

DEMOGRAPHIC RESEARCH

A peer-reviewed, open-access journal of population sciences

DEMOGRAPHIC RESEARCH

VOLUME 46, ARTICLE 17, PAGES 503–546

PUBLISHED 23 MARCH 2022

<https://www.demographic-research.org/Volumes/Vol46/17/>

DOI: 10.4054/DemRes.2022.46.17

Research Article

Accuracy of wives' proxy reports of husbands' fertility preferences in sub-Saharan Africa

Dana Sarnak

Stan Becker

© 2022 Dana Sarnak & Stan Becker.

This open-access work is published under the terms of the Creative Commons Attribution 3.0 Germany (CC BY 3.0 DE), which permits use, reproduction, and distribution in any medium, provided the original author(s) and source are given credit.

See <https://creativecommons.org/licenses/by/3.0/de/legalcode>.

Contents

1	Introduction	504
2	Methods	507
2.1	Data and measures	507
2.2	Analyses	511
3	Results	513
3.1	Couple fertility preferences	513
3.2	Wives' perceptions of husbands' fertility preferences and accuracy of the perceptions	516
3.3	Accuracy and total fertility rates	520
3.4	Accuracy and family-planning use	521
4	Discussion	525
5	Implications and recommendations	529
6	Strengths and limitations	531
7	Conclusions	532
8	Acknowledgments	532
	References	534
	Appendix: Derivation of accuracy measure	542

Accuracy of wives' proxy reports of husbands' fertility preferences in sub-Saharan Africa

Dana Sarnak¹

Stan Becker²

Abstract

BACKGROUND

Demographic researchers have recognized the importance of male partners in reproductive behavior and decision-making. Yet much of the existing literature still relies on female respondents reporting on behalf of their spouses.

OBJECTIVE

The objective of this study is to estimate the accuracy of wives' reports of husbands' fertility preferences in 32 countries in sub-Saharan Africa.

METHODS

We used couple-level data from Demographic and Health Surveys to evaluate the accuracy of wives' reports of their husbands' fertility preferences in 32 countries in sub-Saharan Africa. We created a measure of accuracy based on each partner's response to a set of fertility preference questions. We examined the overall percentages of wives who were accurate, inaccurate, or uncertain across countries.

RESULTS

Despite the fact that most couples were concordant in wanting more children, we found variation in the percentages of wives who were accurate in their proxy reports, ranging from 26% in Chad to 58% in Rwanda. By contrast, percentages of wives who were inaccurate were similar; approximately one-third of wives across all countries gave proxy responses that were at odds with their husbands' responses. Large percentages of wives were uncertain of their husbands' fertility preferences, reaching 50% in Comoros.

CONCLUSIONS

These findings indicate low levels of spousal discussion of fertility preferences. We encourage survey organizations to invest in collecting data from males directly.

¹ Johns Hopkins Bloomberg School of Public Health, USA. Email: dsarnak1@jhu.edu.

² Johns Hopkins Bloomberg School of Public Health, USA.

CONTRIBUTION

By demonstrating that majorities of wives across countries either inaccurately perceive or are uncertain of their husband's fertility preferences, the current study justifies collecting data from male partners directly.

1. Introduction

Fertility levels and trends have critical consequences for population growth, age structure, economic growth and development, and women's status (Ashraf, Weil, and Wilde 2013; United Nations 2020; Upadhyay et al. 2014). While most scholars agree that including a male point of view in fertility research is important, especially in the context of heterosexual marital/in-union relationships, the overwhelming focus in data measurement and analysis has been on the fertility experiences (desires, preferences, and actual childbearing) of women. Since we know fertility decisions and actual fertility involve interactions between at least two individuals, we have an incomplete picture of fertility changes when we fail to take couple perspectives into account.

Couple perspectives on fertility have important consequences in several areas of fertility research. On an aggregate level, couple fertility preferences may illuminate the dynamics of fertility transitions. Fertility decline in sub-Saharan Africa is the focus of much current demographic research as it is ongoing and patterns of fertility decline – including driving factors and the speed of and stalls in fertility decline – in this region are distinct from other regions of the world (Bongaarts 2008, 2017; Liu and Raftery 2020; Pritchett 1994; Schoumaker 2019). To better understand how fertility patterns have changed over time or could be expected to change in the future, researchers often examine fertility preferences, such as the desire for more children, ideal family size, and wantedness of the last pregnancy (Bongaarts 2017; Casterline and Agyei-Mensah 2017). These researchers have shown aggregate-level fertility preferences to be associated with fertility decline across global regions and countries, yet these large demographic studies have utilized data from only women. It remains to be seen if fertility preferences of the couple provide greater insight into patterns of fertility decline.

Longitudinal studies from a wide variety of settings have also shown that couple fertility preferences, based on reports from both spouses, are strong predictors of the subsequent fertility of the couple. Specifically, the percentage of couples who went on to have a subsequent birth was highest when both partners reported a desire for more births at baseline, compared to when only one or neither reported a desire for more births (Bankole 1995; DaVanzo, Peterson, and Jones 2003; Gipson and Hindin 2009; Machiyama et al. 2015; Shreffler et al. 2019; Thomson 1997; Thomson and Hoem 1998).

For example, in the most recent study in Malawi (Machiyama et al. 2015), predicted probabilities of having a child or becoming pregnant over three years rose from 33% when spouses were concordant in their desire to stop childbearing to 47% or 48% when one wanted to stop but not the other, and further to 63% when both wanted more children.

Another area of fertility research where couple perspectives are important and underutilized is fertility preference measurement. An increasing number of surveys ask women to report on their husbands' preferences, desires, and behaviors (e.g., Demographic and Health Surveys, Performance Monitoring for Action). Indeed, many studies that claim to examine couple- or partner-level dynamics, behaviors, and communication use only one partner's reports about his or her partner, most often the wife reporting on her husband. When comparing male and female partner reports, women's responses are often considered the gold standard in reporting objective fertility events defined as pregnancy, birth, and child loss (Fikree, Gray, and Shah 1993). Yet studies that have compared female and male partner reports of these experiences have mixed results; while some studies find that men overreport the number of children ever born, others find that men underreport pregnancies and abortions (Ratcliffe et al. 2002; Velema et al. 1991). The assumption that a wife truly knows and reports accurately on more subjective measures, such as her partner's attitudes and desires, may be problematic, and the level of accuracy will vary based on what the female partner is asked to identify. By using women as proxy reporters for their partners, researchers frequently produce analytic results that differ from those obtained directly from men, which may be due to female partners' misperceptions, often combined with a lack of communication between spouses (Becker 1996; Greene and Biddlecom 2000; Miller, Severy, and Pasta 2004; Testa, Cavalli, and Rosina 2014).

While numerous studies report on the concordance of fertility preferences between spouses (e.g., Bankole and Singh 1998; Diro and Afework 2013; Gebreselassie and Mishra 2011; Uddin, Hossin, and Pulok 2017), few recent studies in developing country contexts have estimated how accurately women perceive the fertility preferences of their male partners. The distinction is subtle but important. Accuracy of the perception of a partner's fertility preferences can be compared to some 'truth' (i.e., the actual fertility preferences reported by the partner). Whether perceptions are accurate is important for survey measurement if the proxy report is meant to represent the actual fertility preferences of the partner. A mixed-methods study in Uganda (Wolff, Blanc, and Ssekamatte-Ssebuliba 2000) found that in the absence of spousal communication on fertility preferences, indirect forms of communication led female partners to often overestimate their husbands' desires for additional children. One study in Malawi examined the concordance of fertility preferences and contraceptive use in couples (Baschieri et al. 2013). The husbands and wives in monogamous relationships in this study perceived that their fertility preferences were more concordant than they actually

were, revealing inaccurate perceptions on both sides. Another more recent study in Malawi (Huber, Garver, and Norris 2017) used couple-level data to explore whether the husband's desires to conceive or avoid pregnancy as perceived by the wife were congruent with the husband's actual desires and vice versa. Results showed that the observed level of accuracy for the wife's understanding of the husband's desires was 66% and the observed accuracy for husbands understanding of wife's desires was 69%.

Despite limited evidence, understanding the accuracy of wives' perceptions of their husbands' fertility preferences has important implications for research on fertility and family planning. For survey organizations and researchers interested in partner dynamics, there is a measurement issue at stake when surveys ask wives to proxy report: What information and knowledge do we lose when we rely on a female partner's reports of her male partner's fertility preferences? Because previous studies on this topic have focused on small, nonrepresentative samples or have been conducted with qualitative methods, there is a gap in our understanding of the prevalence of inaccuracy. This study attempts to fill the gap by creating a measure of accuracy in proxy reporting and describing its prevalence on a national level.

This paper also attempts to connect the question of accuracy with broader trends in fertility. We hypothesize that in lower fertility contexts, wives may be more likely to perceive their partners' fertility preferences accurately. Given that lower fertility reflects an intentional control of fertility, couples in these contexts may be having discussions around reproductive decision-making that could result in a couple's (or one partner's) deliberate decision to control fertility (Coale 1973). By contrast, in higher fertility contexts, women may be less likely to have accurate perceptions as there may be less of a need or expectation to discuss controlling fertility, or it may even be taboo (Oyediran, Isiugo-Abanihe, and Bankole 2006). More generally, spousal communication around family size and timing of births may moderate the link between accurate perceptions of spousal fertility preferences and subsequent reproductive outcomes.

Moving from aggregate patterns to individual-level behaviors, this paper also aims to elucidate how accuracy in perception may predict contraceptive behavior. Just as spousal communication may help explain the link between accuracy and subsequent reproductive trends, it also helps to explain a link between accuracy and subsequent couple-level reproductive behaviors. Studies have shown that spousal communication about family size is related to limiting births, specifically among women who want no more children (Babalola et al. 2017). Spousal communication has also been prospectively linked with contraceptive use, though these studies use data from only women (Bawah 2002; Sarnak et al. 2021). Still, based on this evidence, we would expect wives who accurately perceive their husbands' preferences to be more likely to use contraception than those who are inaccurate, among couples in which both partners desire to limit

childbearing. In this way, accuracy in reporting may produce insights for family-planning programming.

The objective of this study is to estimate the accuracy of wives' reports of their husbands' fertility preferences in 32 countries in the sub-Saharan region of Africa. In addition to providing a descriptive account of wives' accuracy across these countries, we also test two hypotheses. First, we examine the levels of accuracy from an ecological perspective by investigating the relationship between the proportion of women who are accurate on a country level with the total fertility rate (TFR) of the country. We hypothesize that in countries with lower TFRs, the proportion of women who are accurate will be higher. Second, among couples in which both partners desire no more children, we hypothesize that prevalence of contraceptive use will be highest in couples where the wives are accurate.

2. Methods

2.1 Data and measures

Data for this study come from the Demographic and Health Surveys (DHS), nationally representative household surveys that are conducted approximately every five years in participating countries and collect data on key population and health indicators. The DHS uses a multistage, stratified cluster design. We used the couple data sets provided by DHS, which are created by linking eligible and interviewed men and women from the same households who are in union.

This analysis included sub-Saharan African countries with a DHS conducted in the past ten years (since 2010); for countries with more than one DHS in this time period, we use the most recent survey. Within countries, only couples who were concordant in their reporting of being monogamous were included. Due to the way that fertility preference questions are currently asked in the DHS, there is no way to reliably include men and women who are in polygamous relationships as it is not possible to match husbands' responses to any specific wife or partner. Among the 32 countries included, the percentage of polygamous couples ranges from 2% in South Africa to 44% in Guinea. Therefore, results from this analysis will be generalizable only to monogamous couples. Couples in which one partner reported he/she was sterilized or infecund were also excluded.

Table 1 presents the questions and response categories from the DHS questionnaire that were used to evaluate whether a wife's perception of her husband's fertility preference was accurate.

Table 1: DHS questionnaire items and response categories used to create the accuracy measure

DHS questionnaire items	Respondents	Questions	Response categories
Fertility preference	Both partners	"Would you like to have (a/another) child, or would you prefer not to have any (more) children?"	Have another Undecided No more
Ideal family size	Both partners	"If you could go back to the time you did not have any children and could choose exactly the number of children to have in your whole life, how many would that be?"	Numeric response Nonnumeric response
Number of living children	Both partners	Total number of live births minus the number of children born alive but later died	Numeric response
Wife proxy report	Wife only	"Does your husband/partner want the same number of children that you want, or does he want more or fewer than you want?"	Same number More children Less children Don't know

Table 2 demonstrates how the accuracy of wives' perceptions of their husbands' fertility preferences was determined. We began with the joint fertility preference of the couple, derived from the husband's and wife's responses to the fertility preference question, "Would you like to have (a/another) child, or would you prefer not to have any (more) children?" Response categories were as follows: have another, no more, or undecided (partners who responded 'sterilized' or 'declared infecund' were removed from the analytic sample). The nine possible joint fertility preferences of the couples are represented in the nine rows of Table 2 (rows C1–C9).

We compared this response with the proxy-report question (i.e., the wife's perception of her husband's fertility preference), "Does your husband/partner want the same number of children that you want, or does he want more or fewer than you want?" Possible response categories were as follows: "we want same," "he wants more than me," "he wants fewer than me," and "I don't know." These are shown in the four column headers (columns W1–W4). By cross-tabulating the responses to these three survey questions, we determined whether the wife was accurate or inaccurate in her perception. For example, if the husband reported that he wanted more children and the wife reported that she wanted no more children (row C2), and the wife responded that her husband "wants more than [her]" to the perception question (column W2), her perception is classified as accurate. By contrast, if the husband reported that he wanted more children and the wife reported that she wanted no more children (row C2), and the wife perceived they wanted the same number of children (column W1), her perception is classified as inaccurate.

Table 2: Classification of accuracy of wife’s perception of her husband’s fertility preference, by joint fertility preferences

		Wife’s perception of husband’s fertility preference			
		W1 “We want same”	W2 “He wants more than me”	W3 “He wants less than me”	W4 “I don’t know”
Couple joint fertility preference	C1 Husband wants no more, wife wants no more	✓	✗	✗	—
	C2 Husband wants more, wife wants no more	✗	✓	✗	—
	C3 Husband wants no more, wife wants more	✗	✗	✓	—
	C4 Husband wants more, wife wants more	If HDAC=WDAC ✓ Otherwise ✗	If HDAC>WDAC ✓ Otherwise ✗	If HDAC<WDAC ✓ Otherwise ✗	—
	C5 Husband undecided, wife wants no more	✗	✓	✗	✓
	C6 Husband undecided, wife wants more	If HDAC=WDAC ✓ Otherwise ✗	If HDAC>WDAC ✓ Otherwise ✗	If HDAC<WDAC ✓ Otherwise ✗	✓
	C7 Husband wants no more, wife undecided	✗	✗	✓	✓
	C8 Husband wants more, wife undecided	If HDAC=WDAC ✓ Otherwise ✗	If HDAC>WDAC ✓ Otherwise ✗	If HDAC<WDAC ✓ Otherwise ✗	✓
	C9 Husband undecided, Wife undecided	If HDAC=WDAC ✓ Otherwise ✗	If HDAC>WDAC ✓ Otherwise ✗	If HDAC<WDAC ✓ Otherwise ✗	✓

Accuracy classification:

 Accurate
  Inaccurate
  Uncertain

Notes: HDAC = husband desired additional children, WDAC = wife desired additional children, DAC = ideal family size – number of living children.

In the exploratory data phase, we found that fairly large proportions of women across countries responded “I don’t know” to the perception question. Therefore, we created a third category of women whose perceptions were classified as uncertain. Continuing from the prior example, if the husband reported that he wanted more children and the wife reported that she wanted no more children (row C2), and she responded that

she didn't know his fertility preferences (column W4), her perception was classified as uncertain.

In cases where both partners reported wanting more children (row C4), we created a measure of each partner's 'ideal number of additional children desired,' herein referred to as 'number of additional children desired,' to assess the accuracy of wives' perceptions. The measure of the number of additional children desired was derived by subtracting the number of living children from the ideal family size reported ("If you could go back to the time you did not have any children and could choose exactly the number of children to have in your whole life, how many would that be?"). A caveat to this measure should be acknowledged. The wording of the ideal family size question when asked to those who already have children may not align with the current fertility preferences of the respondent. Respondents may report an ideal family size smaller than their current family size or may report wanting an ideal family size larger than they realistically plan to have. Both scenarios reflect hypothetical family size goals, which may not be the same as practical goals that are based on other factors that drive fertility decisions (e.g., economic, social). Despite the criticism over the ideal family size measure, and in the absence of a survey question that asks how many (more) children the respondent wants, our approach to measure of 'number of additional children desired' has been used by other authors (e.g., Akram et al. 2020; Feyisetan and Casterline 2000; Ibisomi et al. 2011). Where the calculated number of additional children desired for either partner was less than zero, meaning that their ideal family size was less than their number of living children, his/her number of additional children desired was recoded to zero.

We illustrate the evaluation of her accuracy if both spouses reported wanting more children with an example: If both spouses reported wanting more children (row C4), we compared the number of additional children desired. If the husband's number of additional children desired was four and the wife's number of additional children desired was one, and the wife reported that her husband wanted more children than her (column W2), we would classify her response as accurate. On the other hand, if she responded that they wanted the same (column W1) or that he wanted less than her (column W3), we would classify her as inaccurate in perceiving her husband's fertility preference. If she responded she did not know (column W4), she was classified as uncertain.

Finally, we illustrate the evaluation of accuracy when one or both partners reported being undecided to the fertility preference question (rows C5–C9). While these joint fertility preferences take up half of Table 2, on average this only represents 10% of couples across countries. Partners who reported they were undecided to the fertility preference question were considered to want more children, in line with the current definition for the unmet need for contraception (Bradley, Croft, and Fishel 2012), and further supported by evidence that these respondents are more similar to those who want more than to those who report wanting no more (Becker and Sutradhar 2007). Therefore,

in couples where one partner was undecided and the other wanted more children (rows C6 and C8), or if they were both undecided (row C9), the classification of accuracy across the wife's perception was treated as if the husband wanted more and wife wanted more (e.g., similar to row C4) and classified as outlined in the section above.

The only differences to the classification of accuracy for couples where one partner was undecided and the other wanted more children (rows C6 and C8), or if they were both undecided (row C9), were in the cases that the wife reported she didn't know his fertility preference (column W4). Instead of classifying her perception as uncertain, as we did in row C4 when both partners reported wanting more children, we classified her as accurate. For example, if the husband was undecided about future childbearing and the wife wanted more (row C6), and the wife responded that she didn't know his fertility preference (column W4), we thought her "I don't know" response could be considered accurate.

Similarly, the joint fertility preference of the couple for an undecided husband and a wife wanting no more children (row C5) is considered the husband wanting more and the wife wanting no more and therefore the accuracy classification of that row resembles row C2. The joint fertility preference of the couple for a husband that wants no more and an undecided wife (row C7) is considered the husband wanting no more and the wife wanting more, and the accuracy classification resembles row C3. Again, in the case that one partner was undecided, we classified a wife's "I don't know" response to the perception as accurate; if one partner's fertility preferences were undecided and the couple had discussed fertility preferences, it may be hard to answer the perception question that includes a comparative component.

Full details of the derivation of the accuracy measure for the complete range of couple response combinations, including how we dealt with nonnumeric ideal family size or internal inconsistencies in fertility preference measures within respondents, can be found in the Appendix.

2.2 Analyses

First, we examined the distribution of couples' joint fertility preferences within countries. We tabulated the number of couples who were concordant in their fertility preferences (both partners wanting more, both partners wanting no more, or both undecided), as well as the number of couples who were discordant (wife wants more, husband wants no more; wife wants no more, husband wants more; wife wants more, husband undecided; wife wants no more, husband undecided; wife undecided, husband wants more; and wife undecided, husband wants no more). We use the kappa statistic to measure how likely

the concordance of couple's fertility preferences departs from chance. Regional and overall medians were computed.

Second, we tabulated the distributions of wives' responses to the perception question within countries. Then, using our constructed measure of accuracy, we examined the overall percentages of wives who were accurate, inaccurate, or uncertain across countries by region. We present descriptive statistics, such as medians and means, to summarize regional and overall patterns.

Third, to test the country-level relationship between the proportion of wives who are accurate in each country with the country's TFR, we regressed the proportions of wives who were accurate, inaccurate, or uncertain on observed TFRs. We used the TFR as a proxy for the stage of the country's fertility transition to determine whether wives in countries further along in the fertility transition were better at perceiving their partners' fertility desires accurately. We used the TFR for each country published in the DHS STATcompiler for the respective survey, which is based on births in the three-year period prior to the survey (USAID 2020).

Fourth, we conducted analyses among the subset of couples in which both partners reported wanting no more children to examine the robustness of the accuracy measure. In these couples, the evaluation was more straightforward than for other pairings: for example, when both partners want more children and we had to compare the numeric values of the numbers of additional children desired. When both partners reported wanting no more children, only when the wife perceived that they wanted the same was she classified as accurate; we did not have to make assumptions about those reporting they were undecided or use the responses to the ideal family size question. We tabulated contraceptive use (traditional, folkloric, or modern) in this group by wives' accuracy, comparing use in couples where the wife accurately reported her partner's fertility preference versus use in couples where the wife was inaccurate versus where the wife reported she was uncertain of his fertility preferences. We used a design-based global F test to test the null hypothesis of no differences across the three groups.

All analyses were conducted using Stata 16 (StataCorp LLC 2020) and incorporated the `svy` command to adjust for complex survey design and sample weights; one exception was for the kappa statistics, where weighted analyses are not possible. In the absence of a couple sampling weight (Becker and Kalamar 2018), we used the men's weight for the couple as it is recommended by the DHS because their response rates are more variable (Demographic and Health Survey 2016).

3. Results

3.1 Couple fertility preferences

Table 3 shows the distribution of concordance on fertility preferences for couples in each of the 32 countries. In an overwhelming majority of countries (22 out of 32), both partners in more than half of the couples reported wanting more children (column 4), though the percentages vary by region (median 59%, range 30% to 86%). The percentages of couples where both partners wanted more children was highest in West Africa (median 65%, range 45% to 86%), followed by Central Africa (median 62%, range 44% to 76%). In East and Southern Africa, percentages of couples where both partners wanted more children were close to or below half (medians of 51% and 41%, respectively).

Table 3: Distribution of couple fertility preferences among monogamous couples

Subregion and country (col 1)	Couple fertility preferences								Kappa statistic x 100 (col 10)
	Year of survey (col 2)	Number of couples (col 3)	Both want more (col 4)	Neither wants more (col 5)	Wife more, husband no more (col 6)	Husband more, wife no more (col 7)	Either or both partner(s) is(are) undecided (col 8)	Concordant fertility preferences (col 9)	
<i>West</i>									
Benin	2017–18	2,356	60	14	6	8	12	75	43
Burkina Faso	2010	2,907	74	10	4	9	3	84	48
Cote d'Ivoire	2011–12	1,405	65	9	7	7	12	75	36
Gambia	2013	840	81	3	2	6	8	84	24
Ghana	2014	1,407	45	24	8	9	14	70	46
Guinea	2018	1,290	73	3	4	10	11	75	14
Liberia	2013	1,584	52	15	11	9	13	68	29
Mali	2018	1,838	67	5	10	9	9	72	16
Niger	2012	1,684	86	1	1	6	6	87	14
Nigeria	2018	5,576	61	14	7	7	9	76	45
Senegal	2018	1,064	79	4	1	11	5	83	28
Sierra Leone	2013	2,275	58	10	7	10	15	70	30
Togo	2013–14	1,476	52	20	9	9	10	73	44
Median			65	10	7	9	10	75	30

Table 3: (Continued)

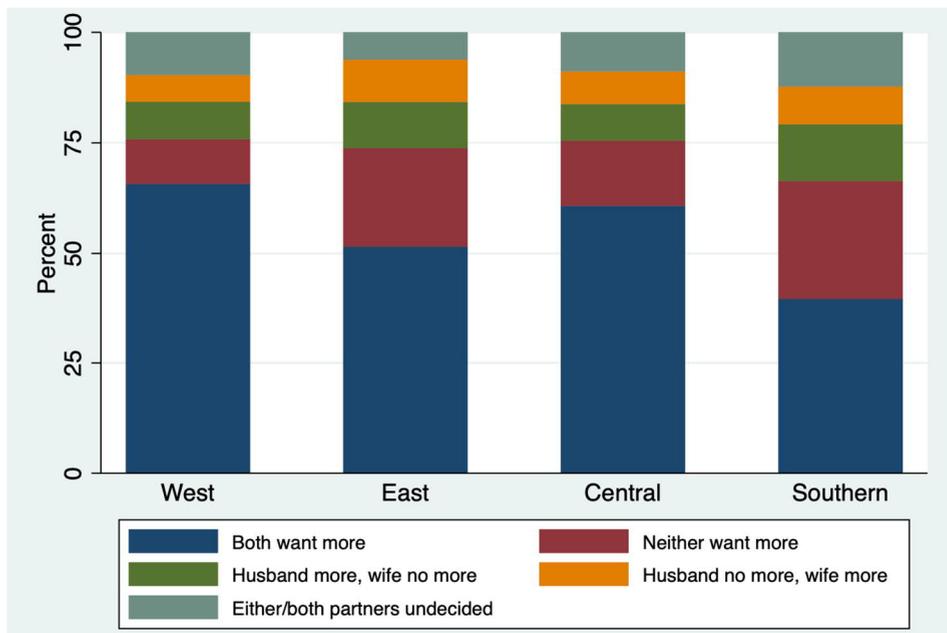
Subregion and country (col 1)	Year of survey (col 2)	Number of couples (col 3)	Couple fertility preferences					Either or both partner(s) is(are) undecided (col 8)	Concordant fertility preferences (col 9)	Kappa statistic x 100 (col 10)
			Both want more (col 4)	Neither wants more (col 5)	Wife more, husband no more (col 6)	Husband more, wife no more (col 7)				
<i>East</i>										
Comoros	2012	657	61	12	10	9	8	74	38	
Ethiopia	2016	5,301	49	20	9	14	8	69	37	
Kenya	2014	4,533	41	33	9	11	6	73	51	
Rwanda	2014–15	2,667	40	38	12	7	2	78	58	
Tanzania	2015–16	1,274	65	12	8	10	6	77	41	
Uganda	2016	1,850	53	19	9	12	6	73	43	
Median			51	20	9	10	6	74	42	
<i>Central</i>										
Burundi	2016–17	3,180	44	32	12	9	2	76	54	
Cameroon	2018	1,886	55	15	9	9	11	71	38	
Chad	2014–15	1,652	76	5	3	6	10	82	29	
Congo	2011–12	1,910	65	11	6	6	11	77	37	
DRC	2013–14	3,380	65	13	7	9	7	78	41	
Gabon	2012	1,553	59	13	7	10	11	72	28	
Median			62	13	7	9	11	77	38	
<i>Southern</i>										
Angola	2015-16	1,795	41	17	9	12	22	59	20	
Lesotho	2014	686	33	39	5	19	4	72	46	
Malawi	2015–16	2,997	44	28	9	10	9	71	45	
Namibia	2013	763	30	27	10	13	20	57	26	
South Africa	2016	570	31	33	12	12	12	65	37	
Zambia	2018	4,845	50	21	7	11	11	71	44	
Zimbabwe	2015	3,166	50	23	7	12	8	73	48	
Median			41	27	9		11	71	44	
Overall median			59	13	8	9	9	71	44	

Countries in the Southern Africa region had the highest percentages of couples where both partners reported wanting no more children (column 5; median 27%, range 17% to 39%). In all countries in the Southern Africa region with the exception of Angola, over one-fifth of both partners reported wanting no more children. The percentage of couples where both spouses wanted no more children was lowest in the West Africa region (median 10%, range 1% to 24%). When partners were discordant on their fertility preferences, in 21 out of 32 countries, it was more common for the husband to want more children while the wife wanted no more (column 7); these percentages ranged from 6% in the Gambia and Niger to 19% in Lesotho. In six countries, the percentage of couples in each discordant category was equal (column 6 vs. column 7). However, in five countries the percentage of couples where the wife wanted more and the husband wanted no more (column 6) was the more likely scenario among discordant couples – Rwanda (12%), Burundi (12%), Liberia (11%), Mali (10%), and Comoros (10%) – although the difference between the two scenarios was only 1% to 3% in all countries except Rwanda (12% vs. 7%). Of note, in approximately 10% of couples in all countries, one or both partners reported being undecided (column 8), ranging from 2% of couples in Burundi to 22% in Angola. The regional means, which exhibit the same patterns as the medians, are shown in Figure 1.

Column 9 of Table 3 shows the overall percent concordance of fertility preferences (i.e., the sum of columns 4 and 5, plus the couples in which both partners were undecided). In 29 countries, over two-thirds of spouses were concordant in fertility preferences (median 71%), ranging from 57% in Namibia to 87% in Niger.

Despite these high levels of concordance, there was considerable variation in the kappa statistic. Column 10 shows the statistic multiplied by 100. In almost half the countries (15), the couples fell in the moderate agreement category, with kappa statistics $\times 100$ from 41 to 60; the highest kappa statistics for concordance were seen in Rwanda (58), Burundi (54), and Kenya (51) (Landis and Koch 1977). The other countries fell into the fair or slight agreement categories, with kappa statistics $\times 100$ ranging from 21 to 40 (slight) or 0 to 20 (fair). The West African region had on average the lowest kappa statistics $\times 100$ (median 30); couples in Guinea and Niger had the lowest statistics (14), indicating only a fair agreement.

Figure 1: Percentage of couple fertility preferences, by region of sub-Saharan Africa



Note: Percentages are regional means.

3.2 Wives' perceptions of husbands' fertility preferences and accuracy of the perceptions

The first panel of Table 4 (columns 2–5) displays the distribution of wives' perceptions of their husbands' fertility preferences relative to their own across the 32 countries. Overall, most wives responded that their husbands wanted the same number of children as they did (column 2; median 40%, range 16% to 63%). Across all countries, close to one-fourth of wives believed their husbands wanted more children than they did (column 3; median 23%, range 11% to 44%), while small percentages of wives believed their husbands wanted fewer children than them (column 4; median 7%, range 1% to 19%). Of note, a substantial percentage of wives across countries reported they did not know their husband's fertility preferences (column 5; median 30%, ranging from 8% in Burundi to over 50% in Chad and Niger). Regionally, East and Southern Africa had the highest percentages of wives reporting their husbands wanted the same number of children as

they did (medians of 43% and 42%, respectively), while in countries in West and Central Africa, close to one-third of wives reported this (medians of 32% and 34%, respectively). Countries in West Africa had the highest percentages of wives who reported their husbands wanted more children than them (median 30%). Similarly, countries in West Africa had the highest percentages of wives who said they didn't know their husbands' fertility preferences (median 36%), followed by the Central (median 30%), and East and then Southern (median 25%) regions. The regional means, which exhibit the same patterns as the medians, are shown in Figure 2a.

Table 4: Distribution of wives' perceptions of husband's fertility preferences and the accuracy of the perception

Subregion and country (col 1)	Wife's perception of husband's fertility preference				Wife's accuracy of husband's fertility preference		
	We want same (col 2)	Husband wants more (col 3)	Husband wants fewer (col 4)	I don't know (col 5)	Accurate (col 6)	Inaccurate (col 7)	Uncertain (col 8)
<i>West</i>							
Benin	32	31	6	31	42	32	26
Burkina Faso	45	30	6	19	47	34	18
Cote d'Ivoire	29	17	6	48	36	23	41
Gambia	26	33	1	40	33	30	37
Ghana	51	21	9	19	52	33	15
Guinea	23	30	3	43	34	29	37
Liberia	43	16	4	36	35	34	31
Mali	21	39	4	36	35	33	32
Niger	16	30	2	52	27	25	47
Nigeria	48	33	7	12	46	44	10
Senegal	21	44	3	32	39	30	31
Sierra Leone	35	13	3	49	35	24	42
Togo	41	19	9	32	42	30	28
Median	32	30	4	36	36	30	31

Table 4: (Continued)

Subregion and country (col 1)	Wife's perception of husband's fertility preference				Wife's accuracy of husband's fertility preference		
	We want same (col 2)	Husband wants more (col 3)	Husband wants fewer (col 4)	I don't know (col 5)	Accurate (col 6)	Inaccurate (col 7)	Uncertain (col 8)
<i>East</i>							
Comoros	25	16	5	55	27	23	50
Ethiopia	43	23	7	28	36	39	25
Kenya	60	21	8	11	57	33	10
Rwanda	61	11	19	10	58	33	10
Tanzania	44	20	7	29	42	31	27
Uganda	38	29	11	21	43	37	20
Median	43	21	7	25	43	33	22
<i>Central</i>							
Burundi	58	18	17	8	52	40	8
Cameroon	38	32	7	23	41	41	19
Chad	19	24	3	54	26	26	48
Congo	39	19	11	31	44	31	26
DRC	30	28	12	30	38	35	27
Gabon	30	22	8	39	35	31	34
Median	34	23	9	30	39	33	26
<i>Southern</i>							
Angola	39	25	8	28	39	41	20
Lesotho	42	27	14	17	48	35	17
Malawi	63	16	9	12	54	35	11
Namibia	42	20	3	35	46	26	28
South Africa	54	19	3	25	49	28	23
Zambia	42	23	10	25	42	36	22
Zimbabwe	45	24	18	12	51	38	11
Median	42	23	9	25	48	35	20
Overall median	40	23	7	30	42	33	26

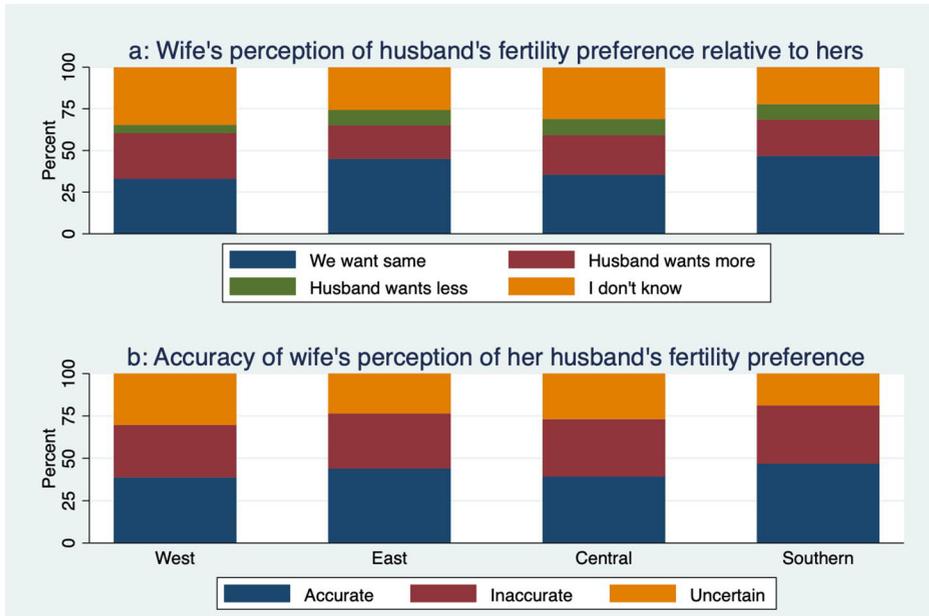
Notes: Percent of wives who reported "I don't know" to the perception question is not identical to the percent who were subsequently classified as uncertain because in a few cases wives who reported "I don't know" were classified as accurate. See Appendix for details.

The second panel of Table 4 (columns 6–8) shows the percent of couples in which the wife accurately perceived, inaccurately perceived, or was uncertain of her husband's fertility preferences. Overall, the percent of accurate preferences ranged from 26% in

Chad to 58% in Rwanda (column 6). In almost all countries, a majority of the wives were inaccurate or classified as uncertain; only in Kenya, Rwanda, Burundi, Malawi, and Zimbabwe were more than 50% of wives' reports classified as accurate. Some regional patterns are apparent. East and Southern Africa had the highest percentages of wives who were accurate (median 43% and 48%, respectively), compared to the Central and West Africa regions (median 39% and 36%, respectively).

Overall, the perceptions of one-third of wives across all countries were classified as inaccurate (column 7; median 33%). These percentages were similar across regions, ranging from a median 30% in the West Africa region to 35% in the Southern Africa region. High percentages of women across all countries were uncertain (column 8), ranging from 8% in Burundi to 48% in Chad (median 26%). Percentages of women classified as uncertain were highest in the West Africa region (median 31%) and Central African region (median 26%) compared to the East and Southern Africa regions (median 22% and 20%, respectively). The regional means are shown in Figure 2b.

Figure 2: Percent distributions of (a) wife's perception of her husband's fertility preference relative to hers and (b) accuracy of her perception, by sub-Saharan Africa region

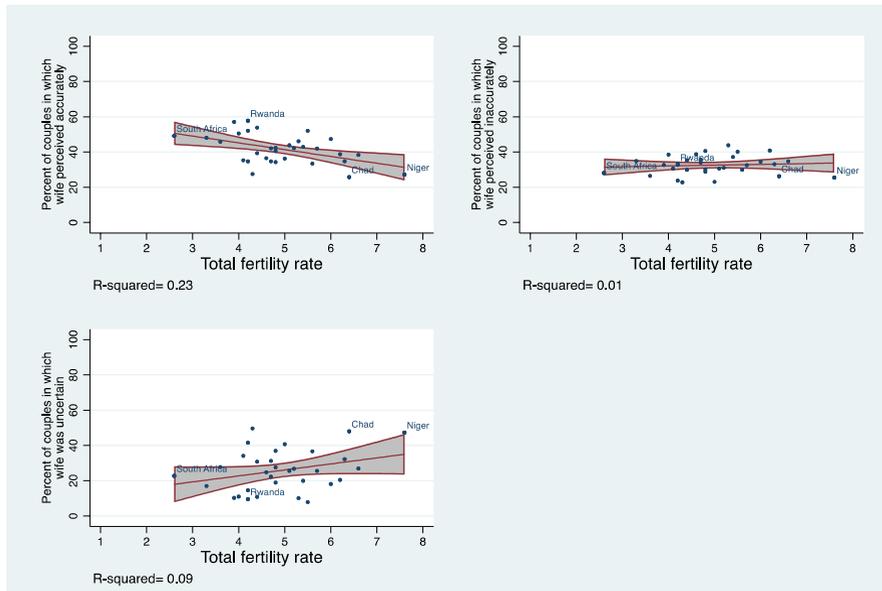


Note: Percentages are regional means.

3.3 Accuracy and total fertility rates

Figure 3 presents a scatterplot of the observed TFR and percent of couples in which the wife was accurate, inaccurate, or uncertain in her perception of her husband's fertility preferences for the 32 countries and includes a best fit line estimated through linear regression with 95% confidence bands. Among the 32 countries in our analysis, we observe a negative correlation between the percent of wives who accurately perceived their husbands' fertility preferences and the TFR. On average, as the TFR of a country increases, the percent of wives who are accurate in the same country decreases ($b = -3.85$; 95% confidence interval [CI] $-6.87, -1.23$; $r^2 = 0.23$). We see no relationship between the percent of wives who inaccurately perceived their husbands' fertility preferences and the TFR. We observe a positive correlation between the percent of wives who were uncertain of their partners' fertility preferences and the TFR ($b = 3.40$; 95% CI $-0.62, 7.42$; $r^2 = 0.09$), though the CI of the regression coefficient crosses 0. The figures also highlight the countries with the lowest and highest TFRs (South Africa and Niger, respectively), as well as the countries with the lowest and highest percent accurate (Chad and Rwanda, respectively).

Figure 3: Scatterplot of the observed TFR and percent of couples in which the wife was inaccurate, accurate, or uncertain of her husband’s fertility preferences for 32 recent DHS surveys of sub-Saharan Africa



Source: Demographic and Health Surveys.

Note: The regression results in the three plots are not independent since the three percentages (accurate, inaccurate, and uncertain) sum to 100.

3.4 Accuracy and family-planning use

Table 5 shows the subgroup analyses in which both partners reported wanting no more children. In 22 countries, the percent accurate was higher in the subgroup as compared to the full sample (column 3 of Table 5 versus column 6 of Table 4). However, high percentages of wives across all countries in this group still provided inaccurate proxy reports or were uncertain of their partners’ fertility preferences; less than half of wives reported accurately in 20 of the 31 countries with adequate sample size (median 44% accurate across all 31 countries).

Table 5: Percentage of wives reporting contraceptive use, by accuracy of her perception, and percentage of wives with accurate perception

Subregion and country (col 1)	All couples where both partners want no more children									
	Total number of couples (col 2)	Percent of wives accurate (she reports they want the same) (col 3)	Number of couples (col 4)	Percent contraceptive use among accurate wives (col 5)	Number of couples (col 6)	Percent contraceptive use among inaccurate wives (col 7)	Number of couples (col 8)	Percent contraceptive use among wives who were uncertain (col 9)	p-value (col 10)	
West										
Benin	339	44	151	36	109	26	79	14	0.008	
Burkina Faso	293	49	145	47	109	32	39	27	0.035	
Cote d'Ivoire	128	37	45	26	37	13	46	20	0.288	
Gambia	25	74	--	--	--	--	--	--	--	
Ghana	320	56	178	30	87	37	55	29	0.537	
Guinea	33	33	--	--	--	--	--	--	--	
Liberia	237	40	96	44	42	25	98	25	0.036	
Mali	80	23	--	--	--	--	--	--	--	
Niger	--	--	--	--	--	--	--	--	--	
Nigeria	804	58	499	48	236	44	69	39	0.495	
Senegal	39	24	--	--	--	--	--	--	--	
Sierra Leone	230	36	80	44	44	35	106	21	0.106	
Togo	274	43	112	32	83	37	78	24	0.170	
Median		41		40		33		24		

Table 5: (Continued)

All couples where both partners want no more children										
Subregion and country (col 1)	Percent of wives accurate (she reports they want the same) (col 2)			Percent contraceptive use among accurate wives (col 5)			Percent contraceptive use among inaccurate wives (col 7)			p-value (col 10)
	Total number of couples (col 2)	Number of couples (col 4)	Percent contraceptive use among accurate wives (col 5)	Number of couples (col 6)	Percent contraceptive use among inaccurate wives (col 7)	Number of couples (col 8)	Percent contraceptive use among wives who were uncertain (col 9)			
East										
Comoros	74	--	--	--	--	--	--	--	--	--
Ethiopia	860	394	49	261	41	205	40	0.059		
Kenya	1,501	1,000	73	367	64	134	57	0.030		
Rwanda	1,021	655	63	267	57	99	57	0.169		
Tanzania	141	76	49	36	61	29	60	0.449		
Uganda	359	142	65	141	45	75	34	0.002		
Median			63		57		57			
Central										
Burundi	1,061	635	36	335	21	91	17	0.000		
Cameroon	292	125	41	115	27	52	43	0.225		
Chad	58	--	--	--	--	--	--	--	--	
Congo	186	80	64	51	43	55	38	0.038		
DRC	376	130	38	127	35	117	17	0.084		
Gabon	184	50	43	45	50	88	33	0.509		
Median			41		35		33			

Table 5: (Continued)

Subregion and country (col 1)	All couples where both partners want no more children									
	Total number of couples (col 2)	Percent of wives accurate (she reports they want the same) (col 3)	Number of couples (col 4)	Percent contraceptive use among accurate wives (col 5)	Number of couples (col 6)	Percent contraceptive use among inaccurate wives (col 7)	Number of couples (col 8)	Percent contraceptive use among wives who were uncertain (col 9)	p-value (col 10)	
Southern										
Angola	217	42	91	20	71	21	55	1	0.000	
Lesotho	258	44	117	76	94	75	47	58	0.207	
Malawi	812	60	499	62	214	63	99	48	0.181	
Namibia	210	50	105	63	39	58	64	61	0.859	
South Africa	196	66	118	56	36	71	42	51	0.191	
Zambia	1,052	42	444	59	371	57	237	49	0.142	
Zimbabwe	762	49	395	81	310	84	57	74	0.349	
Median		49		62		63		51		
Overall median		44		48		43		38		

Note: Following DHS protocol, we have suppressed cells with unweighted $n < 25$ and used italics for unweighted $n \geq 25$ and $n < 49$.

Columns 4–10 of Table 5 compare contraceptive use across the three classifications of wives' accuracy. Among 16 of the 25 countries with an adequate sample size, use was highest among couples in which she perceived his desire for no more children correctly (column 5), compared to when she was inaccurate (column 7) or uncertain (column 8). Of note, use was lowest in couples where wives were uncertain of their husbands' fertility preferences in all but five countries; these differences were notable ($p < 0.05$) in eight of the countries.

4. Discussion

To our knowledge, this is the first study that has attempted to quantify the accuracy of wives' proxy reports of their husbands' fertility preferences across multiple countries using nationally representative data. Using an original measure with couple-level data, we found large variation in the percentages of wives who were accurate in their proxy reports: Percentages ranged from 26% in Chad to 58% in Rwanda, and accuracy was higher in the East and Southern regions as compared to the West and Central regions. By contrast, percentages of wives who were inaccurate were similar across countries; approximately one-third of wives across all countries gave proxy responses that were at odds with their husbands' survey responses. We also found large percentages of wives who were uncertain of their husbands' fertility preferences, reaching 50% in Comoros.

We suggest two explanations for the high percentages of wives classified as inaccurate proxy reporters. The most straightforward explanation relates to spousal communication around fertility and family planning. In general, studies examining the accuracy of proxy reporting in household surveys have demonstrated that questions that generate the greatest discrepancies between proxy reports and self-reports usually concern subjects that are either subjective or not directly observable, and a lack of communication among household members is associated with more discrepant answers (Fulton et al. 2020; Kojetin and Tanur 1996; Schwarz and Wellens 1994). In the present case, inaccurate perceptions may also be based on misinterpreted nonverbal communication. In an in-depth study of negotiation of family size among couples in Uganda, Blanc et al. (1996) find that majorities of husbands and wives who reported never having spoken about limiting childbearing still provided responses of their partners' fertility preferences based on overheard conversations or information from third parties. When wives and husbands do not communicate or miscommunicate about fertility preferences, wives may inaccurately believe their partners want more children when they do not based on pervasive beliefs and aggregate evidence about the presumed pronatalist preferences of men in general (Bankole and Audam 2011; Blanc et al. 1996; Derose, Doodoo, and Patil 2002; Doodoo and Van Landewijk 1996). They could also

believe they are in agreement with their partners on the number of children, when in reality their partners want more or less than they do. Even so, as Wolff, Blanc, and Ssekamatte-Ssebuliba (2000) highlight, "Discussion is no guarantee of knowing a partner's intent" (Wolff, Blanc, and Ssekamatte-Ssebuliba 2000: 127).

A second possible explanation for the high levels of inaccurate proxy reports may be due to social desirability biases. A wife may be uncertain about her husband's preferences but feels that admitting ignorance is undesirable. An additional consideration here is the way in which the DHS survey is administered: The "I don't know" response is not read aloud to the respondent, so the wife may feel inclined to provide a substantive response based on scant information (Beatty et al. 1998). There also may be social desirability bias in husbands' responses to survey questions. DHS reports from Ethiopia, Kenya, Nigeria, Uganda, Tanzania, and Zambia from the 1990s highlighted that when husbands and wives both approved of family planning, their perceptions of spousal approval were often accurate. Nevertheless, in each country surveyed, among couples where wives reported that their spouses disapproved of family planning, the majority of their spouses reported approval of family planning (Central Statistical Authority [Ethiopia]; ORC Macro 2001; Central Statistical Office [Zambia]; Ministry of Health [Zambia]; Macro International Inc. 1997; National Bureau of Statistics [Tanzania]; Macro International Inc. 1997, 2000; National Council for Population and Development [Kenya]; Central Bureau of Statistics; Macro International 1994, 1999; National Population Commission [Nigeria] 2000; Statistics Department [Uganda]; Macro International Inc 1996). However, these published DHS reports cautioned against concluding that wives who had misperceived their husbands' support for family planning had not discussed attitudes toward family planning with their husbands. Rather, they suggest that husbands could have reported more favorable attitudes on family planning to please the interviewer and/or seem more modern. Similar social desirability biases may be at work in the reporting of fertility preferences in the present study, also echoed in Wolff, Blanc, and Ssekamatte-Ssebuliba (2000): Husbands could be overstating their desire to limit childbearing to the interviewer because they may believe that this is what the interviewer wants to hear. In these cases, classifying the wife as inaccurate would be erroneous.

An unexpected finding in the results were the large minorities of wives who reported that they did not know their husbands' fertility preferences, most of whom were subsequently classified as uncertain in the accuracy measure. Further investigation of proxy reporting in other household surveys (e.g., the US census) has revealed that proxy respondents offering "I don't know" responses at high rates is not an uncommon phenomenon (King, Cook, and Childs 2012). We propose three explanations for these high proportions of "I don't know": (1) truthful responses, that is, respondents have true ignorance of the subject matter (Beatty et al. 1998); (2) error-of-omission responses, that

is, respondents don't provide information they have available (Beatty et al. 1998); or (3) responses from women who did not understand the question.

In this study, a truthful "I don't know" response is one in which a wife truly has no information on her husband's fertility preference. Wives may not have communicated (directly or indirectly) about fertility preferences with their spouses recently or at all – a scenario commonly reported by wives in Uganda (Blanc et al. 1996). Even when both partners desire to cease childbearing, there may be factors that impede or complicate spousal discussions, including suspicions of infidelity, desires of other family members, and misinterpretation of indirect forms of communication (Wolff, Blanc, and Ssekamatte-Ssebuliba 2000). Another explanation is that wives believe that their husbands haven't decided a precise number of desired children (e.g., his stated preference for the number of desired children is nonnumeric) (Frye and Bachan 2017). Furthermore, women may not know their husbands' current fertility preferences because such preferences often change (Blanc et al. 1996; Yeatman and Sennott 2014). Wives with an "I don't know" response due to error of omission may have a rough idea of their partners' preferences but choose not to disclose this information due to sensitivity or privacy concerns – a phenomenon consistent with other proxy reporting studies (King, Cook, and Childs 2012; Sudman et al. 1994). Finally, some wives may respond "I don't know" because they have misunderstood the survey question. Thus, we examined whether there were differences in the likelihood of responding "I don't know" to the proxy-report question by level of schooling to inform the explanations above. Women with secondary or higher schooling were less likely to respond "I don't know" to the question than women with primary or less school to the question in 29 out of 32 countries, and the confidence intervals of these odds ratio estimates did not cross 1.00 (referent) in 14 countries. These results suggest that women with less schooling may be less likely to have information on partners' fertility preferences, but they could also reflect a miscomprehension of the survey question.

In the ecological examination of wives' accuracy with the TFR, on average there were higher percentages of accurate wives in countries with lower total fertility rates compared to wives in countries with higher fertility rates. Due to the cross-sectional nature of the data, one cannot infer causality in this relationship, but at least two potential explanations deserve exploration. One possibility is that couples in lower fertility contexts communicate more frequently about family size goals and fertility preferences, resulting in wives being more accurate in their perceptions. Another possibility is that in contexts where family sizes tend to be smaller, wives may be accurate as a matter of probability given the way accuracy was determined. In higher fertility contexts, higher percentages of partners both wanted more children, so accuracy was evaluated by comparing the computed number of additional children desired; for example, in South Africa (TFR of 2.6), in 39% of couples both partners wanted more children compared to

Niger (TFR of 7.6), where both partners wanted more children in 92% of couples. Wives in South Africa would be more likely to correctly guess their husbands' preferences since there is a smaller variance of family sizes (as indicated by the TFR), while a larger variance of family size in Niger makes it less likely for wives to report correctly.

There were higher percentages of wives who were uncertain of their partners' fertility preferences in countries with higher fertility than in countries with lower fertility. This relationship, albeit weak, may signal that communication about family size is less prevalent in higher fertility environments and that high percentages of "I don't know" responses may occur prior to family size being a conscious choice (Coale 1973). That there was no statistical association between the TFR and percent of inaccurate wives implies that regardless of fertility levels, a certain consistent percent of wives are inaccurate. Future research that examines the existence and/or timing of spousal discussions and subsequent fertility, through longitudinal studies, may further elucidate the relationship between reporting accuracy and fertility.

The subgroup analysis among couples in which both partners reported wanting no more children was intended as a robustness check of our accuracy measure. For these cases we did not have to utilize data from the ideal family size measure, which has been criticized in the literature (Casterline and El-Zeini 2007; Johnson-Hanks 2007). Since the desire to cease childbearing requires effort and deliberation, we expected that these couples would have been more likely to discuss fertility preferences than the overall couple population. Relatedly, Blanc et al. (1996) find that couples in Uganda were more likely to have discussed the immediate decision of whether or not to have another child than to discuss an 'abstract' number of children to have (Blanc et al. 1996). Indeed, in a majority of countries, wives' reporting accuracy was higher among these couples than among the full sample of couples, yet the absolute proportion of wives who were accurate in this subgroup was still low. This result suggests that even among couples in which both partners desire to cease childbearing, there may be either a lack of spousal communication or miscommunication between partners.

Further, we hypothesized that in this group, contraceptive use would be highest among those couples in which the wife accurately perceived that her husband wanted no more children. We postulated that wives who were accurate were more likely to have communicated with their husbands about fertility preferences and thus expected that contraceptive use would be more likely when wives knew they and their partners were in agreement. Likewise, we believed that inaccurate wives would be less likely to report contraceptive use since they did not know their husbands also wanted to limit childbearing. The results supported our hypothesis that use was highest among accurate wives. Yet unexpectedly, in most countries, use was lowest among wives who reported they were uncertain of their partners' fertility preferences rather than among wives who

were inaccurate. These findings have important implications as all these couples who were not using contraceptives had an unmet need for contraception.

5. Implications and recommendations

These findings have implications for researchers and survey organizations in the fields of demography, sociology, and family planning, as well as family-planning providers and programs. First, our analysis underscores the importance of using couple data: While many scholars have advocated for the use of couple data, our analysis quantifies what exactly is lost when researchers rely on only the proxy reports provided by wives. Though exact percentages vary by region, in most countries, the majority of wives were classified as inaccurate or uncertain proxy reporters of their husbands' fertility preferences. While the distinction between inaccurate and uncertain is an important nuance, these groups are similar in the sense that neither provides an accurate proxy measure of the husbands' fertility preferences. These inaccuracies could extend to other subjective measures that are proxy reported. For example, there is a large literature about partner opposition to family planning, much of which does not include data from male partners (Machiyama et al. 2017; Prata et al. 2017; Sedgh and Hussain 2014). Researchers that use survey items based on wives' proxy reports must clarify that in the absence of collecting data from male partners, they are making inferences based on partner perceptions. While wives' perceptions are certainly important in their own right, researchers should take care not to make conclusions using these measures as if they were actual responses from partners. Therefore, given that DHS already interviews men in many countries, researchers should use couple data when examining fertility and contraceptive behaviors and decision-making by couples.

Our findings also have implications for survey organizations. We recommend that survey organizations collecting data on fertility and reproductive behavior in sub-Saharan Africa who do not yet interview males invest in interviewing men. Investigations of male perspectives on fertility have been impeded by the logistic and financial costs of interviewing males in social and demographic surveys whose target population of interest is females. However, adding men will not require doubling costs or efforts since survey takers are already traveling to respondents' homes. The DHS minimizes added costs by interviewing men in only one-third of the households that are selected for the female questionnaires and administering a survey to men that is about one-third the length of the female questionnaire. Teams frequently already have a male member who can also serve as the interviewer for the male survey. Thus, adding male partners to survey efforts may pose less of a challenge than assumed.

Our results suggest possible refinements to the DHS as well. High levels of “I don’t know” responses across countries suggest that the survey question on perceptions of husbands’ fertility preferences could be clarified. We propose four recommendations to improve information gathering and subsequent analysis of this question in the DHS. First, the comparative phrasing of the question “Does your husband/partner want the same number of children that you want, or does he want more or fewer than you want?” is unnecessarily convoluted. The question is better in absolute rather than comparative terms, such as “Do you think your partner would like to have (a/another) child, or would he prefer not to have any (more) children?”

Second, many women, particularly in the sub-Saharan Africa context, may be in polygamous unions. Therefore, the survey question should specify whether the question relates to fertility preferences of the husband in general or specifically with the respondent, such as “Do you think your partner would like to have (a/another) child with you, or would he prefer not to have any (more) children with you?”

Third, a follow-up question to wives who answer “I don’t know” to the question would provide insight. Interviewers could probe these respondents to clarify their uncertainty on a multiple-select option, thereby helping to evaluate the relevance of our aforementioned explanations for this phenomenon (e.g., “Do any of the following statements apply to you?”). Response categories could include “I have never discussed fertility preferences with partner,” “I haven’t discussed fertility preferences with my partner recently,” or “I don’t believe my partner has specific or fixed fertility preferences.” Precise and culturally appropriate response choices should be informed by a qualitative investigation of this phenomenon.

Fourth, we suggest a follow-up question for wives and husbands who respond that they want more children to the standard fertility preference question (“Would you like to have (a/another) child, or would you prefer not to have any (more) children?”) by asking the respondent to enumerate how many more children he/she wants (e.g., “How many more children would you like to have?”). In our study, we had to use an indirectly derived measure for the number of desired additional children, which was subject to several limitations as well as potential ad hoc rationalization (discussed below). A direct question regarding how many more children the respondent desires would provide useful information to researchers and eliminate the ambiguities in the question as currently posed.

Finally, our results have implications for family-planning programming, specifically for couples who desire to limit childbearing (i.e., those with a need for family planning). Our finding that accuracy was related to use of family planning among these couples, and specifically that wives who were uncertain were the least likely to be using, may help to identify ways to increase contraceptive uptake. Wives who reported using family planning but who were uncertain of or inaccurately reported their husbands’ fertility

preferences may be using covertly; prior research has found that women tend to use covertly when they believe they have discordant fertility preferences with partners (Heck et al. 2018). Women who are not aware that they in fact share the same fertility preferences as their partners, particularly when they both want no more children, may be unnecessarily hiding use from their partners. Therefore, interventions that involve both partners and increase spousal communication may reveal shared fertility desires (Hartmann et al. 2012; Tilahun et al. 2015). For example, couple-level contraceptive counseling is an intervention that can lead to increases in uptake and continuation (Becker et al. 2014; El-Khoury et al. 2016; Lemani et al. 2017; Terefe and Larson 1993).

6. Strengths and limitations

There are several limitations to this study. First, this analysis is limited to men and women in monogamous relationships. Polygamous men are a significant proportion of the population in some sub-Saharan African countries; among the 32 countries included in this study, the average percentage of in-union women reporting that their partner had at least one other wife was 20%. A related limitation is that we are unable to identify those currently monogamous men included in our sample who plan to be polygamous. These “polygamous in waiting” men (Speizer 1995) may have systematically different fertility preferences than those who plan to remain monogamous. Polygamous men pose a particular analytical challenge because they are asked about their desires for additional children and ideal family sizes in general and not with each specific partner. Accordingly, it is not possible to match their responses to specific wives. Certain survey questions would need to be added to allow the study of polygamous couples. For example, survey questions to polygamous husbands should specifically refer to which wife the fertility preference pertains.

Second, there are limitations in our measures. Measuring respondents’ fertility preferences and ideal family size is inherently difficult because fertility desires are subject to change, often in response to changes in partner relationships, births, child mortality, and economic conditions (Trinitapoli and Yeatman 2018). The current survey questions are also subject to the rationalization of past birth history, the inability to capture nonnumeric or ambivalent responses, and low test-retest reliability (Casterline and El-Zeini 2007; Trinitapoli and Yeatman 2018).

Further, the estimate of a respondent’s number of additional children desired was created by subtracting the number of living children from his/her reported ideal family size. While others have utilized this approach (Akram et al. 2020; Feyisetan and Casterline 2000; Ibisomi et al. 2011), in some cases, the respondent’s answers to these two survey questions may not align to produce the desired construct. For example, a wife

may report an ideal family size smaller than her number of living children, producing a negative value for her number of additional children desired (the percentage of women in this category ranged from 2% in Niger to 29% in Burundi). This may reflect that under ideal circumstances, she would have had a smaller family. On the other hand, a wife may report wanting a much higher ideal family size than she intends to achieve in reality; she may report a number that would be ideal under perfect economic or social circumstances, as opposed to what she plans to achieve in reality given constrained economic and/or social circumstances. By adding the follow-up question on the respondent's desired number of additional children as proposed above, researchers would have a more reliable estimate of this measure.

Despite these limitations, this study has important strengths. A major strength comes from utilizing the DHS couple data, which is one of few nationally representative international surveys to interview both male and female partners in a couple. Second, this study is one of few that evaluates accuracy of wives' proxy reports of husbands' fertility preferences. Third, this study completes this objective in 32 countries.

7. Conclusions

In sum, this study is the first attempt to produce nationally representative estimates of the accuracy of wives' proxy reports of their husbands' fertility preferences in 32 sub-Saharan Africa countries. Across countries, most wives inaccurately perceive or are uncertain of their partners' fertility preferences. This finding reinforces the importance of interviewing men to measure their fertility preferences directly. Future research should qualitatively explore how and why wives respond inaccurately or why they don't know their partners' preferences.

8. Acknowledgments

The authors thank Alison Gemmill for helpful comments and suggestions.

Ethics approval and consent to participate

Secondary data analyses are exempt research. DHS surveys have been approved by the ICF Institutional Review Board (IRB): "Procedures and questionnaires for standard DHS surveys have been reviewed and approved by ICF Institutional Review Board (IRB). Additionally, country-specific DHS survey protocols are reviewed by the ICF IRB and

typically by an IRB in the host country. ICF IRB ensures that the survey complies with the U.S. Department of Health and Human Services regulations for the protection of human subjects (45 CFR 46), while the host country IRB ensures that the survey complies with laws and norms of the nation.”

Source: <https://dhsprogram.com/methodology/Protecting-the-Privacy-of-DHS-Survey-Respondents.cfm>.

Availability of data and materials

The data used in the analysis were derived from the DHS in the public domain: <https://dhsprogram.com/>.

Competing interests

The authors have no conflicts to disclose.

Funding

Preliminary analyses were funded by the Bill & Melinda Gates Foundation INV-009639.

References

- Akram, R., Sarker, A.R., Sheikh, N., Ali, N., Mozumder, M., and Sultana, M. (2020). Factors associated with unmet fertility desire and perceptions of ideal family size among women in Bangladesh: Insights from a nationwide demographic and health survey. *PLOS ONE* 15(5): e0233634. doi:10.1371/journal.pone.0233634.
- Ashraf, Q.H., Weil, D.N., and Wilde, J. (2013). The effect of fertility reduction on economic growth. *Population and Development Review* 39(1): 97–130. doi:10.1111/j.1728-4457.2013.00575.x.
- Babalola, S., Oyenubi, O., Speizer, I.S., Cobb, L., Akiode, A., and Odeku, M. (2017). Factors affecting the achievement of fertility intentions in urban Nigeria: Analysis of longitudinal data. *BMC Public Health* 17(1): 942. doi:10.1186/s12889-017-4934-z.
- Bankole, A. (1995). Desired fertility and fertility behaviour among the Yoruba of Nigeria: A study of couple preferences and subsequent fertility*. *Population Studies* 49(2): 317–328. doi:10.1080/0032472031000148536.
- Bankole, A. and Audam, S. (2011). Fertility preferences and contraceptive use among couples in sub-Saharan Africa. *Etude de la Population Africaine* 25(2): 556–586. doi:10.11564/25-2-246.
- Bankole, A. and Singh, S. (1998). Couples' fertility and contraceptive decision-making in developing countries: Hearing the man's voice. *Family Planning Perspectives* 24(1): 15–24. doi:10.2307/2991915.
- Baschieri, A., Cleland, J., Floyd, S., Dube, A., Msona, A., Molesworth, A., Glynn, J.R., and French, N. (2013). Reproductive preferences and contraceptive use: A comparison of monogamous and polygamous couples in Northern Malawi. *Journal of Biosocial Science* 45(2): 145–166. doi:10.1017/S0021932012000569.
- Bawah, A.A. (2002). Spousal communication and family planning behavior in Navrongo: A longitudinal assessment. *Studies in Family Planning* 33(2): 185–194. doi:10.1111/j.1728-4465.2002.00185.x.
- Beatty, P., Herrmann, D., Puskar, C., and Kerwin, J. (1998). 'Don't know' responses in surveys: Is what i know what you want to know and do i want you to know it? *Memory* 6(4): 407–426. doi:10.1080/741942605.
- Becker, S. (1996). Couples and reproductive health: A review of couple studies. *Studies in Family Planning* 27(6): 291. doi:10.2307/2138025.

- Becker, S. and Kalamar, A. (2018). Sampling weights for analyses of couple data: Example of the Demographic and Health Surveys. *Demography* 55(4): 1447–1473. doi:10.1007/s13524-018-0688-1.
- Becker, S. and Sutradhar, S.C. (2007). Fertility intentions: Are the undecided more like those who want more or want no more children? *Journal of Biosocial Science* 39(1): 137–145. doi:10.1017/S0021932006001283.
- Becker, S., Taalo, F.O., Hindin, M.J., Chipeta, E.K., Loll, D., and Tsui, A. (2014). Pilot study of home-based delivery of HIV testing and counseling and contraceptive services to couples in Malawi. *BMC Public Health* 14(1309). doi:10.1186/1471-2458-14-1309.
- Blanc, A.K., Wolff, B., Gage, A.J., Ezeh, A.C., Neema, S., and Ssekamatte-Ssebuliba, J. (1996). *Negotiating reproductive outcomes in Uganda*. Calverton: Macro International Inc. <https://dhsprogram.com/pubs/pdf/FR75/00FrontMatter.pdf>.
- Bongaarts, J. (1990). The measurement of wanted fertility. *Population and Development Review* 16(3): 487–506. doi:10.2307/1972833.
- Bongaarts, J. (2008). Fertility transitions in developing countries: Progress or stagnation? *Studies in Family Planning* 39(2): 105–110. doi:10.1111/j.1728-4465.2008.00157.x.
- Bongaarts, J. (2017). Africa’s unique fertility transition. *Population and Development Review* 43(S1): 39–58. doi:10.1111/j.1728-4457.2016.00164.x.
- Bradley, S.E.K., Croft, T.N., and Fishel, J.D. (2012). DHS analytical studies 25 revising unmet need for family planning. [https://dhsprogram.com/pubs/pdf/AS25/AS25\[12June2012\].pdf](https://dhsprogram.com/pubs/pdf/AS25/AS25[12June2012].pdf).
- Casterline, J.B. and Agyei-Mensah, S. (2017). Fertility desires and the course of fertility decline in sub-Saharan Africa. *Population and Development Review* 43(S1): 84–111. doi:10.1111/padr.12030.
- Casterline, J.B. and El-Zeini, L.O. (2007). The estimation of unwanted fertility. *Demography* 44(4): 729–745. doi:10.1353/dem.2007.0043.
- Central Statistical Authority [Ethiopia]; ORC Macro (2001). Ethiopia Demographic and Health Survey 2000. <http://dhsprogram.com/pubs/pdf/FR118/FR118.pdf>.
- Central Statistical Office [Zambia]; Ministry of Health [Zambia]; Macro International Inc. (1997). Zambia Demographic and Health Survey 1996. <http://dhsprogram.com/pubs/pdf/FR86/FR86.pdf>.

- Coale, A.J. (1973). Proceedings of the International Population Conference. https://u.demog.berkeley.edu/~jrw/Biblio/Eprints/%20A-C/coale.1973_transition.reconsidered_Liege.IUSSP.pdf.
- DaVanzo, J., Peterson, C.E., and Jones, N. (2003). How well do desired fertility measures for wives and husbands predict subsequent fertility? Evidence from Malaysia. *Asia-Pacific Population Journal* 18(4): 5–24. doi:10.18356/af8888d7-en.
- Demographic and Health Survey (2016). The DHS Program User Forum: India » Weights for Couple Data NFHS3 [electronic resource]. <https://userforum.dhsprogram.com/index.php?t=msg&th=4862&goto=9258&S=Google>.
- Derose, L., Dodoo, F.N., and Patil, V. (2002). Fertility desires and perceptions of power in reproductive conflict in Ghana. *Gender and Society* 16(1). doi:10.1177/0891243202016001004.
- Diro, C.W. and Afework, M.F. (2013). Agreement and concordance between married couples regarding family planning utilization and fertility intention in Dukem, Ethiopia. *BMC Public Health* 13(1): 903. doi:10.1186/1471-2458-13-903.
- Dodoo, F.N.A. and Van Landewijk, P. (1996). Men, women, and the fertility question in sub-Saharan Africa: An example from Ghana. *African Studies Review* 39(3): 29–41. doi:10.2307/524942.
- El-Khoury, M., Thornton, R., Chatterji, M., Kamhawi, S., Sloane, P., and Halassa, M. (2016). Counseling women and couples on family planning: A randomized study in Jordan. *Studies in Family Planning* 47(3): 222–238. doi:10.1111/sifp.69.
- Feyisetan, B.J. and Casterline, J.B. (2000). Fertility preferences and contraceptive change in developing countries. *International Family Planning Perspectives* 26(2): 100–109. doi:10.2307/2648298.
- Fikree, F.F., Gray, R.H., and Shah, F. (1993). Can men be trusted? A comparison of pregnancy histories reported by husbands and wives. *American Journal of Epidemiology* 138(4): 237–242. doi:10.1093/oxfordjournals.aje.a116852.
- Frye, M. and Bachan, L. (2017). The demography of words: The global decline in non-numeric fertility preferences, 1993–2011. *Population Studies* 71(2): 187–209. doi:10.1080/00324728.2017.1304565.
- Fulton, J., Katz, J., Luck, J., Henderson, A., and Davis, M. (2020). Is a proxy response good enough? Using paired cognitive interviews to assess the accuracy of proxy responses. <http://www.census.gov/content/dam/Census/library/working-papers/2020/adrm/rsm2020->.

- Gebreselassie, T. and Mishra, V. (2011). Spousal agreement on preferred waiting time to next birth in sub-Saharan Africa. *Journal of Biosocial Science* 43(4): 385–400. doi:10.1017/S0021932011000083.
- Gipson, J.D. and Hindin, M.J. (2009). The effect of husbands' and wives' fertility preferences on the likelihood of a subsequent pregnancy, Bangladesh 1998–2003. *Population Studies* 63(2): 135–146. doi:10.1080/00324720902859372.
- Greene, M.E. and Biddlecom, A.E. (2000). Absent and problematic men: Demographic accounts of male reproductive roles. *Population and Development Review* 26(1): 81–115. doi:10.1111/j.1728-4457.2000.00081.x.
- Hartmann, M., Gilles, K., Shattuck, D., Kerner, B., and Guest, G. (2012). Changes in couples' communication as a result of a male-involvement family planning intervention. *Journal of Health Communication* 17(7): 802–819. doi:10.1080/10810730.2011.650825.
- Heck, C.J., Grilo, S.A., Song, X., Lutalo, T., Nakyanjo, N., and Santelli, J.S. (2018). 'It is my business': A mixed-methods analysis of covert contraceptive use among women in Rakai, Uganda. *Contraception* 98: 41–46. doi:10.1016/j.contraception.2018.02.017.
- Huber, S., Garver, S., and Norris, A. (2017). *Does it matter if she's right? Accurate perceptions of partner fertility desires on contraceptive use*. Paper presented at the Population Association of America Annual Meeting, Chicago, IL, April 2017.
- Ibisomi, L., Gyimah, S., Muindi, K., and Adjei, J. (2011). Ideal versus actual: The contradiction in number of children born to Nigerian women. *Journal of Biosocial Science* 43(2): 233–245. doi:10.1017/S0021932010000684.
- Johnson-Hanks, J. (2007). Natural intentions: Fertility decline in the African Demographic and Health Surveys. *American Journal of Sociology* 112(4): 1008–1043. doi:10.1086/508791.
- King, T., Cook, S., and Childs, J.H. (2012). *Interviewing proxy versus self-reporting respondents to obtain information regarding living situations*. Paper Presented at the 67th Annual Conference of the American Association for Public Opinion Research (AAPOR), Orlando, Florida, May 17–20, 2012. http://www.asasrms.org/Proceedings/y2012/Files/400243_500698.pdf.
- Kojetin, B.A. and Tanur, J.M. (1996). *Proxies for youths and adults: Communication and reports of job search*. Proceedings of the Survey Research Methods Section, American Statistical Association. http://www.asasrms.org/Proceedings/papers/1996_039.pdf.

- Landis, J.R. and Koch, G.G. (1977). The measurement of observer agreement for categorical data. *Biometrics* 33(1): 159. doi:10.2307/2529310.
- Lemani, C., Tang, J.H., Kopp, D., Phiri, B., Kumvula, C., Chikosi, L., Mwale, M., and Rosenberg, N.E. (2017). Contraceptive uptake after training community health workers in couples counseling: A cluster randomized trial. *PLOS One* 12(4): e0175879. doi:10.1371/journal.pone.0175879.
- Liu, D.H. and Raftery, A.E. (2020). How do education and family planning accelerate fertility decline? *Population and Development Review* 46(3): 409–441. doi:10.1111/padr.12347.
- Machiyama, K., Baschieri, A., Dube, A., Crampin, A.C., Glynn, J.R., French, N., and Cleland, J. (2015). An assessment of childbearing preferences in Northern Malawi. *Studies in Family Planning* 46(2): 161–176. doi:10.1111/j.1728-4465.2015.00022.x.
- Machiyama, K., Casterline, J.B., Mumah, J.N., Huda, F.A., Obare, F., Odwe, G., Kabiru, C.W., Yeasmin, S., and Cleland, J. (2017). Reasons for unmet need for family planning, with attention to the measurement of fertility preferences: Protocol for a multi-site cohort study. *Reproductive Health* 14(23). doi:10.1186/s12978-016-0268-z.
- Miller, W.B., Severy, L.J., and Pasta, D.J. (2004). A framework for modelling fertility motivation in couples. *Population Studies* 58(2): 193–205. doi:10.1080/0032472042000213712.
- National Bureau of Statistics [Tanzania]; Macro International Inc. (1997). Tanzania Demographic and Health Survey 1996. <http://dhsprogram.com/pubs/pdf/FR83/FR83.pdf>.
- National Bureau of Statistics [Tanzania]; Macro International Inc. (2000). Tanzania Reproductive and Child Health Survey 1999. Calverton, Maryland, USA: National Bureau of Statistics/Tanzania and Macro International. <http://dhsprogram.com/pubs/pdf/FR112/FR112.pdf>.
- National Council for Population and Development [Kenya]; Central Bureau of Statistics; Macro International (1994). Kenya Demographic and Health Survey 1993. Calverton, Maryland, USA. <http://dhsprogram.com/pubs/pdf/FR54/FR54.pdf>.
- National Council for Population and Development [Kenya]; Central Bureau of Statistics; Macro International (1999). Kenya Demographic and Health Survey 1998. <http://dhsprogram.com/pubs/pdf/FR102/FR102.pdf>.

- National Population Commission [Nigeria] (2000). Nigeria Demographic and Health Survey 1999. <http://dhsprogram.com/pubs/pdf/FR115/FR115.pdf>.
- Oyediran, K., Isiugo-Abanihe, U.C., and Bankole, A. (2006). Correlates of spousal communication on fertility and family planning among the Yoruba of Nigeria. *Journal of Comparative Family Studies* 37(3): 441–460. doi:10.3138/jcfs.37.3.441.
- Prata, N., Bell, S., Fraser, A., Carvalho, A., Neves, I., and Nieto-Andrade, B. (2017). Partner support for family planning and modern contraceptive use in Luanda, Angola. *African Journal of Reproductive Health* 21(2). doi:10.29063/ajrh2017/v21i2.5.
- Pritchett, L.H. (1994). Desired fertility and the impact of population policies. *Population and Development Review* 20(1): 1–55. doi:10.2307/2137629.
- Ratcliffe, A.A., Hill, A.G., Harrington, D.P., and Walraven, G. (2002). Reporting of fertility events by men and women in rural Gambia. *Demography* 39(3): 573–586. doi:10.2307/3088333.
- Sarnak, D.O., Wood, S.N., Zimmerman, L.A., Karp, C., Makumbi, F., Kibira, S.P.S., and Moreau, C. (2021). The role of partner influence in contraceptive adoption, discontinuation, and switching in a nationally representative cohort of Ugandan women. *PLOS ONE* 16(1): e0238662. doi:10.1371/journal.pone.0238662.
- Schoumaker, B. (2019). Stalls in fertility transitions in sub-Saharan Africa: Revisiting the evidence. *Studies in Family Planning* 50(3): 257–278. doi:10.1111/sifp.12098.
- Schwarz, N. and Wellens, T. (1994). *Cognitive dynamics of proxy responding: The diverging perspectives of actors and observers*. <https://citeseerx.ist.psu.edu/viewdoc/download?jsessionid=F0137EF907BBA8C0A98D8075288AC19A?doi=10.1.1.39.5355&rep=rep1&type=pdf>.
- Sedgh, G. and Hussain, R. (2014). Reasons for contraceptive nonuse among women having unmet need for contraception in developing countries. *Studies in Family Planning* 45(2): 151–169. doi:10.1111/j.1728-4465.2014.00382.x.
- Shreffler, K.M., Tiemeyer, S., McQuillan, J., Greil, A.L., and Spierling, T. (2019). Partner congruence on fertility intentions and values: Implications for birth outcomes. *Journal of Social and Personal Relationships* 36(8): 2307–2322. doi:10.1177/0265407518787232.
- Speizer, I.S. (1995). A marriage trichotomy and its applications. *Demography* 32(4): 533–542. doi:10.2307/2061673.

StataCorp LLC (2020). Stata.

Statistics Department [Uganda]; Macro International Inc (1996). Uganda Demographic and Health Survey 1995. <http://dhsprogram.com/pubs/pdf/FR69/FR69.pdf>.

Sudman, S., Bickart, B., Blair, J., and Menon, G. (1994). The effect of participation level on reports of behavior and attitudes by proxy reporters. In: Schwarz, N. and Sudman, S. (eds.). *Autobiographical memory and the validity of retrospective reports*. New York: Springer: 251–265. doi:10.1007/978-1-4612-2624-6_17.

Terefe, A. and Larson, C.P. (1993). Modern contraception use in Ethiopia: Does involving husbands make a difference? *American Journal of Public Health* 83(11): 1567–1574. doi:10.2105/AJPH.83.11.1567.

Testa, M.R., Cavalli, L., and Rosina, A. (2014). The effect of couple disagreement about child-timing intentions: A parity-specific approach. *Population and Development Review* 40(1): 31–53. doi:10.1111/j.1728-4457.2014.00649.x.

Thomson, E. (1997). Couple childbearing desires, intentions, and births. *Demography* 34(3): 343–354. doi:10.2307/3038288.

Thomson, E. and Hoem, J.M. (1998). Couple childbearing plans and births in Sweden. *Demography* 35(3): 315–322. doi:10.2307/3004039.

Tilahun, T., Coene, G., Temmerman, M., and Degomme, O. (2015). Couple based family planning education: Changes in male involvement and contraceptive use among married couples in Jimma Zone, Ethiopia. *BMC Public Health* 15(1): 682. doi:10.1186/s12889-015-2057-y.

Trinitapoli, J. and Yeatman, S. (2018). The flexibility of fertility preferences in a context of uncertainty. *Population and Development Review* 44(1): 87–116. doi:10.1111/padr.12114.

Uddin, J., Hossain, M.Z., and Pulok, M.H. (2017). Couple's concordance and discordance in household decision-making and married women's use of modern contraceptives in Bangladesh. *BMC Women's Health* 17(1): 107. doi:10.1186/s12905-017-0462-3.

United Nations (2020). *World Fertility 2019: Early and later childbearing among adolescent women*. https://www.un.org/en/development/desa/population/publications/pdf/fertility/World_Fertility_2019.pdf.

- Upadhyay, U.D., Gipson, J.D., Withers, M., Lewis, S., Ciaraldi, E.J., Fraser, A., Huchko, M.J., and Prata, N. (2014). Women's empowerment and fertility: A review of the literature. *Social Science and Medicine* 115: 111–120. doi:10.1016/j.socscimed.2014.06.014.
- USAID (2020). Demographic and Health Surveys Stat Compiler [electronic resource]. <https://www.statcompiler.com/en/>.
- Velema, J.P., Blettner, M., Restrepo, M., and Munoz, N. (1991). The evaluation of agreement by means of log'linear models: Proxy interviews on reproductive history among floriculture workers in Colombia. *Epidemiology* 2(2): 107–115. doi:10.1097/00001648-199103000-00004.
- Wolff, B., Blanc, A.K., and Ssekamatte-Ssebuliba, J. (2000). The role of couple negotiation in unmet need for contraception and the decision to stop childbearing in Uganda. *Studies in Family Planning* 31(2): 124–137. doi:10.1111/j.1728-4465.2000.00124.x.
- Yeatman, S. and Sennott, C. (2014). The relationship between partners' family-size preferences in Southern Malawi. *Studies in Family Planning* 45(3): 361–377. doi:10.1111/j.1728-4465.2014.00396.x.

Appendix: Derivation of accuracy measure

Appendix Figure A-1 demonstrates how the accuracy of wives' perceptions of their husbands' fertility preferences was determined. We began with the joint fertility preference of the couple, derived from the husband's and wife's responses to the fertility preference question, "Would you like to have (a/another) child, or would you prefer not to have any (more) children?" Response categories were "have another," "no more," or "undecided" (partners who responded 'sterilized' or 'declared infecund' were removed from the analytic sample as outlined in the methods section). The nine possible joint fertility preferences of the couples are represented in the nine rows of the table (rows C1–C9).

We compared these responses with the proxy-report question (i.e., the wife's perception of her husband's fertility preference), "Does your husband/partner want the same number of children that you want, or does he want more or fewer than you want?" Possible response categories were "we want same," "he wants more than me," "he wants fewer than me," and "I don't know." These responses are shown in the four column headers (columns W1–W4). By cross-tabulating the responses to these two items, we determined whether the wife was accurate or inaccurate in her perception.

Joint fertility preferences where one partner wants more and the other wants no more, or when both partners want no more (rows C1–C3)

When both partners want no more children (row C1), or if one wants more and the other wants no more (rows C2 and C3), assessing the wife's accuracy is straightforward. For example, if the husband reported that he wanted more children and the wife reported that she wanted no more children (row C2), and the wife responded that her husband "wants more than me" to the perception question (column W2), her perception is classified as accurate. By contrast, if the husband reported that he wanted more children and the wife reported that she wanted no more children (row C2), and the wife perceived they wanted the same number of children (column W1), her perception is classified as inaccurate.

In the exploratory data phase, we found that fairly large proportions of women across countries responded "I don't know" to the perception question. Therefore, we created a third category of women whose perceptions were classified as uncertain. Continuing from the prior example, if the husband reported that he wanted more children and the wife reported that she wanted no more children (row C2), and she responded that she didn't know his fertility preferences (column W4), her perception was classified as uncertain.

Joint fertility preferences where both partners want more (row C4)

In cases where both partners said they wanted more children (row C4), we created a measure of each partner's 'ideal number of additional children desired,' herein referred to as 'number of additional children desired,' to assess the accuracy of wives' perceptions. The measure of the number of additional children desired was derived by subtracting the number of living children from the ideal family size reported ("If you could go back to the time you did not have any children and could choose exactly the number of children to have in your whole life, how many would that be?").

A caveat to this measure should be acknowledged. The wording of the ideal family size question when asked to those that already have children (above) may not align with the current fertility preferences of the respondent. Respondents may report an ideal family size smaller than their current family size or report wanting an ideal family size larger than they realistically plan to have. Both scenarios reflect hypothetical family size goals, which may not be the same as practical goals that are based on other factors that drive fertility decisions (e.g., economic, social). Despite the criticism over the ideal family size measure, and in the absence of a survey question that asks how many (more) children the respondent wants, our approach to measure of 'number of additional children desired' has been used by other authors (e.g., Akram et al. 2020; Feyisetan and Casterline 2000; Ibisomi et al. 2011). Where the calculated number of additional children desired for either partner was less than zero, meaning that their ideal family size was less than their number of living children, his/her number of additional children desired was recoded to zero.

We illustrate the evaluation of the wife's accuracy if both spouses reported wanting more children (row C4) with two examples. First, if both spouses reported wanting more children (row C4), and the wife reported that they wanted the same (column W1), we compared number of additional children desired and allowed for a margin of error of one child more or less. For example, if the husband's number of additional children desired was four and the wife's number of additional children desired was three, and she perceived that they wanted the same number of children, we classified her as accurate.

Second, if both spouses reported wanting more children (row C4), and the wife reported that her husband wanted more children than her (column W2), we compared number of additional children desired. If the husband's number of additional children desired was four and the wife's number of additional children desired was one, we would classify her response accurate. On the other hand, if she responded that they wanted the same (column W1) or that he wanted less than her (column W3), we would classify her as inaccurate in perceiving her husband's fertility preference. If she responded she did not know (column W4), she was classified as uncertain.

In the case where one partner's response to the ideal family size question was "up to god," nonnumeric, or "depends," we considered this partner to want more than the other partner who gave a numeric value. If both partners report a nonnumeric response to

the ideal number of children question, we consider them both wanting more and wanting the same number of children.

Joint fertility preferences where one or both partners are undecided (rows C5–C9)

Partners who reported they were undecided to the fertility preference question were considered to “want more” children, in line with the current definition for the unmet need for contraception (Bradley, Croft, and Fishel 2012), and further supported by evidence that these respondents are more similar to those who want more than to those who report wanting no more (Becker and Sutradhar 2007). Therefore, in couples where one partner was undecided and the other wanted more children (rows C6 and C8), or if they were both undecided (row C9), the classification of accuracy across wife’s perception was treated as if the husband wanted more and wife wanted more (e.g., similar to row C4) and thus classified as outlined in the section above.

The only difference to the classification of accuracy for couples where one partner was undecided and the other wanted more children (rows C6 and C8) or if they were both undecided (row C9) were in the cases that the wife reported she didn’t know his fertility preference (column W4). Instead of classifying her perception as uncertain, as we did in row C4 when both partners reported wanting more children, we classified her as accurate. For example, if the husband was undecided about future childbearing and the wife wanted more (row C6), and the wife responded that she didn’t know his fertility preference (column W4), we thought her “I don’t know” response could be considered accurate.

Similarly, the joint fertility preference of the couple for an undecided husband and a wife wanting no more children (row C5) is considered the husband wanting more and the wife wanting no more, and therefore the accuracy classification of that row resembles row C2. The joint fertility preference of the couple for a husband that wants no more and an undecided wife (row C7) is considered the husband wanting no more and the wife wanting more, and the accuracy classification resembles row C3. Again, in the case that one partner was undecided, we classified a wife’s “I don’t know” response to the perception as accurate; if one partner’s fertility preferences were undecided and the couple had discussed fertility preferences, it may be hard to answer the perception question that includes a comparative component.

Finally, there are two instances where our measures of desired fertility (fertility preferences and number of additional children desired) may not be internally consistent within a respondent. The first scenario is that a husband/wife may report wanting no more children in the fertility preference question and may report wanting a larger ideal family size than he/she currently has (e.g., positive number of additional children desired). We expect this scenario is plausible; someone may report wanting no more children even if

under more favorable circumstances (social, economic, health) he/she may have desired a larger family size (Bongaarts 1990). We trust the fertility preference question more than the ideal family size question (Casterline and El-Zeini 2007), so we kept couples in which one partner was inconsistent in this way.

The second scenario is that a husband/wife may report wanting more children in the fertility preference question but whose number of additional children desired is zero. If both partners reported that they wanted more children and one partner's number of additional children desired was zero (the second type of inconsistency), we excluded that couple. The rationale was that we rely on a comparison of the numeric values of the number of additional children desired when both partners report that they want more children, and if a respondent was inconsistent in his/her own answers in the survey, we may not realistically expect the other partner to be able to perceive the preference accurately. These exclusions were minor across countries; the number of couples that were excluded due to at least one partner having this type of inconsistency ranged from 4% (Nigeria) of the total sample of couples to 12% (Gabon, average 6%).

Appendix Figure A-1

		Wife's perception of husband's fertility preference			
		W1 "We want same"	W2 "He wants more than me"	W3 "He wants less than me"	W4 "I don't know"
Couple joint fertility preference	C1 Husband wants no more, wife wants no more				
	C2 Husband wants more, wife wants no more				
	C3 Husband wants no more, wife wants more				
	C4 Husband wants more, wife wants more	If HDAC=WDAC Otherwise	If HDAC>WDAC Otherwise	If HDAC<WDAC Otherwise	
	C5 Husband undecided, wife wants no more				
	C6 Husband undecided, wife wants more	If HDAC=WDAC Otherwise	If HDAC>WDAC Otherwise	If HDAC<WDAC Otherwise	
	C7 Husband wants no more, wife undecided				
	C8 Husband wants more, wife undecided	If HDAC=WDAC Otherwise	If HDAC>WDAC Otherwise	If HDAC<WDAC Otherwise	
	C9 Husband undecided, Wife undecided	If HDAC=WDAC Otherwise	If HDAC>WDAC Otherwise	If HDAC<WDAC Otherwise	

Accuracy classification:

Accurate Inaccurate Uncertain

Notes: HDAC = husband desired additional children, WDAC = wife desired additional children, DAC = ideal family size – number of living children.