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Measuring child marriage

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Abstract

Child or early marriage is recognized as an important development and human rights issue that affects girls especially in many developing countries. The practice has been linked to psychological, health, and education risks. These negative impacts explain why in many countries child marriage has been prohibited by law but often with little effect. While child marriage has been recognized as a major issue, its measurement has remained unsophisticated. Existing studies tend to simply report the incidence of child marriage, that is the share of girls who marry early within a population. Yet, the consequences of child marriage are not the same whether one marries at the age of 12 versus 18. Typically, the cost of child marriage for health, education, and well-being is much larger when the girl marries very early. This paper suggests that it would be straightforward to use the techniques of poverty measurement in order to provide richer information on the extent of child marriage, including its depth and severity apart from its incidence, and to test for the robustness of child marriage comparisons between groups or over time to the age threshold used to identify child marriage. An illustration is provided for Nigeria.

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1. Introduction

Child or early marriage is recognized as an important development and human rights issue that affects girls in many developing countries (see for example Garenne 2004 on sub-Saharan Africa; Dubey and Rao 1999, and Sagade 2005, on South Asia; and UNICEF 2001, and Mensh et al. 2005 worldwide). The practice has been linked to various psychological and health risks (UNICEF 2001), including vesico-vaginal fistulae (Akpan 2003) and a higher likelihood of acquiring HIV/AIDS, in part because early marriage often eliminates a girl's ability to abstain from sex and thus increases the frequency of intercourse while also decreasing condom use (Clark 2004). Child marriage also has a strong impact on schooling, with most girls who marry early having to drop out of school (Lloyd and Mensch 2008). In Bangladesh, Field and Ambrus (2009) found that for each additional year of delay in the age of marriage, a girl will benefit on average from 0.22 additional year of schooling and an increase in the probability of literacy of 5.6 percent. Through its negative impacts on human development, child marriage also contributes to the perpetuation of poverty (Otoo-Oyortey and Pobi 2003).

The negative impact of child marriage on a wide range of development outcomes explains why in many countries child marriage is now prohibited by law. In the case of Nigeria for example, under Sections 21 and 23 of the Child Rights Act, marriage before the age of 18 is illegal (Toyo 2006). Yet because the practice is often associated with deeply held cultural and religious traditions (see for example Faizunnisa and Ul Haque 2003, in the case of Pakistan), beyond consent law reforms other interventions are often needed to curb the incidence of child marriage. Policies that help in reducing the likelihood of child marriage may include investments in education, with daughters of educated mother less likely to marry early (Bates et al. 2007), and possibly conditional cash transfers as well (Baird et al. 2010).

However, while child marriage has been recognized as a major policy issue, its measurement has remained relatively unsophisticated. To our knowledge, most existing studies simply report the incidence of child marriage, that is the share of girls who marry early (before the age of 18) within a population. Other measures that would take into account how young girls marry are often not provided, and no tests are carried to assess the robustness of comparisons or statistics about child marriage between countries, between groups within countries, or between time periods with respect to the age threshold used to identify child marriage. Yet, the consequences of child marriage are not the same whether one marries at the age of 12 or 18. Typically, the cost of child marriage for a girl's health, education, and well-being is larger when the girl marries very early. For example, child marriage is known to have a negative impact on school enrollment and attainment. The earlier a girl marries, the more likely it is that she will have a low level of schooling, which will not only limit her employment and earnings potential for the rest of her life, but also have other consequences ranging from health to autonomy (if only because education has been shown to have a large impact on a wide range of development outcomes). This example suggests that better measures of child marriage are called for.

The objective of this paper is to suggest that beyond reporting the incidence of child marriage, as well as basic statistics such as the mean or median age of marriage in a population, we would benefit from information on the 'depth' and 'severity' of child marriage, two concepts borrowed from the poverty literature (for an introduction to poverty measurement, see Coudouel et al. 2002; for a technical overview together with software facilitating the empirical analysis of poverty, see Duclos and Araar 2003). The idea of applying poverty measurement techniques to other areas is not new. Morris, Flores, and Zúniga (2000) look at the 'nutrition poor' and define

as stunted children who have a measure of height for age at least two standard deviations below international standards. The authors then simulate a nutrition intervention whose impact is estimated by computing the incidence of stunting (the headcount for the nutrition poor) as well as higher order measures of malnutrition before and after the intervention. Bardasi and Wodon (2010) use poverty measurement techniques to look at various measures of time poverty, and Makdissi and Wodon (2008) show that poverty measurement techniques can also be used for the analysis of climate change, for example in terms of CO2 emissions. But again, to our knowledge, these techniques have not been used to-date for the measurement of child marriage.

In what follows, section two of the paper is devoted to the presentation of measures of child marriage, while section 3 considers the issue of stochastic dominance or robust comparisons when comparing distributions of age at marriage. A conclusion follows.

2. Measurement of Child Marriage

2.1. Methodology[1]

In the poverty literature, the headcount index is simply the share of the population that is poor, i.e. the proportion of the population for whom consumption or income y per equivalent adult is less than the poverty line z. Here, the variable of interest y is the age at marriage of a girl or woman, and the poverty line is the age threshold under which marriage is considered as under-age. In some countries, the (legal) limit may be set at 18 years of age, while in others the norm may be lower, say at 16 years of age. With a female population of size n in which q girls are married under the child marriage age threshold, the headcount index of child marriage (computed among the population as a whole, and not only those who get married) is defined as:

$$H = \frac{q}{n} \tag{1}$$

A second often used measure of poverty is the poverty gap, which represents the 'depth' of poverty. This is defined as the mean distance separating the population from the poverty line divided by the poverty line, with the non-poor being given a distance of zero. The poverty gap is a measure of the poverty deficit of the entire population, where the notion of 'poverty deficit' captures the resources that would be needed to lift all the poor out of poverty through perfectly targeted cash transfers. It is defined as follows:

$$PG = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{z - y_i}{z}\right] \tag{2}$$

where y_i is the income or consumption of individual i (in practice, we often work with household rather than individual income or consumption). The child marriage gap can be defined similarly by considering the distance separating the age at marriage of a girl y_i from the child marriage age threshold z. Note that the poverty gap, or the child marriage gap in our context, can be written as being equal to the product of the age gap ratio and the headcount index of child marriage, that is $PG=AGR*H$, where the age gap ratio is itself defined as:

$$AGR = \frac{z - y_q}{z} \quad where \quad y_q = \frac{1}{q}\sum_{i=1}^{q} y_i \tag{3}$$

[1] The exposition in this section follows Coudouel et al. (2002), but with adaptation to child marriage.

It must be emphasized that the age gap ratio in itself is not a good measure of child marriage. Assume that due to some policy reform, some girls who would have married early but were close to the child marriage age threshold now marry later, so that they are not considered anymore as having been married as children. The child marriage gap will increase because the mean distance separating the girls who still marry early from the child marriage age threshold will increase. This happens because some of the girls who married before the policy just before the child marriage age threshold are now not considered any more as marrying early – this means that those who are still marrying early are on average further away from the child marriage age threshold. Using the child marriage age gap as a child marriage measure would suggest an increase in child marriage while none of the children are actually are worse off with the new policy, and some girls are actually better off because they marry later. Although the age gap ratio AGR will increase, the child marriage gap *PG* will decrease, because the headcount index of child marriage will decrease. This suggests an improvement towards the reduction of child marriage. The problem with the child marriage age gap ratio is that it is defined only on the population that marries early, while the child marriage gap is defined over the whole population.

Finally, the squared poverty gap in the poverty literature is often described as a measure of the 'severity' of poverty. While the poverty gap takes into account the distance separating the poor from the poverty line (as well as the share of the poor in the population), the squared poverty gap takes the square of that distance into account. When using the squared poverty gap, the poverty gap is weighted by itself, so as to give more weight to the very poor. Said differently, the squared poverty gap takes into account the inequality among the poor. It is obtained as follows:

$$P2 = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{z - y_i}{z}\right]^2 \tag{4}$$

The squared child marriage gap would then be defined similarly, by considering for girls who have married early the square of the difference between the age threshold to identify child marriage and the age at marriage, normalized by the age threshold. The headcount, the child marriage gap, and the squared child marriage gap then correspond to the first three poverty measures of the so-called Foster-Greer-Thorbecke (1984) class of poverty measures. The general formula for this class of measures depends on a parameter α which takes a value of zero for the headcount, one for the child marriage gap, and two for the squared child marriage gap in the following expression:

$$P\alpha = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{z - y_i}{z}\right]^\alpha \tag{5}$$

It may be important to use the child marriage gap and the squared child marriage gap in addition to the headcount or incidence for evaluation purposes, or for assessing trends over time in child marriage. Basing evaluations of policies on the headcount index may lead to favoring policies that lift girls who are at risk of marrying closest to the child marriage age threshold over that threshold, because this may be more easy to do than reaching in priority those girls who marry much earlier. By contrast, basing evaluations of policies or assessing trends over time in child marriage by relying on the child marriage gap and the squared child marriage gap puts more the emphasis on helping girls who are further away from the age threshold when they are

likely to marry. These are the girls who are the most at risk in terms of the negative effects of child marriage on a wide range of development outcomes, as mentioned in the introduction.

2.2. Illustration

To illustrate the approach we use data on age at first marriage from the latest Demographic and Health Survey (DHS) for Nigeria. The DHS survey was implemented in 2008 and it asks about age at first marriage for all women in the sample aged 15-49. Here we use the sample of women aged 18-49 in order to avoid the problem of incomplete information for girls below 18 years of age who could still get married before reaching 18, which we consider as our child marriage age threshold. The various measures of child marriage are provided in Tables 1 through 3. All measures are obtained using the household weights in the survey. The table provides the measures of child marriage (headcount, gap, and squared gap) as well as the median and mean age of the first marriage nationally and in various population subgroups.

Consider first table 1, which provides measures at the national level, as well as for urban and rural areas and by region. At the national level, 45.2 percent of women aged 18 to 49 were married as children, that is below the age of 18. The headcount of child marriage is much higher in rural areas, at 54.8 percent, than in urban areas, at 28 percent, and the same is observed for higher order measures of child marriage (gap and squared gap). Two regions – the North East and the North West, where the population tends to be Muslim – have an especially high level of child marriage. Southern regions, where the population tends to be Christian, have lower child marriage measures. Table 1 also reports standard errors for the various child marriage measures. The standard errors tend to be small due to the relatively large sample size of the survey. As a result differences in child marriage measures between urban and rural areas and by location are in most cases statistically significant. As an example of how the use of different child marriage measures may in some cases affect rankings between geographic areas, note that according to the headcount, child marriage is lowest in the South East region, while it is lowest in the South South region according to the child marriage gap and squared gap.

As shown in table 2, the data also suggest that the incidence of child marriage has been declining over time, and quite substantially so in recent years. From the point of view of measurement, it is actually an advantage of a one-time event such as child marriage that the trend over time in measures of child marriage can be estimated using a single cross-sectional survey. While among women aged 30 to 34, 47.7 percent were married as a child, this has decreased to 42.3 percent among women aged 25 to 29, 39.4 percent among women aged 20 to 24, and 35.7 percent among women aged 18 and 19. A similar trend is observed for the child marriage gap and squared gap. Estimates are also provided according to the decade in which women were born, with similar results (since the survey was collected in 2008, we chose 1990 as the end year of the first decade to ensure that our sample is indeed restricted to women aged 18 and over).

Finally, table 3 shows that there are rather large differences between ethnic and religious groups in the measures of child marriage. For example, the ethnic groups with the highest measures are the Fulani and Haussa, as well as the Kanuri/Beriberi, all of which tend to live in the northern part of the country. In those groups more than eight in ten women in the sample married early. The ethnic groups with the smallest child marriage measures, which tend to be located more in the South, are the Igbo, Yoruba, Ibibio, Ijaw/Izon, and Ekoi. Similar differences are observed according to religion. Muslim women, who tend to live in the north, are more likely to be married as children than Christian women, with traditionalist groups falling in

between. Of course, the causes of child marriage are multiple, and we are not in any way establishing causality here. Beyond religion, culture and as socio-economic factors may all play the largest role in the persistence of the practice of child marriage (for a discussion of some of the cultural issues involved in Nigeria, see for example Odimegwu and Okemgbo 2003; see also UNICEF 2001, for a more general discussion). In this note we only show how the techniques of poverty measurement can be used to better measure child marriage. We do not consider its complex causes and determinants, nor do we discuss the policies and programs that could potentially be implemented to reduce the extent of child marriage.

3. Stochastic Dominance

When comparing poverty measures over time or between groups, it is important to test the robustness of observed changes or differences to the threshold used to measure poverty. Indeed, the observed changes or differences may depend on the selected poverty line and using two different poverty lines may lead to different assessments of changes in poverty over time or differences in poverty between groups. To avoid such issues, stochastic dominance techniques are used to establish the robustness of poverty rankings to the choice of the poverty line, and the same can be done for child marriage. It could be for example that when the child marriage age threshold is changed to 16 years as opposed to 18 years, different conclusions are reached in terms of comparisons of the extent of child marriage over time or between groups.

Without entering into technical details here (see Atkinson 1987 on stochastic dominance for poverty measurement, and Duclos and Araar 2003, for a review of the techniques, extensions, and software that can be used in applying the techniques), first order statistical dominance involves comparing the cumulative distribution functions of an indicator for various years or groups. Stochastic dominance is observed at the first order when the cumulative distribution function for, say, one year lies above that for another year at all levels of income or consumption in the case of poverty, or at all age thresholds in the case of child marriage. In that case, it can be said that for a broad range of measures, poverty or child marriage is higher in the first year than in the second. Said differently, if one finds first order dominance between two years (or groups) because the cumulative distributions do not intersect below reasonable poverty lines or age thresholds, then one can affirm that the poverty or child marriage comparisons between the two years will be robust to the choice of the poverty line or age threshold. This will be the case not only for first order measures such as the poverty or child marriage headcount, but also for higher order measures such as the child marriage or poverty gap (second order) and the squared child marriage or poverty gap (third order). By contrast, if the cumulative distributions do intersect, one needs to check for second order dominance. This involves analyzing deficit curves or integrals of the areas below the cumulative distribution functions, in order to make sure that child marriage comparisons of the second order will be robust. If the second order curves still intersect, one can then test for third order stochastic dominance, and so on. There is a large literature on the properties of these tests for robustness, but this need not be detailed here.

To illustrate the techniques, Figures 1 and 2 show how this can be done in practice in the case of child marriage at the first order of stochastic dominance, which relies on simple cumulative distribution functions for the tests. Figure 1 compares the cumulative distributions of age at marriage between religious groups, showing the shares of women that have married below a certain age. The two highest curves are those for Muslims and traditionalists. While the curve for Muslims is higher than that for traditionalists for most of the distribution, it is not the case for

very young ages, where the probability of being married is actually higher for traditionalists than for Muslims. Because the curves do intersect, one cannot affirm that one group dominates (i.e., has higher measures of child marriage) than the other at the first order. By contrast, if one compares either Muslims or traditionalists with Catholics and other Christians, the curves do not intersect, so that dominance is established at the first order. Whatever the measure of child marriage used among the broad class of measures for which these stochastic dominance tests are valid (which includes the FGT class), child marriage will be found to be more present among Muslim and traditionalist populations than among Catholic and Christian populations.

Figure 2 provides an analysis by age groups, with the age defined according to the decade in which women were born. As mentioned earlier, since the survey was collected in 2008, we chose 1990 as the end year of the first decade to ensure that our sample is restricted to women aged 18 and over. For the most recent decade, the cumulative density function stops at age 27, since there are no subsequent observations in the data set in our sample given the start of the decade in 1981. The curves for the various decades are close to each other and indeed intersect for the 1950s, 1960s, and 1970s, suggesting limited progress over that period of time in the reduction of child marriage and no dominance over those decades. By contrast, the curve for the 1980s is lower and does not intersect with the curves for the previous decades, suggesting gains towards the reduction of child marriage that are robust to the choice of the age threshold. Again, when some curves intersect, one may rely on higher order tests of stochastic dominance to obtain higher order robust child marriage comparisons, but this is not needed for the present illustration, since at the first order the curve for the 1980s clearly does not intersect the earlier curves.

4. Conclusion

Child or early marriage often has negative consequences for a girl's well-being, health, and education, which explains why the practice has been outlawed in many countries. Yet even when child marriage is prohibited by law, the practice remains widespread, especially in sub-Saharan Africa. While existing studies simply report the incidence of child marriage, we have suggested in this paper that richer information would be obtained on the extent of the practice and changes in the practice over time (or differences in the practice between groups) by relying on the techniques of poverty measurement. An illustration was provided for Nigeria, suggesting that not only the headcount of child marriage, but also the child marriage gap and the squared gap have been decreasing in recent years, with this change being robust to the choice of the age threshold used to define child marriage. The empirical illustration also provided comparisons of the extent of child marriage according to location, ethnicity, and religious tradition.

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Table 1: Measures of Child Marriage by Location in Nigeria, 2008

	Number of observations	Measures of Child Marriage			Age of first marriage	
		Headcount (%)	Gap (%)	Squared Gap (%)	Median	Mean
Area of residence						
Rural	20,153	54.8	10.8	2.6	16	17.1
		(0.85)	(0.20)	(0.06)		
Urban	9,277	28.0	5.1	1.2	19	19.7
		(0.90)	(0.19)	(0.06)		
Region						
North Central	5,630	43.2	7.6	1.8	17	18.0
		(1.42)	(0.29)	(0.08)		
North East	5,467	71.9	14.8	3.7	15	15.8
		(1.84)	(0.53)	(0.16)		
North West	6,582	79.5	16.5	4.1	15	15.4
		(1.40)	(0.36)	(0.11)		
South East	3,201	18.3	3.2	0.8	20	21.0
		(1.08)	(0.21)	(0.06)		
South West	4,184	26.4	4.6	1.1	19	19.5
		(1.17)	(0.22)	(0.06)		
South South	4,366	19.3	2.9	0.6	20	20.7
		(1.00)	(0.16)	(0.04)		
National	29,430	45.2	8.7	2.1	17	17.9
		(0.68)	(0.15)	(0.04)		

Source: Authors' estimation from the Nigeria DHS 2008. Sample of women aged 18-49.

Table 2: Measures of Child Marriage by Age Groups and Decades in Nigeria, 2008

	Number of observations	Measures of Child Marriage			Age of first marriage	
		Headcount (%)	Gap (%)	Squared Gap (%)	Median	Mean
Age Groups						
18-19	2,636	35.7	6.1	1.3	15	15.4
		(1.22)	(0.24)	(0.07)		
20-24	6,103	39.4	7.2	1.7	16	16.5
		(1.02)	(0.22)	(0.07)		
25-29	6,303	42.3	8.1	2.0	17	18.1
		(0.90)	(0.20)	(0.06)		
30-34	4,557	47.7	9.4	2.3	17	18.6
		(1.06)	(0.24)	(0.07)		
35-39	3,883	49.0	9.6	2.3	17	18.7
		(1.03)	(0.24)	(0.08)		
40-44	3,043	52.8	10.9	2.7	17	18.3
		(1.09)	(0.28)	(0.09)		
45-49	2,905	55.4	11.3	2.8	17	18.1
		(1.15)	(0.30)	(0.10)		
Decades of birth						
1981-1990	12,763	40.7	7.4	1.7	16	16.8
		(0.85)	(0.18)	(0.05)		
1971-1980	9,394	45.7	9.0	2.2	18	18.6
		(0.86)	(0.20)	(0.06)		
1961-1970	6,003	51.7	10.4	2.6	17	18.5
		(0.88)	(0.22)	(0.07)		
1951-1960	1,270	56.2	11.5	2.9	17	17.9
		(1.66)	(0.41)	(0.14)		

Source: Authors' estimation from the Nigeria DHS 2008. Sample of women aged 18-49.

Table 3: Measures of Child Marriage by Ethnicity and Religion in Nigeria, 2008

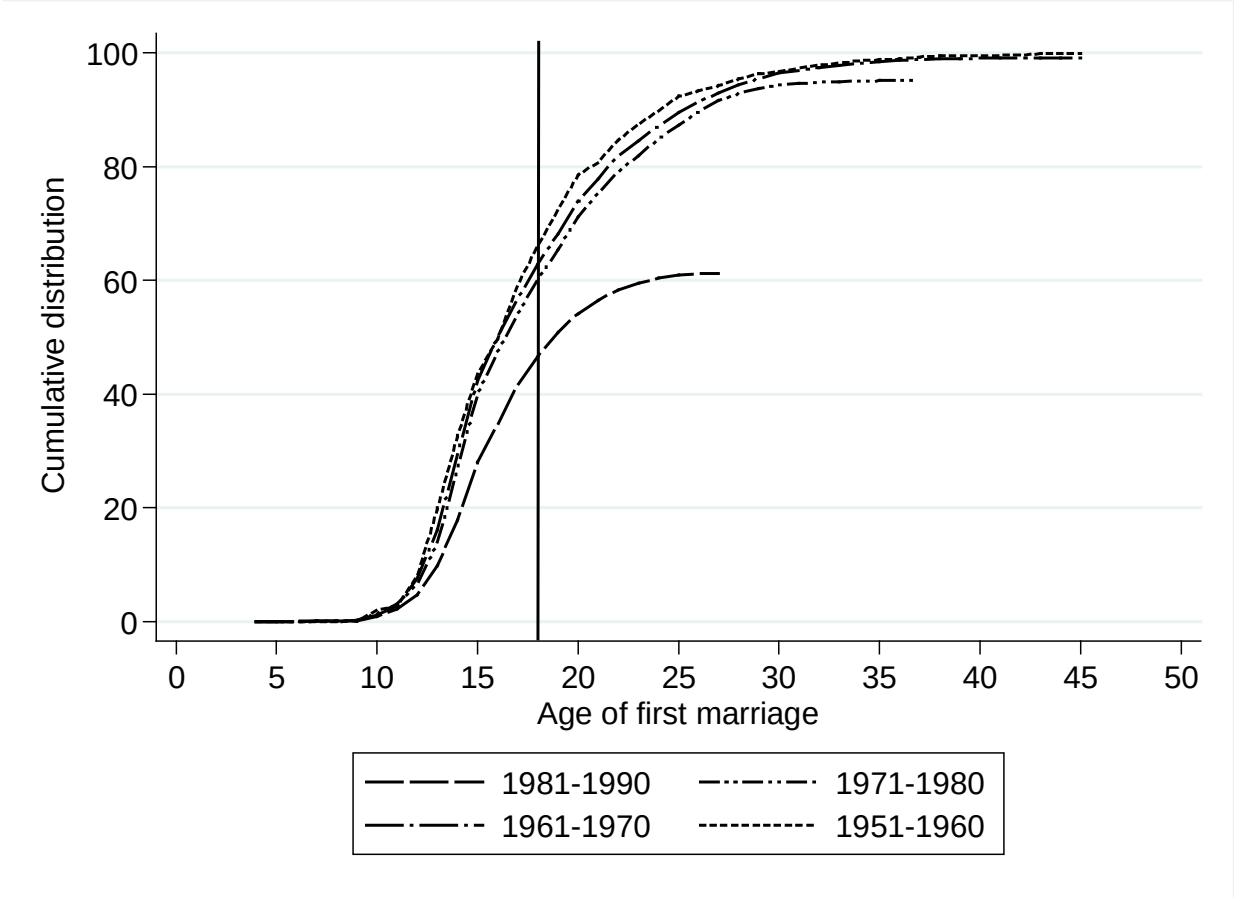
	Number of observations	Measures of Child Marriage			Age of first marriage	
		Headcount (%)	Gap (%)	Squared Gap (%)	Median	Mean
Ethnicity						
Ekoi	511	29.5	5.6	1.4	18	19.0
		(2.59)	(0.61)	(0.18)		
Fulani	2,184	83.5	17.4	4.2	15	15.2
		(1.40)	(0.47)	(0.15)		
Hausa	6,364	81.7	16.9	4.2	15	15.3
		(1.01)	(0.28)	(0.10)		
Ibibio	619	25.9	4.3	0.9	19	19.7
		(2.40)	(0.44)	(0.12)		
Igala	453	38.0	7.6	2.1	17	18.1
		(3.25)	(0.87)	(0.28)		
Igbo	4,016	17.2	3.0	0.7	21	21.2
		(0.92)	(0.18)	(0.05)		
Ijaw/Izon	997	30.9	5.1	1.2	18	19.1
		(2.58)	(0.47)	(0.13)		
Kanuri/Beriberi	742	85.3	19.8	5.3	14	14.7
		(2.42)	(1.02)	(0.39)		
Tiv	781	52.2	9.6	2.3	17	17.1
		(2.45)	(0.56)	(0.19)		
Yoruba	4,236	18.5	2.7	0.6	20	20.7
		(0.91)	(0.15)	(0.04)		
Others	8,386	40.4	7.2	1.7	17	18.2
		(1.15)	(0.24)	(0.07)		
Religion						
Catholic	3,137	25.7	4.6	1.1	19	19.9
		(1.19)	(0.24)	(0.07)		
Other Christian	11,840	23.9	4.0	0.9	19	20.0
		(0.67)	(0.12)	(0.03)		
Muslim	13,746	69.7	14.1	3.5	15	16.1
		(0.86)	(0.23)	(0.07)		
Traditionalist	493	52.8	10.5	2.6	17	17.5
		(2.26)	(0.57)	(0.21)		
Other	214	50.9	9.9	2.4	16	17.7
		(3.16)	(0.79)	(0.27)		

Source: Authors' estimation from the Nigeria DHS 2008. Sample of women aged 18-49.

Figure 1: Cumulative Distribution of Age of First Marriage by Religious Affiliation

Source: Authors' estimation from the Nigeria DHS 2008. Sample of women aged 18-49.

Figure 2: Cumulative Distribution of Age of First Marriage by Decade of Birth



Source: Authors' estimation from the Nigeria DHS 2008. Sample of women aged 18-49.