



## Introduction

While fertility has been decreasing and contraceptive use increasing across the developing world, fertility remains higher and contraceptive levels substantially lower in Sub-Saharan Africa. Fertility decline in Sub-Saharan Africa has generally proceeded more slowly than in other parts of the world, and recent evidence suggests that fertility declines have slowed or even stalled during the past decade (Bongaarts 2008; Shapiro and Gebreselassie 2008). Fertility developments in Sub-Saharan Africa are, however, far from uniform. While some Southern African countries (Botswana, Lesotho, Namibia, South Africa, and Swaziland) recorded estimates of total fertility rates (TFR) of 2.6 to 3.4 children per woman in 2005-2010, countries in Eastern, Western and Central Africa recorded fertility levels almost twice as high (Bongaarts and Casterline 2013).

At the same time, knowledge of at least one modern contraceptive method is nearly universal (i.e., above 90 per cent) in most Sub-Saharan African countries but the use of modern contraceptives among married women is substantially lower in high-fertility countries, West Africa in particular, compared to countries where fertility transitions are taking place (Darroch and Singh 2013). This is related partly to attitudes and less widespread approval of family planning (Khan et al. 2007), and partly to higher fertility preferences (Bongaarts 2003). Despite considerable investments in family planning programmes over the past decades, knowledge of contraception does not necessarily translate into contraceptive use (Cleland, Ngugwa and Zulu 2011).

In this respect, women's education is important. It is widely acknowledged as being one of the most important determinants of both contraceptive use and fertility decline. Because the average level of education is still low among women in Sub-Saharan Africa, there is room for improvement. Nowadays, the emphasis on women's education is often supplemented by women's status and empowerment, where the latter involves a process through which a woman gains decision-making power and agency (Malhotra and Schuler 2005). In this respect, too, there is room for advancements in Sub-Saharan Africa, with potential gains relating to reproductive behaviour.

Against this backdrop, we examine the determinants of contraceptive use among married women in Sub-Saharan Africa. We focus on women's education and empowerment and how these factors influence not only contraceptive use

but also the choice of method effectiveness, net of demographic and socioeconomic factors at individual and couple level, in contemporary Ghana, Kenya, Madagascar, and Zambia. The countries investigated are low-income countries, spread across the continent and experiencing fertility decline - although the decline in Zambia seems to have stalled. We ask to what extent a woman's education and empowerment are related to 1) contraceptive use, 2) her choice of method effectiveness, and 3) whether there are differences in these respects across countries?

## Literature Review and Theoretical Framework

There is a vast literature in which the education of women is acknowledged to be one of the most important determinants of reproductive behaviour and a powerful correlate with both contraceptive use and fertility decline (e.g., Caldwell 1980; Cleland and Rodriguez 1983; Cochrane 1983; Jejeebhoy 1995; Martin 1995). The gender equality literature goes beyond women's education and includes women's status and empowerment as important determinants of contraceptive use and fertility (Mason 1987, 1997; Mason and Smith 2000). The relationship between women's education and reproductive behaviour is not an exhausted research topic as yet. Although the relationship between women's education and fertility is generally a negative one, the positive association between education and fertility control, and other mediating mechanisms, and the differences across geographical settings deserve further exploration.

It has been established in the extant literature that more educated women delay marriage and childbearing, are more prone to use modern (i.e., effective) contraceptives, and ultimately have lower fertility than do women with less education. In the economics literature this is demonstrated through a lower demand for children due to i) the higher opportunity costs of childbearing among better-educated women who generally have better options in the labour market; ii) stronger preferences for other consumer goods and leisure activities; and iii) preferences that favour parental investments (time and money) in fewer children over investments in many children (Becker 1991). Schooling provides literacy and numeracy skills, but it also has a socialisation function, and affects the cognitive abilities of students while improving their ability to process information. Education thus provides women with knowledge and shapes attitudes that enable them to see the advantages of smaller

families and take advantage of existing family planning services. This may be the result of lower infant and child mortality (i.e., the reduced need for child replacement), but it may also be a recognition of the reduced need for children to provide labour and old-age security (Caldwell 1982).

Women's education is a traditional measure of their empowerment<sup>i</sup>; a concept often used interchangeably with women's status or autonomy. However, while education increases their opportunities to become economically active and autonomous decision-makers, women may be restricted in these capacities by norms and institutions (Balk 1994; Jejeebhoy 1995). Mason (1986) argues that the concept of women's status is elusive because of the multi-dimensionality of gender inequality; there are several spheres of society within which an individual is either empowered or powerless, but where being empowered in one does not necessarily mean being so in another. For instance, a woman can be economically independent and at the same time have no legal rights and no power in the sexual relationship she has with her husband. Additionally, gender relations occur in different social strata as well as geographical locations, and may change over the life course. One feature of empowerment that scholars seem to agree on is that it is a process that involves a progression from one state of things to another, specifically from a situation of less gender equality to one of more. Agency is another recurring concept, which signifies that increased gender equality must involve women as agents with a perception of entitlement to decide (Kabeer 1999; Basu and Koolwal 2005).

Although it is clear from the literature that education empowers women, and provides them with increased autonomy and results in an increased use of contraceptives and fewer children in almost every context, the impact of a woman's education varies according to region, culture and level of development. Beyond making general assertions, Jejeebhoy (1995) shows that there is actually little consensus on whether the education-autonomy relationship exists in all cultural contexts, at all times and at all levels of development; neither is there consensus on how much education is needed for changes in autonomy and reproductive behaviour, or on which aspects of autonomy matter in the relationship between education and reproductive behaviour. In Sub-Saharan Africa, for example, the straightforward positive relationship between women's education and contraceptive use is not

always observed. It seems as if a moderate amount of education only marginally affects contraceptive use while secondary and higher education substantially increase use of contraception (Jejeebhoy 1995: 144). Moreover, the positive association between education and contraceptive use is stronger in high-literacy contexts and in countries with higher income and greater gender equality.

Given the above, we can make the following conjectures: education matters for contraceptive use and choice of more effective methods. Moreover, a woman's position is determined both by individual characteristics, such as her own education, and by gender norms, formal institutions and social structures that vary across contexts and affect women's empowerment. A stronger position held by the woman will enhance the positive effect of education on contraceptive use, because she becomes her husband's equal to a greater extent in terms of communication, and it will improve her bargaining power in household decision-making. We acknowledge that this may come about in different ways according to country context.

### Data and Methods

In order to investigate how education and empowerment influence married women's contraceptive use in Sub-Saharan Africa, we made use of data from recent Demographic and Health Surveys (DHS) collected between 2007 and 2009.<sup>ii</sup> The countries analysed were Ghana, Kenya, Madagascar and Zambia.

The selection of these countries was based on the timing of the survey; i.e., the availability of surveys conducted during the same phase; the relatively large sample sizes providing adequate samples of married women; comparable questions and measurements of relevance for our study; variability in the outcomes of interest, and geographical spread over the African continent. All four countries are low-income countries with room for substantial improvement when it comes to education and gender equality. As seen in Table 1 (panel A), the four countries included in this study have both similarities and differences.

Ghana is situated in West Africa. It is the smallest of the four countries. The size of the population has increased rapidly since 1960 when the first census was undertaken. The Ghanaian population is young; 39 per cent is younger than 15 years, and only 3 per cent is 64 years or older. A population policy was introduced in 1969 and revised in 1994, with the

main objectives of reducing total fertility and population growth. In 2011, the total fertility rate (TFR) was 4.0 children per woman, a decline from 7.0 in 1968. Together with a number of development partners, the Ghanaian government has implemented projects for improving reproductive health and health care services, although the principal area of priority has been combating the spread of HIV/AIDS and other sexually transmitted diseases (GSS, GHS & ICF Macro 2009).

Kenya has by far the largest population at 44 million, which is a four-fold increase since 1969. During the self-same period, TFR dropped from 8.1 to 4.5 in 2011. Also the Kenyan population is young; 42 per cent of the population is below 15 years, while three per cent is above 64. In 2000, the Kenyan government launched the National Population Policy for Sustainable Development, outlining ways to achieve continued fertility reduction and the stabilization of population growth, and the empowerment of women and elimination of all forms of discrimination, especially against girls. In 2007, the Ministry of Health adopted its first National Reproductive Health Policy, with the

objective of providing high-quality delivery of reproductive health services throughout the country and of achieving the Millennium Development Goals and the ICPD goals (KNBS & ICF Macro 2010).

Madagascar, a large island off the southeast coast of Africa, has a youthful population of 22.5 million. TFR was 4.6 in 2011, a decline from 7.3 in 1968. A population policy was launched in 1990 with the goal of improving quality of life. The *Politique Nationale de Santé*, created in 2005, aims to reduce maternal and infant mortality and improve family well-being (INSTAT & ICF Macro, 2010).

Zambia has a population of just over 14 million. Fertility is still high; TFR has seen only a modest drop from 7.4 in 1968 to 5.8 in 2011. Like the other countries, Zambia has a youthful population. A national population policy was adopted in 1989, aiming at a population growth rate consistent with the growth rate of the economy. This policy had no visible impact, so a process to revise it was instigated in 2007. Its goals include improving sexual and reproductive health and integrating these into development planning, as well as reducing fertility (CSO, MOH, TDRC, University of Zambia, & Macro International Inc. 2009).

**Table 1. Country indicators and sample characteristics of married women aged 15-49.**

A Country indicators	Ghana	Kenya	Madagascar	Zambia
Population (millions) <sup>a</sup>	25	44	22.5	14
Population density (persons per square km) <sup>a</sup>	111	76	39	19
Life expectancy (e0), women	62	62	65	57
Life expectancy (e0), men	60	59	62	54
Infant mortality rate (per thousand births)	49	49	41	56
TFR	4.0	4.5	4.6	5.8
GDP per capita (current USD) <sup>b</sup>	1,605	865	447	1,469
Rural population (of total population, %)	47 <sup>b</sup>	76 <sup>b</sup>	67 <sup>b</sup>	60 <sup>b</sup>
Adult literacy rate (among population older than 15, %)	67 <sup>c</sup>	87 <sup>c</sup>	64 <sup>d</sup>	71 <sup>c</sup>
Female literacy rate (15-24)	80 <sup>c</sup>	94 <sup>c</sup>	64 <sup>d</sup>	67 <sup>c</sup>
Ratio of girls to boys in primary and secondary education (%)	93 <sup>b</sup>	95 <sup>d</sup>	97 <sup>d</sup>	-
Global gender gap index ranking	76 <sup>a</sup>	78 <sup>a</sup>	56 <sup>a</sup>	113 <sup>a</sup>
Adolescent fertility (15-19, per 1000 population)	60	95	125	128
B Sample characteristics*				
Sample size	1,098	2,316	5,022	1,788
Use of contraceptives (%)				
Non-user	58	37	38	39
Uses ineffective method	19	13	21	20
Uses effective method	23	50	41	41
Educational attainment (%)				
No education	24	6	16	10
Some education	76	94	84	90
Violence not justified (in any of specified domestic cases, %)	66	48	68	38

Notes: Figures from (a) 2013; (b) 2012; (c) 2010; (d) 2009.

All other figures in panel A refer to 2011.

(\*) All figures in panel B refer to weighted percentages.

Source: Panel A: World Bank Database (<http://data.worldbank.org>); World Factbook (2013); World Economic Forum (2013). Panel B: Demographic and Health Surveys (DHS) from Ghana (2008), Kenya (2008-09), Madagascar (2008-09) and Zambia (2007).

#### Data

The data for analysis was retrieved from the fifth phase of DHS conducted in each country: 2008 for Ghana, 2008-09 for Kenya, 2008-09 for Madagascar, and 2007 for Zambia. We included women aged 15-49, who at the time of the survey were married and/or cohabiting with their partners. Women who were pregnant were removed from the sample, as were women who reported that they were infecund, menopausal or had undergone a hysterectomy. We also excluded women who had not been sexually active during the six months preceding the interview. These restrictions and the removal of observations lacking essential values

reduced the sample size from 27,781 observations to a final sample of 10,224 women (1,098 women in Ghana; 2,316 in Kenya; 5,022 in Madagascar, and 1,788 women in Zambia).

#### Variables

All variables for analysis were constructed from those in the standardized DHS data files. We classified the dependent variable, contraceptive use, in two ways: 1) use of any contraceptive method versus non-use, and 2) use of ineffective or effective contraceptive method versus no method. The contraceptive methods included in the DHS survey questionnaire were grouped according to the World Health Organization's classification of effectiveness,

and any method providing less than 85 per cent effectiveness “as commonly used” was classified as ineffective (cf. Trussell and Wynn, 2008). Effective methods typically include hormonal contraceptives such as implants, injections and pills, but they also include the IUD, diaphragm, lactational amenorrhoea and male condom. Ineffective methods include traditional methods such as withdrawal, periodic abstinence and folkloric methods, as well as female condom, foam, and jelly. The use of no method has a pregnancy prevention effectiveness rate of 15 per cent. Our subdivision of women according to method effectiveness is thus somewhat different from the more standard approach of creating a subdivision according to “modern” or “traditional” methods. We also believe this construction allowed for women using no method and less effective methods to be treated as distinct from each other, which a simple binary outcome would not have allowed.

The independent variables of special interest are the woman’s educational attainment and non-instrumental empowerment measures at individual level. These measures included the woman’s attitude to (not their experience of) domestic violence (i.e., whether violence is justified in one or more of the following situations: the woman goes out without telling her husband, she neglects the children, she argues with her husband, she refuses to have sex with him, or she burns the food) and whether or not she frequently listens to the radio. In this way we capture empowerment through education along traditional lines, but also in terms of aspects that encompass the sociocultural and interpersonal dimensions (Basu and Koolwal 2005; Do and Kurimoto 2012; Malhotra and Schuler 2005). These indicators are supposed to reflect the woman’s position in domestic decision-making in relation to contraceptive use.

Demographic and socioeconomic factors are important in the contraceptive decision-making process and may be responsible for observed associations between education and reproductive behaviour. As such, we also considered standard demographic and socioeconomic characteristics including age, place of residence, work status (not working, working at home or working away from home), and household wealth (i.e., quintiles from the poorest to the richest). The data also provide information on a number of other aspects of a woman’s life, such as family life characteristics and attitudes. These are important contributors to sexual behaviour and may affect a woman’s

contraceptive decisions. As such, we controlled for the number of living children and religion (i.e., Christian, Muslim, or other). We also controlled for covariates that may affect a woman’s contraceptive use, including place of residence (i.e., capital city, other urban, or rural), spousal characteristics (education, occupation), and whether the woman wanted another child or not.

#### Analysis

We first conducted a preliminary descriptive analysis (i.e., weighted proportions) of some of the variables used in our multivariate analysis. We also computed the weighted proportions of contraceptive use over education, wealth and empowerment. This preliminary analysis allowed us to determine to what extent there were differences in contraceptive use in these respects, prior to controlling for other potentially important factors.

Logistic models for the probability of using contraception were estimated in order to address our first question. In order to address our second question relating to method effectiveness, and because of the multiple-choice nature of our definition thereof, we employed a multinomial logistic model. Our empirical models were thus models of the optional outcomes of use or non-use and of contraceptive status, i.e., using effective contraceptives versus no method or other methods versus no method. A series of logistic regression analyses assessed the association between education, empowerment and contraceptive use for each of the four countries. The initial model adjusted only for the woman’s age, exploring only the association between education/empowerment and contraceptive use. We then estimated a series of models in a stepwise manner, taking into account the way background characteristics and achieved, modifiable, factors may affect the relationship between our key independent variables (education, empowerment) and contraceptive use. In order to answer our third question, as to whether there were differences across countries with respect to the impact of education and empowerment on contraceptive use, we pooled the country samples and constructed a model that included interaction terms.

Since the DHS contains over-samplings of certain population segments, we used sampling weights in all our multivariate analyses. Estimation techniques that accounted for stratification, clustering and weighting were integrated in the standard error calculations. For each country sample (as well as for the pooled sample), odds ratios were obtained. <sup>iii</sup> A

number of sensitivity analyses were undertaken to examine the robustness of our results. All analyses were performed using commands in STATA/SE version 12.

## Results

### Bivariate analysis

The weighted percentages reported in Table 1 (panel B) show that, with the exception of Ghana, the most common choice was to use an effective contraceptive method, followed by not using any contraceptives. In Ghana the most common choice was to be a non-user. Using ineffective contraceptive methods was the least common, ranging from 13 per cent in Kenya to 21 per cent in Madagascar. The majority of women had had some education, the overwhelming majority having attended primary school, with the proportion of women who had had no education ranging from 6 per cent in Kenya to 24 per cent in Ghana. Attitudes towards domestic violence varied across the four countries; 68 per cent of the Malagasy women said that domestic violence was not justified in any of the stated cases, whereas only 38 per cent of the Zambian women said so.

Turning to Table 2, the results corroborate the nearly universal finding in developing countries that the more educated women are, the fewer children they want. The mean ideal number of children was about six children or more for women with no education, yet it was substantially lower for women with some education. As a reflection thereof, more educated women were more likely to use contraceptives than were less educated women. Both the ideal number of children and the instances

of contraceptive non-use fell in inverse relation to education, yet there were level differences across countries in these respects. There was a less consistent pattern in the association between education and method effectiveness among women who used contraception. Quite surprisingly, in both Ghana and Madagascar, a relatively large share of women with no education used effective methods whereas women with secondary or higher education used no method (Ghana) or ineffective methods (Madagascar) instead. A possible explanation for this is that women in poorer areas are targeted by reproductive health programmes that offer effective methods such as injectables. It should be noted that the associations reported between education and contraceptive use were also found to exist between household wealth and contraceptive use.<sup>iv</sup> There was a much weaker association between women's empowerment and contraceptive use in these countries, but there was a positive association between these two factors in Kenya, where more empowered women were more likely both to use contraception and to resort to more effective methods than were women who thought domestic violence to be justified.

Overall, our descriptive results indicate that the use of (effective) contraception was related to educational attainment, yet varied to some extent by country. In general, cross-country differences between women with no education and better-educated women were larger as regards choice of method effectiveness than as regards use versus non-use. These descriptive statistics, however, do not control for potentially confounding factors.

**Table 2. Mean ideal number of children, use of contraception and choice of method effectiveness (%) among married women aged 15-49 in Ghana, Kenya, Madagascar, and Zambia.**

A Ideal number of children				
	Ghana	Kenya	Madagascar	Zambia
No education	5.6	6.7	6.6	6.3
Some education	4.1	3.8	4.5	5.1
Secondary or higher education	3.6	3.1	3.2	3.8
B Use of contraception				
No education				
- non-use	71	65	60	56
- ineffective method	8	9	8	18
- effective method	21	26	33	26
Some education				
- non-use	55	40	35	38
- ineffective method	21	11	21	20
- effective method	24	49	43	42
Secondary or higher education				
- non-use	48	21	21	25
- ineffective method	29	20	54	24
- effective method	23	59	25	51
Empowerment				
Believes domestic violence is sometimes justified				
- non-use	57	42	36	39
- ineffective method	16	14	19	20
- effective method	27	44	45	41
Believes domestic violence is <b>not</b> justified (in any of specified domestic cases)				
- non-use	58	31	40	38
- ineffective method	21	12	22	20
- effective method	21	57	38	42

Source: Demographic and Health Surveys (DHS) from Ghana (2008), Kenya (2008-09), Madagascar (2008-09) and Zambia (2007).

#### Multivariate analysis

Table 3 presents the results of our multivariate analyses by country. Panel A reports the results for use of contraception versus non-use, and panel B reports the results of the choice of method. We introduced controls for a number of demographic, socioeconomic and attitudinal factors in a stepwise manner.

In Model 1 we adjusted only for the woman's age. In this model, education was strongly associated with contraceptive use in all countries. Controlling for age and household wealth (Model 2) reduced the impact of education on use of contraception, indicating that part of the difference between women with no education and women with some education was due to differences in income, but education remained significant in all countries. The results hold up in our full model (3) controlling for a range of demographic, socioeconomic, attitudinal, and couple factors that may affect contraceptive use in all countries except for Kenya. Women with some

education were significantly more likely to use contraception compared to women who lacked education, although this was not so in Kenya, where attitudinal and couple factors adjusted the impact of education substantially. Turning to panel B, the results indicate that education mattered more in deciding between use and non-use than in deciding which method to use in Ghana, Madagascar and Zambia. The impact of education in these countries was positive and statistically significant, irrespective of method effectiveness, indicating that women with some education were more likely to use contraception than were uneducated women, net of all other factors. In Kenya, education was once again to be non-significant in the choice of method.



**Table 3. Odds ratios of contraceptive use and choice of method effectiveness relative to no method for married women aged 15-49 in Ghana, Kenya, Madagascar, and Zambia.**

A Use of contraception versus non-use												
	Model 1				Model 2				Model 3			
	Ghana	Kenya	Madagascar	Zambia	Ghana	Kenya	Madagascar	Zambia	Ghana	Kenya	Madagascar	Zambia
No education (ref.cat.)	1	1	1	1	1	1	1	1	1	1	1	1
Some education	2.192*** (0.363)	3.363*** (0.811)	2.790*** (0.267)	2.069*** (0.349)	1.884*** (0.351)	2.065*** (0.513)	1.811*** (0.189)	1.646*** (0.268)	1.687*** (0.340)	1.115 (0.302)	1.447*** (0.162)	1.721*** (0.303)
	Model 1				Model 2				Model 3			
	Ghana	Kenya	Madagascar	Zambia	Ghana	Kenya	Madagascar	Zambia	Ghana	Kenya	Madagascar	Zambia
Do not listen to radio (ref.cat.)	1	1	1	1	1	1	1	1	1	1	1	1
Listens to radio at least once a week	1.557** (0.276)	1.784*** (0.254)	2.256*** (0.165)	1.216 (0.150)	1.404* (0.251)	1.350** (0.201)	1.553*** (0.121)	1.024 (0.124)	1.199 (0.222)	1.267 (0.209)	1.430*** (0.116)	0.985 (0.124)
Believes domestic violence is sometimes justified (ref.cat.)	1	1	1	1	1	1	1	1	1	1	1	1
Believes domestic violence is <b>not</b> justified	0.894 (0.135)	1.394** (0.185)	0.815*** (0.0617)	1.053 (0.107)	0.795 (0.122)	1.268* (0.174)	0.853** (0.0671)	0.957 (0.101)	0.762* (0.120)	1.229 (0.169)	0.843** (0.0681)	0.967 (0.105)
B Choice of method effectiveness												
	Ghana		Kenya		Madagascar		Zambia					
	Ineffective	Effective	Ineffective	Effective	Ineffective	Effective	Ineffective	Effective				
No education (ref.cat.)	1	1	1	1	1	1	1	1				
Some education	1.920* (0.663)	1.603** (0.367)	1.296 (0.505)	1.073 (0.336)	1.650*** (0.316)	1.419*** (0.174)	1.800** (0.535)	1.695*** (0.324)				
Do not listen to radio (ref.cat.)	1	1	1	1	1	1	1	1				
Listens to radio at least once a week	1.277 (0.371)	1.172 (0.252)	1.811** (0.504)	1.203 (0.208)	1.706*** (0.218)	1.333*** (0.114)	0.636*** (0.111)	1.143 (0.154)				
Believes domestic violence is sometimes justified (ref.cat.)	1	1	1	1	1	1	1	1				
Believes domestic violence is <b>not</b> justified	0.737 (0.177)	0.744 (0.130)	0.985 (0.272)	1.295* (0.174)	0.992 (0.120)	0.797*** (0.0642)	0.926 (0.176)	0.976 (0.112)				

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Model 1 only controls for age; Model 2 adjusts for age and household wealth; Model 3 controls for age, household wealth, number of living children, place of residence, religion, employment, couple age difference; husband's education and occupation; woman's education/empowerment, and whether she wants more children or not.

Standard errors in parentheses.

Source: See Table 2.

When assessing the impact of empowerment, we found that various measures of empowerment were positively associated with use of contraception when controlling only for age. One such example was being a regular radio listener, indicating openness to information relating to a modern lifestyle and a capability to decide for oneself what do to with one's time. Quite surprisingly, being opposed to domestic violence had inconsistent, often insignificant and even negative impacts on contraceptive use. The results were partly adjusted by income differences and were largely absorbed by the full set of controls included in Model 3, with the exceptions of Ghana and Madagascar, where being a regular radio listener (Madagascar) and being against domestic violence (Ghana and Madagascar) had additional significant impacts on a woman's likelihood to use contraception, net of everything else, although these worked in opposing directions. When it came to the impact of empowerment on choice of method effectiveness, the results did not allow for easy interpretation.

The lack of statistically significant interaction effects (Kenya being the country of reference)<sup>v</sup> suggests that the impact of woman's education on contraceptive use was similar and not statistically different across countries. Instead, the differences observed across countries with respect to the impact of woman's education can be explained by compositional and contextual differences between the countries studied. There were, however, differences across the countries in the way empowerment, when measured as being opposed to domestic violence, affected contraceptive use. Compared to women in Kenya, women in the other countries who held this opinion were, all else equal, less likely to use contraception. As with the results attained for woman's education, the impact of husband's education was not significantly different across countries but rather reflecting compositional and contextual differences affecting contraceptive use.

#### Sensitivity analysis

The stepwise way in which the multivariate analyses were performed provides a sensitivity test of the association between education and use of contraception/contraceptive choice. The most important robustness check consisted of performing our analyses both with and without controls for wealth and couple characteristics. The robustness checks cast light on how education, income and couple dynamics may work simultaneously and affect a woman's contraceptive choice. It is relevant to

note here that the inclusion of household wealth mediated the impact of education on contraceptive use because both were positively associated with the use of contraception in all countries. That said, household wealth was not distributed equally throughout the countries studied. Controlling for wealth, there were no longer any significant differences between urban and rural residence. The inclusion of couple characteristics such as age difference between partners and husband's education and occupation only marginally affected the impact of education on contraceptive use in any of the countries. However, it did impact on the findings of how empowerment was associated with contraceptive use, suggesting that the impact of empowerment work through couple dynamics and spousal characteristics, the most important characteristic being husband's education.

#### Discussion

Overall, our findings with respect to the association between education and contraceptive use fall in line with previous literature in that this study confirms a positive association between a woman's education and contraceptive use in Ghana, Madagascar, and Zambia. In Kenya, education was highly correlated with income and other factors, and therefore education made no impact since it mattered less than household wealth in terms of contraceptive use, while this was not the case in the other countries. However, what is unique about our findings is their indication that education matters more in the woman's deciding between use and non-use than in her deciding between more or less effective methods in Ghana, Madagascar, and Zambia, where women with some education were more likely to use either more or less effective contraceptive methods than were uneducated women, net of all other factors. Despite this, significant disparities between the countries did not exist with respect to education and contraceptive use at the time of study (2007-2009). Our results indicate that there are important contextual differences across the countries studied, which means that underlying background factors included among the socioeconomic, demographic or attitudinal factors that we controlled for were responsible for this association. Extending the scope of analysis to include empowerment measures that capture the woman's decision-making power and agency within the household had few and inconsistent additional effects net of age and education. A number of important robustness checks from our sensitivity analysis lent support to

our findings. The results are indeed highly robust: the addition of the empowerment variables to different models did not alter the magnitude or significance of the education variable in any of the countries.

The way education affected contraceptive use (including choice of method effectiveness) in the countries studied reflects different development and policy contexts. Given this, our findings indicate that women in Ghana, Madagascar, and Zambia would benefit from gaining similar levels of education and access to (effective) contraceptives as women in Kenya have. Our findings regarding education and empowerment resonate with the argument that even if women receive an education, they may not necessarily be empowered because country-specific norms and institutions may restrict them in their decision-making capacities (cf. Balk 1994; Jejeebhoy 1995; Mason 1986). Only in Kenya do the non-traditional empowerment indicators translate into additional impacts in favour of contraceptive use and choice of more effective methods over non-use. The general importance of husband's education across contexts suggests that couple dynamics are important to take into consideration when analysing use of contraception. Husband's education may work through a wider educational gap between spouses, but it may also have an impact in itself. The result showing that husband's education is positively and strongly associated with contraceptive use, net of the woman's education, empowerment, household wealth, and several other mediating factors in all countries except for Zambia, is an interesting finding in itself. In Zambia, household wealth is a more important factor in determining contraceptive use.

Our results confirm that having an education results in an increased use of contraceptives, yet the impact of a woman's education varies according to context, reflecting region, culture, and level of development. When assessing our results, we need to remember that our investigation is focused on the difference between no education at all and some education. In this respect, the decision-making seems to evolve around use versus non-use rather than choice between different methods according to effectiveness. It may be that secondary and higher education substantially affect choice of contraception in favour of more effective methods. It may also be that access to family planning programmes mediates the education/income effect, in that women with no education/poor women receive effective contraceptives such as injectables

from public providers, which seems to be the case in Ghana and Madagascar. Our results, which show an insignificant yet positive association between education and contraceptive use in Kenya and a significant, positive association in the other countries, net of all other individual and couple-level factors, indicate that the association between education and contraceptive use is not always stronger in more literate contexts and in countries with higher income and greater gender equality.

Overall, our findings point to the need for further research into what factors contribute to the differences in the associations between education, empowerment and contraceptive use, including the choice between different methods. In particular, future research should explore the role of couple dynamics more closely and also further explore the impact of education at community level, a subject more recently explored. These include examining the way the role of other women's education may impact on the individual woman net of her own education and assets.

## Conclusion

We have highlighted interesting new findings with respect to the association between education and empowerment and contraceptive use in Ghana, Kenya, Madagascar and Zambia. Specifically, we have ruled out a number of factors which could have confounded the relationship between education/empowerment and contraception use, and have highlighted the need for further investigation into how this dynamic has progressed. Our main findings confirm that education is positively associated with use of contraceptives, yet the impact of a woman's education varies according to context, reflecting region, culture, and level of development. In the Sub-Saharan contexts under study, education matters more for deciding between use versus non-use than it does for the choice of method. Moreover, empowerment has little additional impact, net of everything else. These findings emphasize our need to know more about the factors that mediate the impact of non-traditional empowerment and generate methods use disparities. In particular, we need to investigate couple dynamics and the community effects of other women's education and attitudes that may shape a woman's reproductive behavior.

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<sup>i</sup> According to the World Bank, empowerment is the process of enhancing the capacity of individuals or groups to make choices and to transform those choices into desired actions and outcomes.

<sup>ii</sup> The methodology involved in the collection of DHS data has been described in its entirety by for example Rutstein and Rojas (2006).

<sup>iii</sup> Odds ratios represent the odds of an outcome occurring given a particular exposure, compared to the odds of that the outcome will occur in the absence of that exposure. OR=1; exposure does not affect the odds of the outcome, OR<1; exposure associated with lower odds of the outcome compared to no exposure, OR>1; exposure associated with higher odds of the outcome compared to no exposure.

<sup>iv</sup> Results not shown but available upon request.

<sup>v</sup> Results not shown but available upon request.