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Spatial Analysis of Contraceptive Use and Unmet Need in Kenya

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April 2011

WP-11-118

MEASURE Evaluation PRH is funded by the U.S. Agency for International Development (USAID) through cooperative agreement associate award number GPO-A-00-09-00003-00 and is implemented by the Carolina Population Center at the University of North Carolina at Chapel Hill, in partnership with Futures Group, Management Sciences for Health, and Tulane University. The opinions expressed are those of the authors and do not necessarily reflect the views of USAID or the U.S. government.

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ABSTRACT

Objective: The objective of this study was to examine the geographical variation in the use of modern contraceptive use and unmet need for family planning across Kenya and in Nairobi slums, and to identify associated individual and contextual determinants.

Methods: Data were obtained for women aged between 15-49 years from the 2008-09 Kenya Demographic Health Survey (DHS) and the Maternal and Child Health Project (2007-09) of the Nairobi Urban Health and Demographic Surveillance System (NUHDSS). Multilevel logistic regression was used to identify associated determinants of modern contraceptive use and unmet need, and spatial techniques used to map prevalence at district and village level for the national and slum data respectively.

Results: Significant variation in the prevalence of modern contraceptive use and unmet need was found among districts in Kenya. Age, educational attainment, parity, and household wealth were associated with contraceptive use and unmet need across Kenya and in Nairobi slums.

Conclusion: The geographical variation in modern contraceptive use and unmet need in Kenya suggests that unidentified district-level factors influence these outcomes and need to be the focus of strategies to address the low prevalence across parts of the country.

CONTENTS

INTRODUCTION

Kenya has an estimated population of 39.4 million and with an annual growth rate of 2.8%, the population is projected to exceed 50 million by 2025.[1] The trend in fertility that showed a sharp decline from 1978 to 1997 has leveled off in the last decade.[2] The 2008-09 Kenya Demographic and Health Survey (DHS) reports a total fertility rate (TFR) of 4.6 lifetime births per woman and a prevalence of 46% in the use of contraceptive methods among currently married women.[3] These results did not meet the 2010 targets of 2.5 for TFR and 62% for contraceptive prevalence set by the Kenya National Population Policy for Sustainable Development.[4] The recent plateaus in TFR and contraceptive use in Kenya have been attributed to reduced availability of modern contraceptive methods, diversion of resources to HIV/AIDS, and the lack of support for family planning programs.[5] Family planning services in Kenya are offered by the Kenya Ministry of Health, nongovernmental organizations (NGOs), and the private sector. Studies indicate that health facilities in Kenya that are designated to offer family planning services are not equitably distributed throughout the country.[6] The need to improve access to and quality of family planning services is essential to address unmet need and increase utilization of contraceptive methods. The influence of geographic location, socioeconomic, and other contextual factors needs to be considered in addressing these disparities.

Individual contraceptive use is influenced by factors at the individual, household, and community level, but the geographic distribution of contraceptive use is often associated with contextual variables, particularly at the community level.[7] These contextual variables typically include social, economic, and cultural influences at the community level.[8-9] Grady and colleagues showed that increased use of contraception was linked to rapid population growth rates, high levels of unemployment, religious affiliation, higher socioeconomic status and greater availability of contraceptive services.[10] A study in the Philippines found that provision of family planning outreach services and the average community wage for women were significant community-level predictors of the use of contraceptive services.[11] Research in South Africa has also shown significant relationships between the wealth status, level of female autonomy, level of female education of communities, and the choice of contraceptive method.[12] Other studies have examined the relationship between spatial patterns of use of contraceptive methods and the influence of community-level factors. In Bangladesh and India, districts located on the border and which share a common language were positive outliers for contraceptive use.[13] This example of cross-border influence indicates that the spatial variation of contraceptive use is not only determined by contextual factors confined to administrative boundaries, but also due to cross-boundary diffusion of information and attitudes that alter reproductive behavior.

Studies in Kenya show high unmet need for family planning across the population, which is associated with the characteristics of places of residence. According to the 2008-09 Kenya DHS, the prevalence of unmet need for family planning varied between 2o% in urban areas to 27% in rural areas; as well as among provinces, ranging from 32% in Nyanza to 15% in the Nairobi.[3] The reasons for this variation among provinces in Kenya are not fully understood and are important for addressing the barriers to access to contraceptive services. Unmet need was also influenced by the level of education attained by the women with a higher proportion of those with incomplete or complete primary education having unmet need compared to those with greater than primary education.[3]

The overall aim of this study was, therefore, to examine the role of individual and community-level factors in explaining the spatial variation in use of modern contraceptives and unmet need studies across Kenya and in two slums of Nairobi. Specifically, this study sought to:

i. examine the spatial distribution of the prevalence of modern contraceptive use and unmet need for contraceptives across districts of Kenya using data from Kenya DHS 2008-09;
ii. examine spatial patterns of both outcomes across two slums of Nairobi using data from the MCH Project (2007-09) undertaken in the NUHDSS; and
iii. investigate the influence of individual and community-level factors on use of modern contraceptives and unmet need for across Kenya and in Nairobi slums.

DATA AND METHODS

Kenya Demographic and Health Survey

The data for this study were obtained from the 2008-09 Kenya DHS. Individual and household data were obtained for women aged 15 to 49 years who were included in the survey. The sample, drawn from 400 clusters, was designed to be representative of the eight provinces in Kenya (figure 1). Interviews were conducted in the local language of the respondents, and data collection took place from November 2008 to February 2009. Details of the sampling design and data collection procedures are available in the main survey report.[3] The sample size used in this study was 7,144.

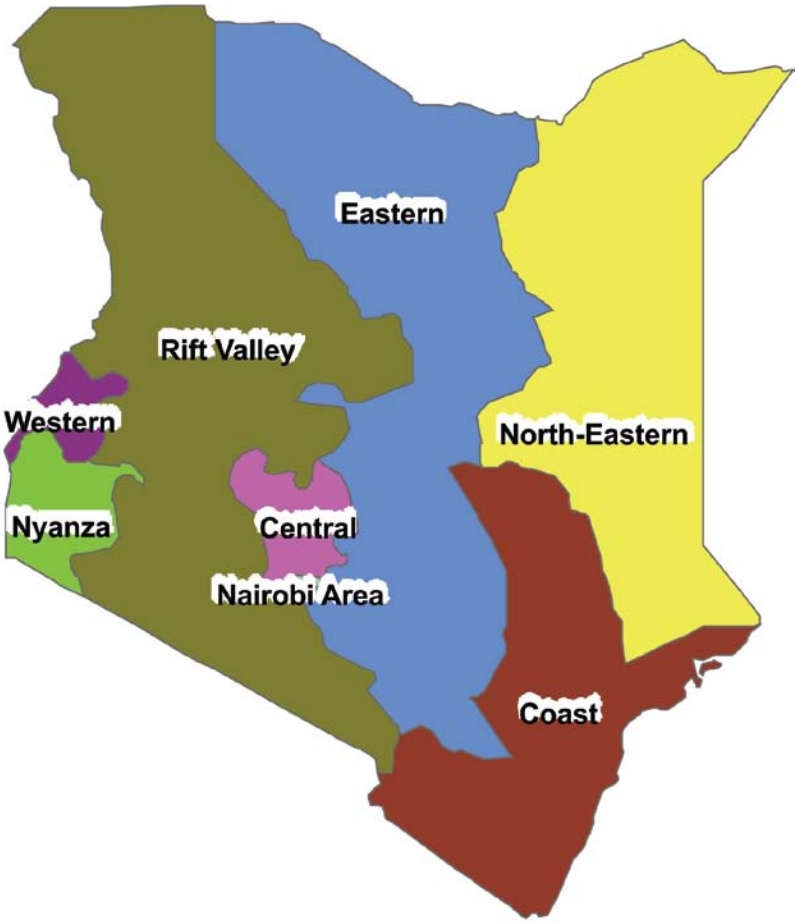


Figure 1: Map of Kenya showing the eight provincial administrative boundaries.

Maternal and Child Health Project

The Maternal and Child Health (MCH) project is nested within the Nairobi Urban Health and Demographic Surveillance System (NUHDSS). The NUHDSS includes households in two slums of Nairobi — Korogocho and Viwandani. The two slums are located about 4 km apart, and are about 10 km from the Nairobi city center. A total of 61,106 residents in 25,089 households were registered in the surveillance system as of December 31, 2008. Three census rounds are conducted each year and data on sociodemographic, economic, and health characteristics are collected from all households. The MCH project, which began in 2007, collects information on maternal and child health, including family planning and fertility. Mothers who gave birth to children in the surveillance area are recruited into the study sample during the next round and followed throughout the duration of the project. Data collection is done three times each year and individual records are linked to the corresponding household characteristics in the NUHDSS database. Over the duration of the project, data have been collected from women who have given birth in the surveillance area from September 2006. The sample of women used in this study was constructed by inclusion of women in the MCH study who were of reproductive age, were not currently pregnant, and were sexually active. The final sample size was 4,181, with 2,250 in Korogocho and 1,931 in Viwandani.

Dependent Variables

This study focuses on the individual and household attributes of women in Kenya who use modern contraceptive methods and those who have an unmet need for contraceptives, and how these factors relate to the geographic variations observed across the districts in the country and within two slums in Nairobi. The dependent variables used for the analyses with both datasets were binary variables:

- **Modern contraceptive use:** This refers to a measure of whether a woman was using a modern method of contraception (oral pill, intrauterine device, condom, female or male sterilization, implant, or injectable) at the time of the survey. This measure was based on a recode of the DHS and MCH variables that asked about the method of contraception currently being used. A woman using any of the modern methods was coded as 1 and a woman not using one of these methods was coded as 0.
- **Unmet need:** This refers to a measure of whether a woman who wants to avoid becoming pregnant is not using any modern method of contraception. The unmet need group includes all fecund women, who either do not want any more children or who wish to postpone the birth of their next child for at least two more years but are not using any method of contraception. The unmet need group also includes all pregnant women whose pregnancies were unwanted or mistimed or who unintentionally became pregnant because they were not using contraception.

Independent Variables

The independent variables utilized in the Kenya DHS analysis included age, marital status, educational attainment, parity, urban-rural residence, household asset index, self-reported fertility desire, and exposure to family planning information. The contextual variables used were derived by aggregation of individual or household variables, and assigning the mean values to all women in the district. These variables included the mean number of years of education of respondents and partners, proportion of respondents who decide on household spending, and mean parity. The same approach was used with the NUHDSS data set, but the independent variables varied slightly and were computed by village. The independent variables at village level included proportion of women with greater than primary education, the mean parity, the mean monthly household expenditure per capita, and proportion of respondents who decide on household spending.

Data Analysis

The analysis included descriptive, multilevel logistic and spatial visualization methods. Descriptive analysis was done to show the prevalence of contraceptive use and unmet need by individual and household socio-demographic characteristics. The mean values for the derived contextual variables among women using or not using contraceptive methods, and those with or without unmet need, were also shown.

Multilevel logistic models were utilized to account for the hierarchical nature of the data and to enable estimation of district-level (in the case of the Kenya DHS data set) and village-level (in the case of the NUHDSS data set) influences on both outcomes. The random effects, which represent unexplained influences after controlling for factors in the regression models, were estimated in all the models. This may be due to omitted variables or measurement errors with included variables.

Spatial Analysis

The DHS and NUHDSS data sets allowed for spatial analyses with which to gain new insights into the patterns of contraceptive use and unmet need across Kenya and within urban slums. The DHS dataset had GPS coordinates and identifiers for clusters (primary sampling units, which represent sampling blocks of approximately 20 to 30 households) and districts (administrative areas) where each respondent resided. Although the clusters were more representative of communities in which the participants resided, there were insufficient sample sizes at this level. Aggregates were obtained at district levels as estimates of district-level prevalence and used to derived contextual variables. Similarly, GPS coordinates for households in the slums were linked to the MCH data and village aggregates obtained as contextual variables. District or sub-national boundary data were obtained from International Livestock Research Institute (ILRI), and village-level shapefiles were developed for the slums using GIS software. Choropleth maps were generated to visualize actual prevalence of both outcomes, as well as the residuals from the models to examine patterns and clusters among the districts or villages countrywide and in the slums, respectively. All maps were created using ArcGIS 9.2 (ESRI International, Redlands, California).[14]

RESULTS

Kenya Demographic and Health Survey

Table 1a shows the percentage of respondents that use modern contraceptives by selected characteristics. The overall prevalence of modern contraceptive use among women aged 15-49 in Kenya was 30.8%. Higher levels of contraceptive use were seen among older women aged 30 years or older, compared to younger women. Modern contraceptive use was also more prevalent among women who had higher levels of education, belonged to households in higher wealth quintiles and lived in urban areas. Similarly, women who were married represented the largest proportion of users of modern contraceptives, and contraceptive use increased with higher parity. Contraceptive use was more prevalent among women who were fecund and those exposed to family planning messages. Table 1b shows the mean levels of the derived contextual variables among users and non-users of modern contraceptive methods. Most of the variables were not different in the two categories except for the mean years of education of the respondent and partner, which were higher among contraceptive users.

Table 1a: Socio-demographic Characteristics of Respondents by Contraceptive Use in Kenya (Kenya DHS, 2008-09)

	Contraceptive use		Total	
	No (%)	Yes (%)	n	%
All respondents	69.2	30.8	7145	-
Age (years)				
15-19	87.1	12.9	766	10.7
20-29	70.1	29.9	2899	40.6
30-39	61.5	38.5	2091	29.3
40-49	69.3	30.7	1389	19.4
Highest educational level				
No education	93.0	7.0	1152	16.1
Primary	67.8	32.2	3769	52.8
Secondary	61.0	39.0	1609	22.5
Higher	55.3	44.7	615	8.6
Wealth quintiles				
Poorest	88.4	11.6	1461	20.4
Poorer	73.3	26.7	1104	15.5
Middle	65.0	35.0	1209	16.9
Richer	61.5	38.5	1347	18.9
Richest	60.9	39.1	2024	28.3
Place of residence				
Urban	63.6	36.4	2208	30.9
Rural	71.8	28.2	4937	69.1
Marital status				
Never married	82.6	17.4	1251	17.5
Married	64.4	35.6	5032	70.4
Formerly married	78.2	21.8	862	12.1
Parity				
0	86.6	13.4	1053	14.7
1-2	66.0	34.0	2388	33.4
3-4	60.8	39.2	1825	25.5
More than 4	71.8	28.2	1879	26.3
Fecund				
Non fecund	85.5	14.5	2819	39.5
Fecund	58.6	41.4	4326	60.5
Exposure to family planning messages				
No	37.5	16.9	2234	31.3
Yes	62.5	37.1	4910	68.7

Table 1b: Derived Contextual Variables by Respondent Use of Contraceptives in Kenya (Kenya DHS, 2008-09)

	No			Yes		
	n	Mean	SD	n	Mean	SD
Respondents that decide household spending (%)	3908	0.50	0.22	1923	0.47	0.21
Mean partner years of education	4947	7.78	3.40	2198	9.33	2.47
Mean parity	4947	2.80	0.94	2198	2.46	0.87
Mean respondent years of education	4947	6.88	3.28	2198	8.55	2.26

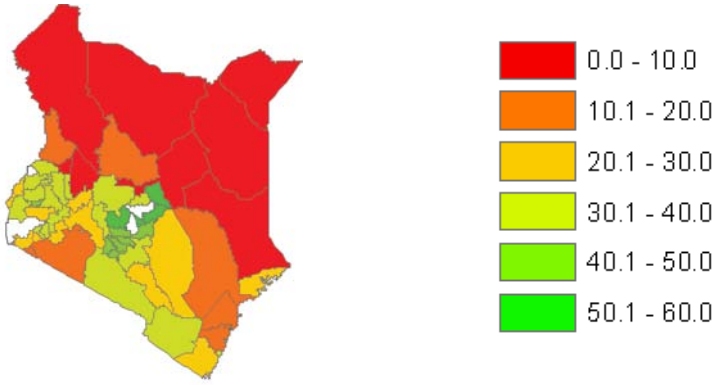
The adjusted odds ratios for use of modern contraceptives in Kenya are shown in table 2. Women aged above 19 years were more likely to use modern contraceptives compared with younger women. Education and higher levels of household wealth were significantly associated with contraceptive use. Married women and those who had given birth to children were more likely to use modern contraceptive compared to women who had never married or given birth. Fecundity and desire for a child after 12 months were also significantly associated with contraceptive use. None of the contextual factors included in the model were significantly associated with contraceptive use. The presence of contextual variables did not significantly alter the district-level variation in contraceptive use.

Table 2: Adjusted Odds Ratios for Use of Modern Contraceptives in Kenya (Kenya DHS, 2008-09)

Factor	Category	OR	P value	95% CI	
Individual variables					
Age group	19 and below				
	20-29	1.34	0.083	0.96	1.85
	30-39	1.62	0.023	1.06	2.46
	40-49	1.13	0.748	0.53	2.39
Education level	No education				
	Primary	3.06	0.000	1.74	5.37
	Secondary	3.71	0.000	2.01	6.83
	Higher	3.81	0.000	1.93	7.53
Household wealth	Poorest				
	Poorer	1.27	0.273	0.83	1.93
	Middle	1.68	0.014	1.11	2.55
	Richer	1.49	0.067	0.97	2.29
	Richest	1.82	0.019	1.10	3.01
Residence	Urban				
	Rural	1.04	0.805	0.74	1.46
Marital status	Never married				
	Married	3.06	0.000	2.26	4.14
	Formerly married	1.58	0.067	0.97	2.59
Parity	0				
	1-2	2.49	0.000	1.83	4.38
	3-4	3.10	0.000	2.04	4.70
	More than 4	2.45	0.002	1.38	4.38
Fecundity	No Fecund				
	Fecund	4.38	0.000	3.41	5.64
Exposure to family planning messages	No exposure				
	Exposed to FP	1.19	0.208	0.91	1.55
Fertility decision	Wants child next 12 mos				
	Another answer	4.61	0.000	3.34	6.36
Community variables					
Respondents decide household spending (%)		0.66	0.122	0.39	1.11
Mean partner years of education		1.08	0.138	0.97	1.19
Mean parity		0.96	0.744	0.77	1.20
Mean respondent years of education		0.99	0.951	0.88	1.13
Variances and random effects					
Cluster level (SE)	0.014 (0.06)				
District level (SE)	0.137 (0.06)				

Figure 2 shows the level of contraceptive use in each of the districts in Kenya (map A). Modern contraceptive use varied substantially across the country. The districts in the northern and eastern regions had low levels of contraceptive use whereas the districts in the central parts had the highest levels of contraceptive use. Map B in figure 2 shows the district level residuals for contraceptive use after accounting for individual and household level factors. The districts with low residual variation clustered as seen with the Rift Valley region (districts in green in the west) and those in the eastern or coastal regions (districts in yellow in the east). There was also a cluster of districts with high

Map A.



Map B.

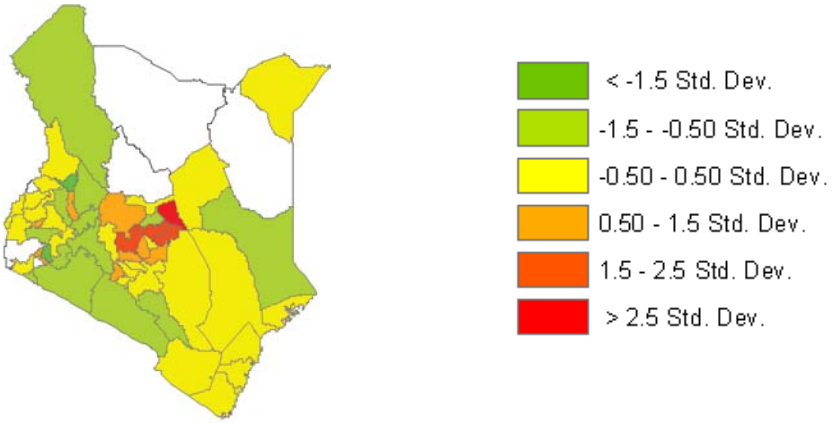


Figure 2: District-level prevalence of modern contraceptive use in Kenya (map A) and residuals from the regression model (map B), Kenya KDHS, 2008-09.

Table 3a shows the socio-demographic characteristics of respondents by unmet need in Kenya. The prevalence of unmet need among all women (aged 15-49 years) in Kenya was 19.2%. The prevalence was highest among those aged 20-29, but was lower among women with higher education, from

households with greater wealth, residing in urban areas, and exposed to family planning messages. Higher levels of unmet need were seen among women with higher parity. Table 3b shows the mean levels of the derived contextual variables among women with or without unmet need in Kenya. The mean years of education of respondents and partners at district level were higher among women who had no unmet need compared to those with unmet need. The other contextual variables were not substantially different in the two categories.

Table 3a: Socio-demographic Characteristics of Respondents by Unmet Need in Kenya (DHS, 2008-09)

	Unmet need		Total	
	No (%)	Yes (%)	n	%
All respondents	80.8	19.2	7145	-
Age (years)				
15-19	86.3	13.7	766	10.7
20-29	79.4	20.6	2899	40.6
30-39	80.5	19.5	2091	29.3
40-49	81.1	18.9	1389	19.4
Highest educational level				
No education	78.1	21.9	1152	16.1
Primary	77.2	22.8	3769	52.8
Secondary	87.2	12.8	1609	22.5
Higher	90.9	9.1	615	8.6
Wealth quintiles				
Poorest	74.1	25.9	1461	20.4
Poorer	76.2	23.8	1104	15.5
Middle	81.0	19.0	1209	16.9
Richer	84.2	15.8	1347	18.9
Richest	85.7	14.3	2024	28.3
Place of residence				
Urban	84.5	15.5	2208	30.9
Rural	79.1	20.9	4937	69.1
Parity				
0	92.0	8.0	1053	14.7
1-2	83.8	16.2	2388	33.4
3-4	78.2	21.8	1825	25.5
More than 4	73.1	26.9	1879	26.3
Exposure to family planning messages				
No	78.1	21.9	2234	31.3
Yes	82.0	18.0	4910	68.7

Table 3b: Derived Contextual Variables by Unmet Need in Kenya (DHS, 2008-09)

	No			Yes		
	n	Mean	SD	n	Mean	SD
Respondents that decide household spending (%)	4703	0.49	0.21	1128	0.51	0.22
Mean partner years of education	5772	8.37	3.28	1373	7.80	2.90
Mean parity	5772	2.64	0.94	1373	2.94	0.89
Mean respondent years of education	5772	7.52	3.14	1373	6.88	2.86

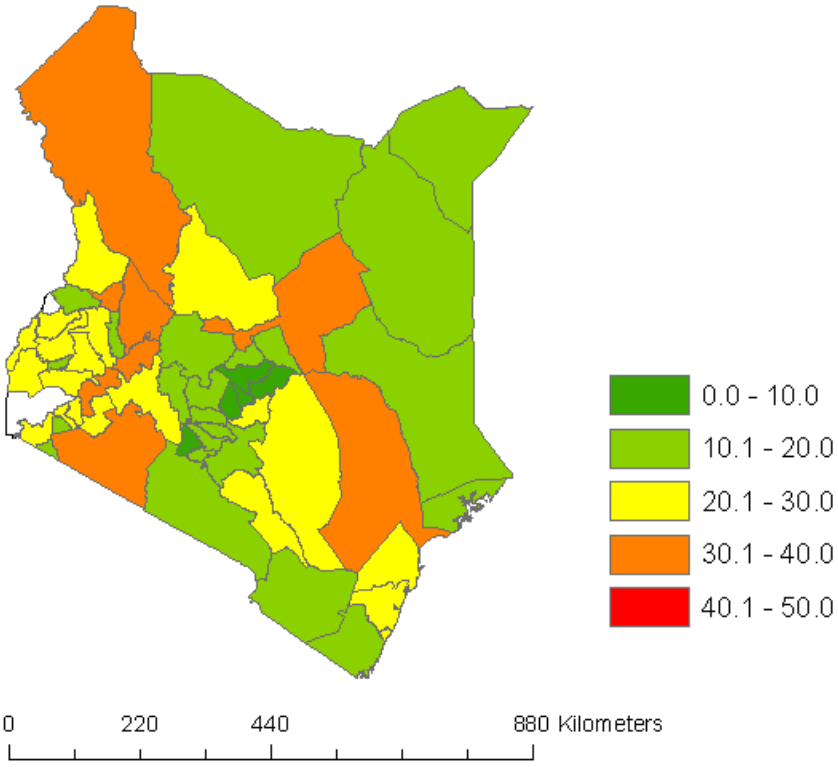
The adjusted odds ratios for unmet need for contraception in Kenya are shown in table 4. Women with secondary or higher education were less likely to have unmet need compared to those with no education, although the odds ratio for those with higher education did not reach significance level. The women in the richest quintile were less likely to have unmet need, whereas those with higher parity were more likely to have unmet need. None of the contextual variables were significantly associated with the likelihood of unmet need. The variance in unmet need due to unobserved factors was not significant.

Table 4: Adjusted Odds Ratios for Unmet Need for Contraceptives in Kenya. (DHS, 2008-09)

Factor	Category	OR	P value	95% CI	
Individual variables					
Age group	19 and below				
	20-29	1.19	0.304	0.85	1.67
	30-39	0.83	0.444	0.51	1.33
	40-49	0.39	0.087	0.13	1.14
Education level	No education				
	Primary	1.08	0.713	0.69	1.69
	Secondary	0.54	0.032	0.31	0.95
	Higher	0.62	0.191	0.30	1.26
Household wealth	Poorest				
	Poorer	0.91	0.619	0.62	1.32
	Middle	0.81	0.306	0.54	1.20
	Richer	0.83	0.409	0.55	1.27
	Richest	0.56	0.039	0.33	0.97
Residence	Urban				
	Rural	0.71	0.082	0.48	1.04
Parity	0				
	1-2	2.40	0.000	1.71	3.36
	3-4	2.95	0.000	1.91	4.55
	More than 4	4.53	0.000	2.64	7.77
Exposure to FP messages	Not exposed				
	Exposed	0.85	0.243	0.65	1.11
Fertility decision	Wants child in next 12 months				
	Another answer	127.88	0.000	17.83	917.07
Community variables					
Respondents that decide on HH spending (%)		1.41	0.222	0.81	2.45
Mean partner years of education		0.98	0.856	0.88	1.11
Mean parity		1.12	0.317	0.89	1.41
Mean respondent years of education		1.03	0.594	0.91	1.17
Variances and random effects					
Cluster level (SE)	0.060 (0.086)				
District level (SE)	0.008 (0.040)				

Figure 3A shows the levels of unmet need for contraceptives in districts in Kenya. The districts in the central region had the lowest levels of unmet need in the country, whereas most of districts in the western regions (Rift Valley and Nyanza) and parts of the coastal regions in the east had higher levels of unmet need. Figure 3B shows the district level residuals for unmet need across Kenya. The districts with low residuals clustered around the central region and parts of the south-east. The districts with higher residuals were seen in the west and the Rift valley.

Map A.



Map B.

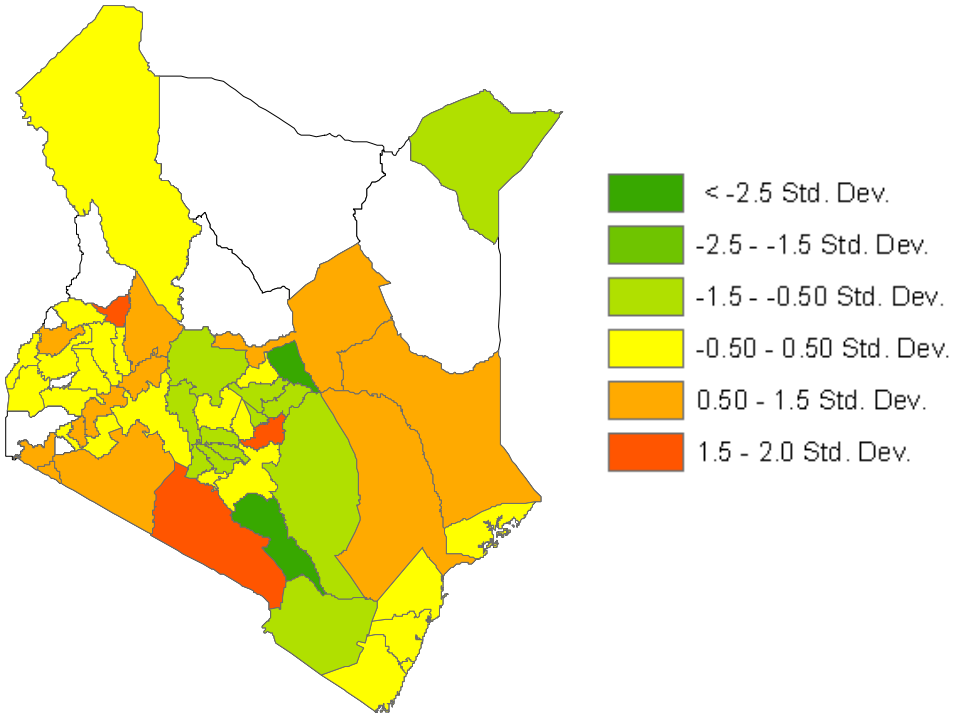


Figure 3: District-level prevalence of unmet need for contraceptives in Kenya (%, map A) and residuals from the regression model (map B), Kenya KDHS, 2008-09.

Nairobi Urban Health and Demographic Surveillance System

Table 5a and 5b show the socio-demographic characteristics of women in Nairobi slums that used modern contraceptives, according to the NUHDSS. The prevalence of modern contraceptive use in Korogocho and Viwandani slums of Nairobi was 32.6%. The highest levels of contraceptive use by age was seen among women aged 20-29. Modern contraceptive use was also more prevalent among women who were married, had higher levels of education, lived in wealthier households, and who jointly made family planning decision with their partners. Women in the slums with higher parity had lower contraceptive use prevalence compared to those with lower parity. Contraceptive use was also less prevalent among women who desired to have a child within 2 years. The contextual variables were not significantly different between users and non-users of contraceptives in the slums.

The adjusted odds ratios for contraceptive use among women in the NUHDSS are shown in table 6. Respondents who were never or formerly married had lower likelihood of using modern contraceptive methods compared to those currently married. Women from households in the highest quintile of household expenditure were more likely to use contraceptives than those in lower quintiles. Parity was inversely associated with the likelihood of use of modern contraceptives, and the odds of contraceptive use were greater when the decision to use family planning was jointly made by the woman and her partner. The derived contextual variables were not significantly associated with the use of contraceptives in the slums.

Table 5a: Socio-demographic Characteristics of Respondents by Modern Contraceptive Use in Nairobi Slums (NUHDSS, 2007-09)

	Contraceptive use		Total	
	No (%)	Yes (%)	n	%
All respondents	67.4	32.6	2611	-
Age (years)				
15-19	81.3	18.7	337	12.9
20-29	60.0	40	1516	58.1
30-39	72.1	27.9	501	19.2
40-49	83.7	16.3	257	9.8
Marital status				
Currently married	61.1	38.9	1899	72.8
Formerly married	89.2	10.8	251	9.6
Never married	81.5	18.5	459	17.6
Monthly expenditure per capital				
Lowest	72.7	27.3	783	38
2nd quintile	64.3	35.7	602	29.2
Middle	59.1	40.9	411	19.9
4th quintile	58.8	41.2	187	9.1
Highest	59.0	41.0	78	3.8
Education level				
None/Incomplete primary	74.9	25.1	844	34.8
Completed primary	64.6	35.4	1053	43.4
Secondary+	54.8	45.2	531	21.9
Parity				
1	67.6	32.4	822	31.5
2	62.9	37.1	698	26.7
3-4	66.6	33.4	701	26.8
More than 4	76.2	23.8	390	14.9
Fertility desire				
Later	66.4	33.6	2456	94.1
Within 2 years	81.9	18.1	155	5.9
Person who decided on family planning				
Mainly respondent	62.4	37.6	768	48.5
Mainly partner/husband	66.7	33.3	48	3
Joint decision	44.5	55.5	769	48.5
Study site				
Korogocho	74.0	26.0	1566	60
Viwandani	57.4	42.6	1045	40

Table 5b: Derived Contextual Variables by Respondent Use of Modern Contraceptives in Nairobi Slums (NUHDSS, 2007-09)

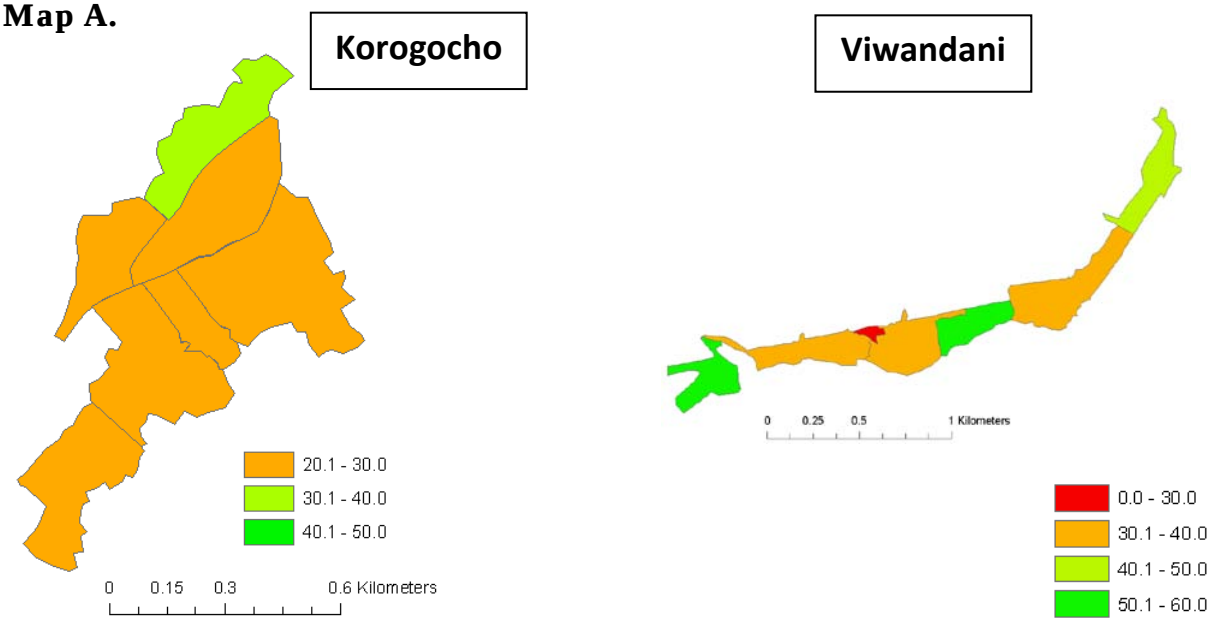
	No			Yes		
	n	Mean	SD	n	Mean	SD
Respondents with post-primary education (%)	1759	0.21	0.10	852	0.25	0.12
Mean parity	1759	2.23	0.16	852	2.17	0.16
Mean monthly household expenditure	1759	1965	258	852	2044	276
Respondents that decide on household spending (%)	1759	0.50	0.16	852	0.46	0.16

Table 6: Adjusted Odds Ratios for Contraceptive Use in Nairobi slums (NUHDSS, 2007-09)

Factor	Category	OR	P value	95% CI	
Individual variables					
Age at interview	15-19				
	20-29	1.74	0.065	0.95	2.98
	30-39	1.02	0.954	0.54	1.91
	40-49	0.85	0.728	0.33	2.17
Marital status	Currently married				
	Formerly married	0.15	0.000	0.09	0.26
	Never married	0.34	0.000	0.23	0.51
Monthly expenditure per capital	Lowest				
	2nd quintile	0.95	0.749	0.70	1.30
	Middle	1.14	0.462	0.80	1.61
	4th quintile	1.01	0.974	0.63	1.61
	Highest	2.06	0.039	1.04	4.09
Education level	None/incomplete primary				
	Completed primary	1.05	0.769	0.77	1.43
	Secondary+	1.22	0.284	0.85	1.74
Parity	1				
	2	0.63	0.019	0.43	0.93
	3-4	0.45	0.000	0.30	0.67
	More then 4	0.46	0.004	0.27	0.77
Fertility desire	Later				
	Within 2 years	0.75	0.401	0.38	1.47
Person who decided on family planning	Mainly respondent				
	Mainly partner/husband	0.62	0.196	0.30	1.28
	Joint decision	1.60	0.000	1.23	2.07
Slum	Korogocho				
	Viwandani	0.72	0.452	0.30	1.71
Community level variables					
Respondents with post-primary education (%)		10.95	0.168	0.37	327.76
Mean parity		0.45	0.443	0.06	3.41
Mean monthly household expenditure		1.00	0.340	1.00	1.00
Respondents deciding on household spending (%)		1.50	0.501	0.46	4.88
Variances and random effects					
Village level (SE)	0.003 (0.02)				

Map A in figure 4 shows the maps of Korogocho and Viwandani with village boundaries. The prevalence of modern contraceptive use among the villages is shown, with six of the seven villages in Korogocho showing contraceptive use levels below 30%. The map of Viwandani shows that four of the seven villages had contraceptive use levels below 40%. Map B in figure 4 illustrates the residuals from the regression model for the villages in the two slums. The variation in residuals among the villages in both slums indicates some degree of spatial variation in the modeled outcome, although all the values were less than 2 standard deviations.

Map A.



Map B.

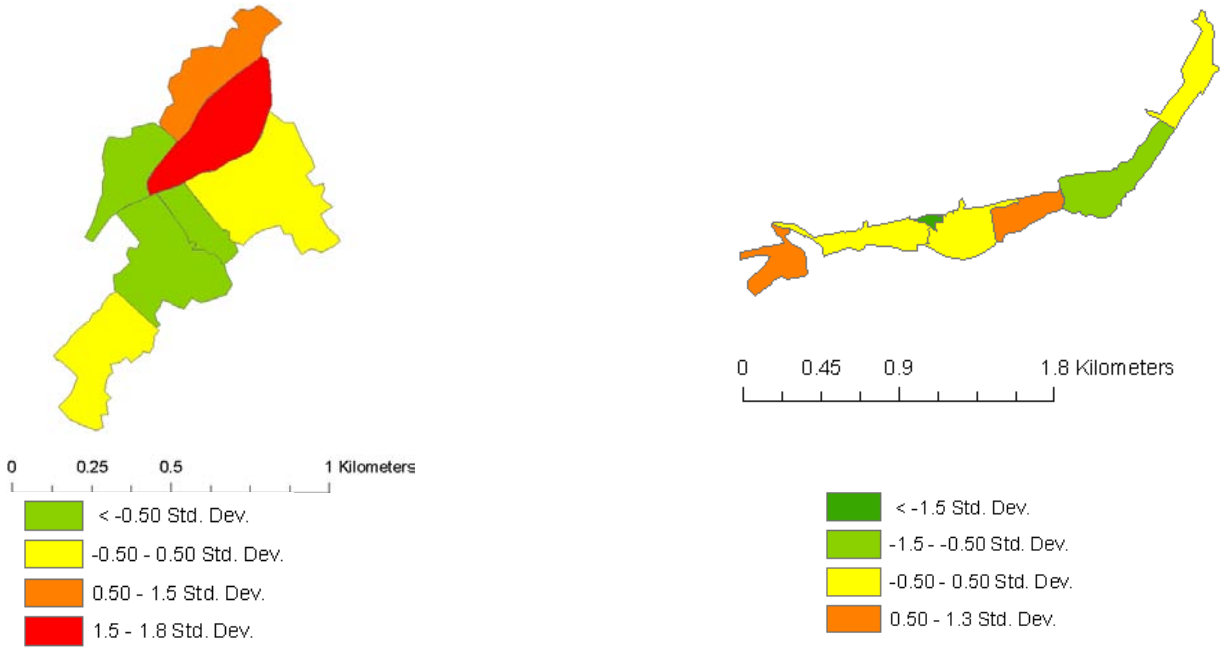


Figure 4: Village-level prevalence of modern contraceptive use in Nairobi slums (%), map A; and residuals from the regression model, map B, NUHDSS, 2007-09.

Table 7a shows the socio-demographic characteristics of women with unmet need for family planning in the slums. The prevalence of unmet need among women aged 15-49 in Korogocho and Viwandani slums was 27.7%. The largest proportion of women with unmet need was in the 30-39 age range, and unmet need reduced as the level of household expenditure increased. Similar unmet need decreased as the level of education of the woman increased. Unmet need was higher among women with higher parity, but lower among women who jointly decided on family planning use with their partner. The differences in the levels of the contextual variables between women with or without unmet need in the slums were not significant.

Table 7a: Socio-demographic Characteristics of Respondents by Unmet Need for Contraceptives in Nairobi Slums (NUHDSS, 2007-09)

	Unmet need		Total	
	No (%)	Yes (%)	n	%
All respondents	72.3	27.7	4181	-
Age (years)				
15-19	76.2	23.8	504	12.1
20-29	74.8	25.2	2543	60.8
30-39	63.0	37.0	746	17.8
40-49	68.8	31.2	388	9.3
Monthly expenditure per capital				
Lowest	69.5	30.5	1156	35.4
2nd quintile	72.1	27.9	997	30.5
Middle	74.7	25.3	669	20.5
4th quintile	78.7	21.3	319	9.8
Highest	80.3	19.7	127	3.9
Education level				
None/Incomplete primary	66.5	33.5	1203	31.0
Completed primary	71.9	28.1	1781	45.9
Secondary+	80.7	19.3	900	23.2
Parity				
1	80.7	19.3	1372	32.8
2	74.8	25.2	1142	27.3
3-4	69.1	30.9	1151	27.5
More than 4	51.6	48.4	516	12.3
Person who decided on family planning				
Mainly respondent	79.0	21.0	1354	45.9
Mainly partner/husband	70.7	29.3	92	3.1
Joint decision	82.5	17.5	1507	51.0
Slum				
Korogocho	65.9	47.8	2250	53.8
Viwandani	34.1	52.2	1931	46.2

Table 7b: Derived Contextual Variables by Respondent Use of Modern Contraceptives in Nairobi Slums (NUHDSS, 2007-09)

	No			Yes		
	n	Mean	SD	n	Mean	SD
Respondents with post-primary education (%)	3022	0.24	0.11	1159	0.21	0.1
Mean parity	3022	2.18	0.16	1159	2.23	0.16
Mean monthly household expenditure	3022	2022	266	1159	1978	259
Respondents deciding on household spending (%)	3022	0.46	0.15	1159	0.5	0.16

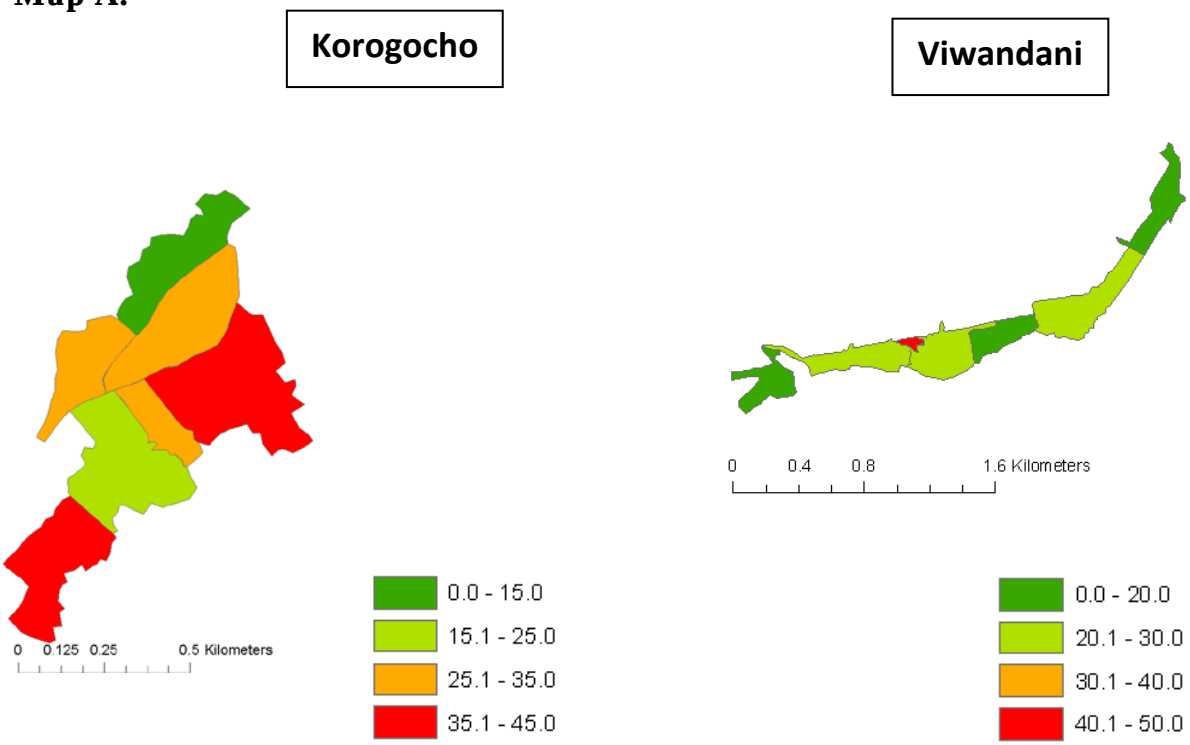
The results for the multivariate regression for unmet need in the slums are shown in table 8. Age of woman, household expenditure and educational level were not significantly associated with unmet need for family planning in the slums. There were significantly higher levels of unmet need among women with higher parity. None of the derived contextual variables included in the model were significantly associated with unmet need for contraceptives in the slums.

Table 8: Adjusted Odds Ratios for Unmet Need for Contraceptives in Nairobi Slums (NUHDSS, 2007-09)

Factor	Category	OR	P value	95% CI	
Individual level variables					
Age (years)	15-19				
	20-29	1.09	0.77	0.60	1.98
	30-39	1.40	0.31	0.73	2.66
	40-49	2.15	0.07	0.94	4.96
Monthly expenditure per capital	1st quintile				
	2nd quintile	1.16	0.28	0.88	1.52
	3rd quintile	1.08	0.65	0.79	1.47
	4th quintile	0.93	0.73	0.60	1.42
	5th quintile	0.64	0.25	0.31	1.36
Education level	None/Incomplete primary				
	Completed primary	1.01	0.92	0.78	1.32
	Secondary+	0.78	0.13	0.56	1.08
Parity	1				
	2	2.63	0.00	1.72	4.02
	3-4	4.17	0.00	2.73	6.37
	More than 4	5.82	0.00	3.49	9.69
Person who decided on family planning	Mainly respondent				
	Mainly partner/husband	2.02	0.07	0.95	3.55
	Joint decision	0.90	0.39	0.71	1.14
Slum	Korogocho				
	Viwandani	1.36	0.44	0.62	2.96
Community variables					
Respondents with post-primary education (%)		0.14	0.21	0.01	3.14
Mean Parity		3.72	0.16	0.60	5.05
Mean household expenditure		1.00	0.06	0.94	1.01
Respondents deciding on household spending (%)		0.79	0.66	0.27	2.32
Variances and random effects					
Village level (SE)	0.001 (0.007)				

Figure 5A shows the prevalence of unmet need in the villages of Korogocho and Viwandani. Five villages in Korogocho and three in Viwandani show levels of unmet need above 25%. Some of the villages are clustered suggesting that unobserved local factors may influence these outcomes. Figure 5B shows the residuals for unmet need from the model for villages in the two slums. High residuals were seen in three villages in Korogocho and two villages in Viwandani.

Map A.



Map B.

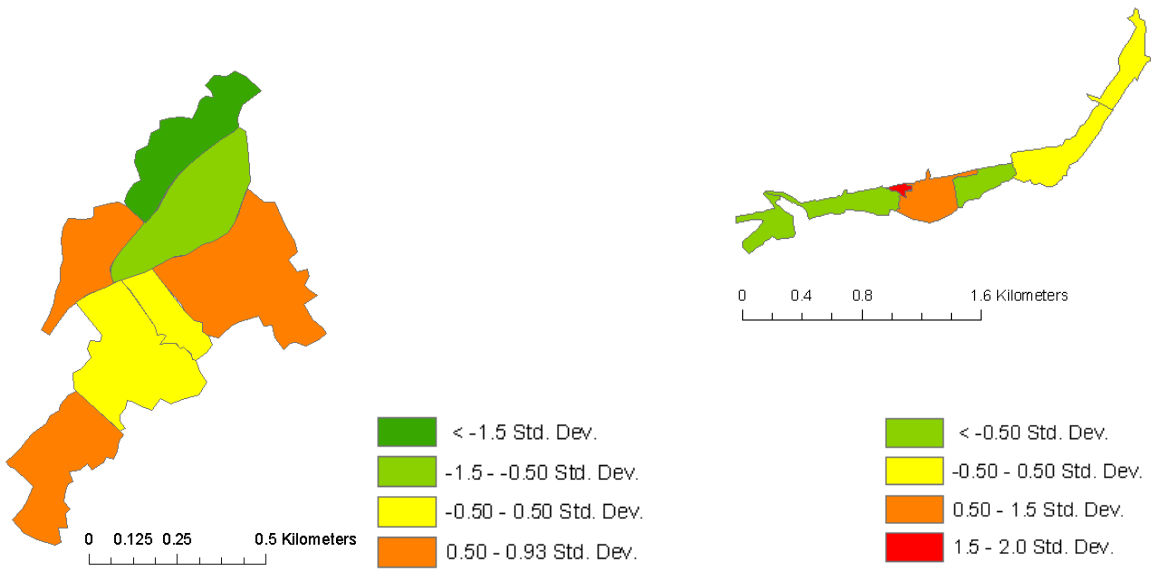


Figure 5: Village-level prevalence of unmet need in Nairobi slums, map A (%) and residuals from the regression model, map B, (NUHDSS, 2007-09).

DISCUSSION

This study examined the prevalence of modern contraceptive use and unmet need, and the associated determinants of these outcomes, among women aged 15-49 across Kenya and in two slums of Nairobi. The results show that although the levels of modern contraceptive use and unmet need in the slums were lower and higher, respectively, than the levels in urban areas of Kenya, the associated determinants and their relationships to these outcomes were not substantially different. The spatial distribution of modern contraceptive use and unmet need across districts in Kenya showed significant variation and clustering. The contextual factors examined in this study were not significantly associated with these outcomes, suggesting that the spatial variation may be due to other unobserved geographically related factors.

The prevalence of the use of modern contraceptives among women aged 15-49 across Kenya was 30.8%. This value excludes women who reported use of the lactational amenorrheal method. The prevalence in urban areas in Kenya was 36.4% and this was slightly higher than the prevalence in two urban slums of Nairobi (32.6%). Analysis of Kenya DHS data shows that higher levels of modern contraceptive use were associated with higher levels of education. However, this relationship was not observed with women in the slums, although the pattern in the descriptive analysis was similar to that in the national study. Other studies in sub-Saharan Africa have reported higher prevalence of contraceptive use among women with higher educational attainment.[15] The influence of household wealth status on contraceptive use was similar in the two data sets, although this was much more pronounced in the national study. The measures of wealth used were different, with the DHS data reflecting wealth quintiles based on asset ownership and the NUHDSS data showing monthly household expenditure adjusted per capita. The disparity between the lowest and highest wealth quintiles in the slum is likely to be much smaller than that observed nationally. Studies show that the gap in contraceptive use between the poor and the non-poor has persisted despite improvements in general socioeconomic status globally and greater provision of family planning services.[16] This disparity in fertility is considered an inequity and demands the implementation of programs to close this gap.

In both the Kenya DHS and NUHDSS data, married women were more likely to use modern contraceptive methods compared to those never married. This is consistent with the results from studies in the African countries of Malawi, Tanzania, and Ghana.[7] A contrary result was obtained in the Lesotho DHS, in which married women were less likely to use family planning methods, and this was associated with the perception of partners regarding the contraception and infidelity among women.[17]

The association of parity with modern contraceptive use was similar across Kenya and in the slums of Nairobi. Although this association was not significant in the 2003 Kenya DHS, other reports suggest that contraception is adopted by high-parity women who wanted to cease childbearing.[18] This relationship has been described in other countries and may be linked to the desire for limiting and/or spacing by women.[19] The likelihood of women with a parity of 2 or less using contraceptives remains less than that of women of higher parity, even if they desire to delay or space their next pregnancy.[20] The desire of the woman to delay her next pregnancy was associated with greater likelihood of contraceptive use across Kenya and in the slums of Nairobi. This relationship is consistent with previous studies using Kenya DHS data.[7, 18]

The spatial distribution of district-level prevalence of contraceptive use highlights the extent of disparity between districts across Kenya. The low levels of contraceptive use in the northern regions, the Rift Valley and coastal areas suggest that unknown district-level factors common to these regions may underlie the spatial patterns observed. This pattern of contraceptive use in Kenya has been previously reported and attributed to the better socioeconomic conditions in the southern regions as a result of greater rainfall and agricultural production.[7] The absence of significant

village-level variance in contraceptive use in the two slums suggests that the small sizes of the slums may not allow for significant heterogeneity in this regard. Also, the variance due to district level factors was more significant than that due to cluster (primary sampling unit) level factors. This suggests that district-level factors influence the spatial patterns of contraceptive use across Kenya more than community-level factors.

The prevalence of unmet need in among women aged 15-49 across Kenya was 19.2% and 15.5% in the urban areas. The prevalence in the Nairobi slums was 27.7% which was much higher than the value in the urban areas across Kenya. This reflects the challenges of providing health and family planning services to residents in these informal settlements. Although educational status and household wealth were significantly associated with unmet need in the national survey, studies in the slums did not find this relationship to be significant. This may be due to the smaller disparity gap between the top and bottom quintiles for these two variables in the slums. The relationship between parity and unmet need was the same across Kenya and the Nairobi slums, with women of higher parity having greater unmet need for contraception. This relationship has been shown in other studies in Kenya [18] and suggests that family planning policies have not addressed the specific needs of this group of women. The derived contextual variables used in this study were not significantly associated with unmet need nationally and in the slums. However, there are likely to be other community-level factors which influence unmet need which were omitted from this study.

The spatial distribution of unmet need across districts in Kenya shows some degree of clustering. The districts in the northeast, which had low contraceptive use prevalence, also had low levels of unmet need. This indicates a lack of use of and low demand for family planning. This suggests that this part of the country has not been adequately covered with messaging about family planning and may still have traditional views regarding fertility. Unmet need was higher in the western regions and Rift Valley, but still lower in these areas than in the central region. The central region, which includes Nairobi, is the most urbanized and densely populated in the country. Socioeconomic and educational status of women is highest in the region and family planning programmes are most often implemented in these area. This disparity in prevalence of unmet need highlights the priority districts where family planning interventions and programs should be targeted.

The findings of this study are important for use by program managers involved in family planning in Kenya. Strategies to address low contraceptive use and unmet need could focus on districts with greater need for services, and lessons from areas with good practice could be adapted and implemented in other areas. Policy-makers and service providers could target areas with low contraceptive use and high unmet need such as urban slums by addressing socioeconomic and behavioral barriers to family planning, as well as service provision challenges, through appropriate policies and programs. The study also highlights the need for further investigation into the patterns of prevalence of contraceptive use in Kenya which transcend district boundaries, as this may guide the prioritization of regions for family planning interventions and programs.

The absence of data on community-level factors that could be linked to the Kenya DHS limited the potential research questions that could be answered with this study. The role of district level factors in the distribution of contraceptive use and unmet need across Kenya and the linkages to individual contraceptive behavior require further investigation using both quantitative and qualitative methods. The study did not include relate individual contraceptive behavior to the availability of health care facilities and family planning services in the various districts. The prevalence of contraceptive use in districts would likely be influenced by the availability of family planning services in those districts. These data were not available and this limits the conclusions that can be drawn from findings of this study. The study however provides important evidence that adds clarity to the situation at district level regarding contraceptive use and which could provide the basis for more in-depth studies at this sub-national level.

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