The Spatial Distribution of Female Genital Mutilation (FGM) in Nigeria

NGIANGA-BAKWIN KANDALA, NGOZI NWAKEZE and SHADRACK NGIANGAII KANDALA

University of Warwick, Warwick Medical School, Clinical Sciences Research Institute, Clifford Bridge Road, CV2 2DX, Coventry, UNITED KINGDOM; University of Lagos, Department of Economics, Akoka, Yaba, Lagos, Nigeria; University of Southampton, Division of Social statistics, Southampton, UNITED KINGDOM

ABSTRACT

The harmful effects of female genital mutilation to women are worldwide recognised. While it is practiced by people of all socioeconomic backgrounds, there are differences within country and between communities. The aim of this study was to use the 2003 Nigeria DHS data to disentangle the spatial distribution of the prevalence of FGM and associated risk factors.

Data were available on 7620 women. 1673 (22.0%) of women interviewed had had FGM. 2168 women had living children of whom 485 (22.4%) daughters with FGM. Unmarried women were likely to report a lower prevalence of FGM. Modernization (education/ high socio-economic status) has minimal impact on the likelihood of FGM but education plays an important role for the mother's decision not to circumcise her daughter. It follows from these findings that community factors have a big impact on the FGM practice with individual factors having explained little on the distribution of FGM.

INTRODUCTION

Female genital mutilation (FGM) is practised commonly in countries in the northern half of sub-Saharan Africa and over 25 countries [3]. It involves surgically altering the female genitalia for non-medical reasons [3]. The procedure is irreversible and the effects last a lifetime. In Nigeria, like many other countries, FGM is forbidden by law.

The harmful health effects of female genital mutilation (FGM) to women are well documented. Laws and campaigns against the practice have not been successful to eliminate the practice and few success stories have been reported in Senegal where a community-led approach has been effective to eradicate the practice [19]. While it is practiced by people of all socioeconomic backgrounds, there are differences within country and between communities.

The objective of this paper is to examine the spatial distribution of FGM including a number of socio-demographic, household, and community characteristics that could confound or mediate the observed prevalence of FGM in Nigeria. It further seeks to highlight patterns that exist within the data, after multiple adjustments of proximate variables. Such estimates illustrate how much can be learned by exploratory analyses and suggest how these data can be used to strategically inform policy.

There has been growing literature on the age-long practice of FGM. Most of the literature deals with issues of the origin, types, and justifications for the practice but little is devoted to patterns and spatial distribution of it. As per the origin some researchers [7] have argued that the origin can be traced to Egypt. The practice of FGM has been justified mostly on social and cultural grounds. Some of the assumptions for the continued practice of FGM in Nigeria are cited in [11]. They include: custom and tradition; purification; family honour; hygiene; aesthetic reasons and protection of virginity and prevention of promiscuity. Others include increased sexual pleasure of husband; enhancing fertility; giving a sense of belonging to a group and increasing matrimonial opportunities. Despite the fact that most of these claims are not substantiated with empirical data, as high as 85% [11] still believe that the practice should be continued. This is possibly due to cultural inertia. Limited emphasis has been made on the economic rationale. It has been argued that FGM provides employment/ lucrative business for the practitioners where “cut body parts” is sold for love charm or medicine. Moreover, an integrative approach to take into account economic, social, cultural and environmental factors is needed to end this practice.

For policy strategies, there is limited literature available. However, the international community has recognized the human rights implications of FGM. Multilateral agencies, such as UNICEF and WHO have played a crucial role in the advocacy. Unfortunately, the efforts have not yielded the desired benefit. However, some community-led approaches have been very effective (an example is the case of Senegal) in eradicating the practice [19]. Government efforts have not yielded the desired benefit possibly due to the fact that some governments have not aggressively addressed the issue as it is often viewed as a private act by individuals and family members. In Nigeria, government recognized FGM as harmful practice to be eliminated but no specific federal law is yet in place to ensure strict compliance. However, some state government have put up laws against the practice of FGM. While psychological and health complications have been emphasized, little or no emphasis has been made regarding the economic implications, especially, of addressing the health complications.

Long-term physical complications include urine retention and associated urinary-tract infections, obstruction of menses and related reproductive-tract infections, infertility, painful intercourse, psychological and sexual problems, and prolonged and obstructed labour (WHO, 2006). Also, the risk of transmission of HIV is considered as a factor in FGM, especially if infected infants and girls are cut in group ceremonies where circumcisers use the same instrument on all the initiates. Even after it has healed, the scarred or dry vulva of an excised or infibulated woman can be torn easily during sexual intercourse, increasing the likelihood of HIV transmission by an infected partner.

This paper discusses the issue of FGM in Nigeria from the feminist theoretical perspective. In feminist literature, circumcising women is closely linked to control over women's sexuality [13]. Using, a representative sample of women from the 2003 NDHS, this study examine the spatial distribution of FGM, by quantifying the effects of geographical locations that might confound the complexity of the practice among ethnic groups within Nigeria , and the role of cultural and demographic factors related to the practice.

BACKGROUND ON FEMALE GENITAL MUTILATION IN NIGERIA

Nigeria is located in the Sub-Saharan African (SSA) region of the world. It shares borders with Benin Republic, Niger, Chad and Cameroon. Demographically, it is the most populous country in the region with an estimated population of 140,003,542 according to the 2006 census figure. About half of the population are women; hence issues concerning women such as FGM should not be ignored. Economically, Nigeria is not very buoyant. With the low per capita income and worsening poverty situation, the country would find it difficult to bear the cost implications of the health burden arising from the complications of FGM. Therefore, there is strong economic justification to stop the practice of FGM.

It should be noted that the World Health Organization's [17] FGM typology distinguished four different types of FGM: Type I or clitoridectomy: excision of the prepuce, with or without partial or total excision of the clitoris; Type II or excision: the excision of the clitoris with partial or total excision of the labia minora; Type III or infibulation: the most severe form of FGM consisting of the partial or total excision of the external genitalia and stitching or narrowing of the raw labial surfaces, leaving a small posterior opening for urinary and menstrual flow; and Type IV: a residual category of FGM consisting of pricking, piercing or incising the clitoris and/or labia, cauterization of tissues, scrapping of the vaginal orifice or cutting of the vagina.

The geographical distribution of the prevalence of FGM (all types) by zones and states of Nigeria is shown in Table 1.

Moreover, the results of the 1997 study conducted by the Inter-African Committee of Nigeria on Harmful Traditional Practices Affecting the Health of Women and Children (IAC) [20], indicated the following geographical distribution of FGM by states and types of FGM: Adamawa (60-70%, Type IV); Akwa Ibom (65-75%, Type II); Anambra (40-60%, Type II); Bauchi (50-60%, Type IV); Benue (90-100%, Type II); Borno (10-90%, Types I, III and IV); Delta (80-90%, Type II); Edo (30-40%, Type II); Imo (40-50%, Type II); Jigawa (60-70%, Type IV); Kaduna (50-70%, Type IV); Kebbi (90-100%, Type IV); Kogi (1%, Type IV); Kwara (60-70%, Types I and II); Lagos (20-30%, Type I); Ogun (35-45%, Types I and II); Ondo (90-98%, Type II); Osun (80-90%, Type I); Oyo (60-70%, Type I); Plateau (30-90%, Types I and IV); Rivers (60-70%, Types I and II); Yobe (0-1%, Type IV). States such as Abia , Taraba, Cross River, Enugu, Katsina , Kano , Niger, Sokoto, and the federal capital Abuja have no prevalence reported because no study was carried out in these states. However, the actual incidence may be much higher than the reported figures according to some Nigerian experts in the field.

It was also reported that Type III, the most severe form, has a higher incidence in the northern states. Type II and Type I are more predominant in the south and the last (type IV) is rare in Nigeria. Of the six largest ethnic groups, the Yoruba, Hausa, Fulani, Ibo, Ijaw and Kanuri, only the Fulani do not practice any form. The Yoruba practice mainly Type II and Type I. The Hausa and Kanuri practice Type III. The Ibo and Ijaw, depending upon the local community, practice any one of the three forms [16].

Legally, there is no federal law banning FGM in Nigeria, although the 1999 Constitution shuns any act of torture or inhuman treatment or violence against any person. However, some states have passed law against the practice. They include Bayelsa, Cross River, Delta, Ebonyi, Edo, Ekiti, Ogun, Ondo and Rivers states. In most cases the persons convicted under the law are liable to fine and imprisonment. The enforcement of the law is not very satisfactory and this many believe is as a result of poor fine and short duration of imprisonment. For instance, Edo State banned this practice in October 1999 and convicts are subject to a fine of approximately (US$10) and imprisonment of only six months. It is important to note here that government law is necessary but not sufficient to eradicating FGM. The involvement of all stakeholders in the implementation process is equally necessary.

Although, law alone is not sufficient to eradicate FGM, law is important. Instance, when practice is abandoned, communities use law to enforce the new norm.

The socio-cultural factors are often given as reasons for the practice of FGM more than the economic reasons. However, instances were cited that those who perform the cutting get paid either in cash or kind and that the cut parts are either buried or sold. There is no known empirical evidence to support the above facts and this is why in the concluding remark, further research is suggested in that respect. While some organisations have focused on retraining cutters to remove the practice, community-led organisation in Senegal (TOSTAN) have used intra-marrying groups to eradicate the practice arguing that FGM is linked to marriage opportunities, abandonment requires a collective decision. By helping to foster collective abandonment, TOSTAN's program allows villagers to share the knowledge they gain with their neighbours, friends, and family members with far reaching results to the entire community [19].

HEALTH CONSEQUENCES OF FGM

The study by the World Health Organization (WHO) study group on female genital mutilation and obstetric outcome analysed data from 28, 373 women giving birth to a single baby between November 2001 to March 2003 at 28 obstetric centres in Burkina Faso, Ghana, Kenya, Nigeria, Senegal, and Sudan. The results confirmed that FGM has very severe consequences ranging from immediate and long term health complications as well as adverse obstetric, perinatal outcomes and physical and emotional health of girls and women (WHO, 2006).

Immediate physical health consequences include: severe pain; injury to adjacent tissue of urethra, vagina, perineum and rectum; heavy Bleeding; shock; acute urinary retention; fracture or dislocation due to restraints; pelvic inflammatory disease; risk of contracting infections such as HIV and Hepatitis B; failure to heal; death

Long term consequences are: difficulty in passing urine; recurrent urinary tract infection; pelvic infections; forming of scar tissue and keloids; loss of normal sexual function; possible infertility; cysts and abscess on genital; difficulty in menstruation; painful intercourse; problem in child birth.

Physical and emotional health problems include: fear; submission; inhibition and suppression of feelings; repeated pain during intercourse and menstruation; constant feeling of betrayal, bitterness and anger; mental and psychosomatic disorder; uncircumcised girls are socially stigmatized and rejected by communities; painful and difficult labour

Serious complications during childbirth include the need to have caesarian section, dangerously heavy bleeding after the birth of the baby and prolonged hospitalization following birth. The study showed that the degree of complications increased according to the extent and severity of FGM.

EFFORTS MADE TO ELIMINATE FGM IN NIGERIA

Although, the international community has recognized the human rights implications of FGM, many countries are yet to implement law to ban the practice. Community-led initiatives such as those in Senegal have to be encouraged in addition to the effort been made by multilateral agencies, such as UNICEF and WHO in the advocacy. Unfortunately, there are to date only limited success stories. This is because one approach alone can not eliminate the practice. There is need to extend the coverage of TOSTAN work in the West African region.

In 1994 Nigeria joined other members of the 47th World Health Assembly to resolve to eliminate FGM (WHA 47.10). Since then Nigeria has taken several initiatives among which are: establishment of a multi-sectoral Technical Working Group on Harmful Traditional Practices (HTPs) , conduct of various studies and national surveys on HTPs, launching of a Regional Plan of Action, formulation of a National Policy and plan of action which was approved by the Federal Executive Council for the elimination of FGM in Nigeria.

To date many campaigns have been carried out to promote awareness of the problem by educating the policy/decision makers, the general public, health workers and those who carry out the practice on all its health and psychosocial consequences. This calls for the active involvement of political leaders, professionals, development workers, local communities and their leaders, and women's group and organizations.

This study is part of the effort to compliment work of campaigns against FGM that have existed in Nigeria since the 1980s in organisation such as: the media (by the Nigerian Council of Women broadcasts), the Inter-African Committee of Nigeria (organise community meetings), and medical professionals [5, 11]. After it has been suggested that Nigeria has a strong social convention supporting FGM [7], we examine how this social convention varies across space (states) and the role that individual factors play in influencing this relationship.

METHOD AND DATA SOURCES

PARTICIPANTS

The data for this paper came from 7620 women aged 15–49 years who were interviewed in the 2003 Nigeria Demographic and Health Survey (NDHS). Response rates by state were at least 90%. Women interviewed were representative of the underlying populations of the different states of Nigeria. The minimum average number of women sample in a state was 915 and the maximum was 1,786. For daughter's sample, the minimum sample in a state was 265 and the maximum was 429. DHS allows a comprehensive picture to be constructed of the current global prevalence rates among women and their daughters. It provides valid data on the occurrence of FGM practice at national and state levels. The survey results can also suggest associations between prevalence and ethnicity, religion or other background variables; indicate how the practice is distributed; help identify girls at risk; and enable monitoring trends over time.

The DHS focuses on two types of prevalence indicators. The first addresses FGM prevalence levels among women and represents the proportion of women aged 15–49 who have undergone FGM. The second type of indicator measures the status of daughters and calculates the proportion of women aged 15–49 with at least one daughter who has undergone genital mutilation. The methods, objectives, organisation, sample design and questionnaires used in the 2003 DHS survey for Nigeria have been described in detail; together with an overview report elsewhere [10]. Briefly, this was a random probability sample of households designed to provide estimates of health, nutrition, water and environmental sanitation, education and genital mutilation practices at the national level, for urban and rural areas, and for the 36 states and Federal Capital Territory (FCT). The survey used a two-stage cluster sampling design to collect data on a wide range of health issues. Personal (face-to-face) interviews were conducted with participants after obtaining their consent. The questionnaire collected information on whether the participant had undergone FGM and, if so, at what age and the type of practitioner and cutting, on attitudes and beliefs about FGM, as well as on their sexual and marital history. The survey procedures and instruments were validated by the Institutional Review Board at ORC Macro.

MEASURES

DEPENDENT VARIABLES

The two outcomes or dependent variables we considered in these analyses were: 1) whether a woman had had FGM and 2) whether if she had daughters, any had had FGM. We define FGM in a broad way to include all sorts of FGM respondents had undergone.

In the 2003 Nigeria DHS sample, nationwide among women who could identify the type of procedure, Type I and II were the most common form of FGM with 42.3% (708/1673) for women and 68.7% (333/485) for daughters. The most severe form of FGM, Type III, was reported by 3.3% (56/1673) of the women and 6.0% (29/485) of daughters, while Type IV was fairly rare for daughters and 2.2% (36/1673) was recorded for women. A total of 17.3% (290/1673) of women reported not knowing the form of FGM performed or did not respond to the question and 25.4% (123/485) for daughters.

INDEPENDENT VARIABLES

The exposure variable investigated is the respondent geographical location (state of residence) in addition to various control variables on socio-demographic factors known to be associated with FGM. The respondent's age at assessment was included as an indicator of the birth cohort of the participant. Other variables included were education of the respondent and of her partner (no education vs. some education), religion (Christian, Traditionalist vs. Muslim), residence (rural vs. urban), final say on health care (Respondent alone, respondent and partner, partner alone vs. someone else), marital status (single vs. married) and a principal component based assets index as an indicator of household wealth [6].

Nigeria is divided into 36 states and the Federal Capital Territory: Abuja. FGM prevalence is aggregated and known at a national level. We went a step further and accounted, simultaneously, for geographical location effects on FGM at the disaggregated level of states, thereby highlighting the spatial distribution of the FGM. We recognise that the state is still a large unit but disaggregating to this level represents a considerable advance over the use of national averages and our analysis provides state-level information on FGM.

On the other hand, one cannot assume that the clusters selected in each district are fully representative of the states in which they are located, as the surveys only attempted to generate a fully representative sample at the regional level. Consequently, the spatial analysis will be affected by some random fluctuations. Some of this random variation can be reduced through structured spatial effects as it includes neighbouring observations in the analysis. It should, however, be pointed out that such a spatial analysis should preferably be applied to census data, where the precision of the spatial analysis would be much higher. Unfortunately, most censuses do not collect data on FGM and often the full dataset is not available for such analyses. We used geo-additive Bayesian modelling, with dynamic and spatial effects, to assess temporal and geographical variation in FGM. The model used also allows for non-linear effects of covariates on FGM. The modelling approach is described in more detail in the next section.

STASTISTICAL ANALYSIS

In the analysis of survey data, the commonly adopted models are probit or logistic, and the standard measure of effect is the odds ratio [7, 15]. DHS data use cluster-sampling to draw upon women respondents via multistage sampling. At the first stage, a stratified sample of enumeration areas (villages/ communities) is taken; at the second stage, a sample of households within the selected communities is taken; and finally, at the third stage, all women respondents (aged 15-49 years) in the sample households are included. These respondents have at least one child. Although, cluster sampling is a cost-saving measure, without the need to list all the households, statistically, it creates analytical problems in that observational units are not independent. Thus, statistical analyses that rely upon the assumption of independence are no longer valid.

In the present study, however, the NDHS data contain geographical or spatial information, such as the state of individuals in the study and the presence of non-linear effects for some covariates means that strictly linear predictors can not be assumed. Analysing and modelling geographical patterns for the prevalence of FGM, in addition to the impact of other covariates, is of obvious interest in many studies. In a novel approach, the geographical patterns of FGM and the possibly non-linear effects of other factors were therefore explored within a simultaneous, coherent regression framework, using a geo-additive, semi-parametric mixed model that simultaneously controlled spatial dependence and possibly nonlinear or time-varying effects of covariates and the complex sampling design [2, 8, 9]. In brief, the strictly linear predictor:

$$\eta_i = x'\beta + w_i'\gamma + \varepsilon_i \qquad (1)$$

is replaced with a logit link function with dynamic and spatial effects, Pr($y_i=1|\eta_\iota$)=e^{η_ι}/(1+ e^{η_ι}) , and a geo-additive semi-parametric predictor $\mu_i = h(\eta_\iota)$:

$$\eta_\iota = f_1(x_{i1}) + \ldots + f_p(x_{ip}) + f_{spat}(s_i) + w'_i\,\gamma + \varepsilon_i \qquad (2)$$

where h is a known response function with a logit link function, $f_1, \ldots, f_p$ are non-linear smoothed effects of the metrical covariates (daughter‘s and mother’s age), and $f_{spat}(s_i)$ is the effect of the spatial covariate $s_i \in \{1,...,S\}$ labelling the state in Nigeria. Covariates in w'_i are categorical variables such as education and urban–rural residence. Regression models with predictors such as those in Equation 2 are sometimes referred to as geo-additive models. P-spline priors were assigned to the functions $f_1,...,f_p$, while a Markov random field prior was used for $f_{spat}(s_i)$ [2, 8, 9] . Although the estimation process with this model is complex, the estimated posterior odds ratios (OR) that were produced could be interpreted as similar to those of ordinary logistic models.

The analysis was carried out using version 0.9 of the BayesX software package [2], which permits Bayesian inference based on Markov chain Monte Carlo (MCMC) simulation techniques. The statistical significances of apparent associations between potential risk factors and the prevalence of FGM were explored in chi-square and Mann–Whitney *U*-tests, as appropriate. Multivariate analysis was used to evaluate the significance of the posterior OR determined for the fixed, non-linear effects and spatial effects. A *P*-value of <0.05 was considered indicative of a statistically significant difference.

RESULTS

The overall prevalence of the FGM in Nigeria in 2003 was 22.0% (1673/7620). This national prevalence and the aggregated regional prevalence concealed, however, important spatial variation in the FGM rates recorded at state level. In the North Central region, for example, the overall prevalence of FGM investigated was 13.2% but the corresponding state-level prevalence varied from 2.2% (in Abuja) to 57.6% (in Kwara). 2,177 women had living children, of whom 2168 (28.5%) had a daughter with the prevalence of FGM of 22.4% (485/2168) among daughters. Of the remaining women with uncircumcised daughters (1666 who answered this question), 127 (1.7%) said that they intended that their daughter should be circumcised in the future; 36 (0.5%) did not know; and 1503 (19.7%) said that they did not intend this.

Among 1673 women that have undergone FGM, 26.4 % (442/1673) at the same time had also at least a daughter with FGM. Preliminary results of these women show that they are mostly of older age (mean age and standard deviation: 37.8 (8.0) compared to 27.8(9.1)), they are among women with no education (55.6%), most of them live in the north central region (39.3%) and of Muslim religion (38.5%), they are among the poorest (33.6%) and are responsible for making their own health care decisions (36.0%).

Figure 1 shows the raw (unsmoothed) prevalence rate of FGM for women (left) and daughters (right). For both women and daughters, the prevalence of FGM was more clustered around the states in the south west region of the country. As expected, smoothing and the control of confounders generally uncovered the real extend of the prevalence rate that is difficult to see in the crude raw (unsmoothed) prevalence rates. This shows the importance of multiple adjustments of confounders. The general patterns seen in the unsmoothed maps remained unchanged. Figure 2 and 3 show the smoothed results after adjustment for the state of residence and other confounders. The prevalence of FGM among women and daughters was most affected by adjustment for the state of residence, showing clearly a north-south divide of the spatial distribution of FGM across the country, and the concentration of high prevalence states in the south-south and southwest regions became more apparent. Adjustment for the state of residence resulted in a similar change for daughter’s sample, though to a larger extent. Therefore adjustment made a big difference to the spatial distribution of FGM for women and daughters.

Other factors associated with higher prevalence of FGM were examined. Urban areas and education are strong predictors of higher prevalence of FGM. The mean age of the women in the sample was 28.01 years; 28.5% of them were never (or not yet) married. The mean level of education was quite low. On the average, women had only 1.5 years of education. Nearly forty percent reported no formal education at all and only eighteen percent had completed secondary and higher education. Forty percent of participants lived in rural areas, about 14.2 in cities, and the remainder in smaller towns. Forty-seven percent of the sample was Muslim.

Selected characteristics of respondents and their daughters by FGM status are reported in Table 1. For both outcomes (i.e. women or daughter had undergone FGM), there were significant, consistent associations for several potential correlates of FGM. The results showed that age, religion, place of residence, wealth, education, state of residence and who in the household had responsibility for health care decisions (RHCD) were all significantly related to the two outcomes ($p<0.01$). FGM was prevalent among respondents of older age. Urban compared to rural women were significantly more likely to have FGM and have circumcised their daughters (see Table 1). There were significant differences between states with respect to the two outcome variables (see Table 1). The higher the level of education attained by the respondent and her partner, the (significantly) lower the prevalence of FGM in women and daughters (see Table 1). There were significant differences between religions for the two outcomes. The proportion of women circumcised was significantly higher among women with Christian religion followed by women from traditional/animist religion and lower among women from Muslim religion. The same trend was observed with the outcome for circumcision among daughters. Wealth index was significantly related to FGM only in women and not in daughters. Women from the 5th quintile (‘richer’ group) had the greatest proportion of circumcised women. Women from the 2nd quintile (‘poor’) had the least proportion of women circumcised. There were statistically significant differences between final say on own healthcare for the two outcomes. A higher proportion of circumcised women was associated with decision on own healthcare being made by respondent and her partner followed by the women themselves. For the two outcomes there were statistically significant differences within states. North central, Kwara, Nassarawa and Niger were associated with a higher proportion of circumcised women and daughters. The Federal Capital Territory Abuja was among states with the lowest proportion of women circumcised. In general, for both outcomes states in the North East and North West regions were associated with the lowest prevalence of FGM.

The estimates of the spatial effects of the FGM were also mapped. Before adjustment for the geographical location, which was acting as a surrogate for cultural, ethnic and environmental differences, a higher prevalence of FGM was concentrated in the southern west regions in areas around Lagos and in the south-south region part of the country (Figure 1). After adjustment, the effect normalised from around Lagos but became more pronounced in the south-eastern part of the country. In Figure 2 & 3, the left-hand maps show estimated posterior OR of residual spatial state effects (i.e. adjusted odds ratios after multiple adjustment of the geographical location, taking into account the auto-correlation structure in the data and other risk factors) for FGM in both women and daughters in each state, with the red colour indicating the maximum posterior OR recorded (9.24 for women and 8.81 for daughters) while green denotes a lower prevalence.

A high prevalence of FGM was concentrated in the south west, south-south and south eastern states both for women and daughters. The right-hand maps show the 95% posterior probability maps of FGM. White colour indicates a negative spatial effect (associated with reduced risk of FGM) and black colour a positive effect (an increased risk).

In multivariate geo-additive regression analyses (Table 2), after multiple adjustments, there were several consistent significant associations in both outcomes. For women FGM, these factors are: living in urban areas [1.26 (1.10-1.45); both partners make healthcare decisions [1.35 (1.04-1.78)] and unmarried women [0.76 (0.61-0.95). For daughter FGM, these factors are: living in urban areas [1.26 (1.05-1.50)];

children from the 5th quintile of the household socio-economic status (richer) [0.56 (0.42-0.75)]; children from educated women [0.78 (0.64-0.96)] and children from unmarried women [0.67 (0.49-0.91)].

Figure 4 shows for the whole national sample the estimated non-linear (logits) effects of the respondent's age for the two outcomes. Shown are the estimated posterior logits of the effects of the respondent's age within the 80% and 90% credible interval. There appears to be a clear linear association between respondent's age (left-hand panels) for FGM in women and the right-hand panel for daughters. Respondent's age appears to be almost linearly positively related to the prevalence of FGM in women and daughters. As expected, it appears that as age increased, the likelihood of respondents circumcised per age also significantly increased, as did the percentage with any of their daughters circumcised (see Fig. 4).

DISCUSSION

This paper demonstrates the importance of quantifying the residual effects of geographic location on the prevalence of FGM in Nigeria. The spatial effects have no causal impact but careful interpretation can identify latent and unobserved factors which directly influence the prevalence of FGM. They can also be interpreted as surrogates of social convention, ethnic, and cultural factors that might confound the observed high prevalence of FGM. For instance, by highlighting the effects of geographic location, diffusion theory [14] that looks at change from the perspective of groups rather than individuals might clarify community influences on FGM. Residual spatial effects of FGM have provided us to see the inherent spatial patterns of the prevalence of FGM as the variability or "noise" has been removed. A more precise spatial pattern of the prevalence of FGM emerged with the estimated residual state effects compared with the crude prevalence without the control of the geographic location effects.

Using the 2003 NDHS, we have attempted to examine the geographical distribution including a number of socio-demographic, household and individual conditions that are likely to represent important determinants of FGM in the general population. This analysis may help to better understand the complex interplay between geographical milieu or environment and traditional practices such as FGM as well as to explore potential mechanisms underlying these associations. In fact, over the past few years, an increasing number of studies have documented that FGM practice, affects the wellbeing of women and children including high risk of HIV/AIDS [11].

The observed associations of both women and children with elevated risks for morbidity and mortality have generated the current move by various states to ban the practice [11]. However, despite the large body of data, much uncertainty remains about the true nature and causality of these associations due to the potential of confounding by other factors and the lack of robust religious or cultural evidence on plausible mechanisms by which FGM practice operates. Specifically, studies [7] have shown that FGM habits in the general population are the result of a complex interaction involving factors of different nature (e.g., social, behavioural, psychological, environmental).

The prevalence rate of FGM is higher in the southern states than in the northern states despite the fact that the level of education is relatively higher in the south. This suggests that the practice of FGM is deeply rooted in the culture which has been very difficult to change.

The result of asset (wealth) index and decision making supports the view that women have limited power in decision-making. According to Nwakeze [12], women’s sexuality is influenced by their limited decision-making power and the decision-making power is a function of their economic independence.

Neither the effect of education nor the effects of the household socio-economic status and the religion have a strong negative impact on FGM. The result of religion did not support the view that the practice may be more prevalent in certain religions (such as Islam). These findings support previous findings in

Nigeria [7] to consider FGM as a social convention. Therefore, reconfirming that modernization (education or religion) has minimal impact on the likelihood of FGM in Nigeria. Other factors such as the influence on the social convention may play a major role on the likelihood of women having FGM.

It is important to mention that the use of DHS data has limitations. Identification of FGM depended on mother's report (recall) as is common in retrospective surveys. However, accuracy and completeness of mother's recall in 19 national Demographic and Health surveys found that highly educated women were more accurate in reporting and identification of illnesses [1]. One might also argue that a live changing event such as FGM cannot be forgotten by individual women. Perhaps, this bias can only affect the classification of type of FGM. To provide a consistent sample, we did not analyse the data by type of FGM.

CONCLUSION

The mapping of residual spatial effects indicated that, the prevalence of FGM varied, differently, at state level. Individual factors such as education and community factors such as area and state of residence were strongly associated with FGM. FGM prevalence maps generated here could be a useful tool for policy design, monitoring and targeted intervention to eradicate this harmful practice in SSA. Also, considering the economic implications of FGM in the policy design is important.

Identifying and understanding environmental factors that are associated with state differences in FGM prevalence represents an important investigation to disentangle fully the influences of communities, ethnic and cultural factors on FGM. Both novel and less conventional methodologies including various data sources are required to broaden the view of environment at both individual women and community level. Understanding where an individual or community is in the process is important in program research, design and evaluation.

CONTRIBUTIONS:

N-B Kandala: Conception and design. Literature review. Data analysis and interpretation. Drafting the article. Critical revisions for important intellectual content. Approval of final article for submission.

N Nwakeze: Literature review. Interpretation of results. Drafting the article. Critical revisions for important intellectual content. Approval of final article for submission.

Ngianga II K: Interpretation of results. Critical revisions for important intellectual content.

Correspondence to:

Kandala Ngianga-Bakwin

University of Warwick

Warwick Medical School

Clinical Sciences Research Institute

Clifford Bridge Road

CV2 2DX, Coventry, UK

Tel: +44(0)2476968669

Fax: +44 (0)2476968653

Email: N-B.Kandala@warwick.ac.uk

REFRENCES

1. Boerma J T , Black R E , Sommerfelt A E , Rustein S O, and Bicego G T ,1991. Accuracy and completeness of mother's recall of diarrhoea occurrence in pre-school children in demographic and health surveys. International Journal of Epidemiology, 20:1073-1080.
2. Brezger A, Kneib T, and Lang S, 2005. BayesX - Software for Bayesian Inference based on Markov Chain Monte Carlo simulation Techniques, Version 1.40. Available under http://www.stat.uni-muenchen.de/~lang/BayesX.
3. Bettina S-D and Hernlund Y, 2000. *Female "Circumcision" in Africa.* Boulder, CO: Lynne Reinner Publishers, Inc.
4. Carr D, 1997. Female Genital Cutting: Findings from the Demographic and Health Surveys Program. Available under www.measuredhs.com.
5. Creel L, 2001. Abandoning Female Genital Cutting: Prevalence, Attitudes, and Efforts to End the Practice [English] Abandonner l'excision féminine : Prévalence, attitudes et efforts pour y mettre fin [French] Population Reference Bureau.
6. Filmer D, and Pritchett LH, 2001. Estimating wealth Effects without Expenditure Data-or Tears: An application to Educational Enrolment in States in India" Demography, 38(1):115-132.
7. Freymeyer RH, Johnson B E, 2007. An exploration of attitudes toward female genital cutting in Nigeria. Population Research Policy Review, 26:69–83.
8. Kandala N-B, Ji C , Stallard N, Stranges S, and Cappuccio FP, 2008. Morbidity from diarrhoea, cough and fever in children in Nigeria. Annals of Tropical Medicine and Parasitology, 2008; 2008;102(5): 427–445.
9. Kandala N-B, Ji C, Stallard N, Stranges S, and Cappuccio FP, 2007. Spatial Analysis of Risk Factors for Childhood Morbidity in Nigeria. American Journal of Tropical Medicine & Hygiene: Oct1, 2007, 77(4), 770-778.

10. National Population Commission (2004) Nigeria Demographic an Health Survey 2003, Caverton, Maryland, USA.
11. Nnorom C C P, 2000. Female Genital Mutilation Practice in Nigeria: Patterns, Preference and Remedies , 2005, vol 2, Number 1.
12. Nwakeze N M, 2001. Economic Decision-making Power in the Household: The Case of Anambra Women, Journal of Women Academics Vol 1, No3, June, pp 124-134.
13. Nwakeze N M, 2006. "The Paradox of Women Empowerment", University of Lagos Sociological Review, Vol.VII.
14. Rogers, Everett M. Diffusion of Innovations. 4thed. New York: Free Press,1995.
15. Van Rossem R, Gage A J, 2007. The Effects of Female Genital Mutilation on the Onset of Sexual Activity and Marriage in Guinea. Archive of Sex Behaviour.
16. U.S. Agency for International Development (USAID), 2000. USAID policy on female genital cutting (FGC). Washington, D.C.: USAID.
17. World Health Organization, 1998. *Female genital mutilation: An overview.* Geneva: WHO. P71 of (2).
18. World Health Organisation, Female genital mutilation complicates births: WHO collaborative prospective study in six African countries. *The Lancet* 2006; 367:1835–1841.
19. TOSTAN [www.tostan.org]
20. Female circumcision in Nigeria. A monograph of Inter African Committee on Harmful & Positive Traditional Practices affecting Women and Children. 1997.

Table 1: Distribution of factors analysed in Female Genital Mutilation (FGM) study in Nigeria (DHS 2003)

		Mother circumcised N (%)			Daughter circumcised N (%)		
		No	Yes	p-value	No	Yes	p-value
Religion							
	Christian	2339(64.3)	1299(35.7)	<0.001	968(74.7)	328(25.3)	<0.001
	Muslim	3218(90.6)	335(9.4)		677(82.7)	142(17.3)	
	Traditionalist/animist	84(68.3)	39(31.7)		38(71.7)	15(28.3)	
Place of residence							
	urban	2052(70.7)	3596(81.4)	<0.001	794(76.6)	242(23.4)	0.29
	rural	852(29.3)	821(18.6)		889(78.5)	243(21.5)	
Final say on health care							
	Respondent alone	731(58.0)	530(42.0)	<0.001	358(63.6)	205(36.4)	<0.001
	Respondent and husband	327(54.7)	271(45.3)		256(72.5)	97(27.5)	
	Husband/partner	3173(87.2)	466(12.8)		985(85.7)	164(14.3)	
	Someone else	1266(77.5)	368(22.5)		80(84.2)	15(15.8)	
Asset Index							
	1st quintile	1208(83.2)	244(16.8)	<0.001	267(74.8)	90(25.2)	0.39
	2nd quintile	1149(84.1)	217(15.9)		262(78.2)	73(21.8)	
	3rd quintile	1174(81.1)	274(18.9)		298(77.0)	89(23.0)	
	4th quintile	1089(72.9)	404(27.1)		373(76.7)	113(23.2)	
	5th quintile	1028(65.8)	534(34.2)		483(80.1)	120(19.9)	
Mother Education							
	None	2677(90.1)	295(9.9)	<0.001	585(76.7)	178(23.3)	0.43
	Some education	2971(68.3)	1378(31.7)		1098(78.2)	307(21.8)	
Partner Education							
	None	2002(90.4)	213(9.6)	<0.001	455(78.7)	123(21.3)	0.38
	Some education	2169(70.1)	927(29.9)		1164(76.9)	349(23.1)	
States							
North Central:	Benue	294(89.9)	33(10.1)		70(83.3)	14(16.7)	
	Kwara	50(42.4)	68(57.6)		29(43.3)	38(56.7)	
	Niger	193(91.9)	17(8.1)		30(75.0)	10(25.0)	
	Plateau	232(97.9)	5(2.1)		37(94.9)	2(5.1)	
	Kogi	182(95.3)	9(4.7)		25(92.6)	2(7.4)	
	Nassarawa	78(72.2)	30(27.8)		33(91.7)	3(8.3)	
	Abuja (FCT)	44(97.8)	1(2.2)		11(100)	0(0.0)	
	Total	1073(86.8)	163(13.2)	<0.001	235(77.3)	69(22.7)	<0.001
North East:	Bauchi	465(99.1)	4(0.9)		83(100)	0(0.0)	
	Borno	266(97.4)	7(2.6)		103(100)	0(0.0)	
	Adamawa	200(100)	0(0.0)		36(94.7)	2(5.3)	
	Taraba	146(98.0)	3(2.0)		36(100)	0(0.0)	
	Yobe	148(99.3)	1(0.7)		66(100)	0(0.0)	
	Gombe	165(97.6)	4(2.4)		34(97.1)	1(2.9)	
	Total	1390(98.7)	19(1.3)	0.11	358(99.2)	3(0.8)	0.021
North West:	Kaduna	428(98.8)	5(1.2)		34(100)	0(0.0)	
	Kano	424(99.8)	1(0.2)		60(98.4)	1(1.6)	
	Katsina	277(100)	0(0.0)		58(100)	0(0.0)	
	Sokoto	155(98.1)	3(1.9)		33(97.1)	1(2.9)	
	Jigawa	196(100)	0(0.0)		6(100)	0(0.0)	
	Kebbi	142(99.3)	1(0.7)		39(97.5)	1(2.5)	
	Zamfora	154(100)	0(0.0)		28(87.5)	4(12.5)	
	Total	1776(99.4)	10(0.6)	0.06	258(97.4)	7(2.6)	0.20
South East:	Anambra	96(46.4)	111(53.6)		74(74.7)	25(25.3)	
	Imo	81(47.4)	90(52.6)		50(64.9)	27(35.1)	
	Abia	72(58.1)	52(41.9)		41(78.8)	11(21.2)	

	Enungu	129(52.9)	115(47.1)		80(70.2)	34(29.8)	
	Ebonyi	58(33.7)	114(66.3)		53(66.3)	27(33.8)	
	Total	436(47.5)	482(52.5)	<0.001	298(70.6)	124(29.4)	0.35
South South:	Akwa-Ibom	132(75.4)	43(24.6)		54(76.1)	17(23.9)	
	Edo	60(50.4)	59(49.6)		28(63.6)	16(36.4)	
	Cross River	78(63.4)	45(36.6)		42(73.7)	15(26.3)	
	Rivers	199(69.8)	86(30.2)		88(88.0)	12(12.0)	
	Delta	66(40.7)	96(59.3)		68(80.0)	17(20.0)	
	Bayelsa	21(41.2)	30(58.8)		26(86.7)	4(13.3)	
	Total	556(60.8)	359(39.2)	<0.001	306(79.1)	81(20.9)	0.018
South West:	Lagos	199(55.3)	161(44.7)		118(77.6)	34(22.4)	
	Ogun	122(79.2)	32(20.8)		46(90.2)	5(9.8)	
	Ondo	26(26.8)	71(73.2)		16(34.8)	30(65.2)	
	Oyo	31(14.8)	179(85.2)		28(29.2)	68(70.8)	
	Osun	19(12.2)	137(87.8)		8(16.3)	41(83.7)	
	Ekiti	20(25.0)	60(75.0)		12(34.3)	23(65.7)	
	Total	417(39.5)	640(60.5)	<0.001	228(53.1)	201(46.9)	<0.001
	Total	5648(77.1)	1673(22.0)		1683(77.6)	485(22.4)	
		MFGM (Mean and Std. dev.)			Daughter FGM (Mean and Std. dev.)		
		No	Yes	p-value	No	Yes	
Current age in year		27.4(9.4)	30.4(10.0)	<0.001	33.3(8.1)	37.5(8.1)	<0.001
Maternal age at FGM(years)			2.5(5.8)				
Daughter's age at FGM(years)						1.1(3.6)	

Chi-square test was used for categorical data and Mann-Whitney test for continuous data in the bivariate analysis.

Table 2: Posterior odd ratio of Female Genital Mutilation (FGM) in Nigeria (DHS 2003)

	Mother circumcised N (%)			Daughter circumcised N (%)		
	OR	95% LCI	UCI	OR	95%LCI	UCI
Religion						
Christian	1.18	0.99	1.40	0.79	0.62	1.00
Muslim	1.00			1.00		
Traditionalist/animist	0.95	0.67	1.35	0.74	0.46	1.15
Place of residence						
urban	1.26**	1.10	1.45	1.26**	1.05	1.50
rural	1.00			1.00		
Final say on health care						
Respondent alone	1.20	0.93	1.55	0.85	0.56	1.37
Respondent and husband	1.35**	1.04	1.78	0.75	0.48	1.25
Husband/partner	1.07	0.84	1.39	0.75	0.49	1.23
Someone else	1.00			1.00		
Asset Index						
1st quintile	1.00			1.00		
2nd quintile	1.06	0.88	1.29	1.00	0.76	1.32
3rd quintile	0.95	0.79	1.15	0.87	0.67	1.12
4th quintile	1.07	0.87	1.31	0.76	0.58	1.00
5th quintile	0.85	0.69	1.05	0.56**	0.42	0.75
Mother Education						
None	1.00			1.00		
Some education	1.07	0.92	1.24	0.78**	0.64	0.96
Partner Education						
None	1.00			1.00		
Some education	1.13	0.96	1.32	1.12	0.91	1.39

Marital Status						
Married	1.00			1.00		
Single	0.76**	0.61	0.95	0.67**	0.49	0.91

**p<0.05 significant.

Figure 1 Map of the raw (unsmoothed) prevalence rates of FGM for women (left) and daughters (right) in Nigeria (2003 NDHS).

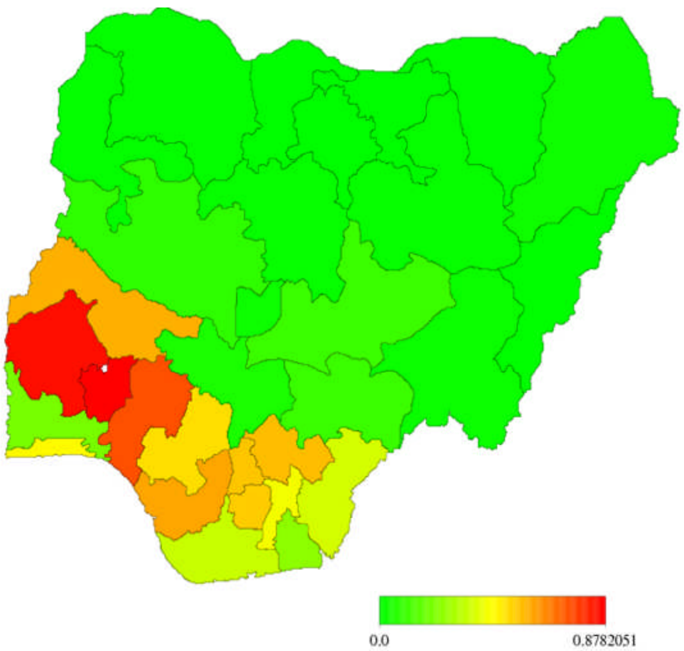


Figure 2 Posterior odds ratio for likelihood of a women having daughter with FGM (left) and posterior probabilities (right) of FGM in Nigeria.

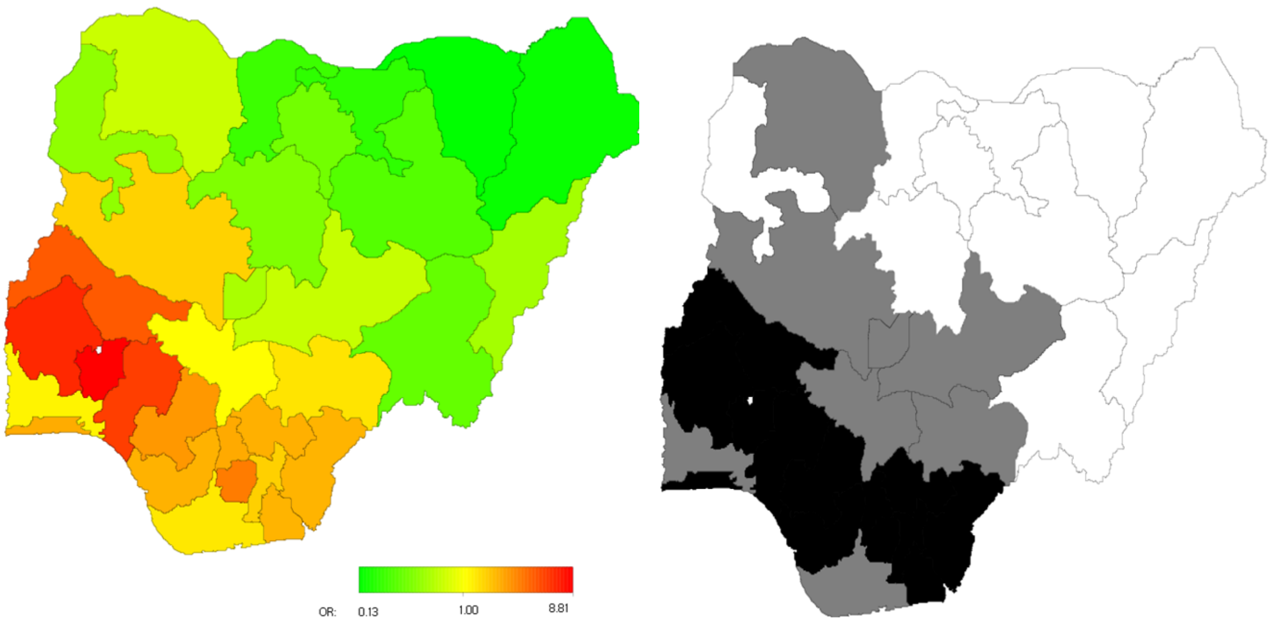
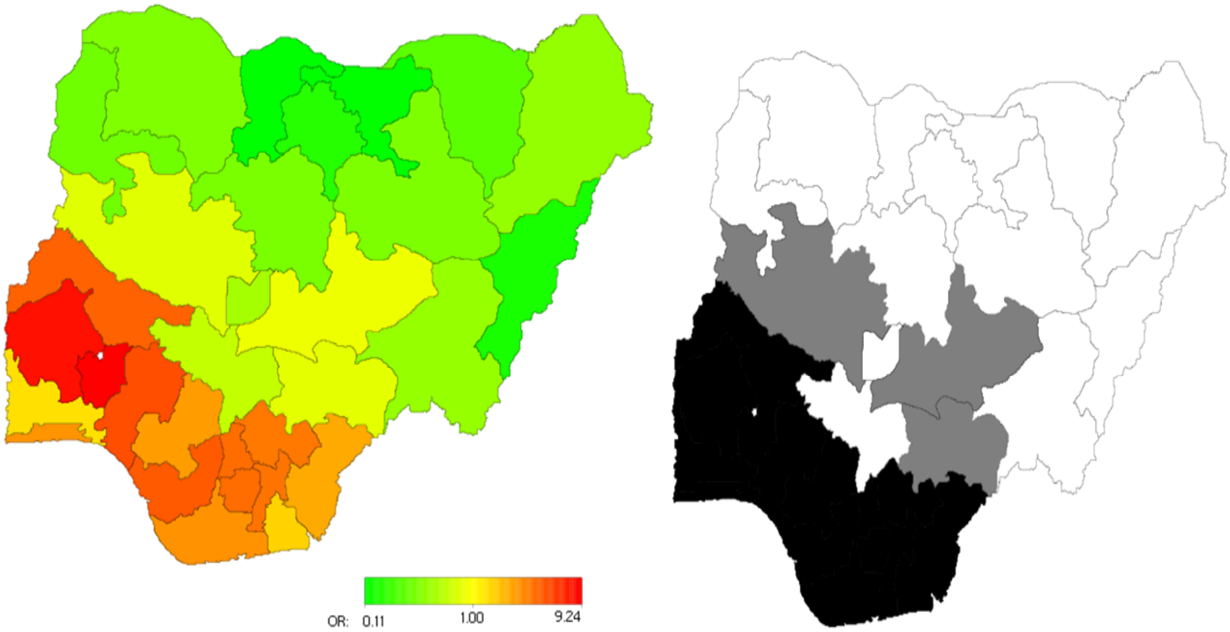


Figure 3 posterior odds ratio for likelihood of FGM in women (left) and posterior probabilities (right) of FGM in Nigeria.



Red coloured – high risk
Green coloured – low risk

Black coloured – significant positive spatial effect
White coloured- significant negative spatial effect
Grey coloured – no significant effect

Figure 4: Estimated nonlinear (logits) effects of mother's age at daughter's FGM (left) and respondent's current on the likelihood of having FGM. Shown are the posterior logits within the 95% and 80% credible intervals.