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# Journal of Health and Social Behavior

## Community Influences on Female Genital Mutilation/Cutting in Kenya: Norms, Opportunities, and Ethnic Diversity

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Abstract:	Female genital mutilation/cutting (FGMC) is a human-rights violation with adverse health consequences. Although prevalence is declining, the practice persists in many countries, and the individual and contextual risk factors associated with FGMC remain poorly understood. We propose an integrated theory about contextual factors and test it using multilevel discrete-time hazard models in a nationally representative sample of 7,535 women with daughters who participated in the 2014 Kenya Demographic and Health Survey. A daughter's adjusted hazard of FGMC was lower if she: had an uncut mother who disfavored FGMC, lived in a community that was more opposed to FGMC, and lived in a more ethnically diverse community. Unexpectedly, a daughter's adjusted FGMC hazard was higher if she lived in a community with more extra-familial opportunities for women. Other measures of women's opportunities warrant consideration, and interventions to shift FGMC norms in more ethnically diverse communities show promise to accelerate abandonment.

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**Community Influences on Female Genital Mutilation/Cutting in Kenya:  
Norms, Opportunities, and Ethnic Diversity**

Rose Grace Grose, PhD  
Assistant Professor, Department of Community Health Education, Colorado School of Public  
Health at the University of Northern Colorado

Sarah R. Hayford, PhD  
Associate Professor, Department of Sociology, Ohio State University

Yuk Fai Cheong, PhD  
Associate Professor, Department of Psychology, Emory University

Sarah Garver  
Post-doctoral Fellow, Department of Sociology, University of Chicago

Ngianga-Bakwin Kandala, PhD  
Faculty of Engineering and Environment, Department of Mathematics, Physics, and Electrical  
Engineering, Northumbria University, Newcastle upon Tyne

Kathryn M. Yount, PhD  
Asa Griggs Candler Chair of Global Health and Professor, Hubert Department of Global Health  
Professor, Department of Sociology, Emory University

**Corresponding Author**  
1518 Clifton Rd, NE, Atlanta, GA, 30322  
Email: kyount@emory.edu

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**Abstract**

Female genital mutilation/cutting (FGMC) is a human-rights violation with adverse health consequences. Although prevalence is declining, the practice persists in many countries, and the individual and contextual risk factors associated with FGMC remain poorly understood. We propose an integrated theory about contextual factors and test it using multilevel discrete-time hazard models in a nationally representative sample of 7,535 women with daughters who participated in the 2014 Kenya Demographic and Health Survey. A daughter's adjusted hazard of FGMC was lower if she: had an uncut mother who disfavored FGMC, lived in a community that was more opposed to FGMC, and lived in a more ethnically diverse community. Unexpectedly, a daughter's adjusted FGMC hazard was higher if she lived in a community with more extra-familial opportunities for women. Other measures of women's opportunities warrant consideration, and interventions to shift FGMC norms in more ethnically diverse communities show promise to accelerate abandonment.

**Keywords**

ethnic diversity, female genital mutilation/cutting, Kenya, multilevel modeling, social norms

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Female genital mutilation/cutting (FGMC) refers to procedures in which the external female genitalia are partially or completely removed for non-medical reasons (United Nations Children Fund [UNICEF] 2016). Over 200 million girls and women have experienced FGMC, with around 2.6 million girls at risk of being cut annually (*ibid.*). A human rights violation (United Nations [UN] 2014), FGMC can have serious negative health consequences, including immediate and long-term genito-urinary, obstetric, sexual, and psychosocial complications, although the outcomes vary with procedure severity (Berg et al. 2014; Kimani, Muteshi-Strachan, and Njue 2016; Yount and Abraham 2007; Yount and Carrera 2006). International resolutions calling for action, and national laws banning and regulating FGMC, have expanded over the past two decades (UNICEF 2010; UN 2015). In parallel, the reported prevalence of FGMC has declined in some countries but remains almost universal in others (UNICEF 2013).

Kenya is often cited as a success story of efforts to encourage abandonment of FGMC. FGMC rates dropped by almost half between the 1998 Kenya Demographic and Health Survey (KDHS) and the 2014 KDHS (NCPD Kenya et al. 1999; Kenya National Bureau of Statistics [KNBS] et al. 2015). Cross-sectional data from the 1998 DHS suggests that declines began even earlier (Hayford 2005). Kenyan non-governmental organizations have been active in social and educational campaigns since at least the early 1990s, and these efforts intensified with growing international opposition in the 1990s and 2000s (Cloward 2016). Legal bans on FGMC were implemented in 2001, and the Prohibition of FGMC Law was passed in 2011 as part of a broader goal to promote “health and gender equality” (National Council for Population and Development [NCPD] 2012). Still, about 11.4% of adolescent girls (15–19 years) had experienced FGMC in 2014, with substantial variation across ethnic groups, geographic regions, and communities (KNBS et al. 2015). Understanding the nature of persistence and decline of FGMC in a

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2  
3 multiethnic, moderate-prevalence society like Kenya can advance efforts toward more  
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5 widespread abandonment and a broader understanding of community influences on sociocultural  
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7 practices with health implications.  
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10 Here, we examine the multilevel influences on FGMC in Kenya. We draw on an  
11  
12 integrated theory of the community-level influences on FGMC (Yount et al. n.d.) and extend this  
13  
14 theory to incorporate community ethnic diversity as an indicator of the “openness” or  
15  
16 “closedness” of community social systems. We develop robust measures of community norms,  
17  
18 opportunity structures, and ethnic diversity to test our theory using multilevel discrete-time  
19  
20 hazard models.  
21  
22

## THEORIZING FGMC DECISIONS

23  
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25  
26 Where FGMC is carried out in infancy or early childhood, mothers or grandmothers often are the  
27  
28 primary decision-makers, although fathers may be involved (Gruenbaum 2001; Shell-Duncan  
29  
30 Hernlund, Wander, and Moreau 2010). In contexts where FGMC occurs in adolescence, girls  
31  
32 may choose to undergo the practice (Hodzic 2016; Leonard 2000). Yet, FGMC decisions are also  
33  
34 is embedded in hierarchical family and community relationships (Bicchieri 2017). FGMC often  
35  
36 marks a rite of passage and ensures social status in the marital family and community (Shell-  
37  
38 Duncan, Naik, and Feldman-Jacobs 2016; Yount 2002). FGMC is tied to beliefs about  
39  
40 belonging, family, and marriage and childbearing, and these social connotations influence  
41  
42 decisions to cut. Thus, decisions about FGMC depend on social relationships and are grounded  
43  
44 in social systems.  
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49 Theories of FGMC have focused on social norms and gendered opportunities as central  
50  
51 determinants of the practice. According to norms-based theories of social behavior, conformity  
52  
53 to descriptive norms (what other people do) and injunctive norms (what other people believe  
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3 should be done) jointly motivate individual behavior. Mackie (1996, 2003) developed  
4  
5 convention theory as an application of norms-based theories to FGMC, arguing that community  
6  
7 norms specific to FGMC are the primary influence on continuation. In communities where  
8  
9 FGMC prevalence is high, parents expect everyone else's daughters to be cut and believe that  
10  
11 others expect their own daughters to be cut. Parents also may expect strong sanctions for  
12  
13 daughters who remain uncut, such as exclusion of daughters from community events and  
14  
15 ceremonies, low position in marriage markets, and reduced social support (Bicchieri 2017;  
16  
17 Mackie 1996; Mackie and LeJeune 2009; Shell-Duncan, Wander, Hernlund, and Moreau 2011;  
18  
19 Yount 2002, 2004). Fear of social sanctions may lead mothers to have their daughters cut even if  
20  
21 the mothers themselves oppose the practice (Shell-Duncan et al. 2016).  
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26  
27 Convention theorists contend that changes in FGMC will take place collectively when a  
28  
29 "tipping point" or "critical mass" is reached in social, moral, and legal opposition to the practice  
30  
31 (Mackie and LeJeune 2009). In theory, a mother will be able to decide not to cut her daughter  
32  
33 when broader social acceptance of uncut daughters emerges and social sanctions for non-  
34  
35 compliance decline. Evidence supports convention theory, in that community norms around  
36  
37 FGMC are related to a mother's decision to cut her daughters (Hayford 2005; Hayford and  
38  
39 Trinitapoli 2011; Yount et al. n.d.), and girls are less likely to experience FGMC if they live in  
40  
41 communities where fewer girls are cut (Farina and Ortensi 2014).  
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45  
46 However, norms specific to FGMC are not the only community-level factors influencing  
47  
48 persistence or abandonment. FGMC norms are gendered norms, in that they govern women's  
49  
50 behavior *as women*, and they are thus situated in larger gender systems. Feminist theorists  
51  
52 emphasize the role of gendered *extra-familial opportunities* in maintaining FGMC (Yount 2002).  
53  
54 FGMC has served to regulate women's access to marriage (Leonard 2000; Yount 2002). As a  
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## FEMALE GENITAL MUTILATION/CUTTING IN KENYA

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3 result, the salience of FGMC is tied to the importance of marriage as a source of economic  
4  
5 security and social identity. This importance is reflected not only in the prevalence of marriage,  
6  
7 but also in the extent to which women are able to participate in economic and social activity  
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9 outside the family or, conversely, the extent to which women are dependent on marriage for  
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11 status and security. In many contexts, institutionalized gender inequalities limit women's  
12  
13 activities outside the family, including education and paid work, and constrain their sexual and  
14  
15 reproductive rights (Kabeer 1999; Muñoz Boudet, Petesch, Turk, and Thumala 2013). In  
16  
17 communities where these constraints are less strict, and women have more extra-familial  
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19 opportunities — such as delaying marriage to adulthood, attending school, and participation in  
20  
21 market work — mothers may see marriage as less necessary for their daughters' survival and  
22  
23 FGMC as less important (Boyle, McMorris, and Gomez 2002; Modrek and Liu 2013; Shell-  
24  
25 Duncan et al. 2016; Yount 2002).

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31 Some evidence supports feminist theories. Daughters have a lower risk of FGMC when  
32  
33 their mothers have more schooling (Andro and Lesclingand 2007; Hayford 2005; UNICEF 2013;  
34  
35 Yount 2002) or work outside the home (Boyle et al. 2002). Women who marry early are more  
36  
37 likely to have their daughters cut (Farina and Ortensi 2014; Jensen and Thornton 2003; Modrek  
38  
39 and Liu 2013). In Mali, women who experienced FGMC were more likely to be in polygamous  
40  
41 marriages and to have experienced physical, sexual, and psychological violence (Salihu et al.  
42  
43 2012). In Kenya, FGMC was unrelated to polygamous marriage, but was related to being  
44  
45 married to older partners and to earlier sexual debut (Yount and Abraham 2007). Thus, existing  
46  
47 theory suggests that women may be better able to act on their preferences for abandoning FGMC  
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49 in communities in which women have more extra-familial opportunities.  
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## COMMUNITY HETEROGENEITY AND FGMC



## FEMALE GENITAL MUTILATION/CUTTING IN KENYA

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Both convention and feminist theories implicitly rely on the assumption that women and their daughters are part of a clearly defined and homogenous community that serves as a reference group for FGMC norms and extra-familial opportunities. In practice, the relevant reference community is not always well-defined or homogenous. To some extent, heterogeneity is captured in measures of community norms or opportunity structures. For instance, communities in which FGMC practices vary will have weaker descriptive norms around FGMC. However, communities in which multiple distinct groups co-reside may be qualitatively different from more homogenous communities, even after accounting for variation in norms.

Here, we operationalize community heterogeneity with a measure of ethnic diversity. A large and vibrant literature examines the influence of ethnic diversity on community relations and social cohesion in high-income countries. At the neighborhood level – that is, in relatively small, geographically contiguous spaces in which people are likely to have repeated informal interactions – ethnic diversity is consistently associated with lower levels of social cohesion (van der Meer and Tolsma 2014). In sub-Saharan Africa, research on how ethnic diversity affects social relations generally focuses on larger levels of aggregation, examining the influence of ethnic competition on political stability, economic investment, and policy implementation at the national level (e.g., Easterly and Levine 2007; Lieberman 2007). However, a few community-level studies have found that ethnically diverse communities have lower levels of social cohesion (Glennerster, Miguel, and Rothenberg 2013) and lower levels of investment in collective goods (Miguel and Gugerty 2005). Ethnically diverse communities appear to be less able to enforce social sanctions that promote pro-social behavior (Habyarimana, Humphreys, Posner, and Weinstein 2007; Miguel and Gugerty 2005). If ethnically diverse communities have weaker social ties and weaker enforcement of norms, they also may have lower levels of FGMC, net of

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community norms and opportunity structures.

FGMC beliefs and practices are tied to ethnic group identity, in Kenya as elsewhere in sub-Saharan Africa (e.g., Thomas 2003; Weinreb 2001; White 1990), but there is substantial variation in FGMC within as well as across ethnic groups (Cloward 2016; Gruenbaum 2001; Leonard 2000; KNBS et al. 2015). The presence of a non-practicing group may facilitate behavioral change among members of a historically practicing group. In a study of Maasai communities in Kenya, Cloward (2016) found that frequent contact with members of other ethnic groups was associated with less likelihood of cutting one's daughter and of plans to do so. However, the impact of ethnic diversity goes beyond exposure to new ideas. Even where co-resident ethnic groups share similar FGMC norms, more ethnically diverse communities may have less kin-based and more diffuse social ties (Bicchieri 2017; Shell-Duncan et al. 2016). Women living in these communities may conclude that community expectations about FGMC are weak (or weakly enforced), and that it is possible to reject the practice without diminishing opportunities for their daughters (Bicchieri 2017). In this way, ethnic diversity may create more favorable environments for women to act upon non-normative beliefs.

## CURRENT STUDY

Drawing on the research and theory described above, we hypothesize direct effects of community FGMC norms, extra-familial opportunity structures, and ethnic diversity on daughters' FGMC. Because FGMC decisions reflect interactions between individual goals and larger social networks, we also hypothesize that a mother's ability to carry out individual preferences regarding FGMC varies across communities depending on these characteristics.

We propose two primary hypotheses:

H1. A daughter has a lower adjusted risk of experiencing FGMC if she lives in a

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community with (a) norms that are less supportive of FGMC; (b) more opportunities for women outside marriage; and (c) greater ethnic diversity.

H2. A mother's disapproval of FGMC is more strongly associated with her daughter's FGMC if the pair live in a community with (a) norms that are less supportive of FGMC; (b) more opportunities for women outside marriage; and (c) greater ethnic diversity.

In a prior case study, we tested a subset of these hypotheses in Egypt (Yount et al. n.d.). In the current study, we assess whether the gender-systems framework developed for Egypt (Yount et al. n.d.) can be extended to a region with a very different range of community characteristics regarding FGMC norms and extra-familial opportunities. We add an important theoretical and empirical dimension to this study in Kenya by exploring the additional influence of community ethnic diversity.

Kenya presents a distinct context both in terms of FGMC practice and prevalence and in terms of gender systems and extra-familial opportunities. Kenya is a multiethnic society that has experienced substantial decline in the prevalence of FGMC. Women's average age at marriage is young (median 20 years), and about 10% of married women are in polygynous marriages (KNBS et al. 2015). Kenya is relatively more industrialized than many countries in the African sub-continent, but subsistence agriculture remains an important source of economic production (World Bank 2018). As in much of sub-Saharan Africa, women's labor is central to agricultural production (Boserup 1970). However, women are more likely to be engaged in the production of crops for food than in cash crops (Ellis et al. 2007) and less likely than men to be employed in the formal labor market (30% vs. 70%; *ibid.*). Thus, extra-familial opportunities for women remain constrained.

## DATA AND METHODS

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*Data and Analytic Sample*

We used data from the 2014 Kenya Demographic and Health Survey (KDHS; KNBS et al. 2015). The 2014 KDHS used a stratified, two-stage cluster sample design, in which 995 clusters in rural areas and 617 clusters in urban areas were randomly selected from 5,360 clusters in the 2009 Kenya Population and Housing Census. These clusters approximate villages and urban neighborhoods (Kohler, Behrman, and Watkins 2000) and were our community-level (level-2) sample. From each selected cluster, 25 households were selected randomly without replacement. Ultimately, 36,430 households were interviewed (99% response rate), including 31,079 eligible women 15–49 years old (97% response rate). Within each cluster, half of the households were randomly assigned to a shorter questionnaire that did not include FGMC questions. Women who received the full survey were eligible for our analysis ( $N = 14,741$ ; 96% response rate).

The 2014 KDHS collected FGMC information in two ways: reports from all women about their attitudes about and experiences with FGMC, and reports from women with daughters aged 0–15 about daughters' experiences with FGMC. Women who received the full survey were asked if they had ever heard of “female circumcision.” Those who had not were asked if they had ever heard of a practice in which a girl has part of her genitals cut. Women who had not heard of FGMC based on these two questions ( $n = 442$ , 3%) did not complete the rest of the FGMC module, and in this analysis, were coded as not having experienced FGMC and not supporting FGMC. Women with missing data on whether they had heard of FGMC ( $n = 4$ ), ethnicity ( $n = 7$ ), religion ( $n = 3$ ), or polygamy status ( $n = 12$ ) were dropped. The final sample used to create community-level variables included 14,715 women 15–49 years old across 1,593 communities. On average, there were 9.2 women per community (*Median* = 9; *range* = 1–23).

The individual-level (level-1) sample included 8,978 mothers with 19,679 daughters. We

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3 dropped daughters older than age 15 ( $n = 4,209$ ) and daughters missing age data ( $n = 1,378$ ).<sup>1</sup> Of  
4  
5 the remaining 14,092 daughters ( $n = 7,938$  mothers), 976 (6.9%) had missing data on FGMC  
6  
7 status ( $n = 957$ ) or age at cutting ( $n = 19$ ). The final sample included mothers ( $n = 7,535$ ) with  
8  
9 daughters aged 0–15 with complete information about FGMC status and age at cutting ( $n =$   
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11 13,116), representing 1,580 communities. We then randomly selected one daughter from each  
12  
13 mother to create 7,535 mother-daughter pairs for our analytical sample. In this sample, there  
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15 were 10 women per community on average (*Median* = 10; *range* = 1–23).  
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19 In addition to FGMC information, the 2014 KDHS women's survey included questions  
20  
21 about marital status, age at first co-residence with a husband/partner, schooling attainment, and  
22  
23 recent work experience. A household survey included questions on demographic characteristics  
24  
25 of members and household assets and amenities (e.g., housing material, electricity) that the DHS  
26  
27 used to calculate a household wealth index (KNBS et al. 2015).  
28  
29  
30

### 31 *Measures*

32  
33 Our measures reflect the hierarchical nature of the data, with mothers and daughters at level 1  
34  
35 nested within communities at level 2.  
36  
37

38 *Outcome: Hazard of daughter's FGMC.* The outcome variable for this analysis was a  
39  
40 daughter's hazard of experiencing FGMC. Maternal responses to questions on daughters' FGMC  
41  
42 status and age at cutting were used to create a discrete-time survival file based on person-periods  
43  
44 of exposure. We used multi-year periods of exposure (risk sets) rather than single person-years to  
45  
46 reduce computational burden and to allow for estimation of hazards during age risk sets where  
47  
48 the number of events was sparse (Stewart 2010).<sup>2</sup> Based on an examination of the hazard curves  
49  
50 and exploratory analyses, we modeled periods of exposure for the age risk sets 0–5, 6–7, 8–9,  
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52 10–11, and 12–15-years-old. For each exposure period, daughters were coded 0 if they did not  
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## FEMALE GENITAL MUTILATION/CUTTING IN KENYA

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3 experience FGMC and 1 if they experienced FGMC. Exposures for girls who had not  
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5 experienced FGMC by the time of the survey were right-censored. Daughters' age risk sets were  
6  
7 not centered.  
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9  
10 *Individual-level variables.*

11  
12 *Maternal FGMC status and attitudes.* We created a composite measure using four  
13  
14 questions about maternal FGMC status and attitudes about FGMC. Mothers indicated whether  
15  
16 they had experienced FGMC (0 = *yes*, 1 = *no*). Self-reports of FGMC status have been shown to  
17  
18 be reliable (Klouman, Manongi, and Klepp 2005). We included this behavioral indicator with  
19  
20 measures of attitudes because women's FGMC experience reflects the FGMC attitudes and  
21  
22 norms of the family and community in which they grew up. These beliefs, in turn, influence  
23  
24 daughters' FGMC directly (because maternal kin may participate in FGMC decisions) and  
25  
26 indirectly (through their effect on mothers' beliefs). Mothers answered three attitudinal questions  
27  
28 about whether they believed: 1) their religion required FGMC; 2) their community required  
29  
30 FGMC; and 3) FGMC should be abandoned. For all three variables, attitudes disfavoring FGMC  
31  
32 were coded 1, and neutral (*it depends, don't know*) or favorable attitudes about FGMC were  
33  
34 coded 0. Women who reported *no religion* were coded 1 for questions about religious support.  
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40 We explored and confirmed that these four items reflect a single latent construct using  
41  
42 exploratory factor analysis (EFA) and confirmatory factory analysis (CFA) in random-split half  
43  
44 samples of mothers using MPlus (Muthén and Muthén 1998-2012). We assessed model fit using  
45  
46 the Root Mean Squared Error of Approximation (RMSEA less than .07 with a 90% confidence  
47  
48 interval including .05), Comparative Fit Index (CFI greater than .95), Tucker-Lewis Index (TLI  
49  
50 greater than .95), and non-significant  $\chi^2$  (Hu and Bentler 1999; Kline 2005; Steiger 2007). The  
51  
52 factor had good fit ( $RMSEA = .04$  [.03, .06],  $CFI = 1.00$ ,  $TLI = .999$ ,  $\chi^2 = 26.40$ ,  $p = .000$ ), large  
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3 standardized factor loadings (.84–.98), and good reliability ( $\alpha = .84$ ). We used the estimated  
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5 factor score for “maternal FGMC status and attitudes” as a predictor in our models.  
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7  
8 *Individual-level control variables.* We controlled for several maternal characteristics: age  
9  
10 (in years), schooling attainment (1 = *primary school or higher*, 0 = *no education, or incomplete*  
11 *primary*), work status (1 = *works for cash, or cash and in-kind payment*, 0 = *does not work, or*  
12 *works only for in-kind payment*), age at first co-residential relationship (1 = *age 18 or older at*  
13 *first union or age 18 or older and unmarried*, 0 = *less than age 18 at first union, or less than age*  
14 *18, unmarried, and has a daughter*), marital status (1 = *never married*, 0 = *ever married*), and  
15 whether her husband/partner had other wives (1 = *married and not in a polygamous union or not*  
16 *currently married*, 0 = *in a polygamous union*). Maternal religion also was included (1 =  
17 *Christian or Catholic*, 0 = *Muslim, no religion, or other religions*) because FGMC varies across  
18 religious groups in some contexts (Hayford and Trinitapoli 2011; Kandala and Komba 2015;  
19 UNICEF 2013). There were 23 ethnic group categories in the KDHS, including an “other”  
20 category. Because many of the ethnic groups were small, including all 23 categories led to  
21 multicollinearity. Instead, we created a four-category measure for maternal ethnicity based on  
22 group size and current FGMC prevalence. This classification incorporated proxies for FGMC  
23 norms and political influence (size of group). The categories were: Large circumcising groups  
24 (percentage of adult women in the full sample  $\geq 9.5\%$ ,  $\geq 10\%$  of mothers cut; Kalenjin, Kamba,  
25 Kikuyu), large non-circumcising groups (percentage of adult women in the full sample  $\geq 9.5\%$ ,  
26  $< 10\%$  of mothers cut; Luhya and Luo), small circumcising groups (percentage of adult women in  
27 the full sample  $< 9.5\%$ ,  $\geq 10\%$  of mothers cut; Boran, Embu, Gabbra, Kisii, Kuria, Maasai, Mbere,  
28 Meru, Orma, Rendille, Samburu, Somali, Taita/Taveta, and other), and small non-circumcising  
29 groups (percentage of adult women in the full sample  $< 9.5\%$ ,  $< 10\%$  of mothers cut;  
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## FEMALE GENITAL MUTILATION/CUTTING IN KENYA

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3 Mijikenda/Swahili, Turkana, Pokomo, Iteso). We also included a binary covariate from the DHS  
4 household wealth index quintiles (1 = *wealth in the top 40% [top two quintiles]*, 0 = *wealth in the*  
5 *bottom 60% [bottom three quintiles]*). Daughters from wealthier families tend to be at lower risk  
6 of cutting (Andro et al. 2016; Kandala and Komba 2015; Yount 2002). Last, we included a  
7 continuous variable representing the calendar year in which a daughter was born to capture  
8 variance explained by the normative, legal, and institutional environment at birth (1999–2014).  
9 Individual-level variables were group-mean centered except for maternal age and daughter's birth  
10 year, which were grand-mean centered.  
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22 In exploratory analysis, we tested different specifications for education, wealth, and ethnic  
23 identity to assess the sensitivity of results to our coding. Coefficients for theoretically central  
24 variables were virtually unchanged when including all education categories (no education,  
25 incomplete primary, complete primary, incomplete secondary, complete secondary) and wealth  
26 categories (all five quintiles). Using the full set of 23 ethnic groups was not possible, due to  
27 collinearity issues. An alternative coding scheme with seven categories (five largest ethnic groups  
28 and two small combined groups) produced similar overall results (all theoretically central  
29 coefficients are similar in magnitude; most theoretically central coefficients are unchanged in  
30 significance except for the squared terms for community FGMC norms, which is only marginally  
31 significant in this specification,  $p = .053$ ).  
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44 *Community-level variables.*

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47 *Community FGMC norms and extra-familial opportunities.* For community norms and  
48 extra-familial opportunities, we constructed latent factors using a similar procedure to that  
49 described above for maternal FGMC status and attitudes. We constructed factors from  
50 proportions of key community characteristics. To assess community FGMC norms, we computed  
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## FEMALE GENITAL MUTILATION/CUTTING IN KENYA

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3 the proportions of women who had not experienced FGMC, believed their religion did not  
4 require FGMC, believed their community did not require FGMC, and believed FGMC should be  
5 abandoned (coded as described above). A behavioral outcome (proportion of adult women cut)  
6 was included because it measures descriptive norms, or the actual behavior of people in the  
7 community, a salient element of the normative context.  
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15 To measure extra-familial opportunities, we calculated the community-level proportions  
16 of women who had: completed primary schooling or higher, worked for cash or both cash and in-  
17 kind payment in the past twelve months, first lived with their partner at age 18 or older (ever-  
18 married women), and were not in polygamous unions (includes unmarried women). We included  
19 the level of polygamy in a community because research across contexts in sub-Saharan Africa  
20 shows that settings in which polygamy is common are characterized by other factors related to  
21 women's power and status inside and outside the family: young age at marriage, large spousal  
22 age differences, less freedom of choice in one's spouse, higher acceptability of intimate partner  
23 violence, and less influence for women in the distribution of economic resources in the  
24 household, whether women were in polygamous or monogamous marriages (Agadjanian and  
25 Ezeh 2000; Chojnacka 2000; Goldman and Pebley 1989; Smith-Greenaway and Trinitapoli  
26 2014; Timæus and Reynar 1998). In exploratory analyses, we included separate variables for the  
27 proportion of unmarried women and the proportion of women in monogamous unions; the factor  
28 structure was similar, so we retained the more parsimonious specification.  
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47 We created "community FGMC norms" and "community opportunities" factor scores  
48 using the KDHS sample of women 15–49 years old from 1,593 communities. All adult women  
49 were included in the factor analysis to capture characteristics representative of the wider  
50 community. We performed EFA and CFA to confirm that community-level items reflected two  
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## FEMALE GENITAL MUTILATION/CUTTING IN KENYA

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3 latent factors. The model had adequate fit ( $RMSEA = .10$  [.09, .11],  $CFI = .970$ ,  $TLI = .955$ ,  $\chi^2 =$   
4  $322.43$ ,  $p = .000$ ) and high standardized factor loadings for community FGMC norms (.75–.97)  
5  
6 and community opportunities (.49–.90). Reliability was excellent for norms ( $\alpha = .94$ ) and fair for  
7  
8 opportunities ( $\alpha = .68$ ). We calculated factor scores based on these models and used them as  
9  
10 predictors in our models. Because theory suggests that there may be a “critical mass” for  
11  
12 community norms, we also included a squared term to account for nonlinear associations.  
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17 *Community ethnic diversity.* We measured ethnic diversity of communities using the  
18  
19 Herfindahl-Hirschman Index (HHI; Hirschman 1964). The HHI was calculated by summing the  
20  
21 squared proportions of each ethnic group in the community. We used a normalized (re-scaled)  
22  
23 version of the index with values between 0 and 1, then reverse-coded the HHI so higher scores  
24  
25 represented more ethnic diversity. This measure, sometimes called “ethnic fractionalization,” can  
26  
27 be interpreted as the likelihood that two randomly selected individuals would be members of  
28  
29 *different* ethnic groups, and is the standard measure used in the field (van der Meer and Tolsma  
30  
31 2014). We used all 23 ethnic groups in the KDHS to calculate the HHI rather than the collapsed  
32  
33 set of four categories used at the individual level. Our factor was designed to capture the role of  
34  
35 ethnic diversity in contributing to the heterogeneity and openness of social ties, not the FGMC  
36  
37 practices of specific ethnic groups (as captured in the collapsed categories).  
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42 *Community-level control variables.* We controlled for two community-level attributes:  
43  
44 urbanicity (KDHS urban designation) and the proportion of women living in households in the  
45  
46 top 40% (top two quintiles) of the KDHS household wealth index. Urbanicity and wealth are  
47  
48 associated with daughters’ risk of FGMC (Hayford 2005; UNICEF 2013; Yount 2002) and were  
49  
50 included to account for characteristics that could influence the relationship between daughters’  
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52 risk of FGMC and community norms, opportunities, or ethnic diversity. A robustness test with  
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## FEMALE GENITAL MUTILATION/CUTTING IN KENYA

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3 all wealth quintiles revealed identical results for theoretically central variables, so we used the  
4  
5 more parsimonious specification (as we did at level 1). Community-level variables were grand-  
6  
7 mean centered.  
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*Analysis*

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12 We used multilevel discrete-time hazard models (Barber et al. 2000; Reardon, Brennan, and  
13  
14 Buka 2002) to estimate the association of individual-level (mother/daughter) and community-  
15  
16 level variables with daughter's age-risk-set hazard of FGMC. Using event-history models, we  
17  
18 predicted the risk that a daughter experienced FGMC at each age risk set, while accounting for  
19  
20 censoring. We used a multilevel hazard model to account for the hierarchical nature of the data,  
21  
22 with women nested in their communities.  
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26 We estimated a baseline model including only key explanatory variables (maternal  
27  
28 FGMC status and attitudes, community FGMC norms, community extra-familial opportunities,  
29  
30 community ethnic diversity, and cross-level interactions) and a full model including controls.  
31  
32 Both models included four risk sets for daughter's age (6–7, 8–9, 10–11, and 12–15 years) with  
33  
34 0–5 as the reference group. Level-2 correlations and variation inflation factors indicated that  
35  
36 multicollinearity was not a concern (results available on request). The assumption of  
37  
38 proportional odds was statistically tenable ( $\chi^2(28), p = .08$ ) based on a joint test of significance  
39  
40 for 28 interactions between age risk sets and key predictors (Reardon et al. 2002; Stewart 2010).<sup>3</sup>  
41  
42 Model results with individual-level and community-level predictors entered in separate steps  
43  
44 were virtually identical to the final models (available on request). Models were estimated using  
45  
46 STATA 14.1 (StataCorp 2015).  
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52 Ideally, multilevel analyses using DHS data would use individual- and community-level  
53  
54 weights to account for the unequal probability of selection at the household and community  
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## FEMALE GENITAL MUTILATION/CUTTING IN KENYA

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3 levels. However, DHS datasets only include individual-level weights (Pullum 2015). We ran a  
4  
5 weighted single-level model with the full set of variables to examine whether our findings were  
6  
7 robust to the incorporation of information on the stratified sample design (available on request).  
8  
9  
10 There were no substantive changes to the inferential conclusions. All descriptive statistics were  
11  
12 weighted.

## RESULTS

*Sample Characteristics*

19  
20 The average age of mothers at the time of the survey was 31.9 years, and the average age of  
21  
22 daughters was 6.6 years (Table 1). One quarter (26%) of mothers in the sample had experienced  
23  
24 FGMC. However, just 2% of daughters had experienced FGMC at the time of the survey, with  
25  
26 an average age at cutting of 7.5 years. Girls had a 12.8% cumulative probability of being cut by  
27  
28 age 15 based on Kaplan-Meier failure calculations (not shown). Mothers tended to be married  
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30 (81%), not in a polygamous partnership (89%), and Christian or Catholic (91%). The majority  
31  
32 (66%) began living with their first husband/partner at age 18 or later. Almost half (45%)  
33  
34 belonged to a large, circumcising ethnic group (Kalenjin, Kamba, or Kikuyu). While 62% of  
35  
36 mothers had completed primary schooling or higher, just 23% had completed at least secondary  
37  
38 school. Over one third (37%) lived in urban areas, and 60% worked for cash or both cash and in-  
39  
40 kind payment.  
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44 [Table 1 about here]

*Multivariate Results*

49 In Model 1 (Table 2), the maternal FGMC status and attitudes factor is significantly associated  
50  
51 with a daughter's hazard of experiencing FGMC. The hazard of being cut is lower for daughters  
52  
53 with mothers expressing greater opposition towards FGMC ( $AOR = .25[.14, .43]$ ). As  
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## FEMALE GENITAL MUTILATION/CUTTING IN KENYA

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3 hypothesized, a daughter's hazard of cutting is lower if she lives in a community with norms that  
4 are less supportive of FGMC ( $AOR = .03[.02, .05]$ ; H1a). The coefficient for the squared  
5 community norms factor is also statistically significant, indicating a non-linear relationship with  
6 FGMC norms. Hazards of cutting are lower in communities with greater ethnic diversity ( $AOR =$   
7  $.25[.13, .49]$ ; H1c). Yet, a daughter has a higher hazard of cutting ( $AOR = 2.16[1.53, 3.05]$ ) as  
8 extra-familial opportunities for women in her community increase, an association contrary to  
9 expectation (H1b).

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19 [Table 2 about here]

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21 To illustrate the non-linear association between community norms and daughters'  
22 FGMC, we graphed predicted probabilities of daughters' FGMC across communities with  
23 varying levels of FGMC norms, setting other variables to their mean (Figure 1). The shape of the  
24 curve indicates that, once a certain level of normative support for rejecting FGMC is reached, the  
25 impact of additional community support levels off. Although not a direct test, this finding is  
26 consistent with the idea of a "tipping point" for community norms.

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35 Contrary to hypotheses H2a and H2b, interactions of maternal FGMC status and attitudes  
36 with community norms and community opportunities are not significant. A significant  
37 interaction is observed between maternal FGMC status and attitudes and community ethnic  
38 diversity ( $AOR = .29[.09, .97]$ ; H2c). The reduction in the hazard of cutting for girls living in  
39 more ethnically diverse communities is greater for daughters whose mothers had negative  
40 attitudes toward the practice. In Model 2, findings for key predictors are robust to the inclusion  
41 of controls, except for the interaction of maternal FGMC status and attitudes with community  
42 ethnic diversity, which no longer is significant.

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54 *Alternative Models of Extra-Familial Opportunities*

## FEMALE GENITAL MUTILATION/CUTTING IN KENYA

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3 Because the relationship between daughters' FGMC hazard and community-level extra-  
4 familial opportunities was contrary to expectations, we tested an alternative model employing the  
5 separate components of the extra-familial opportunities factor and their cross-level interactions  
6 in order to understand whether a particular measure was driving the unexpected results. Results  
7 are shown in Table 3. Associations between other predictors and daughters' hazard of cutting are  
8 substantively unchanged in these alternative models.  
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17 [Table 3 about here]  
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19 In this alternative model, daughters have greater hazard of cutting in communities with  
20 higher proportions of mothers who completed primary school or higher ( $AOR = 7.78[2.53,$   
21  $23.92]$ ), consistent with the model including a factor score for women's extra-familial  
22 opportunities. The proportion of mothers not in polygamous unions is also positively associated  
23 with the hazard of daughters' FGMC ( $AOR = 4.12[1.08, 15.72]$ ). Neither the proportion of  
24 women working in the community nor early marriage in the community is significantly  
25 associated with daughters' FGMC hazard.  
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35 The interaction between maternal FGMC status and attitudes and the community  
36 proportion of women not in polygamous unions is statistically significant in the hypothesized  
37 direction ( $AOR = .02[.00, .98]$ ). Thus, there is some support for H2b in this specification.  
38 However, including the four cross-level interactions as a group does not improve model fit  
39 compared to a model without them (based on  $\chi^2$  and AIC). Overall, the association of women's  
40 extra-familial opportunity structures with daughters' FGMC is largely consistent when items are  
41 tested individually or as a single factor score. Because the items are highly correlated, and  
42 because our theoretical framework considers the opportunity system rather than individual  
43 elements of the system, we prefer the main specification.  
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## FEMALE GENITAL MUTILATION/CUTTING IN KENYA

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## DISCUSSION

In this article, we use nationally representative data to study the multilevel determinants of mothers' decisions about FGMC for their daughters in Kenya, a context where FGMC prevalence is declining. Our analysis extends recent studies of FGMC that focused on the influence of gender systems comprised of community gender norms and structural opportunities for women outside the family (Yount et al. n.d.) by testing this framework in a context with different social and economic manifestations of patriarchal kinship networks and by adding a measure of community ethnic diversity. Following the innovations of recent prior work, we also improve the measurement of key explanatory variables and account for the hierarchical and survival nature of the data (i.e., variation in exposure to risk among daughters of different ages at the time of the survey) using multilevel discrete-time hazard models.

Consistent with prior research, we find that a daughter's hazard of FGMC is lower if she had a mother who was less supportive of FGMC. Extending prior research, our measure of maternal FGMC status and attitudes incorporates experiences of FGMC and perceptions of community and religious pressures toward FGMC, thus combining multiple aspects of individual beliefs. Also consistent with prior research, community norms disfavoring FGMC are strongly associated with a lower hazard of cutting for daughters. The community norms factor includes FGMC prevalence, indicating that a daughter's hazard of FGMC is lower in communities with fewer women who had been cut. Both what others do, and what others expect a woman to do, matter for her ability to reject a harmful social norm like FGMC (Bicchieri 2017). Our assessment supports the theory that a "collective change of expectations" alongside "coordinated actions" are necessary to change community norms (Bicchieri 2017:111). This relationship is non-linear, suggesting that once community-level normative support for rejecting FGMC is high

## FEMALE GENITAL MUTILATION/CUTTING IN KENYA

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3 enough further changes have minimal impact on daughters' hazard of cutting.  
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6 Unexpectedly, a daughter's FGMC hazard is higher if she lived in a community with  
7  
8 more extra-familial opportunities for women. This finding is evident even after controlling for  
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10 urbanicity and community wealth and contradicts feminist theory and findings from Egypt  
11  
12 (Yount et al. n.d.). It is possible that our measures do not adequately capture women's access to  
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14 extra-familial opportunities. Our factor is based on aggregate measures of women's experiences  
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16 outside of marriage, including later first union, fewer polygamous relationships, more formal  
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18 schooling, and more prevalent employment. If mothers in this context do not see these  
19  
20 experiences as desirable "opportunities" or real alternatives for their daughters, increases in these  
21  
22 experiences may not facilitate the abandonment of FGMC. For instance, some scholars argue  
23  
24 that rising ages at first marriage in much of sub-Saharan Africa result from economic  
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26 uncertainty, which constrains young couples' ability to support themselves (Shapiro and  
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28 Gebreselassie 2014). If this interpretation bears out, a greater proportion of unmarried women  
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30 may indicate strained marriage markets rather than increased opportunities. Further, measures of  
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32 work in the DHS tend not to capture the full range of economic activities in which women are  
33  
34 engaged (Langsten and Salem 2008); this limitation may be more salient in Kenya than in Egypt  
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36 because more of women's work takes place outside the formal labor force. More research is  
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38 needed to understand whether and to what extent women's collective community-level  
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40 empowerment may be protective.  
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47 We find that a daughter's FGMC hazard is lower if she lived in a more ethnically diverse  
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49 community, regardless of maternal ethnic-group membership. This is an important contribution  
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51 as it explicitly models within-community heterogeneity as a factor facilitating social change. By  
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53 studying community ethnic diversity, we move beyond a simplistic understanding of ethnic  
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## FEMALE GENITAL MUTILATION/CUTTING IN KENYA

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3 identity as an index of “culture” or a proxy for the specific content of social norms toward  
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5 considering ethnic diversity as a way of understanding the nature of social boundaries. Ethnic  
6  
7 diversity could be a proxy for exposure to networks that oppose cutting, or for awareness of  
8  
9 alternative practices, as Cloward (2016) found in Maasai communities. However, the persistent  
10  
11 association of ethnic diversity with FGMC hazard when controlling for community norms and  
12  
13 maternal ethnic identity indicates that this association is not fully explained by exposure to  
14  
15 beliefs and suggests that heterogeneity may play a role in processes of social change. Most  
16  
17 research on the impact of ethnic heterogeneity on social cohesion, both in high-income countries  
18  
19 and in sub-Saharan Africa, frames reduced social cohesion as a negative outcome that hinders  
20  
21 the equitable distribution of resources or economic development. Our findings highlight the  
22  
23 potentially positive role of weakened social sanctions in facilitating social change around  
24  
25 harmful practices. Importantly, unlike measures of ethnic group identity which are country-  
26  
27 specific, ethnic diversity is a measure of social interaction and exchange that can be easily  
28  
29 calculated for other multiethnic countries (i.e., most other sub-Saharan countries where FGMC is  
30  
31 practiced). Furthermore, both theory and measures related to ethnic diversity could be extended  
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33 to assess other forms of diversity that may bear on processes of social change, such as religious  
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35 diversity or diversity of national origin.  
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43 Contrary to expectations, interactions between maternal FGMC status and attitudes and  
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45 community FGMC norms, extra-familial opportunities, and ethnic diversity are not significant  
46  
47 after including covariates. Regardless of community characteristics, daughters have a lower  
48  
49 hazard of cutting when their mothers were uncut and disfavored the practice. Community  
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51 opposition to FGMC and ethnic diversity both reduce daughters’ hazard, regardless of maternal  
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53 FGMC status and attitudes. The independence of these associations suggests the importance of  
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## FEMALE GENITAL MUTILATION/CUTTING IN KENYA

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3 other social institutions not measured here. For example, communities that oppose FGMC may  
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5 have stricter law enforcement or fewer people willing to perform FGMC procedures. These  
6  
7 factors would reduce FGMC prevalence regardless of maternal intentions. Further, the long  
8  
9 history of educational campaigns and efforts to promote alternatives to cutting in Kenya  
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11 (UNICEF 2013) may have resulted in national-level normative support for abandonment,  
12  
13 allowing even women in communities with strong FGMC norms to deviate from them.  
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17 This study underscores the importance of a multilevel social ecological framework to  
18  
19 understand the structural and normative conditions that jointly influence daughters' FGMC  
20  
21 hazard. Maternal FGMC status and attitudes, community norms disfavoring FGMC, and  
22  
23 community ethnic diversity are related to a lower hazard of FGMC for daughters in Kenya.  
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25 Further research is needed to understand whether these findings apply to other countries. In  
26  
27 Kenya, the presence of large and politically powerful ethnic groups that are historically non-  
28  
29 circumcising may create conditions that are propitious for decline. Substantial past prevalence  
30  
31 reductions also may increase the salience of Kenyan mothers' attitudes for daughters' outcomes.  
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33 Our factor analytic approach facilitates comparative analyses using similar measures of attitudes,  
34  
35 norms, and opportunities.  
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40 *Limitations and Recommendations for Future Research*

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42 Certain limitations of this analysis inform recommendations for future research. First, we use  
43  
44 DHS clusters as a proxy for "community." Averages based on a sample of respondents from each  
45  
46 cluster are imprecise estimates of the true population value and may introduce biases in the  
47  
48 estimation, especially when both the intra-class class correlations (ICCs) and the average cluster  
49  
50 size are small (Kravdal 2006). In our sample, estimated ICCs are .33 for community  
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52 opportunities and .73 for community norms, well above the .20-level at which bias becomes  
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## FEMALE GENITAL MUTILATION/CUTTING IN KENYA

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3 unacceptable for the standard DHS cluster size of 25 respondents (Kravdal 2006). Although our  
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5 ICCs are within a reasonable range, our average cluster size is small. In the absence of specific  
6  
7 simulation studies, however, it is not possible to definitively state the level of bias. Future DHS  
8  
9 should consider asking FGMC questions to all women, or randomly assigning the shorter survey  
10  
11 to clusters instead of households, to ensure multilevel modeling approaches may be used with  
12  
13 adequate cluster sizes. Substantively, the DHS clusters may not fully capture the varied and  
14  
15 multiple social networks in which mothers are embedded (Bicchieri 2017). Future research may  
16  
17 consider new ways to identify other influential networks, such as social network analysis and  
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19 Global Positioning System mapping. Community-level measures of heterogeneity are a step in  
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21 this direction.  
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27 Second, our analysis is restricted to two ecological levels. Other characteristics at the  
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29 meso-level (i.e., regional politics), and macro-level (i.e., national legal environment) warrant  
30  
31 consideration. This type of comparison will be necessary to understand why change has taken  
32  
33 place more rapidly in some contexts than in others.  
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35  
36 Third, our predictors were measured at the time of the survey, while the FGMC outcome  
37  
38 occurred before the survey. The average age of daughters in the sample is 6.6 years; it is likely  
39  
40 that most maternal and community characteristics are reasonably stable over this time, although  
41  
42 some may be more variable (e.g., mother's current work status). Longitudinal data are needed to  
43  
44 fully confirm these findings.  
45

## CONCLUSION

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49 Research on effective interventions around FGMC is limited to date (Berg and Denison  
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51 2012), but our results suggest continued support is needed for interventions that address both  
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53 individual attitudes and normative expectations. The influence of community ethnic diversity in  
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## FEMALE GENITAL MUTILATION/CUTTING IN KENYA

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3 this analysis suggests more generally that communities with a high degree of social cohesion  
4  
5 may be less willing to give up practices such as FGMC, and that this characteristic of  
6  
7 communities exerts an independent influence, above and beyond FGMC norms and opportunities  
8  
9 for women. Such findings suggest the importance of understanding the social fabric of  
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11 communities as a way to identify the processes of social change with respect to practices like  
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15 FGMC.  
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## NOTES

1. Inspection of our missing data suggests that missingness is more common for daughters of mothers opposed to FGMC, which would bias our results toward zero. However, missingness also is more common among 15-year-olds, suggesting that it may be related to confusion about who met the birthday cut-off during survey administration.
2. We examined single-year exposures in an exploratory analysis. Based on the results and prior knowledge of FGMC in Kenya, we chose to use age-groupings of discrete-time risk sets. A post-hoc sensitivity test showed that the overall results were virtually identical when using the single-year dummy variables compared to grouped ages.
3. Multilevel hazard models assume proportional errors and parallel logit hazard curves because the community characteristics affect only the level of the hazard but not the shape of the hazard. We attempted to test the proportionality of level-2 errors, but these models did not converge, even after repeated efforts to simplify the model and use alternative estimation strategies. Reardon et al. (2002) experienced similar difficulties.

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For Peer Review

## FEMALE GENITAL MUTILATION/CUTTING IN KENYA

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## AUTHOR BIOS

**Rose Grace Grose, PhD**, assistant professor in the Department of Community Health

Education, Colorado School of Public Health at the University of Northern Colorado. Grose was a Satcher Health Policy Leadership Fellow at Morehouse School of Medicine and a post-doctoral fellow at Emory University. She studies gender, power, and sexuality to inform policy, evidence-based programs, and collective actions to reduce health disparities and promote gender equity.

**Sarah R. Hayford, PhD**, associate professor in the Department of Sociology and faculty

affiliate of the Institute for Population Research at Ohio State University. Her research addresses reproductive health, childbearing, and family formation intentions and outcomes in the United States and in sub-Saharan Africa.

**Yuk Fai Cheong, PhD**, associate professor in the Department of Psychology at Emory

University. His research interests include multi-level, Bayesian, and Rasch analyses as applied to the study of women's agency, intimate partner violence, test bias, and learning.

**Sarah Garver, PhD**, postdoctoral scholar in the Department of Sociology at University of

Chicago. Her research broadly centers on reproductive health issues with a focus on childbearing intentions and outcomes in sub-Saharan Africa. Of key consideration are the economic and social conditions that create and sustain social vulnerability.

**Ngianga-Bakwin Kandala, PhD**, professor in biostatistics at Northumbria University, United

Kingdom. Kandala's research interests include Bayesian statistical methods and their application to epidemiology and health, working on maternal and child health and a variety of health-related inequalities both in developing countries and command economies using large-scale household data. His 2018 book with Springer Science is entitled 'Female Mutilation around the World: Analysis of Medical Aspects, Law and Practice.'



## FEMALE GENITAL MUTILATION/CUTTING IN KENYA

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**Kathryn M. Yount, PhD**, Asa Griggs Candler Chair of Global Health and Professor of Global Health and Sociology at Emory University. Yount is a world-class researcher on gender, women's health, and gender-based violence. She has received more than 30 research grants from federal agencies and private foundations to undertake collaborative studies in parts of Africa, Asia, the Middle East, Latin America, and the United States. Her work has resulted in more than 150 publications in top venues in the social sciences and public health.

For Peer Review

## FEMALE GENITAL MUTILATION/CUTTING IN KENYA

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Table 1. Weighted Sample Characteristics for Women and their Daughters in Kenya, DHS 2014  
( $N = 7,535$ )

	Mean	SD	Range
<i>Daughters</i>			
Age in years	6.61	4.38	0 to 15
Proportion of Daughters Cut	.02	.15	0 to 1
Age at FGMC	7.53	2.31 <sup>a</sup>	0 to 15
Birth Year	9.04	4.38	1 = 1999, 16 = 2014
<i>Maternal Demographics</i>			
Age in years	31.91	7.46	15 to 49
Religion: Christian/Catholic	.91	.29	0 to 1
<i>Ethnicity</i>			
Large size, $\geq 10\%$ moms cut (CM)	.45	.50	0 to 1
Large size, $< 10\%$ moms cut (CM)	.26	.44	0 to 1
Small size, $\geq 10\%$ moms cut (CM)	.22	.41	0 to 1
Small size, $< 10\%$ moms cut (CM)	.08	.26	0 to 1
Completed Primary School or Higher	.62	.49	0 to 1
Completed Secondary School or Higher	.23	.42	0 to 1
Works for Cash/Cash & In-Kind	.60	.49	0 to 1
<i>Marital Status</i>			
Never married	.06	.25	0 to 1
Not Married Currently (includes never married)	.19	.40	0 to 1
Not in a Polygamous Union (includes unmarried)	.89	.32	0 to 1
First Union 18+	.66	.47	0 to 1
<i>Household Wealth Quintiles</i>			
Poorest	.18	.39	0 to 1
Poorer	.19	.40	0 to 1
Middle	.20	.40	0 to 1
Richer	.21	.41	0 to 1
Richest	.21	.41	0 to 1
<i>Maternal FGMC Status and Attitudes</i>			
No FGMC Experienced	.74	.44	0 to 1
FGMC Not Required by Religion	.95	.23	0 to 1
FGMC Not Required by Community	.91	.29	0 to 1
FGMC Should be Stopped	.91	.28	0 to 1
<i>Community Characteristics</i>			
Living in Urban Area	.37	.48	0 to 1
Number of Ethnic Groups in the Community	2.07	1.31	1 to 8
Ethnic Diversity Index	.35	.38	0 to 1
<i>Factor Scores</i>			
Maternal FGMC Status and Attitudes	.01	.55	-1.50 to .35
Community FGMC Norms	.23	.66	-3.19 to .55
Community Extra-Familial Opportunities	.16	.81	-2.53 to 1.39

<sup>a</sup>Daughter's age of FGMC is weighted without design factors because there was a stratum with a single sampling unit.

## FEMALE GENITAL MUTILATION/CUTTING IN KENYA

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Table 2. Discrete-Time Hazard Models Predicting Daughter's Risk of FGMC

Included Variables	Model 1		Model 2	
	AOR	CI	AOR	CI
<i>Daughter Age Cut (ref=0 to 5)</i>				
6 to 7	14.53 ***	[10.27, 20.60]	11.78 ***	[8.26, 16.78]
8 to 9	39.60 ***	[26.71, 58.70]	29.35 ***	[19.55, 44.05]
10 to 11	67.11 ***	[41.67, 108.07]	45.49 ***	[27.64, 74.88]
12 to 15	32.10 ***	[15.79, 61.28]	18.96 ***	[9.38, 38.34]
<i>Level 1 Maternal Explanatory Variable</i>				
FGMC Status & Attitudes Factor (CM)	.25 ***	[.14, .43]	.30 ***	[.17, .54]
<i>Level 2 Maternal Explanatory Variables</i>				
Comm. FGMC Norms Factor (GM)	.03 ***	[.02, .05]	.03 ***	[.01, .05]
Comm. FGMC Norms Factor (GM) <sup>2</sup>	.58 ***	[.49, .69]	.60 ***	[.50, .71]
Comm. Opportunities Factor (GM)	2.16 ***	[1.53, 3.05]	2.58 ***	[1.72, 3.86]
Comm. Ethnic Diversity Index (GM)	.25 ***	[.13, .49]	.29 **	[.14, .60]
<i>Cross-Level Interactions</i>				
FGMC Status & Attitudes (CM) x Comm. FGMC Norms (GM)	.83	[.43, 1.57]	.77	[.39, 1.54]
FGMC Status & Attitudes (CM) x Comm. Opportunities (GM)	.80	[.40, 1.60]	.90	[.43, 1.89]
FGMC Status & Attitudes (CM) x Comm. Ethnic Diversity (GM)	.29 *	[.09, .97]	.42	[.11, 1.56]
<i>Level 1 Daughter Covariates</i>				
Birth Year (GM)			.88 ***	[.83, .93]
<i>Level 1 Maternal Covariates</i>				
Age in years (GM)			1.01	[.99, 1.04]
Religion (ref=Muslim/other/none)				
Christian/Catholic (CM)			1.45	[.56, 3.71]
Education (ref=none/incomplete primary)				
Complete Primary School or Higher (CM)			.80	[.49, 1.30]
Work (ref=none/only in-kind)				
Works for Cash/Cash & In-Kind (CM)			.87	[.60, 1.28]
Marital Status (ref=Ever married)				
Never Married (CM)			.95	[.26, 3.50]
Age at First Union (ref= <18)				
First Union 18+ (CM)			.78	[.56, 1.08]
Polygyny (ref=polygynous union)				
Not Polygynous Union/Unmarried (CM)			.89	[.64, 1.24]
Ethnicity (ref=Large size, ≥10% moms cut)				
Large size, <10% moms cut (CM)			1.61	[.19, 13.57]
Small size, ≥10% moms cut (CM)			10.72 **	[2.63, 43.69]
Small size, <10% moms cut (CM)			3.21	[.29, 35.50]
Wealth Index (ref. = bottom 60%)				
Top 40% (CM)			.63	[.35, 1.16]
<i>Level 2 Maternal Covariates</i>				
Prop. living in an Urban Area (GM)			1.17	[.69, 2.00]
Wealth Index: Prop. Top 40% (GM)			.36 *	[.15, .86]
Level 2 residual variance	1.83	[1.14, 2.61]	1.80	[1.19, 2.73]
Chi-Square	550.40		523.98	
AIC	2731.41		2699.45	
BIC	2856.47		2949.57	

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ , two tailed

Note: Models are unweighted because level-2 weights are not provided with the DHS. CI = 95% confidence intervals; CM = cluster mean centered; GM = grand mean centered; Comm = community

## FEMALE GENITAL MUTILATION/CUTTING IN KENYA

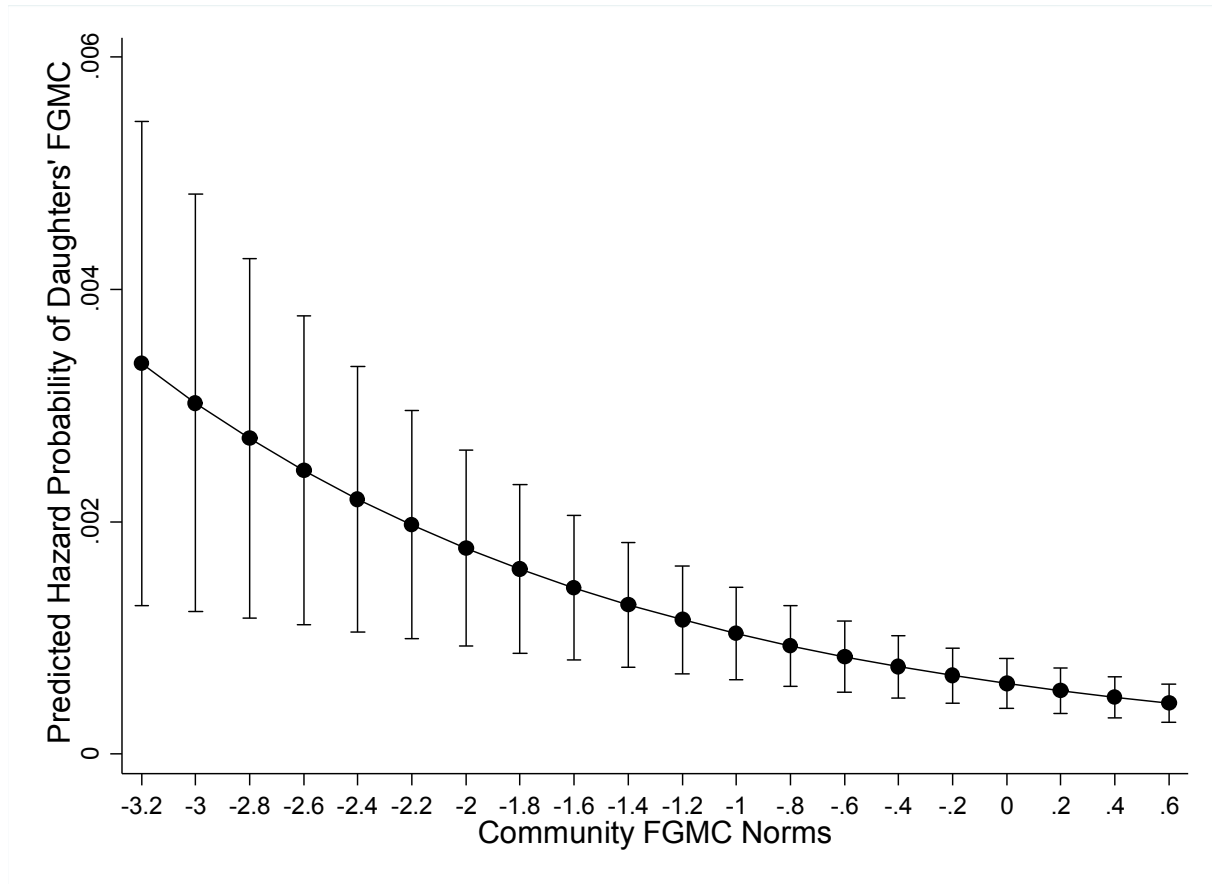
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Table 3. Alternative Discrete-Time Hazard Model Predicting Daughter's Risk of FGMC

Included Variables	AOR	CI
<i>Daughter Age Cut (ref=0 to 5)</i>		
6 to 7	11.66 ***	[8.19, 16.60]
8 to 9	29.16 ***	[19.43, 43.74]
10 to 11	45.34 ***	[27.54, 74.65]
12 to 15	19.05 ***	[9.42, 38.55]
<i>Level 1 Maternal Explanatory Variable</i>		
FGMC Status & Attitudes Factor (CM)	.30 ***	[.16, .54]
<i>Level 2 Maternal Explanatory Variables</i>		
Comm. FGMC Norms Factor (GM)	.03 ***	[.02, .06]
Comm. FGMC Norms Factor (GM) <sup>2</sup>	.57 ***	[.48, .68]
Prop. Completed Primary School or Higher (GM)	7.78 ***	[2.53, 23.92]
Prop. Works for Cash/Cash & In-Kind (GM)	.39	[.14, 1.10]
Prop. First Union 18+ (GM)	1.49	[.61, 3.67]
Prop. Not Polygynous Union/Unmarried (GM)	4.12 *	[1.08, 15.72]
Comm. Ethnic Diversity Index (GM)	.32 **	[.15, .66]
<i>Cross-Level Interactions</i>		
FGMC Status & Att. (CM) x Comm. FGMC Norms (GM)	.80	[.44, 1.46]
FGMC Status & Att. (CM) x Prop. Primary School or Higher (GM)	3.33	[.35, 31.56]
FGMC Status & Att. (CM) x Prop. Works Cash/Cash & In-Kind (GM)	.24	[.03, 1.93]
FGMC Status & Att. (CM) x Prop. First Cohabited 18+ (GM)	1.32	[.15, 11.25]
FGMC Status & Att. (CM) x Prop. Not Polygamous/Unmarried (GM)	.02 *	[.00, .98]
FGMC Status & Att. (CM) x Comm. Ethnic Diversity (GM)	.27	[.08, .92]
<i>Level 1 Daughter Covariates</i>		
Birth Year (GM)	.87 ***	[.83, .93]
<i>Level 1 Maternal Covariates</i>		
Age in years (GM)	1.01	[.99, 1.04]
Religion: Christian/Catholic (CM) (ref=Muslim/other/none)	1.58	[.61, 4.09]
Education (ref=none/incomplete primary)		
Completed Primary School or Higher (CM)	.79	[.48, 1.29]
Work: Works for Cash/Cash & In-Kind (CM) (ref=none/only in-kind)	.87	[.59, 1.28]
Marital Status: Never Married (CM) (ref=Ever married)	1.06	[.28, 4.00]
Age at First Union: First Union 18+ (CM) (ref=<18)	.78	[.56, 1.08]
Polygyny (ref=polygynous union)		
Not Polygynous Union/Unmarried (CM)	.87	[.62, 1.22]
Ethnicity (ref=Large size, ≥10% moms cut)		
Large size, <10% moms cut (CM)	1.45	[.17, 12.75]
Small size, ≥10% moms cut (CM)	10.68 **	[2.60, 43.93]
Small size, <10% moms cut (CM)	3.18	[.29, 34.43]
Wealth Index: Top 40% (CM) (ref. = bottom 60%)	.62	[.34, 1.14]
<i>Level 2 Maternal Covariates</i>		
Prop. living in an Urban Area (GM)	1.12	[.66, 1.90]
Wealth Index: Prop. Top 40% (GM)	.39 *	[.16, .93]
<i>Constant</i>		
Level 2 residual variance	1.68	[1.09, 2.59]
Chi-Square	528.56	
AIC	2698.76	
BIC	3002.47	

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ , two tailed

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*Figure 1.* Predicted hazard probability of daughters' FGMC according to community FGMC norms with 95% confidence intervals, based on Model 1, Table 2. All characteristics besides community norms set at sample mean.