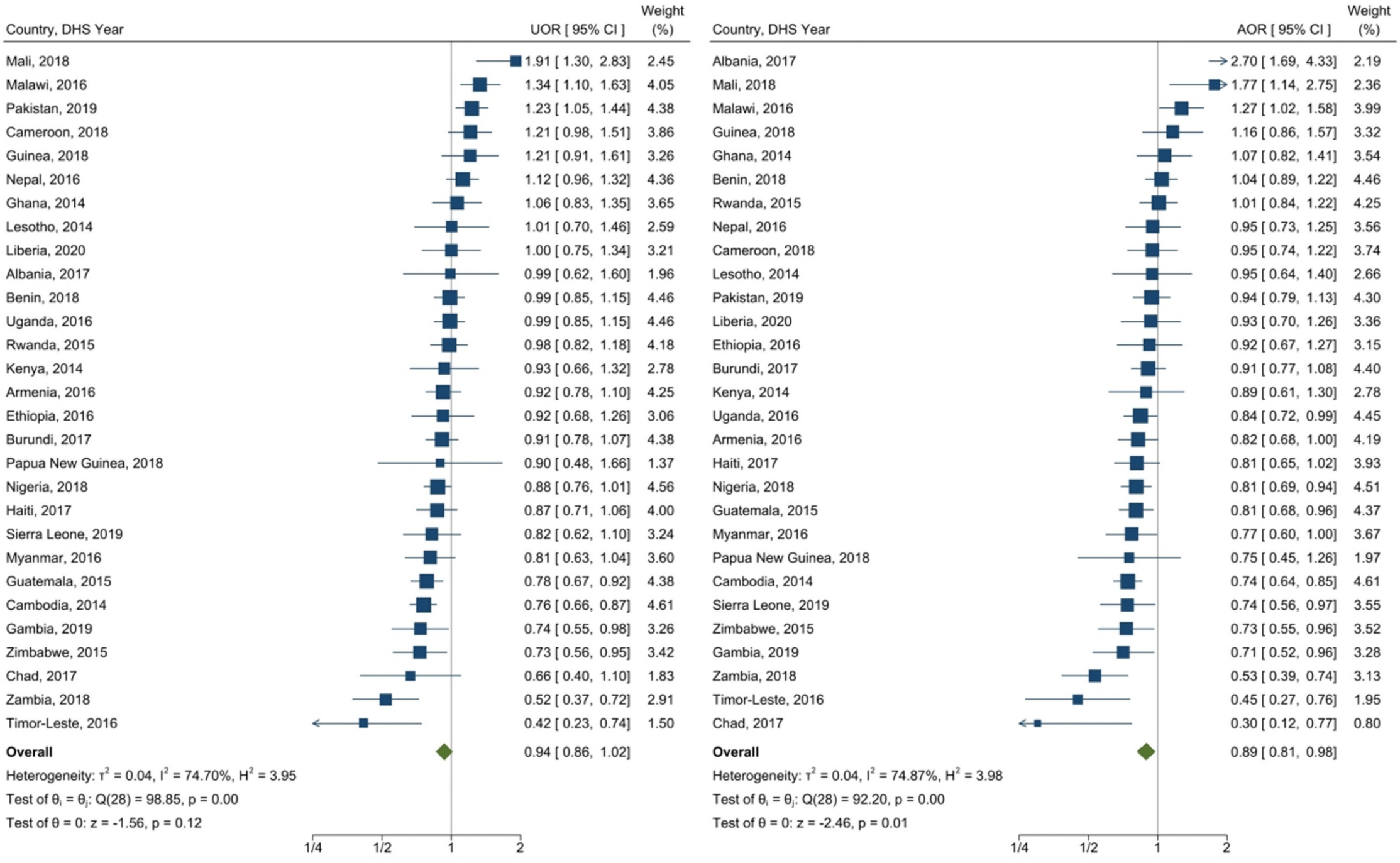


[1]*UOR = unadjusted odds ratios; AOR = adjusted odds ratios*

5.3.2.6 The joint household decision-making domain

Figure 5. 8 is a forest plot displaying the results of the meta-analysis of country-country variation and the pooled OR for the association between the domain joint household health decision-making and abortion. For the UOR, there was no evidence of an association between the joint household decision-making and abortion and there was moderate heterogeneity (UOR 0.94, 95% CI: 0.86 – 1.02, I^2= 74.7%) whereas after adjusting for confounding, empowerment was associated with an 11% decrease in the odds of abortion compared with the less empowered women for this domain and there was moderate heterogeneity (95% CI: 0.81 – 0.98, I^2= 74.9%).

Figure 5.8 Meta-analysis of cross-national variation in the association between the domain joint household decision-making and abortion[1]



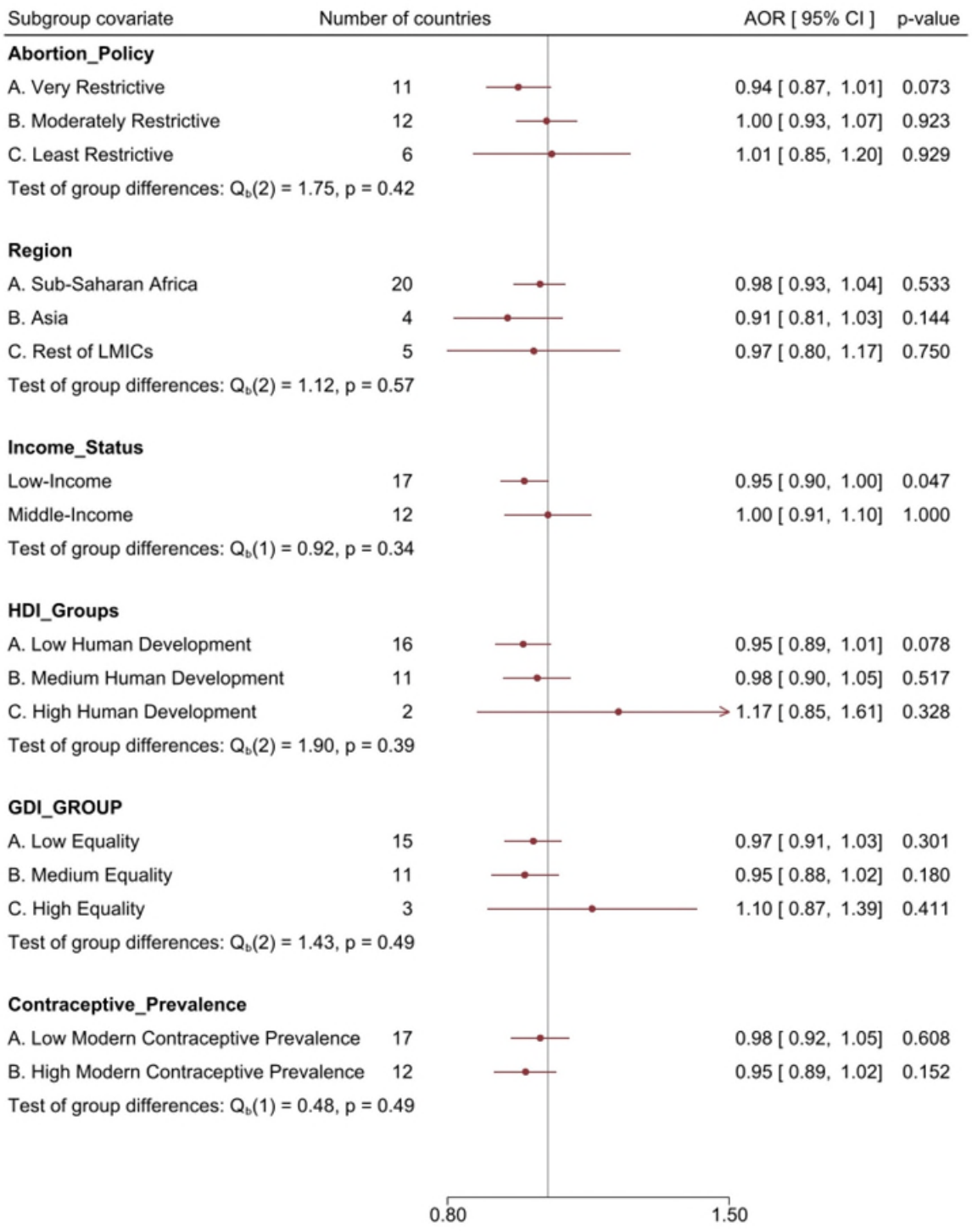
[1]*UOR = unadjusted odds ratios; AOR = adjusted odds ratios*

5.3.3 Subgroup analysis

5.3.3.1 Subgroup analyses for the woman-alone empowerment index

Figure 5. 9 shows the results of the subgroup analyses for abortion policy, the geographical region, income status, HDI, GDI and prevalence of modern contraceptive use and the association between the woman-alone empowerment index and abortion. There was no evidence that abortion varied between women in the upper and lower medians by the country's abortion policies, geographical region, socioeconomic status, HDI groups, GDI groups or modern contraceptive use prevalence.

Figure 5.9 Subgroup analysis for the association between woman-alone empowerment index and abortion

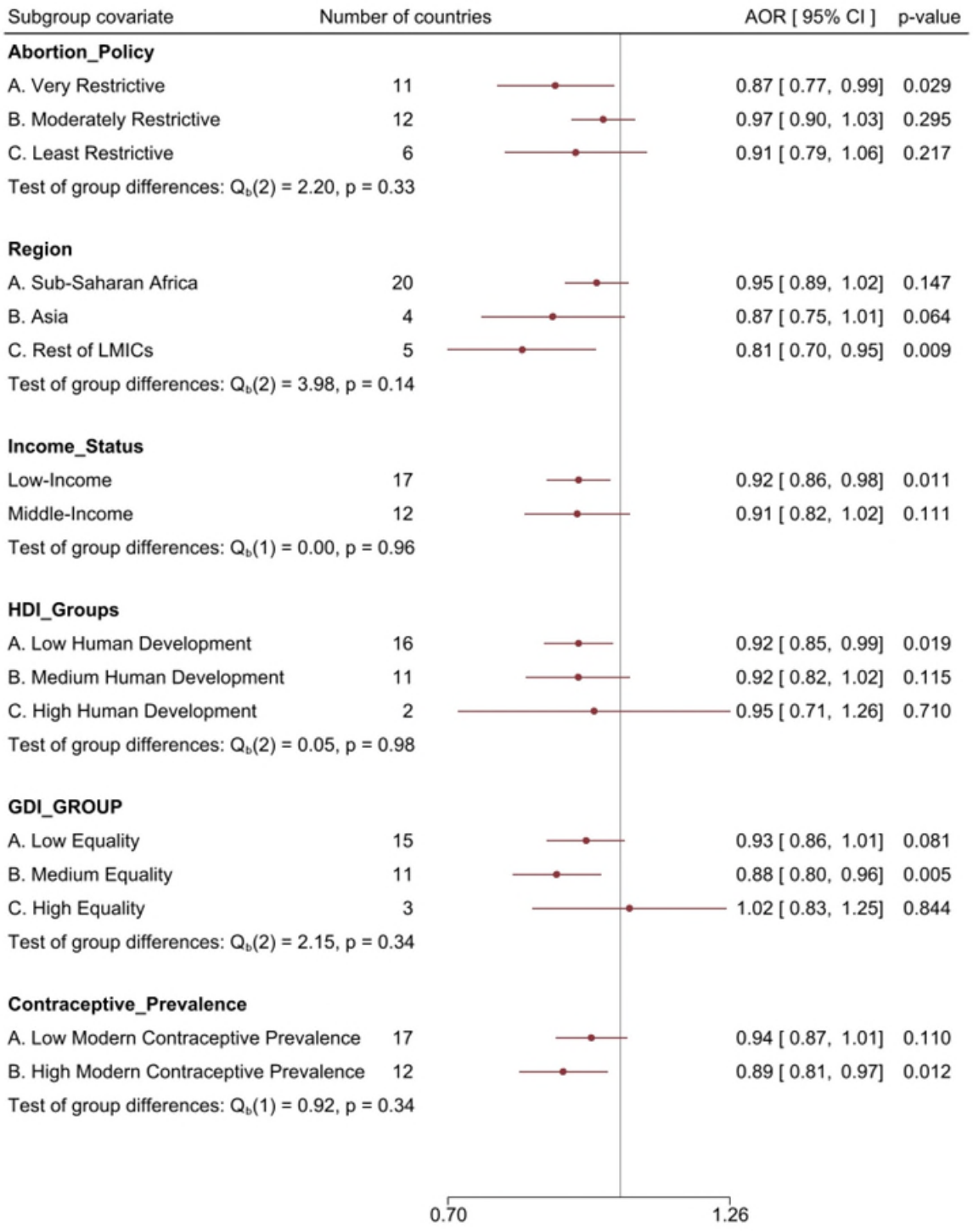


5.3.3.2 Subgroup analyses for the joint empowerment index

Figure 5. 10 shows the results of the subgroup analysis for the association between women's empowerment index two and abortion by abortion policy, the geographical

region, income status, HDI, GDI and prevalence of modern contraceptive use. There was no evidence that the odds of abortion between women in the more empowered and less empowered groups differed by the country's abortion policies, region, socioeconomic status, HDI groups, GDI groups or modern contraceptive use prevalence.

Figure 5.10 Subgroup analysis for the association between joint empowerment index and abortion



The details of individual subgroup analysis for each covariate and the indices and the domains including the individual countries included and subgroup I^2 are given in **Appendix D.3 – D.38.** There was no evidence that abortion differed by any of the covariates for the subgroup domains except for attitudes towards domestic violence for

which there was evidence of moderating effect by country's abortion policy (X^2 =4.81, degrees of freedom (df) =2, p = 0.09). The AOR for countries with very restrictive (AOR 0.83; 95% CI: 0.74 – 0.94, p=0.002) and least restrictive abortion policies (AOR 0.84; 95% CI: 0.73 – 0.98, p=0.023) were similar, showing a lower odds of abortion in more empowered compared with less empowered groups in both settings, while the results for the moderately restrictive settings were not statistically significant (AOR 0.95; 95% CI: 0.89 – 1.02, p=0.164).

5.3.4 Sensitivity analysis

The leave-one-out sensitivity analysis did not reveal any outlier or overly influential countries. Therefore, the analysis was conducted without removing any country. The details of the sensitivity analysis are given in **Appendix D.39 – D.44.**

5.4 Discussion

This analysis used two validated empowerment indices and their domains – the woman-alone and the joint empowerment indices – to explore the association between women's empowerment and abortion in 29 LMICs using the DHS datasets. The association between women's empowerment and abortion among women in the DHS study population from the 29 LMICs was inconsistent. While there was no evidence of an overall association observed for the woman-alone empowerment index, higher women's empowerment was associated with lower odds of abortion for the joint empowerment index. Two of the empowerment domains – attitudes towards domestic violence and joint household decision-making – were also negatively associated with abortion. Women who did not justify domestic violence were less likely to have an abortion than those who justified it and women who made household decisions jointly with their male partners were also less likely to have an abortion compared with women who made household decisions alone or whose male partners made those decisions for them. There was no evidence of an overall association for the other two domains – reproductive health decision-making

and woman-alone household decision-making. Subgroup analysis did not suggest any moderating effects for the two empowerment indices, but it suggested that the association between women's empowerment and the domain attitudes towards domestic violence may differ by a country's abortion laws. Women who did not justify domestic violence had statistically significant lower odds of abortion, similar in countries with very restrictive and least restrictive abortion laws compared with women who justified domestic violence.

The negative association with the joint empowerment index and the domain joint household decision-making observed in this analysis suggests there is an important role of male partner support and agreement in the women's realisation of sexual and reproductive health services[140, 187, 329, 331]. Male partner's support and concordance in decision-making has been shown to improve women's uptake of modern contraceptives[328, 332–335], thus reducing the risk of unintended pregnancies and hence the need for abortion[8, 14, 16, 241, 318]. Male partner's awareness of and support for modern contraceptive use has also been shown to be associated with an increased desire by women for contraception[332]. Supportive male partners may also provide financial support to enable women to access modern family planning methods[67, 328]. Conversely, lack of support and resistance from male partners has been associated with reduced uptake of modern contraceptive use in LMICs[328] as well as reduced uptake of other SRH services[330, 331]. A study exploring the global incidence of abortion and unintended pregnancies showed that the unmet need for modern contraception is lower among married or cohabiting women than among single, sexually active women, especially adolescents[8]. Thus, joint empowerment may lower the need for abortion by reducing unintended pregnancies. Although in this analysis there was no evidence of an independent association between the domain reproductive health decision making and abortion, male partner involvement and support is known to be associated with increased uptake of sexual and reproductive health services such as skilled birth attendance, institutional births and post-partum visit uptake[140, 187, 329, 331].

This analysis of DHS data showed lower odds of abortion among women who did not find domestic violence acceptable compared with women who said they did find domestic violence acceptable. This finding is in line with other studies that have linked women's experiences of domestic violence, especially intimate partner violence (IPV) to an increased risk of abortion[318, 336–340]. Women who denounce domestic violence are less likely to experience or tolerate IPV and are more likely to have supportive male partners which may encourage uptake and utilisation of SRH services such as family planning which reduces the risk of unintended pregnancies[341] and hence the need for abortion. For example, Yaya *et al*. (2018) showed that women who do not find domestic violence acceptable are 13% more likely to use modern contraceptives than those who find it acceptable[261]. Being unaccepting of domestic violence is one of the domains of women's empowerment (Chapter 2) which has been associated with modern contraceptive use in LMICs[261, 267–272]. Women's empowerment has been shown to be associated with lower fertility rates, smaller families, longer birth intervals, and lower rates of unintended pregnancy[150, 279, 325]. Empowered women are more likely to access information and resources such as modern family planning methods that reduce the risk of unintended pregnancies and subsequently abortions[323].

As with the inconsistent and complex association between women's empowerment and other sexual and reproductive health services[279], this analysis also showed that the association between women's empowerment and abortion is inconsistent across the indices and domains as well as between countries suggesting both a complexity and context-specificity of the relationship between the two. Factors such as women's and male partner's level of education, exposure to media, woman's age, access to health care and socioeconomic status were important confounders which influenced the association between women's empowerment and abortion, although the role of each might vary between the 29 countries. Other studies have also shown that the association between women's empowerment and abortion could be influenced by potential confounders such

as the woman's education level, access to media and health care, socioeconomic status, and age[1, 5, 31, 34, 40, 41, 315–321].

Furthermore, the observed country-wide variations are consistent with the findings from a systematic review conducted by Prata *et al*. (2017) which showed that the association between women's empowerment and family planning was both complex and inconsistent[279]. However, while such heterogeneous findings could be related to use of unvalidated and different tools and definitions to measure women's empowerment[279], the analysis reported here which used two validated indices, suggests that the association between women's empowerment and abortion is indeed complex and different in different countries.

The subgroup analysis suggests that a country's abortion laws may moderate the association between the women's empowerment domain of attitudes towards domestic violence and abortion. Women in both the most restrictive and the least restrictive settings have similarly reduced odds of abortion among more empowered compared with less empowered women. Globally, between 2010 – 2014, abortion rates were similar in both the most restrictive and the least restrictive settings[8]. A global estimate of unintended pregnancies and abortion from 1990 – 2019 showed that in countries with liberal abortion laws, the rates of abortion were lower compared with those with restrictive laws[14]. However, the authors also showed that the unintended pregnancy rates were lower in restrictive settings compared to liberal settings[14]. This may be related to women in restrictive settings being more likely to have access and using modern contraception to avoid unintended pregnancy. The lack of variation in abortion by women' empowerment status in the analysis reported here for the two contexts may be related to the legal framework that may directly decrease the need for abortion in liberal contexts and indirectly decrease its need in restrictive settings through reduced unintended pregnancies as a consequence of increased modern contraceptive use. Importantly in the DHS data, abortion is self-reported and while recall bias is unlikely due to the nature of

the outcome, women especially in restrictive settings may also underreport abortions for fear of prosecution[326, 327]. It is also possible that abortion services might not be available in restrictive settings although their absence does not preclude women's need for abortion and use of clandestine abortion providers in such settings[8]. However, these results need to be interpreted with caution because subgroup analyses may result in false positive results especially if there is an imbalance between the number of countries in the different subgroups[145, 147]. In the analysis reported here, there were six countries in the least restrictive group compared with 10 countries the most restrictive group.

5.4.1 Strengths and limitations

The analysis reported here has several strengths. First, it employed two unique empowerment indices that have been validated premised on the understanding that women's decisions taken alone may not necessarily imply that women are more empowered than those whose decisions are taken jointly with their male partner. Second, data from multiple countries were used in which the indices and their domains have been independently validated. Third, a two-level analysis method involving analysis of empowerment at the individual level and then by country level was used. This ensured that the associations between each empowerment index and abortion at the individual level for each country was not masked by merging all the countries together. Finally, the analysis was restricted to self-reported terminations of pregnancies that were at five months or less gestation to minimise including stillbirths in the outcome.

Despite these strengths, the analysis has some limitations. First, due to the cross-sectional nature of the DHS data, these findings cannot necessarily be considered causal. Moreover, the DHS asks women questions covering the preceding five years which increases the possibility of recall bias and reporting bias. For example, "socially undesirable" responses to questions about attitudes towards domestic violence and reproductive health decision-making – that are seen to justify domestic violence or non-

consensual sex – are likely to be underreported by women in the DHS either because they cannot recall accurately or because of social desirability bias as the data are directly collected by data collectors. This underreporting leads to a misclassification with a left- or negatively skewed distribution, with more women scoring higher on these domains and hence “more empowered” than they really are, according to the empowerment indices used here. The resultant misclassification results in an attenuation or a lack of observed association between the exposure and the outcome[313, 314]. Similarly, the outcome of interest was self-reported history of abortion in the previous five years preceding the survey, increasing the likelihood of underreporting. However, reverse causality was minimised by dropping variables such as employment and earnings that were only collected over the preceding 12 months from the analysis. Miscarriages are likely to have been included in this analysis since the DHS question does not distinguish between induced abortions and miscarriages. However, evidence suggests that women are likely to report induced abortion as miscarriages[1, 326, 327] so the effect of inclusion of miscarriages may not be so great. Second, given the cross-sectional nature of the data, it was inappropriate to conduct mediation analysis to explore mechanisms or pathways through which women’s empowerment may influence abortion. Third, dichotomising the continuous variable, women’s empowerment scores in the indices, may have resulted in loss of power and within group variability[291]. Fourth, the marked heterogeneity observed with the indices and the domains means that the results need to be interpreted with caution as the subgroup analyses did not explain much of the variation. However, the subgroup analysis is inherently underpowered to detect group differences, especially in the presence of significant heterogeneity, fewer countries in each group and the imbalance between the number of countries in each group[144–148]. Furthermore, several countries showed lack of evidence of an association between women’s empowerment and abortion. Thus, it may not be possible to extrapolate the overall associations to these settings although a random-effects model was used in which the findings can reasonably

be generalised to other settings. However, to be cautious, it is important that this analysis is replicated in countries not included in this analysis.

5.4.2 Public health implications, recommendations, and conclusion

The findings of this study importantly suggest that despite a complex relationship between women's empowerment and abortion, empowerment that encompasses joint decision-making between the woman and her male partner has the potential to lower women's need for abortion, potentially averting the high morbidity and mortality of unsafe abortion in LMICs. It also suggests that liberal abortion laws may further lower women's need for abortion.

The findings suggest that there is need to empower women to increase their autonomy in decision-making with regards to abortion and other sexual and reproductive health services. There is also a need to increase male partner's participation in family planning campaigns to improve their knowledge, and thus acceptance of modern contraceptives to facilitate joint decision making. Further research is needed to understand how male partners' attitudes, preferences and involvement is associated with abortion in multiple settings. There is also a need to research about how modern contraceptive use may mediate the association between women's empowerment and abortion in multiple settings.

Chapter 6: DISCUSSION AND CONCLUSION

6.1 Summary of the main findings

The overall aim of the thesis was to synthesise the existing evidence and generate new evidence about abortion decision-making trajectories and their determinants in LMICs to inform policy, practice, and research to reduce abortions in these settings. To address the overall aim, a mixed methods systematic review and a meta-analysis was conducted to map out the abortion decision-making trajectories and their determinants in LMICs. The findings from the systematic review and the meta-analysis were used to refine the further objectives, which together with available data considerations led to an additional three specific study objectives:

(i) To synthesise evidence about abortion decision-making trajectories and their determinants in LMICs

(ii) To generate and validate a women's empowerment index for women in LMICs

(iii) To investigate the relationship between women's empowerment and modern contraceptive use in LMICs.

(iv) To investigate the relationship between women's empowerment and abortion in LMICs

Data analysed from the mixed methods review and meta-analysis identified nine abortion decision-making trajectories: pregnancy awareness, self-reflection, initial abortion decision, disclosure and seeking support, negotiations, the final decision, access and information, abortion procedure, and post-abortion experience and care. Three meta-themes related to determinants of abortion decision-making were identified: autonomy in decision-making, access, and choice. The themes under autonomy were women's empowerment, the role and influence of male partners and other social networks in decision-making; the themes under access were abortion laws and policies, knowledge

and information, and affordability/cost; while the three themes under choice were women's perceptions of safe abortion (social safety), availability of preferred methods and providers, and attitudes of abortion providers. The meta-analysis of the 14 studies involving 7737 women showed that the proportion of women's primary or sole involvement in the decision-making was 0.53 (95% CI: 0.34 to 0.73; prediction intervals (PI): 0.20 to 0.99, I^2 = 99.7%), overall the proportion of women's involvement in abortion decisions was 0.86 (95% CI: 0.73 – 0.95, I^2 = 99.5%) and the overall male partner involvement was 0.48 (95% CI:0.29–0.68, I^2 = 99.6%).

Using DHS data, two indices and three domains related to women's empowerment were generated and validated: attitudes towards domestic violence, reproductive health decision-making and household decision-making. The domains were similar for both empowerment indices except the household decision-making domains in which the woman-alone domain was used to construct the woman-alone empowerment index (index-1) and the joint household domain was used to construct the joint empowerment index (index-2). The three generated domains explained 54% and 58% of the variance in women's empowerment for the woman-alone and joint empowerment indices respectively, above the recommended 50%, suggesting that a good number of valid items were included in the indices. The indices and their domains had good psychometric properties with acceptable reliability scores (Cronbach's alpha > 0.70) and had strong invariance suggesting that the indices and domains can be understood similarly by different groups and thus the tool can be compared meaningfully across different settings, times, or groups.

The findings from analyses designed to address the third objective to investigate the relationship between women's empowerment and modern contraceptive use showed that women's empowerment was positively associated with modern contraceptive use among women in LMICs for both empowerment indices and the domains reproductive health decision-making and household decision-making, but there was no evidence of an

association with the domain reflecting attitudes towards domestic violence. The woman-alone empowerment index was associated with a 30% increase in the odds of modern contraceptive use after adjusting for potential confounding while the joint empowerment index was associated with a 33% increased odds of modern contraceptive use among the 20% most empowered women compared with the 20% least empowered women. For the reproductive household decision-making domain, women's empowerment was associated with a 15% increase in the odds of modern contraceptive use while for the woman-alone and joint household domains, women's empowerment was associated with a 14% and a 19% increase in the odds of modern contraceptive use respectively. Heterogeneity varied from negligible (for the domain attitudes towards domestic violence) to considerable (for the woman-alone empowerment index and the domain reproductive health decision-making). Subgroup analysis suggested that the association between women's empowerment for both empowerment indices (but not the domains) and modern contraceptive use differed by GDI, with increased gender disparity associated with increased odds of modern contraceptive use compared with increased gender parity.

The finding from the analyses addressing the final objective showed that the association between women's empowerment and abortion was inconsistent across the LMICs with no association observed for the woman-alone empowerment index while a negative association, in which women's empowerment was associated with decreased odds of abortion, was observed with the joint empowerment index. Domain-level analysis showed that attitudes towards domestic violence and the joint household decision-making were negatively associated with abortion while no association was observed with the reproductive health decision-making and the woman-alone household decision-making domains. For the joint empowerment index, women's empowerment was associated with an 8% decrease in the odds of abortion with moderate heterogeneity (47%). For the domain attitudes towards domestic violence, women's empowerment was associated with a 12% decrease in the odds abortion with moderate heterogeneity (45%) whereas for the

domain joint household domain, women's empowerment was associated with an 11% decrease in the odds of abortion with moderate heterogeneity (75%). Subgroup analysis showed that only in the attitudes towards domestic violence domain, the association between women's empowerment and abortion varied by a country's abortion laws, although the odds of abortion were similar in both the most restrictive and least restrictive settings.

6.2 Discussion of the main findings

6.2.1 Abortion decision-making trajectories and their determinants

Abortion decision-making trajectories occur in a fluid environment involving a complex web of time-dependent individual, household, community, health system and community-level actors with factors interacting to shape the trajectory of a pregnancy that ends in abortion[1, 5]. While the final decision to terminate their pregnancy is straightforward for some women, for the majority it involves a complex network of actors who support, oppose or are ambivalent about the woman's decision to terminate the pregnancy[32–34, 62, 86, 97]. The trajectories are not always linear and while some women go through some stages repeatedly, some skip other stages[1]. The woman's choice of the social network to involve in the abortion decision-making process is built upon careful considerations of trust, confidentiality, closeness, availability of financial support, the ability to provide missing information the woman may need, the ability to act as intermediaries between her and abortion providers, or the expected level of support for the woman's initial decision[32, 33, 42, 60, 62, 65, 69, 85, 90, 92, 97, 100]. The temporal sequence of events from pregnancy recognition to termination are influenced by several individual, interpersonal, societal, and health system factors including national policies and laws that act to expedite, delay, alter or even reverse the trajectory the woman may have initially chosen as well as to impact on the access to abortion[1, 5]. For example, delays in making the

final decision or obtaining the necessary paperwork from third party authorisations such as consent from their male partner, parents or physicians make legal abortion impossible to obtain when gestational age is exceeded in contexts where abortion is legal but with gestational age limits[33, 34]. Such delays compel some women to obtain clandestine abortions from unskilled traditional herbalists and other unskilled abortion providers who have no incentive to refuse to conduct the illegal abortion or report it to the authorities[61, 73, 98]. Such delays also influence the choice of method for abortion, for example, by necessitating the use of the more expensive and less safe methods such as dilatation and curettage when the gestational age for the cheaper and safer medical abortion using misoprostol is exceeded[4]. The trajectories are broadly similar in both restrictive and liberal settings[1]. While women in restrictive settings encounter access issues and risks of arrest following illegal abortion, onerous requirements for obtaining legal abortion such as mandatory waiting times, third-party authorisations (from parents, male partners, or health workers), and healthcare workers' conscientious objection impede women's access to safe and timely abortion services in liberal settings[1].

While the majority of women are involved in the majority of the decision-making process, social networks including male partners, parents, teachers, abortion providers (both skilled and unskilled), religious leaders, relatives, friends, and peers play important roles at various stages of the decision-making processes[32, 62, 83]. Adult married women in stable relationships are the main decision-makers for the majority (86% overall) of abortions while male partners are the main social networks consulted or confided in[1]. However, for adolescent women, boyfriends, parents including the parents of the boyfriend, teachers, peers, and other relatives are often consulted before a final decision is made[32, 62, 83]. The various determinants of these trajectories facilitate or impede access to timely and safe abortion services in LMICs. An important finding from the systematic review is women's perception of safe abortion. For women seeking abortion, safe abortion is not about high-quality hospitals or equipment, but rather reputational

integrity, confidentiality, secrecy, privacy, affordability, and legal safety[1, 73]. This social safety contrasts with the WHO's definition of safe abortion which has historically focused on only biomedical safety[136] This difference has important implications for abortion safety understanding, quantifying, policy and programming in LMICs.

6.2.2 The women's empowerment indices and their domains

As identified in the systematic review, women's empowerment is an important determinant of women's abortion decision-making trajectories in LMICs. Subsequent exploration and analysis of the DHS data from 30 LMICs identified and validated three domains related to women's empowerment in these settings: women's attitudes towards domestic violence, reproductive health decision-making, and household decision-making.

All three domains which were identified in the analysis had good psychometric properties. Internal consistency as measured by Cronbach's alpha values was acceptable, with values being above 0.70 and the proportion of total variance of women's empowerment explained by the retained domains factors being above 50% for both indices[190, 216, 217, 342, 343]. Discriminant construct validity was demonstrated by low factor covariances (<0.35) between the retained factors while convergent construct validity was demonstrated by high factor loadings (>0.50) for items loading onto specific domains or factors with the CFA[190]. The domains showed strong (scalar) invariance meaning that the indices can be generalised and meaningfully compared across the different settings without risk of any systematic biases or measurement errors[9, 192].

Annan *et al*.[29] described three ways in which power can be exercised in a household in LMIC settings: (i) joint participation (uncontested power) in household decision-making, (ii) the wife reports participating in decisions, but the male partner does not, i.e., she takes power, and (iii) the male partner reports that the wife participates in decisions but the wife reports she does not, i.e., the male partner gives power. The indices identified in the analyses reported here correspond to women taking power (the woman-alone

empowerment index) and joint decision-making (the joint empowerment index) while the third dimension of exercising power was not ascertained because the variables for its generation were not available in the DHS datasets. While the first index of woman-alone decision-making reflects greater agency for women and thus may reflect true empowerment of women, the second index of joint decision-making considers interpersonal power relations and the environments that foster women's empowerment in LMICs[28]. The second index also recognises the mediating role of family power dynamics and gender norms in decision-making in some contexts[28, 86].

6.2.3 The relationship between women's empowerment and modern contraceptive use

Although the reasons why abortions are sought are outside the scope of this thesis, the majority of abortions in the studies included in the systematic review result from unplanned pregnancies where women's empowerment was one of the eight determinants of abortion decision-making trajectories. Increased modern contraceptive use among women of reproductive age is associated with improved maternal and child health outcomes including reducing unintended pregnancies, overall abortion rates, and unsafe abortions[251, 255, 256]. Thus, having generated the woman's empowerment index, the aim was to investigate the relationship between women's empowerment and modern contraceptive use among married or cohabiting women. For this analysis, data from the DHS in 30 LMICs were used. This analysis showed wide cross-national variations in the prevalence of modern contraceptive use in the 30 countries included, ranging from 4% in Albania to 73% in Zimbabwe. This was similar to the findings by Yaya *et al*.[261] who showed in their analysis of DHS data from 32 SSA countries that modern contraceptive use among all women of reproductive age, whether married or unmarried, varied from 6.7% in Chad to 72% in Namibia. However, this thesis focused only on married or cohabiting women.

The positive association between women's empowerment and modern contraceptive use in the pooled results from the analysis reported here is consistent with other studies in LMICs that have suggested that women's empowerment is positively associated with modern contraceptive use in these settings[261, 267–273]. However, there was considerable variability between the countries suggesting there is complexity and heterogeneity in the association between women's empowerment and modern contraceptive use in LMICs[279]. The analysis suggested that women's empowerment or the various domains of women's empowerment were very important in some countries but not in others as highlighted by Richardson[306]. Subgroup analysis also showed that gender inequality moderated the association between women's empowerment and modern contraceptive use. In countries with high gender inequality, women's empowerment was more important compared with countries with low gender inequality suggesting that achieving equal status between men and women in societies improves women's uptake of SRH services and women's empowerment at the societal level may not be required[261]. As descried by Kabeer (1999) empowered women have greater autonomy and control over their lives[160] which may include making informed decisions to use modern contraceptives. In addition, empowered women may have the resources[160] which allows them to prioritise their own health including access to and use of modern contraceptives.

Conversely, the positive association with joint empowerment index may not only reflect women's autonomy in which they are able to equally contribute to household decisions, but it also reflects increased communication with and support from their male partner on matters related to SRH including modern contraceptive use[28, 34, 344]. However, it is also probable that an unequal power balance with the male partner may lead to "joint decisions" actually being decisions that the man mainly makes with minimal or no involvement from the woman herself[1]. However, this is an unlikely explanation of the findings reported here since the indices were based on the analysis of responses from

women's self-report to DHS questions. Nonetheless, these findings should be interpreted with caution in light of this possibility and the considerable heterogeneity observed in the findings.

6.2.4 The association between women's empowerment and abortion

The mean prevalence of abortion in the analysis reported here was 9.2% and varied from 2.1% in Timor-Leste to 27.5% in Armenia. This is much lower than the estimated global mean prevalence of 29% between 2015 and 2019[14]. These differences in the prevalence are likely a result of the differences in ascertainment of information about abortion and the study population. First, the global prevalence is an estimate of abortion prevalence for all women of reproductive age (15 – 49) while the analysis reported here was restricted to only married or cohabiting women. However, these prevalence estimates contrast with findings from Sedgh *et al.* (2016) that showed that abortion rates are higher among married compared with unmarried women globally (33% vs 25% respectively) as well as in LMICs (37% vs 27% respectively)[322]. Second, the global abortion estimates used data from various sources including official statistics, country-based surveys, and published studies whilst this analysis was restricted to only DHS-obtained data. However, the sources used in the global estimates appear to have very low reliability. Bearak *et al.* (2022) reported that only 38% of countries globally and 24% of countries in SSA have reliable abortion data[16]. The mean prevalence in the data reported here is also lower than the 16.5% (range of 7.5% to 39.5%) reported by Seidu *et al*.[247] in their analysis of the DHS datasets from 27 SSA countries. However, while in this thesis abortion was defined as pregnancies terminated at five months of gestation or less, to exclude potential stillbirths, as done by Yokoe *et al*.[135], Seidu *et al*.[247] did not exclude potential stillbirths. Moreover, the number and the geographical distribution of the countries included in the thesis were different from that by Seidu *et al*. (2020), with the thesis including a total of 29 countries from SSA, Eastern Europe, Asia, Latin America, and

Oceania while Seidu *et al.* (2020) only included 27 countries from SSA. It is also possible that the analysis in this thesis underestimated abortions by being overly strict. However, factors other than outcome ascertainment may be explain these differences in prevalence estimates including recall bias and intentional underreporting which may explain the low prevalence in this thesis[326, 327].

In line with the findings from other small-sized studies in LMICs[183, 247, 261, 275, 279, 321, 324, 325], the association between women's empowerment and abortion in the findings reported here were inconsistent with considerable degrees of heterogeneity. Interestingly, this analysis did not find a positive association between women's empowerment and abortion, but rather there was a negative (for the joint empowerment index, and the domains attitudes towards domestic violence and joint household decision-making) or no (for the woman-alone empowerment index, and the domains reproductive health decision-making and the woman-alone household decision-making) association. For the group of women in this analysis, women's empowerment was positively associated with modern contraceptive use for both indices and two of the domains (reproductive health and household decision-making) but not for attitudes towards domestic violence. It therefore seems plausible that more empowered women have greater use of modern contraceptives which prevents unintended or unplanned pregnancies and hence less need for abortion compared with less empowered women. Thus, abortion for the population of less empowered women is likely to result from the unmet need for modern contraception which predisposes women to unintended pregnancies and consequently abortions[14]. However, factors other than women's empowerment may also influence abortion in these settings. These include women's and male partner's education, household socioeconomic status, and age. For example, education may not only improve a woman's agency through her access to information but also her access to resources through economic empowerment that in turn enable her to afford modern contraceptives[311]. In fact, other studies have considered these factors

proxy measurements of women's empowerment and have included them in their measurement of women's empowerment. However, inclusion of such formative indicators is problematic and can lead to erroneous results. Assumptions that determinants of women's empowerment are synonymous with indicators of women's empowerment ignore the complex gender and power imbalances in which the decision-making process occurs[28].

As with modern contraceptive use, the considerable variation in the association between women's empowerment and abortion between different countries suggests that empowerment or its domains may be an important factor in some settings but not in others[306]. Furthermore, some domains were more important than others in different countries. This finding is consistent with findings and conclusion by Bussolo *et al*.[28] that women's empowerment is context specific. It is also congruent with findings by Annan *et al*.[29] that those different aspects of women's empowerment (uncontested power, taking power and giving power) have different effects on different maternal and child health outcomes, being positive or negative for different outcomes or having no effect at all.

6.3 Strengths and limitations of the methods used

6.3.1 Strengths

The key strengths of the studies reported in this thesis are the methodological rigour in measuring women's empowerment in LMICs and the consequent generalisability of the findings.

6.3.1.1 Methodological improvements in measuring women's empowerment in LMICs

The main strength of this thesis is the methodological rigour of the analyses conducted and thus the consequent contribution to studying women's empowerment and sexual and reproductive health outcomes in LMICs compared with previous attempts to generate

women's empowerment indices by other researchers. Unlike earlier women's empowerment measures that focused on only women[157, 162, 171, 173, 174, 345], the analysis reported here was designed to also generate a joint empowerment index to acknowledge the role of couple's shared decision-making and the increasingly important role of the male partner as an actor in the attainment of women's empowerment and gender equality[1, 28, 29, 184]. This second index was informed by the systematic review that showed that "woman-alone" decisions did not necessarily imply these women were empowered[1]. Rather, some of the decisions were made in anticipation of the male partner's perceived reaction. Additionally, this second index allows the investigation of the impact of male partner's support of their spouses in utilisation of SRH services in LMICs. Male partner support has been shown to improve maternal and child health outcomes [3, 184–187]. In fact, some studies have shown that joint decision-making leads to better SRH outcomes such as an increase in modern contraceptive use[265, 268, 274, 276, 307] and maternal and child health wellbeing[29] compared with woman-alone decision. However, in this thesis it is recognised that such joint decisions may not always truly reflect the woman's active involvement or equal participation in decision-making. As found in the systematic review, some women were passive participants in some of the abortion decision-making trajectories[1].

The other methodological improvement is in the choice of reflective indicators as opposed to proxy or formative indicators to measure women's empowerment [177–180]. The limitations of formative or proxy indicators such as education, economic empowerment, age, include spurious findings and model misspecifications. Importantly, while formative indicators are likely to lead to women's empowerment, they do not tell us what an empowered woman would or would not do, unlike reflective indicators which provide such information. Including formative indicators in factor analysis is likely to produce biased results. Thus, the domains generated to measure women's empowerment are fewer in this thesis than most other studies of women's empowerment[177–180]. Nevertheless, the

two indices explained at least 50% of the variance in women's empowerment, a level which is considered acceptable in social sciences research [343].

In the final two studies, the two-level analysis at the individual- and country-level enabled comparison of the effect of women's empowerment for both indices and domains on SRH outcomes at the individual- and country-level. Most of the analyses using the DHS to study maternal and child health outcomes in LMICs have tended to use pooled data which may mask the individual country estimates[29, 247, 261]. This two-level approach, which has been used by Ahmed *et al*.[141], allowed identification of countries where women's empowerment is more important than others. This is important information to enable programmes to be focused on interventions targeting women's empowerment in those settings whereas the focus needs to be elsewhere where empowerment appears less important.

6.3.1.2 Generalisability

The other main strength of this thesis is the generalisability of the findings and the recommendations for LMICs throughout all the chapters. The systematic review and meta-analysis were rigorously conducted and included an extensive number of studies from countries on the continuum of abortion laws and policies as well as geographic distribution. The final studies included were from 27 countries in which abortion is prohibited altogether or only to save a woman's life, 18 countries in which abortion is permitted to preserve health, 17 countries in which abortion is permitted on socioeconomic grounds while there were 17 countries in which abortion is available on request albeit with varying gestational age limits[1]. Geographically, 33 studies were from SSA, 28 from Southern and Eastern Asia, 13 from Latin America, two from Eastern Europe, one each from the Pacific and Caribbean, while one study included countries from both SSA and Latin America[1]. All the eight recommendations had no concerns regarding adequacy or relevance. Thus, the systematic review findings and

recommendations can be generalised with confidence to all LMICs with varying abortion laws and policies.

The DHS data analysed in this thesis involved a representative sample of married women from 30 countries from SSA, Eastern Europe, Asia, Oceania, and Latin America again ensuring the findings and recommendations are generalisable to these settings. The women's empowerment indices and domains generated had strong (scalar) invariance meaning that they can be compared meaningfully across different settings, times, and groups. This generalisability can be seen in the comparability of the thesis' findings for the association of women's empowerment between modern contraceptive use and abortion with findings from studies carried out in similar contexts[183, 247, 261, 275, 279, 321, 324, 325].

6.3.2 Limitations

The major limitations of the analyses reported here are data quality and methodological limitations.

6.3.2.1 Data quality limitations

The main limitation relates to the reliability and completeness of the data used in the analysis.

First, while the systematic review and meta-analysis identified eight key determinants of abortion decision-making trajectories[1], it was not possible to empirically assess all potential determinants such as social safety as this would have required primary data collection which was not possible due to Covid-19. As a consequence of Covid-19, a heavy reliance had to be placed on using existing data and thus the DHS.

Second, the DHS is limited in the questions available for assessing women's empowerment. For example, only two questions about asset ownership are asked (house

and land ownership). While a domain related to asset ownership was identified using the EFA, only these two items (house and land ownership) loaded saliently with the factor analysis which is a sign of over-extraction[212]. When a three-factor model was considered, these two items loaded weakly onto the household decision-making domain but the model had poor psychometric properties and it was theoretically meaningless. Additionally, the DHS lacks variables to adequately capture other indicators of women's empowerment at the individual, household, and community level[174]. For example, it would be useful to capture information about women's political participation, community engagement e.g., whether they can attend or speak in meetings or whether they participate in decisions about community affairs. Given that the DHS provides few response options for the variables included to measure women's empowerment this led to violation of the assumption of multivariate normality[212]. However, this was overcome with use of a polychoric matrix which does not assume multivariate normality[210] and the use of the iterated principal factor (IPF) extraction method which is robust and is less sensitive to nonnormality[211].

Third, the DHS does not provide information about availability, accessibility, preferences, and frequency of utilisation of modern contraceptive methods which could affect access and utilisation of modern contraceptives in LMIC settings[346, 347]. For example, spousal preferences, individual woman's method preferences, access and availability, cultural acceptability of the contraceptive methods, and socioeconomic influences are known to influence women's choice and use of modern contraceptives[346–350]. From the information available it was also not possible to tease out which methods were preferred by men and how these might correlate with the two empowerment indices and the domains. For example, it is well known that women sometimes use modern contraceptive methods without the knowledge or approval of their male partners by using methods such as injectables and implants[351]. On the other hand, there are methods such as condoms, periodic abstinence that require the male partner's awareness, approval and

active participation[344]. It would have been preferable to be able to compare the association between the two indices and such covert and overt contraceptive methods. Furthermore, the DHS does not ask women whether they need contraceptive, instead inferring this from her current sexual and reproductive status and fertility preferences using the unmet need for family planning[237]. A better indicator of assessing the association between women's empowerment and modern contraceptive use would be to compare the women who wanted to use modern contraceptives and accessed them versus those women who wanted to use them but were unable to access them.

Fourth, the DHS captures all pregnancies that are terminated and potentially includes miscarriages, induced abortions and stillbirths. The focus of this thesis was on induced abortions and while attempts were made to minimise including stillbirths in the analysis by restricting the analysis to only pregnancy which ended at five months or less of gestational age, miscarriages are likely to be included in the analysis. Furthermore, the DHS does not provide information about "the intention to abort". As with modern contraceptive use, a better outcome would have been to compare women who wanted an abortion and had one versus women who wanted an abortion but were unable to have one. Such data would have provided a better indication of the effect of women's empowerment on abortion in these settings. Additionally, the questions used in the DHS analysis were asked to only women. Thus, it was not possible to explore the three dimensions of agency in relation to their male partner as proposed by Annan *et al*.[29] i.e., uncontested power, taking power and giving power which have provided useful information about the differential effect of empowerment and its domains on modern contraceptive use and abortion. Moreover, there were no qualitative studies that might have explained the considerable heterogeneity in how women and their male partners conceptualise women's empowerment as well as its associations with abortion and modern contraceptive use[306].

Fifth, the focus here was on married or cohabiting women which limits the generalisability of the findings to only these women. However, other women such as those who are single, widowed, divorced, or separated also have contraceptive needs and access challenges, and the association between women's empowerment and SRH outcomes for these groups of women needs to be examined before conclusions relating to them can be reached [237, 352]. The focus on unintended pregnancies and abortion, means that the results may not be generalisable to other abortions carried out for reasons other than unintended pregnancy. Similarly, the focus here was on women with male partners, but not all partners are male.

Finally, the DHS is a cross-sectional survey system that collects information about the five years preceding the survey. For example, due to the possibility of reverse causality and lack of temporal data, causal inferences cannot be made from any associations between the exposures and the outcomes[353]. Thus, mediation analysis to examine pathways or mechanisms by which women's empowerment may influence modern contraceptive use and abortion could not be explored. Finally, the long interval between the surveys increases the risk of recall bias.

6.3.2.2 Statistical/methodological limitations

The second major limitation is methodological in terms of the statistical methods used.

For the analyses examining the association between women's empowerment and modern contraceptive use and abortion, the main exposures (women's empowerment indices and domains) which were continuous were categorised into quintiles or dichotomous variables. Moreover, in the analysis of the association between women's empowerment and modern contraceptive use, only the lowest and the highest quintiles were used and the information relating to the others was discarded. While this grouping of data and then discarding groups is a common practice in research[162], it results in loss of information and thus loss of power and within group variability and may mask nonlinearity[291–294].

Reduced power may result in a failure to detect a real association between the exposure and outcome if such an association exists[292, 293] but may also increase the risk of type I error or false positive results[294]. The loss of within group variability which can result in false negative results[292, 293]. However, the categorisation of variables makes the interpretation easier, especially for non-technical users of information such as policymakers and programme managers, which was the aim of this thesis. Most importantly, the sample was large which served to minimise the impact of loss of power[291].

Second, in this thesis the analyses were focused one only DHS cycle – the most recent in each country. An alternative would have been to study trends to explore how women's empowerment and its association with SRH outcome have varied over time[266, 278]. Analysis of trends over multiple periods has several advantages over a single cross-sectional analysis including replicating the results and measuring changes over time which strengthens the confidence in the findings or tracking any changes between the different time periods[354]. However, it was not possible to take this approach because some of the variables used to generate the empowerment indices were absent in the earlier survey cycles.

6.4 Implications for policy and recommendations

The findings from this thesis have implications for defining and quantifying safe abortion, policy, practice, routine data collection and future researcher on abortion in LMICs.

6.4.1 Implications for defining safe abortion

The systematic review showed that while women recognise biomedical safety as important, for them the need for social safety superseded biomedical safety concerns. The updated "WHO Guidelines on safe abortion" focus on quality of care which includes respectful care[4]. However, it is clear that there is a need to expand the definition of safe

abortion to include social, legal, and financial safety components. This also has implications for defining and quantifying abortion safety, especially in LMICs where over 97% of biomedically unsafe abortions occur[15]. The systematic review also showed that biomedically unsafe abortions may be in part a consequence of women's greater need for social, legal, and financial safety[1].

6.4.2 Implications for policy

The findings from the systematic review and meta-analysis and the analyses of the DHS data provide important information for policymakers to address abortions in LMICs.

The findings reported here show that women's empowerment has the potential to improve the use of modern contraceptive in LMICs which reduces the risk of abortion from unintended pregnancies. Furthermore, limitations notwithstanding, the findings demonstrate that shared decision-making of the woman and her male partner has the potential to improve the use of modern contraceptives and thus reduce abortions in LMICs. This finding is consistent with findings from other studies in LMICs that have shown that joint decision-making has far greater beneficial effects on some maternal and child health compared with woman-alone or male-partner's-alone decisions[29, 265, 268, 274, 276, 307]. In fact, for married women, the male partners can be the first actors to play an important role in women's empowerment and gender parity[28].

The systematic review also showed that restrictive abortion laws and policies restrict women's access to quick and safe abortions but do not reduce women's need for abortion[1]. This often compels women in restrictive settings to opt for clandestine and unsafe abortion which increases the risk of complications, associated treatment costs for post-abortion complications, and mortality[1, 355–358]. However, even in countries with liberal abortion laws, onerous requirements such as the need for third party authorisations, mandatory waiting periods, and conscientious objections from health workers, hinder women's access to safe and timely abortion services[1, 4]. Thus,

restrictive abortion laws need to be modified or accompanied by programmatic abortion policies that remove these additional barriers.

6.4.3 Implications for abortion programming and clinical practice

The systematic review has shown that within the remits of the abortion laws, a wide range of abortion methods should be provided so that women have a choice[1]. For example, some women preferred surgical methods as they are a one-off event while others prefer medical abortion with misoprostol as it mimics the natural menstrual periods and therefore allows them to continue with their normal daily activities[1]. Misoprostol also has the potential to improve access to safe abortion since, once prescribed, the drug can be taken at home without the need for a skilled abortion provider and the complexities of providing anaesthesia and sterile facilities for the procedure[1]. For some women, minimising contact with abortion providers is also socially safe[1].

In addition, abortion should be provided in socially safe environments that foster integrity, privacy, and secrecy for the woman. For example, some women find designating some places as “abortion corners or shelters” – specially designated places in hospitals where women seeking an abortion are taken – accusatory and not private as anyone going there can easily be identified as having an abortion[1].

Mechanisms to address poor staff attitude and conscientious objection need to be put in place to ensure timely referral and/or transfer to colleagues who are willing to provide safe abortions when this is provided for by law[1]. Where there are requirements for approval by senior doctors, there must be mechanisms to ensure their availability or delegation to avoid unnecessary delays for women seeking abortion[1].

6.4.4 Implications for routinely collected data (the DHS)

This thesis has underscored the importance of the availability of routinely collected data for research and policy, programming, and practice. However, because this data is not

controlled by the researchers, information about some very important parameters needed to study a phenomenon may be missing[359]. The reliability and completeness of the DHS data was one of the major limitations of the research reported here because the dataset lacked some key variables and limited the response options for even those few variables it captured. In the DHS, women's empowerment is measured as participation in household decision-making while the findings reported here have shown that empowerment is much broader than that and includes attitudes towards domestic violence and reproductive health decision-making[198, 280]. There is thus a need to expand the repertoire of questions collected in the DHS to capture multiple facets of women's empowerment such as women's participation in community decision-making processes, freedom of movement, political and legal involvement, gender preferences, and attitudes about women's economic roles[174, 306].

While individual countries do adapt and modify the DHS questionnaire according to their priority areas[198, 280], this then makes it difficult to compare countries on a broad range of variables due to the non-uniformity or even the absence of some important variables. For example, in the generation and validation of the women's empowerment indices, data from 13 countries had to be excluded from the final analysis because they did not have all the variables required to generate and validate the empowerment indices. Additionally, the DHS could be improved to collect detailed information about the availability, access, and frequency of use of modern contraceptives by women. Furthermore, detailed information about abortion including capturing data on whether the pregnancy termination was spontaneous, induced or a stillbirth would enhance the value of the dataset in a critically important area for women's health. This is already done in some countries such as Nepal[360], India[361, 362], and Albania[363] where it is now possible to determine which abortions are induced and also whether these were biomedically safe or unsafe.

The DHS could be modified further to ask women direct questions about whether they need modern contraceptives or not[237]. The current definition of "current use of modern

contraceptives" does not distinguish women who need family planning methods from those who do not. The inclusion in analyses of women who do not need to use family planning methods is likely to lead to attenuation or dilution of the association between the exposure and the outcomes.

6.4.5 Implications for further research

The systematic review highlighted some key abortion decision-making trajectories in LMICs that it was not possible to explore in the analyses reported here because of various reasons including lack of data to empirically explore them or they were beyond the scope of the aims of this thesis. Gaps were also identified that could be addressed through further research.

This research acknowledges that empowerment involves both the willingness and ability to take a desired action[160].There are women likely to be willing or indeed wishing to terminate unwanted pregnancies but do not due to several factors. Therefore, there is a need to explore the association between women's empowerment and women who wanted an abortion and had one versus women who wanted an abortion but did not have one. Similarly, there is a need to explore the association between women's empowerment and women who wanted to use modern family planning methods and were able to do so compared with women who wanted to use modern family planning methods but did not do so.

The systematic review and meta-analysis identified the important role of the male partners in the abortion decision-making trajectories and the analyses of the association between women's empowerment and the outcomes modern contraception and abortion, showed that joint decision-making with male partners has the potential to improve modern contraceptive use and thus reduce the need for abortions in LMICs. However, the questions used in the analyses of the association between women's empowerment and the outcomes modern contraception and abortion were only asked to women and not

men. There is thus a need for further research to understand male partners' attitudes towards SRH outcomes such as modern contraceptive use and abortion, exposure to family planning messaging, and fertility preferences and their association with modern contraceptive use and abortion in these settings.

This systematic review and meta-analysis focused on married or cohabiting women. Unmarried women, or women with special needs such as those with HIV/AIDS, commercial sex workers, refugees and women affected by conflict for whom little research seems to have been done were excluded[1]. There is thus a need to conduct research for these special categories of women and understand their trajectories to abortion as well as the determinants of those trajectories.

Due to the cross-sectional nature of the DHS data used in this thesis, it was not possible to explore the possible mechanisms or pathways by which women's empowerment leads to increased use of modern contraceptives or reduces the risk for abortion in the settings studied. While longitudinal studies to explore such pathways may not be feasible or even recommended, qualitative research could help explain some of the phenomenon[306]. The other alternative is to link studies from different DHS cycles or years and establish trends to assess reproducibility over different time periods. This is especially important given that the majority of quantitative studies have found inconsistent relationships between women's empowerment and modern contraceptive use as well as abortion in LMICs.

6.5 Conclusion

The findings reported in this thesis are the first, to the knowledge of the author, to map out the complexity of abortion decision-making and their determinants in LMICs through an extensive systematic review and meta-analysis. Based on the findings from the systematic review and meta-analysis, a set of recommendations was developed and their confidence graded. These recommendations, if implemented, could reduce women's need

for abortion and its associated complications in LMICs. The findings from the systematic review broaden the understanding of abortion, in particular from the women's perspective as social, legal, reputational, and financial safety. This has implications for our understanding, defining, and quantifying abortion. The relationship between women's empowerment and modern contraceptive use and abortion was empirically tested using the publicly available DHS datasets from 30 countries. The findings suggested that these relationships are complex and heterogenous with positive, negative or no associations observed in different countries. These results should be interpreted in light of the methodological and data limitations as well as other existing literature which have found inconsistent associations between women's empowerment and modern contraceptive use and abortion. Further studies on special categories of women such as adolescents, and "intended vs actual" outcomes are needed to more fully understand the complexity of women's abortion decision-making trajectories. Overall, this thesis has provided valuable information about abortion decision-making trajectories and their determinants, and empirically examined the relationship between women's empowerment and two key sexual and reproductive health outcomes which can inform policy, programming, practice, and research.

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APPENDIX A: SYSTEMATIC REVIEW

PRISMA Chart

A. 1 PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Page 13
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	NA
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Page 13-14
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Page 14
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Page 15-16
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Page 15
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Appendix A.2
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Page 16
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Page 16-17
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Page 16-17
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Page 16-17
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Page 17

Section and Topic	Item #	Checklist item	Location where item is reported
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Page 16-17
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Page 17-19
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Page 17-19
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Page 17-19
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Page 19
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	Page 19-20
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	Page 20-21
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Page 20
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Page 21
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Page 22
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Page 22, Appendix A.3
Study characteristics	17	Cite each included study and present its characteristics.	Page 26-50
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Page 52-58
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Page 65-71
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Page 26-50
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Page 65-71
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Page 68-70
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	Page 71
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Page 71

Section and Topic	Item #	Checklist item	Location where item is reported
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Page 80-83
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Page 84
	23b	Discuss any limitations of the evidence included in the review.	Page 86-88
	23c	Discuss any limitations of the review processes used.	Page 86-88
	23d	Discuss implications of the results for practice, policy, and future research.	Page 88-89
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Page 15
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Page 15
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Not applicable
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Not applicable
Competing interests	26	Declare any competing interests of review authors.	Not applicable
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Not applicable

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, *et al*. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

For more information, visit: http://www.prisma-statement.org/

A. 2 Search strategy for Ovid Medline

#	Search	16/02/2021	06/06/2022
1	(afghanistan or albania or algeria or american samoa or angola or "antigua and barbuda" or antigua or barbuda or argentina or armenia or armenian or aruba or azerbaijan or bahrain or bangladesh or barbados or republic of belarus or belarus or byelarus or belorussia or byelorussian or belize or british honduras or benin or dahomey or bhutan or bolivia or "bosnia and herzegovina" or bosnia or herzegovina or botswana or bechuanaland or brazil or brasil or bulgaria or burkina faso or burkina fasso or upper volta or burundi or urundi or cabo verde or cape verde or cambodia or kampuchea or khmer republic or cameroon or cameron or cameroun or central african republic or ubangi shari or chad or chile or china or colombia or comoros or comoro islands or iles comores or mayotte or democratic republic of the congo or democratic republic congo or congo or zaire or costa rica or "cote d'ivoire" or "cote d' ivoire" or cote divoire or cote d ivoire or ivory coast or croatia or cuba or cyprus or czech republic or czechoslovakia or djibouti or french somaliland or dominica or dominican republic or ecuador or egypt or united arab republic or el salvador or equatorial guinea or spanish guinea or eritrea or estonia or eswatini or swaziland or ethiopia or fiji or gabon or gabonese republic or gambia or "georgia (republic)" or georgian or ghana or gold coast or gibraltar or greece or grenada or guam or guatemala or guinea or guinea bissau or guyana or british guiana or haiti or hispaniola or honduras or hungary or india or indonesia or timor or iran or iraq or isle of man or jamaica or jordan or kazakhstan or kazakh or kenya or "democratic people's republic of korea" or republic of korea or north korea or south korea or korea or kosovo or kyrgyzstan or kirghizia or kirgizstan or kyrgyz republic or kirghiz or laos or lao pdr or "lao people's democratic republic" or latvia or lebanon or lebanese republic or lesotho or basutoland or liberia or libya or libyan arab jamahiriya or lithuania or macau or macao or republic of north macedonia or macedonia or madagascar or malagasy republic or malawi or nyasaland or malaysia or malay federation or malaya federation or maldives or indian ocean islands or indian ocean or mali or malta or micronesia or federated states of micronesia or kiribati or marshall islands or nauru or northern mariana islands or palau or tuvalu or mauritania or mauritius or mexico or moldova or moldovian or mongolia or montenegro or morocco or ifni or mozambique or portuguese east africa or myanmar or burma or namibia or nepal or netherlands antilles or nicaragua or niger or nigeria or oman or muscat or pakistan or panama or papua new guinea or new guinea or paraguay or peru or philippines or philipines or phillipines or phillippines or poland or "polish people's republic" or portugal or portuguese republic or puerto rico or romania or russia or russian federation or ussr or soviet union or union of soviet socialist republics or rwanda or ruanda or samoa or pacific islands or polynesia or samoan islands or navigator island or navigator islands or "sao tome and principe" or saudi arabia or senegal or serbia or seychelles or sierra leone or slovakia or slovak republic or slovenia or melanesia or solomon island or solomon islands or norfolk island or norfolk islands or somalia or south africa or south sudan or sri lanka or ceylon or "saint kitts and nevis" or "st. kitts and nevis" or saint lucia or "st. lucia" or "saint vincent and the grenadines" or saint vincent or "st. vincent" or grenadines or sudan or suriname or surinam or dutch guiana or netherlands guiana or syria or syrian arab republic or tajikistan or tadjikistan or tadzhikistan or tadzhik or tanzania or tanganyika or thailand or siam or timor leste or east timor or togo or togolese	2013224	2219677

	republic or tonga or "trinidad and tobago" or trinidad or tobago or tunisia or turkey or turkmenistan or turkmen or uganda or ukraine or uruguay or uzbekistan or uzbek or vanuatu or new hebrides or venezuela or vietnam or viet nam or middle east or west bank or gaza or palestine or yemen or yugoslavia or zambia or zimbabwe or northern rhodesia or global south or africa south of the sahara or sub-saharan africa or subsaharan africa or africa, central or central africa or africa, northern or north africa or northern africa or magreb or maghrib or sahara or africa, southern or southern africa or africa, eastern or east africa or eastern africa or africa, western or west africa or western africa or west indies or indian ocean islands or caribbean or central america or latin america or "south and central america" or south america or asia, central or central asia or asia, northern or north asia or northern asia or asia, southeastern or southeastern asia or south eastern asia or southeast asia or south east asia or asia, western or western asia or europe, eastern or east europe or eastern europe or developing country or developing countries or developing nation? or developing population? or developing world or majority world or less developed countr* or less developed nation? or less developed population? or less developed world or lesser developed countr* or lesser developed nation? or lesser developed population? or lesser developed world or under developed countr* or under developed nation? or under developed population? or under developed world or underdeveloped countr* or underdeveloped nation? or underdeveloped population? or underdeveloped world or middle income countr* or middle income nation? or middle income population? or low income countr* or low income nation? or low income population? or lower income countr* or lower income nation? or lower income population? or underserved countr* or underserved nation? or underserved population? or underserved world or under served countr* or under served nation? or under served population? or under served world or deprived countr* or deprived nation? or deprived population? or deprived world or poor countr* or poor nation? or poor population? or poor world or poorer countr* or poorer nation? or poorer population? or poorer world or developing econom* or less developed econom* or lesser developed econom* or under developed econom* or underdeveloped econom* or middle income econom* or low income econom* or lower income econom* or low gdp or low gnp or low gross domestic or low gross national or lower gdp or lower gnp or lower gross domestic or lower gross national or lmic or lmics or third world or lami countr* or transitional countr* or emerging economies or emerging nation?).ti,ab,sh,kw.		
2	exp Abortion, Induced/	40511	41807
3	abortion.mp.	89438	93169
4	pregnancy termination.mp.	2432	2578
5	2 or 3 or 4	90960	94829
6	decision making.mp.	226784	253814

7	exp Decision Making/	207933	224714
8	6 or 7	333192	369831
9	1 and 5 and 8	498	528
10	limit 9 to (humans and yr="2000 -Current")	323	360

A. 3 Articles excluded with reasons for their exclusion

Study	Title	Reason for Exclusion
Biney *et al* (2017)	Examining the association between motivations for induced abortion and method safety among women in Ghana	Exclusion reason: Wrong outcomes: Reason for abortion
Erfani *et al* (2016)	Levels, trends and correlates of abortion in Tehran, Iran: 2009-2014	Exclusion reason: Wrong outcomes: Discusses abortion trends
Kaye *et al* (2005)	Reasons, methods used and decision-making for pregnancy termination among adolescents and older women in Mulago Hospital, Uganda	Exclusion reason: Wrong outcomes: Discusses reasons for abortion
Bailey *et al* (2003)	Adolescents' decision-making and attitudes towards abortion in North-East Brazil	Exclusion reason: Wrong outcomes: About attitudes one-year post abortion;
Hess *et al* (2007)	Women's Stories of Abortion in Southern Gabon, Africa	Exclusion reason: Wrong outcomes: Reasons for abortions, methods and post-abortion contraception
Gipson *et al* (2008)	"Having another child would be a life or death situation for her": Understanding pregnancy termination among couples in rural Bangladesh	Exclusion reason: Wrong outcomes: The qualitative findings discuss more of autonomy rather than trajectories
Hirz *et al* (2017)	The role of men in induced abortion decision making in an urban area of the Philippines	Exclusion reason: Wrong outcomes: Reasons for abortions
Varga *et al* (2002)	Pregnancy termination among South African adolescents	Exclusion reason: Wrong patient population: The story on abortion decision-making is a role play
Moore *et al* (2015)	Costs and decision-making regarding abortion and abortion care-seeking in Zambia	Exclusion reason: Wrong outcomes: Cost analysis
Zamberlin *et al* (2012)	Latin American women's experiences with medical abortion in settings where abortion is legally restricted	Exclusion reason: Wrong study design: Literature review;
Elul *et al* (2010)	Assessments of the importance of provider characteristics for abortion care: data from women in Rajasthan, India	Exclusion reason: Wrong patient population: Women did not necessarily have abortions
Orner *et al* (2011)	'It hurts, but I don't have a choice, I'm not working and I'm sick': decisions and experiences regarding abortion of women living with HIV in Cape Town, South Africa	Exclusion reason: Wrong outcomes: Studies is about challenges women with HIV face in accessing abortion services in South Africa

Study	Title	Reason for Exclusion
Whittaker (2002)	'The truth of our day by day lives': Abortion decision making in rural Thailand	Exclusion reason: Wrong outcomes: Results are based on vignettes being discussed to explore social norms about abortion and to investigate how people talk about abortion decisions
Gipson *et al* (2011)	Perceptions and practices of illegal abortion among urban young adults in the Philippines: A qualitative study	Exclusion reason: Wrong patient population: This is about an hypothetical pregnancy;
Schwandt *et al* (2013)	Pathways to unsafe abortion in Ghana: The role of male partners, women and health care providers	Exclusion reason: Wrong outcomes: Focus more is on reasons for and experiences of abortion rather than trajectories
Capelli *et al* (2019)	Non-marital pregnancies and unmarried women's search for illegal abortion in Morocco	Exclusion reason: Wrong outcomes: mostly focused on reproductive rights, only briefly mentions a few case studies; Does not directly address the questions
Kebede *et al* (2012)	The tale of the hearts: deciding on abortion in Ethiopia	Exclusion reason: Wrong study design: Case studies
Bhilwar *et al* (2016)	Prevalence of induced abortions and contraceptive use among married women in an urban slum of Delhi, India	Exclusion reason: Wrong outcomes: irrelevant outcomes
DaVanzo *et al* (2014)	Pregnancy Termination in Matlab, Bangladesh: Trends And Correlates of Use of Safer and Less-Safe Methods	Exclusion reason: Wrong outcomes: This is comparing trends and not specific to our question
Ray-Bennett *et al* (2019)	Understanding reproductive health challenges during a flood: Insights from Belkuchi Upazila, Bangladesh	Exclusion reason: Wrong outcomes: About service provision than trajectories, unclear whether the menstrual regulation was for induced abortions or miscarriages
Whittaker *et al* (2002)	Reproducing inequalities: Abortion policy and practice in Thailand	Exclusion reason: Wrong study design: case studies, rest of women excluded
Ciren *et al* (2020)	Pragmatics of everyday life: A qualitative study of induced abortion among Tibetan women in Lhasa	Exclusion reason: Wrong outcomes: Discusses services available and reasons for abortion
Mothiba *et al* (2020)	Experiences leading to the choice of termination of pregnancy amongst teenagers at a regional hospital in Mpumalanga province, South Africa	Exclusion reason: Wrong outcomes: About experiences not pathways or their determinants
Sheehy *et al* (2015)	"We can lose our life for the abortion": exploring the dynamics shaping abortion care in peri-urban Yangon, Myanmar	Exclusion reason: Wrong patient population: The participants are not people who had an abortion;
Moseson *et al* (2020)	Effectiveness of self-managed medication abortion between 13 and 24 weeks gestation: A retrospective review of case	Exclusion reason: Wrong study design: Retrospective review of case records, comparison of methods and linkage to care

Study	Title	Reason for Exclusion
	records from accompaniment groups in Argentina, Chile, and Ecuador	
Mumah *et al* (2020)	Adolescents' narratives of coping with unintended pregnancy in Nairobi's informal settlements	Exclusion reason: Wrong outcomes: Reasons for and experiences of abortion
Plummer *et al* (2008)	Aborting and suspending pregnancy in rural Tanzania: an ethnography of young people's beliefs and practices	Exclusion reason: Wrong outcomes: Explored beliefs and perceptions on abortion
Scott *et al* (2018)	A qualitative analysis of decision-making among women with sexual violence-related pregnancies in conflict-affected eastern Democratic Republic of the Congo	Exclusion reason: Wrong outcomes: Focus on outcomes of sexual violence-related pregnancies only
Omideyi *et al* (2011)	Contraceptive practice, unwanted pregnancies and induced abortion in Southwest Nigeria	Exclusion reason: Wrong outcomes: Reasons for and community perceptions of unintended pregnancies and abortion
Depiñeres *et al* (2017)	'I felt the world crash down on me': Women's experiences being denied legal abortion in Colombia	Exclusion reason: Wrong patient population: This is about women who were denied abortion
Webb *et al* (2000)	Attitudes to 'Kaponya Mafumo': The terminators of pregnancy in urban Zambia	Exclusion reason: Wrong patient population: Participants were school children discussing a hypothetical case
Kyilleh *et al* (2018)	Adolescents' reproductive health knowledge, choices and factors affecting reproductive health choices: a qualitative study in the West Gonja District in Northern region, Ghana	Exclusion reason: Wrong patient population: Discusses issues around abortion by adolescents who had no abortion
Gbagbo *et al* (2015)	Decision-making for induced abortion in the Accra metropolis, Ghana	Exclusion reason: Wrong outcomes: Discusses reasons for abortions, outside the scope of the review
Motaghi *et al* (2013)	Triangular assessment of the etiology of induced abortion in Iran: a qualitative study	Exclusion reason: Wrong outcomes: Reasons for abortion or pregnancy continuation
Oduro *et al* (2014)	"Abortion--it is my own body": women's narratives about influences on their abortion decisions in Ghana	Exclusion reason: Wrong outcomes: Discusses women's autonomy in decision-making

A. 4 Abortion decision-making trajectories

Process	Trajectory	Description	ID numbers of studies contributing to the findings	Quotations: First or second order
Pregnancy awareness	**Pregnancy awareness**	The abortion decision-making trajectory starts with the discovery of pregnancy which may be expected or unexpected. Unexpected pregnancies are likely preceded by “unpreparedness” which may include casual sex or non-use of modern contraceptives. For some women, the pregnancy may be discovered through a pregnancy test or after missing periods. The pregnancy may have been planned by one or both partners. In other cases, the pregnancy may not have been planned at all.	[31, 32, 62, 67, 77, 86, 88–90, 95, 99, 100].	*"I found out that I have a son. I had a casual relationship...with a woman I knew...that any time she or I felt like it [having sex], one person would say, “hey, should we see each other” ... and the other person would say, "yes, okay" ... One day she showed up and said, "I'm late. I took a test and I think I'm pregnant." So we went to the doctor, they confirmed it...she was one and a half months along...The doctor talked to us and said everything, "The decision is for both of you to make. If you want to make the decision to not have it, you have 2 - 3 more weeks...You can come to my office or to another office, for them to do an aspiration and in 3 - 4 hours, you'll walk out of my office without a problem ... so talk about it and make the best decision...We talked and we agreed that she wasn't going to have it ... But then she had it. (Male, 32 years old, Mexico)*[67]. *"When I opened the test and saw that it was positive, I called him, he came at the same time. I was upset, he told me not to worry that everything was going to be fine, that he doesn't earn much money, but what he earns will allow us to manage the pregnancy [...]. When I left him, I went straight to my friends to say that it is positive, that my boyfriend wants me to keep but I want to have an abortion. She agreed that I should have an abortion and she already knew a good method to have a safe abortion [...] When I explained to him [her boyfriend] that I was going to have an*

Process	Trajectory	Description	ID numbers of studies contributing to the findings	Quotations: First or second order
				abortion, he didn't want it. [...] But then, as we were talking, he calmed down a bit, he changed his mind."(Female, 23 years old, Burkina Faso)[31].
	Self-reflection	While some women may be stress-free during this phase, women may alternate between stressful and stress-free periods. The reaction to a pregnancy may be that of shock, surprise, and stress or ambivalent with periods of stress alternating with stress-free situations. The phase is variable and can take a few hours to weeks or even months.	[31, 39, 41, 65, 85, 90, 100, 119]	*"I was still deciding what to do; I was still doubting. So many things run into my mind until I come with the decision to do [---] to [---] to [---] end the pregnancy. At that time [---] [I] even think I lost [---][weight] cause [because of the] stress I have [---]having so many stress [---] losing weight cause of the stress."(Female, 22 years old, Kenya)[41].* *Women shared that this time of reflection enables them to decide what they want before the personal decision becomes subject to community perspectives (both supportive and in opposition to the decision(Kenya)[41].*
	Abortion contemplation /initial decision-making	Following the phase of self-reflection, women may make an initial abortion decision, a decision most often influenced by the environment in which she lives and the perceived reactions of her social networks to the pregnancy. The initial decision may be pregnancy termination, pregnancy continuation or ambivalence about the pregnancy but women may go through all these phases iteratively at different time intervals. While the perceived reaction of the social network to the pregnancy may influence the initial abortion decision, adult women often	[31, 32, 41, 62, 65, 67, 76, 83, 86, 88, 100, 119, 127]	*"At first, I decided I wanted to continue... so a few weeks went by and I talked to my grandmother about it.... She helped me and told me to [have the baby]. But when I talked to my mom, things changed. She told me I would lose lots of things, that I would lose the house, school, that they wouldn't give me anything. Then things started to look pretty bleak.... That same night, I got my things together and said to my dad, "You know what? I'm going to live with [my boyfriend]," but my dad got mad and started to yell. "No, no, no. I don't want you to have [the baby]." [female, 17-year-old, Mexico][32].* *"At first, I didn't dare talk about it with anyone, even my boyfriend, I didn't want to tell him because I was thinking he*

Process	Trajectory	Description	ID numbers of studies contributing to the findings	Quotations: First or second order
		make their decisions independently. Adolescents may defer the initial decision to their parents often due to fear of their parents' reaction to the pregnancy or because they are resigned to the fact that the decision will be made by parents irrespective of their choice. However, even in cases where adolescents may make the initial decision on abortion, parents often override this initial decision if it is mostly at variance with their choice.		*would abandon me. I've been thinking for several days, how am I going to do that [tell him]? Finally, I decided that I had to talk to my boyfriend about it since he is also affected." (Female, 20 years old, Burkina Faso)[31].*
	Disclosure and seeking support	Following the initial abortion decision is Faso)ase of disclosure and seeking support. The pregnant woman may disclose to or conceal the pregnancy and the initial decision from her social networks including male partner, parents, siblings, teachers, and other close friends. This disclosure and seeking support depend on the level of trust and expected support from the persons to whom the pregnancy or its decision is disclosed. When the level of trust and support is perceived to be low or non-existent, women may not disclose the pregnancy to their social networks. Some women may only disclose to a person who is expected to make the decision or provide emotional support for the abortion	[31, 32, 62, 65, 69, 86, 90, 100, 128]	*"I was doubting what to do and on the other hand afraid of sharing with anybody. I believed if I share it with so many people some people will give me other advice, some will give me this; that's why I ended up sharing with my sister that I'm staying with because I trusted her." (Female, 22 years old, Kenya)[41].* *"I did not ask someone for advice because if you ask one they will start talking about it and everybody will know about it, so I was afraid to talk about it to someone [---] and maybe it will go back to my [male] partner, and I didn't want that to happen." (Female, 32 years old, Kenya)[41].*

Process	Trajectory	Description	ID numbers of studies contributing to the findings	Quotations: First or second order
		process. For example, adolescents may disclose their pregnancies to their parents who they expect will make decisions on their behalf but may also conceal the pregnancy due to fear or perceived opposition to their initial decision. Disclosure or concealment among adult married women is dependent on level of support from their partner and relationship stability.		
	Negotiations/ bargaining	The woman and the actors to whom the abortion decision has been disclosed to then enter a stage of negotiation in cases of discordance and indecision where the woman tries to convince her social networks to agree to her initial decision.	[31–33, 62, 86, 97]	*"She is the one who at first told me it was not the baby's fault and that it was me who had been irresponsible.... My friend was basically against the idea of my getting an abortion.... She said, "And what if you do not make it through? What will I do without you?" I said, "Nothing is going to happen. I am going to be fine." [female, 16-year-old, Mexico][32].*
	Final decision	With the completion of the negotiations, the decision-making process may enter the second stage which begins with the final abortion decision – whether to keep or terminate the pregnancy. The decision may be made jointly with the male partner/parents, by the woman alone – sometimes without even informing the male partner or parents, by the male partner alone or primarily, or by others such as parents, in-laws, relatives, friends,	[31–33, 40, 41, 61, 63, 65, 67, 68, 70–72, 76–78, 83, 85, 86, 88–93, 96–103, 109, 110, 112–114, 119, 121, 123, 125–129]	*"Then I spoke to my boyfriend and he said, "I am going to do the right thing. We are going to talk to your father." Then [my father] sent for my boyfriend and asked, "How is it going to be? What are you going to do?" My boyfriend told him, "I am going to be responsible. I am going to do what I have to do." [female, 17-year-old, Mexico][32].* *"When I had my first pregnancy, I didn't tell my husband about it, so I went to abort it…I thought he was going to get angry because he already told me that he is not ready for pregnancy." [Female, 22 years old, Nigeria][86].*

Process	Trajectory	Description	ID numbers of studies contributing to the findings	Quotations: First or second order
		and teachers. Even in cases in which the majority of the decisions were made by women, men or parents still influenced their decision. Thus, decisions made by women were either passive in which the woman agreed to the decision imposed on her by others or active in which she actively participated in the decision-making processes. In cases where women were excluded or played a very limited role, threats, coercion, violence, or trickery were often employed by male partners or parents to get the woman to terminate the pregnancy reflecting a lack control and power of women in making decisions regarding their own pregnancy.		*“I wanted to keep it but he said, "Why are you so eager to keep it? It must be someone else’s. If it is mine, you will do as I say. After that what could I do?" (Female, 19-year-old, India)[119].* *“It was great, he said, "stop it, what you decided, it's decided. If you want to have it, then you will have it. If you want to have an abortion, I'm with you, don't worry." Still, he is so friendly and supportive of me.” [Female, 23 years old, Brazil][91].* *"My dad told me he would disown me if I don't get an abortion." [Female, 17 years old, Ghana][40].*

Process	Trajectory	Description	ID numbers of studies contributing to the findings	Quotations: First or second order
	Access and information	Once the final decision has been made, women and their social networks such as parents or male partners consult multiple sources to obtain information about availability, affordability, safety or accessibility to abortion services. Various sources of information include skilled abortion providers, chemists or unskilled abortion providers, intermediaries or brokers, male partners, social networks such as friends, parents, teachers, and relatives, the media and internet or school.	[41, 63, 66, 68, 69, 72, 77, 78, 84–86, 88–92, 95, 96, 99–101, 114, 126]	*“Once you get pregnant you will know all of those places and the ones who are selling those drugs. You will have their contacts as well as doctor's contacts. You can even find students who are agents for these doctors, and they will direct you to them as they know who are good at this job.” (Female, 21 years, Tanzania)[95].* *"My [male] partner began investigating options on the Internet. He found the government webpage and called the number. They told him where the clinics were, what the requirements were, and that you don't necessarily have to live here in Mexico City, and that in fact a lot of people come from other states."[Female, 21 years old, Mexico][66].* *"I knew that I couldn't ask for information about abortion services from people who I am close to and yet keep my pregnancy secret. [...] I did not know even how to raise the issue. But the delala (abortion intermediaries) was there. He approached me while sitting outside the hospital compound. He himself brought up the issue and gave me the information about abortion service providers. Back then I didn't know that he was a delala. He was nice. He promised to find me a provider who gives clean services for a fair price."(female, 19 years old, Ethiopia)[84].*
	Methods	Methods used to terminate the pregnancy are either safe or unsafe. Safe methods used include medical abortion	[30, 40, 41, 60–65, 68, 69, 71–73, 75, 77, 83,	*“Yes. We prefer the [MA] (medical abortion) kit only; it is more trustworthy and we would visit the same store for purchasing the kit in future.” (Male partner, 31 years,*

Process	Trajectory	Description	ID numbers of studies contributing to the findings	Quotations: First or second order
		(MA) which is preferred by women for its ease and convenience of use, avoidance of painful surgical procedures and because of the control the woman has over the process. Surgical methods including both manual vacuum aspiration (MVA) and dilatation and curettage (D&C) are preferred by some women considering them to be a one-time effective method for terminating the pregnancy with no requirement for visiting the hospital again. The unsafe methods include traditional methods that involve ingestion of over-the-counter drugs such as chloroquine, quinine, and antibiotics, local herbs and roots, insertion of sticks and cassava roots to the cervix by unskilled women or applying blunt manual force to the abdomen.	86, 88–92, 95–103, 110, 118–126, 129]	*India)[63].* *"She asked me to wait and said that the abortion would definitely occur. But my family members started shouting and saying nothing is happening with the tablet and the days (gestational age) are increasing, so I decided to get admitted for a surgical abortion." (Female, 35 years old, India)[63].* *Unskilled old women who insert sticks or roots of cassava into the cervix carry out another type of traditional method used to provoke unsafe abortion. When left in place, the cassava dilates the cervix and stimulates uterine contractions. Two girls who aborted at home were admitted to the hospital with severe infections after having cassava sticks or roots inserted into their cervices (Zambia)[120].*
	Place	Abortion services are obtained at various places including government/public facilities which are considered to be generally safe, cost-effective and have a good reputation. These could be referral centres for management of post abortion complications arising from clandestine and unsafe abortion, private licensed clinics and health facilities which may be run by NGOs and offer subsidised, safe	[30, 33, 60, 61, 65, 68, 69, 72, 75, 79, 83, 86, 89–91, 96–101, 103, 104, 110, 118, 120, 121, 125, 126]	*"I never knew one could stay in the comfort of your house. I think I really never knew about all that before, all my mind was that abortion must be done in the Health Care for Women International hospital or you start to use all those local concoctions that you don't even know what the future holds." (Female, 29 years old, Nigeria)[89].* *"The operating theatre is very big, equipped with powerful lighting, and the table is very big and the sheets are very clean. There was an anaesthetist and I could see so much*

Process	Trajectory	Description	ID numbers of studies contributing to the findings	Quotations: First or second order
		and legal abortion services, private unlicensed clinics that often offer illegal, unsafe, clandestine but low cost abortion services, homes of traditional abortion providers which are preferred for cost-effectiveness, social safety, and ease of access and availability, or at own home, school or neighbour's home which are considered comfortable and permitted for convenient use of medical abortion. Government facilities and private licensed clinics and health facilities often provide safe and legal abortions while all the other abortion services mostly provide unsafe, clandestine and often illegal abortion services.		*fancy medical equipment inside the theatre. The doctor was very polite and the theatre staff are equally good and kind to the patients. Doctor "kku rasianna kai" (The doctor has lucky hands). I was asked to change my clothes and they provided me with a neatly pressed hospital gown that I had to wear before I got on the table. The theatre surgeon was very polite and kind. Although I got restless waiting for a long time, still I was pleased with the overall treatment that was given to me. I did not have any complications after getting abortion and sterilisation. (Female, unknown age, India)[60].*
	Providers	The providers of abortion services include skilled and trained health workers who provided safe abortion services and are often obstetricians/gynaecologists, other medical doctors, nurses or midwives trained in provision of abortion services, health workers not trained in providing safe abortion services including doctors, nurses, midwives, clinicians and nurse-assistants who often provide clandestine abortion services in their clinics and are preferred by women due to low cost, social safety and proximity, traditional	[60, 61, 65, 68, 69, 72, 73, 77–79, 86, 90, 91, 95–102, 108, 110, 118–121, 124, 126, 129]	*"This chemist is one of my friends. Hence, I had already decided to consult and buy the medical abortion kit from him. I knew that he, being my friend, would advise me better than other chemists. He would be more reliable and accurate for buying the kit. He could also explain in detail about MA: "he was the ultimate option for me. Therefore, I planned to buy medical abortion kit from this chemist." (Partner, male, 32 years old, India)[90].* *"The doctor is extremely polite and does not discriminate among patients. I like this doctor. I went to her for the first time for my childbirth. She is very impressive and gentle in treating people." (Female, unknown age, India)[60].*

Process	Trajectory	Description	ID numbers of studies contributing to the findings	Quotations: First or second order
		herbalists or abortionists who have no medical training but are preferred due to accessibility, social safety and low cost, social networks such as relatives or friends who are trusted to keep the procedure confidential, or self-induced for fear of stigma or in cases of prescribed medical abortion which may be done at home by the woman herself. Abortion seekers may visit multiple providers several times, especially when the abortion is incomplete.		
Post abortion care and experiences	**Post-abortion complications**	Incomplete abortions or abortions with complications were often treated at referral health facilities or hospitals that had the capacity to manage severe complications and provide comprehensive post-abortion care, or in clinics as part of the MA package or as an independent service for post-abortion care.	[30, 32, 61, 68, 69, 75–77, 79, 82, 85, 86, 88, 90, 91, 96–98, 121, 124, 129]	*"I didn't have any intention of visiting the hospital but when I began to bleed, the blood came gradually. About a few weeks later, I began to have severe stomach-ache, my parents thought it was malaria, so my younger sister went to get a drug for me at the chemist, a white drug sort of, that was what I used, and I was relieved. I couldn't even check the name because of my condition. So, when I used it, I felt ok for about 2 weeks but on Saturday the pains began again, and I was bleeding that is why my grandma brought me here." (Female, 23 years old, Nigeria)[86].* *"I came because my bleeding wouldn't stop. It continued for 20 days. I felt weak and was really scared. I told my neighbour about my condition, and she suggested that I consult this doctor. She had consulted her previously. She said the doctor was very good." (Female, 23 years old, India)[88].*

Process	Trajectory	Description	ID numbers of studies contributing to the findings	Quotations: First or second order
				"I thought that if I don't come to the hospital and get help, I remain in the house I will get worse and die. I would get worse if I didn't tell my family. That's why when I told my family they helped me come to the hospital." (Female, 20 years old, Papua New Guinea)[77].
	Post-abortion contraceptive use	Only two of the included articles provided information on provision of post-abortion services and counselling on contraception and it was not universally offered to all the women who might have needed the services.	[85, 92]	*Not all women received contraceptive counselling after abortion. Some said they were informed about pills, injection, and intrauterine device (IUD), and a few women reported being advised to use traditional methods such as the calendar method (Cambodia)[92].*

First order quotes: study participants quotes; **second order quotes**: author interpretations/explanations; first order quotes are in quotation marks

APPENDIX B – GENERATING AND VALIDATING THE WOMEN'S EMPOWERMENT INDEX

B. 1 Variables for construction of empowerment index for married women or cohabiting women

Variable name	Variable label
V106	Highest educational level
V155	Literacy
V157	Frequency of reading newspaper or magazine
V158	Frequency of listening to radio
V159	Frequency of watching television
V212	Age of respondent at first birth
V467b	Getting medical help for self: getting permission to go
V467c	Getting medical help for self: getting money needed for treatment
V467d	Getting medical help for self: distance to health facility
V467f	Getting medical help for self: not wanting to go alone
V511	Respondent's age at first cohabitation
V633b	Reason for not having sex: husband has other women
V701	Husband/male partner's educational level
V714	Respondent currently working
V731	Respondent worked in last 12 months
V732	Respondent employed all year/seasonal
V739	Person who usually decides how to spend respondent's earnings
V741	Type of earnings from respondent's work
V743a	Person who usually decides on respondent's healthcare
V743b	Person who usually decides on large household purchases
V743d	Person who usually decides on visits to family or relatives
V744a	Beating justified if wife goes without telling husband/male partner
V744b	Beating justified if wife neglects children
V744c	Beating justified if wife argues with husband/male partner
V744d	Beating justified if wife refuses to have sex with husband/male partner
V744e	Beating justified if wife burns food
V745a	Owns a house alone or jointly
V745b	Owns land alone or jointly

V746	Respondent earns more than husband/male partner
V822	Wife justified asking husband/male partner to use condom if he has
V850a	Respondent can refuse sex
V850b	Respondent can ask husband/male partner to use a condom

B. 2 Descriptive summaries of the included variables (N=273,238)

Variable	Mean	SD	Median	IQR	Min	Max	Range	Skewness	Kurtosis
House ownership	1.60	0.73	1.00	1.00	1	3	2	0.78	2.26
Land ownership	1.50	0.73	1.00	1.00	1	3	2	1.07	2.69
Earning's	2.09	1.28	1.00	2.00	1	4	3	0.50	1.48
Health care	1.90	0.74	2.00	1.00	1	3	2	0.16	1.86
Household	1.79	0.68	2.00	1.00	1	3	2	0.29	2.15
Visiting parents	1.92	0.68	2.00	1.00	1	3	2	0.11	2.14
Not informing	1.72	0.45	2.00	1.00	1	2	1	-1.01	2.01
Neglects children	1.69	0.46	2.00	1.00	1	2	1	-0.81	1.65
Argues with	1.75	0.44	2.00	1.00	1	2	1	-1.13	2.28
Refuses sex	1.78	0.42	2.00	0.00	1	2	1	-1.32	2.74
Burns food	1.85	0.35	2.00	0.00	1	2	1	-2.00	5.02
Permission for	1.84	0.37	2.00	0.00	1	2	1	-1.86	4.46
No sex if other	1.68	0.47	2.00	1.00	1	2	1	-0.76	1.58
Can refuse sex	1.68	0.47	2.00	1.00	1	2	1	-0.77	1.59
Condom if has STI	1.59	0.49	2.00	1.00	1	2	1	-0.37	1.14
Can ask condom	1.76	0.43	2.00	0.00	1	2	1	-1.23	2.51
House	1.82	0.94	1.00	2.00	1	3	2	0.37	1.24
Land	1.63	0.88	1.00	2.00	1	3	2	0.78	1.76
Earning's	2.03	1.22	1.00	2.00	1	4	3	0.52	1.58
Health care	2.12	0.87	2.00	2.00	1	3	2	-0.24	1.35
Household	2.13	0.91	2.00	2.00	1	3	2	-0.27	1.25
Visiting parents**	2.25	0.86	3.00	2.00	1	3	2	-0.50	1.52

******** *reversed recoding items for index two in which joint decisions score higher than alone ones*

APPENDIX C – THE ASSOCIATION BETWEEN WOMEN'S EMPOWERMENT AND MODERN CONTRACEPTIVE USE

C. 1 Definitions of potential mediators, moderators, and confounders for the association between women's empowerment and abortion and modern contraceptive use

Variable name	Definition	DHS codes	Codes to use
Woman's age	Woman's current age	Continuous from 15-44/49	Continuous from 15-44/49
Woman's place of residence	Type of place of residence where the household resides	1 = Urban 2 = Rural	0 = Rural 1 = Urban
Woman's education level	Highest education level attended	0 = No education 1 = Primary 2 = Secondary 3 = Higher	0 = No education 1 = Primary 2 = Secondary 3 = Higher
Access to mass media	This is a composite score obtained from the following three questions: Frequency of reading newspaper or magazine; Frequency of listening to radio; Frequency of watching television. The composite score will range from 0 (no access at all to any media type) to 6 (access at least once a week to all the media types)	0 = Not at all 1 = Less than once a week 2 = At least once a week	Continuous
Wealth index	Combined wealth index of the household	0 = Poorest 1 = Poorer 2 = Middle 3 = Richer 4 = Richest	0 = Poorest 1 = Poorer 2 = Middle 3 = Richer 4 = Richest
First birth	Age of respondent at first birth	Continuous from 15-44/49	Continuous from 15-44/49
Knowledge of fertile period	Indicates when during her monthly cycle the respondent thinks a woman has the greatest chance of becoming pregnant	1 = During her period 2 = After period ended 3 = Middle of the cycle	0 = (1, 2, 4, 5, 6, 7) Don't know 1 = 3 Know

Variable name	Definition	DHS codes	Codes to use
		4 = Before period begins 5 = At any time 6 = Other 7 = Don't know	
Exposure to FP messages	This is a composite score from three questions: Heard about FP on the radio in the last few months; Heard about FP on the TV in the last few months; Heard about FP from a newspaper or magazine in the last few months	0 = No 1 = Yes	Continuous
Informed consent for FP	This is a composite variable generated from the following three questions: Talked about side effects or problems the respondent might have when first obtained the method she is currently using; Told how to deal with side effects; Told about the availability of other FP methods than the one she is using	0 = No 1 = Yes	Continuous
Access to health care	This is a composite score generated from four questions on access to health care. Getting medical help for self: getting money needed for treatment; Getting medical help for self: distance to health facility; Getting medical help for self: not wanting to go alone	1 = Big problem 2 = Not a big problem	Continuous
Living together	Whether the husband/male partner lives in the household or is now living elsewhere	1 = Living with her 2 = Staying elsewhere	0 = Staying elsewhere 1 = Living with her
Type of marriage	Whether the respondent is in a polygamous marriage or cohabitation and the number of other wives the respondent's husband/male partner currently has	Variable	0 = Monogamy 1 = Polygamous
First marriage	Age at first marriage or cohabitation	Continuous from 15-44/49	Continuous from 15-44/49
Age at first birth	Age at first birth	Continuous from 15-44/49	Continuous from 15-44/49
Fertility preferences	This variable records the original response to the question "How long would you like to wait from now before the birth of another child?" Women who respond that they want another child, but when asked when they would like the	1 = Have another child 2 = Undecided 3 = No more	Continuous

Variable name	Definition	DHS codes	Codes to use
	next child, respond that they cannot get pregnant, are classified in the "declared infecund category", and not in the "Wants another" category	4 = Sterilised (respondent or husband/male partner) 5 = Declared infecund	
Male partner's age	Age of the respondent's husband or male partner	Continuous, variable	Continuous
Male partner's education level	The current or most recent husband or male partner's highest level of education attended	0 = No education 1 = Primary 2 = Secondary 3 = Higher 8 = Don't know	0 = No education 1 = Primary 2 = Secondary 3 = Higher (Drop 8)
Employment last 12 months	Respondent worked in last 12 months;	0 = No 1 = In the past year 2 = Currently working 3 = have a job, but on leave last 7 days	0= Not working 1 = In the past year 2 = (=2 or 3) Currently working/have a job, but on leave last 7 days
Earnings	Type of earnings from respondent's work	0 = Not paid 1 = Cash only 2 = Cash and in-kind 3 = In-kind only	0 = Not working 1 = In-kind only 2 = Cash and in-kind 3 = Cash only
Seasonality	Respondent employed all year/seasonal	1 = All year 2 = Seasonal 3 = Occasional	0 = Not working 1 = Seasonal or occasional 2 = All year
Differences in earnings	Respondent earns more than husband/male partner	1 = More than him 2 = Less than him 3 = About the same 4 = Husband/male partner has no income	0 = Not working 1 = Husband/male partner has no income 2 = Less than him 3 = About same 4 = More than him
Spousal difference in education	Formula: Woman's highest education level —Husband/male partner's highest education level	Highest education level recorded in the dataset to create a dummy variable	0=respondent is less educated than husband/male partner

Variable name	Definition	DHS codes	Codes to use
			1=Respondent and husband/male partner have same educational attainment 2= Respondent is more educated than husband/male partner
Country's abortion laws and policies	This is according to a country abortion laws which will be split according to four categories: To save woman's life (most restrictive), To preserve health (restrictive), Broad socioeconomic grounds (liberal), On request (most liberal)	Not applicable	Categorical groups: Very restrictive, moderately restrictive, least restrictive 1 = Restrictive 2 = Liberal 3 = Most liberal
Geographical regions	Sub-Saharan Africa (SSA), Europe and Asia, India, The Americas, Oceania	Not applicable	Three categories: SSA, Asia, and rest of LMICs
Socioeconomic Group	The income status of each country according to the World Bank	Not applicable	Two groups: Low-income and Middle-income
Human Development Index (HDI)	"HDI is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living. The HDI is the geometric mean of normalized indices for each of the three dimensions. The health dimension is assessed by life expectancy at birth, the education dimension is measured by mean years of schooling for adults aged 25 years and more and expected years of schooling for children of school entering age. The standard of living dimension is measured by gross national income per capita. The HDI uses the logarithm of income, to reflect the diminishing importance of income with increasing GNI. The scores for the three HDI dimension indices are then aggregated into a composite index using	Not applicable	Three groups: Low human development, medium human development, and high human development

Variable name	Definition	DHS codes	Codes to use
	geometric mean. The HDI ranges from 0 to 1, with higher scores reflecting higher development and lower scores lower development"(Human Development Report, 2022). It was analysed as a categorical variable following the United Nations Development Programme (UNDP) classification into low human development (HDI <0.550), medium human development (HDI 0.550 – 0.699), high human development (HDI 0.700 – 0.799) and very high human development (HDI 0.800 bd greater)(Human Development Report, 2022).		
Gender Development Index (GDI)	"GDI measures gender inequalities in achievement in three basic dimensions of human development: health, measured by female and male life expectancy at birth; education, measured by female and male expected years of schooling for children and female and male mean years of schooling for adults ages 25 years and older; and command over economic resources, measured by female and male estimated earned income. The GDI ranges from 0 to 1, with higher scores reflecting gender parity and lower scores greater gender disparity"(Hirway & Mahadevia, 1996; Human Development Report, 2022; Malik, 2018). It was analysed as a categorical variable from a modified UNDP classification into three groups based on absolute deviation from gender parity in HDI values: Group 1: high equality (absolute deviation of 2.5% or less), Group 2: medium equality (absolute deviation of 2.5 – 10%) and Group 3: low equality (absolute deviation of more than 10%)(Human Development Report, 2022).	Not applicable	Categorical: low equality, medium equality, and high equality groups

Variable name	Definition	DHS codes	Codes to use
Modern contraceptive use prevalence	The country's prevalence of modern contraceptive use estimated from nonpregnant women currently using modern contraceptives	Not applicable	Low and high prevalence

C. 3 Geographical classification of included countries

Region	Countries
Sub-Saharan Africa	Benin, Gambia, Ghana, Guinea, Liberia, Mali, Nigeria, Sierra Leone, Chad, Cameroon, Burundi, Ethiopia, Kenya, Rwanda, Uganda, Lesotho, Malawi, Zambia, Zimbabwe
Asia	Nepal, Pakistan, Cambodia, Myanmar, Timor-Leste, Philippines
“Rest of LMICs”	Guatemala, Haiti, Albania, Armenia, Papua New Guinea

C. 4 Descriptive statistics for woman-alone empowerment index

Country	Woman-alone Empowerment Index													
	Q1		Q2		Q3		Q4		Q5		Mea	SD	Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Albania	1432	15.3	141	17.1	148	22.0	2071	34.2	719	11.4	19.1	1.8	712	100
Armenia	800	17.7	854	20.3	137	37.6	72	2.5	700	22.0	19.4	1.2	380	100
Benin	796	21.0	771	20.4	786	20.0	764	19.6	755	19.1	16.7	2.6	387	100
Burundi	1590	21.5	159	21.1	157	19.5	1581	18.8	158	19.2	17.0	2.4	792	100
Cambodia	2095	18.6	196	19.2	203	20.4	2027	20.1	202	21.9	18.9	2.0	100	100
Cameroon	1077	22.6	106	20.3	118	20.7	1501	27.9	491	8.6	17.5	2.1	531	100
Chad	487	19.8	485	21.0	492	19.8	480	19.4	483	19.9	14.6	2.5	242	100
Ethiopia	1319	22.4	132	22.6	133	20.1	1348	19.9	124	15.1	16.4	2.5	657	100
Gambia	1274	17.1	116	18.7	124	23.0	1200	19.3	120	22.0	16.5	2.1	609	100
Ghana	868	17.9	864	18.6	997	24.3	846	18.6	753	20.6	18.7	1.6	432	100
Guatemala	2528	21.5	244	20.0	388	31.3	1075	9.1	220	18.2	19.4	2.2	120	100
Guinea	1073	18.5	107	19.3	107	19.6	1077	21.1	106	21.5	15.0	2.1	536	100
Haiti	892	19.7	866	19.7	126	27.8	491	11.3	866	21.5	19.6	1.6	438	100
Kenya	1466	16.0	143	19.3	147	20.7	1440	23.0	143	21.0	18.5	3.0	724	100
Lesotho	652	18.3	659	19.7	648	20.8	660	20.3	641	20.9	19.0	1.2	326	100
Liberia	709	20.7	670	18.8	793	20.4	743	23.7	528	16.4	18.3	1.6	344	100
Malawi	2530	21.4	247	20.8	248	19.5	3323	25.7	156	12.6	18.5	2.4	120	100
Mali	1129	21.1	112	21.4	143	24.9	814	14.8	112	17.8	13.9	2.0	563	100
Myanmar	1410	20.5	142	21.2	141	20.2	1394	20.9	140	17.2	18.5	2.0	704	100
Nepal	1711	21.2	152	18.4	164	20.5	1598	19.9	160	20.0	18.8	2.1	809	100
Nigeria	3861	19.6	431	21.6	358	17.7	3895	21.2	365	19.9	17.2	4.2	190	100
Pakistan	2315	17.5	230	20.4	228	21.5	2320	21.7	227	19.0	16.4	3.2	110	100
Papua New	1618	21.1	162	21.0	161	21.2	1609	19.1	161	17.6	16.9	2.5	807	100
Philippines	2797	17.7	291	20.3	321	25.9	3066	22.3	198	13.8	19.9	1.8	140	100
Rwanda	1182	20.0	119	20.8	117	20.1	1499	25.2	847	14.0	18.7	1.7	589	100
Sierra Leone	1479	19.8	148	20.2	155	20.7	1396	19.2	147	20.1	16.3	2.6	738	100
Timor-Leste	451	19.3	457	20.1	443	19.8	465	20.5	431	20.3	15.8	2.1	224	100
Uganda	1650	19.3	169	20.6	168	20.8	1951	23.5	127	15.8	18.2	2.2	824	100
Zambia	1188	17.9	119	19.8	117	20.5	1484	25.9	883	15.9	17.7	2.2	593	100
Zimbabwe	1038	21.3	103	20.8	105	20.9	1022	19.3	103	17.7	18.9	1.6	518	100

Total	4300	19.6	430	20.1	460	22.2	4300	20.2	380	17.9	17.8	2.7	210	100

No. = Number, % = percentage

C. 5 Descriptive statistics for joint empowerment index

Country	Joint Empowerment Index													
	Q1		Q2		Q3		Q4		Q5		Mean	SD	Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Albania	1427	18.5	1423	17.3	1715	24.4	2559	39.9	0	0.0	21.6	2.4	7124	100
Armenia	765	18.3	979	26.6	785	20.4	1271	34.6	0	0.0	21.5	1.3	3800	100
Benin	844	22.7	709	18.0	773	19.8	772	19.7	774	19.8	18.0	3.2	3872	100
Burundi	1587	21.3	1587	20.2	1593	20.1	1656	20.3	1505	18.1	18.9	3.0	7928	100
Cambodia	2064	19.5	2004	20.7	2091	21.4	1965	19.8	2024	18.6	20.6	2.3	10000	100
Cameroon	1140	24.2	1005	19.3	1069	19.0	1108	19.1	995	18.4	19.1	2.8	5317	100
Chad	489	19.5	482	21.1	487	18.9	486	20.6	483	19.8	15.2	2.7	2427	100
Ethiopia	1367	21.0	1276	19.5	1299	21.8	1365	19.6	1263	18.0	18.4	2.9	6570	100
Gambia	1219	16.7	1231	21.0	1251	20.6	1179	21.0	1215	20.7	17.6	2.5	6095	100
Ghana	937	20.0	799	19.8	867	21.1	977	23.6	748	15.6	20.1	1.8	4328	100
Guatemala	2545	21.8	2341	19.2	2438	20.1	4818	38.9	0	0.0	21.1	2.7	12000	100
Guinea	1076	18.5	1339	23.9	806	15.2	1132	22.3	1012	20.2	16.1	2.5	5365	100
Haiti	888	19.6	882	21.0	949	22.7	802	18.3	863	18.4	20.7	1.9	4384	100
Kenya	1452	16.6	1490	20.1	1454	19.5	1408	20.3	1443	23.5	19.8	3.7	7247	100
Lesotho	655	18.4	664	19.7	742	24.0	555	17.2	644	20.8	20.6	1.4	3260	100
Liberia	690	20.7	701	19.0	675	19.2	724	20.1	653	21.1	19.9	1.8	3443	100
Malawi	2760	23.7	2310	19.2	2375	19.1	2520	20.1	2416	17.9	20.1	3.1	12000	100
Mali	1128	21.1	1126	21.4	1393	24.1	861	15.7	1125	17.8	14.4	2.2	5633	100
Myanmar	1429	20.5	1391	19.5	1444	19.8	1409	19.6	1373	20.5	19.7	2.2	7046	100
Nepal	1621	19.8	1682	20.3	1627	19.2	1565	19.6	1595	21.1	19.4	2.2	8090	100
Nigeria	4013	20.3	3716	19.3	3959	20.2	4052	21.6	3564	18.8	18.6	5.2	19000	100
Pakistan	2306	16.8	2334	21.0	2269	20.3	2388	22.1	2198	19.8	17.8	4.0	11000	100
Papua New	1624	21.3	1636	22.4	1628	21.0	1668	20.3	1520	15.0	18.4	2.9	8076	100
Philippines	2796	17.9	2835	19.6	4296	30.5	4051	32.0	0	0.0	21.6	2.2	14000	100
Rwanda	1182	20.2	1179	20.2	1214	21.0	2323	38.7	0	0.0	20.5	2.2	5898	100
Sierra Leone	1478	20.0	1528	20.4	1501	20.3	1407	19.5	1470	19.9	17.5	3.2	7384	100
Timor-Leste	451	20.8	490	20.8	430	18.9	450	20.4	426	19.2	17.3	2.3	2247	100
Uganda	1650	19.2	1664	20.0	1705	21.2	1620	20.0	1610	19.6	19.5	2.7	8249	100
Zambia	1190	18.2	1193	19.8	1197	21.4	1170	20.6	1182	19.9	19.0	2.5	5932	100
Zimbabwe	1045	21.5	1055	20.6	1014	19.5	1086	20.0	981	18.4	20.3	1.8	5181	100
Total	44000	20.0	43000	20.4	45000	20.9	49000	22.9	33000	15.8	19.2	3.2	210000	100

No. = Number, % = percentage

C. 6 Descriptive statistics for attitudes towards domestic violence and reproductive health decision-making domains

Country	Attitudes towards domestic violence								Reproductive health decision-making							
	Low		High		Mean	SD	Total		Low		High		Mean	SD	Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Albania	1062	9.3	9339	90.7	8.9	0.7	10000	100	4071	51.0	3053	49.0	5.5	1.2	7124	100
Armenia	698	14.9	3110	85.1	8.8	0.6	3808	100	1593	37.2	2212	62.8	5.8	0.6	3805	100
Benin	2692	34.5	5293	65.5	8.2	1.5	7985	100	3111	80.2	761	19.8	4.7	1.2	3872	100
Burundi	4759	61.1	3169	38.9	7.5	1.7	7928	100	5454	69.2	2474	30.8	5.2	1.0	7928	100
Cambodia	5513	54.7	4642	45.4	7.8	1.7	10000	100	3936	37.1	6216	62.9	5.9	0.7	10000	100
Cameroon	1693	30.2	4130	69.8	8.4	1.1	5823	100	3434	65.1	1883	34.9	5.2	1.0	5317	100
Chad	5437	78.9	1829	21.1	6.5	1.7	7266	100	2259	90.1	190	9.9	4.4	1.0	2449	100
Ethiopia	3805	64.5	2765	35.5	7.1	1.7	6570	100	5143	79.4	1427	20.6	4.8	1.0	6570	100
Gambia	3703	54.4	2392	45.7	7.7	1.4	6095	100	4478	73.0	1617	27.0	5.1	0.9	6095	100
Ghana	1373	28.7	2959	71.3	8.4	1.0	4332	100	2236	52.1	2092	47.9	5.6	0.7	4328	100
Guatemala	1374	10.8	11000	89.2	8.9	0.8	12000	100	4048	33.9	8106	66.1	5.8	1.1	12000	100
Guinea	3790	70.5	1575	29.5	6.9	1.5	5365	100	4817	89.1	548	10.9	4.3	0.9	5365	100
Haiti	1031	15.6	5511	84.4	8.8	0.7	6542	100	2131	48.5	2253	51.5	5.7	0.7	4384	100
Kenya	3530	43.6	3733	56.4	8.1	1.9	7263	100	3501	43.9	3759	56.1	5.7	1.2	7260	100
Lesotho	1084	31.9	2176	68.1	8.4	0.8	3260	100	1753	52.9	1507	47.1	5.7	0.5	3260	100
Liberia	1449	38.3	1994	61.7	8.1	0.9	3443	100	2038	55.2	1405	44.8	5.4	0.7	3443	100
Malawi	1985	16.4	10000	83.6	8.8	1.1	12000	100	6403	52.1	5978	48.0	5.5	1.3	12000	100
Mali	4269	81.7	1364	18.3	6.7	1.3	5633	100	5242	92.4	391	7.6	4.2	0.8	5633	100
Myanmar	3926	56.1	3123	44.0	8.0	1.2	7049	100	3470	49.2	3576	50.8	5.6	0.9	7046	100

Nepal	2219	27.6	5871	72.4	8.6	0.9	8090	100	2598	33.2	5492	66.8	5.9	0.8	8090	100
Nigeria	5358	27.0	14000	73.1	8.2	2.5	19000	100	13000	68.9	5938	31.1	5.2	1.6	19000	100
Pakistan	5287	41.4	6211	58.6	7.8	1.9	11000	100	7682	69.2	3815	30.8	4.9	1.3	11000	100
Papua New Guinea	5968	74.8	2313	25.2	6.9	1.8	8281	100	4365	56.0	3835	44.0	5.3	1.1	8200	100
Philippi	1805	11.6	12000	88.4	8.9	0.7	14000	100	5293	35.9	8685	64.1	5.8	1.1	14000	100
Rwanda	2362	40.1	3592	59.9	8.2	1.2	5954	100	2303	38.5	3632	61.6	5.9	0.6	5935	100
Sierra Leone	3998	53.4	3386	46.6	7.6	1.6	7384	100	5267	71.0	2117	29.0	5.1	1.0	7384	100
Timor-Leste	5324	80.8	1285	19.2	6.4	1.5	6609	100	2068	90.6	179	9.4	4.1	1.0	2247	100
Uganda	4026	47.9	4225	52.1	8.0	1.5	8251	100	3615	43.4	4634	56.6	5.8	0.8	8249	100
Zambia	2908	48.1	3024	51.9	7.7	1.5	5932	100	3526	60.3	2406	39.7	5.3	0.9	5932	100
Zimbabwe	1788	36.5	3395	63.5	8.4	1.0	5183	100	3010	60.9	2171	39.1	5.5	0.7	5181	100
Total	94000	42.8	140000	57.2	8.0	1.6	230000	100	120000	57.9	92000	42.1	5.3	1.1	210000	100

No. = Number, % = percentage, SD = standard deviation

C. 7 Descriptive statistics for household decision-making domains

Country	Woman-alone household decision-making								Joint household decision-making							
	Low		High		Mean	SD	Total		Low		High		Mean	SD	Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Albania	8709	81.6	1692	18.4	4.7	0.9	10000	100	1558	14.6	8843	85.5	7.1	1.6	10000	100
Armenia	2733	69.5	1072	30.5	4.8	0.6	3805	100	594	17.2	3211	82.8	6.9	0.9	3805	100
Benin	6747	84.6	1238	15.4	3.9	1.3	7985	100	4622	58.0	3363	42.0	5.2	2.1	7985	100
Burundi	6788	86.0	1140	14.0	4.3	1.1	7928	100	2786	35.4	5142	64.6	6.3	1.9	7928	100
Cambodia	5188	47.4	4961	52.6	5.2	1.0	10000	100	1514	15.9	8635	84.1	6.9	1.3	10000	100
Cameroon	4834	83.0	989	17.0	4.0	1.1	5823	100	2566	46.9	3257	53.1	5.6	1.9	5823	100
Chad	6018	82.6	1234	17.4	3.6	1.3	7252	100	5974	81.3	1278	18.7	4.2	1.6	7252	100
Ethiopia	4836	78.6	1734	21.4	4.5	1.0	6570	100	2117	28.4	4453	71.6	6.5	1.6	6570	100
Gambia	5105	84.6	990	15.4	3.8	1.1	6095	100	4028	67.7	2067	32.3	4.8	1.7	6095	100
Ghana	3021	66.2	1310	33.8	4.7	0.8	4331	100	1605	38.7	2726	61.4	6.2	1.2	4331	100
Guatemala	8113	66.6	4044	33.4	4.7	1.3	12000	100	3590	30.3	8567	69.7	6.4	1.9	12000	100
Guinea	4629	86.1	736	14.0	3.7	1.1	5365	100	3576	66.0	1789	34.0	4.8	1.7	5365	100
Haiti	3756	54.8	2786	45.2	5.0	1.1	6542	100	2765	43.6	3777	56.4	6.1	1.5	6542	100
Kenya	4514	62.5	2745	37.6	4.7	1.7	7259	100	3205	42.3	4054	57.7	6.0	2.4	7259	100
Lesotho	2043	61.8	1217	38.3	4.9	0.6	3260	100	1043	29.8	2217	70.2	6.4	0.9	3260	100
Liberia	2316	68.7	1127	31.3	4.7	0.8	3443	100	1213	37.2	2230	62.8	6.3	1.2	3443	100
Malawi	10000	82.5	2138	17.5	4.2	1.5	12000	100	5316	44.9	7065	55.1	5.8	2.4	12000	100
Mali	5214	91.5	419	8.5	3.1	1.0	5633	100	4805	87.5	828	12.6	3.6	1.3	5633	100
Myanmar	3860	57.7	3187	42.3	5.0	1.1	7047	100	2940	39.9	4107	60.1	6.2	1.5	7047	100

Nepal	5445	66.7	2645	33.3	4.3	1.6	8090	100	5689	68.0	2401	32.0	4.9	1.8	8090	100
Nigeria	17000	85.6	2516	14.4	3.8	2.0	19000	100	11000	57.0	8343	43.0	5.2	3.4	19000	100
Pakistan	10000	89.9	1174	10.1	3.7	1.4	12000	100	6938	57.7	4562	42.3	5.1	2.4	12000	100
Papua New Guinea	5699	68.4	2519	31.6	4.7	1.2	8218	100	2826	37.4	5392	62.6	6.2	1.8	8218	100
Philippi	7218	52.5	6760	47.5	5.1	1.2	14000	100	3034	20.5	11000	79.5	6.8	1.7	14000	100
Rwanda	4535	76.7	1407	23.3	4.6	0.9	5942	100	1863	31.9	4079	68.1	6.5	1.5	5942	100
Sierra Leone	6411	86.2	973	13.8	3.7	1.3	7384	100	4671	63.1	2713	36.9	4.8	2.1	7384	100
Timor-Leste	3239	48.3	3370	51.7	5.3	0.9	6609	100	1666	25.4	4943	74.6	6.7	1.2	6609	100
Uganda	5862	71.7	2387	28.3	4.5	1.3	8249	100	3915	48.0	4334	52.0	5.8	1.9	8249	100
Zambia	3924	64.7	2008	35.3	4.7	1.0	5932	100	2465	41.7	3467	58.3	6.0	1.5	5932	100
Zimbabwe	2862	56.4	2319	43.6	5.0	0.8	5181	100	1601	30.6	3580	69.4	6.5	1.2	5181	100
Total	170000	72.3	63000	27.7	4.4	1.3	230000	100	100000	43.6	130000	56.4	5.9	2.0	230000	100

No. = Number, % = percentage, SD = standard deviation

C. 8 Descriptive statistics for woman's characteristics: age, education, and place of residence

Country	Age		Woman's education										Place of Residence					
	Mean	SD	No		Primary		Secondary		Higher		Total		Urban		Rural		Total	
			No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Albania	42.4	12.3	58	0.6	5769	48.9	3228	33.5	1346	17.0	10000	100	4636	57.3	5765	42.7	10000	100
Armenia	35.1	5.4	3	0.1	189	5.1	1725	43.2	1894	51.6	3811	100	2139	57.2	1672	42.8	3811	100
Benin	32.0	8.4	5151	64.5	1472	18.8	1224	15.2	138	1.6	7985	100	3427	41.3	4558	58.7	7985	100
Burundi	32.9	7.9	3669	48.5	3149	40.3	1009	10.2	101	1.0	7928	100	1432	10.1	6496	90.0	7928	100
Cambodia	33.5	9.5	1486	14.8	5199	54.1	3138	28.7	332	2.4	10000	100	2940	15.3	7215	84.7	10000	100
Cameroon	33.7	8.6	1303	25.3	1942	31.0	2234	37.4	344	6.4	5823	100	2910	51.2	2913	48.8	5823	100
Chad	30.9	8.3	5264	65.2	1298	22.8	674	11.0	56	1.0	7292	100	1578	20.9	5714	79.1	7292	100
Ethiopia	31.0	7.4	3572	57.4	1849	29.4	686	7.7	463	5.6	6570	100	1881	18.5	4689	81.5	6570	100
Gambia	32.0	7.2	3151	44.7	1050	16.9	1647	32.6	247	5.8	6095	100	3041	69.4	3054	30.6	6095	100
Ghana	34.2	5.8	1482	26.7	809	17.8	1842	50.0	200	5.6	4333	100	2020	51.8	2313	48.2	4333	100
Guatemala	32.7	10.6	2082	17.6	6172	50.0	3226	26.9	696	5.5	12000	100	5127	43.6	7049	56.4	12000	100
Guinea	32.4	7.1	4221	78.6	499	9.1	509	9.5	136	2.9	5365	100	1703	32.0	3662	68.0	5365	100
Haiti	33.7	7.4	1373	19.7	2464	35.3	2427	39.6	278	5.4	6542	100	2308	41.4	4234	58.6	6542	100
Kenya	32.2	11.0	2195	7.3	7996	53.4	3704	28.4	1392	11.0	15000	100	5620	40.2	9667	59.8	15000	100
Lesotho	31.5	5.4	45	1.2	1495	43.6	1462	46.7	258	8.6	3260	100	926	32.0	2334	68.0	3260	100
Liberia	33.2	5.4	1685	42.4	833	20.5	831	31.9	94	5.2	3443	100	1238	55.2	2205	44.9	3443	100
Malawi	30.8	10.3	1525	13.3	7795	63.3	2730	20.7	331	2.7	12000	100	2492	17.3	9889	82.7	12000	100
Mali	31.1	7.1	4028	71.2	672	11.9	833	15.0	100	1.9	5633	100	1728	24.1	3905	75.9	5633	100

Myanmar	35.0	7.8	1026	14.7	3253	47.2	2199	29.8	569	8.3	7047	100	1892	26.7	5157	73.3	7049	100
Nepal	32.2	8.7	3172	38.4	1422	18.1	2491	30.5	1005	13.0	8090	100	5166	63.9	2924	37.8	8090	100
Nigeria	32.7	13.1	6907	35.4	3330	16.5	6868	35.8	2199	12.4	19000	100	7804	46.4	12000	53.6	19000	100
Pakistan	32.7	8.9	5465	46.3	1654	17.1	2507	22.1	1875	14.6	12000	100	5672	38.4	5829	61.6	12000	100
Papua New Guinea	32.9	8.4	1831	26.8	4070	47.4	2100	21.9	344	3.9	8345	100	2092	12.6	6253	87.4	8345	100
Philippines	35.1	11.0	197	0.9	2688	16.5	6636	48.7	4457	33.9	14000	100	4653	45.4	9325	54.6	14000	100
Rwanda	33.4	6.5	958	16.7	4180	70.9	637	9.8	200	2.6	5975	100	1352	17.1	4623	82.9	5975	100
Sierra Leone	33.0	7.9	4739	60.8	879	12.8	1499	22.3	267	4.1	7384	100	2441	37.7	4943	62.3	7384	100
Timor-Leste	34.1	7.5	1892	29.1	1223	17.9	2944	43.8	550	9.3	6609	100	2061	29.0	4548	71.0	6609	100
Uganda	31.0	8.6	1073	10.8	4854	57.4	1693	22.7	631	9.1	8251	100	1739	24.7	6512	75.3	8251	100
Zambia	32.1	7.2	553	8.3	2980	49.1	2037	37.2	362	5.5	5932	100	2145	42.4	3787	57.6	5932	100
Zimbabwe	31.6	6.4	51	1.2	1311	27.6	3368	63.8	453	7.5	5183	100	2220	35.9	2963	64.2	5183	100
Total	33.0	8.7	70000	29.6	82000	32.3	68000	29.2	21000	8.8	240000	100	86000	36.6	160000	63.4	240000	100

No. = Number, % = percentage, SD = standard deviation

C. 9 Descriptive statistics for male partner's characteristics

Country	Male partner's		Male partner's education level										Living together					
			No education		Primary		Secondary		Higher		Total		Yes		No		Total	
	Mean	SD	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Albania	47.6	12.7	170	1.2	5104	43.2	4169	42.6	957	13.1	10000	100	6636	93.3	488	6.7	7124	100
Armenia	39.7	6.0	7	0.2	358	9.2	1913	48.9	1527	41.7	3805	100	3596	93.9	213	6.2	3809	100
Benin	39.0	11.0	3953	52.3	1546	21.3	1521	19.9	530	6.5	7550	100	6674	83.6	1311	16.4	7985	100
Burundi	38.3	10.5	3021	40.2	3739	47.6	915	10.0	240	2.2	7915	100	6824	87.4	1104	12.7	7928	100
Cambodia	36.5	10.5	976	9.8	4321	45.5	4100	39.1	723	5.6	10000	100	9734	95.6	419	4.4	10000	100
Cameroon	42.8	10.8	1040	21.1	1866	31.7	2186	37.0	563	10.3	5655	100	5094	87.6	729	12.4	5823	100
Chad	41.1	11.7	4487	56.6	1100	19.4	1137	20.4	207	3.7	6931	100	6151	85.8	1089	14.2	7240	100
Ethiopia	38.8	10.6	2793	42.9	2019	37.7	889	10.7	799	8.7	6500	100	5571	90.4	999	9.6	6570	100
Gambia	43.5	10.5	3347	50.5	335	6.1	1464	32.9	444	10.6	5590	100	4023	67.3	2072	32.7	6095	100
Ghana	40.9	7.4	1155	19.4	478	9.6	2136	57.7	502	13.3	4271	100	3496	80.0	836	20.0	4332	100
Guatemala	35.9	12.6	1436	11.6	6154	50.3	3740	31.0	843	7.2	12000	100	10000	84.7	1994	15.3	12000	100
Guinea	45.6	10.9	3866	72.2	348	6.4	634	12.5	441	8.9	5289	100	4529	84.2	836	15.8	5365	100
Haiti	39.4	9.2	1187	16.6	2144	31.1	2602	42.4	536	9.9	6469	100	4370	66.6	2172	33.4	6542	100
Kenya	38.7	13.9	838	5.4	3352	47.6	2090	32.4	926	14.6	7206	100	5435	77.9	1791	22.1	7226	100
Lesotho	37.0	6.4	495	13.3	1535	47.7	958	31.4	230	7.5	3218	100	1766	56.5	1494	43.6	3260	100
Liberia	39.5	7.0	954	27.3	502	11.8	1468	47.8	289	13.1	3213	100	3051	88.7	392	11.3	3443	100
Malawi	36.0	13.0	1073	9.5	6315	52.9	4061	31.7	786	5.9	12000	100	11000	85.6	1725	14.4	12000	100
Mali	42.0	9.8	3939	72.2	487	9.0	714	13.1	295	5.8	5435	100	4973	88.4	660	11.6	5633	100

Myanmar	37.6	8.7	981	14.1	2723	40.4	2774	38.9	460	6.6	6938	100	6400	92.8	649	7.2	7049	100
Nepal	36.3	9.7	1178	14.7	1710	20.9	3666	45.1	1520	19.3	8074	100	5228	65.8	2862	34.2	8090	100
Nigeria	42.5	17.2	5280	27.6	3030	14.9	7264	38.4	3504	19.2	19000	100	17000	90.0	2057	10.0	19000	100
Pakistan	37.7	10.5	2949	27.9	1520	15.6	4105	36.0	2903	20.6	11000	100	9667	84.9	1830	15.2	11000	100
Papua New	37.6	9.7	1358	20.8	3503	42.2	2545	28.1	727	8.8	8133	100	7176	85.4	1124	14.6	8300	100
Philippines	38.1	12.6	218	1.1	3826	23.5	5818	42.7	4109	32.7	14000	100	13000	92.3	1140	7.8	14000	100
Rwanda	38.1	8.8	994	17.0	4127	70.5	586	9.0	257	3.4	5964	100	5339	89.9	628	10.1	5967	100
Sierra Leone	42.7	12.6	4305	56.1	524	7.6	1704	26.1	647	10.2	7180	100	5975	80.5	1409	19.5	7384	100
Timor-Leste	39.2	9.6	1778	27.2	1335	19.9	2649	39.3	844	13.7	6606	100	5977	90.1	632	9.9	6609	100
Uganda	37.0	10.7	631	6.5	4218	51.3	2144	28.1	1048	14.1	8041	100	6861	83.3	1390	16.7	8251	100
Zambia	38.0	8.8	326	5.6	2095	35.1	2662	49.0	639	10.3	5722	100	5395	90.7	537	9.4	5932	100
Zimbabwe	38.0	8.2	55	1.2	968	20.0	3429	67.6	670	11.3	5122	100	3860	75.4	1323	24.6	5183	100
Total	39.5	11.0	5500	24.8	7100	29.5	7600	33.7	2800	12.0	23000	100	19000	84.0	3600	16.1	230000	100

No. = Number, % = percentage, SD = standard deviation

C. 10 Descriptive statistics for couple characteristics

Country	Spousal educational differences								Wealth index											
	Less		Same		More		Total		Q1		Q2		Q3		Q4		Q5		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Albania	1857	17.4	6816	66.2	1727	16.3	10000	100	2919	20.2	2539	20.4	1993	19.5	1762	19.9	1188	19.9	10000	100
Armenia	441	10.8	2443	65.6	921	23.6	3805	100	709	18.0	869	21.5	814	18.3	801	20.3	618	21.9	3811	100
Benin	2265	29.9	4502	59.5	783	10.7	7550	100	1516	18.2	1527	19.2	1516	19.7	1601	21.0	1825	21.9	7985	100
Burundi	2038	25.7	4614	58.4	1263	15.9	7915	100	1463	20.0	1566	21.3	1511	20.2	1536	20.0	1852	18.5	7928	100
Cambodia	3289	32.5	5509	54.1	1322	13.5	10000	100	1880	19.3	1872	20.0	1686	19.9	1979	20.1	2738	20.8	10000	100
Cameroon	1420	24.6	3429	61.4	806	14.1	5655	100	888	18.6	1136	18.5	1403	20.4	1237	20.7	1159	21.9	5823	100
Chad	1506	26.3	4946	65.5	479	8.2	6931	100	1270	18.5	1399	20.7	1516	20.5	1784	21.4	1323	19.0	7292	100
Ethiopia	1968	30.2	3841	59.5	691	10.3	6500	100	1870	18.2	930	18.8	864	19.5	882	20.2	2024	23.3	6570	100
Gambia	1144	23.9	3207	54.2	1239	21.9	5590	100	1869	19.2	1219	18.6	1189	19.9	996	21.2	822	21.1	6095	100
Ghana	1316	31.1	2512	60.0	443	9.0	4271	100	1217	18.2	806	17.5	788	18.2	774	21.7	748	24.5	4333	100
Guatemala	3134	26.5	7221	59.2	1818	14.3	12000	100	2077	17.2	2318	18.4	2543	20.1	2695	22.5	2543	21.9	12000	100
Guinea	1049	20.5	3761	70.8	479	8.8	5289	100	1193	21.2	1099	21.2	1069	20.3	1083	19.0	921	18.3	5365	100
Haiti	1748	27.1	3768	58.7	953	14.2	6469	100	1478	17.7	1349	18.0	1322	20.3	1285	22.7	1108	21.4	6542	100
Kenya	1786	24.9	4575	62.7	845	12.4	7206	100	3454	14.9	2874	17.2	2936	19.2	3013	22.2	3010	26.6	15000	100
Lesotho	358	11.4	1623	50.4	1237	38.2	3218	100	637	15.8	594	16.7	628	18.4	686	23.5	715	25.5	3260	100
Liberia	1397	39.4	1528	50.8	288	9.8	3213	100	983	20.7	937	20.5	721	19.7	459	19.1	343	20.0	3443	100
Malawi	3686	29.3	7290	60.2	1259	10.5	12000	100	1982	17.8	2354	20.2	2403	19.7	2512	19.8	3130	22.6	12000	100
Mali	867	16.3	3843	70.3	725	13.4	5435	100	1006	18.1	996	18.9	1133	20.7	1224	20.6	1274	21.8	5633	100

Myanmar	1783	25.3	3722	54.9	1431	19.8	6936	100	1431	19.7	1438	20.4	1456	20.4	1416	19.8	1308	19.9	7049	100
Nepal	3617	44.5	3668	45.7	789	9.8	8074	100	1657	16.3	1679	19.4	1645	20.4	1614	21.2	1495	22.6	8090	100
Nigeria	5241	27.3	12000	61.0	2218	11.7	19000	100	3467	16.5	3716	18.1	3934	19.1	4168	21.8	4019	24.6	19000	100
Pakistan	4777	39.4	5382	46.9	1318	13.8	11000	100	1986	16.5	2386	18.9	2275	20.4	2268	21.6	2586	22.7	12000	100
Papua New	2536	31.8	4409	53.4	1188	14.8	8133	100	1203	18.3	1291	18.9	1533	19.8	2057	20.9	2261	22.1	8345	100
Philippines	2093	15.1	8440	62.1	3438	22.8	14000	100	3675	19.4	3227	19.9	2694	20.1	2397	21.0	1985	19.7	14000	100
Rwanda	1028	17.1	3927	66.2	1009	16.7	5964	100	1107	18.7	1212	21.1	1177	20.8	1159	19.9	1320	19.6	5975	100
Sierra Leone	1638	24.5	4608	61.9	934	13.6	7180	100	1747	21.3	1632	21.1	1580	20.2	1319	18.1	1106	19.3	7384	100
Timor-Leste	1646	24.8	3668	55.6	1292	19.6	6606	100	1164	18.0	1282	19.5	1374	20.2	1496	20.4	1293	21.9	6609	100
Uganda	2408	29.2	4655	57.6	978	13.3	8041	100	1789	18.0	1665	18.8	1598	19.2	1555	20.1	1644	23.9	8251	100
Zambia	1916	32.5	3184	56.3	622	11.2	5722	100	1314	19.2	1225	18.7	1221	19.2	1048	21.3	1124	21.7	5932	100
Zimbabwe	1090	21.9	3459	67.2	573	10.9	5122	100	833	18.5	830	18.5	797	17.3	1361	23.3	1362	22.4	5183	100
Total	61000	26.0	140000	59.2	33000	14.8	230000	100	50000	18.4	48000	19.4	47000	19.7	48000	20.8	49000	21.7	240000	100

No. = Number, % = percentage, SD = standard deviation

C. 11 Descriptive statistics for couple characteristics

Country	Spousal differences in earnings												Employment in last 12 months							
	Unemployed		Unknown		Less		Same		More		Total		Unemploye		Past year		Yes		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Albania	7356	62.	31	0.	1065	14.	1294	15.	655	7.8	10000	10	6549	54.	373	3.6	3479	41.	1000	10
Armenia	2547	66.	17	0.	829	22.	242	6.7	176	4.8	3811	10	2221	57.	274	7.5	1315	34.	3810	10
Benin	2172	26.	464	6.	4430	55.	446	5.8	473	6.0	7985	10	1145	14.	159	1.9	6681	83.	7985	10
Burundi	4419	56.	25	0.	2586	32.	540	6.8	358	4.3	7928	10	558	6.6	401	5.4	6969	88.	7928	10
Cambodia	2359	24.	13	0.	3594	36.	2924	26.	1265	12.	10000	10	1766	17.	906	9.5	7482	72.	1000	10
Cameroon	2308	39.	158	2.	2589	46.	483	7.4	285	4.4	5823	10	1476	24.	207	3.9	4140	71.	5823	10
Chad	4921	60.	273	4.	1826	30.	99	1.4	173	2.9	7292	10	3843	46.	532	8.4	2913	45.	7288	10
Ethiopia	4976	77.	39	0.	962	13.	287	4.4	306	4.0	6570	10	3563	51.	782	16.	2225	32.	6570	10
Gambia	2764	43.	166	3.	2703	45.	109	1.6	353	6.6	6095	10	1713	30.	878	10.	3504	58.	6095	10
Ghana	1409	27.	105	3.	2277	55.	229	5.9	313	7.8	4333	10	548	12.	100	2.4	3684	85.	4332	10
Guatemala	7034	57.	5	0.	3570	29.	1091	9.0	476	3.8	12000	10	6743	55.	672	5.4	4756	39.	1200	10
Guinea	3174	56.	195	3.	1631	32.	184	3.8	181	3.6	5365	10	1278	22.	288	5.2	3799	72.	5365	10
Haiti	1682	25.	13	0.	3205	49.	895	12.	747	12.	6542	10	1647	25.	927	14.	3968	60.	6542	10
Kenya	11000	72.	77	0.	2705	19.	506	3.5	563	3.5	15000	10	2063	24.	364	5.3	4844	70.	7271	10
Lesotho	2054	57.	36	1.	657	23.	96	3.3	417	14.	3260	10	1776	49.	266	8.7	1218	41.	3260	10
Liberia	1840	49.	63	1.	1039	34.	240	5.9	261	8.3	3443	10	761	23.	107	2.9	2575	73.	3443	10
Malawi	8960	71.	61	0.	2278	19.	502	4.0	580	4.0	12000	10	3473	27.	497	4.3	8411	68.	1200	10
Mali	3370	56.	111	1.	1919	37.	79	1.4	154	3.0	5633	10	2601	39.	175	3.6	2857	57.	5633	10

Myanmar	2626	33.	28	0.	2517	38.	1155	16.	723	11.	7049	10	2103	28.	557	6.4	4388	64.	7048	10
Nepal	5751	69.	17	0.	1695	22.	347	4.5	280	3.5	8090	10	2363	31.	726	8.7	5001	60.	8090	10
Nigeria	6896	34.	295	1.	1000	54.	1222	6.2	762	3.9	19000	10	4384	22.	686	3.5	14000	74.	1900	10
Pakistan	9980	83.	23	0.	1054	12.	173	1.6	271	2.2	12000	10	9777	80.	190	2.8	1531	16.	1100	10
Papua New	6703	82.	84	1.	684	6.9	271	2.5	603	6.5	8345	10	5030	62.	322	4.2	2963	33.	8315	10
Philippi	7871	54.	34	0.	3058	22.	1371	10.	1644	12.	14000	10	5589	40.	1074	7.4	7315	51.	1400	10
Rwanda	2153	36.	12	0.	2432	40.	892	15.	486	7.6	5975	10	342	5.5	423	7.3	5210	87.	5975	10
Sierra Leone	4629	60.	135	1.	2059	28.	275	4.0	286	4.9	7384	10	1070	15.	194	2.5	6120	81.	7384	10
Timor-Leste	5040	76.	46	0.	540	8.7	507	6.8	476	7.7	6609	10	3635	56.	149	2.6	2825	40.	6609	10
Uganda	2987	35.	112	1.	3857	48.	720	8.5	575	6.8	8251	10	1249	15.	301	3.8	6701	80.	8251	10
Zambia	3059	50.	44	0.	1910	34.	508	7.7	411	6.7	5932	10	2320	39.	452	7.4	3160	52.	5932	10
Zimbabwe	2530	48.	31	0.	1774	35.	417	7.9	431	8.2	5183	10	2341	44.	506	10.	2336	45.	5183	10
Total	14000	53.	271	1.	7200	31.	1800	7.2	1500	6.5	24000	10	84000	34.	1300	6.2	14000	59.	2E+0	10

No. = Number, % = percentage, SD = standard deviation

C. 12 Descriptive statistics for healthcare access factors

Country	Media access		Healthcare access		Exposure to family		Informed	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Albania	1.2	0.8	3.4	1.1	0.3	0.7	2.2	0.5
Armenia	1.3	0.5	3.1	0.6	0.4	0.5	3.0	0.0
Benin	0.6	0.8	2.8	1.3	0.7	0.9	1.8	0.6
Burundi	0.3	0.6	2.8	1.0	0.4	0.6	2.0	0.7
Cambodia	0.9	0.9	2.3	1.5	1.0	1.2	2.0	0.6
Cameroon	0.7	0.7	2.3	1.2	0.4	0.7	1.7	0.7
Chad	0.2	0.6	1.6	1.3	0.2	0.5	2.3	0.3
Ethiopia	0.3	0.6	2.1	1.4	0.4	0.7	1.7	0.5
Gambia	1.0	0.7	3.3	0.8	0.5	0.7	2.2	0.7
Ghana	1.1	0.7	3.2	0.8	1.2	0.7	2.1	0.6
Guatemala	1.8	1.3	2.6	1.5	1.2	1.4	1.9	0.9
Guinea	0.5	0.6	2.3	1.2	0.4	0.6	1.3	0.4
Haiti	1.0	0.8	2.6	1.0	0.4	0.7	1.6	0.5
Kenya	1.3	1.2	3.2	1.4	1.5	1.4	2.1	0.9
Lesotho	1.0	0.6	3.3	0.6	0.5	0.5	1.9	0.5
Liberia	0.4	0.5	3.0	0.9	0.4	0.4	2.2	0.5
Malawi	0.5	0.9	2.5	1.6	0.6	1.0	2.0	0.8
Mali	0.9	0.7	2.8	1.2	0.6	0.7	2.2	0.5
Myanmar	0.9	0.8	3.1	1.1	0.6	0.9	1.8	0.7
Nepal	0.8	0.8	2.0	1.5	0.8	1.0	2.0	0.8
Nigeria	0.7	1.4	3.0	1.9	0.6	1.4	1.8	1.2
Pakistan	0.6	0.7	2.5	1.5	0.3	0.6	1.1	0.3
Papua New Guinea	0.5	0.9	2.1	1.5	0.3	0.8	1.8	0.9
Philippines	1.3	1.1	3.1	1.5	1.2	1.4	2.3	1.0
Rwanda	0.8	0.6	3.1	0.8	0.7	0.6	2.3	0.6
Sierra Leone	0.4	0.6	2.3	1.3	0.4	0.7	2.4	0.5
Timor-Leste	0.5	0.7	2.4	1.5	0.4	0.8	1.8	0.7
Uganda	0.9	0.8	2.9	1.1	1.0	0.9	2.1	0.8
Zambia	0.8	0.8	3.3	0.9	0.4	0.6	2.3	0.7
Zimbabwe	0.8	0.7	3.0	0.8	0.7	0.8	2.2	0.6
Average	0.8	0.9	2.8	1.3	0.6	0.9	2.0	0.7

SD = standard deviation

C. 13 Descriptive statistics for a woman's reproductive health history

Country	Age at first		Age at first		Knowledge of fertile period						Fertility preferences							
	Mean	SD	Mean	SD	No		Yes		Total		No more		Undecided		Wants more		Total	
					No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Albania	25.4	10.	22.9	4.	9200	85.	1201	14.	10000	10	4938	69.	631	9.0	1555	21.	7124	10
Armenia	20.7	2.4	21.8	2.	1570	39.	2241	60.	3811	10	2437	64.	434	10.	937	25.	3808	10
Benin	20.0	4.1	20.5	3.	5600	70.	2385	29.	7985	10	2279	28.	563	7.4	5143	64.	7985	10
Burundi	20.1	3.6	21.1	3.	6146	78.	1782	21.	7928	10	3736	47.	74	0.8	4118	51.	7928	10
Cambodia	20.2	4.5	21.6	4.	7684	77.	2471	23.	10000	10	5717	56.	292	2.8	4143	40.	10000	10
Cameroon	20.2	4.1	20.2	3.	3173	53.	2650	46.	5823	10	1766	31.	233	4.4	3318	64.	5317	10
Chad	17.5	2.8	19.0	3.	5291	72.	2001	28.	7292	10	1387	20.	534	7.0	5308	72.	7229	10
Ethiopia	18.4	3.2	19.9	3.	4981	75.	1589	24.	6570	10	1972	35.	259	4.4	4339	59.	6570	10
Gambia	19.5	3.3	20.5	3.	5164	82.	931	17.	6095	10	1128	18.	182	3.3	4785	78.	6095	10
Ghana	20.6	3.3	21.2	3.	2729	61.	1604	38.	4333	10	1649	39.	318	8.1	2365	52.	4332	10
Guatemala	19.2	4.6	20.2	4.	9454	77.	2722	22.	12000	10	6824	56.	25	0.2	5320	43.	12000	10
Guinea	19.3	3.5	20.3	3.	3835	70.	1530	29.	5365	10	1342	24.	482	8.7	3541	66.	5365	10
Haiti	21.8	4.4	21.4	4.	5091	77.	1451	22.	6542	10	3999	59.	54	0.9	2489	40.	6542	10
Kenya	20.0	5.1	20.1	4.	13000	87.	1935	12.	15000	10	3602	51.	293	2.9	3348	45.	7243	10
Lesotho	19.9	2.4	20.5	2.	2433	74.	827	26.	3260	10	1904	58.	31	1.0	1325	40.	3260	10
Liberia	20.7	3.5	19.5	2.	2993	87.	450	12.	3443	10	1288	35.	335	8.9	1820	55.	3443	10
Malawi	18.6	4.0	19.2	3.	10000	83.	2148	16.	12000	10	6262	50.	501	4.3	5618	45.	12000	10
Mali	18.6	3.1	19.7	3.	4023	71.	1610	28.	5633	10	1478	26.	278	3.9	3877	69.	5633	10

Myanmar	21.1	4.3	22.8	4.	6602	93.	447	6.2	7049	10	4368	63.	237	3.1	2443	33.	7048	10
Nepal	18.3	3.1	20.3	3.	5907	72.	2183	27.	8090	10	5902	72.	149	2.0	2039	25.	8090	10
Nigeria	20.1	7.4	21.0	6.	14000	73.	5124	26.	19000	10	5853	29.	1087	5.7	12000	65.	19000	10
Pakistan	20.0	4.1	21.8	4.	10000	91.	1017	8.1	12000	10	5457	48.	1114	8.1	4919	43.	11000	10
Papua New	20.3	4.0	21.3	4.	6434	76.	1911	24.	8345	10	4434	56.	1064	13.	2265	30.	7763	10
Philippines	21.6	6.2	22.4	5.	10000	73.	3959	26.	14000	10	8723	63.	842	5.4	4413	30.	14000	10
Rwanda	21.1	3.1	22.0	3.	4769	81.	1206	19.	5975	10	2958	49.	73	1.2	2931	49.	5962	10
Sierra Leone	20.0	4.6	20.0	3.	4267	60.	3117	40.	7384	10	2211	29.	1053	14.	4120	56.	7384	10
Timor-Leste	20.9	3.8	22.1	3.	5886	89.	723	10.	6609	10	2155	32.	2007	30.	2447	37.	6609	10
Uganda	19.2	3.9	19.4	3.	6263	75.	1988	24.	8251	10	3234	39.	215	2.7	4802	58.	8251	10
Zambia	19.2	3.3	19.2	2.	4675	77.	1257	22.	5932	10	2362	39.	279	4.8	3291	56.	5932	10
Zimbabwe	19.6	3.0	19.9	2.	4427	86.	756	13.	5183	10	2262	42.	162	3.3	2759	54.	5183	10
Total	20.1	4.5	20.7	3.	19000	75.	5500	24.	24000	10	10000	44.	1400	6.1	11000	49.	23000	10

No. = Number, % = percentage, SD = standard deviation

C. 14 Adjusted association between women's empowerment (domains) and modern contraceptive use

Country	Attitudes towards domestic violence								Reproductive health decision-making							
	Unadjusted				Adjusted				Unadjusted				Adjusted			
	OR[2]	95% CI		p-	OR[2]	95% CI		p-	OR[2]	95% CI		p-	OR[2]	95% CI		p-
Albania	1.29	0.80	2.06	0.297	1.35	0.85	2.15	0.198	1.50	1.05	2.15	0.028	1.47	1.03	2.09	0.035
Armenia	1.28	1.02	1.60	0.031	0.95	0.74	1.23	0.715	1.41	1.19	1.69	<0.001	1.23	1.03	1.46	0.023
Benin	1.23	1.06	1.44	0.008	1.01	0.85	1.19	0.928	1.37	1.07	1.77	0.013	1.08	0.81	1.44	0.610
Burundi	0.98	0.86	1.11	0.713	0.92	0.80	1.06	0.248	1.36	1.20	1.55	<0.001	1.26	1.10	1.44	0.001
Cambodia	0.93	0.84	1.02	0.137	0.95	0.85	1.06	0.353	1.11	1.01	1.23	0.035	1.06	0.95	1.17	0.296
Cameroon	1.15	0.96	1.37	0.128	0.87	0.72	1.04	0.131	2.14	1.76	2.60	<0.001	1.31	1.08	1.60	0.007
Chad	0.61	0.43	0.88	0.008	0.67	0.32	1.39	0.280	1.61	0.89	2.90	0.115	1.03	0.46	2.30	0.949
Ethiopia	1.30	1.08	1.55	0.004	1.02	0.85	1.22	0.859	1.55	1.28	1.88	<0.001	1.03	0.82	1.29	0.790
Gambia	1.12	0.93	1.34	0.245	1.06	0.88	1.29	0.524	1.49	1.24	1.80	<0.001	1.51	1.23	1.86	<0.001
Ghana	1.14	0.93	1.39	0.218	1.17	0.95	1.43	0.138	0.93	0.78	1.10	0.388	0.85	0.71	1.01	0.060
Guatemala	1.56	1.37	1.79	<0.001	1.11	0.95	1.31	0.184	2.33	2.10	2.59	<0.001	1.73	1.53	1.95	<0.001
Guinea	0.81	0.61	1.06	0.127	0.87	0.65	1.16	0.332	2.05	1.54	2.72	<0.001	1.31	0.95	1.81	0.094
Haiti	0.82	0.68	0.97	0.025	0.82	0.68	1.00	0.047	1.18	1.00	1.39	0.049	1.08	0.92	1.27	0.336
Kenya	1.33	1.17	1.51	<0.001	1.19	1.03	1.37	0.017	1.38	1.22	1.57	<0.001	1.06	0.92	1.22	0.402
Lesotho	1.18	0.99	1.40	0.057	0.94	0.77	1.14	0.525	0.98	0.82	1.17	0.823	0.84	0.68	1.03	0.093
Liberia	0.97	0.76	1.23	0.774	0.90	0.70	1.15	0.388	1.77	1.42	2.21	<0.001	1.74	1.37	2.21	<0.001
Malawi	1.01	0.88	1.17	0.863	1.02	0.89	1.18	0.736	1.08	0.98	1.19	0.143	1.05	0.95	1.16	0.362
Mali	0.97	0.77	1.21	0.781	0.98	0.77	1.25	0.885	1.56	1.19	2.04	0.001	1.27	0.95	1.71	0.109
Myanmar	1.01	0.90	1.14	0.849	0.93	0.80	1.08	0.347	1.29	1.14	1.45	<0.001	1.04	0.90	1.20	0.581
Nepal	1.06	0.92	1.21	0.427	0.96	0.82	1.12	0.585	0.95	0.84	1.09	0.490	1.03	0.90	1.18	0.660

Country	Attitudes towards domestic violence								Reproductive health decision-making							
	Unadjusted				Adjusted				Unadjusted				Adjusted			
	OR[2]	95% CI		p-	OR[2]	95% CI		p-	OR[2]	95% CI		p-	OR[2]	95% CI		p-
Nigeria	2.05	1.75	2.39	<0.001	1.21	1.04	1.40	0.012	1.74	1.56	1.94	<0.001	1.18	1.06	1.31	0.003
Pakistan	1.23	1.08	1.40	0.002	0.96	0.82	1.12	0.606	2.13	1.88	2.41	<0.001	1.67	1.46	1.91	<0.001
Papua New	1.03	0.89	1.20	0.682	0.93	0.80	1.09	0.390	1.45	1.19	1.77	<0.001	1.05	0.87	1.27	0.625
Philippines	0.95	0.80	1.13	0.577	1.10	0.93	1.31	0.273	0.95	0.84	1.06	0.357	0.96	0.86	1.08	0.535
Rwanda	1.06	0.95	1.20	0.292	1.02	0.90	1.16	0.725	1.13	1.02	1.26	0.026	1.10	0.98	1.23	0.122
Sierra Leone	1.11	0.96	1.28	0.175	0.99	0.84	1.17	0.923	1.50	1.29	1.75	<0.001	1.20	1.02	1.40	0.026
Timor-Leste	0.87	0.73	1.04	0.134	0.86	0.72	1.02	0.090	0.88	0.59	1.31	0.537	0.82	0.54	1.23	0.329
Uganda	1.19	1.07	1.32	0.002	1.06	0.94	1.20	0.309	1.23	1.11	1.36	0.000	1.13	1.01	1.26	0.035
Zambia	1.06	0.92	1.23	0.420	0.99	0.85	1.16	0.919	1.17	1.03	1.33	0.016	1.15	0.99	1.33	0.064
Zimbabwe	1.19	1.03	1.39	0.023	1.06	0.88	1.26	0.550	1.14	0.97	1.34	0.101	1.02	0.87	1.20	0.812

[1]*Baseline group less empowered women*
[2] *OR = odds ratios*

C. 15 Adjusted association between women's empowerment (domains) and modern contraceptive use

Country	Woman-alone household decision-making								Joint household decision-making							
	Unadjusted				Adjusted				Unadjusted				Adjusted			
	OR[2]	95% CI		p-value	OR[2]	95% CI		p-value	OR[2]	95% CI		p-value	OR[2]	95% CI		p-value
Albania	0.98	0.64	1.50	0.910	1.05	0.70	1.56	0.810	0.91	0.55	1.50	0.71	1.17	0.74	1.85	0.510
Armenia	1.16	0.94	1.43	0.170	1.08	0.86	1.35	0.499	1.04	0.78	1.39	0.779	0.94	0.66	1.33	0.709
Benin	1.39	1.20	1.61	<0.001	1.19	1.01	1.40	0.035	1.52	1.30	1.78	<0.001	1.23	1.04	1.46	0.017
Burundi	0.91	0.80	1.04	0.156	0.91	0.79	1.04	0.154	0.96	0.84	1.10	0.618	0.96	0.83	1.11	0.584
Cambodia	1.18	0.98	1.42	0.074	1.12	0.93	1.35	0.223	1.18	0.94	1.48	0.165	1.14	0.89	1.46	0.304
Cameroon	1.72	1.41	2.10	<0.001	1.10	0.90	1.35	0.366	1.81	1.50	2.19	<0.001	1.08	0.88	1.32	0.455
Chad	2.26	1.65	3.09	<0.001	1.55	0.92	2.61	0.100	2.24	1.67	3.01	<0.001	1.64	0.96	2.81	0.071
Ethiopia	1.30	1.06	1.60	0.012	1.23	0.99	1.54	0.064	1.42	1.14	1.77	0.002	1.29	1.00	1.65	0.050
Gambia	1.23	1.02	1.49	0.030	1.19	0.99	1.44	0.067	1.27	1.07	1.51	0.006	1.22	1.01	1.47	0.036
Ghana	1.30	1.05	1.61	0.017	1.24	0.99	1.55	0.063	1.31	1.06	1.62	0.014	1.15	0.94	1.42	0.179
Guatemala	1.59	1.43	1.77	<0.001	1.28	1.13	1.45	<0.001	1.58	1.39	1.80	<0.001	1.17	1.01	1.35	0.038
Guinea	2.47	1.99	3.06	<0.001	1.97	1.56	2.48	<0.001	2.12	1.68	2.68	<0.001	1.81	1.42	2.31	<0.001
Haiti	1.00	0.86	1.17	0.997	1.03	0.87	1.22	0.718	1.06	0.92	1.22	0.421	0.99	0.84	1.16	0.906
Kenya	1.06	0.93	1.21	0.402	0.95	0.81	1.12	0.566	1.18	1.03	1.36	0.015	1.03	0.88	1.21	0.734
Lesotho	1.33	1.11	1.59	0.002	1.08	0.88	1.33	0.462	1.45	1.17	1.80	0.001	1.26	1.00	1.60	0.052
Liberia	1.17	0.92	1.49	0.192	1.13	0.87	1.46	0.361	1.38	1.09	1.74	0.008	1.24	0.96	1.59	0.094
Malawi	1.13	1.02	1.25	0.025	1.09	0.98	1.22	0.129	1.29	1.14	1.46	<0.001	1.21	1.08	1.36	0.001
Mali	1.16	0.94	1.44	0.181	1.10	0.88	1.37	0.391	1.31	1.07	1.60	0.010	1.18	0.95	1.45	0.131

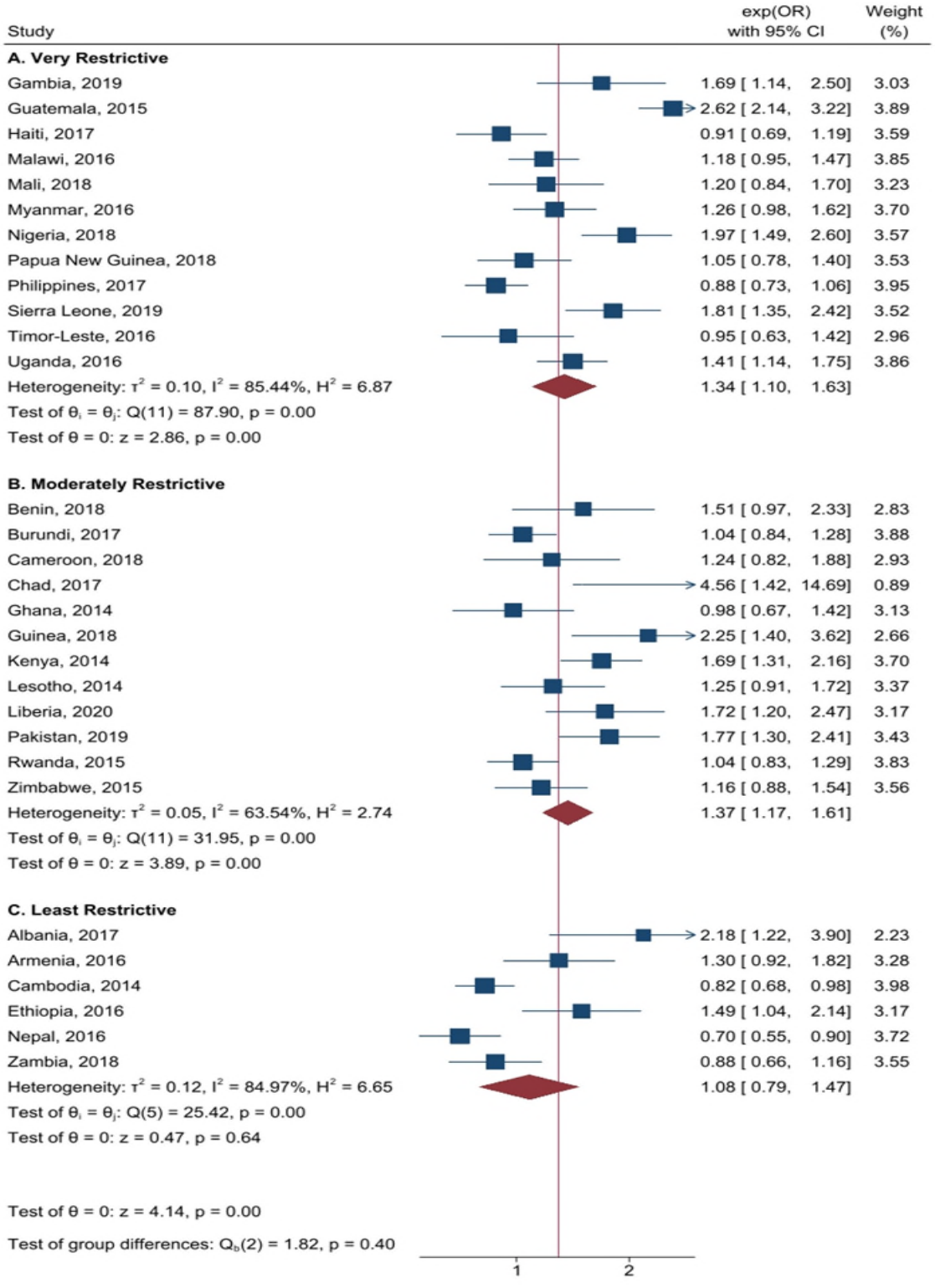
Myanmar	1.11	0.96	1.29	0.155	1.21	1.01	1.45	0.043	1.28	1.10	1.49	0.001	1.40	1.17	1.67	<0.001
Nepal	1.01	0.89	1.14	0.816	0.95	0.83	1.08	0.435	1.28	1.13	1.45	<0.001	1.12	0.99	1.27	0.072
Nigeria	2.01	1.80	2.25	<0.001	1.15	1.01	1.31	0.030	1.87	1.65	2.12	<0.001	1.07	0.92	1.23	0.382
Pakistan	1.42	1.25	1.61	<0.001	1.12	0.97	1.30	0.123	1.46	1.30	1.65	<0.001	1.08	0.94	1.24	0.274
Papua New Guinea	1.22	1.02	1.47	0.040	1.02	0.83	1.25	0.871	1.38	1.16	1.64	<0.001	1.17	0.98	1.40	0.087
Philippines	1.06	0.88	1.28	0.515	1.04	0.85	1.27	0.690	1.08	0.89	1.31	0.448	1.11	0.91	1.36	0.284
Rwanda	0.91	0.81	1.03	0.153	0.94	0.82	1.06	0.311	0.99	0.86	1.14	0.842	1.01	0.86	1.17	0.946
Sierra Leone	1.46	1.21	1.76	<0.001	1.33	1.09	1.61	0.004	1.47	1.25	1.72	<0.001	1.34	1.15	1.58	<0.001
Timor-Leste	1.88	1.43	2.47	<0.001	1.90	1.44	2.52	<0.001	1.72	1.28	2.32	<0.001	1.66	1.21	2.28	0.002
Uganda	1.17	1.05	1.30	0.004	1.16	1.04	1.30	0.008	1.22	1.08	1.37	0.001	1.23	1.09	1.40	0.001
Zambia	1.18	1.01	1.38	0.043	1.15	0.98	1.35	0.080	1.26	1.09	1.45	0.002	1.17	1.00	1.36	0.047
Zimbabwe	1.28	1.02	1.60	0.032	1.29	1.01	1.65	0.045	1.90	1.53	2.37	<0.001	1.84	1.45	2.34	<0.001

[1] *Baseline group less empowered women*
[2] *OR = odds ratios*

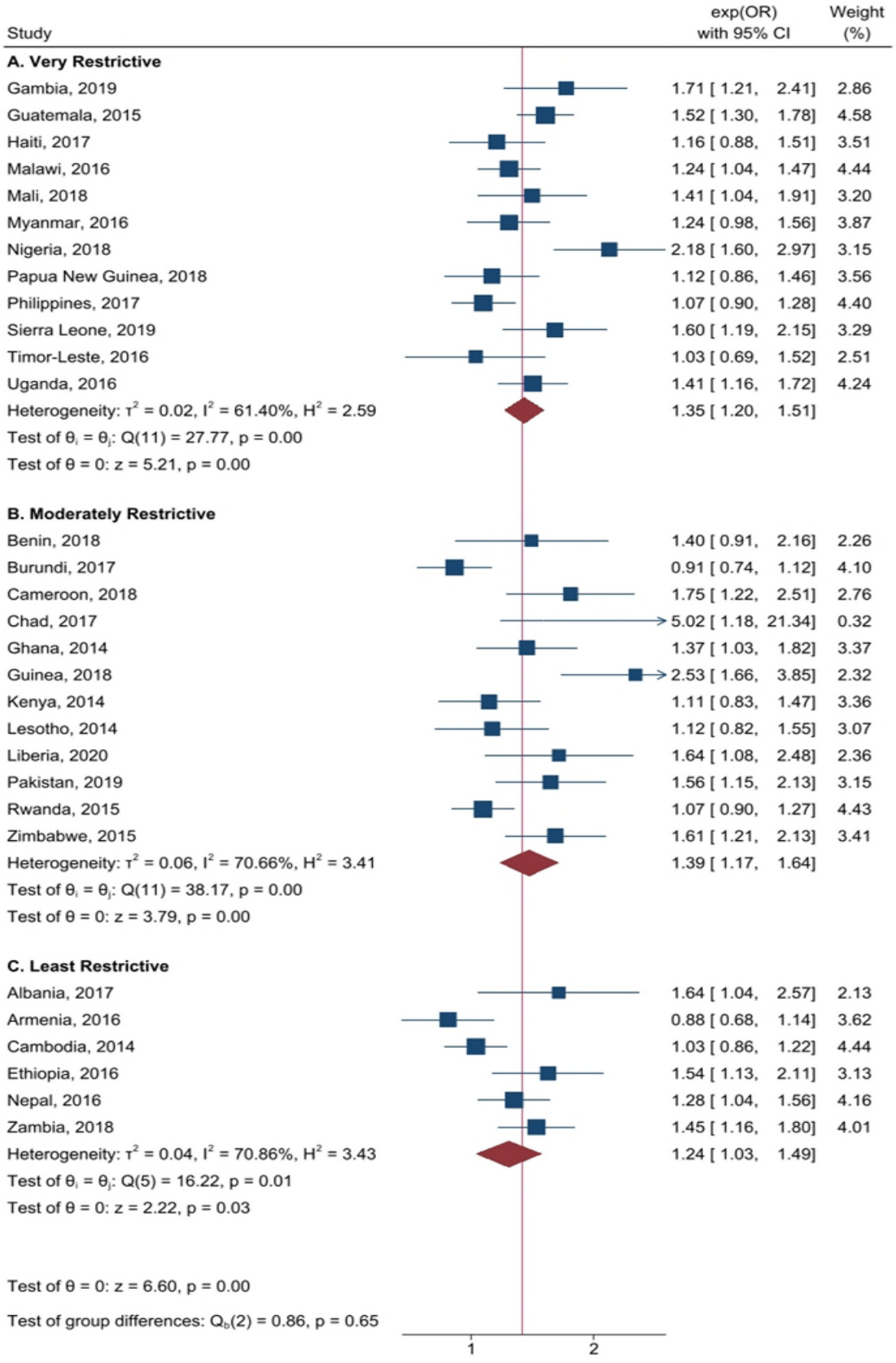
Subgroup analysis

By abortion laws

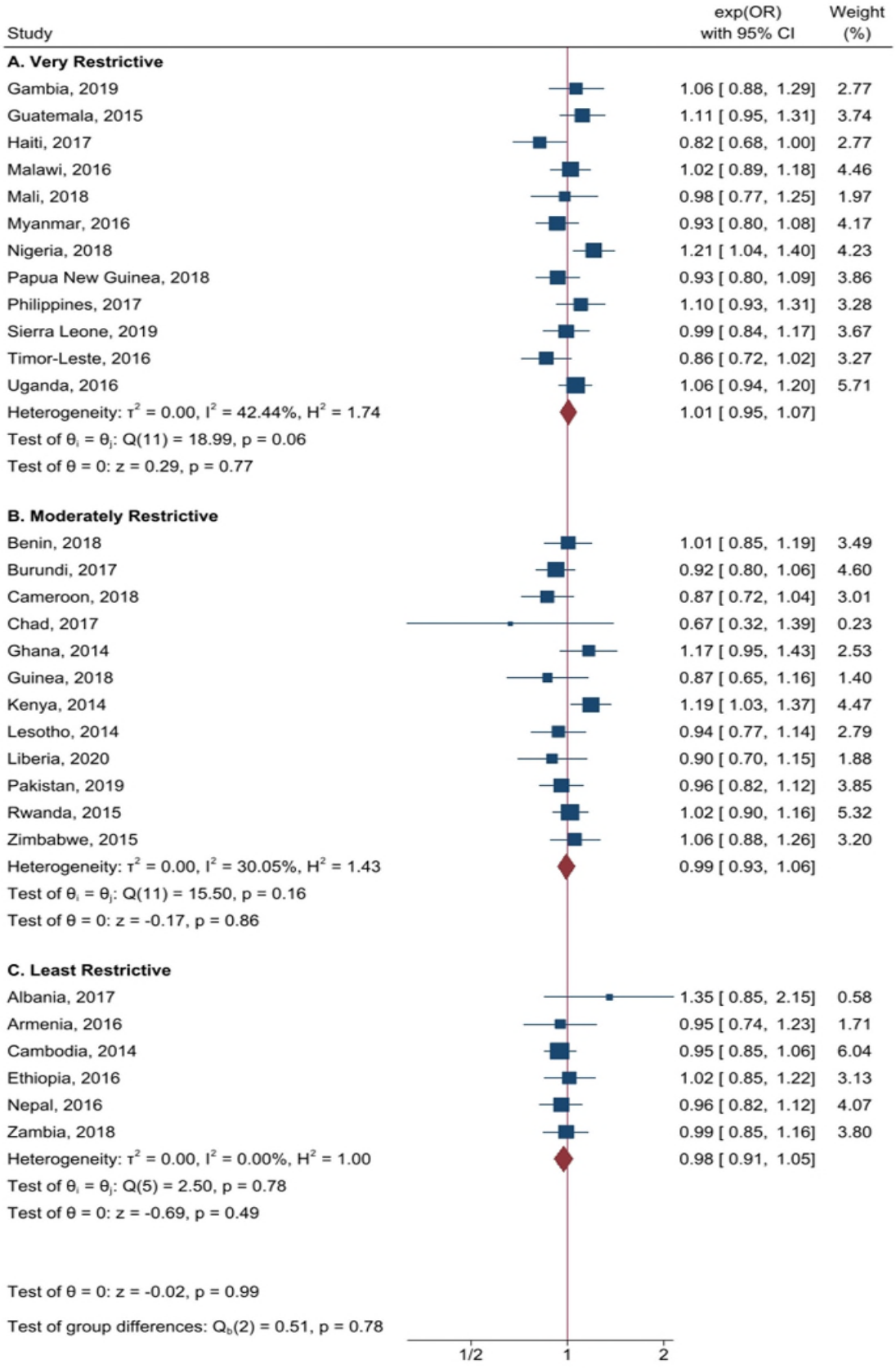
C. 16 Subgroup analysis by abortion laws on the association between woman-alone empowerment index and modern contraceptive use in 30 LMICs



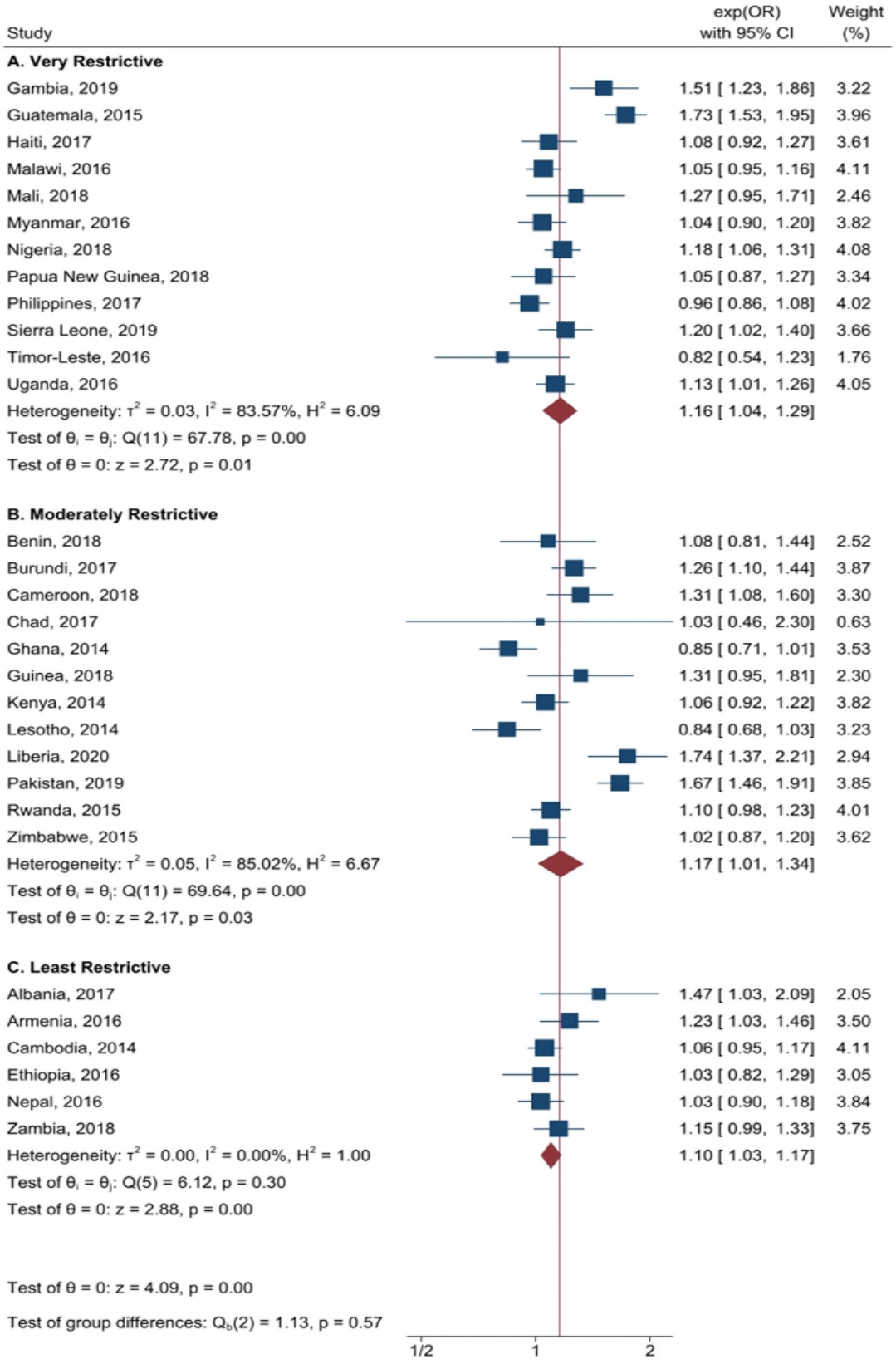
C. 17 Subgroup analysis by abortion laws on the association between joint empowerment index and modern contraceptive use in 30 LMICs



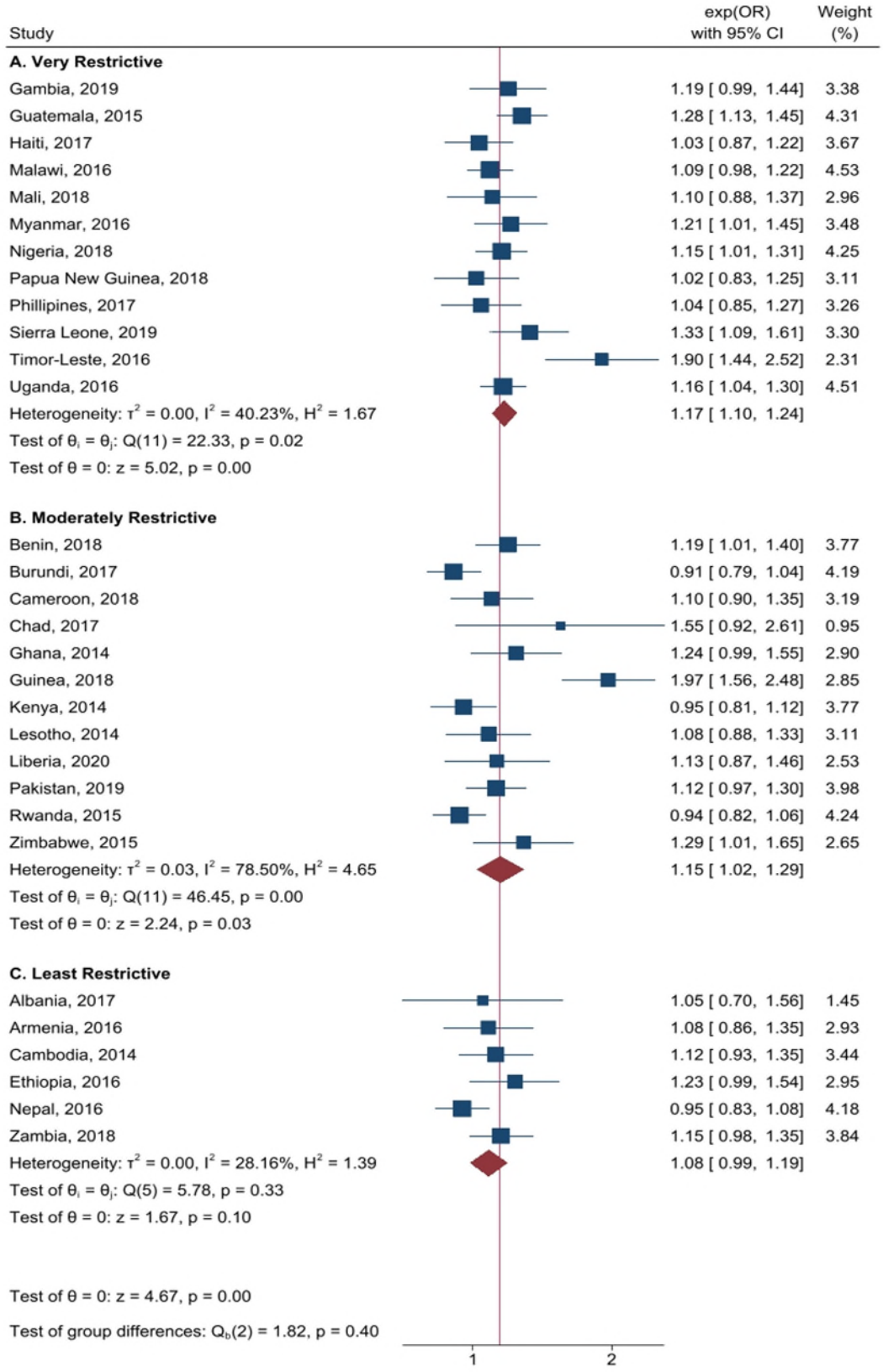
C. 18 Subgroup analysis by abortion laws on the association between women's attitudes towards domestic violence and modern contraceptive use in 30 LMICs



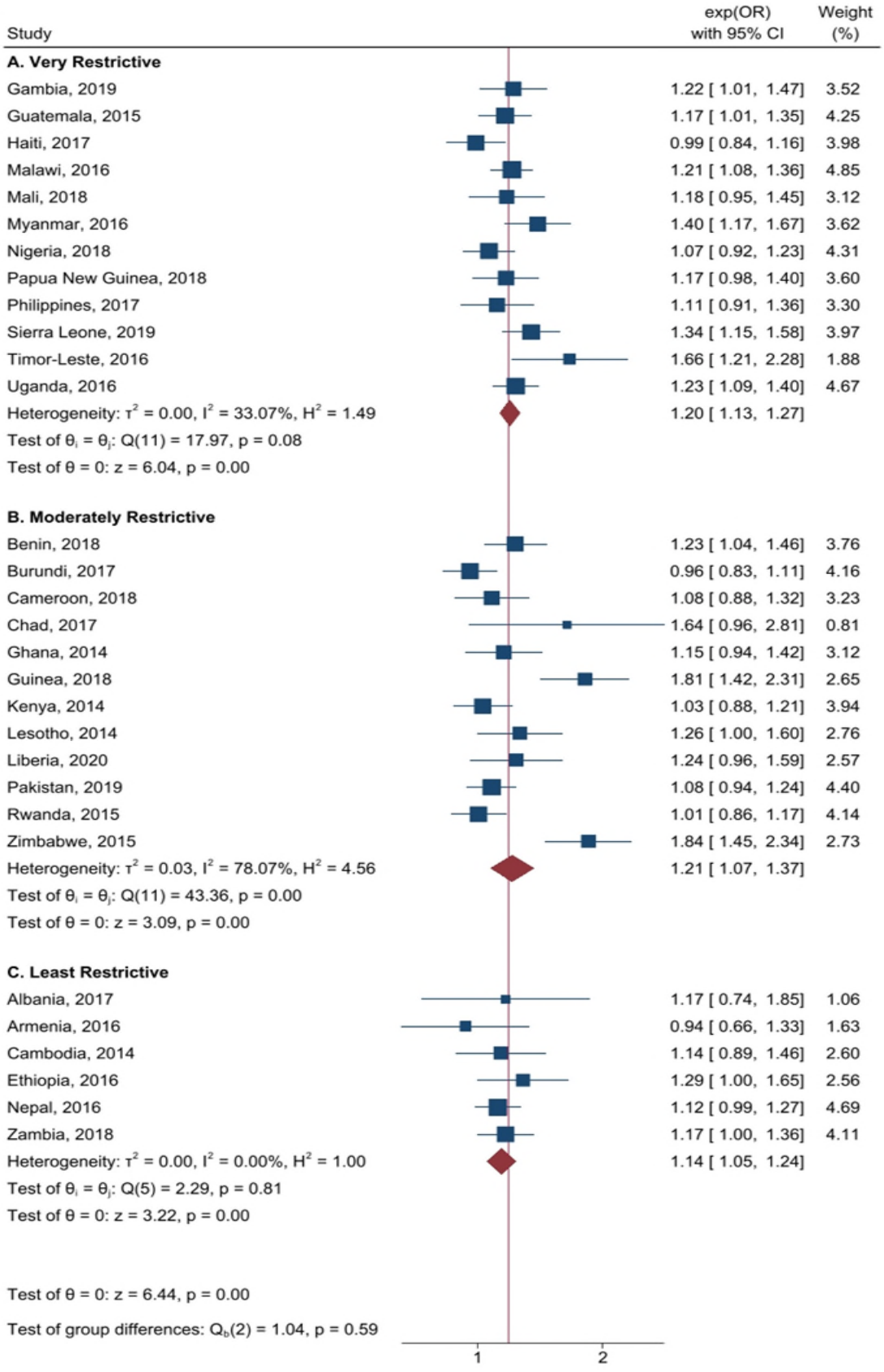
C. 19 Subgroup analysis by abortion laws on the association between women's reproductive health decision-making and modern contraceptive use in 30 LMICs



C. 201 Subgroup analysis by abortion laws on the association between the domain woman-alone household decision-making domain and modern contraceptive use in 30 LMICs

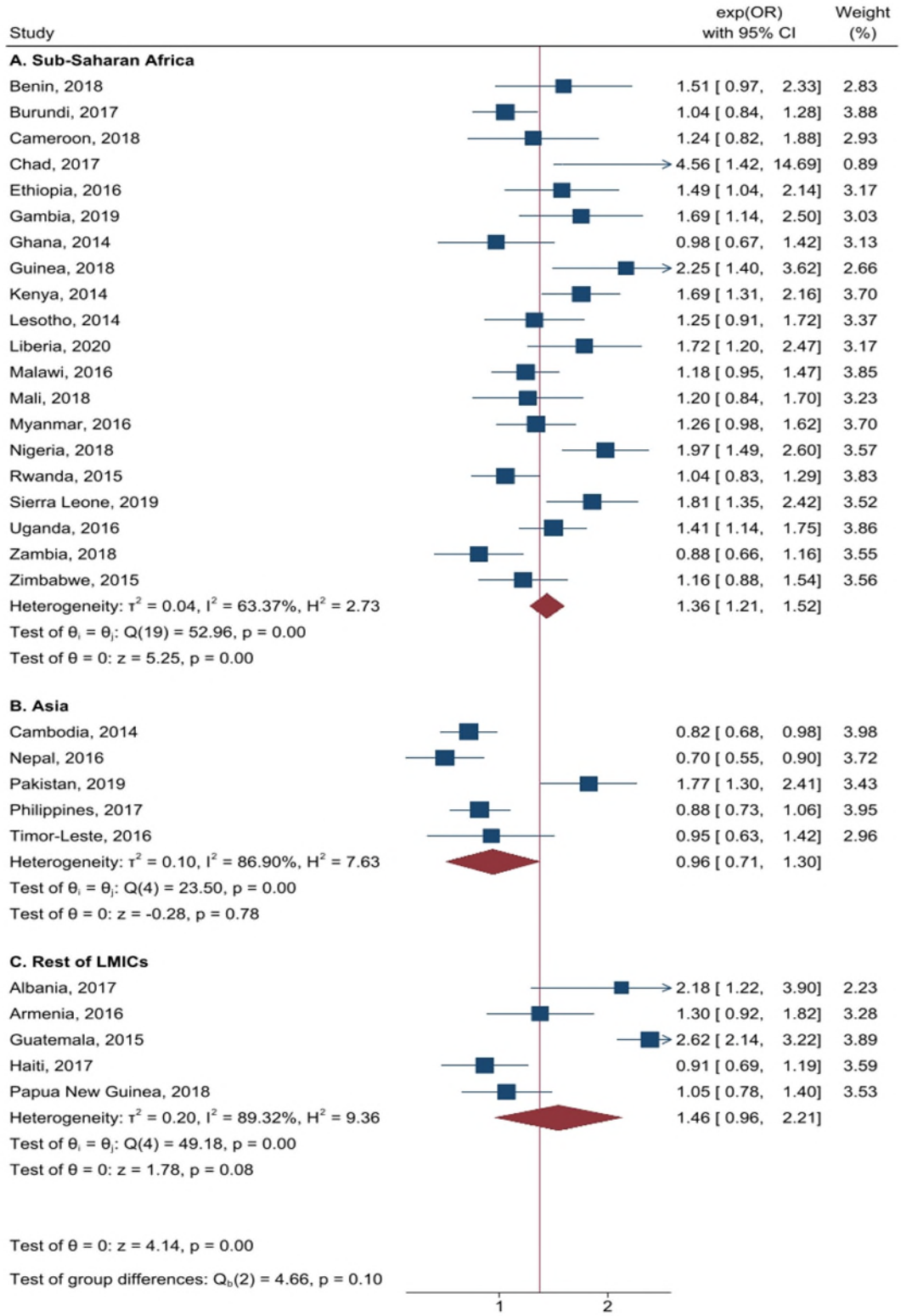


C. 21 Subgroup analysis by abortion laws on the association between the domain joint household decision-making and modern contraceptive use in 30 LMICs

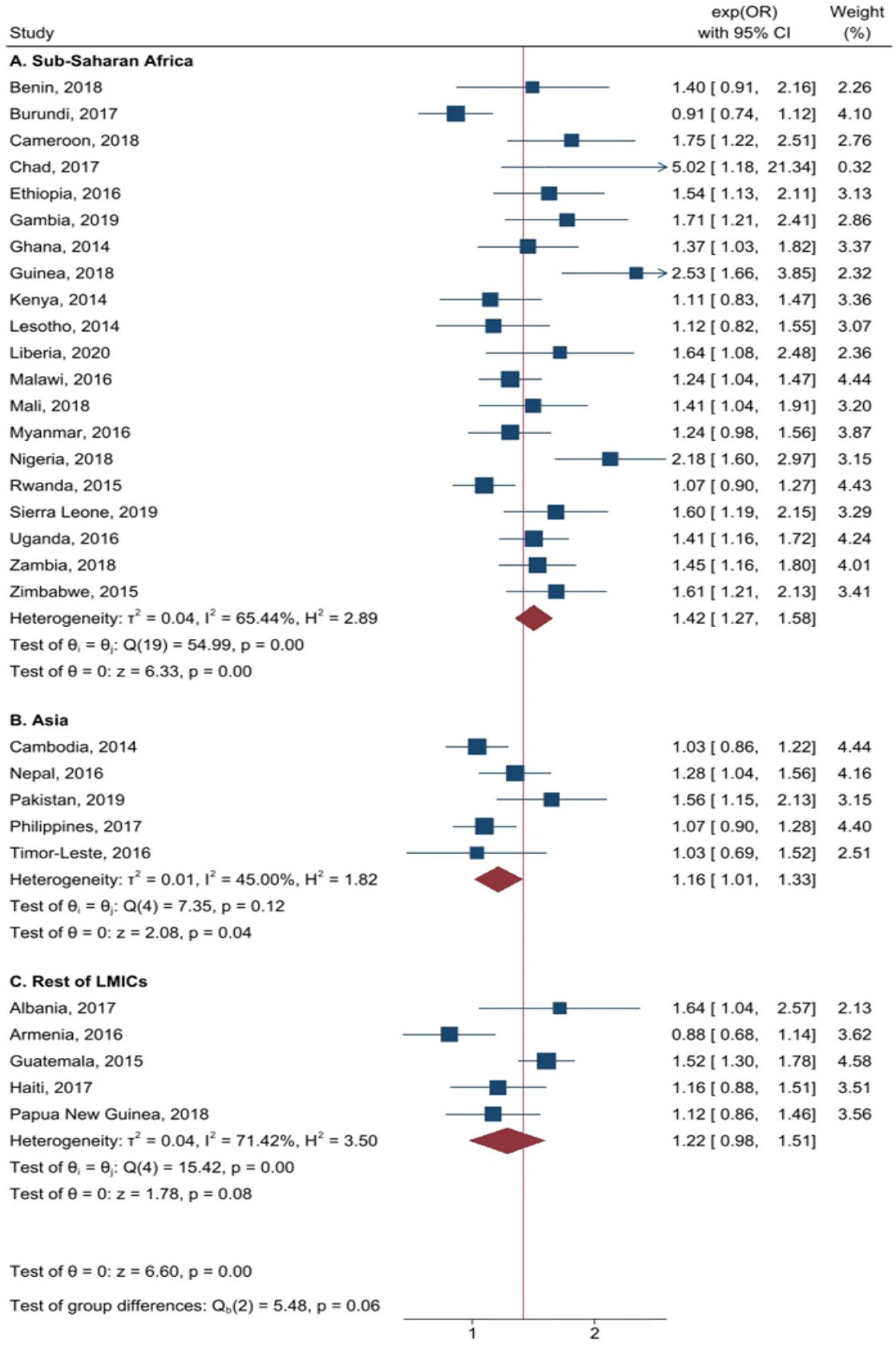


By region

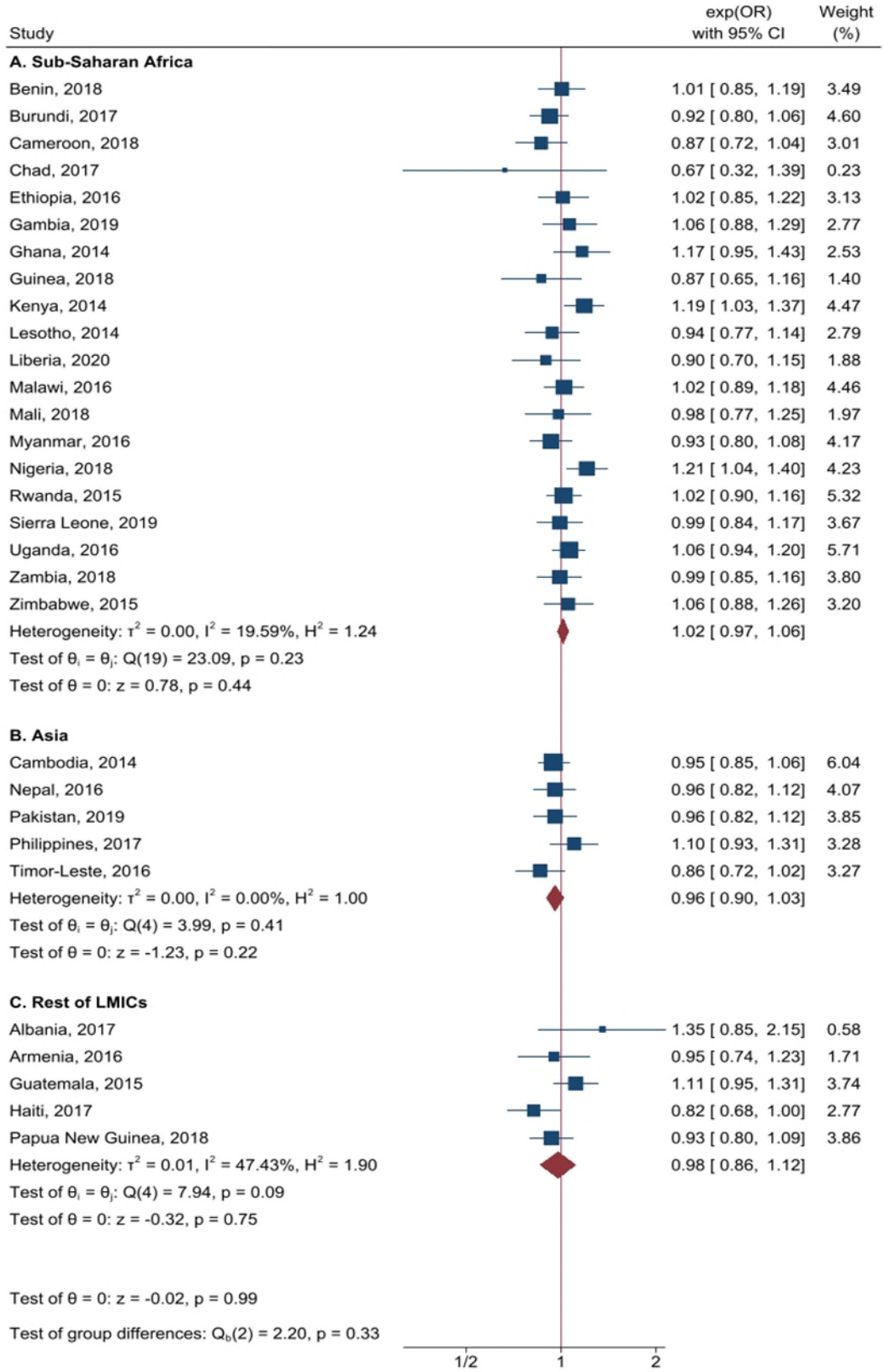
C. 22 Subgroup analysis by geographical regions on the association between woman-alone empowerment index and modern contraceptive use in 30 LMICs



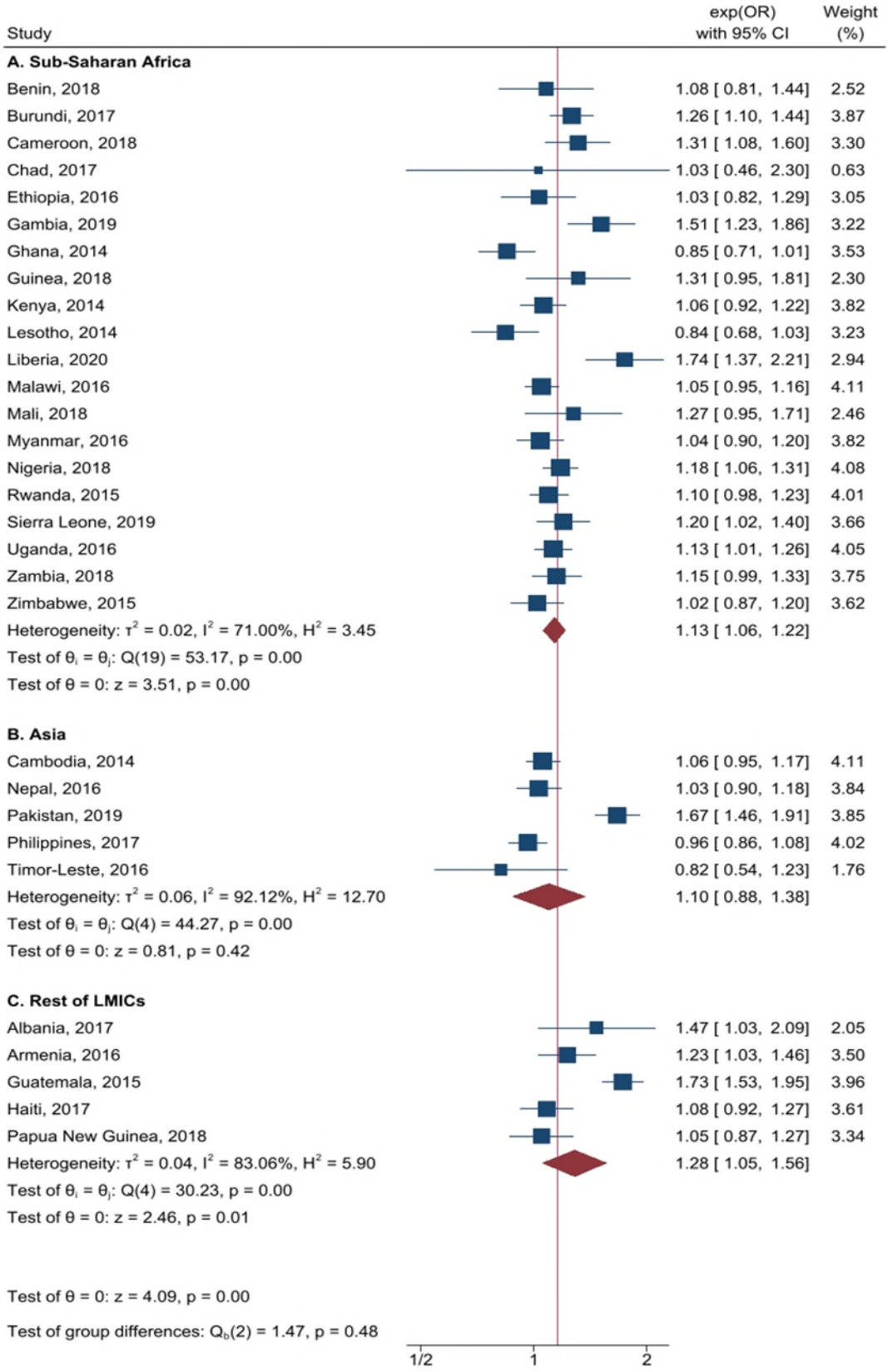
C. 23 Subgroup analysis by geographical regions on the association between joint empowerment index and modern contraceptive use in 30 LMICs



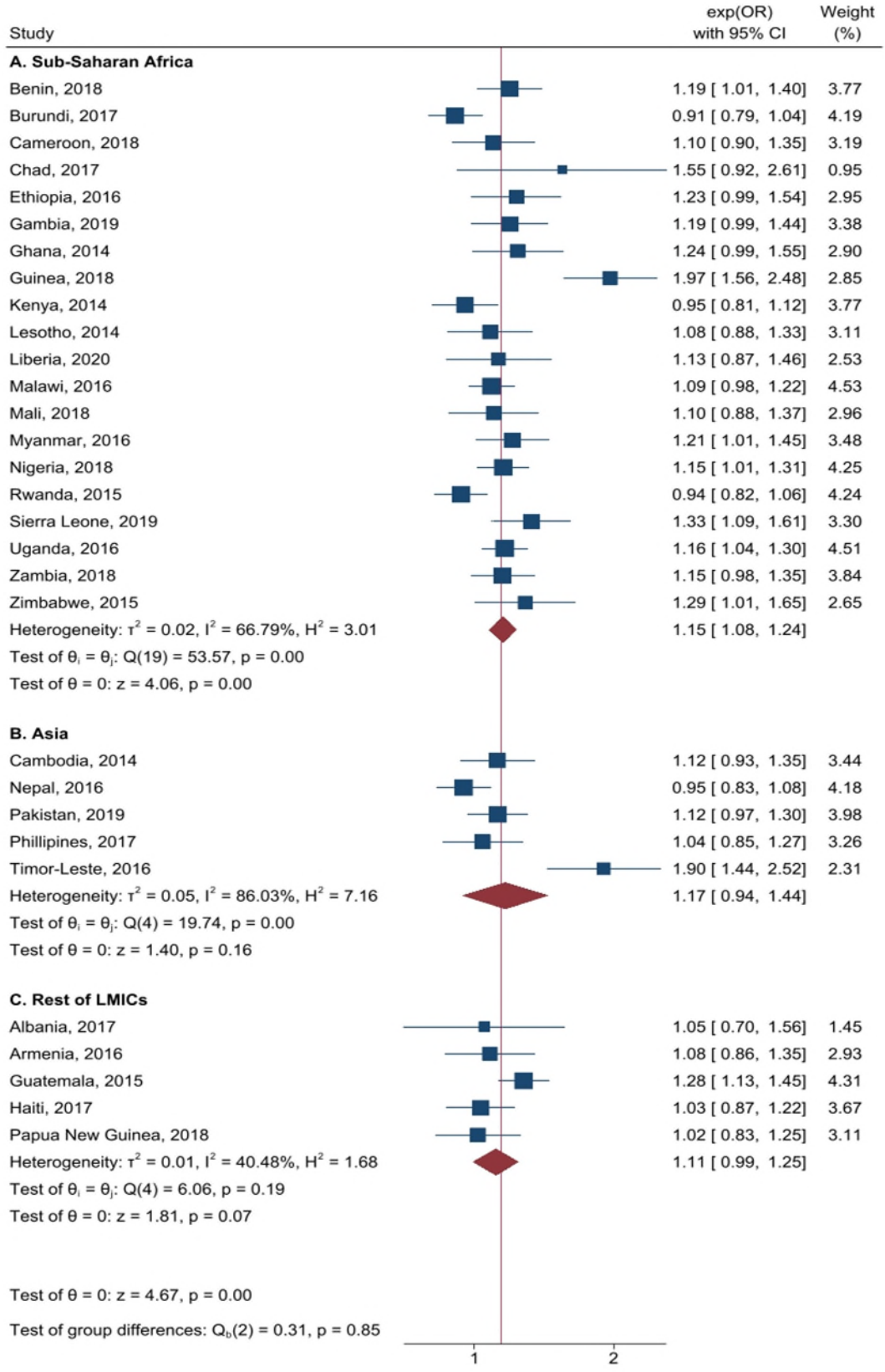
C. 24 Subgroup analysis by geographical regions on the association between women's attitudes towards domestic violence and modern contraceptive use in 30 LMICs



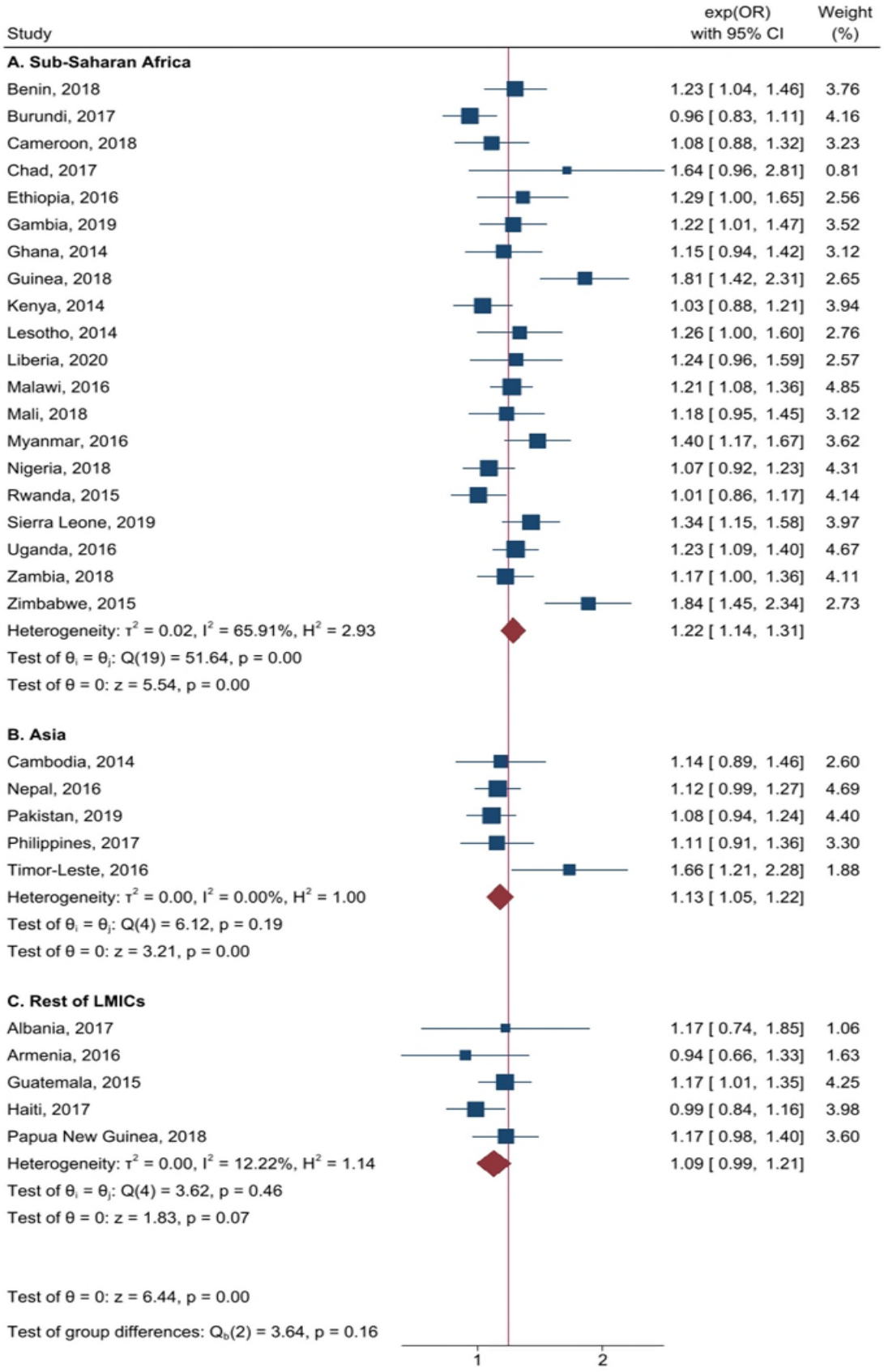
C. 25 Subgroup analysis by geographical regions on the association between women's reproductive health decision-making and modern contraceptive use in 30 LMICs



C. 26 Subgroup analysis by geographical regions on the association between the domain woman-alone household decision-making and modern contraceptive use in 30 LMICs

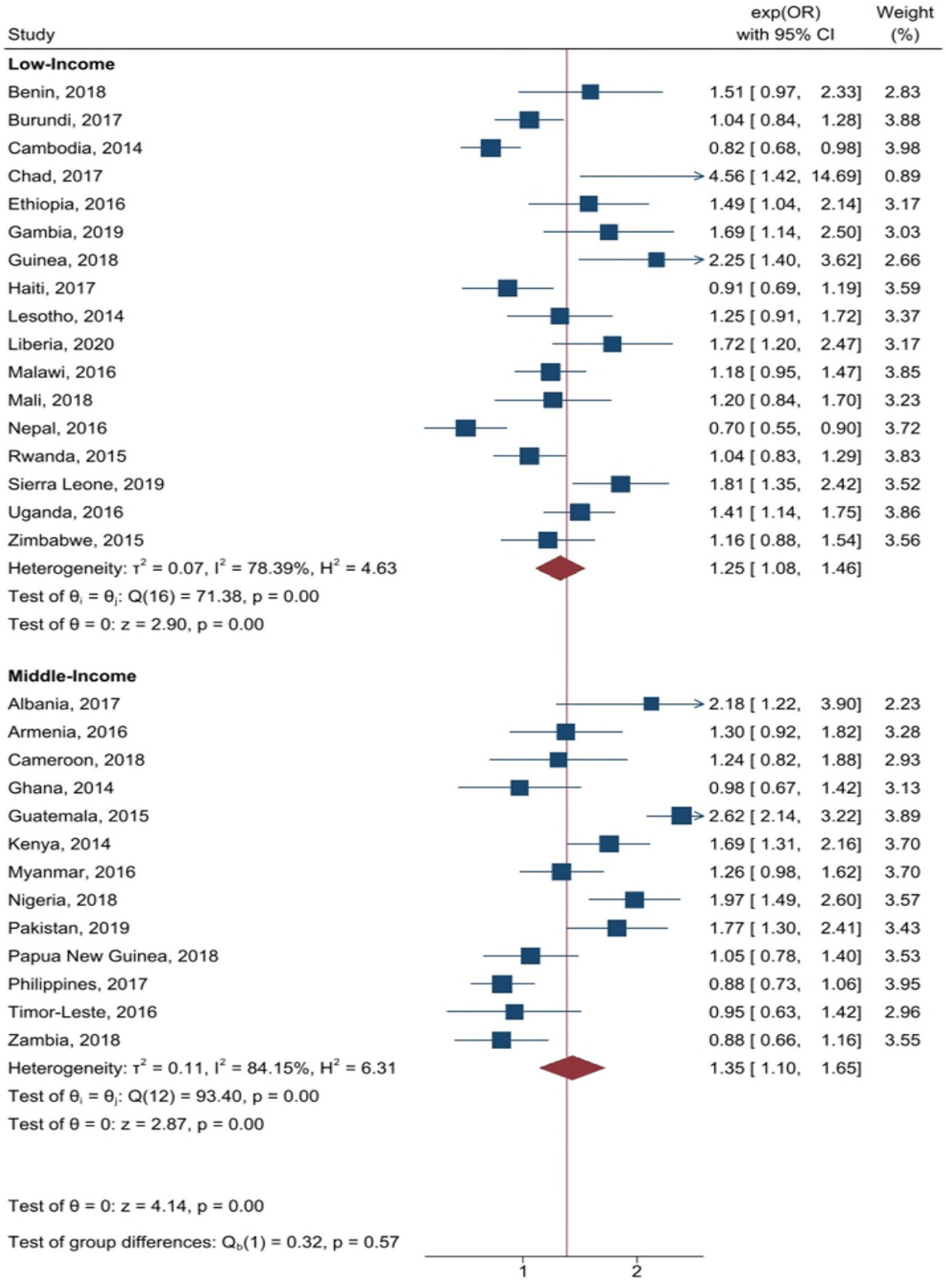


C. 27 Subgroup analysis by geographical regions on the association between the domain joint household decision-making domain two and modern contraceptive use in 30 LMICs

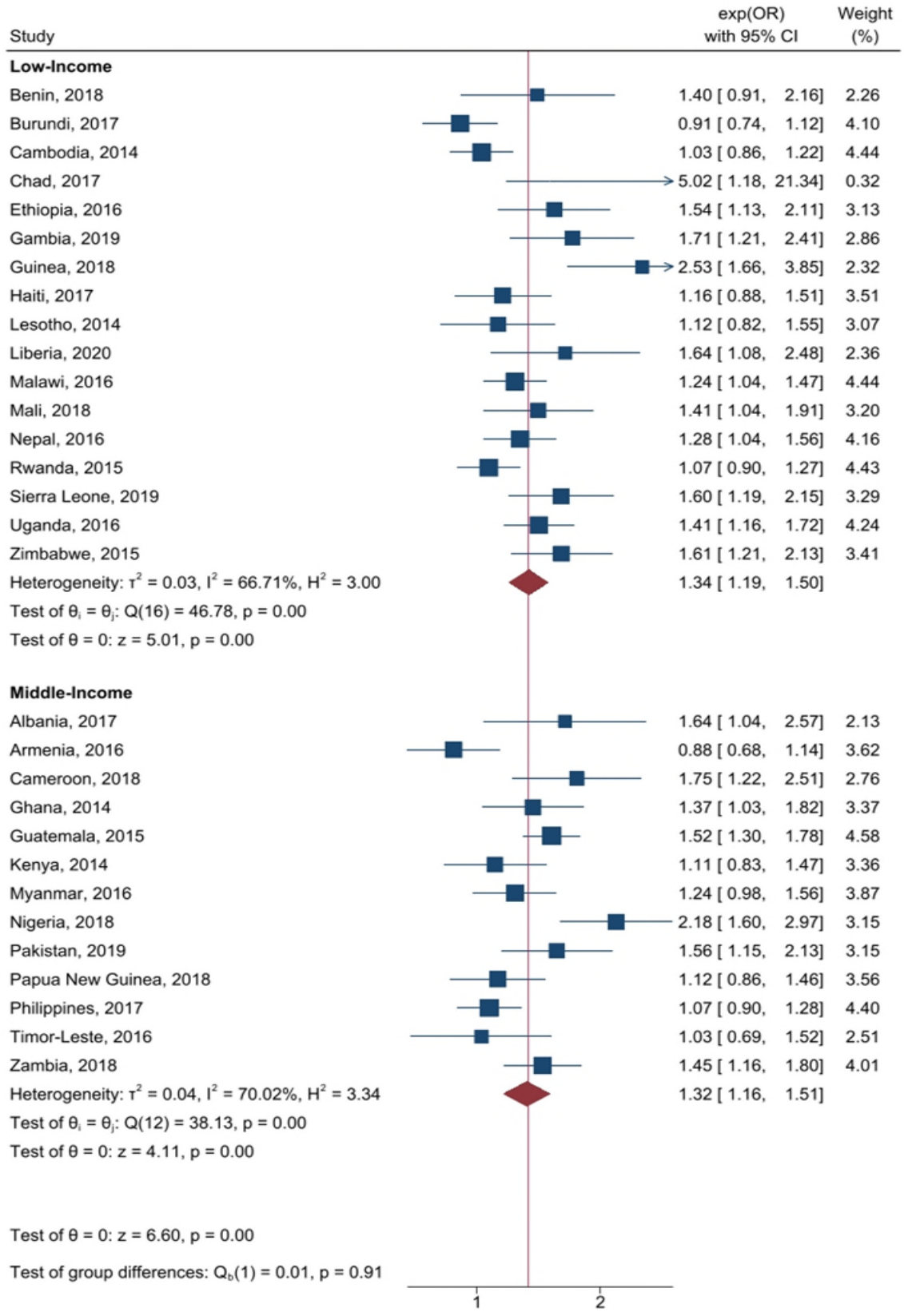


By socioeconomic status

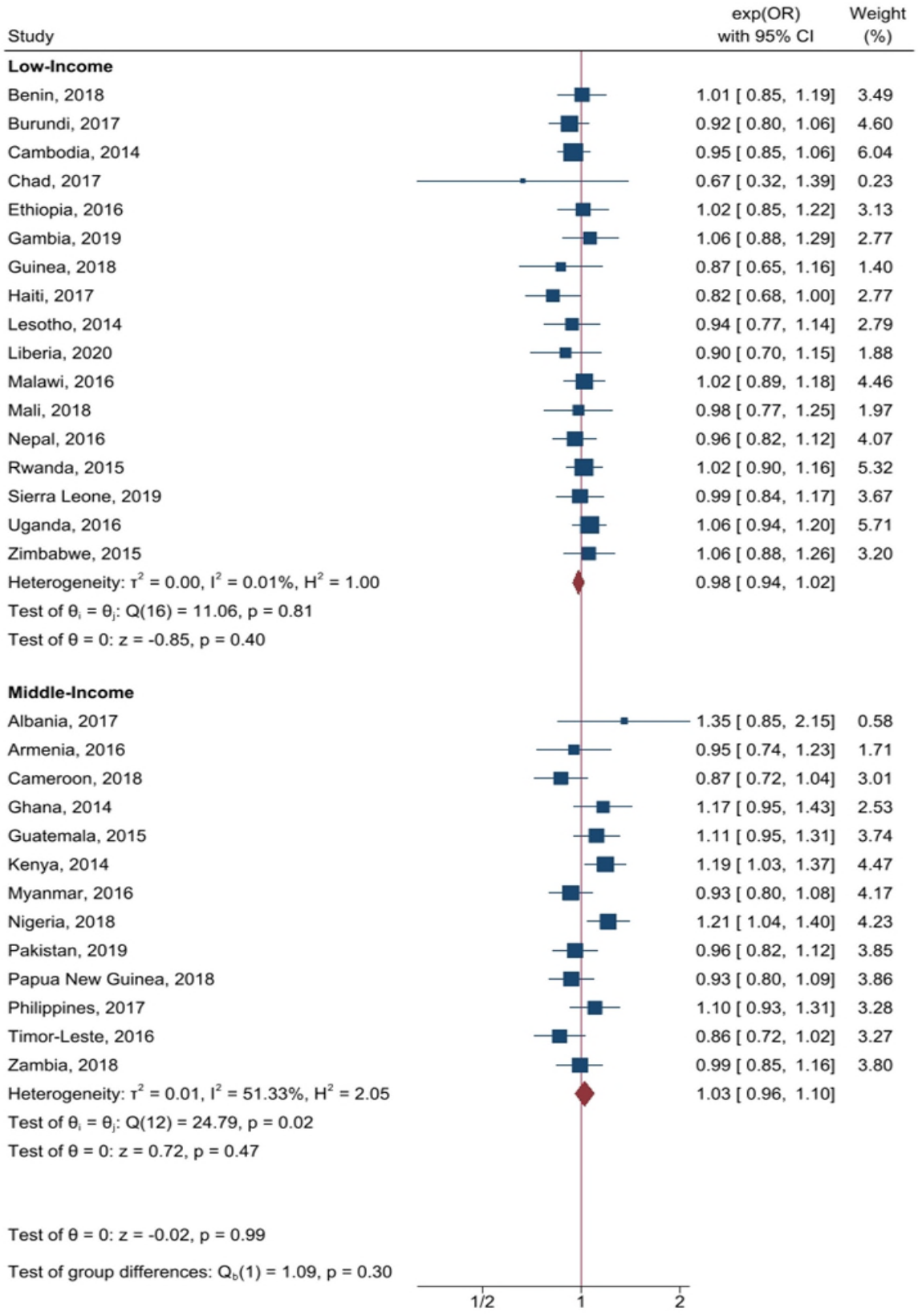
C. 28 Subgroup analysis by socioeconomic status on the association between woman-alone empowerment index and modern contraceptive use in 30 LMICs



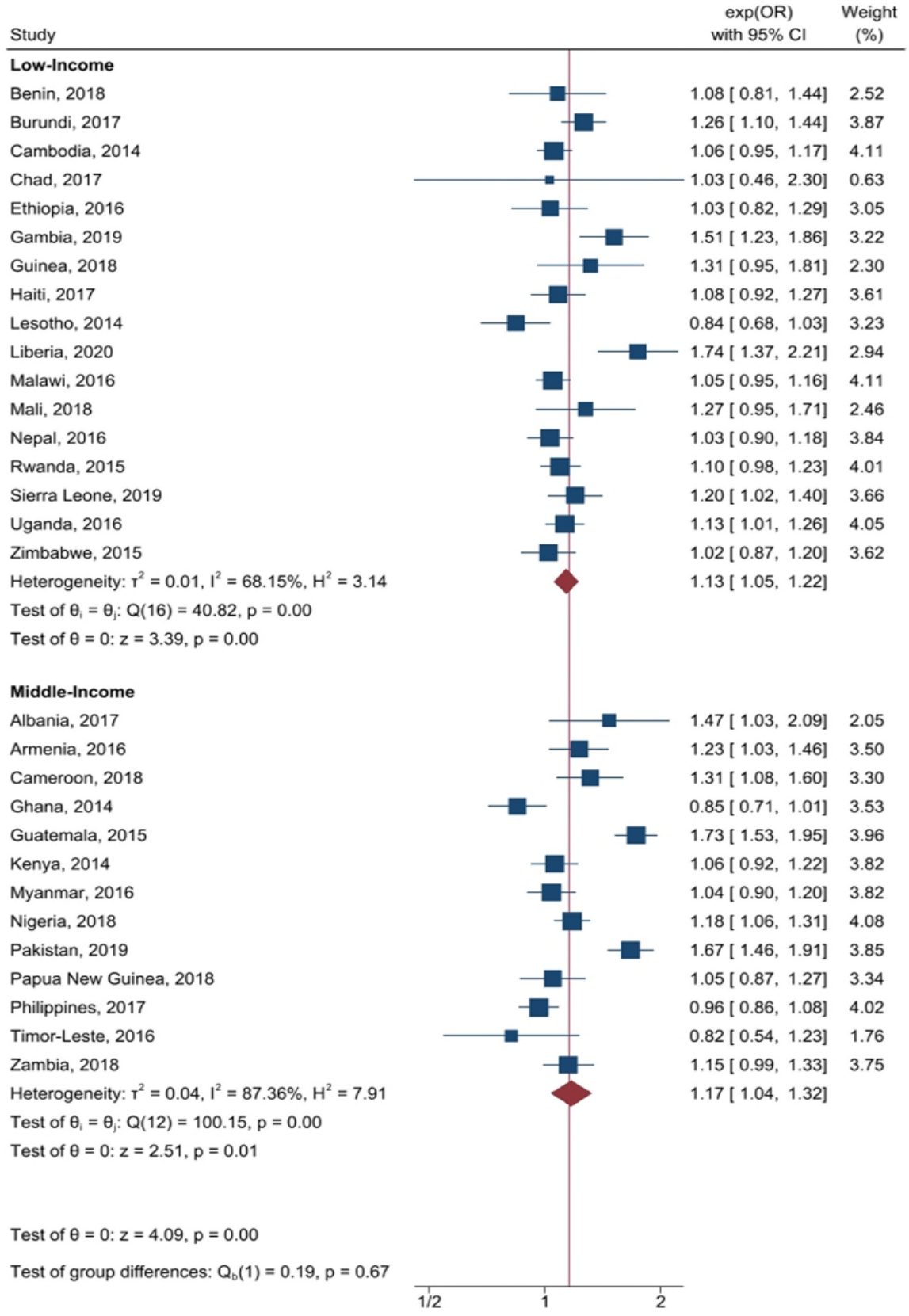
C. 29 Subgroup analysis by socioeconomic status on the association between joint empowerment index and modern contraceptive use in 30 LMICs



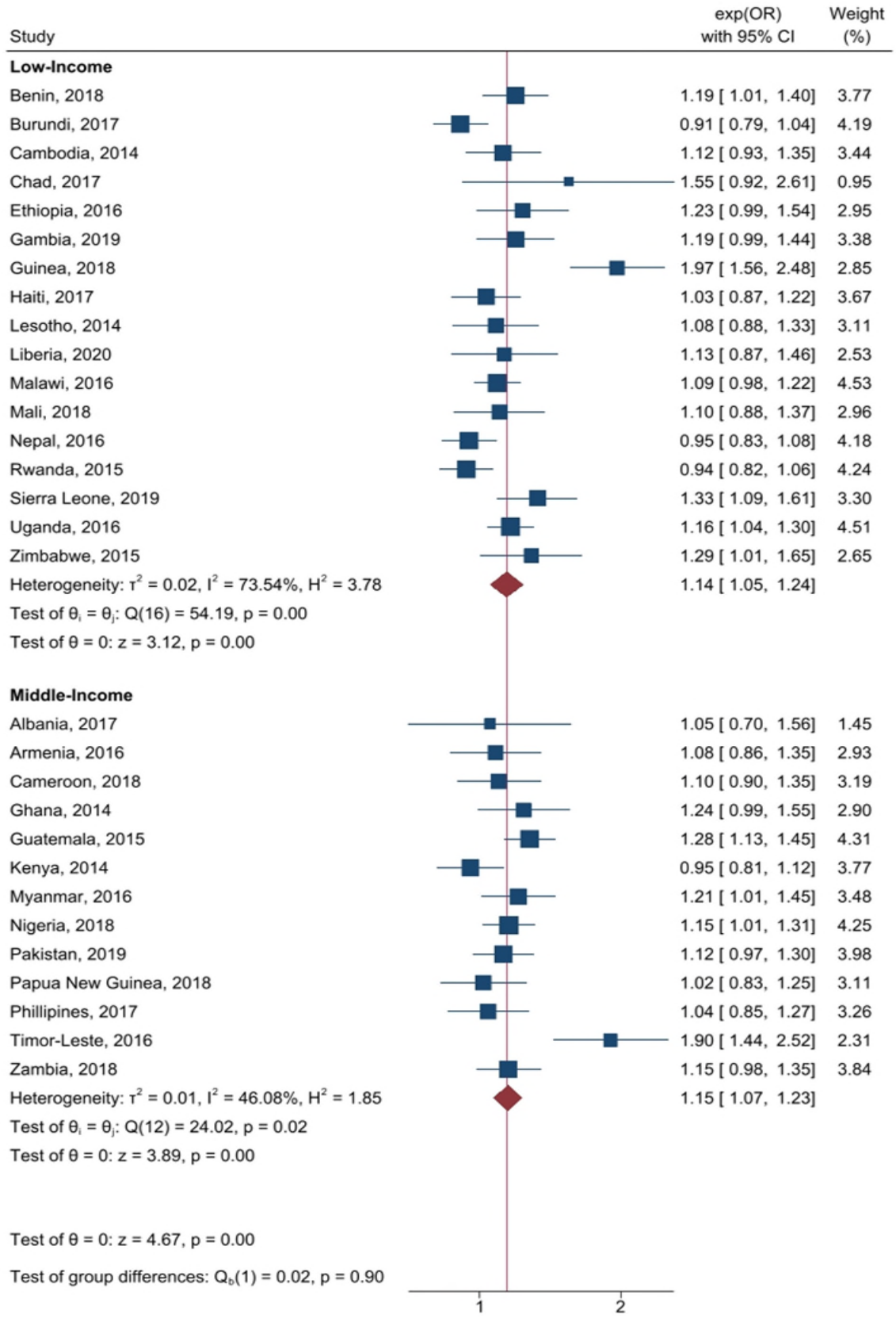
C. 30 Subgroup analysis by socioeconomic status on the association between women's attitudes towards domestic violence and modern contraceptive use in 30 LMICs



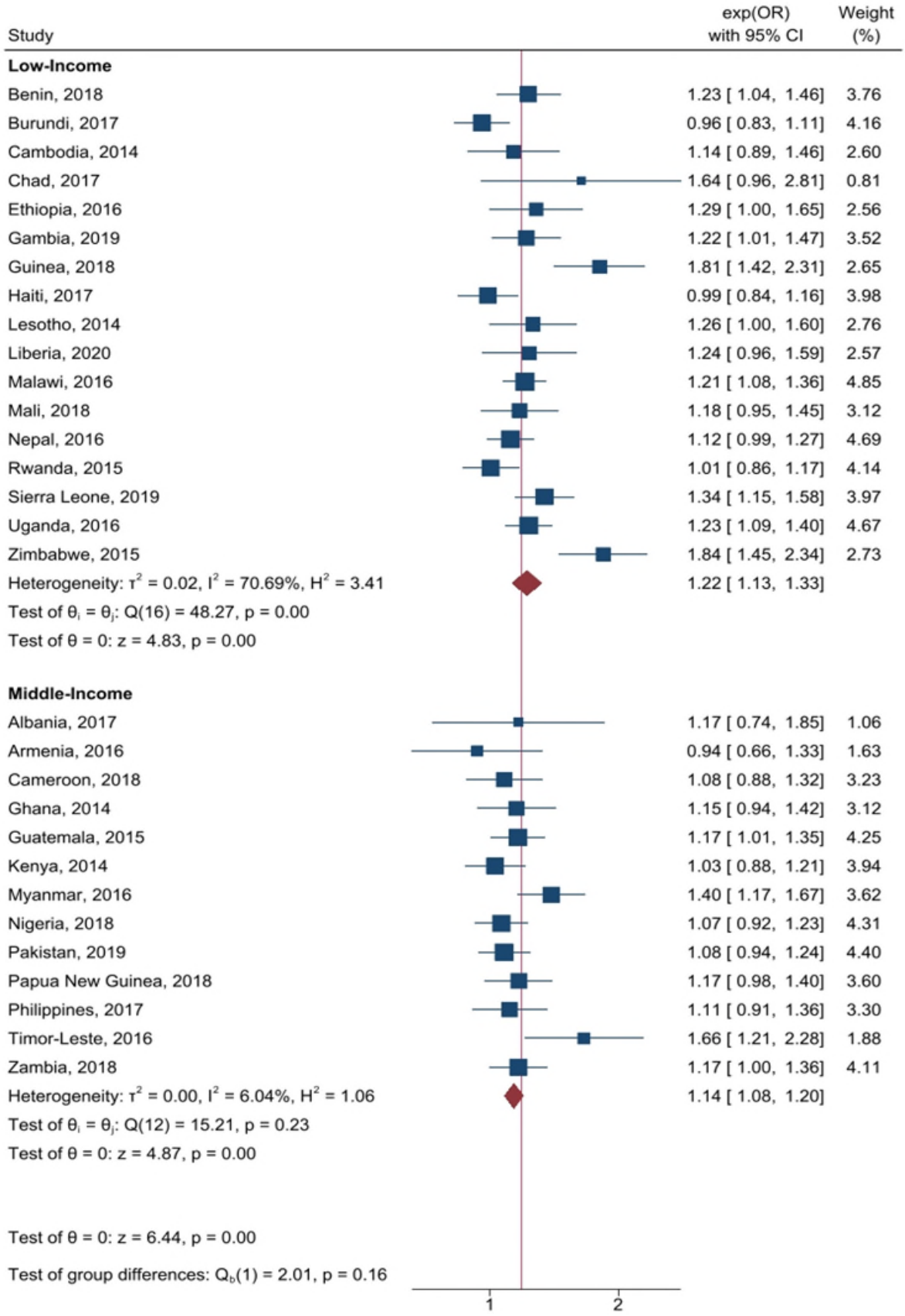
C. 31 Subgroup analysis by socioeconomic status on the association between women's reproductive health decision-making and modern contraceptive use in 30 LMICs



C. 32 Subgroup analysis by socioeconomic status on the association between women's household decision-making domain one and modern contraceptive use in 30 LMICs

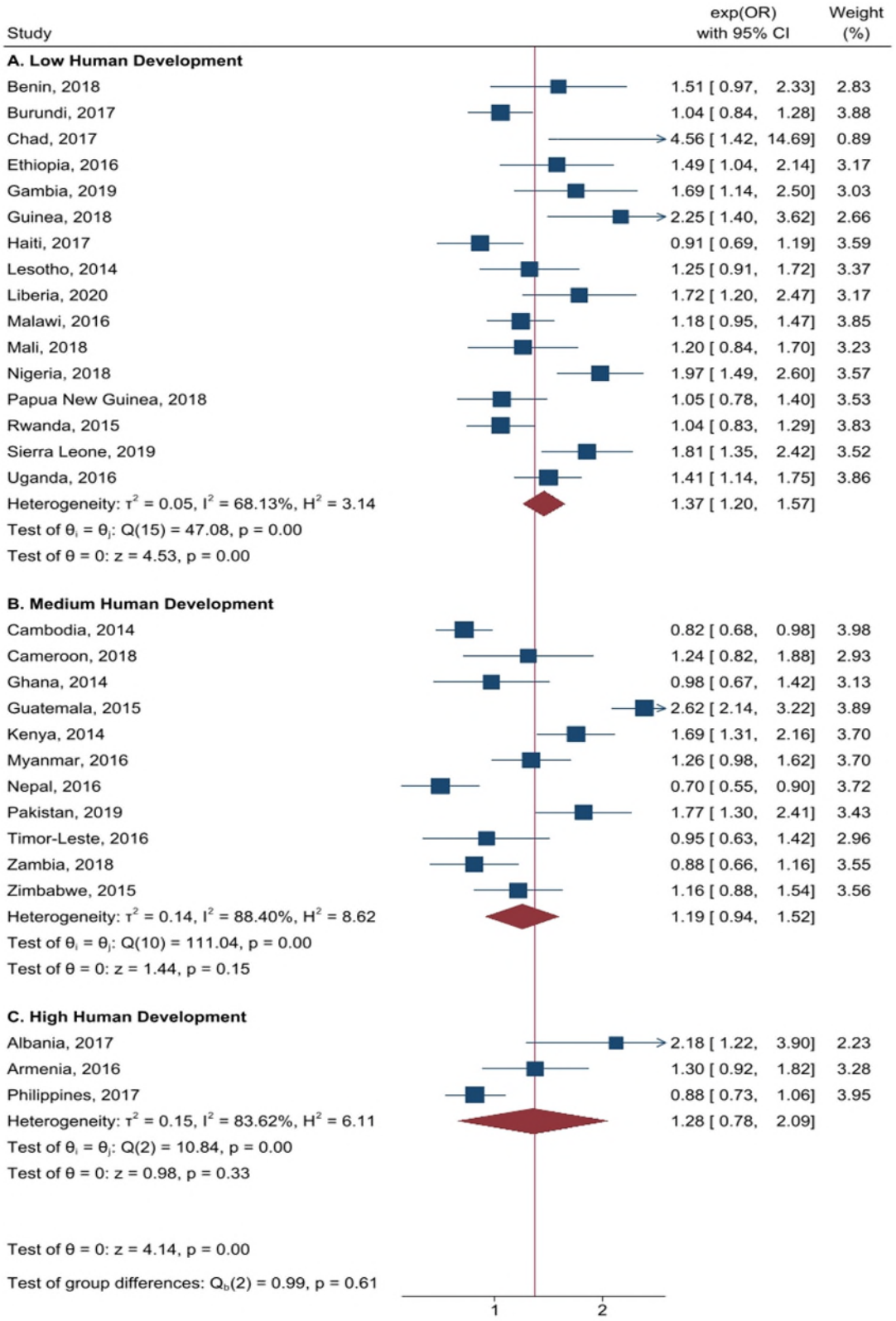


C. 33 Subgroup analysis by socioeconomic status on the association between women's household decision-making domain two and modern contraceptive use in 30 LMICs

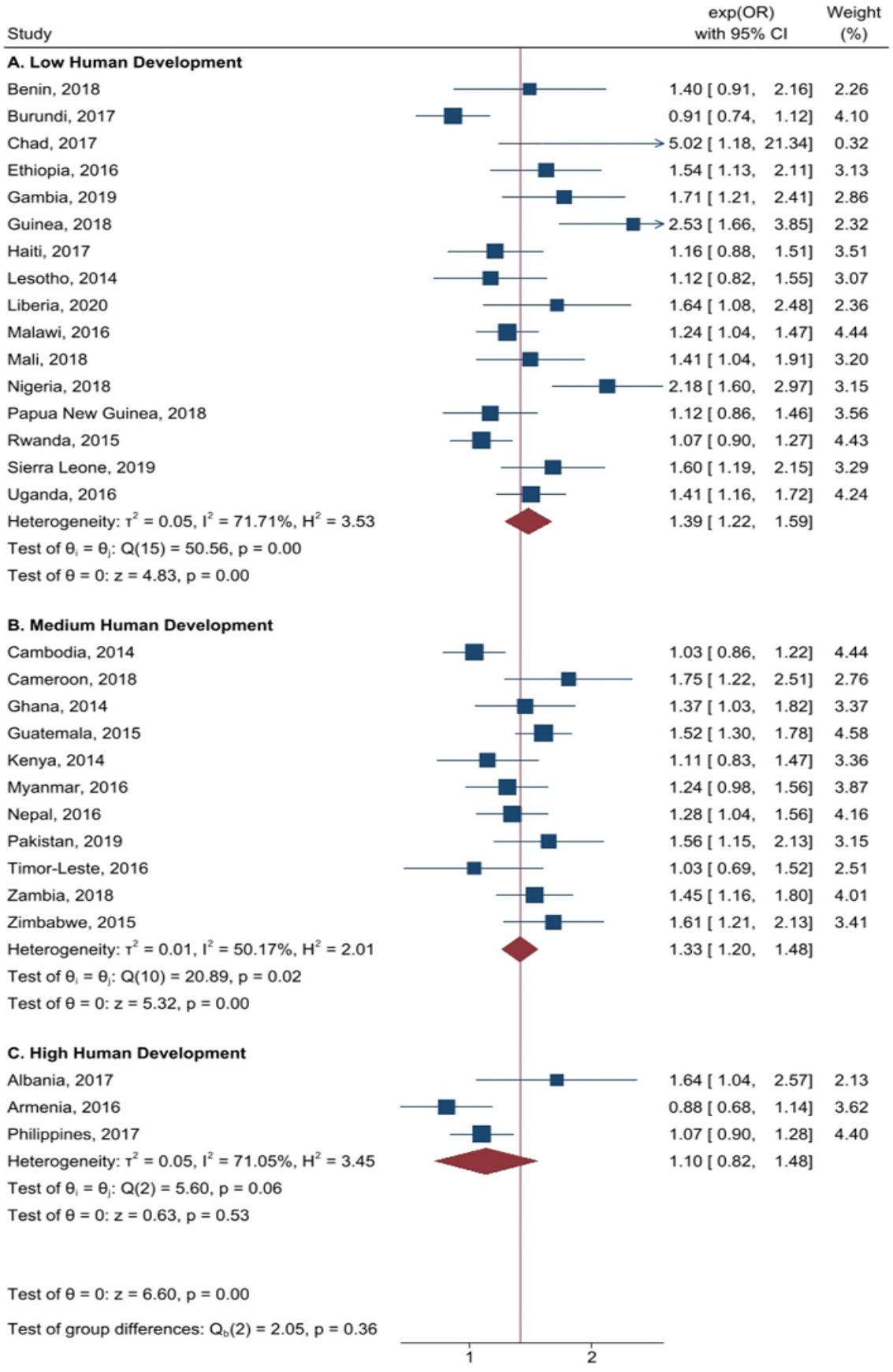


By HDI

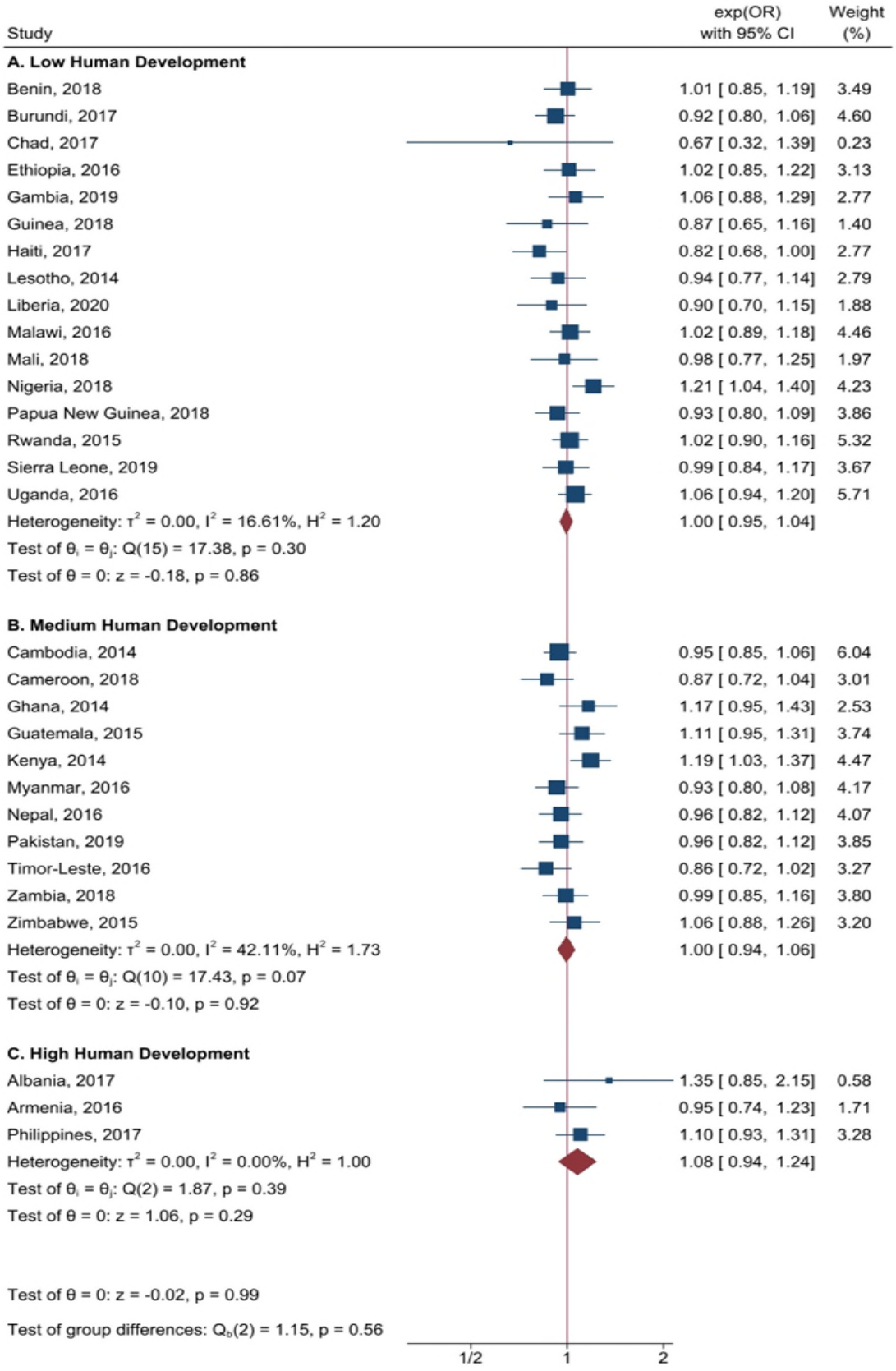
C. 34 Subgroup analysis by HDI on the association between women's empowerment index one and modern contraceptive use in 30 LMICs



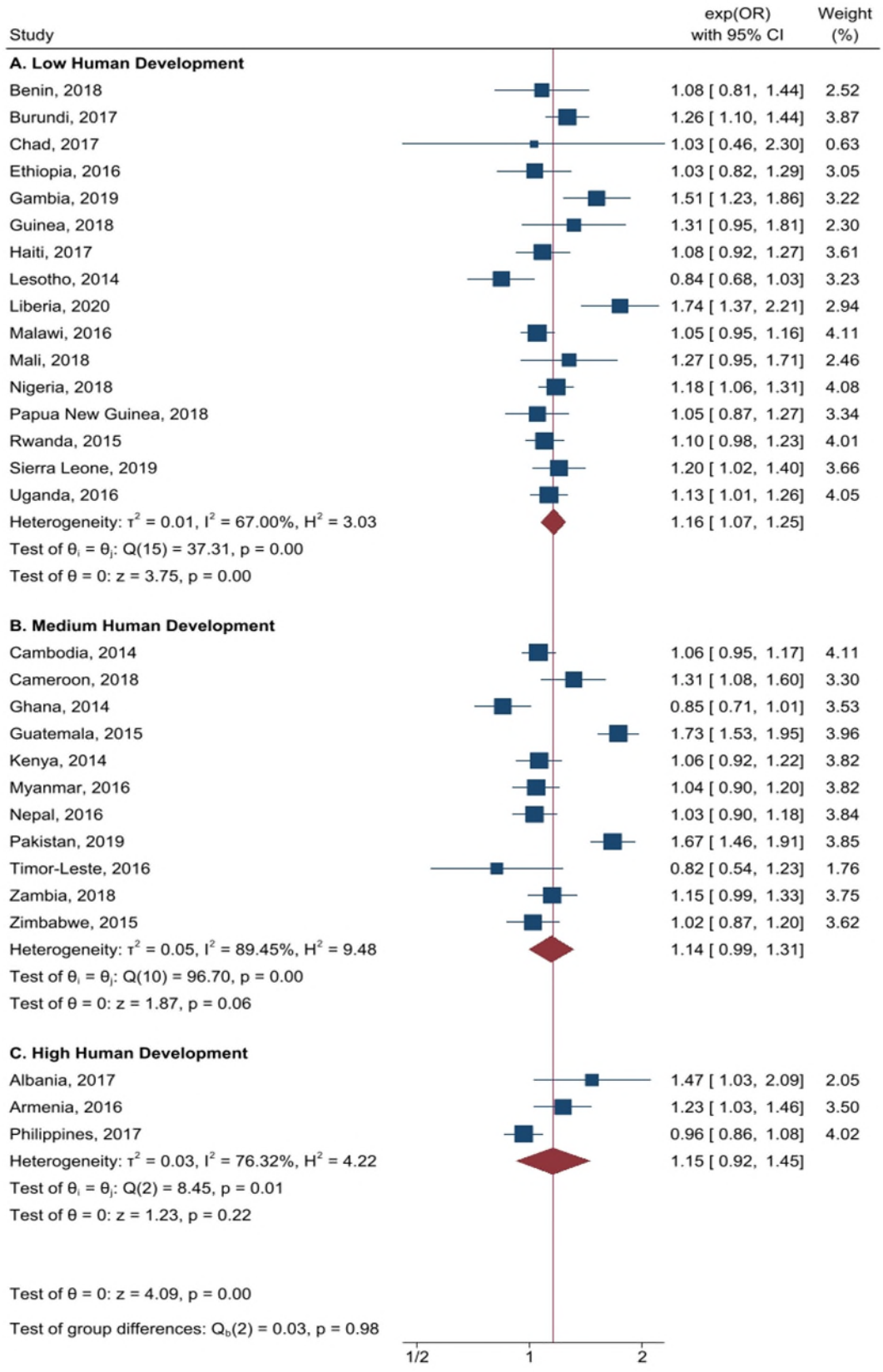
C. 35 Subgroup analysis by HDI on the association between women's empowerment index two and modern contraceptive use in 30 LMICs



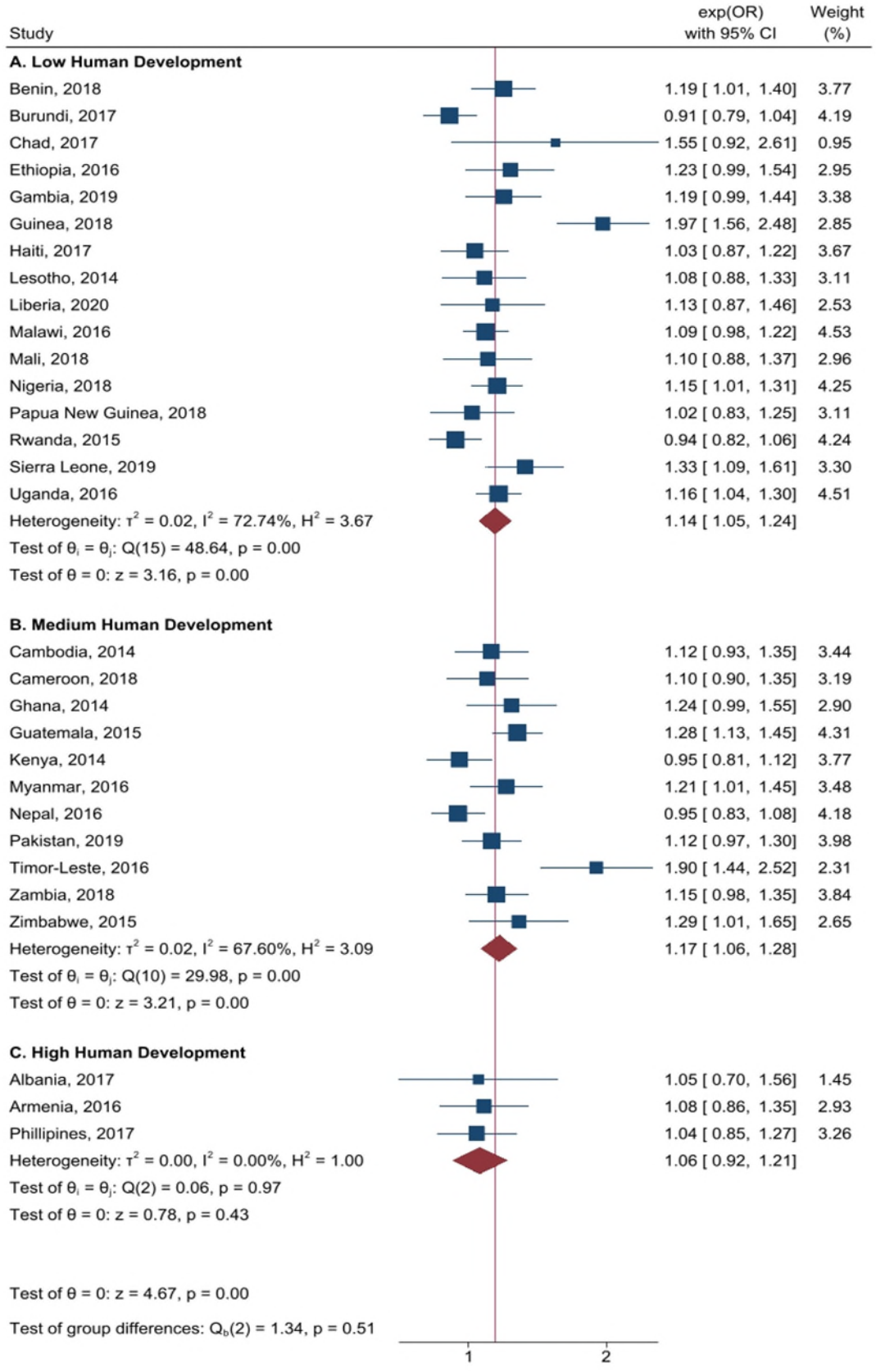
C. 36 Subgroup analysis by HDI on the association between women's attitudes towards domestic violence and modern contraceptive use in 30 LMICs



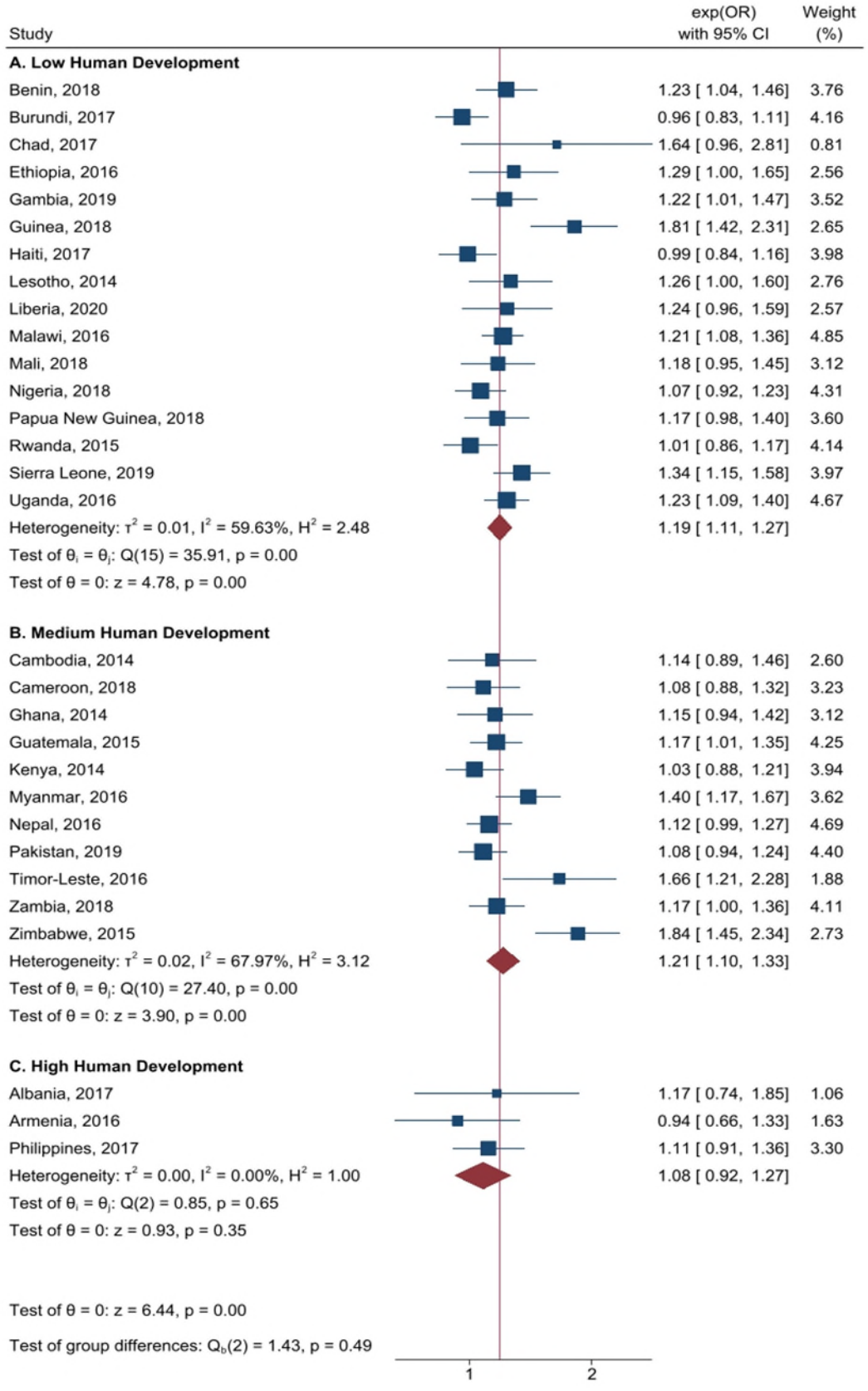
C. 37 Subgroup analysis by HDI on the association between women's reproductive health decision-making and modern contraceptive use in 30 LMICs



C. 38 Subgroup analysis by HDI on the association between women's household decision-making domain one and modern contraceptive use in 30 LMICs

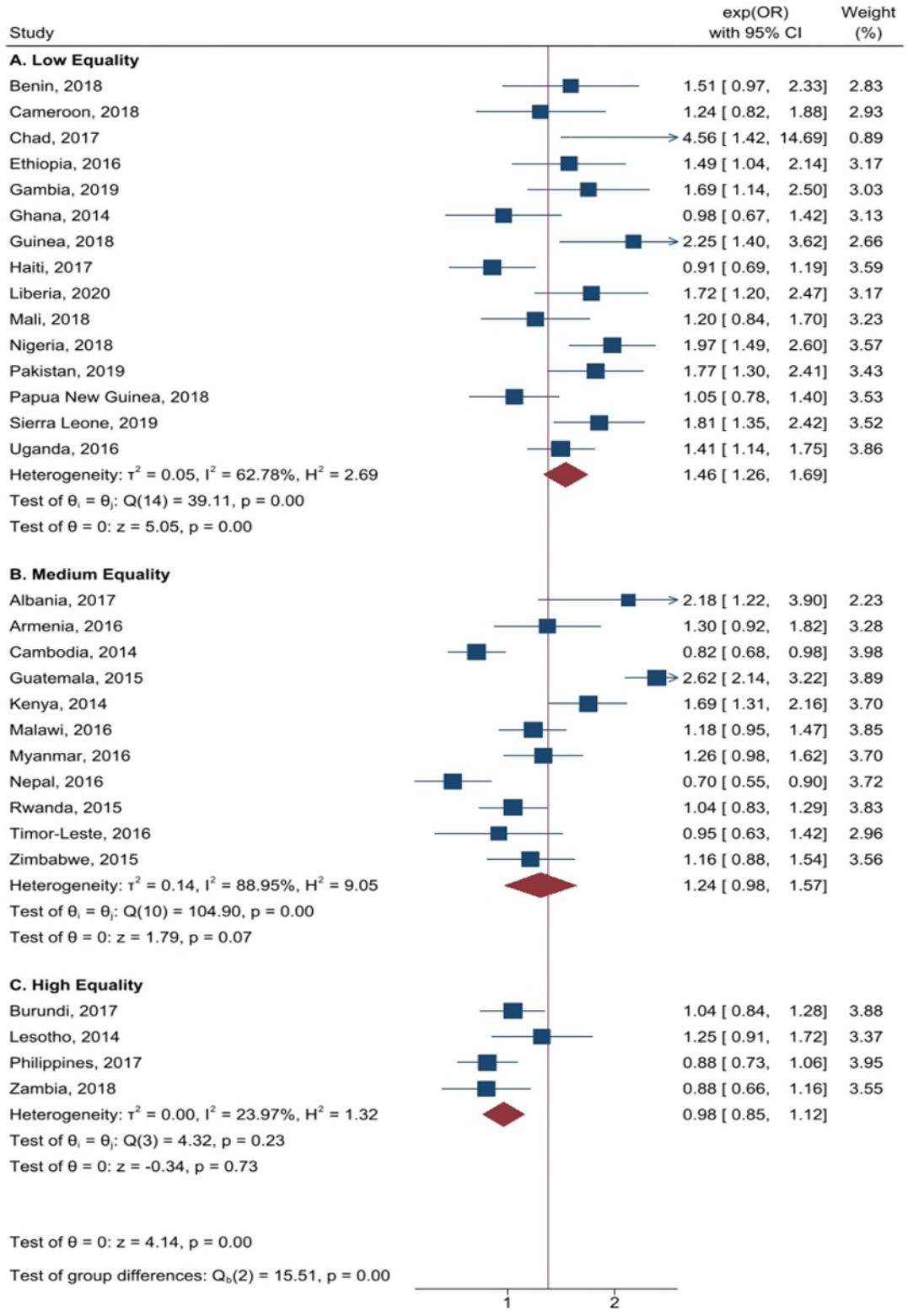


C. 39 Subgroup analysis by HDI on the association between women's household decision-making domain two and modern contraceptive use in 30 LMICs

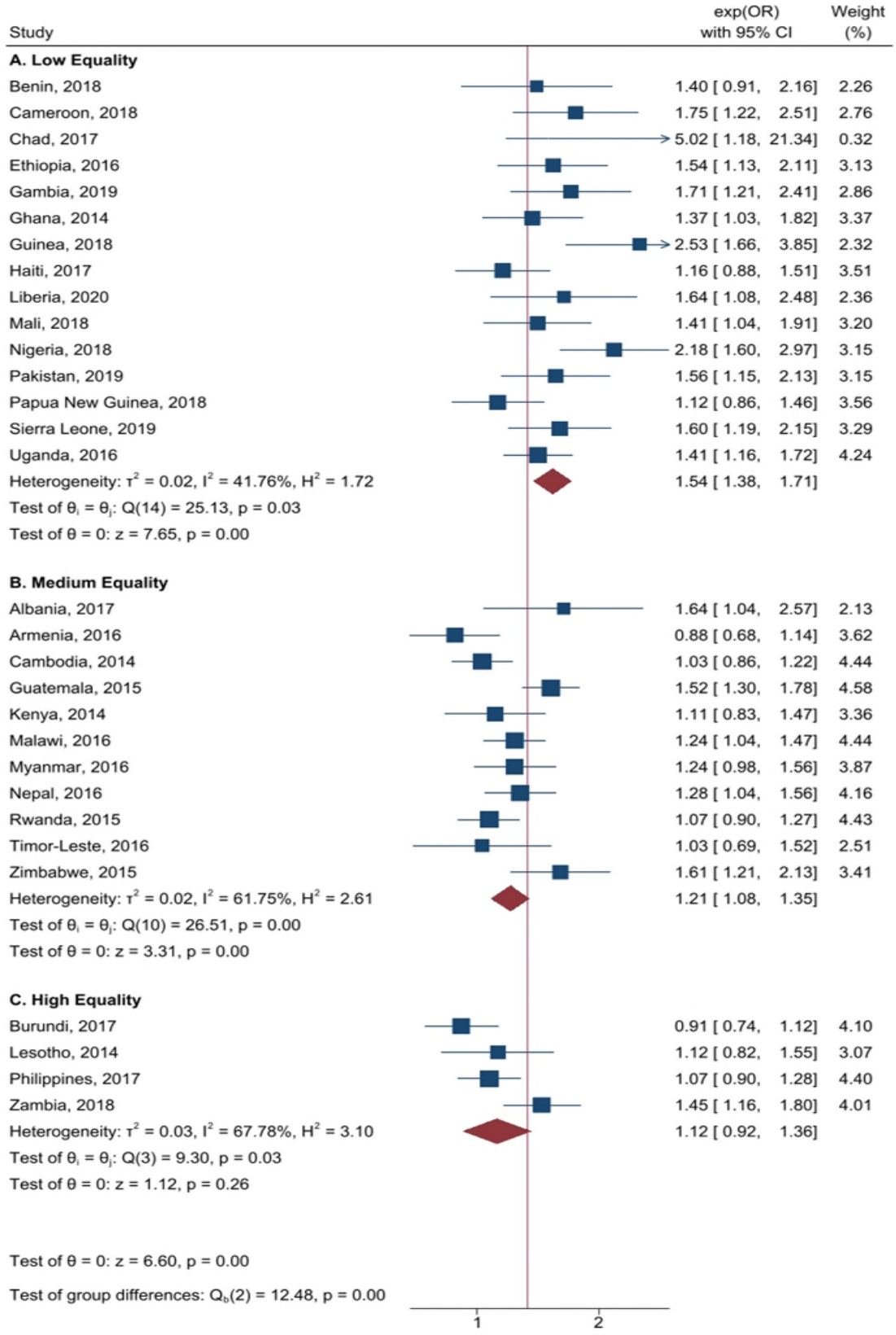


By GDI

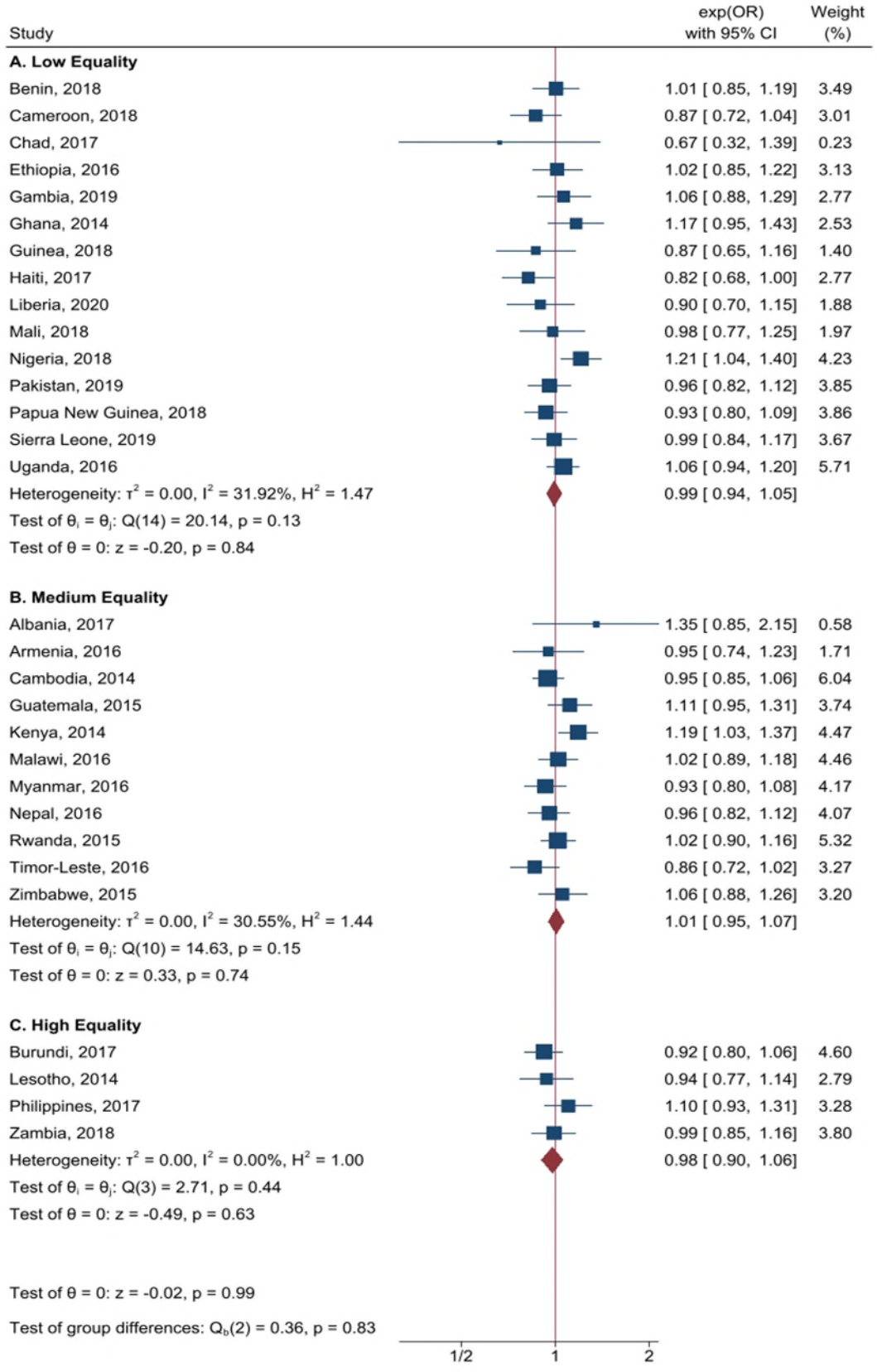
C. 40 Subgroup analysis by GDI on the association between women's empowerment index one and modern contraceptive use in 30 LMICs



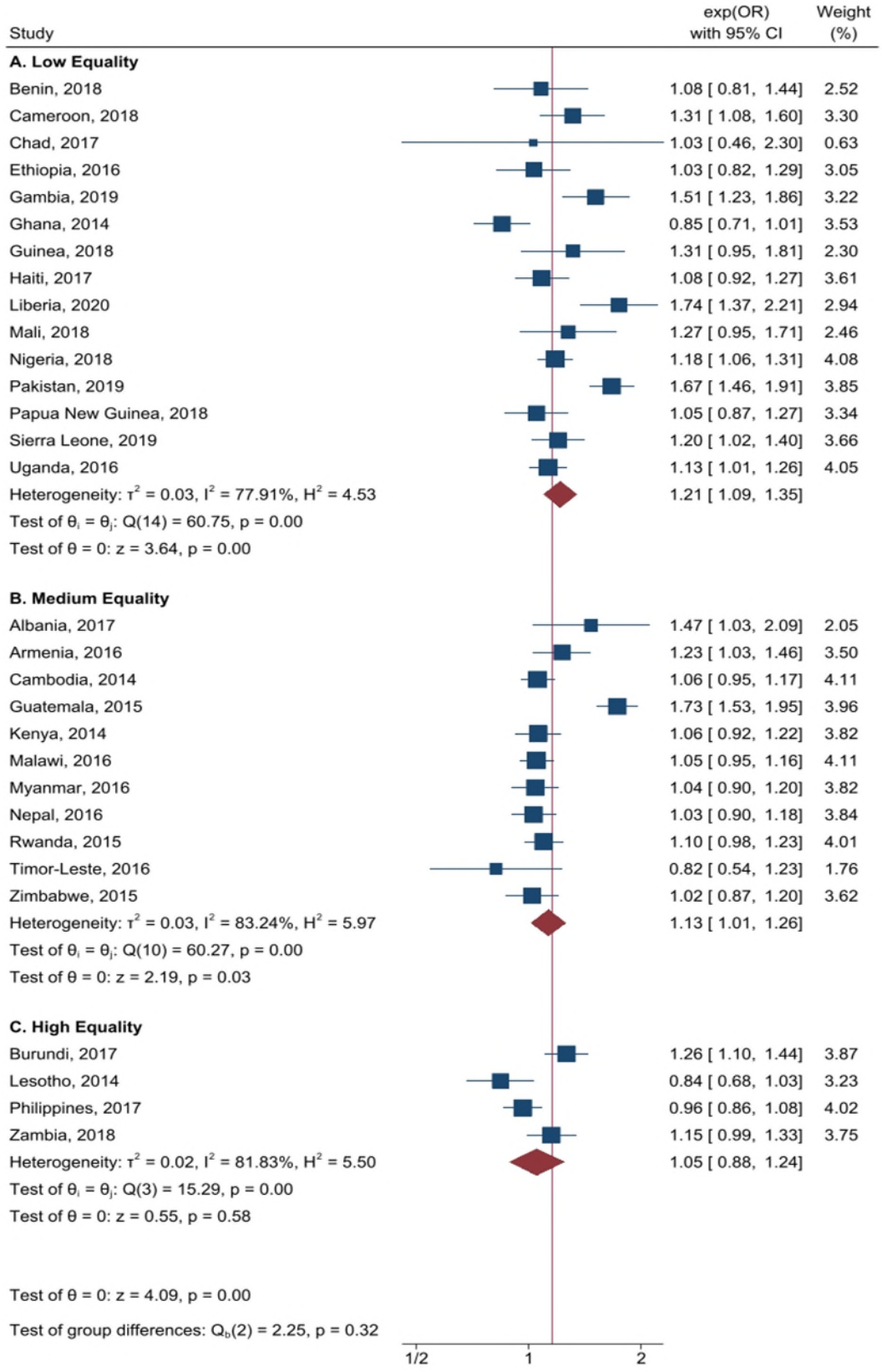
C. 41 Subgroup analysis by GDI on the association between women's empowerment index two and modern contraceptive use in 30 LMICs



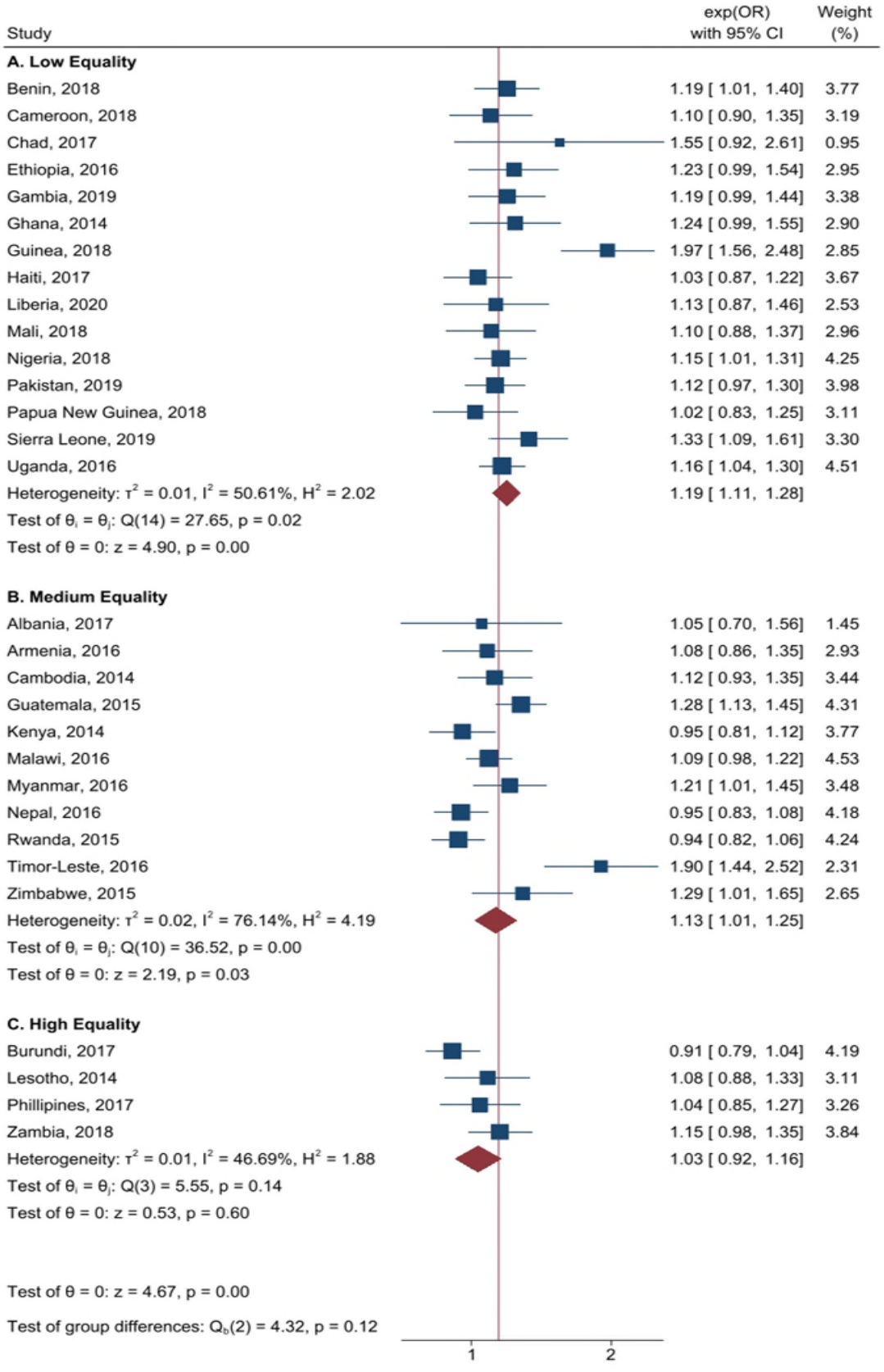
C. 42 Subgroup analysis by GDI on the association between women's attitudes towards domestic violence and modern contraceptive use in 30 LMICs



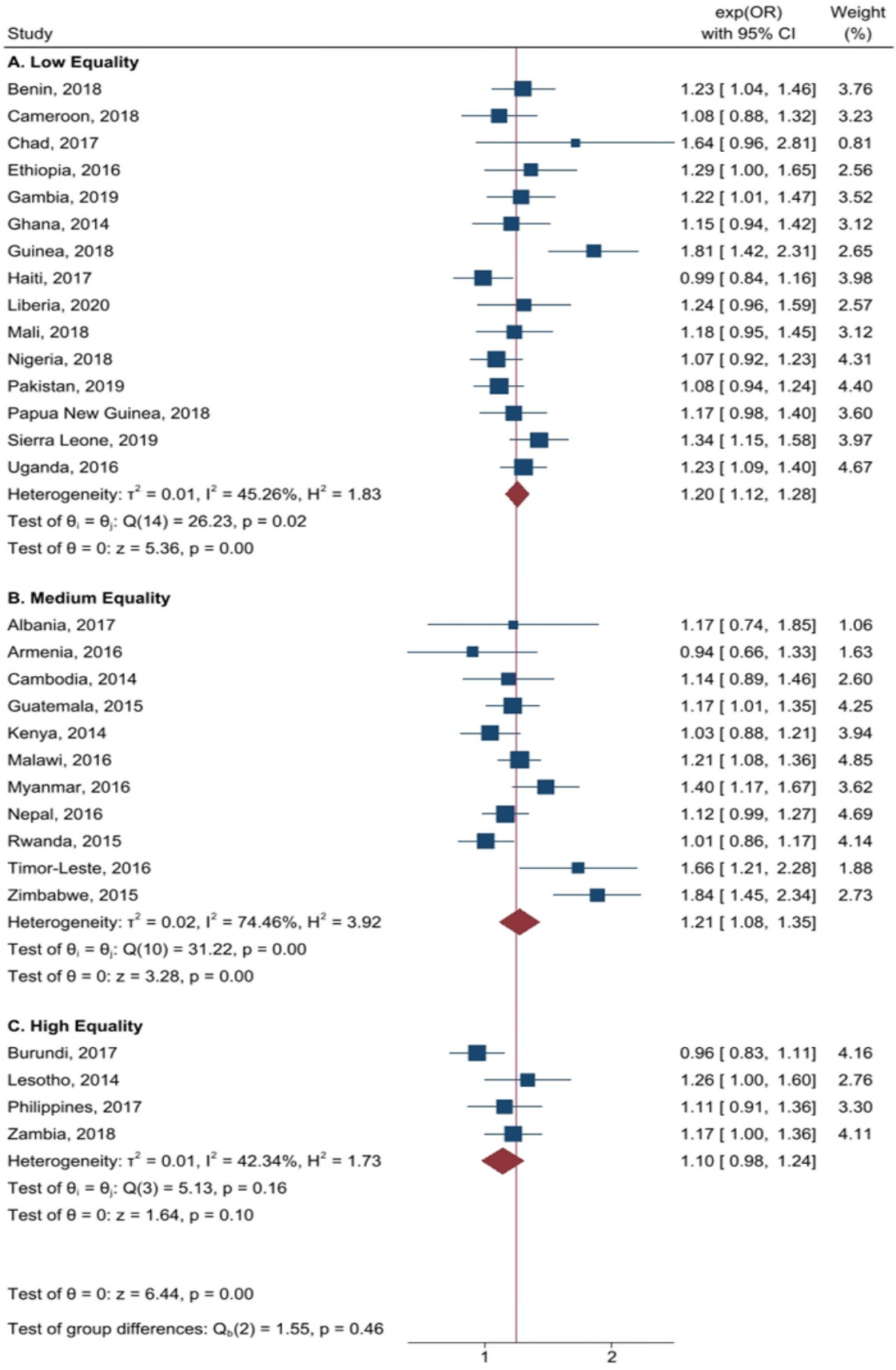
C. 43 Subgroup analysis by GDI on the association between women's reproductive health decision-making and modern contraceptive use in 30 LMICs



C. 44 Subgroup analysis by GDI on the association between women's household decision-making domain one and modern contraceptive use in 30 LMICs

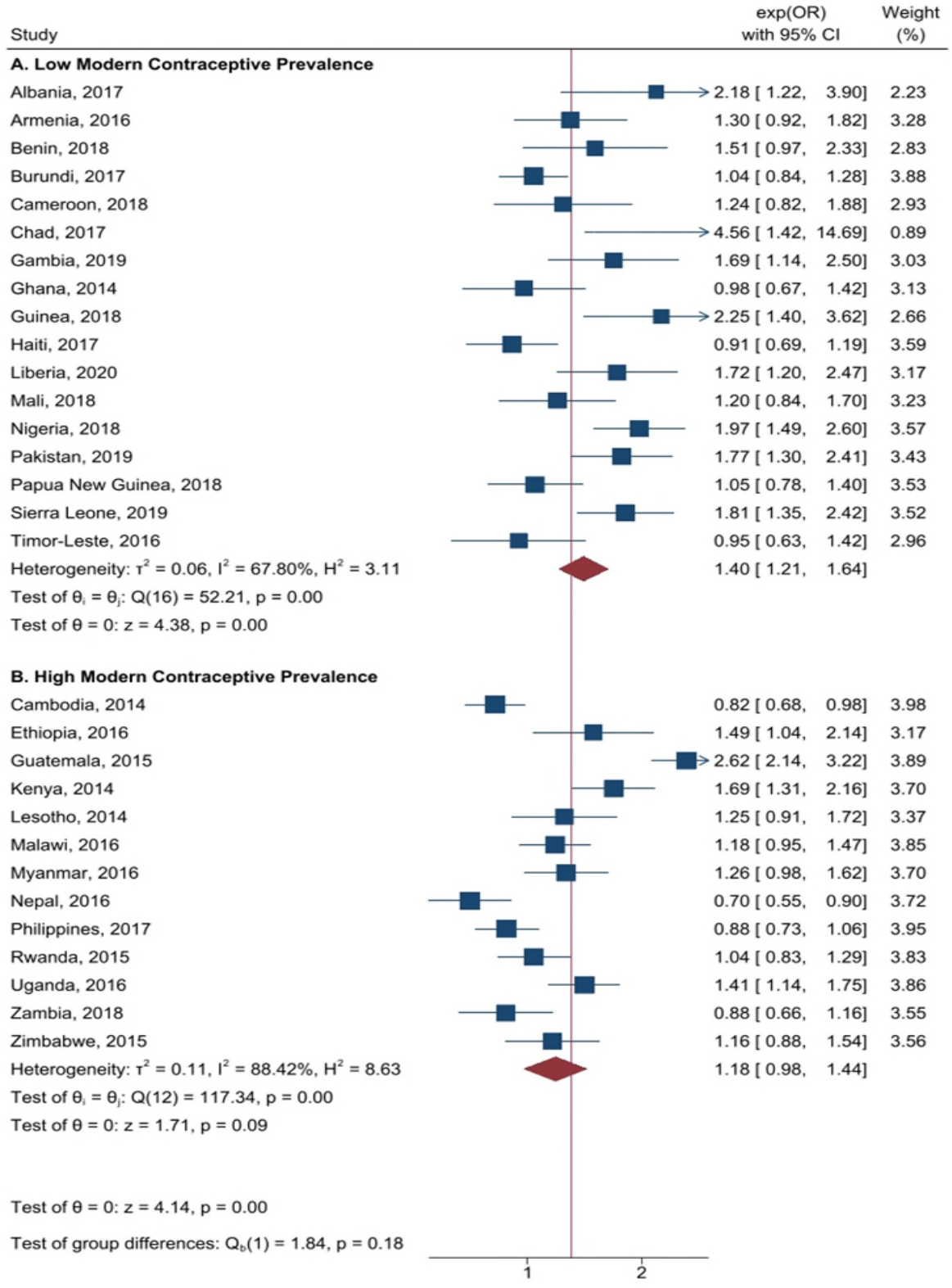


C. 45 Subgroup analysis by GDI on the association between women's household decision-making domain two and modern contraceptive use in 30 LMICs

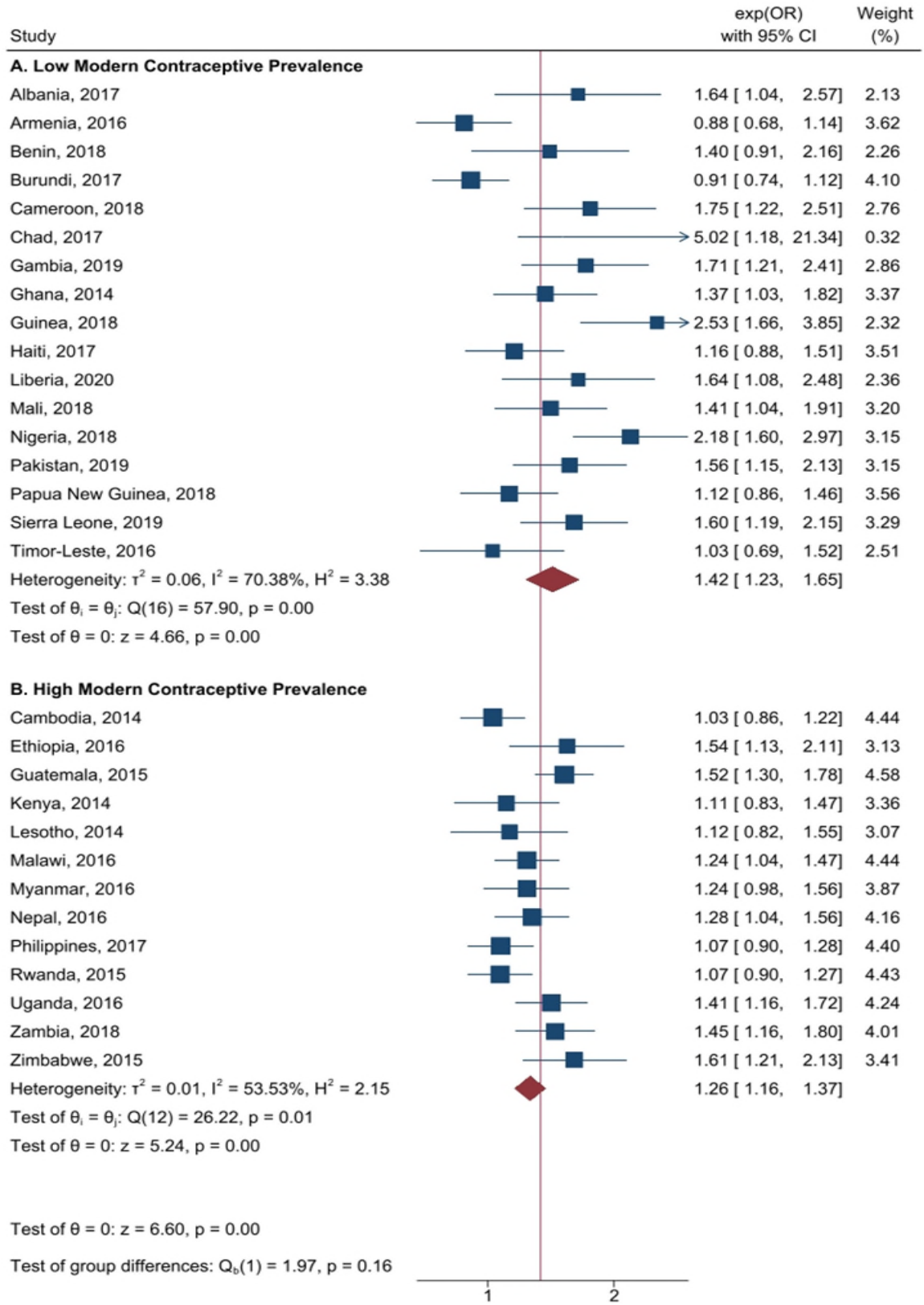


By modern contraceptive use prevalence

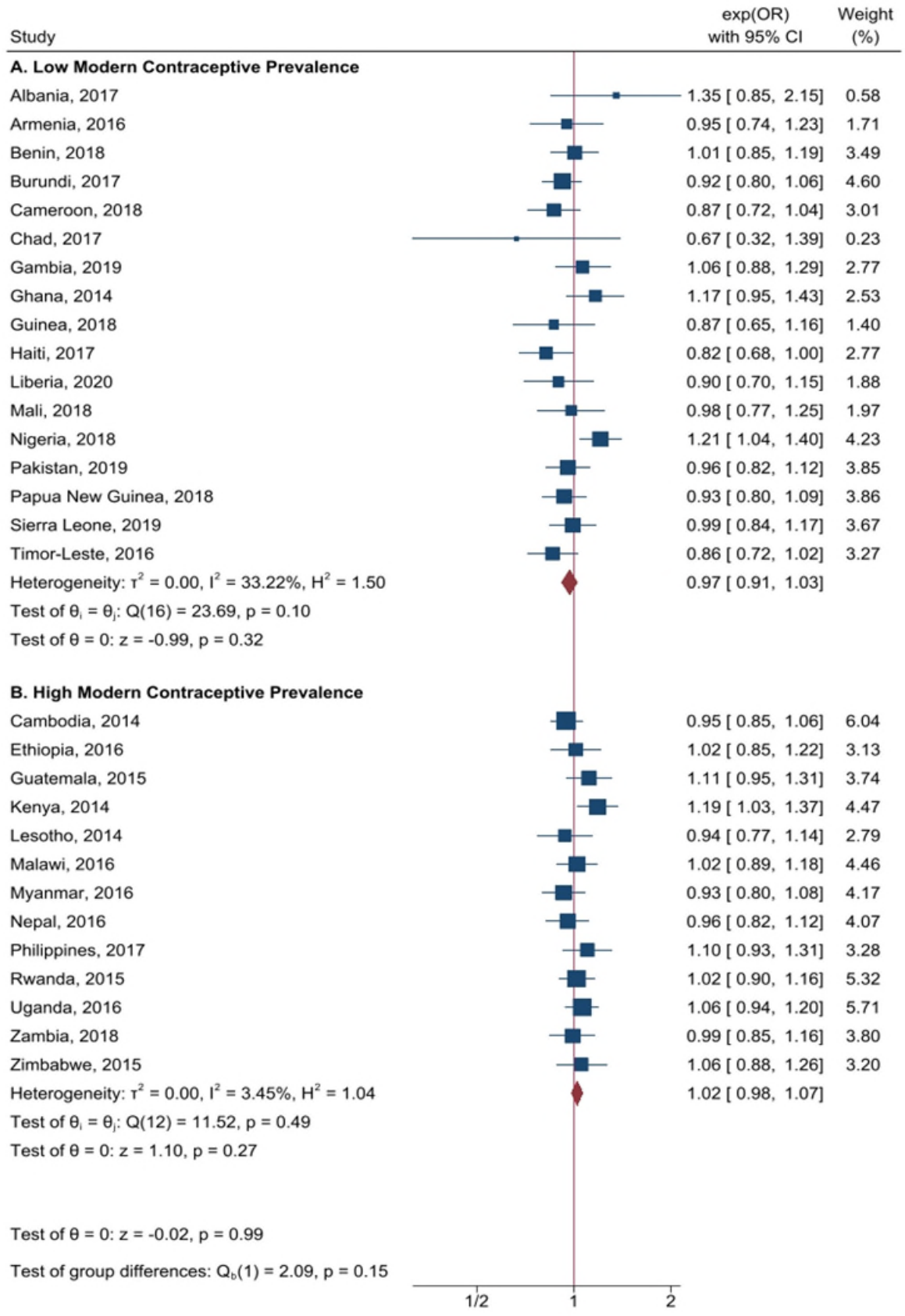
C. 46 Subgroup analysis by prevalence of modern contraceptives on the association between women's empowerment index one and modern contraceptive use in 30 LMICs



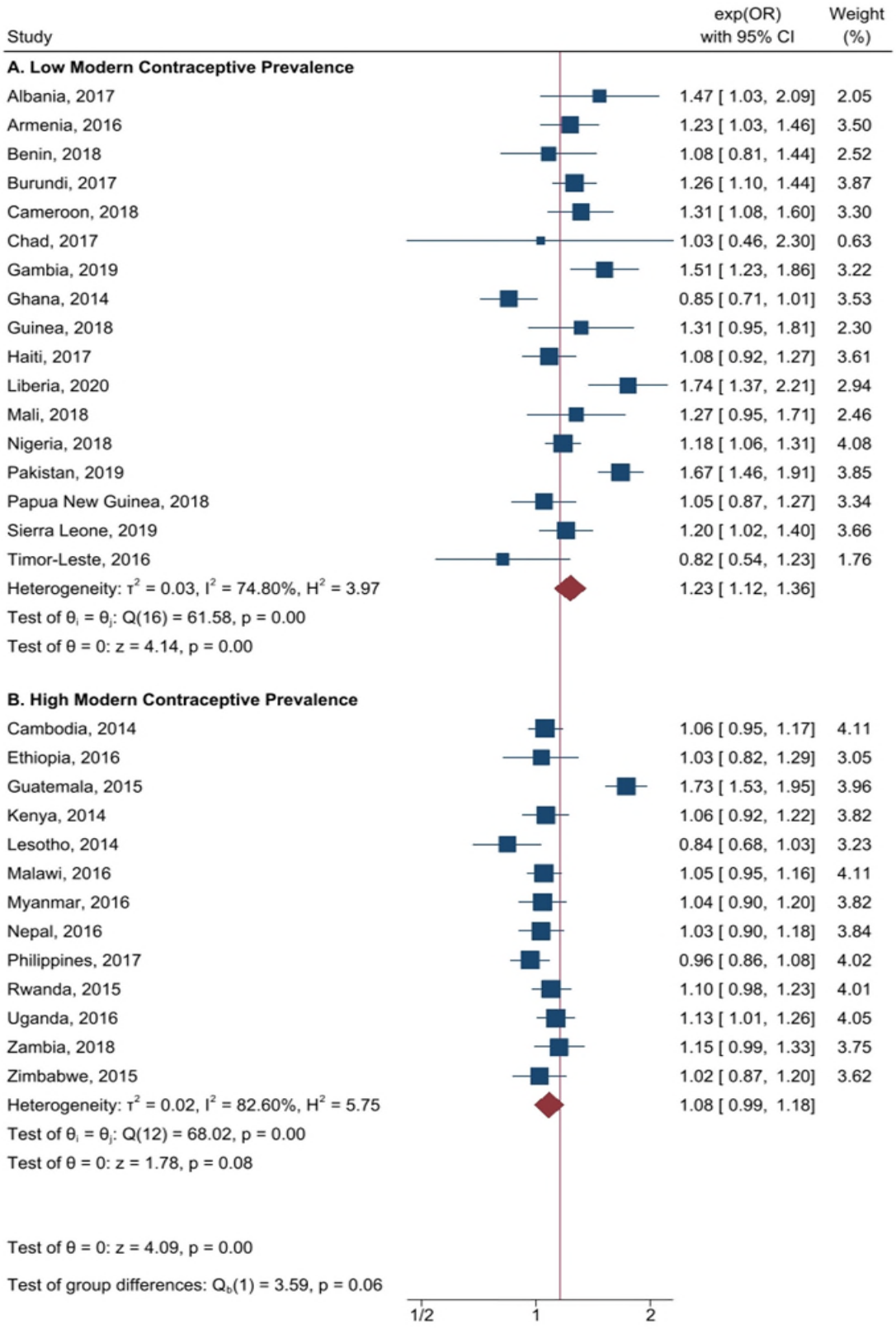
C. 47 Subgroup analysis by prevalence of modern contraceptives on the association between women's empowerment index one and modern contraceptive use in 30 LMICs



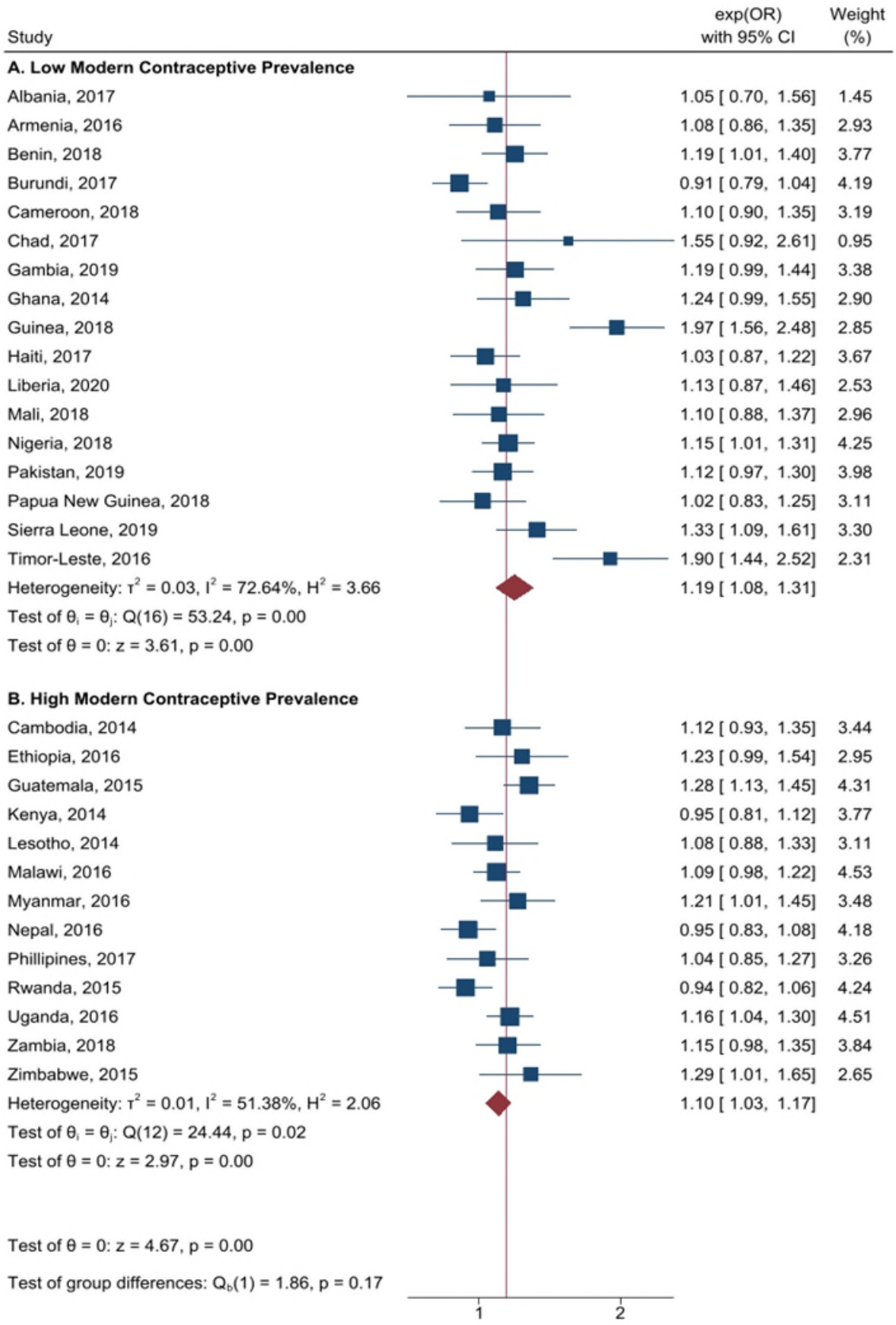
C. 48 Subgroup analysis by prevalence of modern contraceptives on the association between women's attitudes towards domestic violence and modern contraceptive use in 30 LMICs



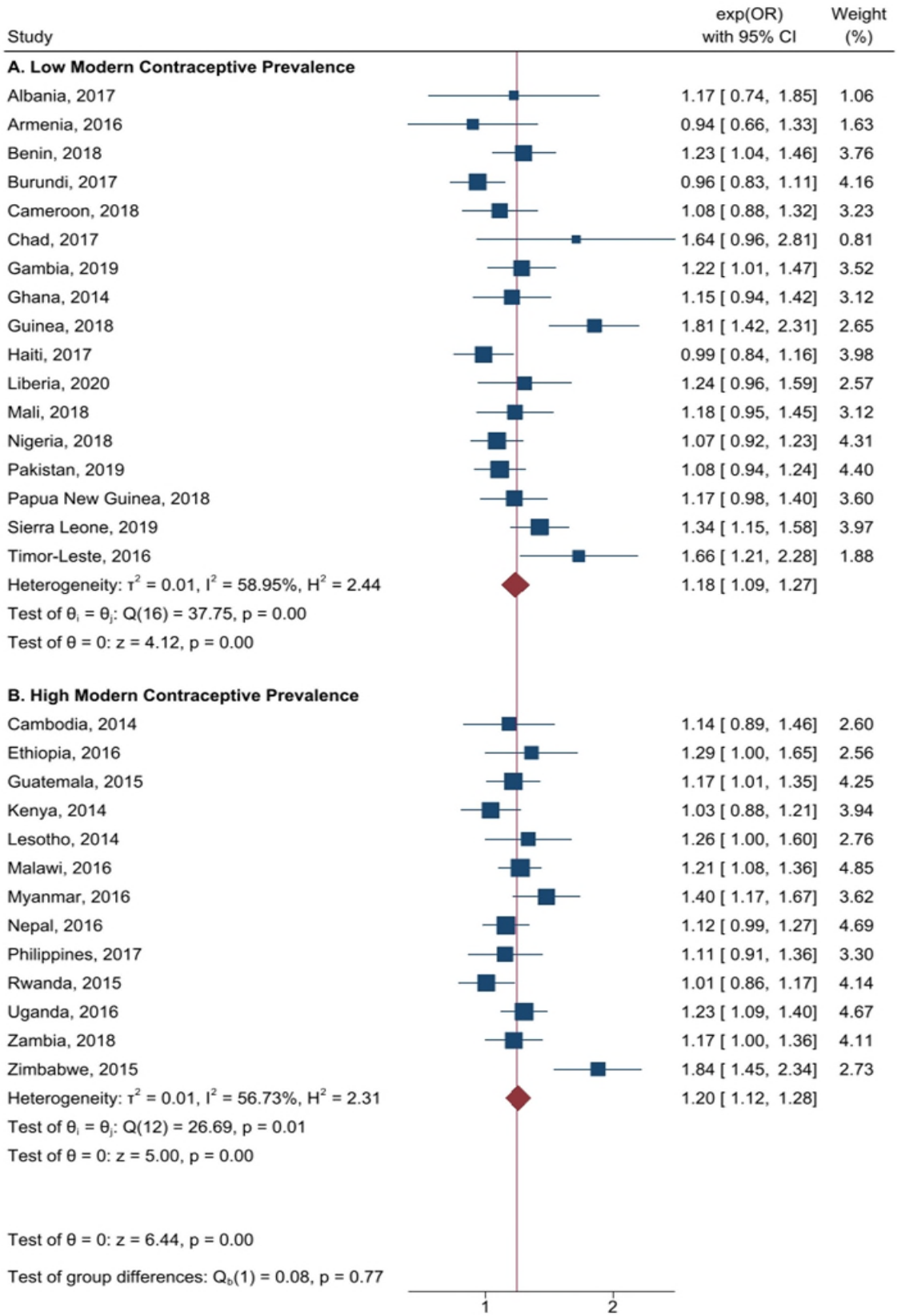
C. 49 Subgroup analysis by prevalence of modern contraceptives on the association between women's reproductive health decision-making and modern contraceptive use in 30 LMICs



C. 50 Subgroup analysis by prevalence of modern contraceptives on the association between women's household decision-making index one and modern contraceptive use in 30 LMICs

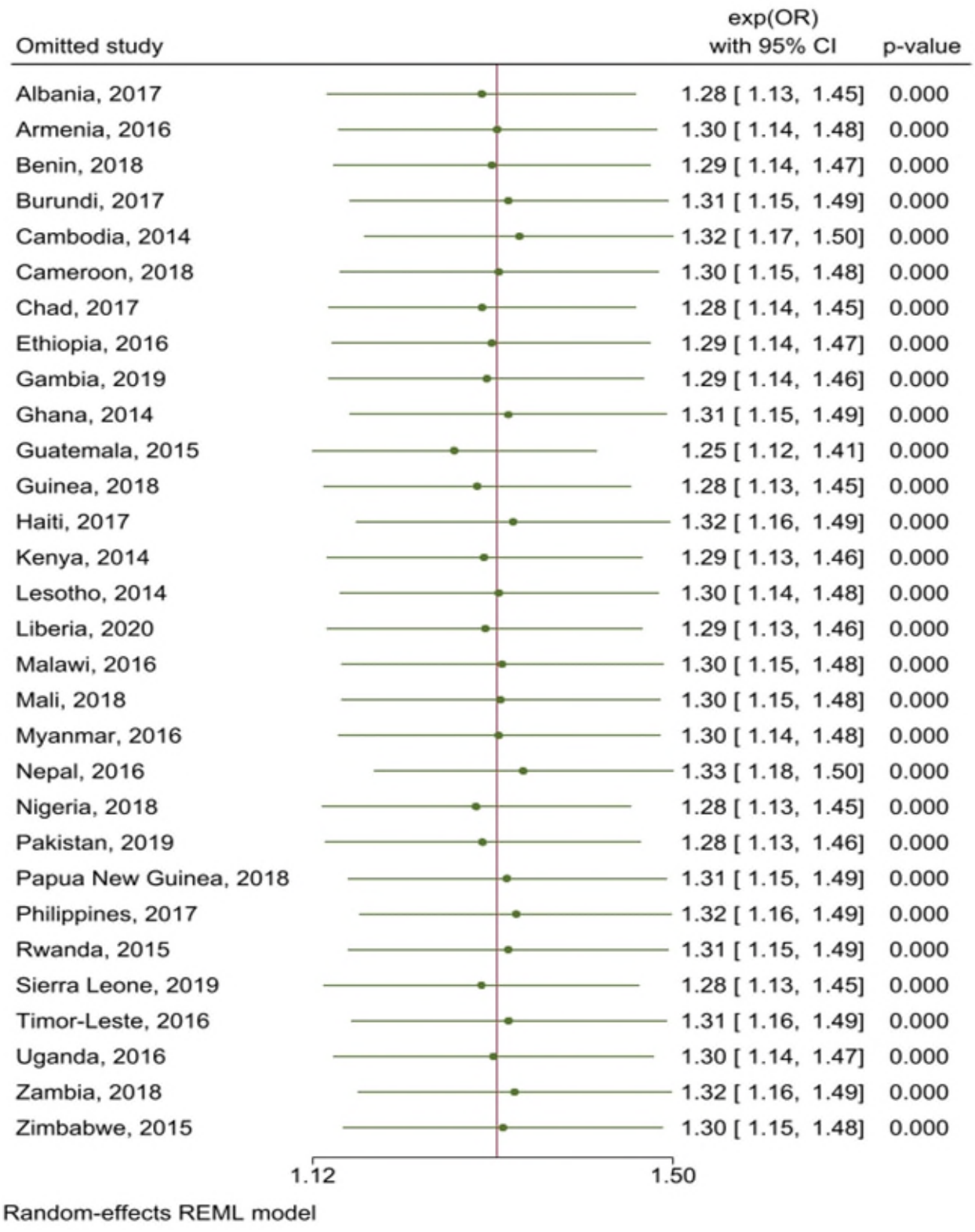


C. 51 Subgroup analysis by prevalence of modern contraceptives on the association between women's household decision-making domain two and modern contraceptive use in 30 LMICs

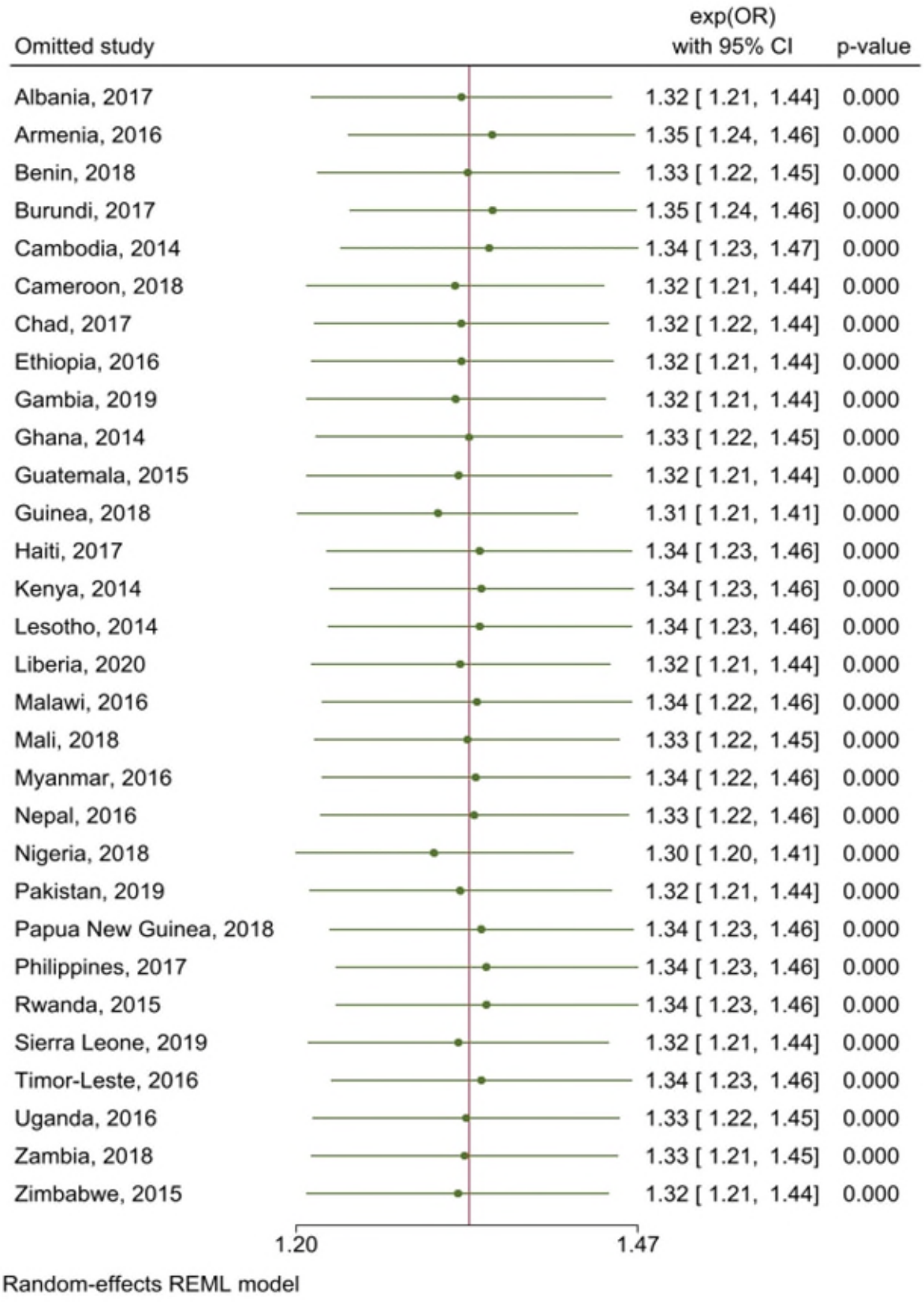


Sensitivity analysis: Leave-one-out analysis

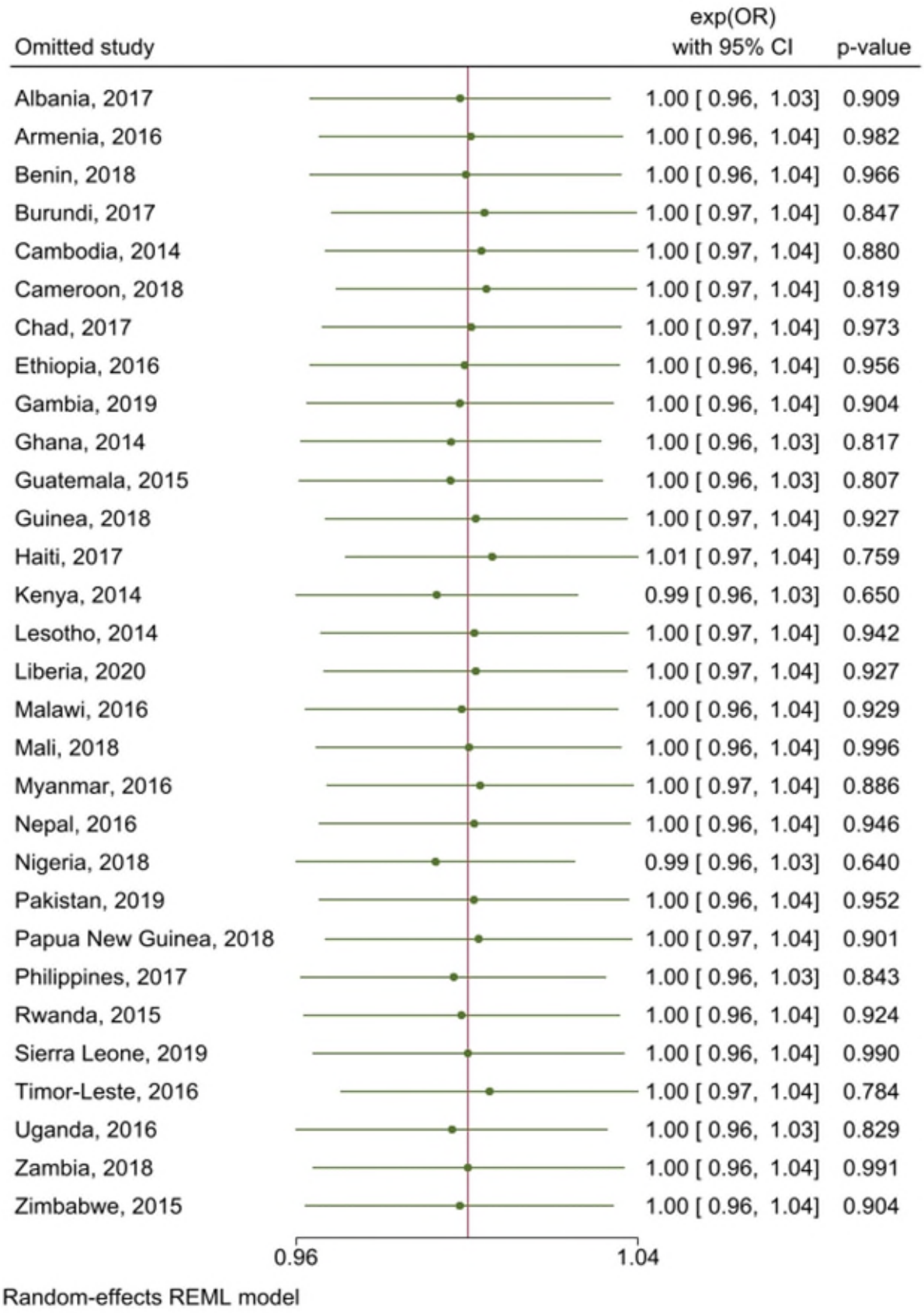
C. 52 The association between women's empowerment index one and modern contraceptive omitting one study at a time



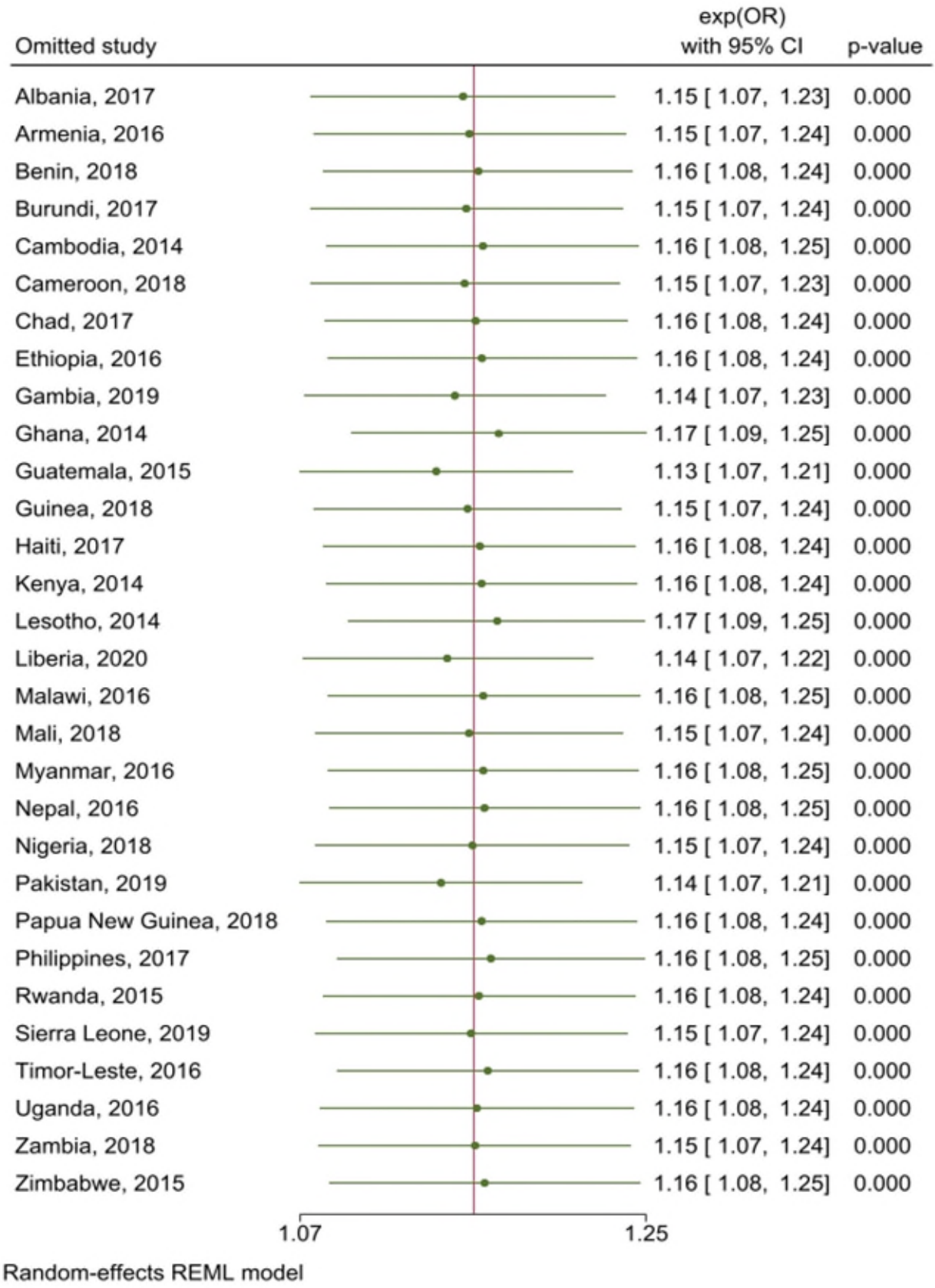
C. 53 The association between women's empowerment index two and modern contraceptive omitting one study at a time



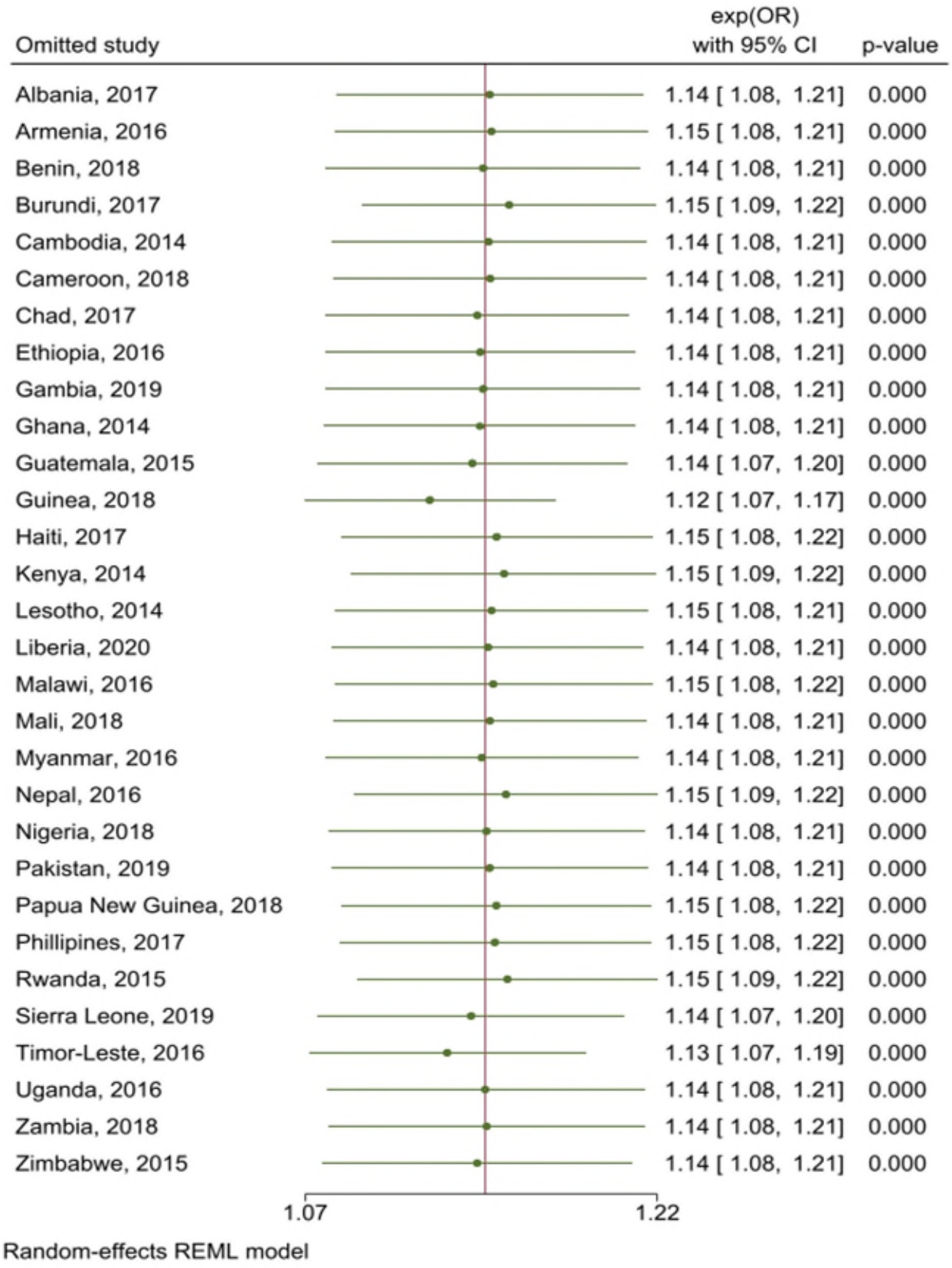
C. 54 The association between women's attitudes towards domestic violence and modern contraceptive omitting one study at a time



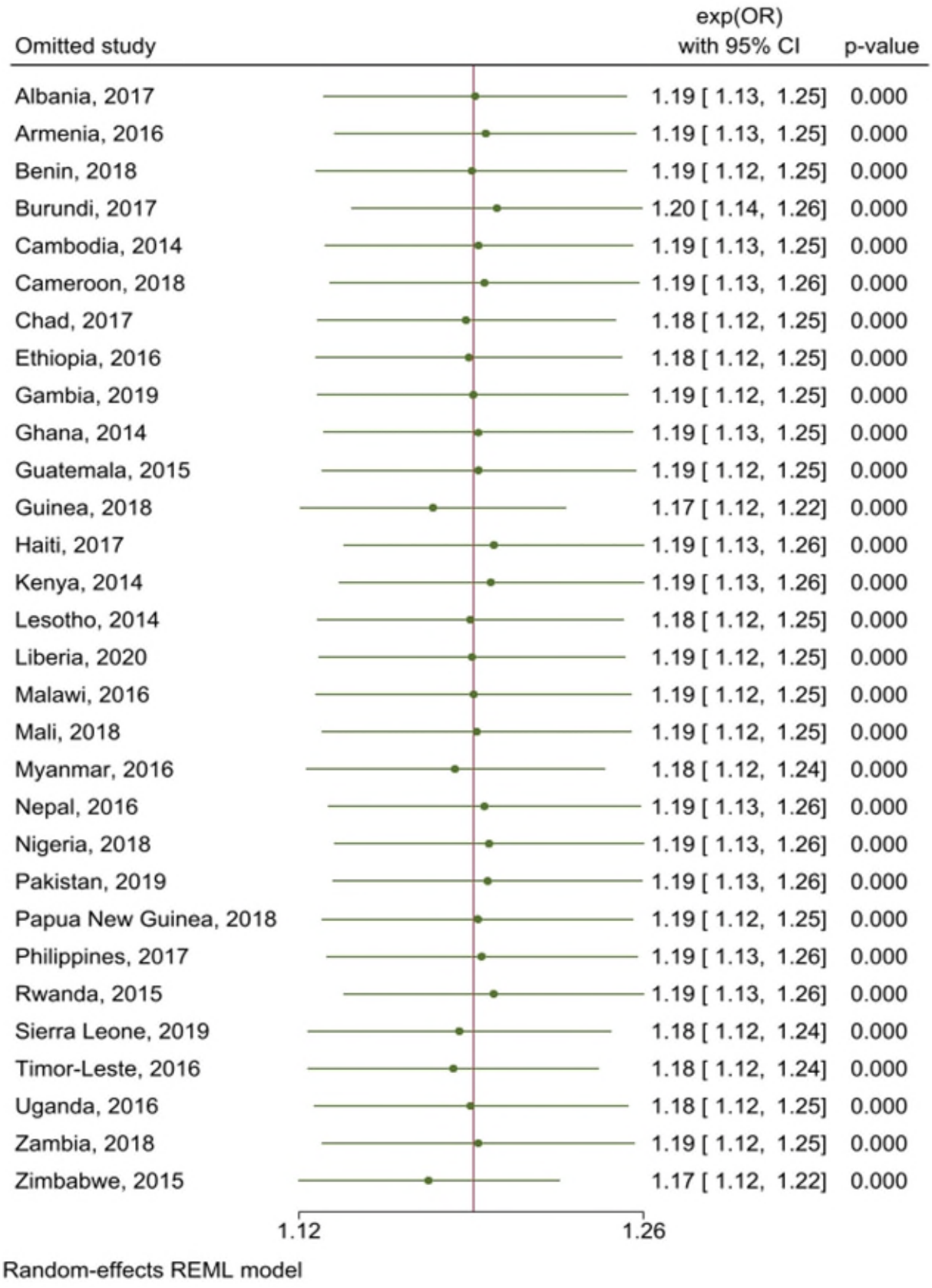
C. 55 The association between women's reproductive health decision-making and modern contraceptive omitting one study at a time



C. 56 The association between women's household decision-making index one and modern contraceptive omitting one study at a time



C. 57 The association between women's household decision-making index two and modern contraceptive omitting one study at a time



APPENDIX D – THE ASSOCIATION BETWEEN WOMEN'S EMPOWERMENT AND ABORTION

D. 1 Association between women's empowerment domains attitudes towards domestic violence and reproductive health decision-making and abortion in 29 low- and middle-income countries

Country	Attitudes towards domestic violence								Reproductive health decision- making							
	Unadjusted				Adjusted				Unadjusted				Adjusted			
	OR	95% CI		p-value	OR	95% CI		p-value	OR	95% CI		p-value	OR	95% CI		p-value
Albania	0.88	0.57	1.35	0.558	1.09	0.70	1.70	0.705	1.00	0.75	1.33	0.995	1.07	0.78	1.45	0.693
Armenia	0.61	0.48	0.78	<0.001	0.73	0.57	0.94	0.015	1.03	0.86	1.24	0.739	1.16	0.95	1.42	0.137
Benin	0.93	0.80	1.08	0.331	0.88	0.74	1.04	0.121	0.99	0.85	1.15	0.869	1.02	0.87	1.19	0.836
Burundi	0.95	0.79	1.15	0.619	0.96	0.78	1.18	0.700	0.93	0.77	1.11	0.411	0.99	0.82	1.21	0.933
Cambodia	0.75	0.66	0.86	<0.001	0.75	0.65	0.87	<0.001	1.06	0.93	1.20	0.380	1.13	0.98	1.29	0.088
Cameroon	1.10	0.89	1.35	0.367	1.01	0.80	1.28	0.913	1.68	1.40	2.02	<0.001	1.36	1.12	1.64	0.002
Chad	0.91	0.68	1.21	0.514	1.25	0.80	1.94	0.333	1.35	0.74	2.46	0.327	0.88	0.42	1.82	0.725
Ethiopia	1.04	0.75	1.44	0.830	0.93	0.65	1.34	0.705	1.07	0.76	1.51	0.695	1.00	0.69	1.44	0.989
Gambia	0.78	0.65	0.94	0.009	0.70	0.57	0.86	0.001	1.21	0.99	1.48	0.064	1.25	1.01	1.54	0.040
Ghana	1.46	1.13	1.89	0.004	1.21	0.91	1.62	0.197	1.02	0.81	1.29	0.842	0.97	0.75	1.24	0.787
Guatemala	1.07	0.85	1.36	0.551	1.04	0.81	1.33	0.769	0.93	0.79	1.10	0.413	0.91	0.76	1.10	0.342
Guinea	0.88	0.67	1.16	0.361	0.87	0.66	1.16	0.349	1.00	0.73	1.39	0.985	0.86	0.60	1.23	0.398
Haiti	1.14	0.84	1.56	0.390	1.01	0.73	1.41	0.951	0.77	0.61	0.98	0.037	0.68	0.53	0.89	0.005
Kenya	1.01	0.78	1.30	0.959	0.95	0.72	1.27	0.742	1.09	0.83	1.42	0.546	1.17	0.86	1.59	0.322
Lesotho	0.86	0.61	1.20	0.374	0.80	0.55	1.17	0.257	1.13	0.80	1.59	0.481	1.16	0.80	1.68	0.427
Liberia	0.79	0.53	1.18	0.255	0.68	0.46	1.00	0.052	1.01	0.77	1.32	0.941	0.97	0.72	1.30	0.830
Malawi	1.22	0.92	1.61	0.160	1.12	0.85	1.48	0.420	0.90	0.73	1.09	0.274	0.88	0.71	1.08	0.211
Mali	0.95	0.71	1.27	0.738	0.90	0.65	1.24	0.519	1.31	0.91	1.89	0.152	1.38	0.92	2.06	0.117
Myanmar	0.86	0.69	1.07	0.180	0.87	0.69	1.11	0.272	1.01	0.80	1.27	0.933	1.06	0.82	1.37	0.644
Nepal	0.88	0.74	1.05	0.152	0.76	0.63	0.93	0.007	0.82	0.69	0.99	0.037	0.83	0.68	1.01	0.063
Nigeria	0.90	0.79	1.03	0.127	0.81	0.70	0.94	0.005	0.90	0.79	1.03	0.137	0.84	0.72	0.98	0.024
Pakistan	1.06	0.91	1.24	0.472	1.02	0.85	1.22	0.858	1.33	1.14	1.56	0.000	1.27	1.09	1.49	0.003

Country	Attitudes towards domestic violence								Reproductive health decision- making							
	Unadjusted				Adjusted				Unadjusted				Adjusted			
	OR	95% CI		p-value	OR	95% CI		p-value	OR	95% CI		p-value	OR	95% CI		p-value
Papua New Guinea	0.59	0.36	0.98	0.041	0.54	0.33	0.87	0.012	1.36	0.85	2.17	0.194	1.00	0.67	1.48	0.991
Rwanda	0.91	0.76	1.08	0.276	0.94	0.78	1.12	0.463	0.88	0.73	1.05	0.153	0.93	0.77	1.12	0.420
Sierra Leone	0.72	0.56	0.93	0.012	0.63	0.50	0.79	0.000	0.90	0.70	1.14	0.368	0.82	0.64	1.04	0.098
Timor-Leste	0.68	0.38	1.21	0.186	0.69	0.38	1.26	0.226	0.54	0.14	2.07	0.367	0.43	0.09	1.98	0.281
Uganda	0.93	0.80	1.08	0.331	0.88	0.74	1.04	0.119	0.99	0.85	1.15	0.869	1.02	0.88	1.19	0.780
Zambia	1.09	0.83	1.42	0.534	1.11	0.85	1.45	0.439	1.00	0.77	1.31	0.976	1.04	0.79	1.37	0.797
Zimbabwe	1.02	0.80	1.31	0.846	0.98	0.75	1.28	0.870	0.84	0.63	1.12	0.229	0.84	0.63	1.13	0.242

D. 1: Association between women's empowerment household decision-making domains and abortion in 29 low- and middle-income countries

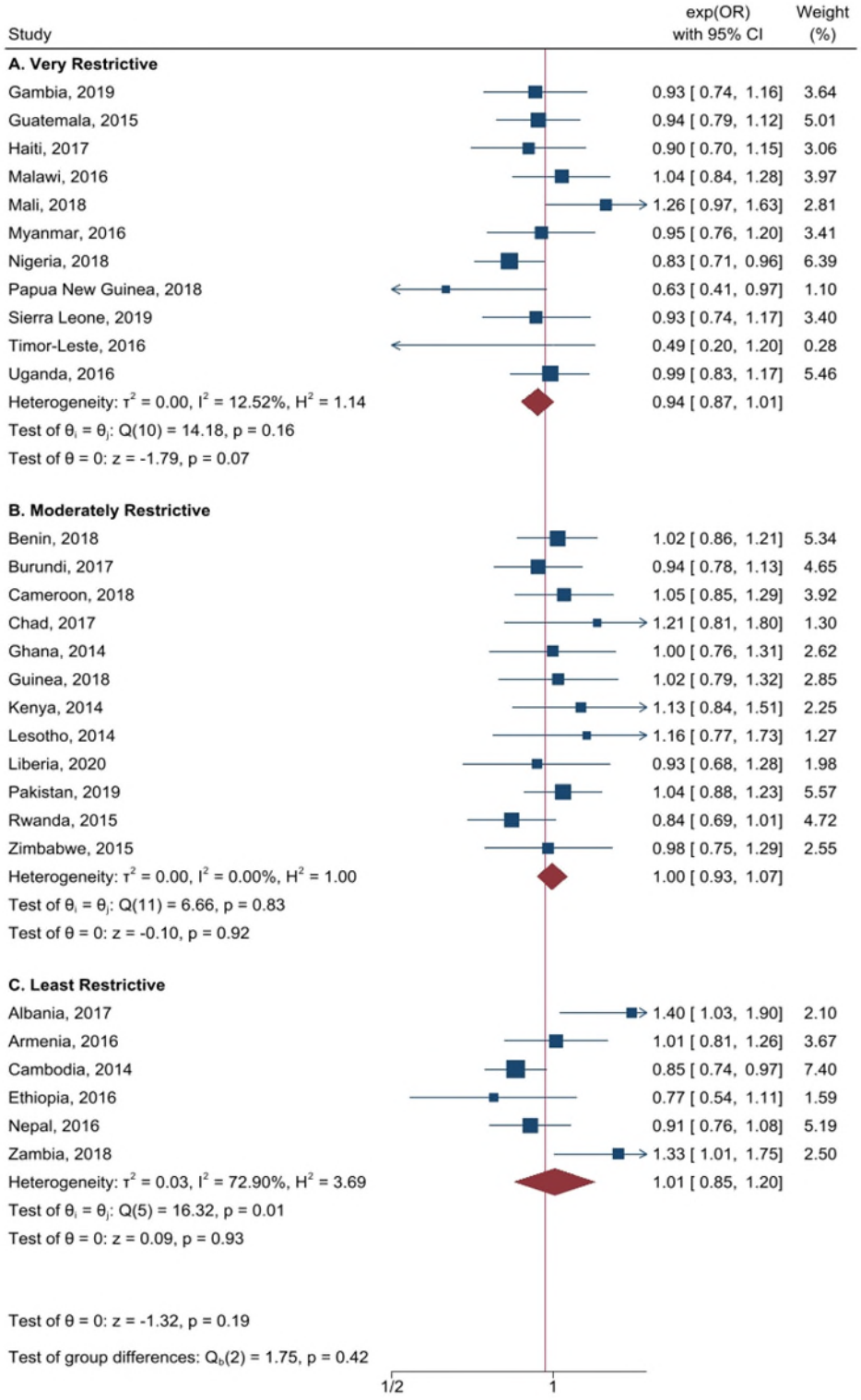
Country	Woman-alone household decision-making								Joint household decision-making							
	Unadjusted				Adjusted				Unadjusted				Adjusted			
	OR	95% CI		p-value	OR	95% CI		p-value	OR	95% CI		p-value	OR	95% CI		p-value
Albania	1.02	0.67	1.53	0.936	1.08	0.69	1.68	0.742	0.99	0.62	1.60	0.981	2.70	1.69	4.33	0.981
Armenia	3.20	2.04	5.01	<0.001	2.73	1.58	4.73	<0.001	0.92	0.78	1.10	0.373	0.82	0.68	1.00	0.050
Benin	1.28	0.98	1.67	0.073	0.90	0.66	1.22	0.487	0.99	0.85	1.15	0.856	1.04	0.89	1.22	0.616
Burundi	1.03	0.71	1.50	0.876	0.93	0.62	1.39	0.707	0.91	0.78	1.07	0.260	0.91	0.77	1.08	0.268
Cambodia	1.16	0.91	1.46	0.229	1.04	0.80	1.34	0.782	0.76	0.66	0.87	<0.001	0.74	0.65	0.85	<0.001
Cameroon	0.94	0.62	1.44	0.788	0.82	0.50	1.34	0.421	1.21	0.98	1.51	0.080	0.95	0.74	1.22	0.674
Chad	1.66	1.05	2.63	0.029	1.40	0.57	3.40	0.462	0.66	0.40	1.10	0.109	0.30	0.12	0.77	0.013
Ethiopia	1.36	0.78	2.39	0.283	1.35	0.76	2.41	0.309	0.92	0.68	1.26	0.608	0.92	0.67	1.28	0.624
Gambia	1.00	0.49	2.01	0.995	0.76	0.60	0.97	0.025	0.74	0.55	0.98	0.034	0.71	0.52	0.96	0.029
Ghana	0.82	0.57	1.18	0.290	0.84	0.55	1.29	0.421	1.06	0.83	1.35	0.632	1.07	0.82	1.41	0.608
Guatemala	1.09	0.80	1.49	0.582	0.86	0.72	1.02	0.082	0.78	0.67	0.92	0.003	0.81	0.68	0.96	0.014
Guinea	1.13	0.71	1.78	0.606	1.09	0.66	1.80	0.727	1.21	0.91	1.61	0.189	1.17	0.86	1.58	0.323
Haiti	1.26	0.98	1.62	0.071	1.16	0.88	1.52	0.294	0.87	0.71	1.06	0.175	0.81	0.65	1.02	0.072
Kenya	1.24	0.85	1.82	0.260	1.10	0.72	1.67	0.662	0.93	0.66	1.32	0.698	0.89	0.61	1.30	0.549
Lesotho	0.58	0.27	1.26	0.168	0.65	0.29	1.48	0.309	1.01	0.70	1.46	0.973	0.95	0.64	1.40	0.784
Liberia	0.71	0.42	1.18	0.182	0.83	0.47	1.49	0.537	1.00	0.75	1.34	0.986	0.94	0.70	1.26	0.654
Malawi	1.48	0.95	2.31	0.084	1.40	0.90	2.19	0.134	1.34	1.10	1.63	0.004	1.27	1.02	1.58	0.032
Mali	1.48	1.09	2.01	0.012	0.92	0.43	2.01	0.841	1.91	1.30	2.83	0.001	1.77	1.14	2.75	0.012
Myanmar	1.07	0.78	1.45	0.683	1.03	0.74	1.43	0.859	0.81	0.63	1.04	0.094	0.77	0.60	1.00	0.048
Nepal	1.05	0.84	1.31	0.690	1.01	0.80	1.29	0.919	1.12	0.96	1.32	0.155	0.95	0.73	1.25	0.731
Nigeria	0.99	0.72	1.36	0.944	0.84	0.73	0.97	0.019	0.88	0.76	1.01	0.060	0.81	0.69	0.94	0.006
Pakistan	1.15	0.99	1.34	0.075	0.84	0.52	1.36	0.471	1.23	1.05	1.44	0.011	0.94	0.79	1.13	0.523
Papua New Guinea	1.19	0.63	2.25	0.590	0.91	0.56	1.48	0.691	0.90	0.48	1.66	0.728	0.75	0.45	1.26	0.280
Rwanda	1.27	0.95	1.69	0.110	0.94	0.67	1.31	0.698	0.98	0.82	1.18	0.818	1.01	0.84	1.22	0.883
Sierra Leone	1.66	1.13	2.43	0.010	1.67	1.13	2.49	0.011	0.82	0.62	1.10	0.188	0.74	0.56	0.97	0.030

Country	Woman-alone household decision-making								Joint household decision-making							
	Unadjusted				Adjusted				Unadjusted				Adjusted			
	OR	95% CI		p-value	OR	95% CI		p-value	OR	95% CI		p-value	OR	95% CI		p-value
Timor-Leste	0.46	0.25	0.84	0.012	0.52	0.30	0.89	0.019	0.42	0.23	0.74	0.003	0.45	0.27	0.76	0.003
Uganda	1.22	1.04	1.43	0.016	0.92	0.68	1.24	0.560	0.99	0.85	1.15	0.856	0.84	0.72	0.99	0.036
Zambia	1.57	0.93	2.65	0.091	1.33	0.75	2.36	0.333	0.52	0.37	0.72	<0.001	0.53	0.39	0.74	<0.001
Zimbabwe	0.84	0.56	1.27	0.419	0.80	0.51	1.25	0.327	0.73	0.56	0.95	0.022	0.73	0.55	0.96	0.026

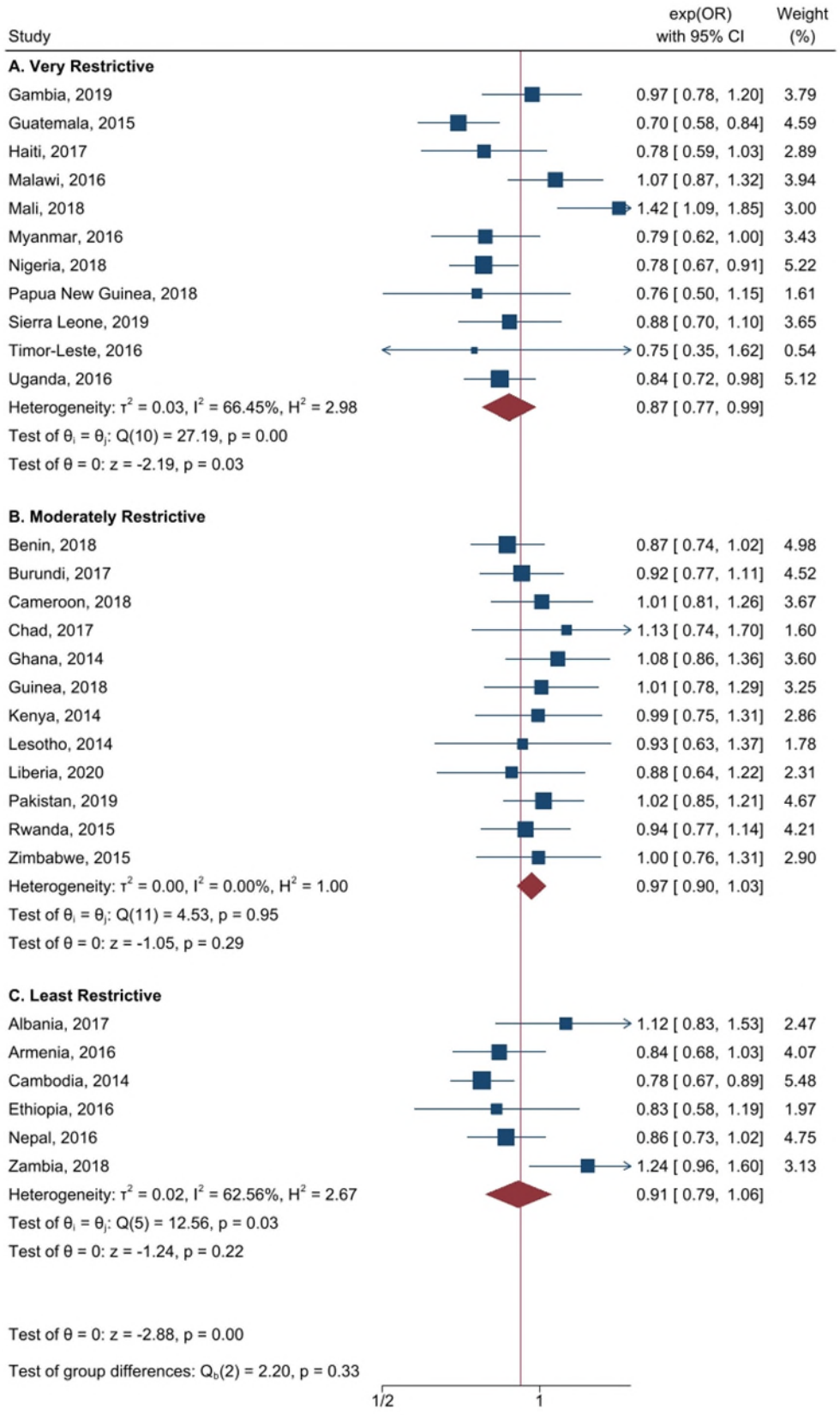
Subgroup analysis

By abortion policy

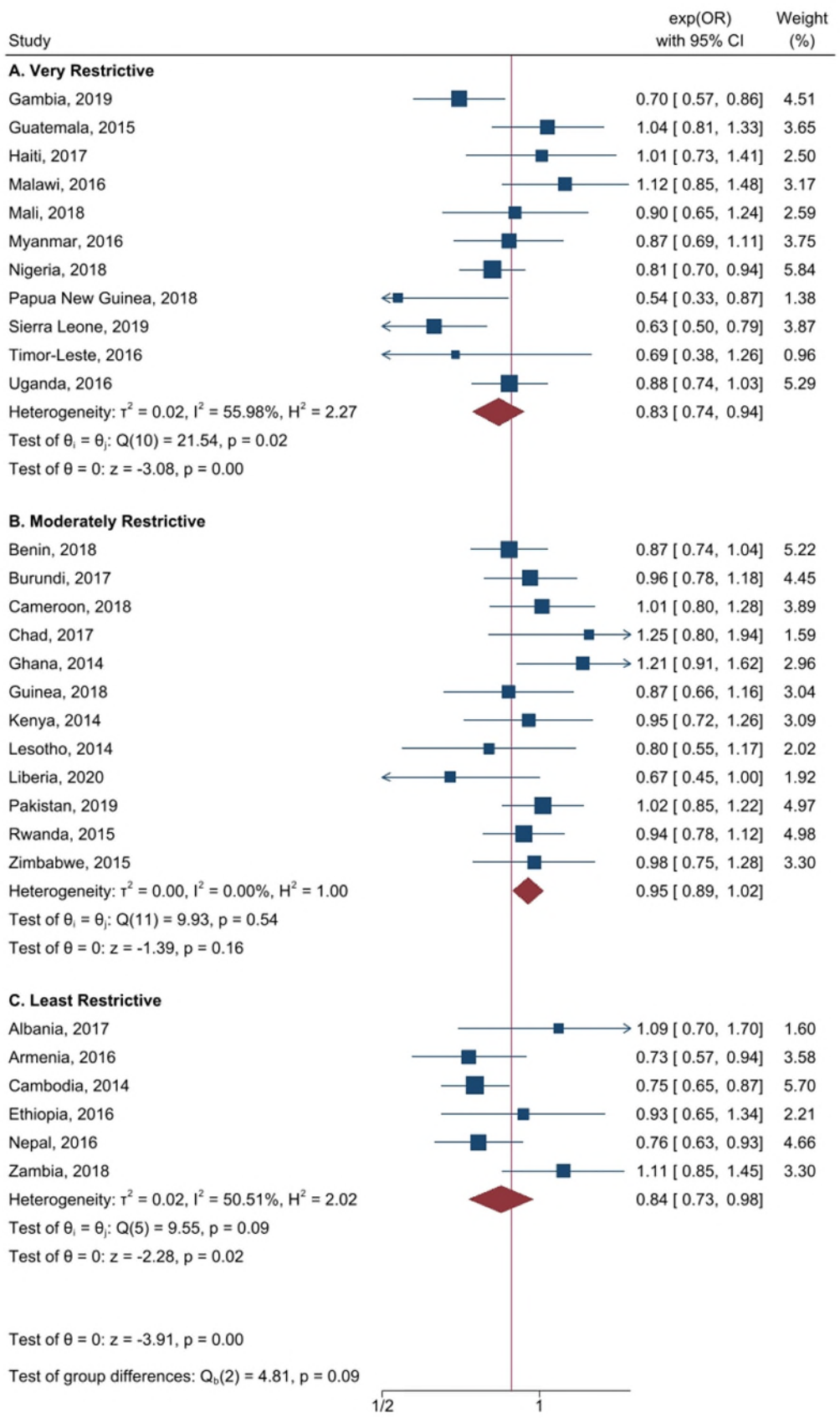
D. 2: Subgroup analysis by abortion laws on the association between woman-alone empowerment index and abortion in 29 LMICs



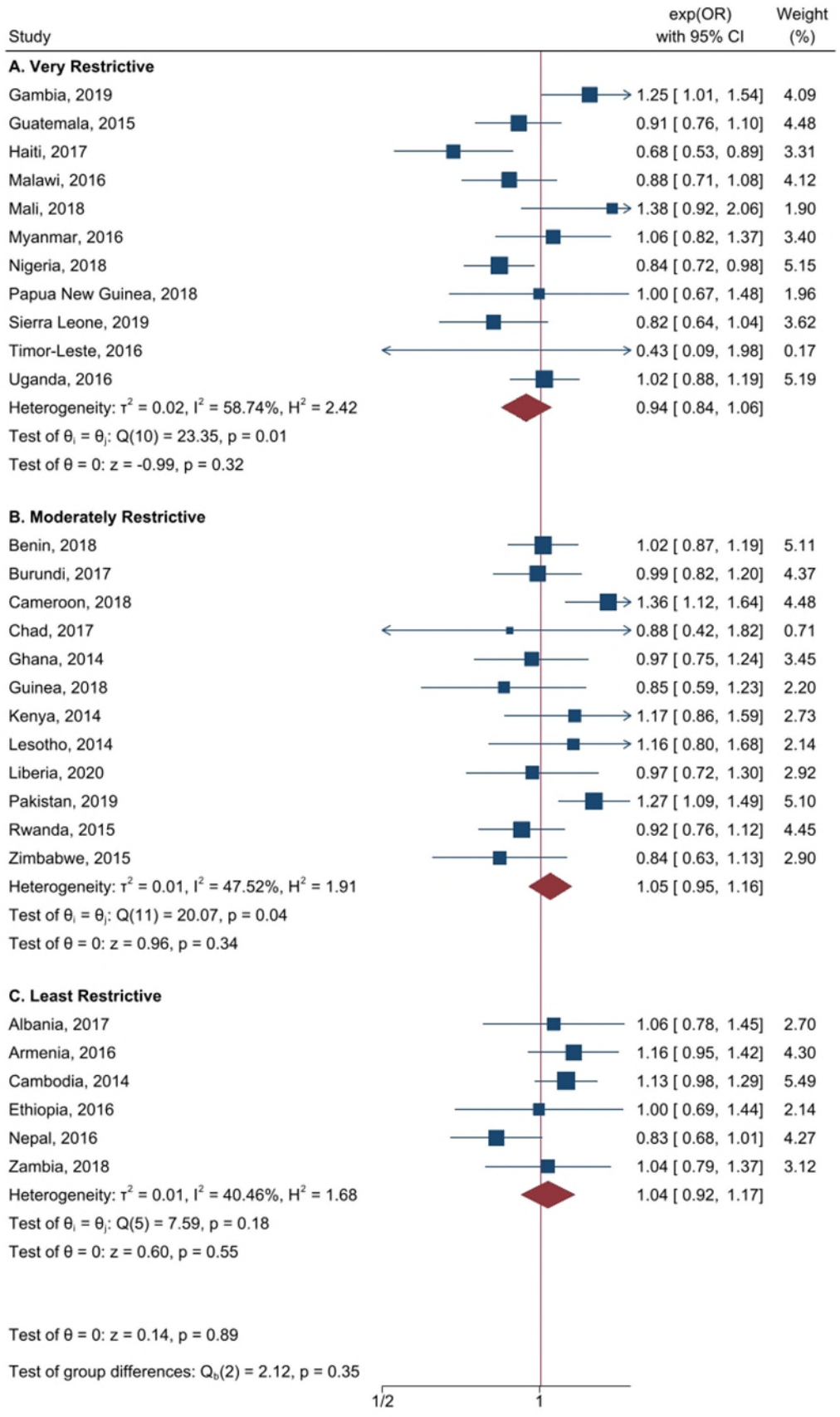
D. 3: Subgroup analysis by abortion laws on the association between joint empowerment index and abortion in 30 LMICs



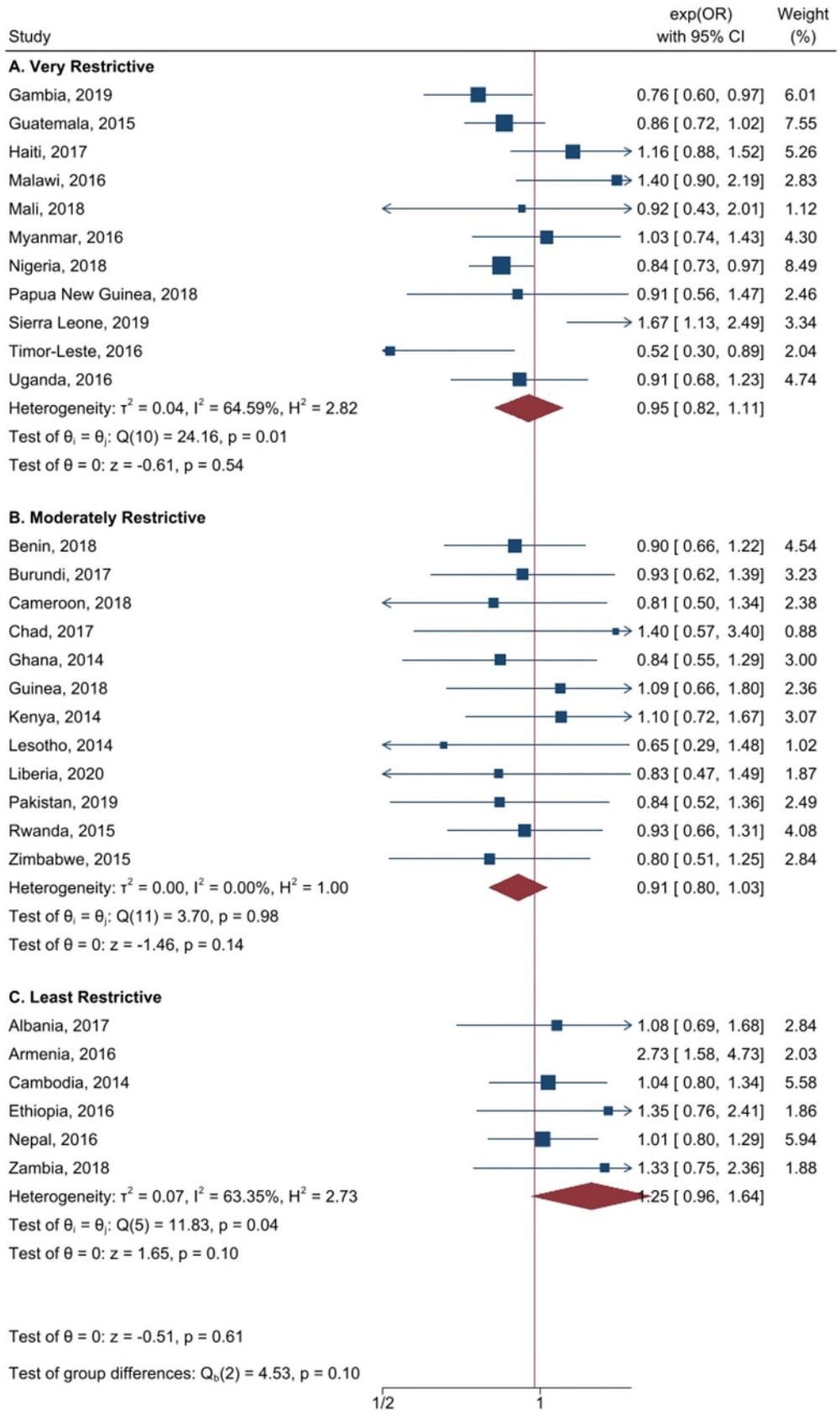
D. 4: Subgroup analysis by abortion laws on the association between the domain women's attitudes towards domestic violence and abortion in 29 LMICs



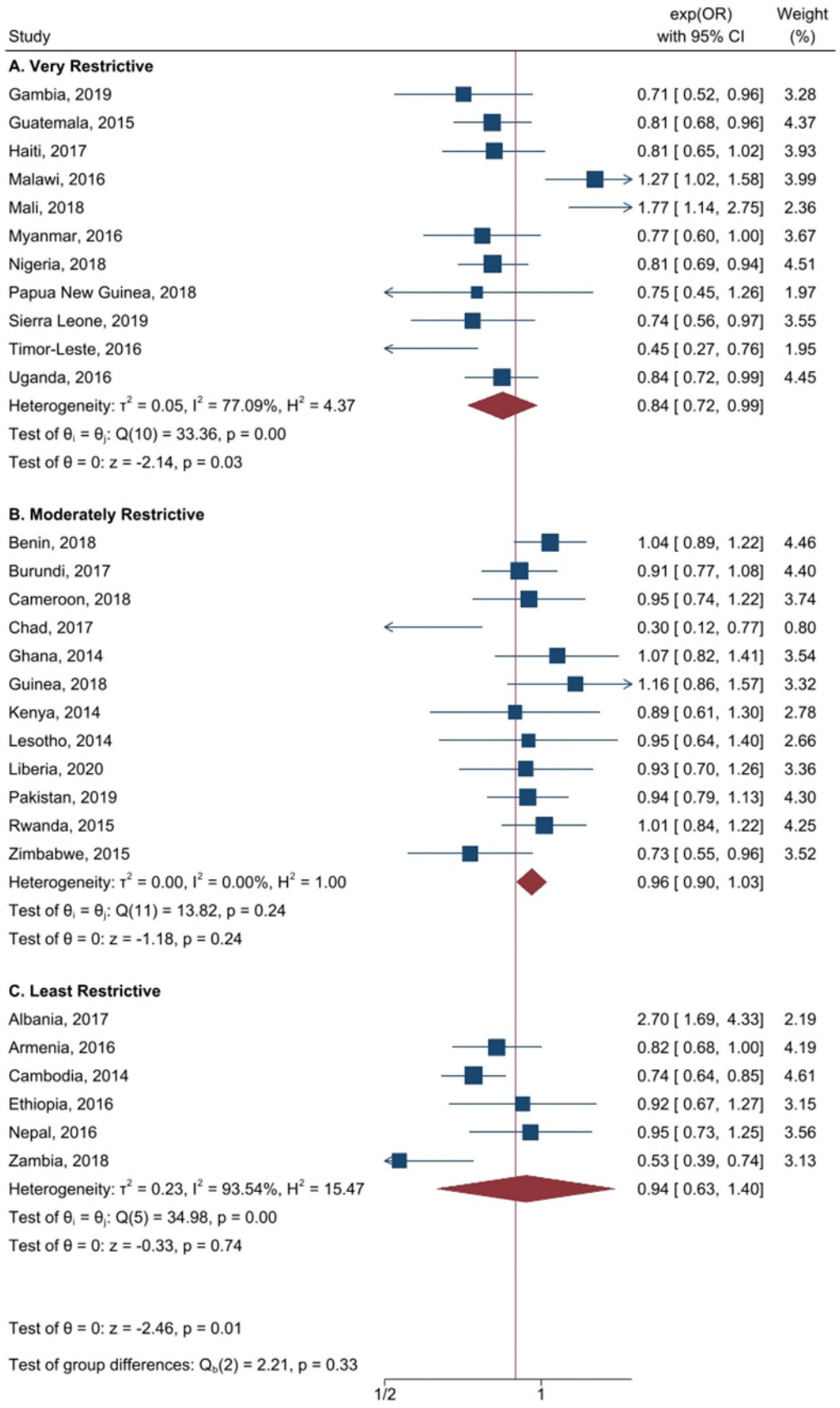
D. 5: Subgroup analysis by abortion laws on the association between the domain women's reproductive health decision-making and abortion in 29 LMICs



D. 6: Subgroup analysis by abortion laws on the association between the domain woman-alone household decision-making and abortion in 29 LMICs

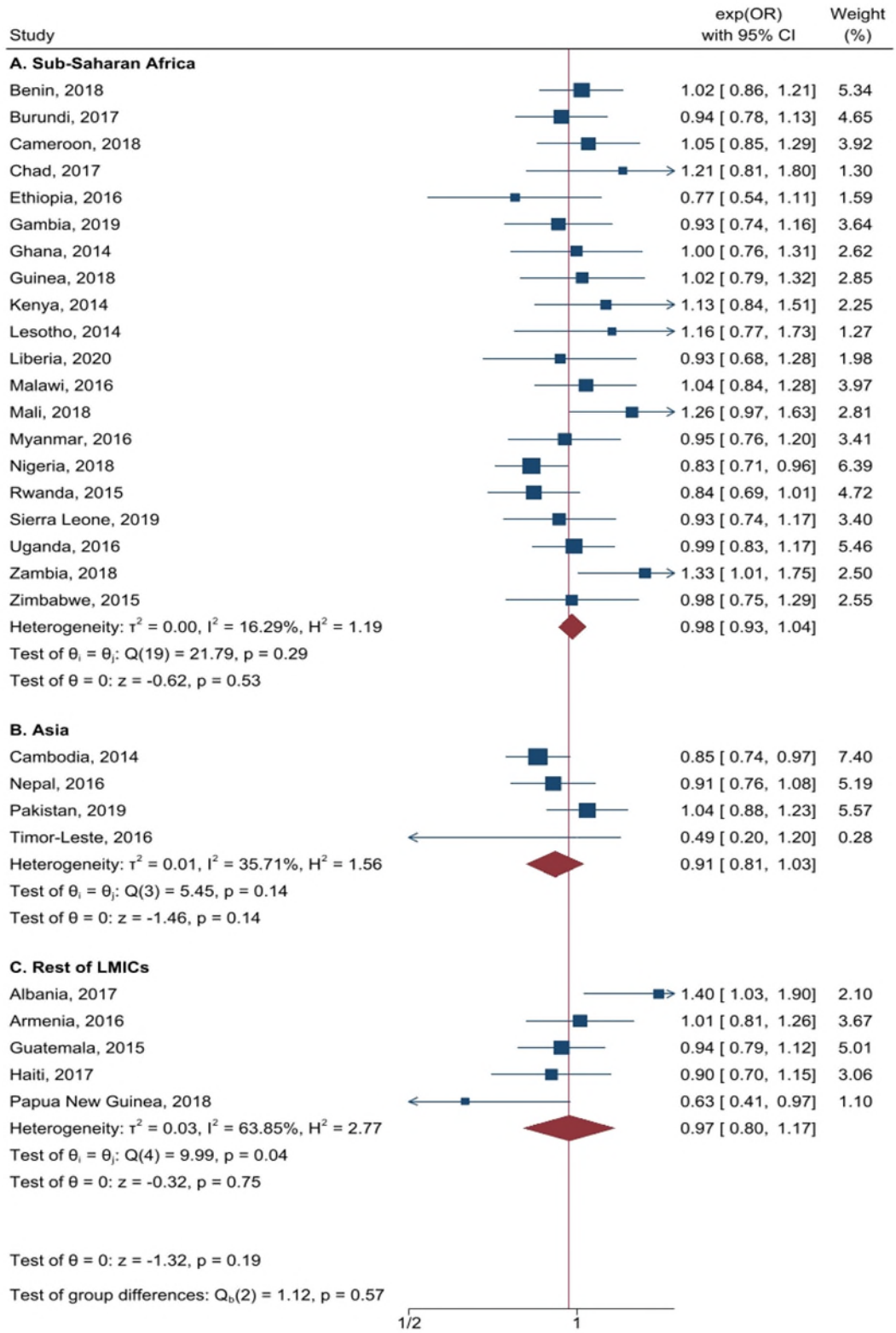


D. 7: Subgroup analysis by abortion laws on the association between the domain joint household decision-making and modern contraceptive use in 29 LMICs

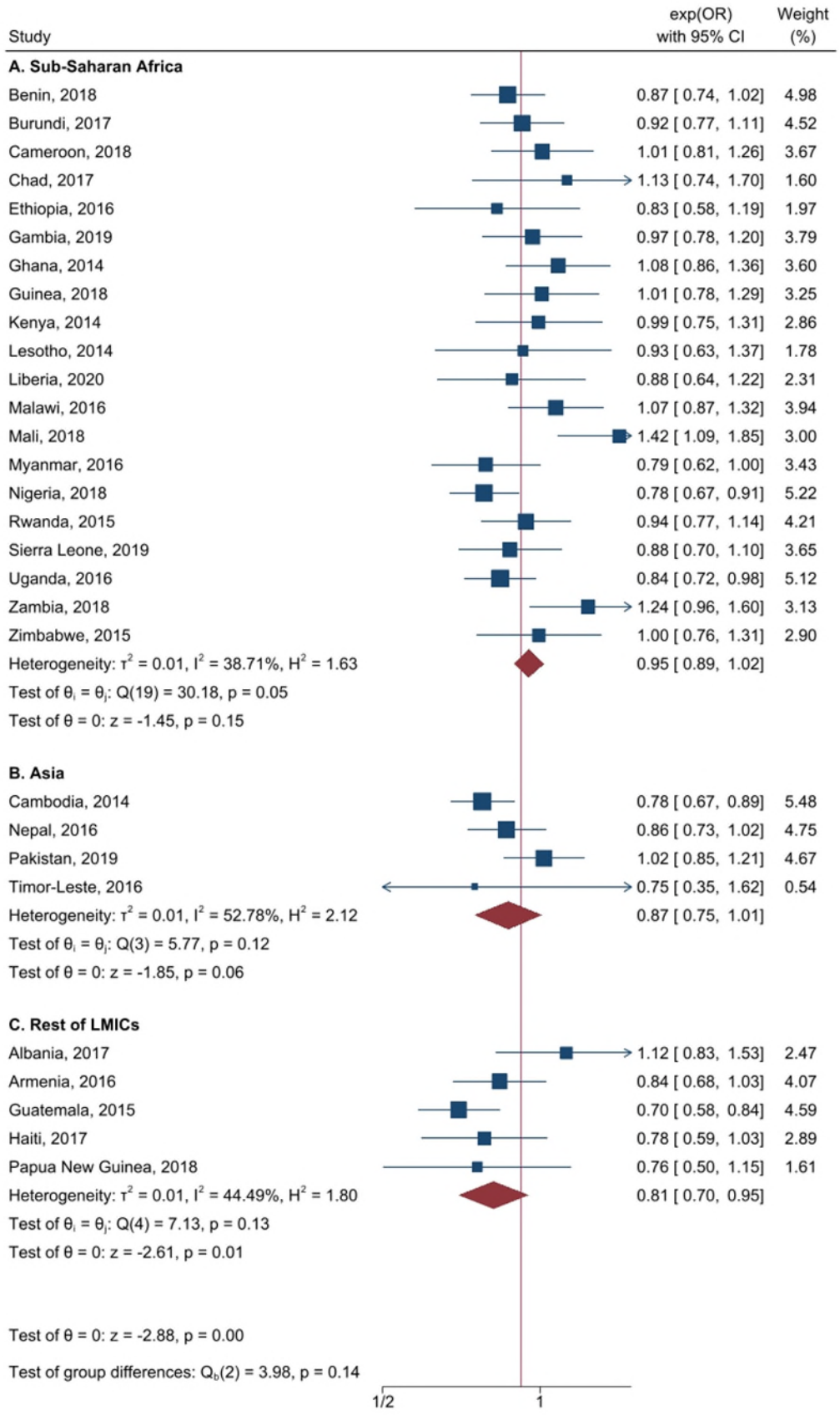


By region

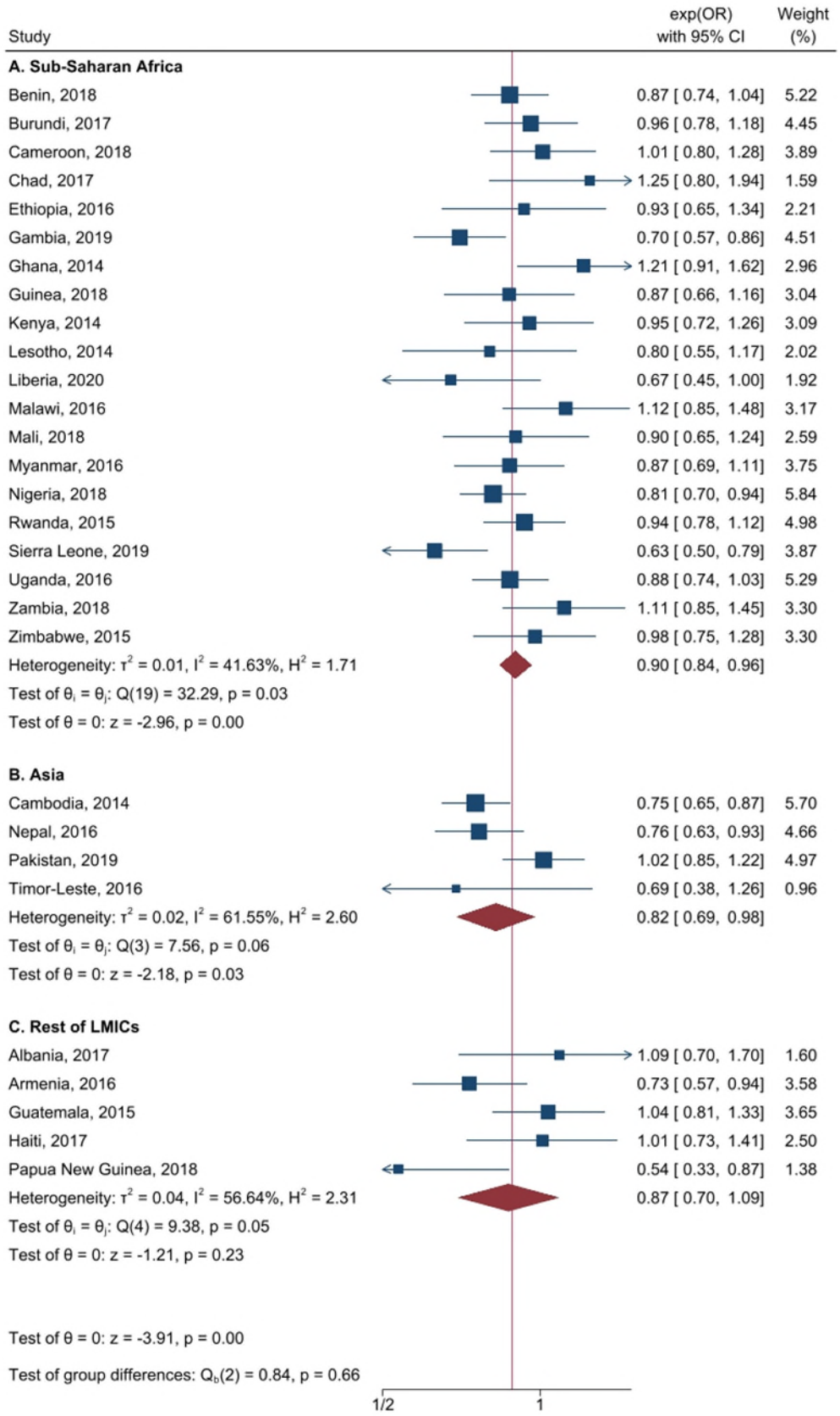
D. 8: Subgroup analysis by geographical regions on the association between woman-alone empowerment index and abortion in 29 LMICs



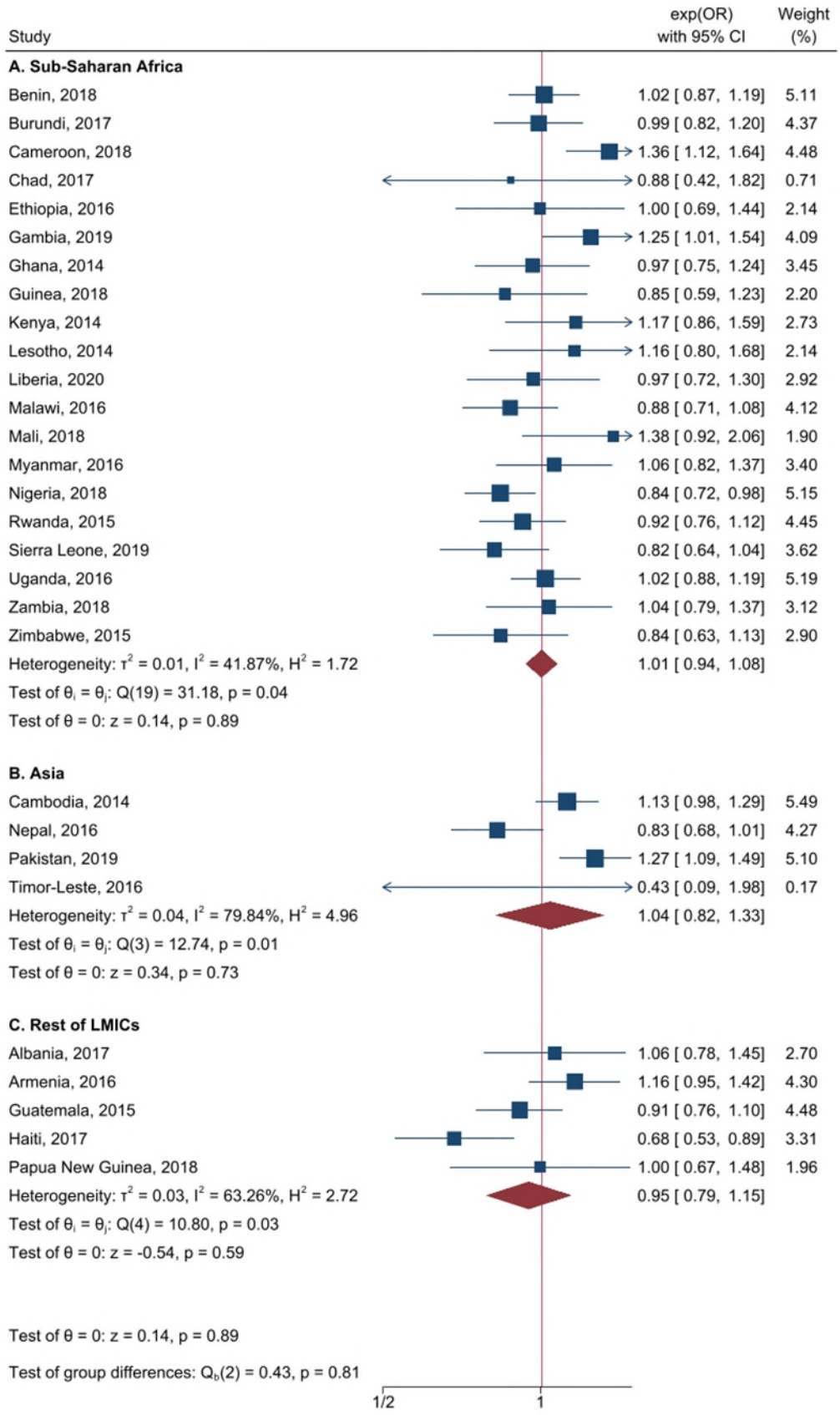
D. 9: Subgroup analysis by geographical regions on the association between joint empowerment index and abortion in 29 LMICs



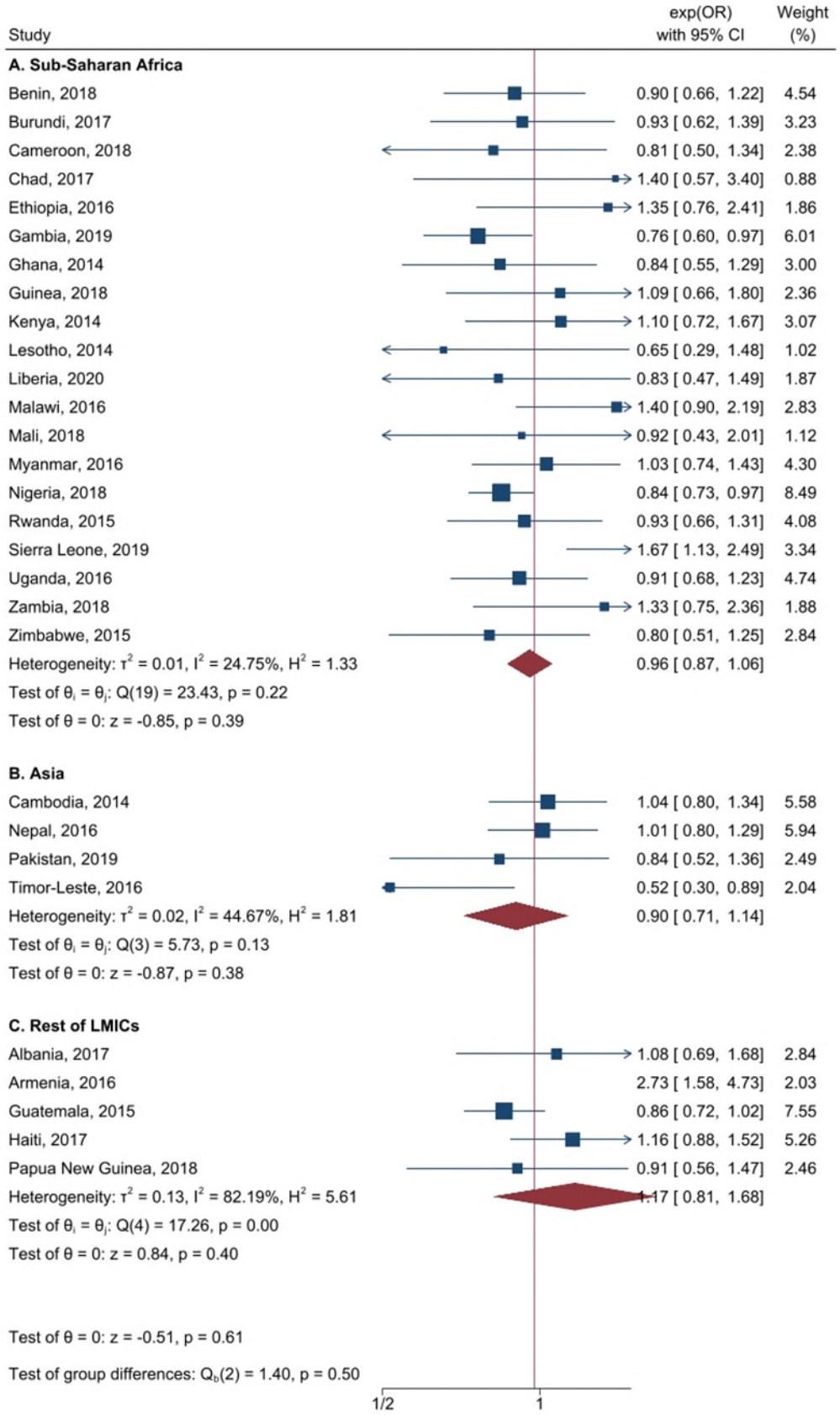
D. 10: Subgroup analysis by geographical regions on the association between the domain women's attitudes towards domestic violence and abortion in 29 LMICs



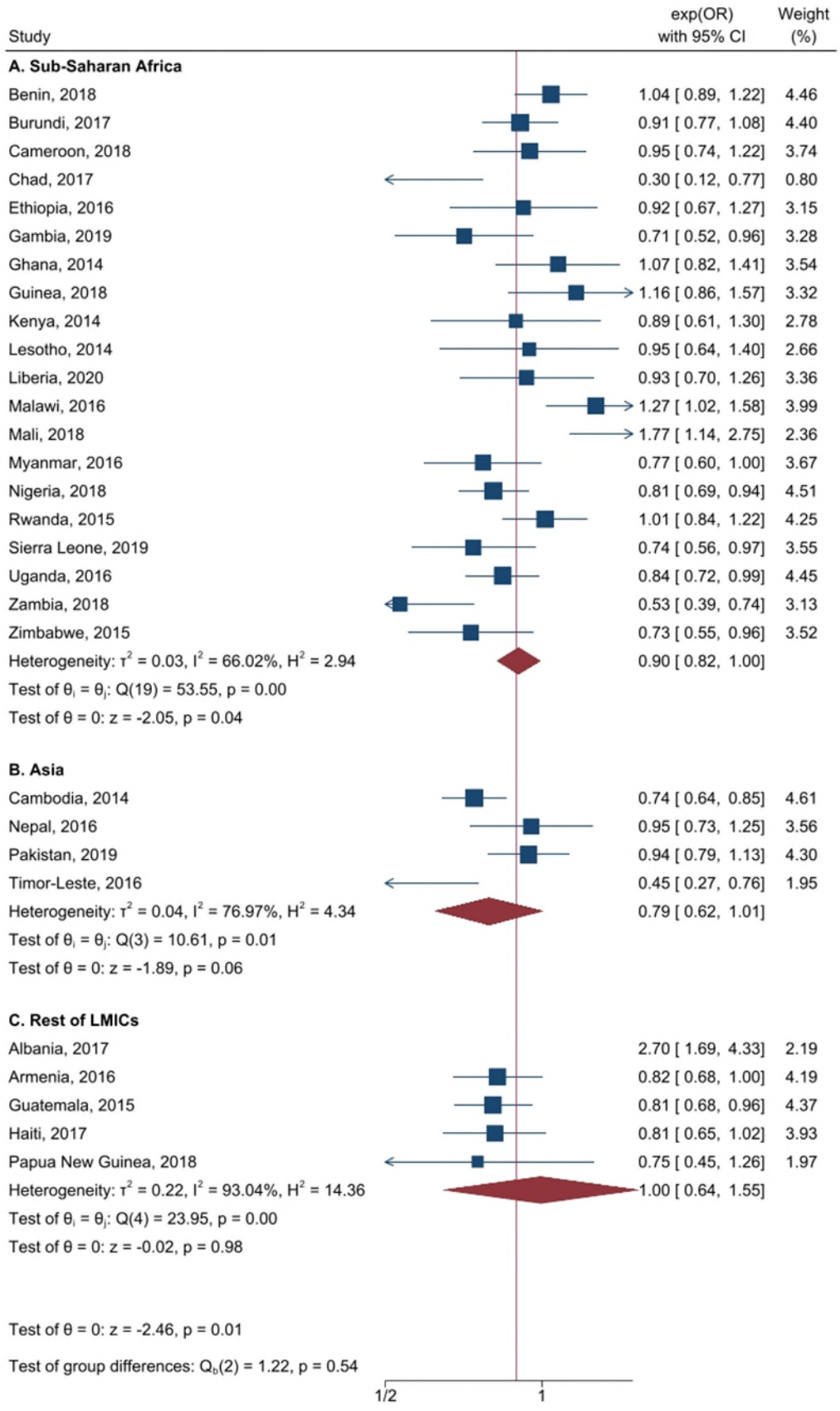
D. 11: Subgroup analysis by geographical regions on the association between the domain women's reproductive health decision-making and abortion in 29 LMICs



D. 12: Subgroup analysis by geographical regions on the association between woman-alone household decision-making and abortion in 29 LMICs

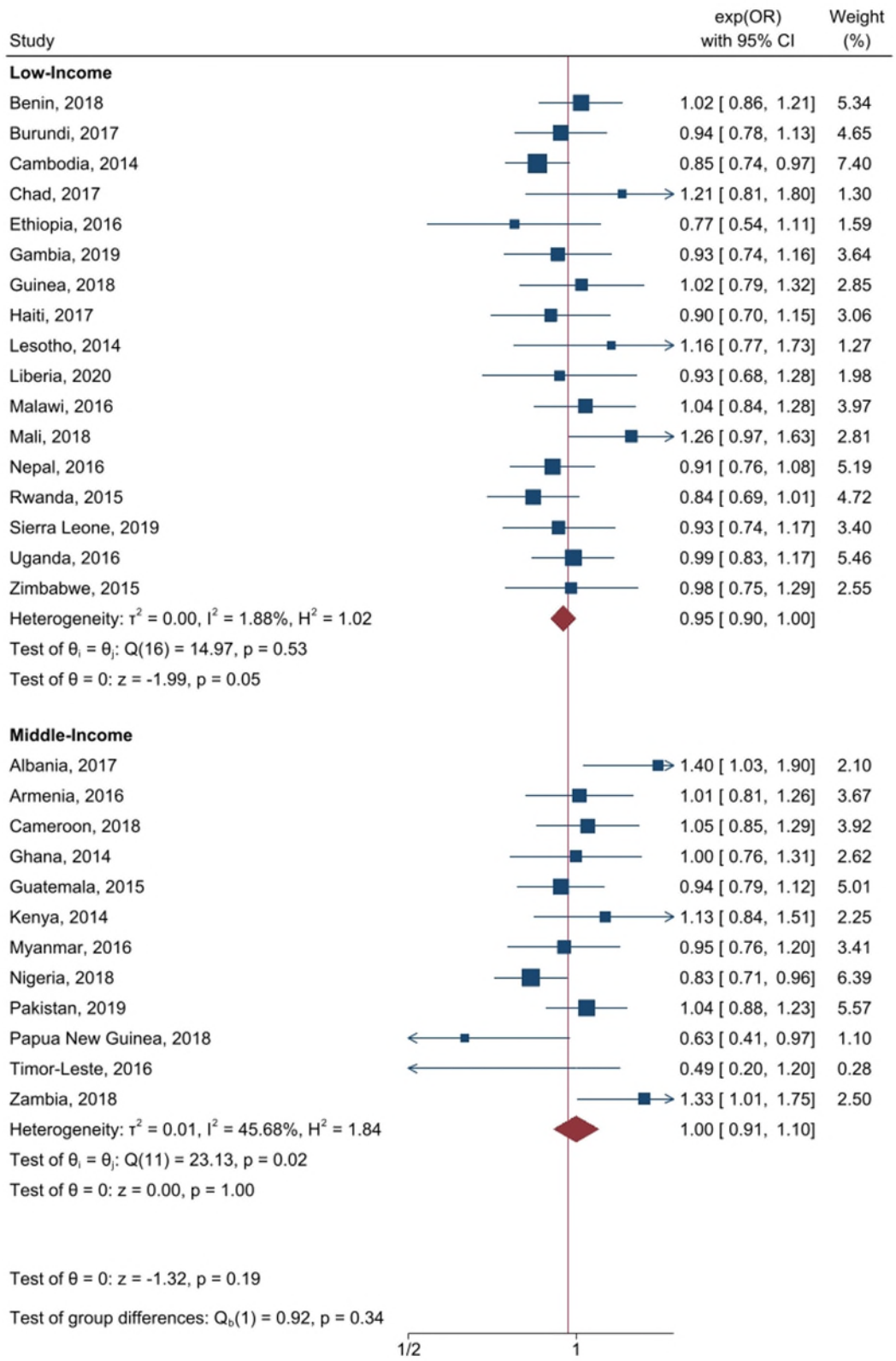


D. 13: Subgroup analysis by geographical regions on the association between the domain joint household decision-making domain two and modern contraceptive use in 29 LMICs

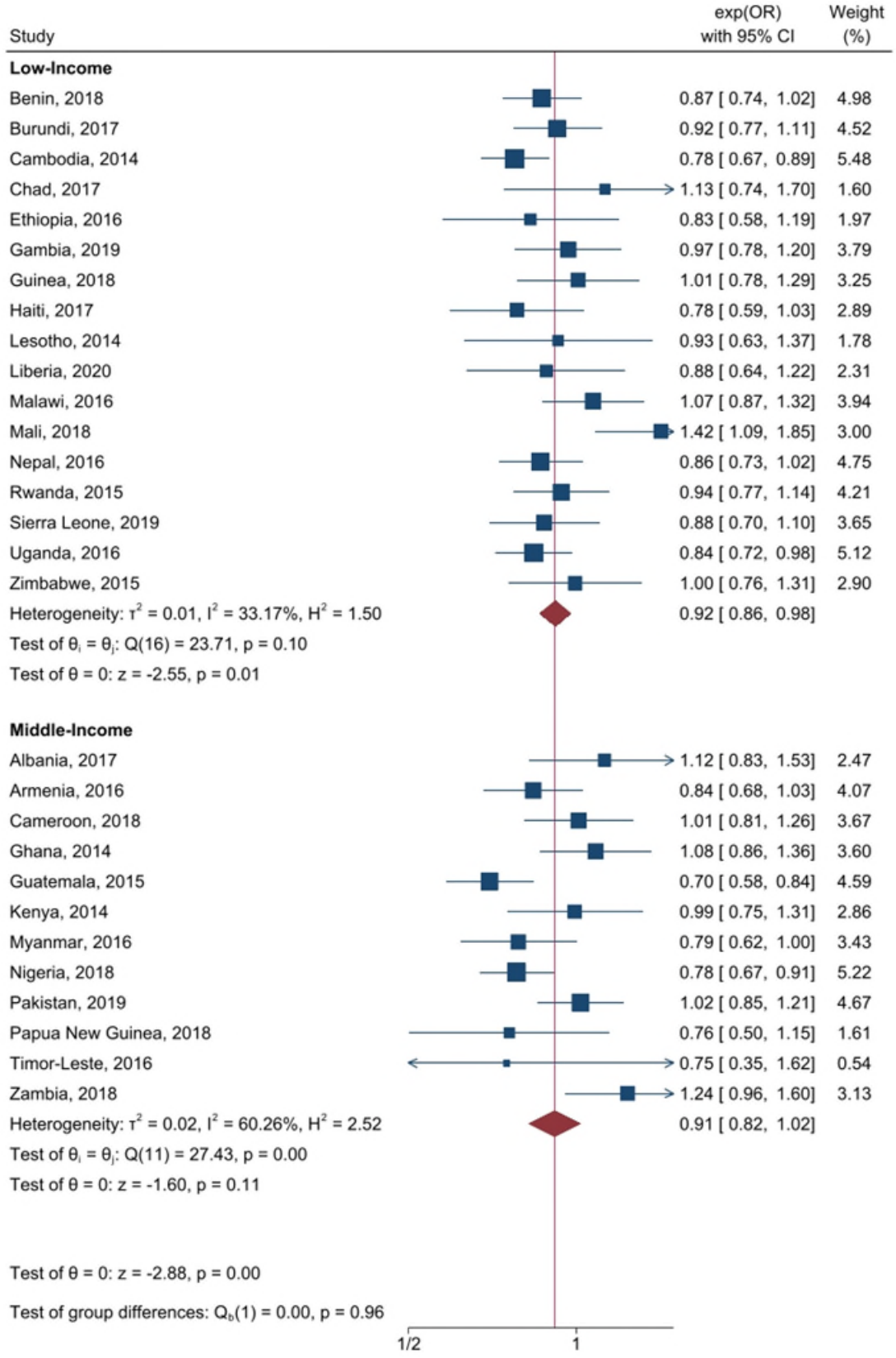


By socioeconomic status

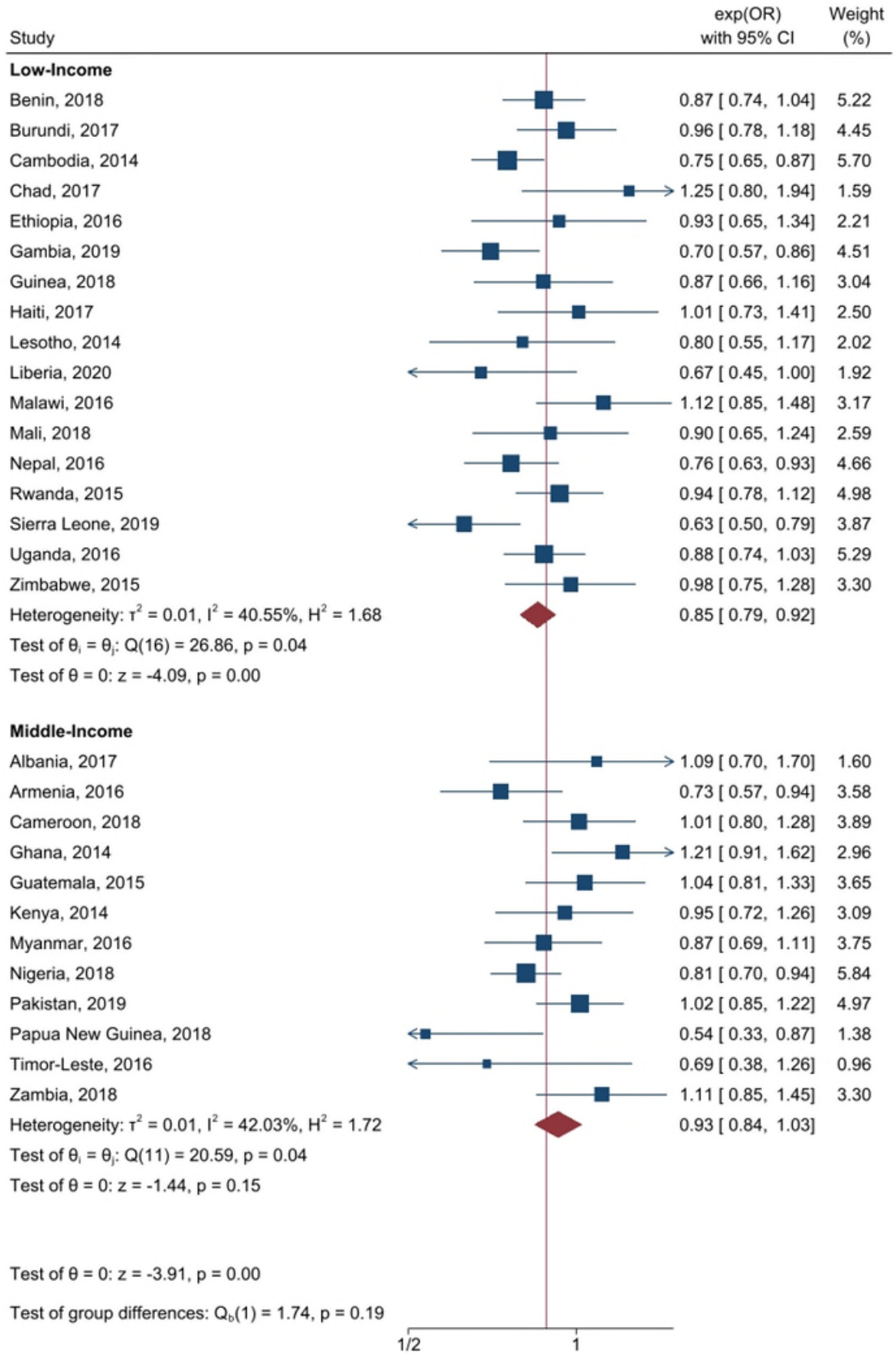
D. 14: Subgroup analysis by socioeconomic status on the association between woman-alone empowerment index and abortion in 29 LMICs



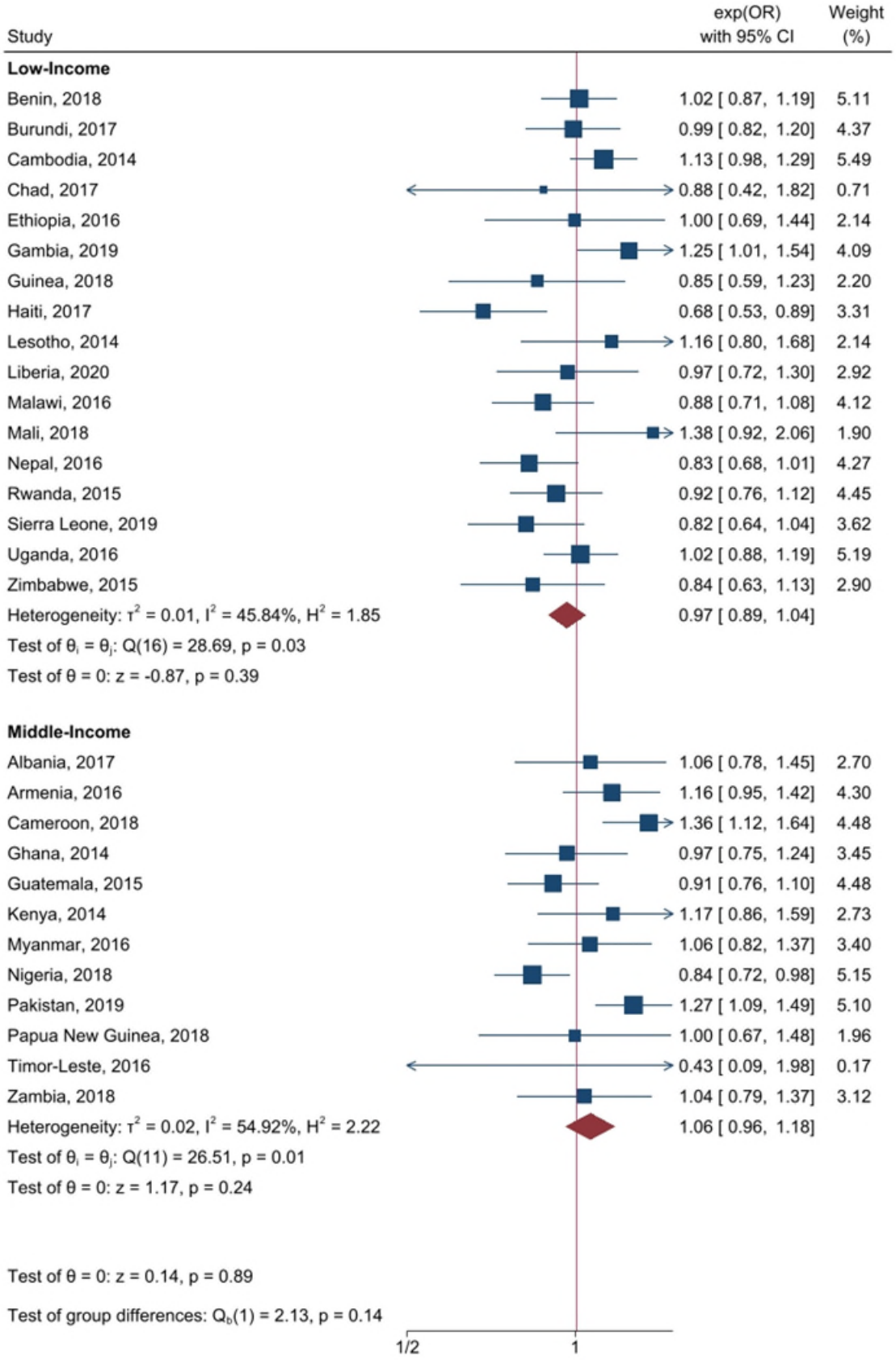
D. 15: Subgroup analysis by socioeconomic status on the association between joint empowerment index and abortion in 29 LMICs



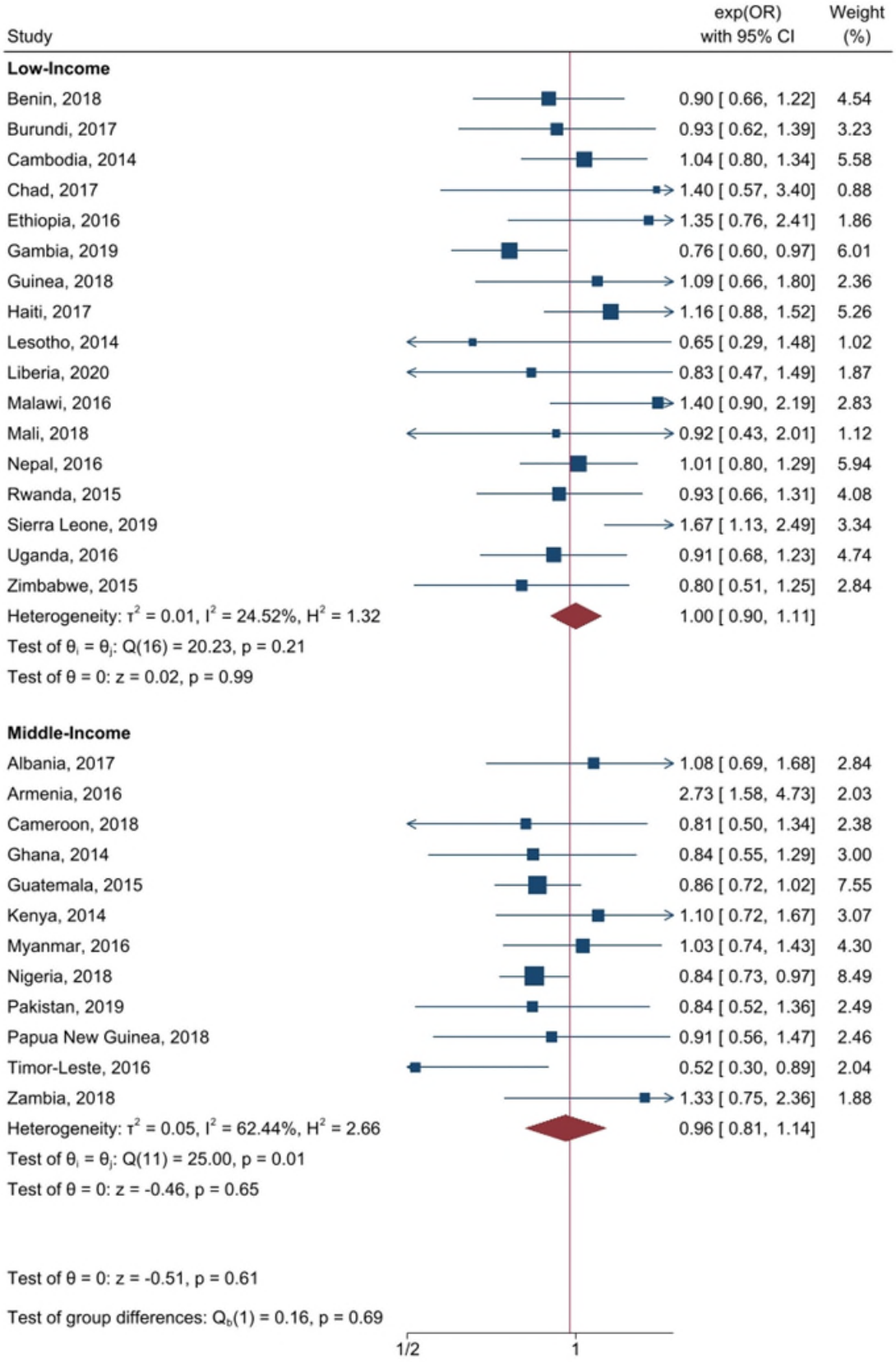
D. 16: Subgroup analysis by socioeconomic status on the association between the domain women's attitudes towards domestic violence and abortion in 29 LMICs



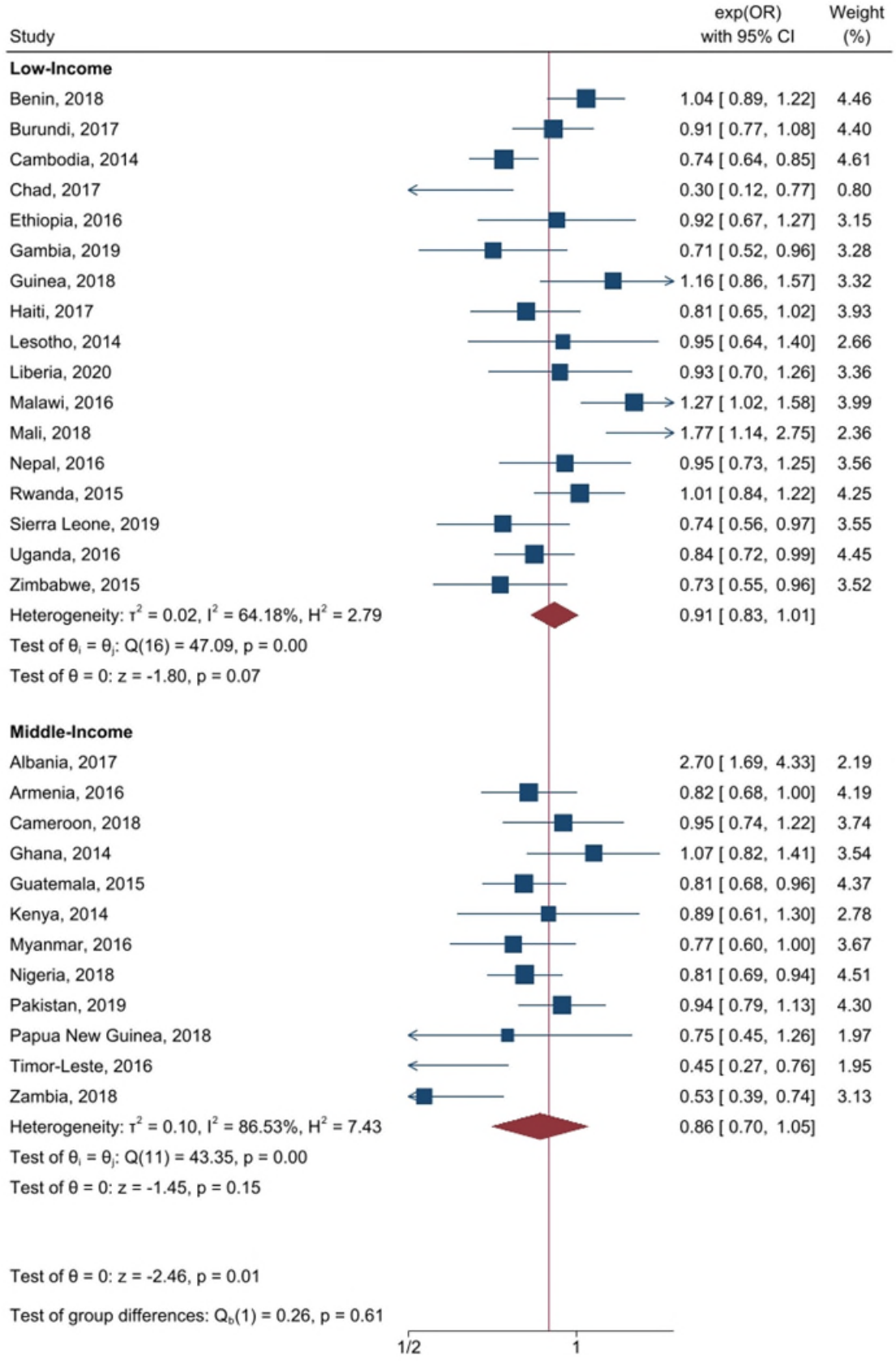
D. 17: Subgroup analysis by socioeconomic status on the association between the domain women's reproductive health decision-making and abortion in 29 LMICs



D. 18: Subgroup analysis by socioeconomic status on the association between the domain woman-alone household decision-making and abortion in 29 LMICs

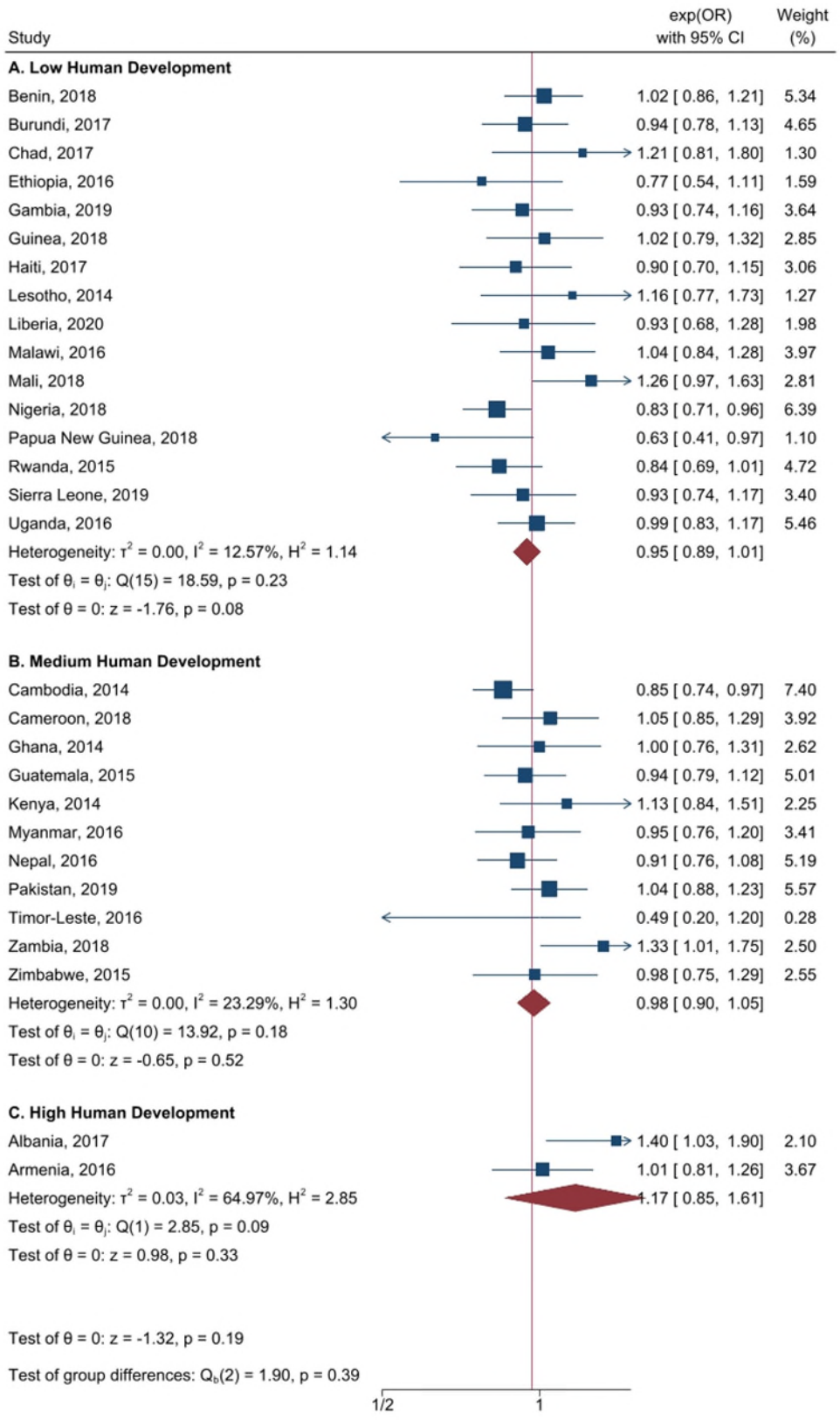


D. 19: Subgroup analysis by socioeconomic status on the association between the domain joint household decision-making and abortion in 29 LMICs

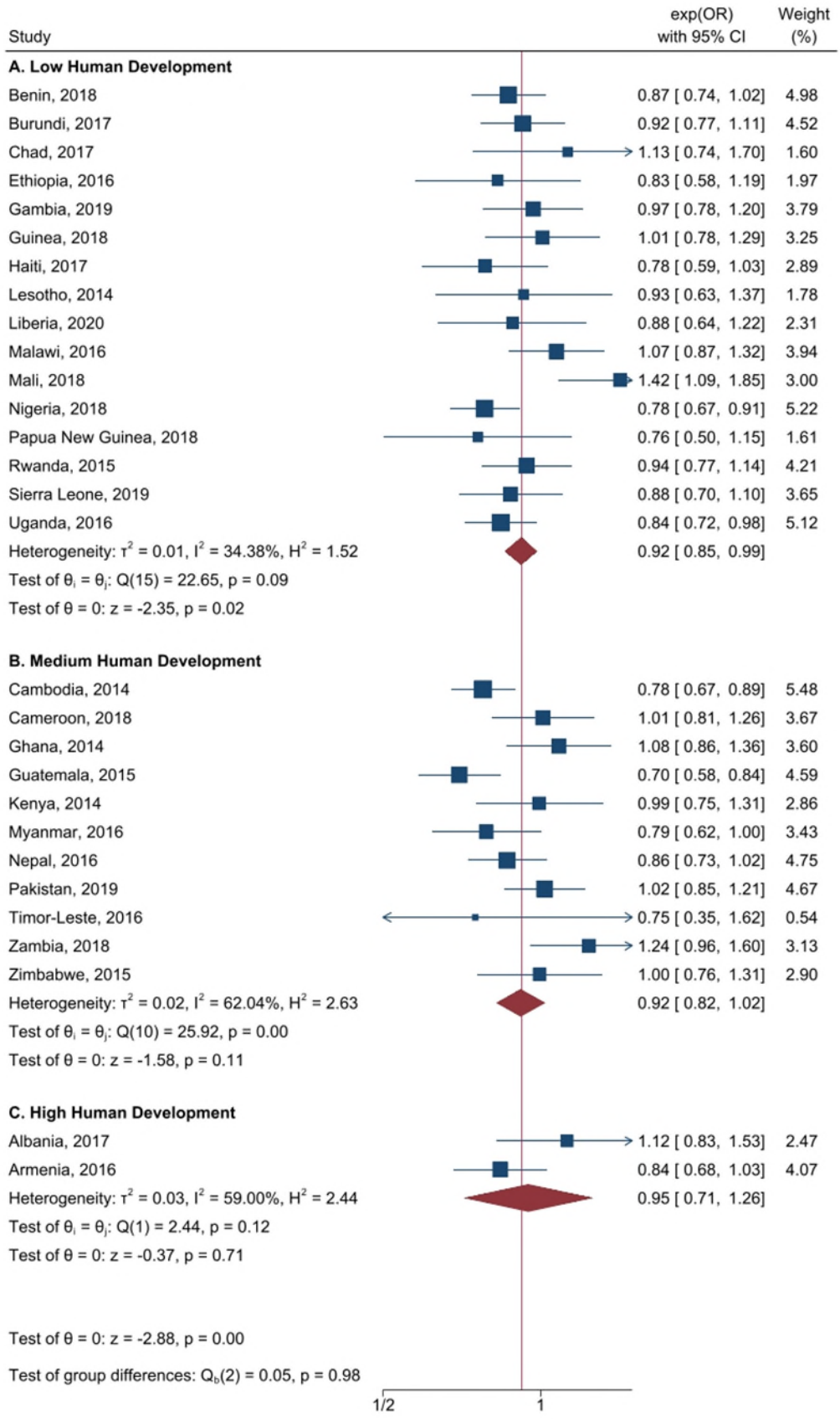


By HDI

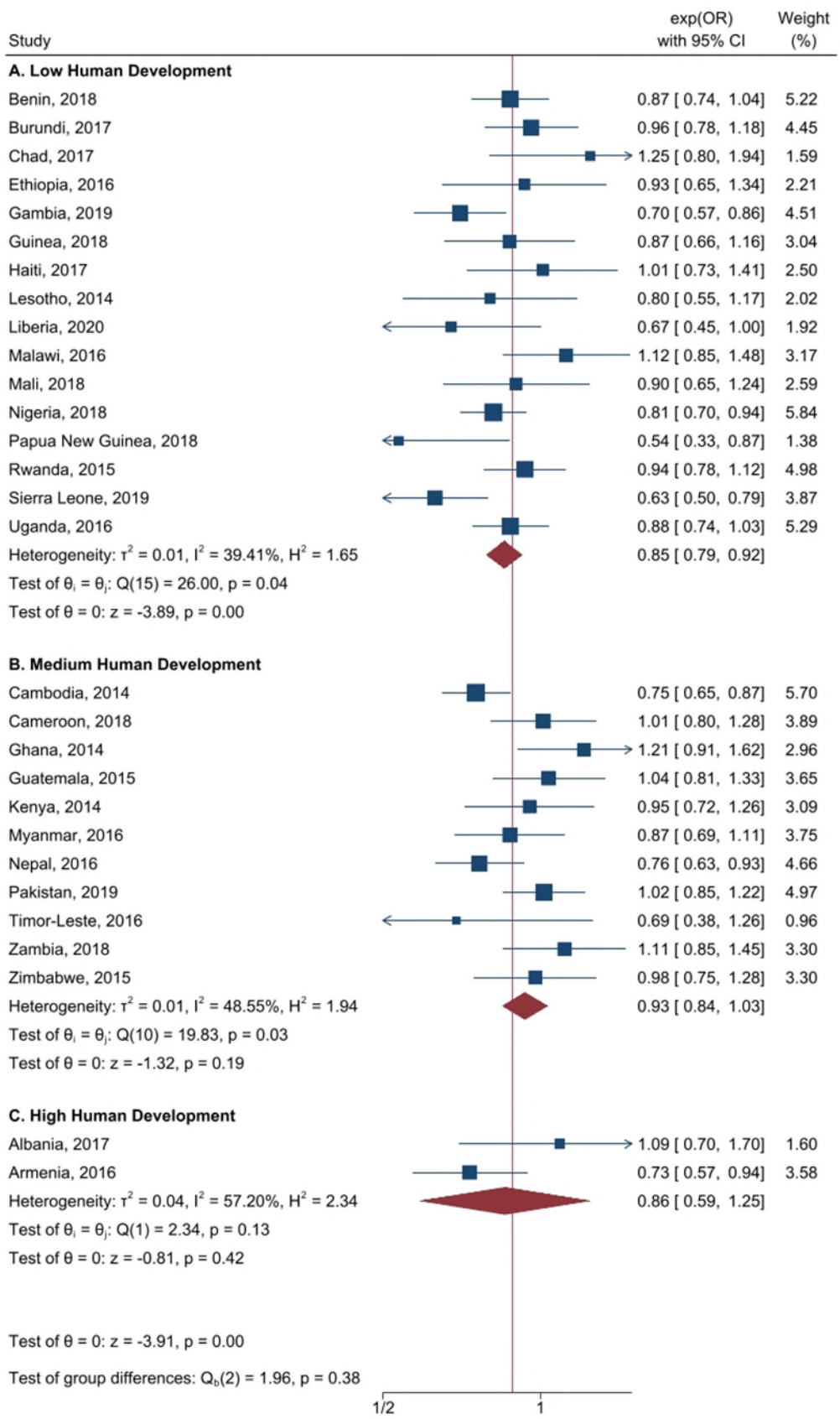
D. 20: Subgroup analysis by HDI on the association between woman-alone empowerment index and abortion in 29 LMICs



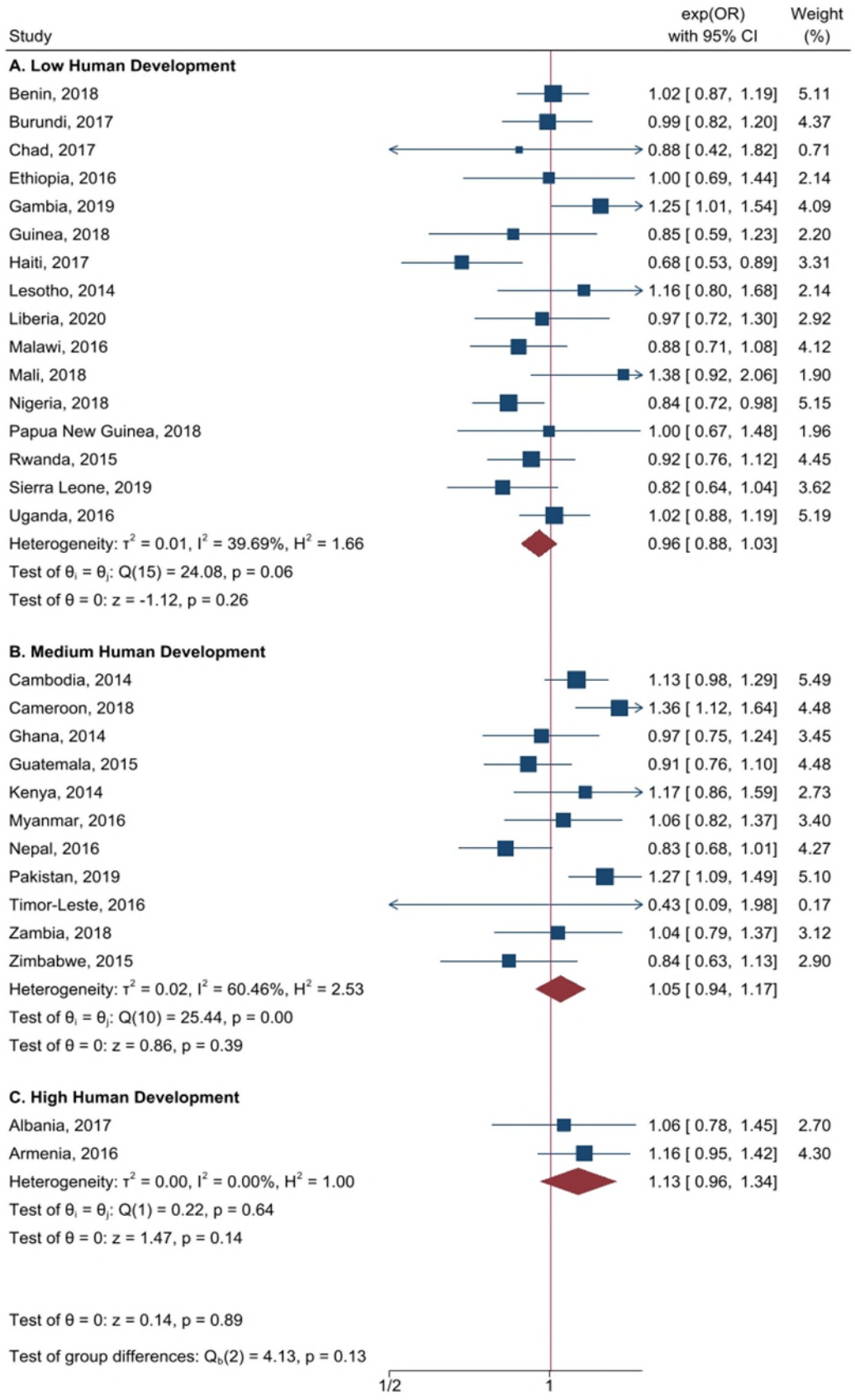
D. 21: Subgroup analysis by HDI on the association between joint empowerment index and abortion in 29 LMICs



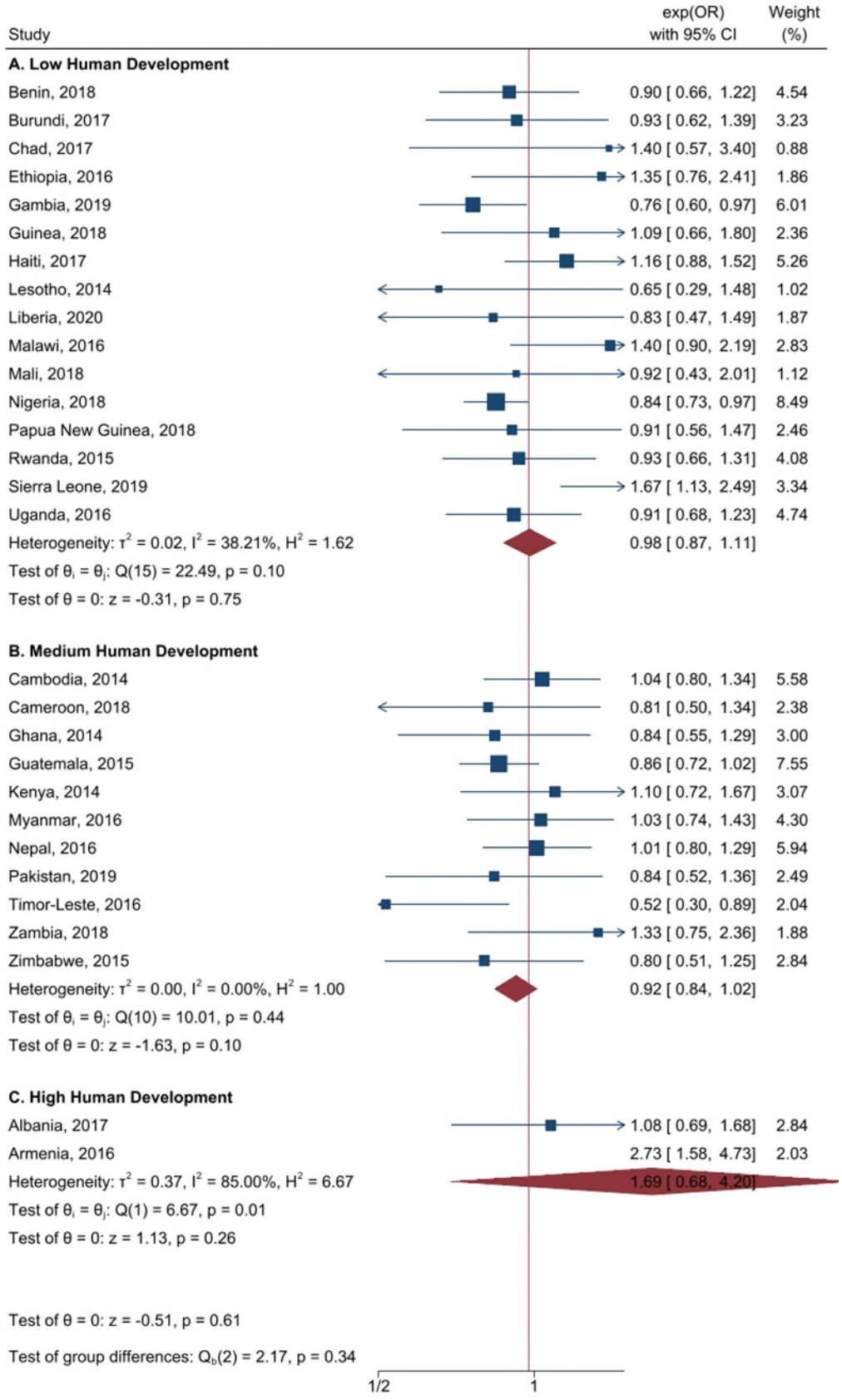
D. 22: Subgroup analysis by HDI on the association between the domain women's attitudes towards domestic violence and abortion in 29 LMICs



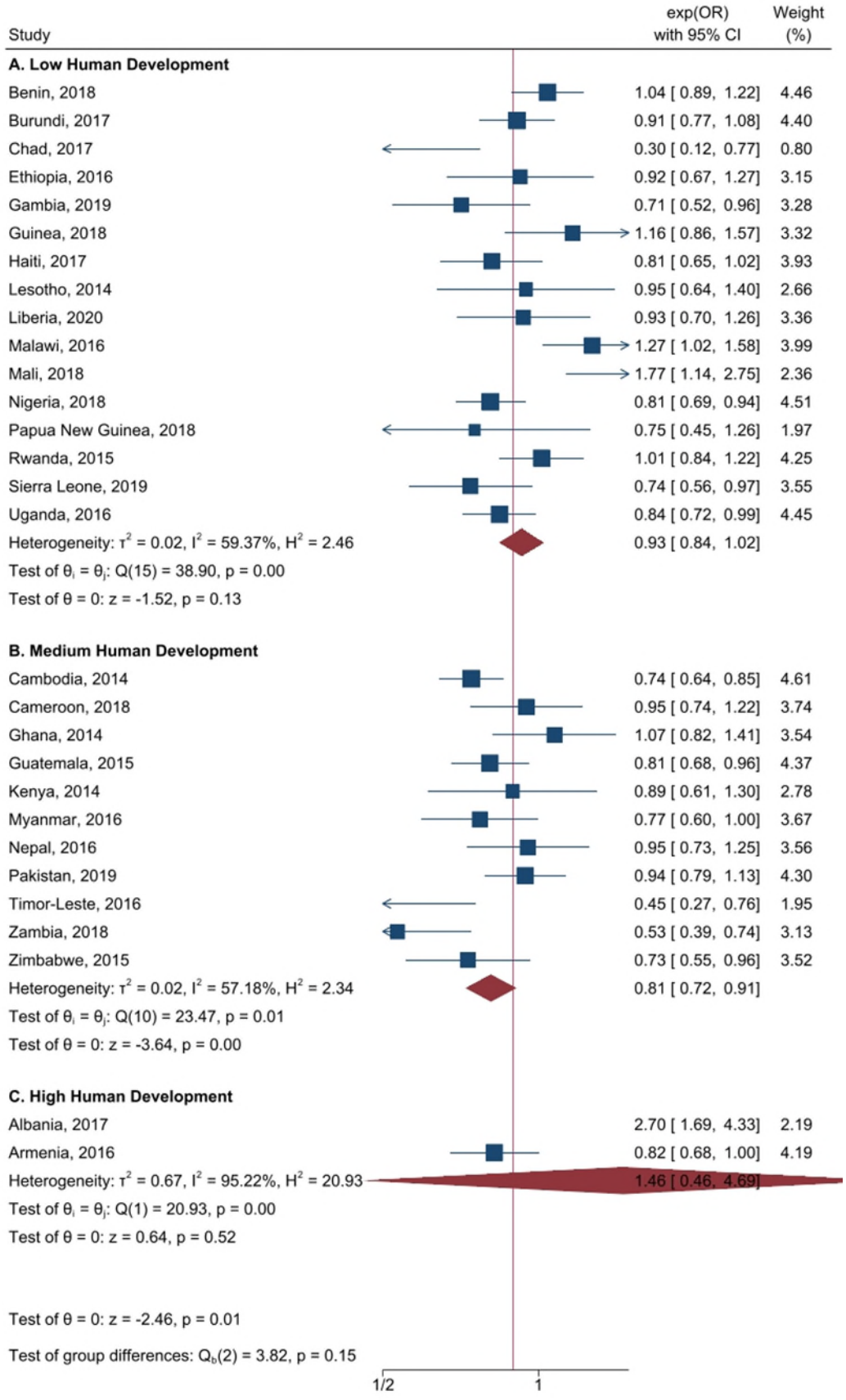
D. 23: Subgroup analysis by HDI on the association between the domain women's reproductive health decision-making and abortion in 29 LMICs



D. 24: Subgroup analysis by HDI on the association between the domain woman-alone household decision-making and abortion in 29 LMICs

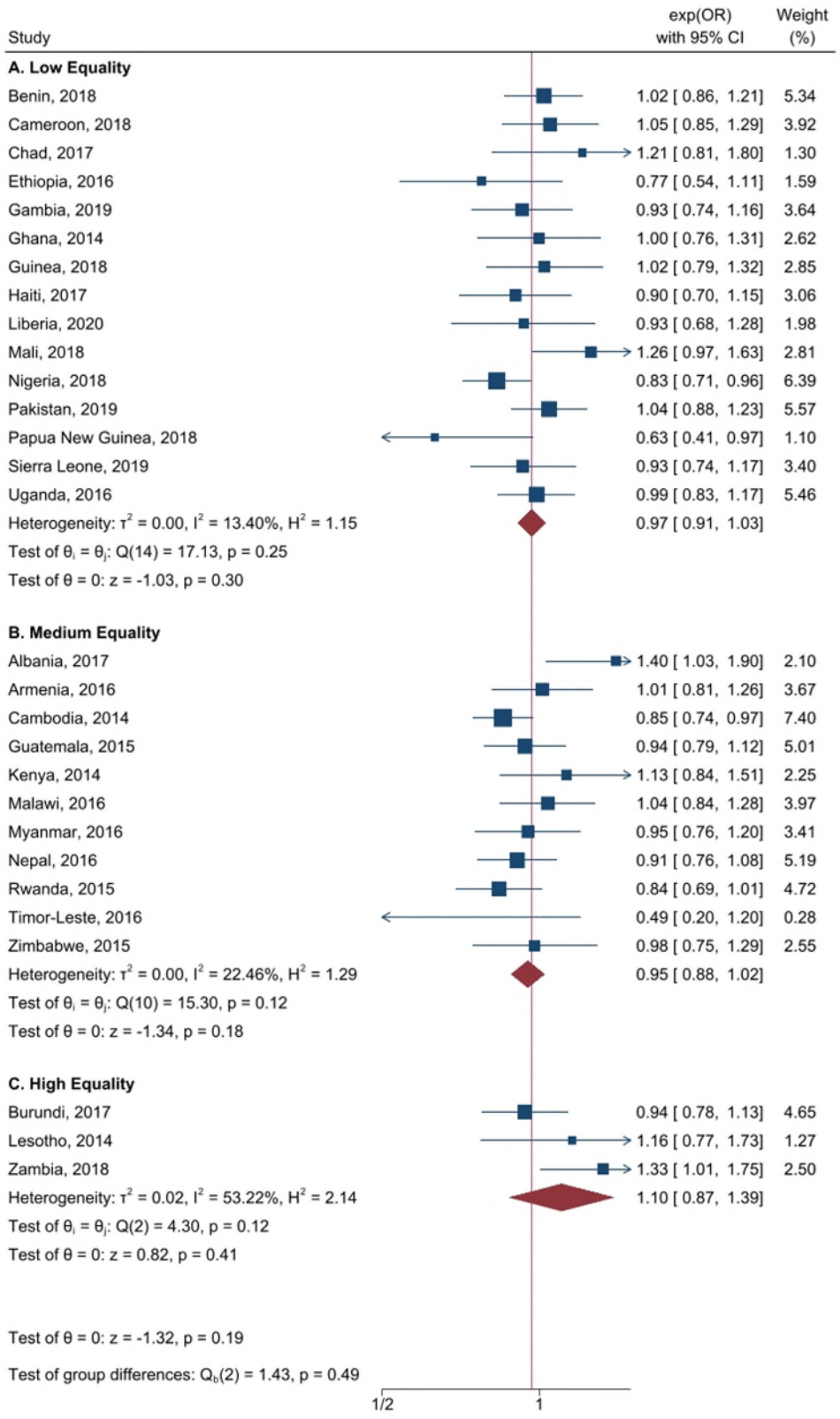


D. 25: Subgroup analysis by HDI on the association between the domain joint household decision-making and abortion in 29 LMICs

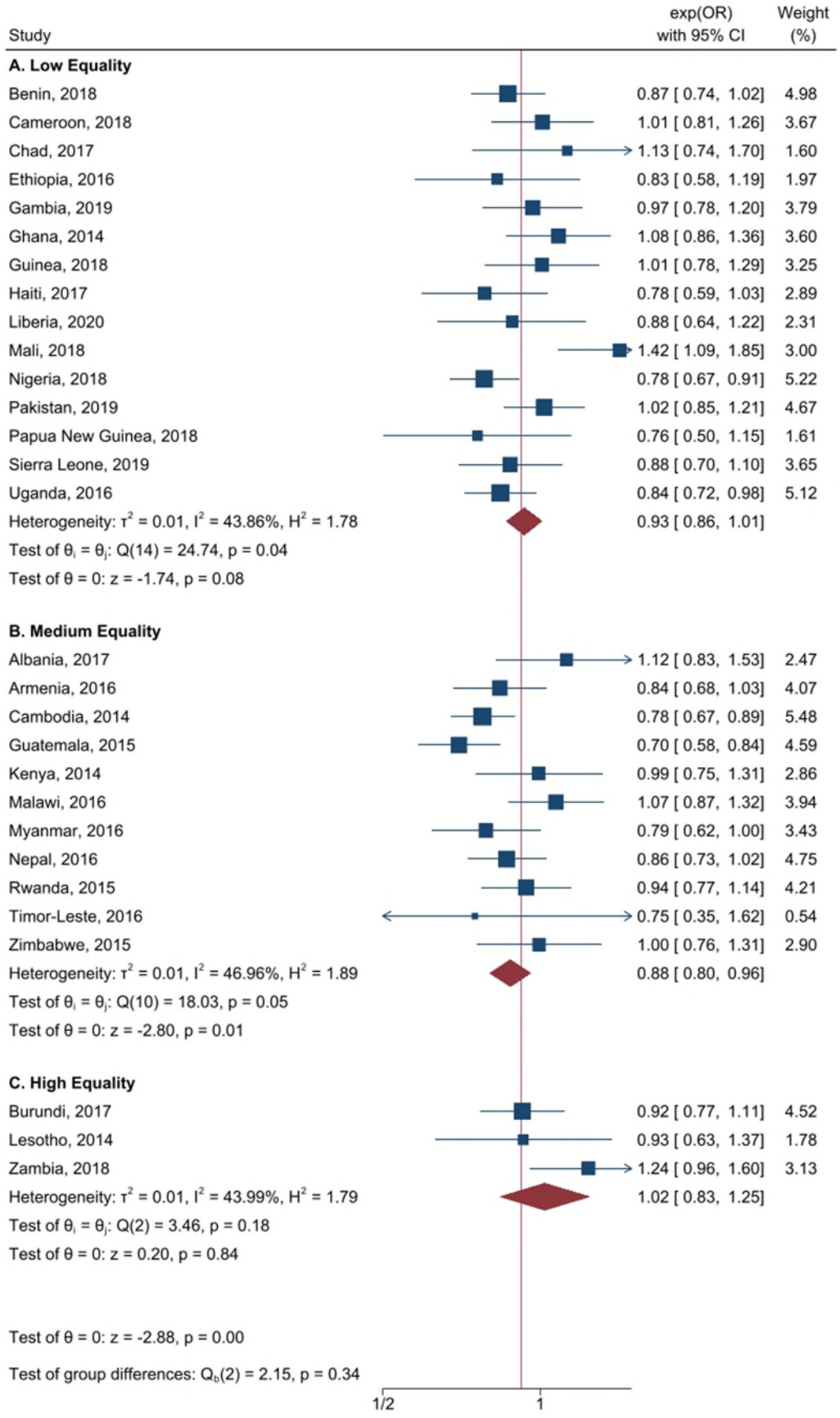


By GDI

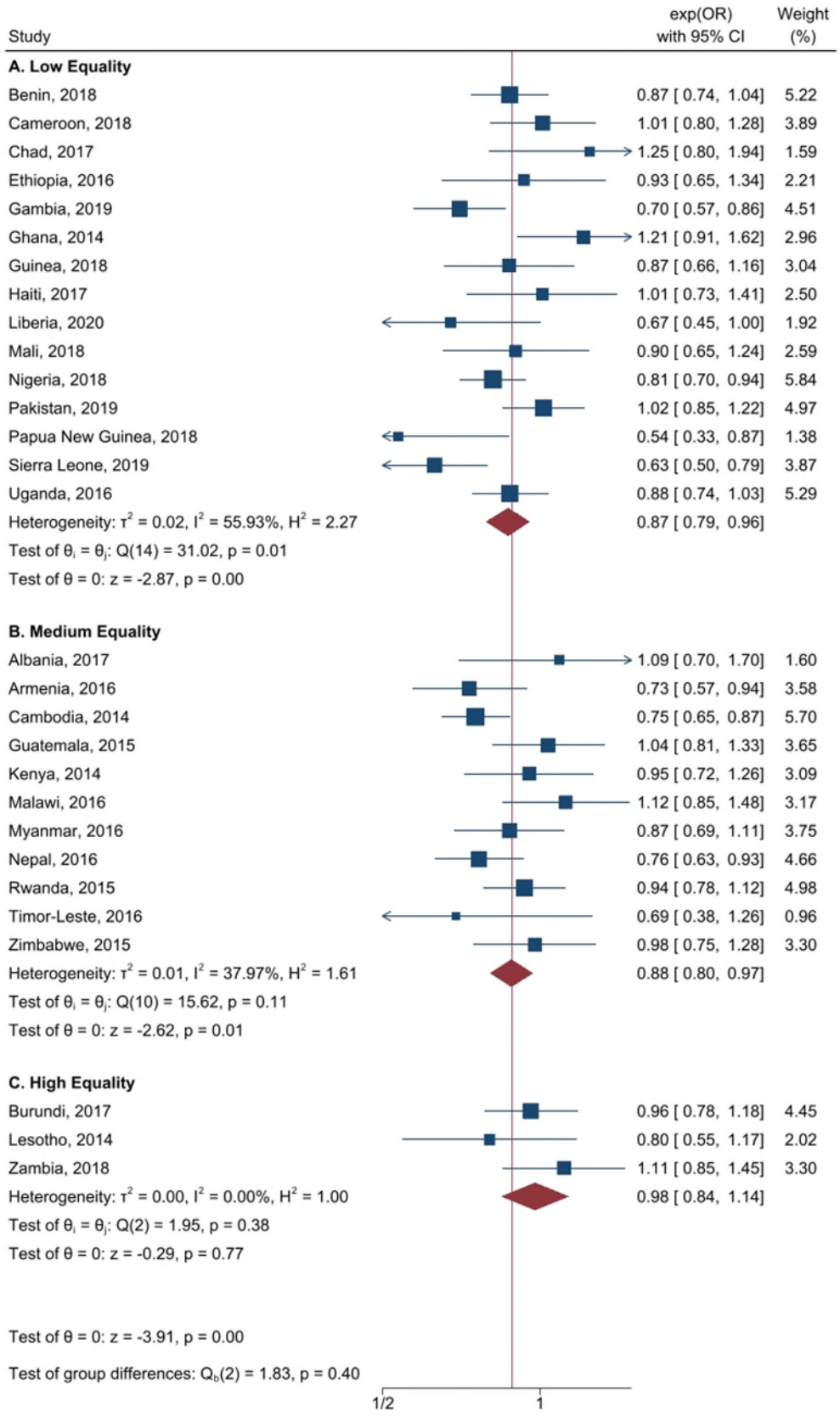
D. 26: Subgroup analysis by GDI on the association between woman-alone empowerment index and abortion in 29 LMICs



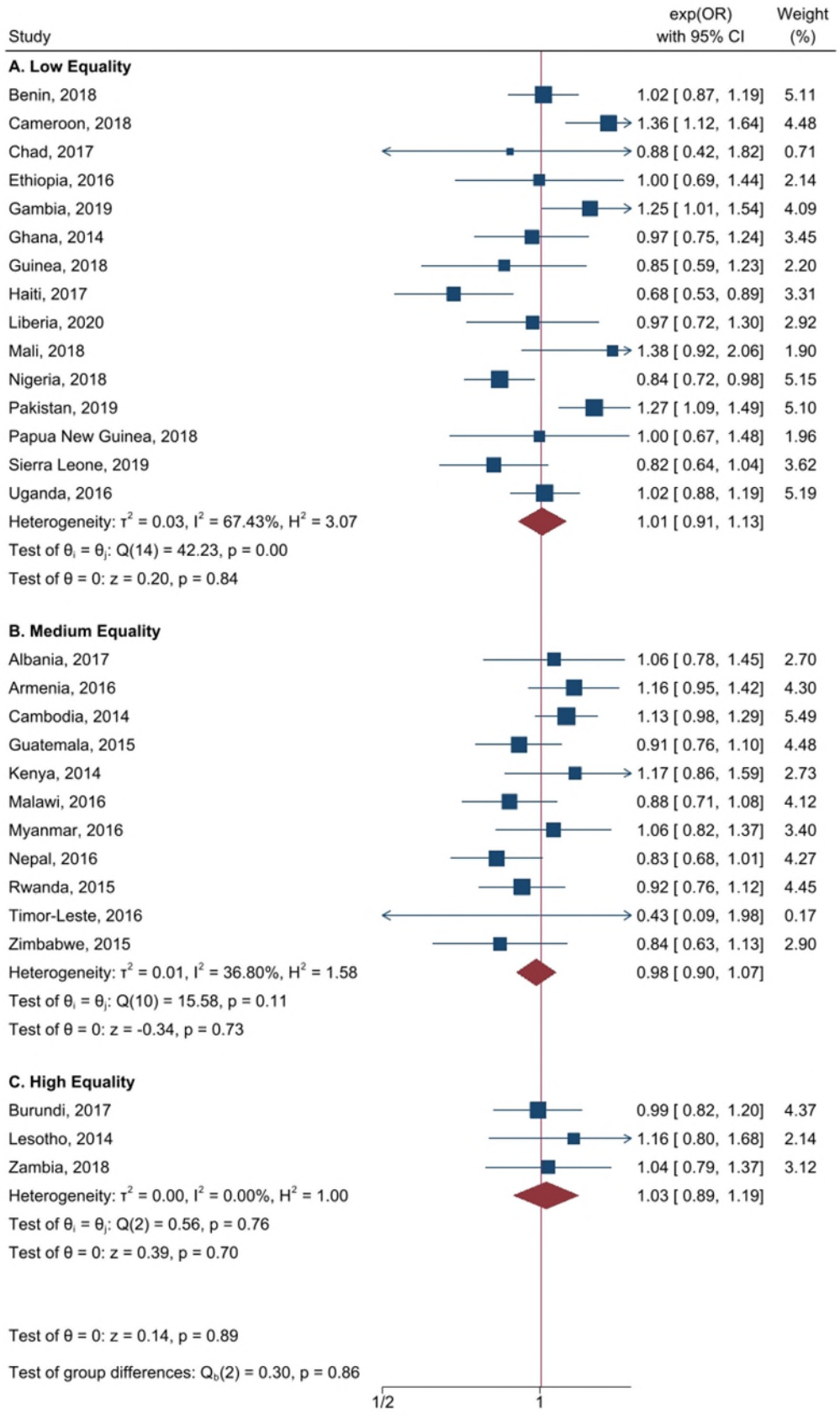
D. 27: Subgroup analysis by GDI on the association between women's empowerment index two and abortion in 29 LMICs



D. 28: Subgroup analysis by GDI on the association between the domain women's attitudes towards domestic violence and abortion in 29 LMICs



D. 29: Subgroup analysis by GDI on the association between the domain women's reproductive health decision-making and abortion in 29 LMIC



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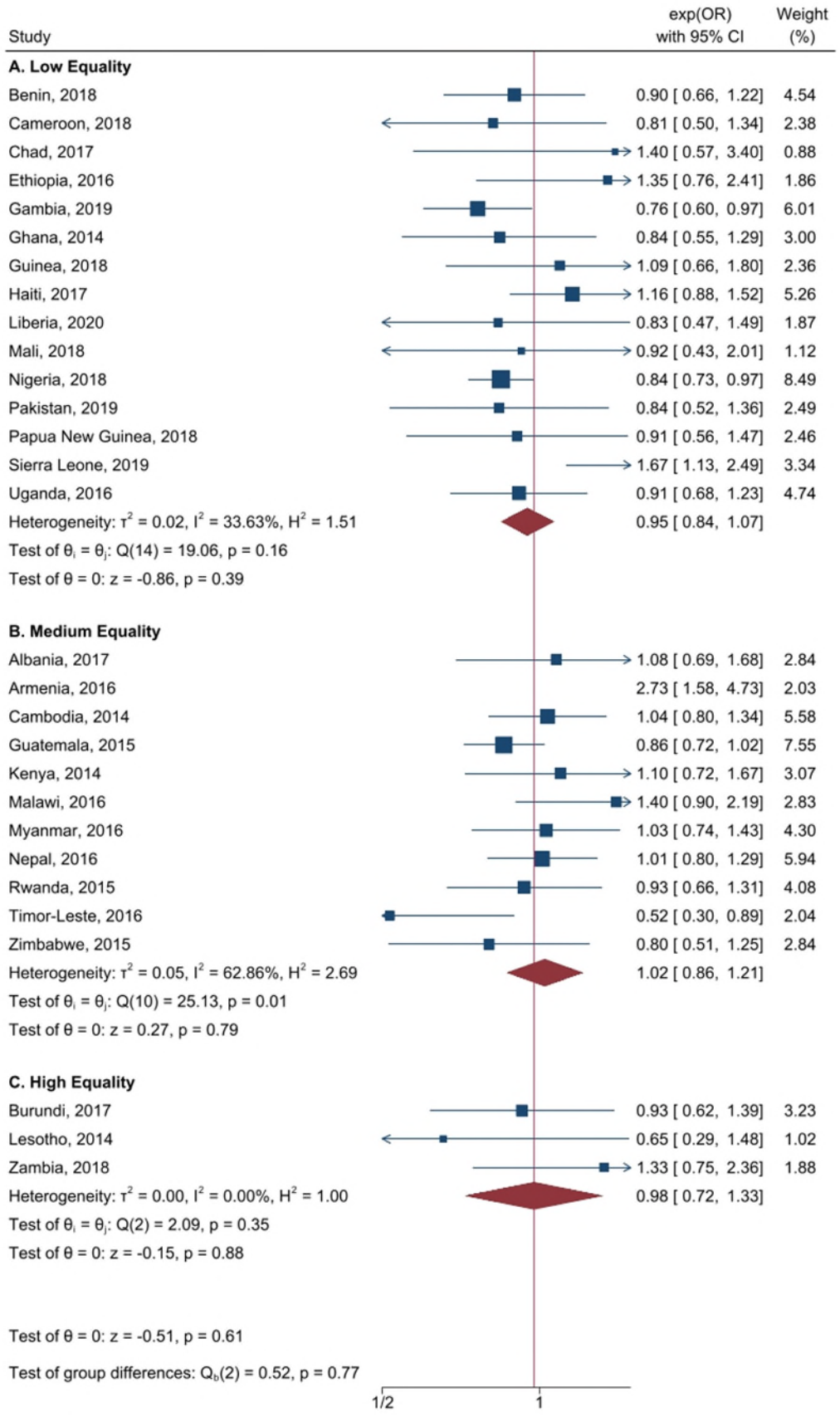
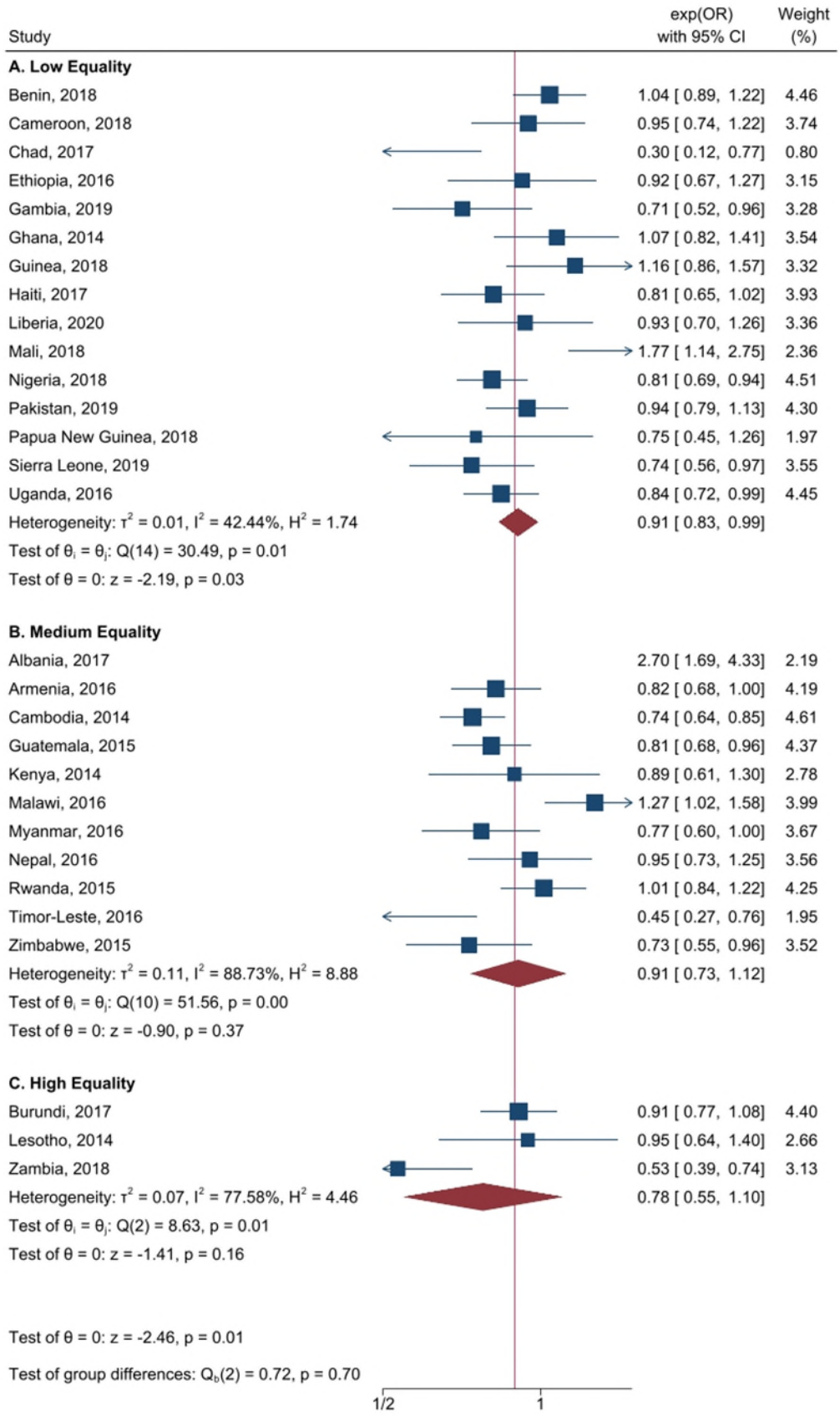
D. 30: Subgroup analysis by GDI on the association between the domain woman-alone household decision-making and abortion in 29 LMICs

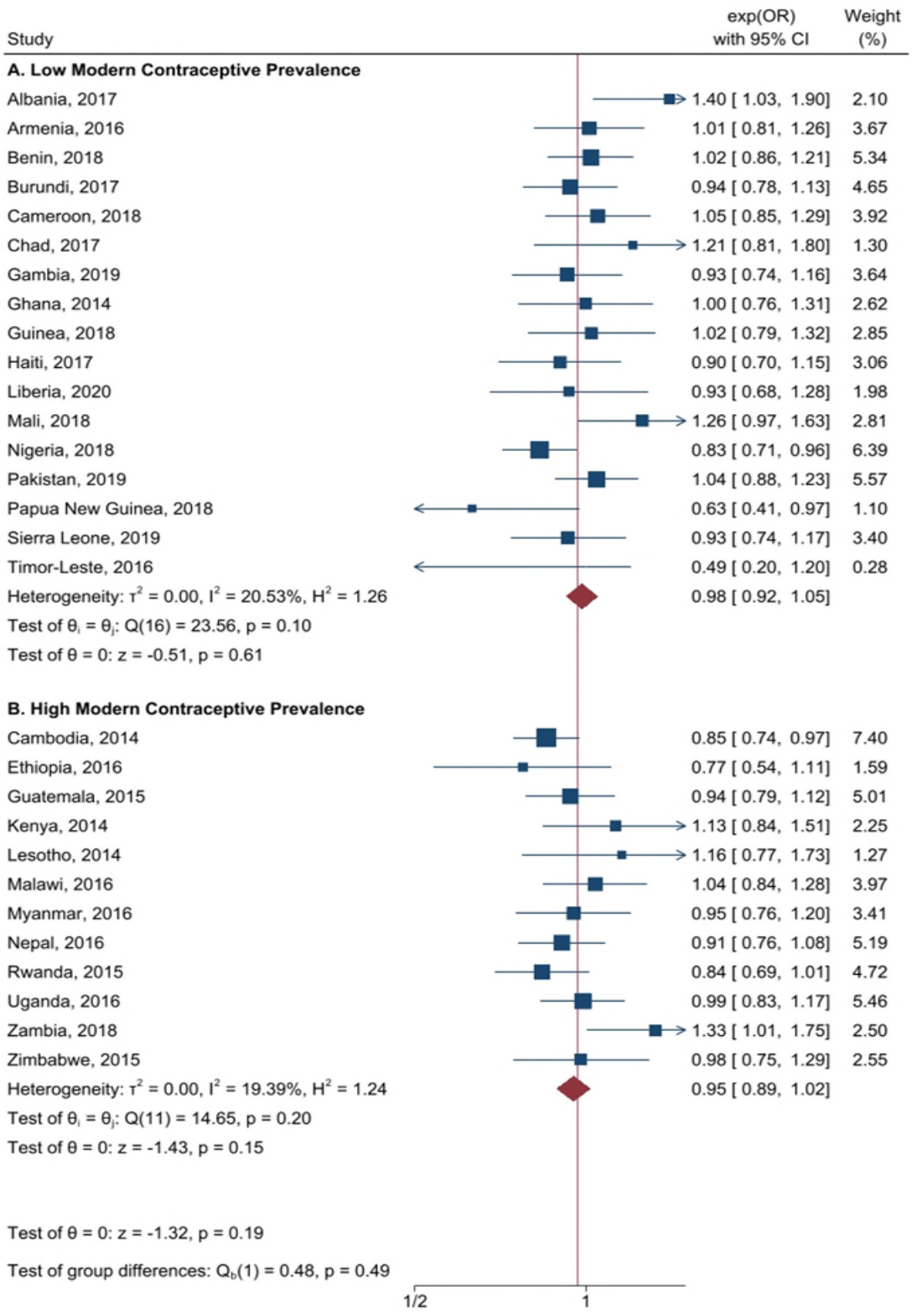


D. 31: Subgroup analysis by GDI on the association between the domain joint household decision-making and abortion in 29 LMICs

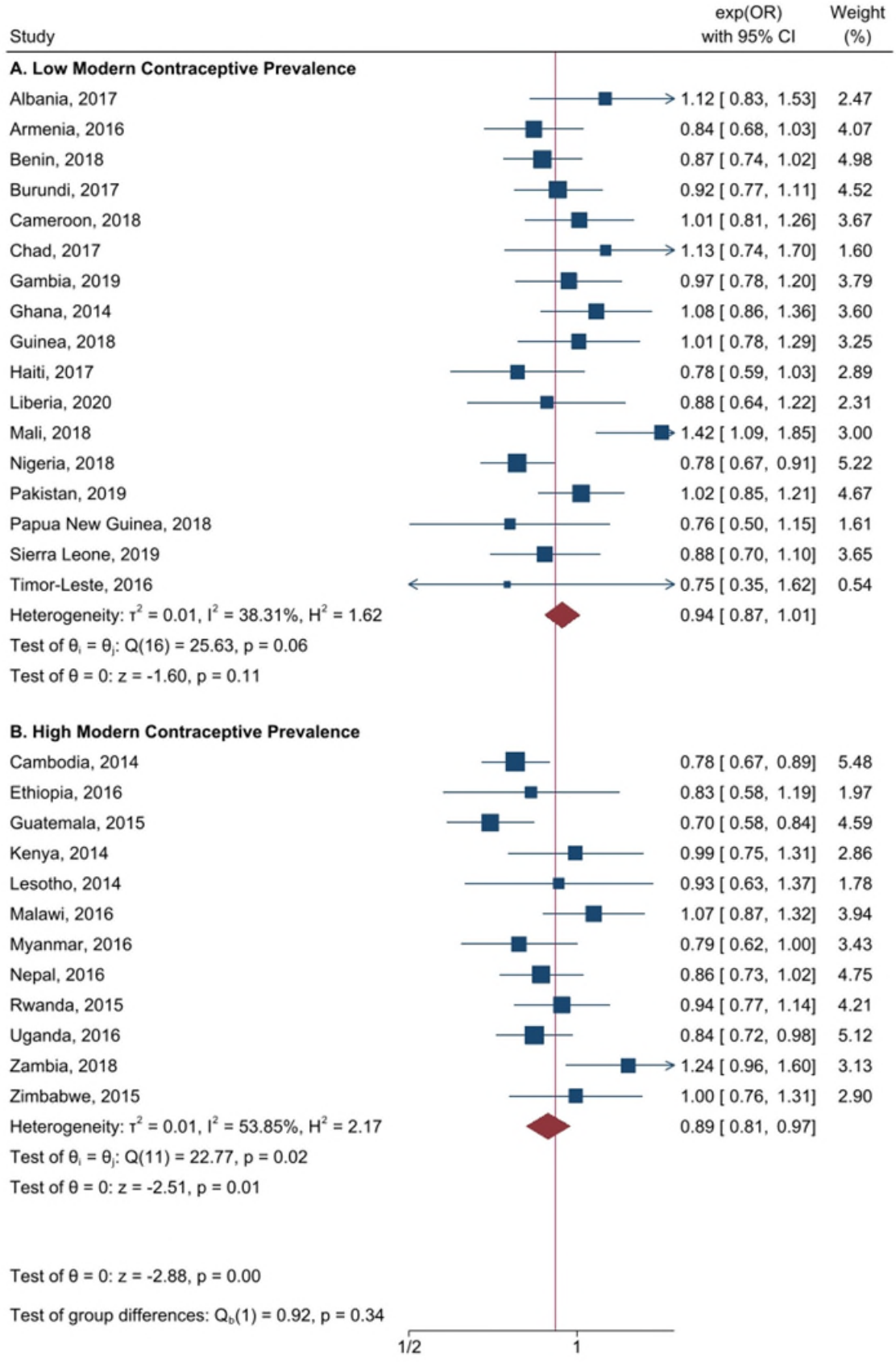


By modern contraceptive use prevalence

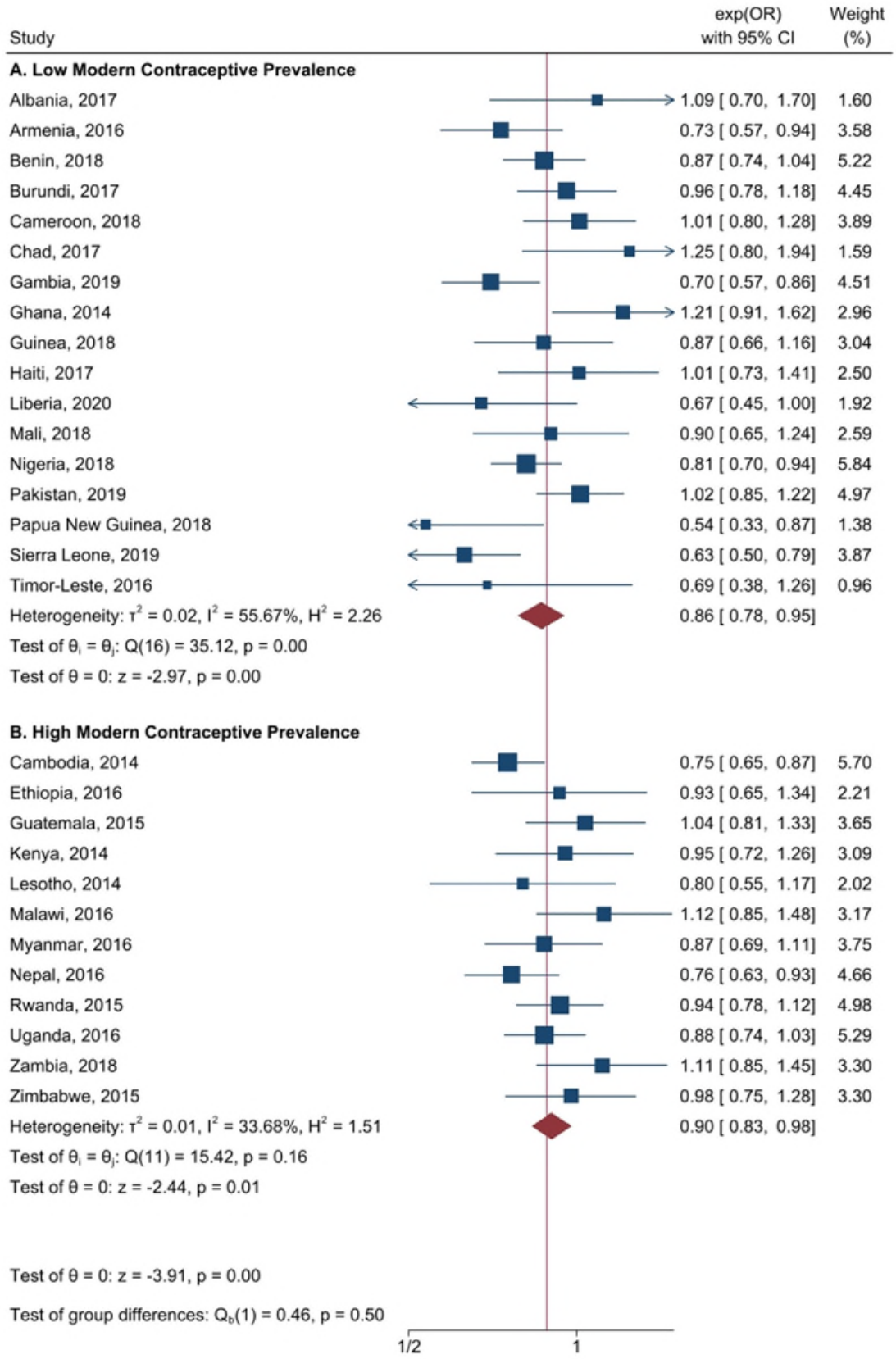
D. 32: Subgroup analysis by prevalence of modern contraceptives on the association between woman-alone empowerment index and abortion in 29 LMICs



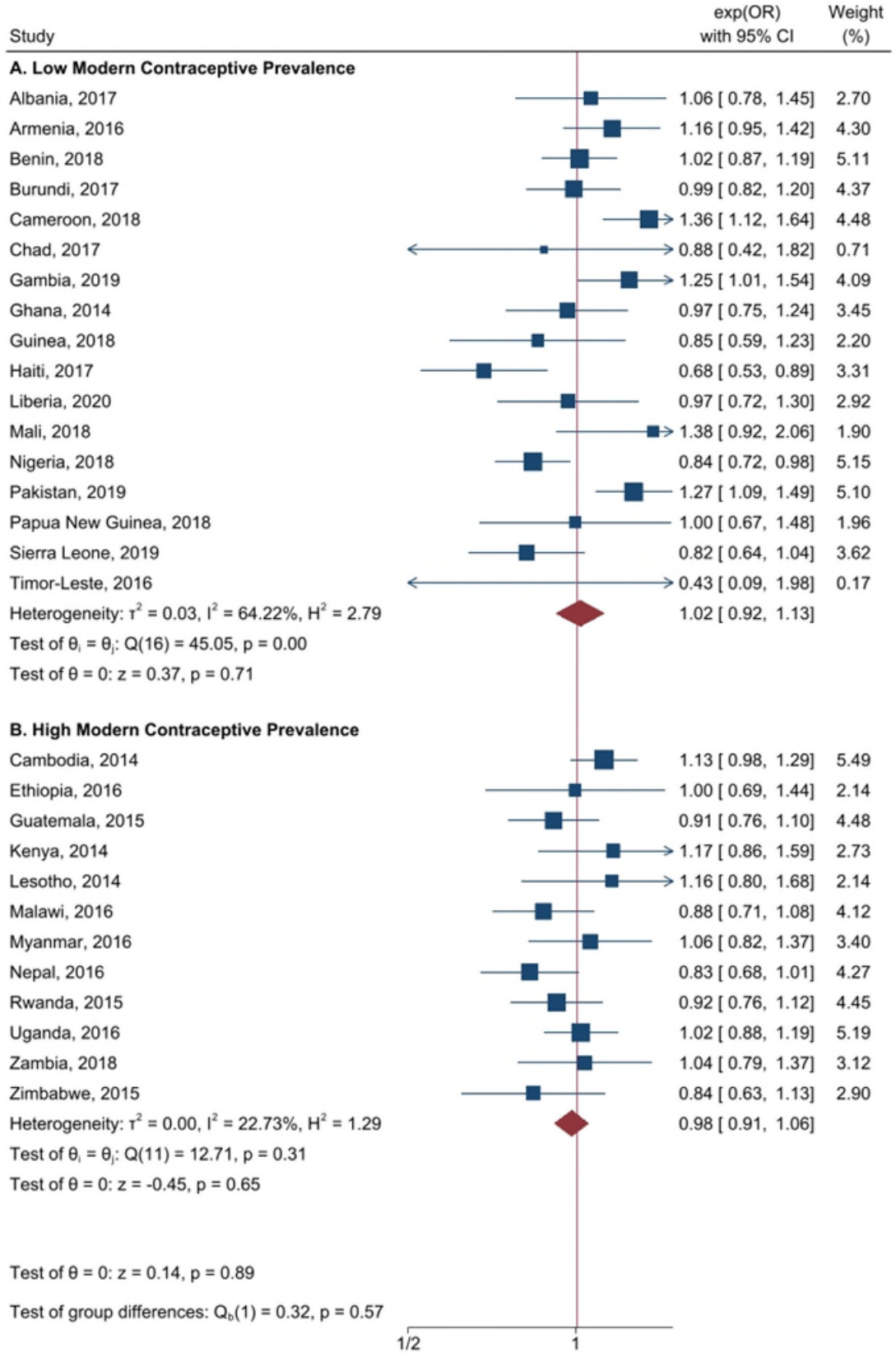
D. 33: Subgroup analysis by prevalence of modern contraceptives on the association between women's empowerment index one and abortion in 29 LMICs



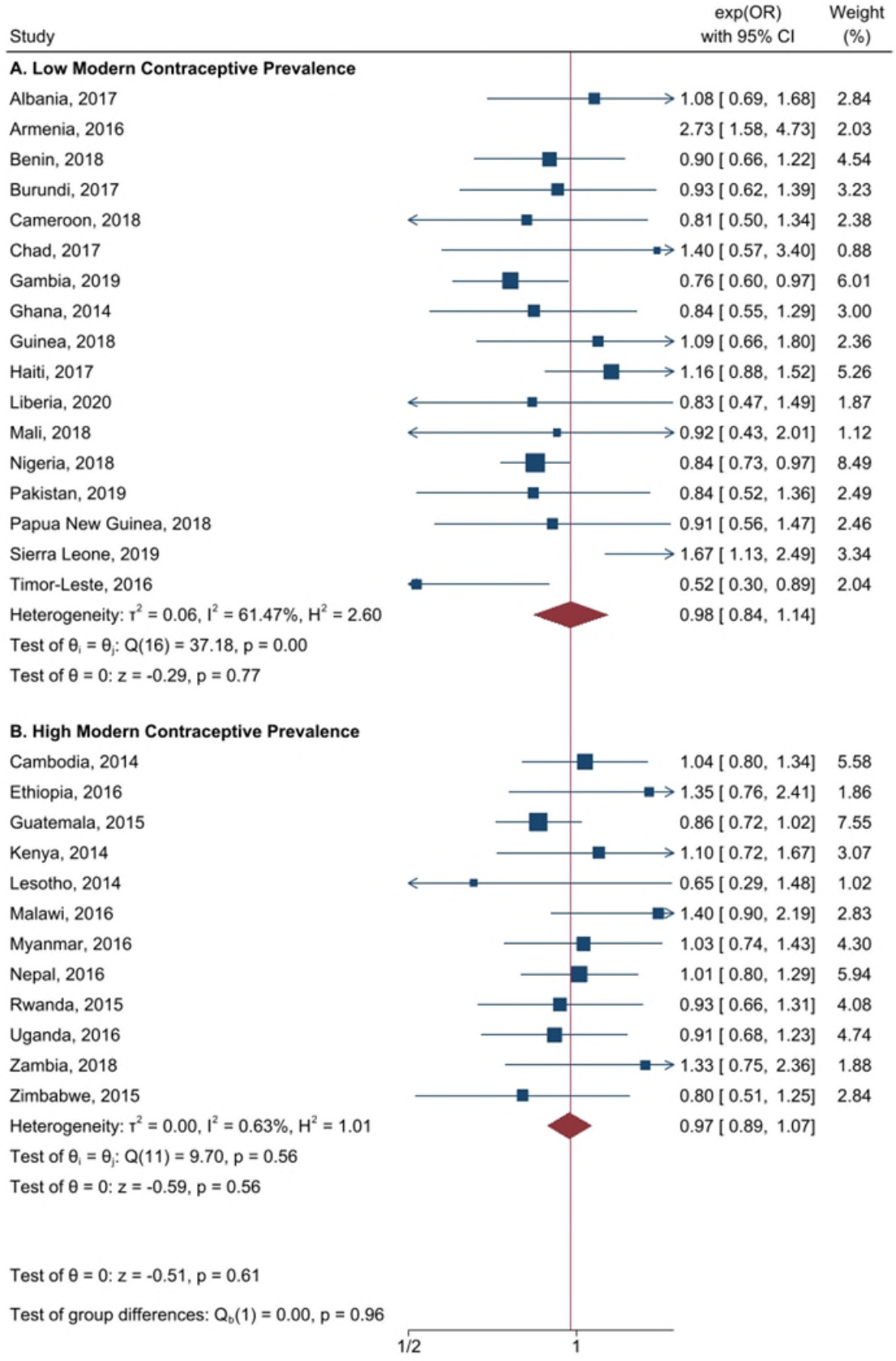
D. 34: Subgroup analysis by prevalence of modern contraceptives on the association between the domain women's attitudes towards domestic violence and abortion in 29 LMICs



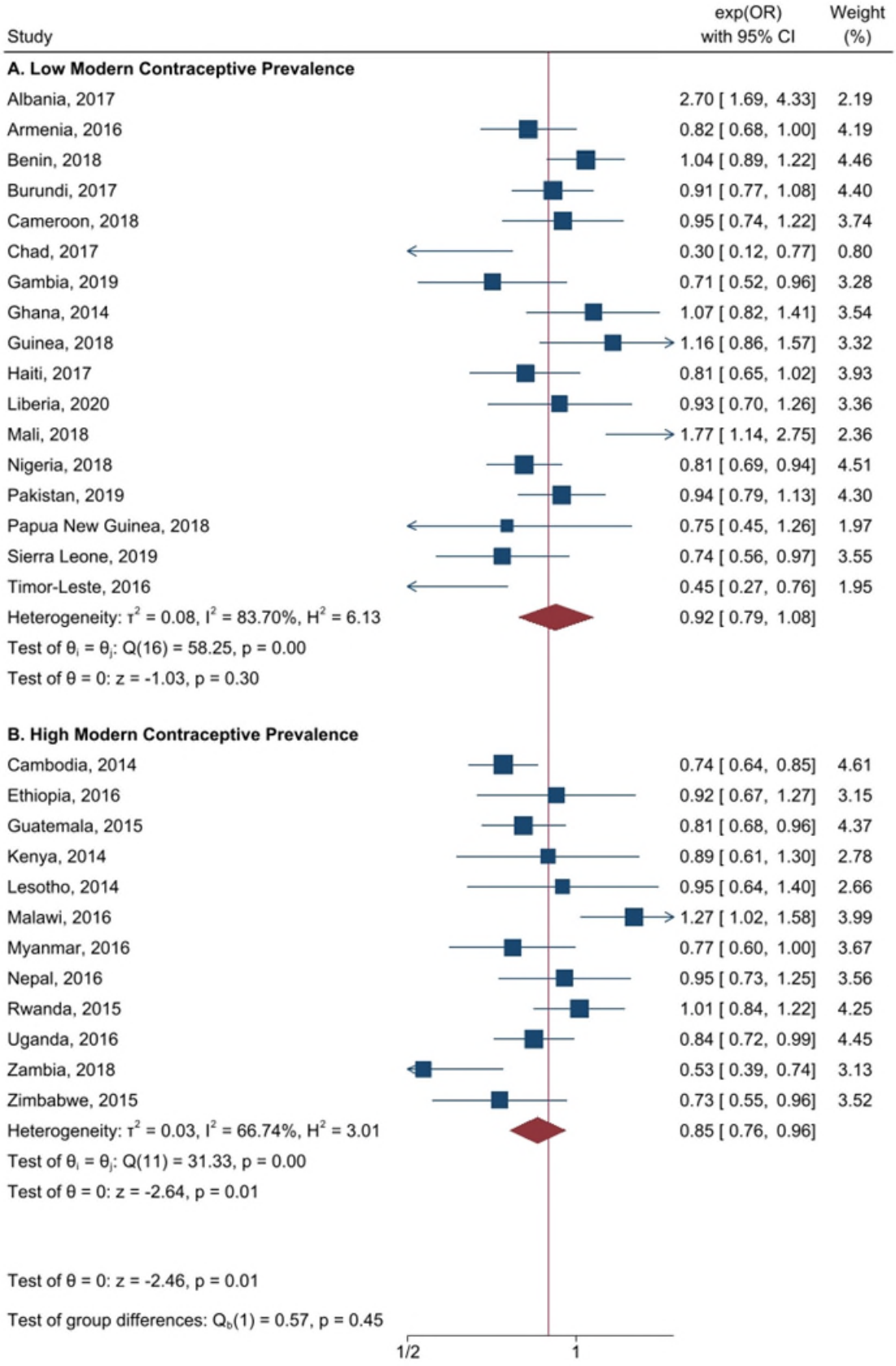
D. 35: Subgroup analysis by prevalence of modern contraceptives on the association between the domain women's reproductive health decision-making and abortion in 29 LMICs



D. 36: Subgroup analysis by prevalence of modern contraceptives on the association between the domain woman-alone household decision-making and abortion in 29 LMICs

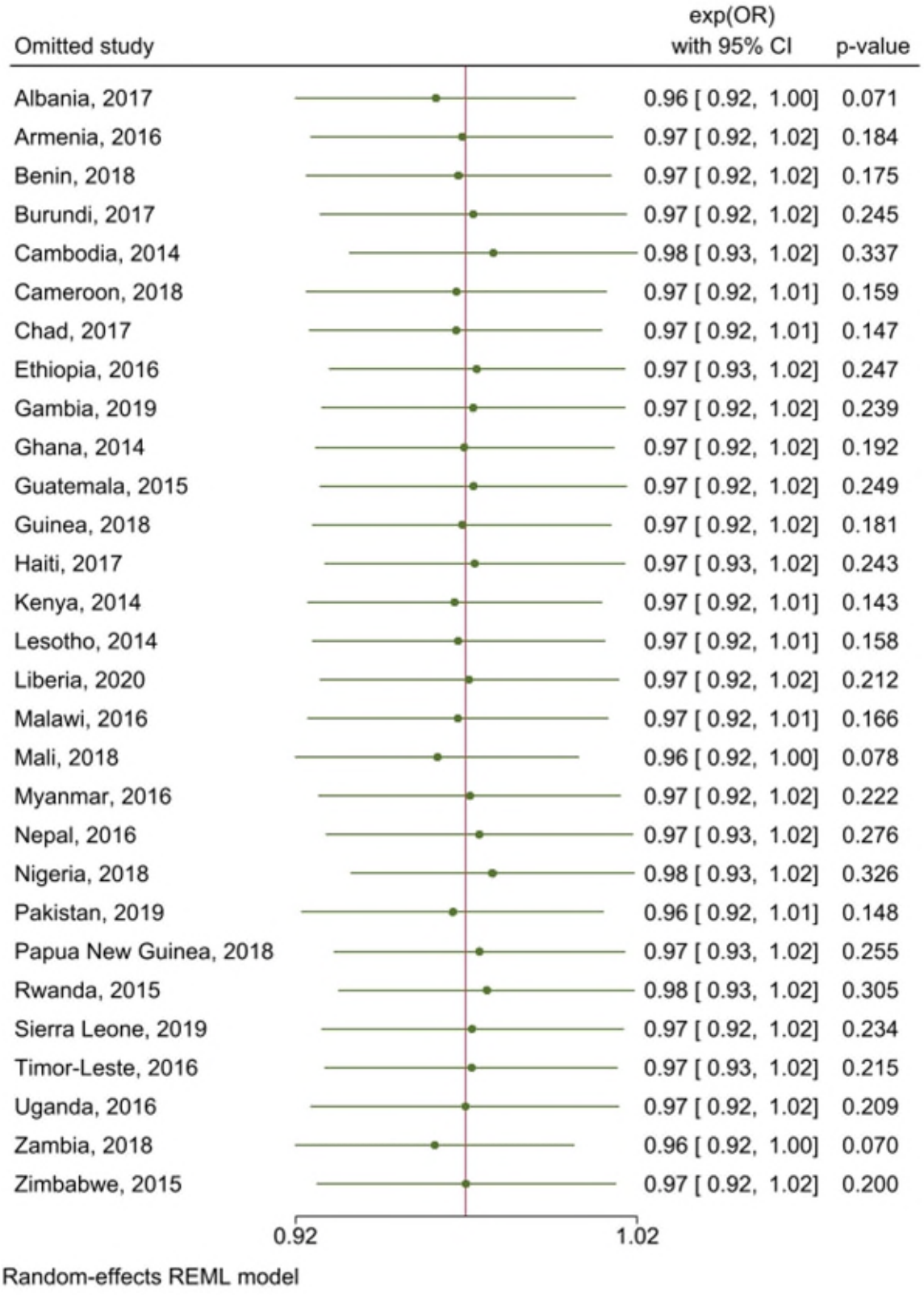


D. 37: Subgroup analysis by prevalence of modern contraceptives on the association between the domain joint household decision-making and abortion in 29 LMICs

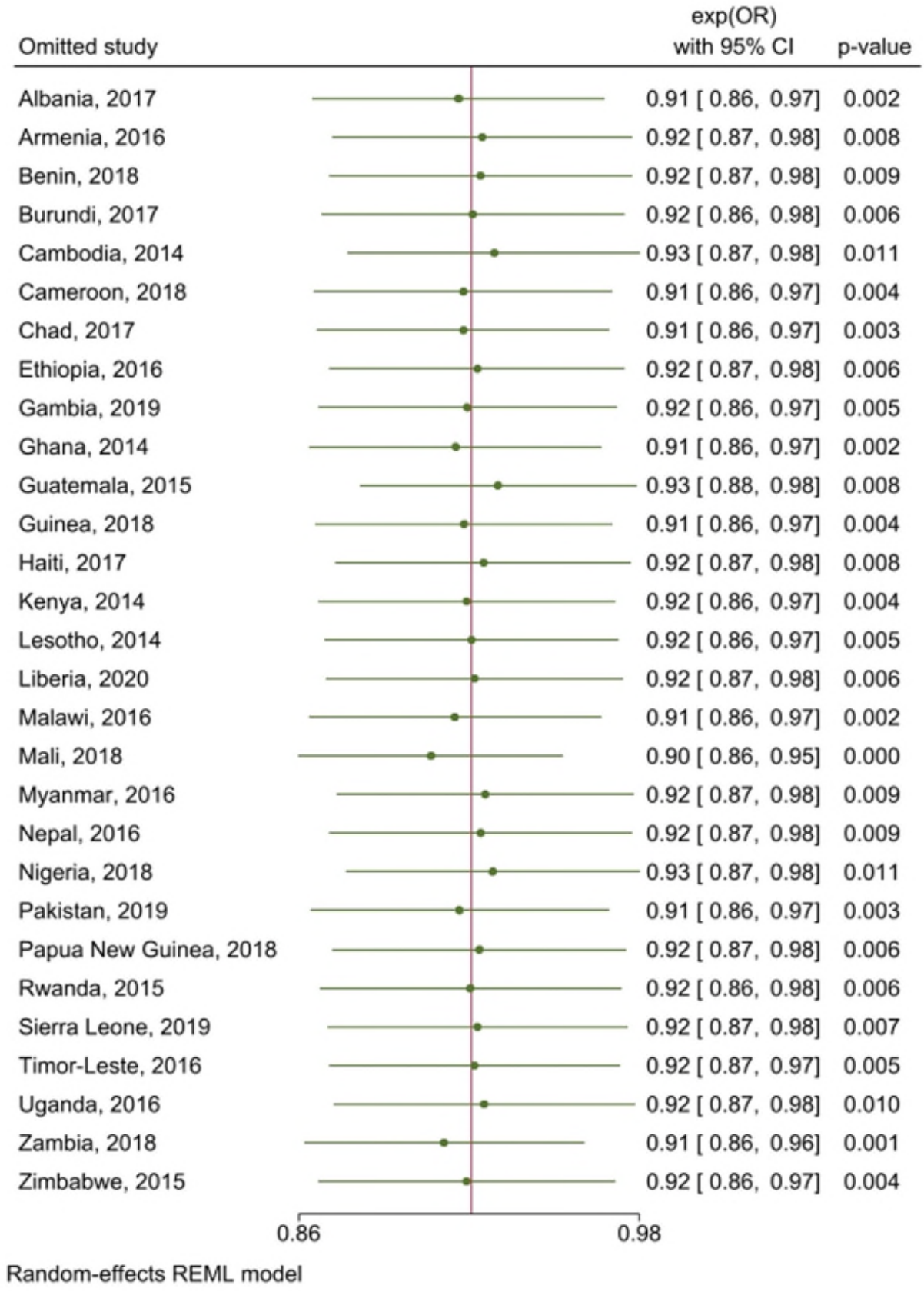


Sensitivity analyses

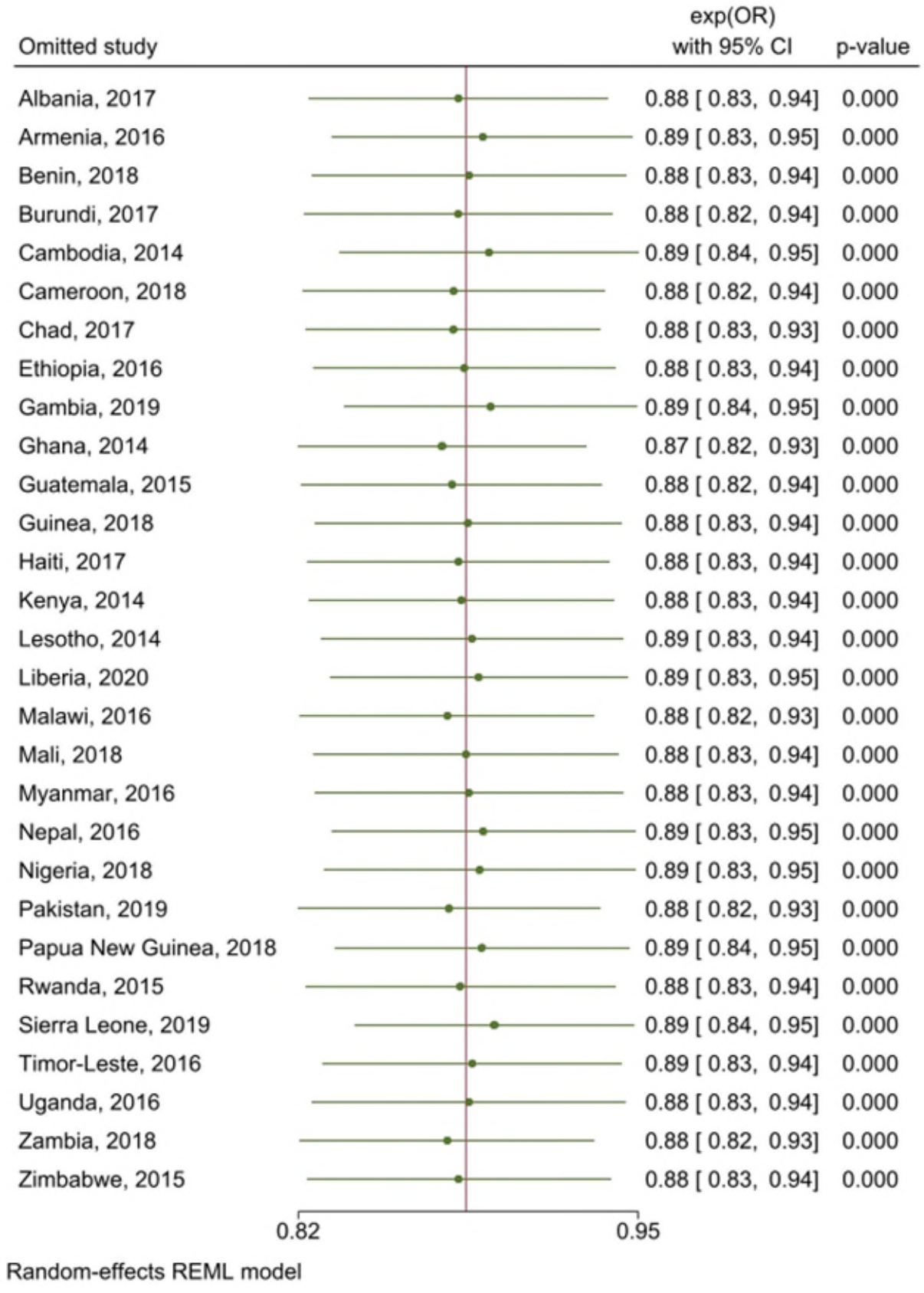
D. 38: The association between woman-alone empowerment index and abortion omitting one country at a time



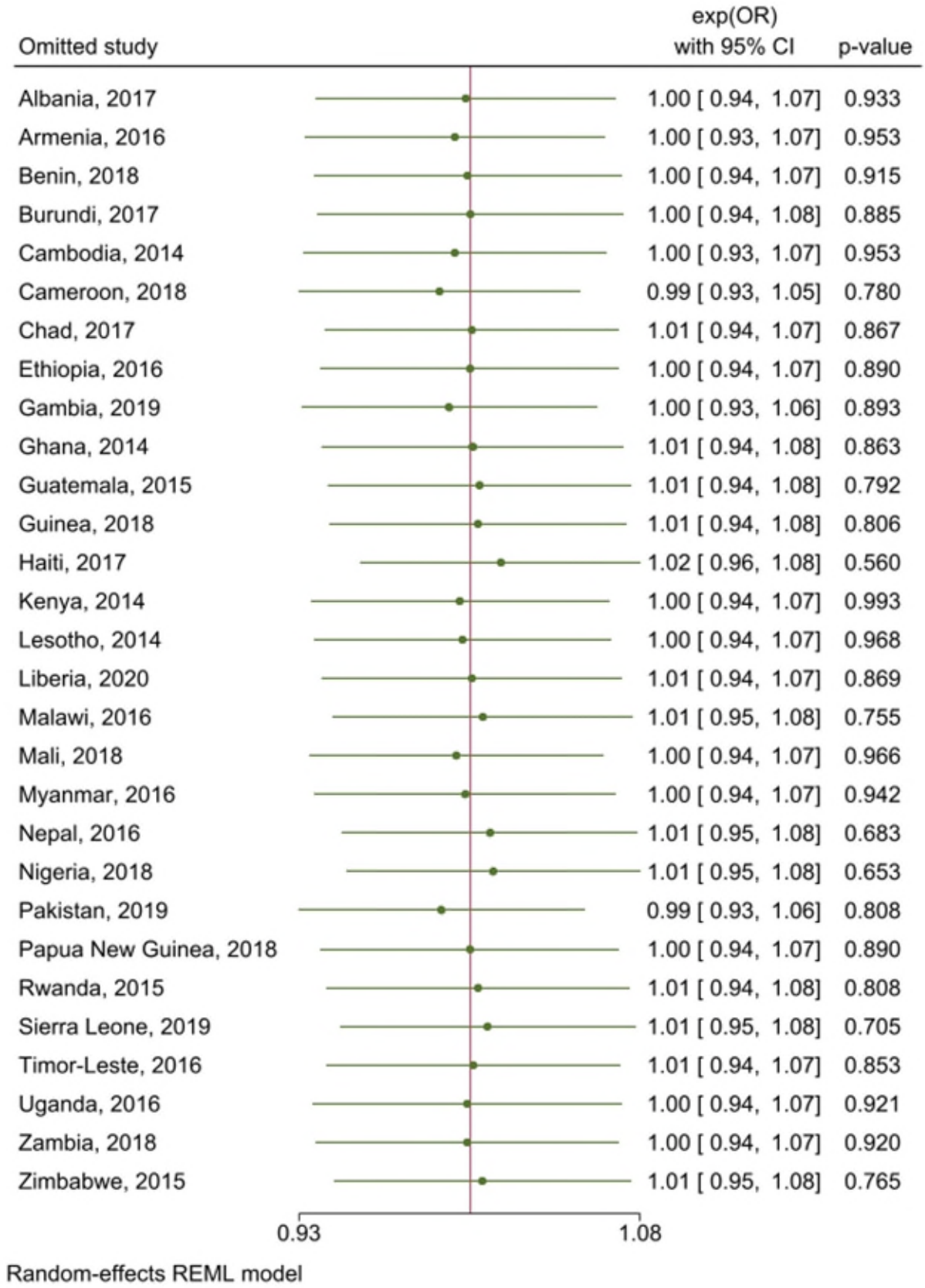
D. 39: The association between joint empowerment index and abortion omitting one country at a time



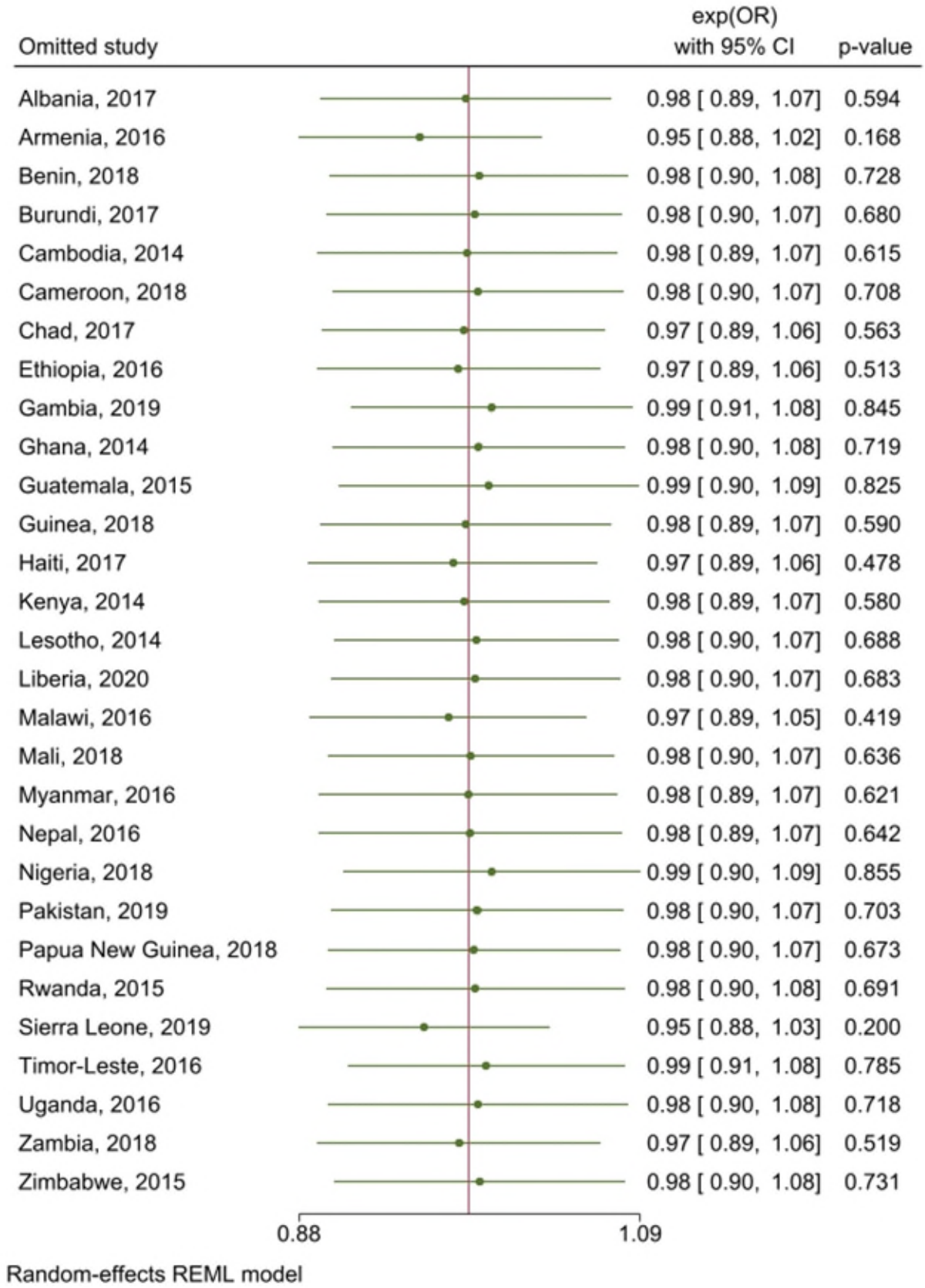
D. 40: The association between the domain women's attitudes towards domestic violence and abortion omitting one country at a time



D. 41: The association between the domain women's reproductive health decision-making and abortion omitting one country at a time



D. 42: The association between the domain woman-alone household decision-making and abortion omitting one country at a time



D. 43: The association between the domain joint household decision-making and abortion omitting one country at a time

