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Research Article

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Factors explaining the North–South differentials in contraceptive use in Nigeria: A nonlinear decomposition analysis

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Abstract

BACKGROUND
Northern Nigeria has some of the worst reproductive health indicators worldwide. Conspicuous North–South variations exist in contraceptive use; not much is known about the drivers of contraceptive use disparities in the North compared to the South.

OBJECTIVE
In this study, we examine the relative weights of the factors that contribute to this North–South gap in contraceptive prevalence.

METHODS
Using the women's 2013 Demographic Health Survey dataset, we applied a nonlinear decomposition technique to determine the contribution of sociodemographic and socioeconomic characteristics, conjugal relationship dynamics, intimate partner violence, ideational variables, and Islamic culture to the North–South disparities in contraceptive use.

RESULTS
There was a gap of 12.4 percentage points in contraceptive prevalence between the north and south of Nigeria (5.2% vs 17.6%). The largest contributors to the gap were ideational characteristics (explaining 42.0% of the gap) and socio-economic profiles (explaining 42.6%). Patterns of conjugal relationship dynamics (11.1%), socio-demographic characteristics (–11.0%), Islamic religious culture (7.6%), and exposure to family planning messaging (6.1%) were also significant contributors.

CONCLUSIONS
Effective interventions to increase contraceptive use in northern Nigeria should aim at addressing socioeconomic disadvantage in the North, impacting ideational

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characteristics and specifically targeting poor women and those with low levels of education. Working with Islamic religious leaders is also critical to bridging the gap.

CONTRIBUTION

This paper broadens the knowledge on the determinants of contraceptive use in Nigeria by identifying contextual factors that operate differently in the North compared to the South.

1. Introduction

In spite of being a middle-income country, Nigeria remains one of the countries with the poorest reproductive health outcomes in the world. Recent statistics show a maternal mortality ratio of 814 per 100,000 births in 2015. With an estimated 58,000 maternal deaths in 2015, Nigeria accounts for about one-fifth of all maternal deaths worldwide (World Health Organization et al. 2015). Furthermore, there is no conclusive evidence that maternal mortality has decreased significantly in Nigeria over the last decade (Alkema et al. 2016). According to the Demographic and Health Survey (DHS) (2013), fertility is high at an average of 5.5 children per woman and about two-thirds of women aged 15–49 years had a live birth in the five years preceding the survey (National Population Commission and ICF International 2014). The majority of these births were not delivered in a health facility, and only 38% of the deliveries were attended by a skilled birth attendant.

Nationally aggregated indices in actuality hide the broad regional variations in health outcomes across Nigeria, which stem from the socioeconomic, cultural, and religious differences across the country. Poverty, a main cause and consequence of ill-health, is more predominant in northern Nigeria with about two-thirds (66%) of the Nigerian poor residing in the North (World Bank 2014). According to the 2014 Nigerian Economic Report, poverty rates in southern Nigeria ranged from 16% in the South West to 28% in the South East, while poverty rates in the North West and North East were 45.9% and 50.2% respectively (World Bank 2014). Recent estimates suggest that the North–South gap in poverty is widening. Whereas the southern states are experiencing poverty reduction, except North Central, poverty rates in northern Nigeria have largely remained the same or have increased as a result of insurgency in the region (World Bank 2014). By the same token, there are lower levels of formal education attainment in northern Nigeria compared to the South. This diversity has been linked to the exposure of southerners to Western education along with Christianity by early missionaries and probably accounts for the easier acceptance of Western culture in the South (Okehie-Offoha and Sadiku 1996). The vast majority of northerners are Muslim

and southerners Christian. Studies have reported poorer health care facilities in the North with fewer highly skilled medical personnel possibly because of the unattractiveness of the environment due to the prevailing conflicts compared to the South (Oyekale 2017; National HIV/AIDS Division 2014). Even so, Eboreime, Abimbola, and Bozzani (2015) did not find any obvious differences in the accessibility of immunization services in the North compared to the South of Nigeria to account for the lower immunization coverage in the North (Eboreime, Abimbola, and Bozzani 2015). By and large, the prevailing sociopolitical, economic, cultural, and religious differences have translated to varying health care seeking behaviors and demand for health care services in the North and South of Nigeria. The consequence is that maternal and child health indicators are worse off in the northern states compared to the southern states (Adebayo et al. 2013; National Population Commission and ICF International 2014; Adebowale, Yusuf, and Fagbamigbe 2012; Bankole et al. 2009).

The use of family planning has been shown to be a cost-effective intervention to improve maternal, child, and socioeconomic indices globally. However, despite the substantial investment of the Nigerian government and major international donors in family planning service provision in Nigeria, modern contraceptive use remains low most especially in northern Nigeria (Adebayo et al. 2013). Overall, only about 10% of in-union women of reproductive age were using a modern method in 2013, and contraceptive prevalence has not meaningfully changed since 2003 (National Population Commission and ICF International 2014). Moreover, regional contraceptive prevalence estimates vary widely. According to the 2013 Nigerian Demographic and Health Survey, modern contraceptive prevalence was between 2.7% and 12.4% in the northern zones compared to between 11.4% and 24.9% in the southern zones. Northern states like Yobe, Jigawa, and Sokoto had modern contraceptive prevalence rates of 0.5, 0.6, and 0.7% respectively (National Population Commission and ICF International 2014).

Studies have identified multiple factors that underlie low contraceptive prevalence in Nigeria. These factors span demand and supply domains. The supply side factors associated with low contraceptive use in Nigeria include method mix, provider technical and interpersonal skills, provider bias, erratic supply of contraceptives, and type of facility (Schwandt, Spreizer, and Corroon 2017; Nigerian Federal Ministry of Health 2014). Among the demand side factors that have been found to be associated with contraceptive use in Nigeria are sociodemographic and socioeconomic characteristics, including age, parity, education, religion, monogamous marriage, urban residence, and household wealth (Ejembi et al. 2015; Odewale, Oiadosun, and Amoo 2016; Okigbo et al. 2017; Sekoni and Oladoyin 2016; Ankomah, Anyanti, and Oladosu 2011). Ideational or psychosocial variables have also been found to be strongly associated with contraceptive use, including perceived self-efficacy to take actions

related to contraceptive use, spousal communication about family size and contraceptive use, perceived social approval of contraception, ideal family size, and misconceptions about contraceptives and family planning (Okigbo et al. 2017; Babalola et al. 2015; Babalola 2017; Gueye et al. 2015; Ankomah, Anyanti, and Oladosu 2011; Avidime et al. 2010; Tumlinson et al. 2013). Studies have also found male partners' characteristics to be associated with contraceptive use, including age, education, and family size desires (Ejembi et al. 2015; Oyediran, Ishola, and Feyisetan 2002; Ibisomi 2014). Furthermore, women's autonomy and decision-making agency have been positively linked with contraceptive use (James-Hawkins et al. 2016). In general, the more agency a woman has, the more likely it is that she will be using a modern contraceptive method.

In Nigeria, contextual factors may help explain the North–South discrepancy in contraceptive use (Ejembi et al. 2015). In the predominantly Muslim northern Nigeria, pronatalist beliefs probably contribute a fair amount of the differences we see in the use of contraceptive methods compared to the South. There is widespread belief that having many children is a way of preserving the community and a religious duty. Against that background, contraceptive use is often believed to be contrary to the teachings of Islam (Izugbara and Ezeh 2010; Duze and Mohammed 2006). Moreover, polygyny, which is permitted by Islam, encourages higher fertility rates and lower contraceptive use (Baschieri et al. 2013; Audu et al. 2008). Furthermore, the value system of purdah, which restricts women's autonomy and movement out of the family home, impedes their access to family planning and other reproductive health services (Konje and Ladipo 1999). Other factors that play a part in the lower contraceptive utilization rates and reproductive health care in northern Nigeria include mistrust for family planning programs, gendered incentives to keep having children, and poor access to family planning messaging (Renne 1996; Izugbara et al. 2010; Ajaero et al. 2016).

The North–South differences in socioeconomic, ideational, and cultural factors, although significant, are not novel. However, there is a dearth of data on the relative importance of the various factors that explain the North–South gap in contraceptive use in Nigeria. A better understanding of the potentially modifiable factors contributing to the disparities will add to the body of information on factors that can be influenced to improve contraceptive use in Nigeria and provide a basis for developing interventions geared at improving the uptake of contraceptives in northern Nigeria.

In this manuscript, we use data from the 2013 Demographic and Health Survey (DHS) to assess the extent of the North–South disparities in marital contraceptive use and identify the variables that explain the gap. Specifically, using nonlinear decomposition techniques, we examine the relative importance of sociodemographic characteristics, socioeconomic profiles, exposure to family planning information in media, ideational variables, couple–relationship dynamics, experience of intimate

partner violence, and culture to the differences in contraceptive use between the North and South of Nigeria.

2. Methods

2.1 Data

For the analyses reported in this manuscript, we used nationally representative data from the 2013 DHS. Participants in the DHS were selected through a multistage sampling process that involves first sampling clusters with probability proportional to size and then households within the selected clusters (National Population Commission and ICF International 2014). During the survey, information was collected from a total of 38,948 women aged 15–49 years. Of these, 27,274 were currently married or cohabiting. Furthermore, we excluded from the analysis women who were not asked the questions on intimate partner violence and those who declared themselves infecund, leaving us with a sample of 18,523 women.

2.2 Variables

The dependent variable assessed in this manuscript is current use of modern methods of contraception. Modern contraceptive use is defined as the use of one or more of the following methods: pill, injectable, intrauterine device, implant, diaphragm, male condom, female condom, vasectomy, and tubal ligation.

We assessed the predictive value of 16 explanatory variables, divided into six categories, viz.:

- Sociodemographic characteristics:
  - Current age in years. We also included the square of age to assess if there exists a curvilinear association with age; and,
  - Parity defined as the number of children ever born.
- Socioeconomic characteristics:
  - Education level defined as none, primary, secondary, or higher;
  - Household wealth quintile: an asset-based measure that is used to divide the women into five categories;
  - Employment status; and
  - Urban residence.
- Exposure to family planning information in media:

  - Exposure to family planning information on the radio in the last 12 months;
  - Exposure to family planning information on television in the last 12 months; and
  - Exposure to family planning information in newspapers/magazines in the last 12 months.
- Ideational variables:
  - Awareness of modern contraceptive methods, defined as the number of modern methods recalled spontaneously or after prompting;
  - Ideal number of children, defined as the number of children that the woman desired to have;
  - Belief that a wife is justified to ask the husband to use condoms; and
  - Perceived self-efficacy to ask the husband to use condoms: the woman's perception of her ability to ask her husband to use a condom.
- Conjugal relationship dynamics:
  - Age difference between partners. We compared women whose husbands were at least ten years older to women whose husbands were less than ten years older;
  - Difference in education between partners. We distinguished between women whose husbands had a level of education higher by at least five years than theirs and those whose husbands had a level of education less than five years higher than theirs.
  - Participation in household/health decisions. We assessed women's participation (either along or jointly with the partner) in the following decisions: health care for the woman, large household purchases, and visits to family and friends. We distinguished between those who participated in at least one of these decisions and those who participated in none;
  - Husband's desired family size compared to that of the woman; and
  - Women who expressed fear of their husband/partner most or some of the time versus never afraid.
- Experience of intimate partner violence: This component was operationalized through the woman's reported experience of any form of physical violence (severe or non-severe) from the husband/partner.
- Islamic culture: We operationalize this factor using the prevalence of Islamic religion in the cluster of residence.

2.3 Analytic methods

We first calculated unadjusted weighted prevalence of contraceptive use for the North and the South separately. We then ran a stepwise multivariable logistic regression to identify the variables that were significantly associated with contraceptive use in Nigeria. The variables that were significantly associated with the outcome at $p < 0.2$ were retained for use in the next stages of the analyses. We had included 26 variables in the stepwise regression. Based on the results, we excluded five variables from the next stages of the analyses, including polygamous marriage, experience of emotional violence, experience of sexual violence, experience of controlling behaviors from the husband, and perceived self-efficacy to refuse sex. Subsequently, we assessed North–South differences in the distribution of the explanatory variables.

For our main analytic method, nonlinear decomposition, we followed Fairlie (2005, 1999) to define the gap in contraceptive use between northern and southern Nigeria as:

$$\overline{Y}^S - \overline{Y}^N = \left[\sum_{i=1}^{N^S} \frac{F(X_i^S \hat{\beta}^S)}{N^S} - \sum_{i=1}^{N^N} \frac{F(X_i^N \hat{\beta}^S)}{N^N}\right] + \left[\sum_{i=1}^{N^N} \frac{F(X_i^N \hat{\beta}^S)}{N^N} - \sum_{i=1}^{N^N} \frac{F(X_i^N \hat{\beta}^N)}{N^N}\right],$$

Endowment (compositional) effect — Coefficient (behavioral) effect

where $\overline{Y}^S$ and $\overline{Y}^N$ are the predicted contraceptive use for the South and the North, respectively; N^S and N^N are the sample size for married women in the South and the North; $\hat{\beta}^S$ and $\hat{\beta}^N$ are the vector of coefficient estimates; and F is the cumulative distribution function from the logistic distribution. The first component of the equation is the endowment effect. It represents the portion of the contraceptive use gap that is due to North–South differences in the distribution of the explanatory variables included in the model. In essence, it denotes the portion of the gap that will be eliminated if northern women have similar characteristics to southern women. The second component is the behavioral effect, and it is the portion of the contraceptive use gap that is due to fundamental differences in contraceptive behavior between the North and the South. This second component also represents the portion of the gap that is due to unobservable factors not included in the model.

Nonlinear decomposition involves first estimating the probabilities of contraceptive use for each woman in both the northern and the southern groups based on the explanatory variables included in the model using the sample of either of the two groups or a pooled sample of both groups. The estimated probabilities are then used to match the women in the two groups (northern and southern women) and the differences

between the two evaluated. This process is repeated over several subsamples (replications), and the results averaged to obtain the final predicted gap. Because the numbers of southern and northern women are unequal (7,194 versus 11,329), we used the coefficients from the pooled sample to estimate the probabilities, as suggested by Fairlie (2005). Path dependence (that is, the sensitivity of the decomposition results to the order in which the explanatory variables are introduced into the model) is a concern in nonlinear decomposition technique. To address this concern, we estimated the model by randomly ordering the explanatory variables across replications as suggested by Fairlie (1999). We implemented the procedure using 1,000 replications. We applied sample weights to adjust for the complex sampling strategy used in the DHS. The model was estimated using the *fairlie* command in Stata 14.

3. Results

The unadjusted results show that contraceptive prevalence is significantly lower in the North (5.0%; 95% CI: 4.6, 5.3) compared to the South (17.8%; 95% CI: 16.8, 18.7), a difference of 12.8 percentage points.

3.1 North–South differences in explanatory variables

A look at the weighted mean of the explanatory variables reveals significant differences between the North and the South (Table 1). On average, the northern women are younger and have had more births than their southern peers. Similarly, the northern women are more likely to be poor compared to southern women. Proportionally fewer women in the North compared to the South have secondary education or higher. Urban residence is more common in the South than in the North.

Table 1: Socio, demographic, ideational, and behavioral characteristics of study participants

Respondents' characteristics	Weighted* % / Mean [95% CI]	
	North	South
Sociodemographic characteristics		
Mean age in years	29.7 (29.5, 29.8)	33.3 (33.2, 33.5)
Mean number of children ever born	4.1 (4.0, 4.2)	3.6 (3.5, 3.7)
Socioeconomic variables		
Percent working	61.7 (60.8, 62.5)	84.9 (84.0, 85.8)
Percent distribution by highest educational level		
No education	67.3 (66.5, 68.1)	8.8 (8.2, 9.5)
Primary education	15.2 (14.6, 15.8)	27.3 (26.2, 28.4)
Secondary education	14.0 (13.4, 14.6)	48.5 (47.3, 49.7)
Higher education	3.4 (3.2, 3.7)	15.3 (14.4, 16.2)
Percent urban	23.6 (22.9, 24.4)	62.6 (61.4, 63.7)
Wealth status		
Poorest	32.9 (32.1, 33.7)	2.2 (1.9, 2.6)
Poorer	27.9 (27.1, 28.7)	8.7 (8.0, 9.3)
Middle	18.2 (17.5, 18.8)	17.5 (16.6, 18.4)
Richer	12.7 (12.1, 13.3)	29.7 (28.6, 30.8)
Richest	8.4 (7.9, 8.9)	41.9 (40.7, 43.2)
Ideational characteristics		
Mean number of modern contraceptive methods known	3.7 (3.6, 3.8)	6.6 (6.5, 6.7)
Mean ideal number of children	8.1 (8.1, 8.2)	5.2 (5.1, 5.2)
Percent who believed that it was acceptable to ask husband to use condoms	72.2 (71.5, 73.0)	82.8 (81.9, 83.7)
Percent who perceived the self-efficacy to ask husband to use condoms	31.8 (31.0, 32.6)	51.1 (50.0, 52.3)
Exposure to family planning information in media		
Percent exposed to family planning information on the radio	21.7 (20.9, 22.4	53.1 (51.8, 54.3)
Percent exposed to family planning information on television	7.1 (6.6, 7.5)	38.9 (37.7, 40.1)
Percent exposed to family planning information in newspapers/magazines	2.6 (2.3, 2.9)	11.1 (10.4, 11.9)
Couple–relationship dynamics		
Percent of women with at least 5 years less education than husband	22.3 (21.5, 23.0)	16.2 (15.2, 17.0)
Percent of women at least 10 years younger than husband	53.7 (52.9, 54.6)	34.7 (33.5, 35.9)
Percent afraid of their husband	64.9 (63.9, 65.8)	38.5 (37.2, 39.9)
Percent that participate in at least one key household decision	35.5 (34.6, 36.3)	85.5 (84.7, 86.3)
Spousal agreement about number of children to have		
Husband wants same number as wife	26.5 (25.8, 27.3)	49.8 (48.6, 51.0)
Husband wants more children than wife	48.4 (47.5, 49.2)	23.3 (21.9, 24.0)
Husband wants fewer children than wife	2.2 (2.0, 2.5)	7.6 (6.9, 8.3)
Does not know how many children husband wants	22.8 (22.1, 23.6)	19.6 (18.7, 20.6)
Intimate partner violence		
Percent report physical violence	7.2 (6.7, 7.6)	17.5 (16.6, 18.4)
Islamic culture		
Average prevalence of Islamic religious affiliation in cluster of residence	80.7 (80.1, 81.3)	17.6 (16.9, 18.3)

Note: * Weights refer to the Demographic Health Survey sample weights.

Differences by exposure to family planning in media are equally substantial. There are also considerable North–South variations in ideational variables. The average ideal number of children is significantly higher in the North compared to the South. Northern women are less likely than their southern peers to display other relevant ideational characteristics, including contraceptive awareness, the belief that asking a partner to use a condom was acceptable, and the perceived self-efficacy to ask the partner to use a condom.

As for couple–relationship dynamics, there are again clear differences between the North and the South. Proportionally more women in the North compared to the South have a level of education lower by at least five years than their husbands'. Similarly, proportionally more northern women compared with their counterparts the South are at least ten years younger than their husband/partner. About two-thirds of northern women compared to about two-fifths of their southern peers report being afraid of their husband/partner. Southern women are more likely than their peers in the North to participate in key household decisions. Moreover, proportionally more women in the South than in the North want the same number of children as their husband/partner.

The data further shows that intimate partner violence is significantly more common in the South than in the North. Finally, the prevalence of Muslims in the cluster of residence is higher in the North compared to the South.

3.2 Nonlinear decomposition

Results of the nonlinear decomposition show that modern contraceptive prevalence predicted by the explanatiory variables included in the estimated model is 17.6% in the South and 5.2% in the North, a gap of 12.4 percentage points. The variables included in the model explain more than 100% of the North–South gap in contraceptive use. The interpretation of this finding is that the gap is mainly due to the endowments – intergroup differences in observable characteristics of study participants. The finding further indicates that fundamental differences in contraceptive behaviors between the two regions (behavioral effect) make a negligeable negative contribution (–1.5 percentage points) to the North–South gap.

The contribution of each category of explanatory variables to the endowment effect is presented in Table 2; details about the contribution of individual variables are presented in Annex 1 (available online). All the categories of explanatory variables make significant contribution to explaining the North–South gap. Nonetheless, the data shows that North–South differences in socioeconomic characteristics make the largest contribution to the gap, explaining more than two-fifths (42.6%) of the endowment effect. Substantively, if northern women had socioeconomic profiles similar to those of

southern women, the gap would have been smaller by 5.9 percentage points. The bulk of this contribution came from North–South differences in secondary education and the highest wealth quintile (Annex 1). For example, if northern women included the same proportion of women in the highest wealth quintile as southern women, the gap would have been 4.3 percentage points smaller. Variations in ideational characteristics between the North and the South are equally responsible for a substantial portion of the North–South divide, accounting for 42.0% of the explained gap. The data shows that if northern women had similar ideational profiles as southern women, the North–South gap would have been 5.8 percentage points smaller. A breakdown of the contribution of the individual ideational variables (Annex 1) reveals that ideal family size is the largest ideational contributor to the gap (contributing 3.4 percentage points) followed by awareness of contraceptive methods (1.4 percentage points).

Table 2: Nonlinear decomposition of North–South gap in contraceptive use in Nigeria, 2013

Predicted prevalence of contraceptive use: South (n = 7,194)			0.176
Predicted prevalence of contraceptive use: North (n = 11,329)			0.052
North–South gap			0.124
Explained (Endowments effect)			0.139
Percent explained			100.00%[1]
Explanatory factors	**Contribution to explained gap**	**Std. error**	**Percent contributed**
Sociodemographic characteristics [a]	–0.01533***	0.00296	–11.0
Socioeconomic characteristics [b]	0.05924***	0.00476	42.6
Exposure to FP information in media [c]	0.00854**	0.00269	6.1
Ideational characteristics [d]	0.05844***	0.00423	42.0
Conjugal relationships dynamics [e]	0.01540***	0.00396	11.1
Intimate partner violence [f]	0.00229**	0.00072	1.6
Culture [g]	0.01057**	0.00409	7.6

[1] The model explains 100% of the gap; the rest is noise due to the fact that the unexplained portion is negative.
[a] Sociodemographic characteristics: Age and total number of children.
[b] Socioeconomic characteristics: Educational attainment, employment status, wealth index, and urban residence.
[c] Exposure to FP information in media: Exposed to family planning through the radio, television, and newspapers.
[d] Ideational characteristics: Number of modern methods known, ideal number of children, belief that it is acceptable to ask husband to use a condom, and perceived self-efficacy to ask husband to use a condom.
[e] Conjugal relationship dynamics: Wife reportedly afraid of husband, husband's level of education of 5 years or more than wife, husband's age 10 years or more than wife, spousal agreement on how many children to have, and high participation in household decisions.
[f] Intimate partner violence: Ever experienced any form of physical violence perpetrated by husband/partner.
[g] Culture: Proportion of Muslims in the cluster of residence.

Sociodemographic variables make a negative contribution, indicating that northern women have sociodemographic characteristics (particularly higher parity) that are naturally more favorable to contraceptive use compared to their southern peers. If the northern women had similar sociodemographic characteristics to the southern women,

the gap would have been 1.5 percentage points larger. The contribution of exposure to family planning information in media is small but significant.

Couple–relationship dynamics play a strong and positive role, accounting for 11.1% of the explained gap. Participation in household decisions is the largest contributor in this category (Annex 1). The contribution of intimate partner violence is significant but small, accounting for only 1.6% of the explained gap. Finally, differences in the prevalence of Islamic religious affiliation between the North and the South also explains a significant portion (7.6%) of the gap.

4. Discussion

This manuscript uses a nonlinear decomposition method to assess North–South inequalities in contraceptive use in Nigeria. Northern and southern women differ conspicuously with regard to sociodemographic characteristics, socioeconomic profiles, ideational attributes, partner relationships, intimate partner violence, and the prevalence of Islamic religious affiliation. These differences are reflected in the huge inequality in modern contraceptive use between the two regions: 12.4 percentage points to the advantage of the South. The explanatory variables jointly account for more than 100% of the gap, indicating that differences in contraceptive behaviors (unexplained gap) between the North and the South make a negative albeit negligeable contribution to the gap. The negative unexplained gap suggests that some individuals in the North are slightly more inclined to use contraception than identical individuals in the South. Nonetheless, the population of the North is dominated by groups that are very unlikely to use contraception. If these people lived in the South, they would probably be even more unlikely to use contraception; however, there are comparatively fewer of them living in the South.

Ideational characteristics, a reflection of the way people think about contraception and fertility, are major contributors to the North–South gap in contraceptive use. The most important ideational variable is ideal family size, underscoring the critical role of pronatalist attitudes. The unique role of ideational variables in explaining the North–South differences in contraceptive use echoes what other studies have found in connection with the importance of ideation for contraceptive use (Okigbo et al. 2017; Babalola et al. 2015; Babalola 2017; Tumlinson et al. 2013; Gueye et al. 2015; Ankomah, Anyanti, and Oladosu 2011; Avidime et al. 2010). Socioeconomic characteristics contribute about two-fifths of the explained gap, pointing to the critical role of education and household wealth. In particular, North–South differences in the attainment of secondary education and the highest wealth quintile play a key role in this category. This finding is consistent with what studies that have examined the

association of contraceptive use with education and wealth found (Ankomah, Anyanti, and Oladosu 2011; Ejembi et al. 2015; Odewale, Oiadosun, and Amoo 2016; Sekoni and Oladoyin 2016; Palamuleni 2013).

The negative contribution of sociodemographic differences between the North and the South to the explained gap implies that northern women generally have sociodemographic characteristics that favor contraceptive use, particularly higher parity. Indeed, many studies have linked higher parity with contraceptive use in Nigeria and other African countries (Palamuleni 2013; Ogbe and Okezie 2010). Conjugal relationship dynamics also make a significant contribution to the explained gap. Fear of the husband and participation in household decisions are the key contributors in this category of variables. While only a few studies have explored the role of fear of the husband (partner phobia) in relation to contraceptive use, the evidence suggests that this variable might be a hindrance to contraceptive use or other reproductive health behaviors (Ankomah et al. 2013; Agadjanian and Hayford 2009). Our finding on the importance of women's participation in household decisions in explaining the North–South differences in contraceptive use is consistent with the wealth of empirical evidence on the positive association of women's decision-making agency with contraceptive use (Do and Kurimoto 2012; Nketiah-Amponsah, Arthur, and Abuosi 2012; Blackstone 2016).

Not surprisingly, differences in access to FP information in media contribute significantly, albeit modestly, to the North–South gap. The positive link between mass media communication on family planning and contraceptive use has been documented in many studies in Africa and elsewhere (Babalola and Vondrasek 2005; Kincaid 2000; Speizer et al. 2014; Hutchinson and Meekers 2012). North–South differences in the prevalence of intimate partner violence also make a small but significant contribution to the gap in contraceptive use. Research on the link between intimate partner violence and contraceptive use has yielded mixed results. Indeed, many studies have found a significant negative association between the two outcomes (Pearson et al. 2017; Peasant et al. 2017), whereas some have documented a positive association (McCloskey, Doran, and Gerber 2017; Tsai, Cappa, and Petrowski 2016), and others have found no significant association at all (Kwagala and Wandera 2016; Adjiwanou and N'Bouke 2015).

The findings from this study have important implications for family planning programming in Nigeria. The fact that northern and southern women are considerably different in terms of the socioeconomic variables included in the estimated model and the large contribution of these variables to the observed North–South gap in contraceptive use indicate that structural interventions to correct socioeconomic inequities between the North and South might go a long way to bridge the observed gap. In addition to these structural interventions, the North–South differences in

sociodemographic, socioeconomic, ideational, media exposure, religion, and couple–relationship variables indicate that separate health communication strategies should be developed for promoting contraceptive use in the two regions. For example, communication efforts specifically targeting low-literate and high-parity groups are more relevant in the North than in the South. Similarly, efforts to reach men and promote spousal communication are critical in the North.

The distinct importance of ideational variables in explaining the North–South gap in contraceptive use suggests that an approach based on the ideation framework (Kincaid 2000) might be successful in bridging the gap. Furthermore, North–South differentials in access to FP information in media is a significant contributor to the gap. Taken together, these findings suggest that a comprehensive health communication campaign targeting northern women and using multiple strategies (mass media, interpersonal communication, community mobilization, etc.) and data-informed, culturally appropriate messages to promote contraceptive knowledge, small family norm, and women's self-efficacy to negotiate contraceptive use with their spouses might go a long way to increase contraceptive use in the North. Of note is the need for such a comprehensive approach to use culturally appropriate channels and content to address pronatalist attitudes in the North.

The documented role of Islamic religious affiliation also has implications for programming and further research. Programmatically, this finding, coupled with the extent of social conservativeness in the northern part of Nigeria, suggests that working with religious leaders is critical in the North. Specifically, the finding implies the need to empower religious leaders to be advocates for family planning and to emphasize the positive position of Islamic religious tenets on contraception through multiple channels (Underwood 2000). Providing visibility to the success of family planning programs in predominantly Muslim countries might help to alleviate the misinformation that family planning is anti-Islam. Indeed, evidence from some predominantly Muslim countries (for example, Egypt and Indonesia) reveals the existence of government-supported family planning programs and a high level of contraceptive prevalence irrespective of religious affiliation (Roudi-Fahimi 2004; Rahayu, Utomo, and McDonald 2009). This finding also has implications for further research. There is need for a better understanding of the contextual factors that make Islamic religious affiliation to be negatively linked with contraceptive use in Nigeria. The relevant research will require the use of qualitative methods with various segments of the population to understand the factors underlying the observed negative effects of Islam on contraceptive use.

5. Conclusion

Inequities exist in the use of contraception between northern and southern Nigeria. These disparities are mainly due to north-south differences in socio-economic variables, ideation, socio-demographic characteristics, conjugal relationships, exposure to family planning messaging, and community compositional characteristics.

The findings of this study are relevant to non-governmental organizations, program staff, and policy makers interested in eliminating the disparities in family planning use in Nigeria. North–South equity in contraceptive use can be achieved by increasing access to culturally relevant family planning messaging particularly focused on the poor, uneducated northern Nigerians.

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