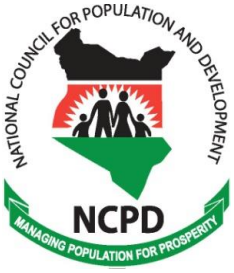

NATIONAL COUNCIL FOR POPULATION AND DEVELOPMENT

"Insights on Population Issues in Kenya to enhance Knowledge Management"

Tetanus Toxoid Vaccination: Evidence from the 2014 Kenya Demographic and Health Survey

Stock Out of Family Planning Commodities: Evidence from the 2015 Kenya Health Facility Assessment

Working Papers

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Quality Population for Sustainable Development

Preface

This study was carried out with support from the Government of Kenya. Main objectives of this study was to enhance an understanding on Population and Health issues as part of the implementation of the data and knowledge management indicator in the Government of Kenya Performance Contracting system. It addresses the following sub-component of the data and knowledge management indicator:

i. Identification of and documentation of data needs and data gaps under NCPD mandate
ii. Capture, organize and processing of data and information in a consistent manner
iii. Establishment of patterns, trends and attributes of the processed data and information.
iv. Drawing of insights from the data and knowledge intelligence in addressing critical problems to inform on policy and resource allocation
v. Preservation and sharing of knowledge and lessons learnt across the NCPD, sector and Government for continual improvement.

The two topics for this study were drawn from the chapter 15 on **"Health Systems and Service Delivery for Sexual Reproductive Health (SRH)"** of the Research Agenda on Population and development in Kenya published in May 2015. In this chapter, a number of issues were identified including:

i. Inadequate access to family planning (FP) and Reproductive Health Services
ii. Frequent contraceptive sock outs, weak procurement and supplies system

The views expressed in this publication are those of the authors and do not necessarily reflect the views of the Government of Kenya.

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FACTORS ASSOCIATED WITH TETANUS TOXOID UPTAKE AMONG WOMEN OF REPRODUCTIVE AGE IN KENYA: EVIDENCE FROM KDHS 2014

Beatrice Okundi
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Abstract

Neonatal Tetanus is still a major cause of morbidity and mortality in the developing countries and was estimated by World Health Organization (WHO) to have killed about 59,000 newborns in 2008 alone. The WHO adopted the goal of eliminating neonatal tetanus worldwide, and a major strategy for its prevention is the administration of at least two doses of tetanus toxoid to women of childbearing age during pregnancy or outside pregnancy. This study sought to establish the factors associated with tetanus toxoid uptake among women of reproductive age in Kenya.

The study used data from 2014 Kenya Demographic and Health Survey. Study participants were 6,506 women of reproductive age (15-49 years) who had at least one birth in the last three years preceding the survey and responded to the question on Tetanus Toxoid injection and assistance during delivery. Tetanus toxoid uptake (outcome variable) was measured based on the responses on the number of tetanus toxoid injections received during the last birth. Chi square tests and multivariate logistic regression models were performed for data analysis.

Out of 6,506 women in this study, slightly above half (52%) received the recommended two doses of tetanus toxoid. Chi square tests showed significant association between tetanus toxoid uptake and woman's age, education level, wealth index, place of residence, assistance during delivery and county of residence. Results from logistic regression analysis revealed that assistance during delivery (P=0.0004, OR=0.829), wealth index (P=0.0005) OR=1.252), Woman's age (P=0.000 OR=0.613), and Education level (P=0.000 OR=2.043) were significantly associated with uptake of the two recommended doses of tetanus toxoid.

Based on the findings, this study suggests that the government should put more efforts to improve education standards and socio economic status of women and also increase women's access to and use of clean delivery services to ensure elimination of neonatal and maternal tetanus in the country.

1.0. INTRODUCTION

1.1. Background

Tetanus is caused by spores of bacterium *Clostridium tetani* when it infects a wound or the umbilical stump. The spores are present in the soil and in animal intestinal tracts, and as such can contaminate many surfaces and substances. The disease when it occurs in the first 28 days of life of a new born who are particularly vulnerable because of their low immunity and umbilical cord wound is called neonatal tetanus (NT). When the disease occurs during pregnancy or within 6 weeks of the end of pregnancy, it is called maternal tetanus (MT). Studies from Kenya have shown that NT has high case fatality and that those who survive often have evidence of brain damage (Mwaniki et al, 2010; Barlow et al, 2001).

Maternal and neonatal tetanus represents a very high proportion of the total tetanus disease burden mainly due to inadequate immunization services, limited or unsafe delivery services and improper post-partum cord care. The majority of mothers and newborns dying of tetanus live in Africa and Southern and East Asia, generally in areas where women are poor, have little access to health care, and have little information about safe delivery practices (KNBS, 2014, UNICEF, 2017).

The World Health Organization (WHO) estimated neonatal tetanus killed about 59,000 newborns in 2008 alone. In 2000, Kenya was among the 59 countries having 11–50% of its districts at high risk of NT deaths (UNICEF, 2000). Ten years later, NT was still a public health problem in 34 countries, including Kenya. Consequently, it was among the 10 countries selected by WHO to implement a policy of three doses of tetanus toxoid in high risk areas in the year 2012. By May 2013, Kenya was still among the 28 remaining countries yet to meet the elimination target (WHO, 2013).

Tetanus can be prevented through immunization with tetanus-toxoid-containing vaccines (TTCV). Neonatal tetanus can be prevented by immunizing women of reproductive age with TTCV, either during pregnancy or outside of pregnancy. This protects the mother and - through a transfer of tetanus antibodies to the fetus - also her baby (WHO, 1989). Additionally, clean practices when a mother is delivering a child are also important to prevent neonatal and maternal tetanus.

In order to achieve maternal and neonatal tetanus (MNT) elimination, the WHO, UNICEF and UNFPA (2005) recommended 3 key strategies which included; provision of at least 2 doses of tetanus Toxoid (TT2) to all pregnant women in high risk areas and 3 doses (TT3) to all women of childbearing age, promotion of clean delivery services to all pregnant women and ensuring effective surveillance for MNT. The World Health Organization estimates that immunization of women of childbearing age with at least two doses of tetanus toxoid reduces mortality from neonatal tetanus by 94%. Where a

country is deemed to have eliminated maternal and neonatal tetanus, the two doses TT vaccinations coverage has to be over 80% (WHO, 2006)

In Kenya, the Ministry of Health (MOH) recommends that for full protection, women should receive at least two doses of TT vaccine during each pregnancy. However, if a woman has been vaccinated during a previous pregnancy or during maternal and neonatal tetanus vaccination campaigns, she may require only one dose for her current pregnancy. Five doses are considered to provide lifetime protection (MOH 2012). In the last national survey conducted in Kenya, women receiving two dosages of TT vaccinations and above were averaged to be 51.1% whilst those deemed to have been protected from NT averaged 75.6% nationally (KNBS, 2014); still below the 80% coverage recommended by WHO to consider the country as having eliminated MNT.

Following a study by WHO and UNICEF, Kenya in January 2018 was recommended for the removal from the list of 15 countries globally that were yet to achieve the maternal and neonatal tetanus elimination (MNTE). The recommendation follows a two week survey carried out in September 2017 in Narok; a county considered to have the highest risk of neonatal tetanus. The survey also found that the proportion of women of reproductive age receiving at least two doses of TT was found to be 83% while deliveries by skilled birth attendants were found to be 58% (WHO & UNICEF, 2018).

Despite these findings and as evidenced by the Kenya Demographic and Health Survey 2014, NMT continues to be a killer amongst newborns and mothers in Kenya given that skilled care deliveries in the 47 counties are not at par and further that access to the second TT vaccination is still limited in almost half of the counties in the country.

The Sustainable Development Goals number 3 aimed to be achieved by the year 2030 indicates the need to ensure healthy lives and promotion of wellbeing for all among all ages. Specifically, the goal targets that by the year 2030, there should be a reduction in the global maternal mortality ratio to less than 70 per 100 000 live births. It further targets an end to preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1000 live births and under-5 mortality to at least as low as 25 per 1000 live births. The estimates for Kenya in these three indicators are still not within the goal targets with MMR estimated at 362 deaths per 100,000 live births, neonatal mortality at 22 per 1000 live births and child mortality at 52 per 1000 live births with neonatal mortality exhibiting the slowest decline in the last 5 years preceding the Kenya Demographic and Health Survey (2014).

1.2. Study objectives and Hypothesis

The main objective of this study is to examine factors associated with Tetanus Toxoid uptake among women of reproductive age in Kenya. In order to achieve this, the study sought to address the following specific objectives;

1. To measure the uptake of the recommended Tetanus Toxoid vaccination by county
2. To determine the influence of religion, educational level, and wealth index on uptake of the recommended two doses of Tetanus Toxoid vaccinations before birth
3. To find out the effect of place of residence, assistance during delivery and woman's age on uptake of the recommended two doses of the Tetanus Toxoid vaccine.

Given the above objectives and available data, the following null hypotheses will be tested:

i. Religion, education level, and wealth index does not have significant influence on uptake of the recommended two doses of tetanus toxoid vaccination among women of reproductive age.
ii. Place of residence, assistance during delivery and woman's age does not have effect on uptake of the recommended two doses of tetanus toxoid vaccination among women of reproductive age.

1.3. Overview of factors influencing the uptake of tetanus toxoid vaccination

Globally, several studies have been conducted to investigate coverage for TT immunization among women of child bearing age (Dietz et al, 1996; Liu et al, 2014; Blencowe, 2010; Vandlear et al, 2002). Most of the studies conducted in developing countries on TT immunization coverage have shown factors like knowledge, education and place of residence, occupation, religion and ethnicity to be significantly associated with low TT immunization coverage (Bagichi, 2013; Scott et al, 2012; Poudel et al, 2008; Naik et al, 2013; Mosuir, 2009; Kachimba,2011).

Other studies in Nigeria, Turkey, Ethiopia, Bangladesh and Kenya have identified physician attitude, staffing levels, provider knowledge, lack of knowledge on TT

vaccinations, cultural beliefs and poverty status to be contributors to poor uptake of the two doses of TT vaccinations (Ayobanjo & Posi, 2017; Ibinda et al, 2015; Maina, 2009; Yarani et al, 2000; Maral et al 2001, Kidani, 2009; Mohammed et al, 2010, Rahman, 2009; UNICEF, 2004).

Kachimba (2011), in his study of the reasons for the low uptake of TT vaccination in Luanysha district of Zambia attributes it to service related factors, social cultural beliefs and economic factors. The service related factors included availability of the vaccines, staffing levels, poor record keeping, staff attitude and sometimes lack of transport for the health workers during planned outreach activities.

Social cultural beliefs to include misconceptions and fear of side effects also contribute to poor uptake of the TT vaccine. USAID (2003) and UNICEF (2004) reports that the association of the TT vaccination with a family planning method that causes sterility in women have always led to the poor uptake by women in childbearing ages. Mohammed et al, 2010 in their study in Peshawar, Pakistan further attributes the low uptake to lack of awareness, distance to the health facility and misconceptions/fear of side effects.

Economic factors relating to distance to health facilities and reduced funding to the health facilities which affects outreach activities that include awareness creation and staffing levels have also had an impact on the utilization of TT vaccinations (Maina, 2003; Ayobanjo & Posi, 2017).

2.0. METHODOLOGY

2.1. Study Population

The study targeted women of reproductive age 15-49 years who had at least one birth in the last three years preceding the survey. It comprised a total of 6,506 of 31,079 women who were interviewed during 2014 Kenya Demographic and Health Survey (KDHS).

2.2. Sources of Data

The study utilized data from 2014 Kenya Demographic and Health Survey (KDHS) focusing on women aged 15–49 years. The survey was designed to provide Population and Health indicator estimate at national, regional level and county level. The Kenya DHS applied probability sampling to provide nationally representative of women aged 15-49 years. The survey was conducted by the National Bureau of Statistics of Kenya

and Inner-City Fund (ICF). A total of 31,079 women were interviewed out of 32,172 eligible women selected for both full and short questionnaires, giving a response rate of 97 percent. Data was weighted in order to adjust for differences in probability of selection and to adjust for non-responses.

This analysis is restricted to the 6,506 (weighted) women who reported that they have given birth to at least one child three years preceding the survey, as they were likely to receive tetanus injection during pregnancy and to recall the incident. The study excluded women who had not given birth in the three years prior to the survey and also those who did not respond to the question on tetanus toxoid vaccination as well as assistance during delivery.

2.3. Sampling Design

This study adopts the National Sample Survey and Evaluation Programme (NASSEP V) frame used in the 2014 KDHS. A stratified probability proportion to size sampling was used to draw the clusters based on 96,251 enumeration areas (EAs) created from 2009 Population and Housing Census.

The stratification was done by dividing each of the 47 counties into urban or rural strata, with exclusion of Nairobi and Mombasa Counties that have only urban areas, hence resulting to a total of 92 sampling strata.

In order to make the sample representative at national level (for both urban and rural), a total of 40,300 households were selected using simple random sampling from 1,612 clusters spread across the country, comprising 995 clusters in rural areas and 617 in urban areas. Samples were selected independently in each sampling stratum, using a two-stage sample design. In the first stage, the 1,612 EAs were selected with equal probability from the NASSEP V frame. The households from listing operations served as the sampling frame for the second stage of selection, in which 25 households were selected from each cluster.

The 2014 KDHS selected a total of 39,679 households, among which, 36,812 households were eligible for participation in the survey, nonetheless 36,430 households were actually interviewed, representing 99 percent response rate. 31,079 women, age 15-49 years were interviewed, however only 6,506 had at least one birth in the last three years preceding the survey and also responded to the question on tetanus toxoid injection. Thus this sample size (6,506) was used for this study.

2.4. Data Collection tools

The 2014 KDHS used three questionnaires, however the study utilised woman's questionnaire to analyse factors that are associated with Tetanus Toxoid Vaccination status. Woman's questionnaire collected information on; contextual characteristics like educational achievement, current age of respondents , media exposure, number of children, use of family planning and knowledge of contraceptive , fertility preference, Antenatal and delivery care, Vaccination and Childhood illness, childhood mortality, marriage and sexuality, awareness and attitudes towards HIV, domestic violence and sexually transmitted diseases.

2.5. Description of Variables

The dependent variable for this study is Tetanus Toxoid uptake and was measured in terms of number of tetanus toxoid injections received before birth. During the survey, women were asked on the number of tetanus toxoid injections received before their last birth. Based on the responses, those who received at most one injection was coded No=0 and was considered as low uptake while those who received at least two injections was coded Yes=1 and were considered as high uptake.

The independent variables used in this study were categorized as hypothesized to influence uptake of tetanus toxoid vaccination. The variables included; Age which was categorized into five year age group (15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49), religion was categorized as (Catholic, Protestant, Muslim, and No religion) whereas level of education was categorized as (No education, Primary, Secondary, and Higher). Wealth index was recoded and categorized as (Poor, Middle and Rich) and place of residence was either urban or rural; assistance during delivery for respondents was recoded and categorized as (skilled assistance and unskilled assistance). Respondents were also categorized based on their County of residence.

2.6. Data Analysis

Statistical Package for Social Scientists (SPSS) version 22 was used to analyse the data. The first step in the data analysis was descriptive statistics. Percentages of study population across independent variables was done using frequency tables. Cross tabulation was performed to identify the independent variables of significant association with tetanus toxoid uptake. Significance of association was estimated by chi-square test. Only the variables, which showed statistical significance ($P<0.05$) in chi-square test were retained in logistic regression analysis.

Finally, binary logistic regression analysis was conducted to sort out the variables which significantly impacted the uptake of tetanus toxoid among women of reproductive age. Binary logistic regression method was used since the dependent variable is dichotomous as the response was either No or Yes. Results of the regression analysis were reported in terms of P-value, odds ratios, and 95% confidence intervals

(upper &lower). P-value less than 0.05 (two tailed) was considered statistically significant in all cases.

2.7. Study limitation

The study makes use of cross sectional survey data that relies on point of time information provided by the respondents, leaving little room for follow up and confirmation of information received.

The data looks at women who have had at least one birth in the three years preceding the survey and narrows to the two recommended doses of TT vaccinations presupposing that they had not had a prior vaccination to the reference period. The data further may be limited by the recall biases that may be exhibited by the respondents as it looks at the last three years and their experience of a TT vaccination.

3.0. RESULTS

Descriptive analysis results as described in Table 3.1 reveal the distribution of women of childbearing age who had at least a birth in the last three years preceding the survey. In terms of the women's age, the highest proportion of women were in the age group 25 to 29 (30.2%) with those in the age group 40-49 forming the least proportion due to the fact that they are almost approaching menopause hence less likely to have given birth in the last three years preceding the survey . About six out of ten (60.3%) of the women resided in rural areas, with majority (70.4%) coming from the protestant religion.

Table 3.1 further indicates that slightly above half (54.1%) of the women had primary level of education with the highest proportion being rich (43.3%) in terms of socio-economic status and about four out of ten (38.4%) are from poor socio-economic status. From the sampled population, almost seven out of every ten (69.7%) women reported delivering using skilled care.

Table 3.1: Percentage distribution of sampled population by various background characteristics

Characteristic	*Percent (%)*	*Number (N=6,506)*
Respondents Age		
15-19	5.7	374
20-24	24.2	1575
25-29	30.2	1963
30-34	20.3	1323
35-39	12.8	835

Characteristic	*Percent (%)*	*Number (N=6,506)*
40-44	5.1	330
45-49	1.6	106
Place of Residence		
Urban	39.7	2584
Rural	60.3	3922
Religion		
Roman Catholic	19.7	1280
Protestant	70.4	4582
Muslim	7.1	465
No Religion	2.8	179
Level of Education		
No Education	9.4	610
Primary	54.1	3521
Secondary	27.3	1775
Higher	9.2	600
Wealth Index		
Poor	38.4	2497
Middle	18.3	1189
Rich	43.3	2820
Assistance During Delivery		
Skilled Assistance	69.7	4537
Unskilled Assistance	30.3	1969

Source: Primary analysis of the 2014 KDHS data

Summary of the findings on the status of Tetanus Toxoid uptake by County is presented in Table 3.2. Overall, in 2014, more than half (52%) of Kenyan women received the two recommended TT dose during their last pregnancy three years preceding the survey. However as shown in Table 3.2, there are differentials among counties with some counties performing much better than the National average while others are below the National average. About half (22) of the counties are above the National average with Embu County recording the highest proportion of women (72.5%) who received the recommended two doses of TT vaccine while West Pokot (20.4%) and Isiolo (22.2%) counties registering the lowest proportion.

Table 3.2: Status of Tetanus Toxoid uptake by County

County	*Tetanus Toxoid Vaccination Uptake (at least two TT injections)*				*Total (N=6506)*
	Yes		*No*		
	Number	*Percent*	*Number*	*Percent*	
Nairobi	465	61.6%	290	38.4%	755
Nyandarua	44	51.8%	41	48.2%	85
Nyeri	66	70.2%	28	29.8%	94

County	*Tetanus Toxoid Vaccination Uptake (at least two TT injections)*				*Total (N=6506)*
	Yes		*No*		
	Number	*Percent*	*Number*	*Percent*	
Kirinyaga	53	64.6%	29	35.4%	82
Muranga	59	54.6%	49	45.4%	108
Kiambu	183	56.7%	141	43.5%	324
Mombasa	149	69.3%	65	30.4%	214
Kwale	83	64.8%	45	35.2%	128
Kilifi	150	69.8%	65	30.2%	215
Tana River	26	54.2%	22	45.8%	48
Lamu	8	44.4%	10	55.6%	18
Taita Taveta	25	64.1%	14	35.9%	39
Marsabit	10	33.3%	20	66.7%	30
Isiolo	6	22.2%	21	77.8%	27
Meru	109	53.7%	94	46.3%	203
Tharaka Nithi	32	56.1%	25	43.9%	57
Embu	58	72.5%	22	27.5%	80
Kitui	83	60.1%	55	39.9%	138
Machakos	93	50.0%	93	50.0%	186
Makueni	74	60.2%	49	39.8%	123
Garissa	20	30.3%	46	69.7%	66
Wajir	22	36.7%	38	63.3%	59
Mandera	16	32.7%	33	67.3%	49
Siaya	43	38.7%	68	61.3%	111
Kisumu	83	48.0%	90	52.0%	173
Migori	84	52.5%	76	47.5%	161
Homabay	85	42.9%	113	57.1%	198
Kisii	72	41.4%	102	58.6%	174
Nyamira	36	50.7%	35	49.3%	71
Turkana	22	26.2%	62	73.8%	84
West Pokot	19	20.4%	74	79.6%	93
Samburu	17	50.0%	17	50%	34
Trans Nzoia	78	54.2%	66	45.8%	144
Baringo	43	58.1%	31	41.9%	74
Uasin Gishu	98	55.4%	79	44.6%	178
Elgeyo Marakwet	16	29.6%	38	70.4%	54
Nandi	48	35.0%	89	65.0%	137
Laikipia	49	70.0%	21	30.0%	70
Nakuru	164	54.5%	137	45.5%	300
Narok	75	41.7%	105	58.3%	181
Kajiado	89	58.2%	64	41.8%	153
Kericho	61	45.9%	72	54.1%	132
Bomet	42	27.3%	112	72.7%	154
Kakamega	95	39.9%	143	60.1%	238
Vihiga	35	47.3%	39	52.7%	74
Bungoma	127	47.4%	141	52.6%	268
Busia	67	54.9%	55	45.1%	122
TOTAL	**3382**	**52.0%**	**3124**	**48.0%**	**6506**
χ^2 ***=362.269***	***P Value =0.000***		***df=46***		

Source: Primary analysis of the 2014 KDHS data

Table 3.3 highlights the relationship between independent variables and its association with receiving the two recommended dosages of TT vaccination. The bivariate analysis in Table 3.3 indicates that a strong association exists between women's age (P value = 0.000), place of residence (P value = 0.000), educational level (P value = 0.000), wealth index (P value = 0.000) and assistance during delivery (P value = 0.000). On the contrary, the results showed that there is no significant association between religion and women's uptake of the recommended two dosages of TT vaccination (P value = 0.267).

Table 3.3: Relationship between Independent variables and the uptake of Tetanus Toxoid Vaccination

Variable	*Tetanus Toxoid Vaccination Uptake (at least two TT injections)*				*Total (N=6506)*
	Yes		*No*		
	Number	*Percent*	*Number*	*Percent*	
Respondents Age					
15-19	225	60.2%	149	39.8%	374
20-24	909	57.7%	666	42.3%	1575
25-29	1036	52.8%	927	47.2%	1963
30-34	639	48.3%	684	51.7%	1323
35-39	367	44.0%	468	56.0%	835
40-44	155	46.8%	175	53.0%	330
45-49	51	48.1%	55	51.9%	106
χ^2 *= 75.265 P Value =0.000 df=6*					
Type of Residence					
Urban	1491	57.7%	1092	42.3%	2583
Rural	1891	48.2%	2032	51.8%	3923
χ^2 *=56.560 P Value =0.000 df=1*					
Highest Education Level					
No Education	254	41.6%	356	58.4%	610
Primary	1717	48.8%	1804	51.2%	3521
Secondary	998	56.2%	777	43.8%	1775
Higher	413	68.8%	187	31.2%	600
χ^2 *=120.738 P Value =0.000 df=3*					
Religion					
Roman Catholic	664	51.9%	616	48.1%	1280
Protestant	2408	52.6%	2174	47.4%	4582
Muslim	228	49.0%	237	51.0%	465
No Religion	82	45.8%	97	54.2%	179
χ^2 *= 4.958 P Value= 0.175 df=3*					
Wealth index					
Poor	1116	44.7%	1381	55.3%	2497
Middle	605	50.8%	623	49.1%	1190
Rich	1661	58.9%	1158	41.1%	2819

Variable	*Tetanus Toxoid Vaccination Uptake (at least two TT injections)*				*Total (N=6506)*
	Yes		*No*		
	Number	*Percent*	*Number*	*Percent*	
Respondents Age					
χ^2 *= 108.150 P Value= 0.000 df=2*					
Assistance During Delivery					
Skilled Assistance	2528	55.7%	2009	44.3%	4537
Unskilled Assistance	853	43.3%	1116	56.7%	1969
χ^2 *=84.696 P Value= 0.000 df=1*					
Total	**3382**	**52.0%**	**3124**	**48.0%**	**6506**

Source: Primary analysis of the 2014 KDHS data

Table 3.4 presents findings of logistic regression analysis. It is noteworthy to state that this study used all variables that were statistically significant at bivariate level to examine the factors associated with Tetanus Toxoid Uptake. Therefore religion was not included at multivariate analysis level since it was found to be insignificant with tetanus toxoid uptake among women of reproductive age

Women's age was found to be very significant in the TT vaccination uptake with an exception of age group 20-24 years found to be insignificant. The poor and the rich categories in the wealth index were also found to have a significant association with uptake of the two dosages of TT. In terms of education, the women with no education and those with higher education were also found to have a significant relationship with the uptake of the TT vaccination whereas only urban residence was found to be significant at the multivariate level. Assistance during delivery continues to be significant even at the multivariate analysis level with the odds of receiving the recommended two dosages of TT vaccination being lower for those who delivered without skilled care (P value = 0.004 OR = 0.829) as indicated in Table 3.4.

When county of residence was taken into consideration, fifteen counties were found to have significant relationships with whether the women receive the recommended two dosages of TT vaccination. These counties include Nairobi (P value = 0.000), Mombasa (P value = 0.001), Kilifi (P value = 0.000), Isiolo (P value = 0.004), Garissa (P value = 0.004), Siaya (P value = 0.001), Homa Bay (P value = 0.001), Kisii (P value = 0.001), Turkana (P value = 0.000), West Pokot (P value = 0.000), Elgeyo Marakwet (P value = 0.001), Nandi (P value = 0.000), Narok (0.003), Bomet (P value = 0.000) and Kakamega (P value = 0.000).

However the odds of women in the reproductive age receiving two dosages of the tetanus toxoid vaccination were higher in only fourteen counties when compared to Nairobi County which was the reference county with Kilifi (OR=2.021)and Embu (OR=1.96) counties registering higher odds. The odds were also higher for those in the rich quintile when compared to the poor quintile and; higher for women with higher

level of education when compared to those with no education. In terms of ages, the level of uptake decreased with age, that is the odds of receiving the two dosages of TT vaccination decreased when compared to the women in the age group 15 to 19 years, which was the reference category.

Table 3.4: Results of logistic regression of tetanus toxoid vaccination uptake

Variables	*Sig.*	*SE*	*Exp(B)/Odds*	*95% CI for Exp(B)*	
				Lower	*Upper*
Assistance During Delivery					
Skilled Assistance ***(Ref)***	0.000	-	**1.00**	-	-
Unskilled Assistance	0.004	0.065	0.829	0.731	0.942
Wealth Index					
Poor ***(Ref)***	0.014	-	**1.000**		
Middle	0.037	0.078	1.177	1.010	1.373
Rich	0.005	0.081	1.252	1.069	1.468
Respondents Age					
*15-19****(Ref)***	0.000	-	**1.000**	-	-
20-24	0.155	0.121	0.841	0.663	1.068
25-29	0.000	0.120	0.613	0.484	0.775
30-34	0.000	0.125	0.522	0.409	0.666
35-39	0.000	0.132	0.467	0.360	0.605
40-44	0.000	0.160	0.505	0.369	0.691
45-49	0.027	0.231	0.600	0.382	0.943
Education Level					
No education ***(Ref)***	0.000	-	**1.000**		
Primary	0.558	0.123	0.931	0.731	1.184
Secondary	0.492	0.134	1.097	0.843	1.427
Higher	0.000	0.157	2.043	1.501	2.780
Place of Residence					
Urban ***(Ref)***	0.000	-	**1.000**	-	-
Rural	0.546	0.074	1.046	.904	1.210
County of Residence					
Nairobi ***(Ref)***	0.000	-	**1.000**	-	-
Nyandarua	0.419	0.241	0.823	.514	1.320
Nyeri	0.044	0.243	1.632	1.014	2.627
Kirinyaga	0.157	0.254	1.432	0.870	2.357
Muranga	0.668	0.216	0.911	0.597	1.393
Kiambu	0.131	0.139	0.811	0.618	1.064
Mombasa	0.003	0.169	1.660	1.192	2.310
Kwale	0.028	0.213	1.600	1.053	2.431
Kilifi	0.000	0.181	2.021	1.417	2.880
Tana River	0.752	0.315	1.105	0.596	2.046

Variables	Sig.	SE	Exp(B)/Odds	95% CI for Exp(B)	
				Lower	Upper
Lamu	0.473	0.501	0.698	0.262	1.864
Taita Taveta	0.214	0.348	1.541	0.779	3.051
Marsabit	0.045	0.413	0.436	0.194	0.981
Isiolo	0.003	0.479	0.246	0.096	0.630
Meru	0.315	0.174	0.840	0.597	1.181
Tharaka Nithi	0.799	0.290	1.077	0.610	1.900
Embu	0.013	0.273	1.967	1.153	3.356
Kitui	0.172	0.203	1.320	0.886	1.967
Machakos	0.119	0.171	0.767	0.549	1.071
Makueni	0.250	0.212	1.276	0.842	1.933
Garissa	0.002	0.301	0.396	0.220	0.715
Wajir	0.061	0.305	0.565	0.311	1.027
Mandera	0.038	0.337	0.498	0.257	0.964
Siaya	0.001	0.221	0.471	0.306	0.726
Kisumu	0.012	0.176	0.642	0.455	0.906
Migori	0.819	0.188	0.958	0.663	1.384
Homabay	0.003	0.177	0.589	0.416	0.833
Kisii	0.001	0.182	0.531	0.371	0.759
Nyamira	0.233	0.259	0.734	0.442	1.220
Turkana	0.000	0.279	0.325	0.188	0.562
West Pokot	0.000	0.284	0.237	0.136	0.413
Samburu	0.569	0.370	0.810	0.392	1.673
Trans Nzoia	0.639	0.195	0.912	0.622	1.338
Baringo	0.715	0.257	1.098	0.664	1.817
Uasin Gishu	0.245	0.176	0.815	0.578	1.151
Elgeyo Marakwet	0.000	0.321	0.317	0.169	0.596
Nandi	0.000	0.206	0.417	0.278	0.625
Laikipia	0.033	0.281	1.823	1.051	3.162
Nakuru	0.199	0.144	0.831	0.626	1.103
Narok	0.003	0.184	0.578	0.403	0.829
Kajiado	0.993	0.188	1.002	0.693	1.448
Kericho	0.034	0.200	0.654	0.442	.968
Bomet	0.000	0.209	0.288	0.191	0.434
Kakamega	0.000	0.167	0.516	0.372	0.716
Vihiga	0.269	0.254	0.755	0.459	1.242
Bungoma	0.018	0.159	0.687	0.503	.938
Busia	0.841	0.209	0.959	0.636	1.446

Source: Primary analysis of the 2014 KDHS data

4.0 DISCUSSION, CONCLUSION AND RECOMMENDATIONS

This study examined the factors associated with Tetanus Toxoid uptake among women of reproductive age (15-49 years) who participated in 2014 Kenya DHS. The findings from bivariate and multivariate analysis to an extent conformed to general literature on factors associated with tetanus Toxoid uptake among women of reproductive age. At bivariate analysis, women's background characteristics were found to be strongly associated with tetanus toxoid uptake. These included age, Education level, wealth index, place of residence, and assistance during delivery. However, religion was found to be insignificant with tetanus toxoid uptake. Results at bivariate level indicated that uptake of tetanus toxoid was almost similar among women of different religious groups with slightly above half of the women from Catholic (51.9%), and Protestant (52.6%) faith having taken the recommended two doses of TT vaccine. 49 percent of the Muslim faithful received the two doses and those with no religious affiliation, 45.8 percent received the two TT vaccine dose.

Multivariate analysis identified Wealth index, woman's age, higher education level, county of residence and assistance during delivery as the most important factors associated with tetanus toxoid uptake among women of reproductive age in Kenya. These findings are consistent with similar studies conducted in Ethiopia by Anatea etal (2018), Bangladesh by Mosiur Rahman (2008), and Peshawar India by Mohammad Naeem etal (2010).

The study concludes that the level of uptake of the recommended two doses among women of reproductive age is still low despite interventions by the government and other non-governmental organizations. Noting the key factors that have been associated with the uptake of the recommended two dosages of the TT vaccine, education, skilled delivery and socio-economic status of the woman plays a role and therefore should still be emphasized as the country aims at reducing unavoidable deaths by tetanus to the mother and the neonate.

The data shows that in some counties, a woman is more likely to have the two dosages of TT vaccine than others with Kilifi and Embu standing out. It is noted further that being resident in some counties, one has a lower chance of having achieved the recommended two dosage TT vaccine and in this aspect, counties like Isiolo, West Pokot amongst others stand out. Special programmes should be targeted to these counties as they also exhibit high maternal and neonatal mortality. It would be premature to rule out tetanus as having contributed to the maternal and neonatal mortalities given that the percentage of women delivering with skilled care in these counties tend to be lower than the national average.

Therefore, more efforts should be made on routine vaccinations of pregnant women through fixed sites, outreaches or other methods and also increase women's access to and use of clean delivery services with a specific focus on counties already highlighted as exhibiting challenges in meeting the required two TT dosages of vaccination. It is only at this point that Kenya can comfortable say that maternal and neonatal tetanus mortality has been eliminated in Kenya.

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Determinants of Stock Outs of Family Planning Commodities in Kenya's Health Facilities

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1 Abstract

Stock out of family planning commodities in health facilities has been cited as a critical factor that contributes to increased unmet need for family planning and unplanned pregnancies. Some studies have suggested that factors related to supply chain are responsible for stock outs. This study sought to establish the supply chain factors that determine the stock out of family planning commodities. Data from the 2015 Kenya Health Facility Assessment (KHFA) survey was used. Results from the study show that the only supply related factor that determines stock outs is frequency of resupply of commodities. Specifically, facilities that receive their resupplies every 3 months have lower odds of 0.198 ($p<0.5$, [CI 0.041 – 0.955]) of experiencing a stock out compared with those that receive their resupplies every 2 weeks. This suggests the need for facilities to organize for resupply of their commodities every 3 months (quarterly).

2. Introduction

Universal Health Coverage (UHC) is one of the Sustainable Development Goals (SDGs) and Kenya has committed to the achievement of this goal by 2030. UHC is defined as providing access to needed health services without incurring financial hardships for the whole population (WHO, 2015). The country is expected to address health needs of the people as stipulated in health goal (Goal 3) –"ensuring healthy lives and promoting well-being for all at all ages". Family planning is central to this agenda. A key indicator on progress towards addressing health needs of the people is the "proportion of women of reproductive age (15–49 years) who have their need for family planning satisfied with modern methods."

Unmet need for family planning in Kenya is still an issue of concern. This describes the condition of fecund women of reproductive age who do not want to have a child soon or ever but are not using contraception (Westoff, 1988). The 2014 Demographic and Health Survey indicates that 18 percent of married women of reproductive age (aged 15-49) who wanted to delay their next birth or stop childbearing reported not using contraception. Unmet need for family planning can have negative consequences on women's health and well-being. It could result to unintended pregnancies and maternal mortality due to unsafe abortions.

As noted by Bongaarts (2014), making modern contraceptives more widely available ensures more women who do not want to become pregnant practice contraception, thereby reducing unmet need. Contraceptive stock outs at health care facilities on the other hand can impede women's access to preferred methods of family planning resulting to inconsistent use, gaps in use, or use of no method at all. Stock outs occur when one or more contraceptive options are unavailable at a health facility that routinely provides that method, or that—based on policy—should be providing that method (Durham, et al.) 2015.

According to World Health Organization (WHO), addressing contraceptive stock outs is a key priority for global family planning research to help address unmet need for family planning (Durham,et al., 2015). Although stock outs are repeatedly cited as one of the barriers to family planning (Durham et. al 2015), there is limited information on determinants of family planning commodities stock outs. A study on Experience and Impact of contraceptive Stock outs Among Women, Providers and Policymakers in two districts of Uganda confirms this and indicates that only few published studies have focused on contraceptive stock outs. The study further notes that stock outs is presented as one of many factors impeding access and use of modern contraceptives (Grindlay et al.2016).

The authors also reported that stock outs were common and they varied by facility and method type, with providers at private facilities less likely than those at public facilities to report experiencing contraceptive stock outs. Progestin-only pills were reported as having been out of stock for years in most public facilities, while combined oral contraceptives were often supplied in small quantities leading to a chronic stock out. Long acting methods mainly implants and IUDs were frequently not available.

Poor supply chain planning and requisition process were cited as major causes for stock outs. The "Push system" method whereby providers were not involved in kit development also contributed to stock outs especially at lower level public facilities. In private facilities lack of reliable suppliers contributed to stock outs. Other contributing factors included inaccurate demand forecasting at higher-level facilities, limited provider input and feedback, lack of dedicated budget to family planning – facilities relied on supplies from National Medical stores.

A review of literature on contraceptives stock out by Durham et al. (2015) noted that contraceptive stock outs in Uganda were common mainly due to logistics and procurement problems. Baraka et al. (2015) in a qualitative study undertaken in Tanzania on Challenges Addressing Unmet Need for Family Planning found that health care providers' efforts to address unmet need for FP services were constrained by FP commodities stock outs which was occasioned by delay in the Government procurement processes.

In Kenya, implementation of the family planning program is taking place within the context of decentralization initiated in Kenya's 2010 constitution. This has created challenges especially with regard to consistent supply of family planning commodities. The availability and access of family planning commodities and reproductive health medicines in health facilities remains limited and frequent stock-outs of contraceptive commodities within facilities has been identified as a major challenge to FP provision (MOH, 2017). This can be attributed to diminishing donor support and an ineffective supply chain system.

The government of Kenya has committed to increase the country's mCPR from 52 percent (2014) to 58 percent by 2020 and 66 percent by 2030. Strengthening family planning supply chain will be critical to the achievement of this goal.

Study Objectives and Hypothesis

The objective of this study is to examine factors that determine FP stock out at facility level in Kenya based on the 2015 Kenya Health Facility Assessment. Specifically the study seeks to address the following key questions:

1. What is the status of family planning commodities stock outs in health facilities in Kenya?

2. What supply chain factors determine FP commodities stock out in health facilities in Kenya?

In addition to the above, this study sought to make recommendations that will help to alleviate the stock out of FP commodities in Kenya's health facilities.
The null hypothesis for this study is as follows;

Supply chain factors do not determine FP commodities stock outs in Kenya's health facilities.

3. Data and Methods

Data from the 2015 Kenya Health Facility Assessment (KHFA) survey was used to explore the determinants of stock outs of family planning commodities in Kenya's health facilities. KHFA was a national cross-sectional survey that was undertaken to assess the availability of family planning and maternal health services as well as the commodities and medicines required for the provision of these services. A sample of 641 health facilities was drawn from the national Master Facility List (MFL) for the assessment. Two types of questionnaires were used for this assessment, namely; Facility questionnaire and Client exit interview. Given that the 2015 KHFA was not self-weighting, the resulting data was weighted before analysis. Results from this survey were representative at the national and regional levels.
In order to explore the determinants of stock outs of family planning commodities in Kenya's health facilities, data from 530 out of the 641 sampled facilities was used. Forty two facilities were dropped from the analysis because they do not provide modern family planning services and a further 69 facilities that provide family planning services were dropped because information on the stock out status of their family planning commodities was not available.
The dependent variable for this study was 'incidence of stock out of family planning commodities in the last 3 months' which was recoded from variables Q16. Categories for this variable were 'Stock out experienced' and 'Stock out NOT experienced' which were coded '1' and '0' respectively. Thirteen independent variables were used for this study. These were; SDP Level of Care (FACTYPE), SDP Managing Authority (Q007), Residence (URBRUR), Region, Main Source of Regular FP Commodities Supplies (Q005A), Distance to Nearest Warehouse (Q005B), Duration Between Order and Supply (Q50), Frequency of Resupplies (Q51), Person Determining Quantities of FP Commodities for Resupply (Q46), Persons Responsible for Ordering (Q45), Responsibility for Transportation of Supplies (Q49), Use of ICT for Supply Chain

Management (Q40H), and Use of Logistics Form (Q47). The categories for all these variables, with the exception of the Residence variable, were recoded to create new categories for the purpose of analysis.

Analysis of the data was done using both bivariate and multivariate methods. The bivariate analysis entailed a crosstab and Chi-Square test of the dependent variable with each of the independent variables with the aim of establishing which independent variables have a significant association with the dependent variable. On the other hand, the multivariate analysis entailed a binary logistic regression analysis between the dependent and independent variables to establish the association between the two groups of variables while controlling for various supply chain factors.

4. Results

Table 1.1 shows the distribution of health facilities by various characteristics including supply chain factors. Overall, the results show that 86 percent of the facilities in Kenya experienced a stock out of at least one contraceptive method in the three months before the survey. From the Chi-Square test, the independent variables that had a significant association ($p<0.05$) with the dependent variable were; Managing authority, Region, Main source of regular RH/FP supplies, Duration between order and supply, Frequency of resupplies, and Use of logistics form. Facilities that are private for profit (96%), those in Nairobi region (94%), the ones that mainly source their medical supplies from private institutions (91%), and those that order and receive their resupplies within 2 weeks (92%) had the highest incidence of contraceptive stock outs. This also applies to facilities that on average receive resupplies every 2 weeks and those that do not use logistics forms to manage their supplies (94%). The Chi-square test did not yield any significant association between the dependent variables and the following independent variables; Level of health care, Residence, Distance to nearest warehouse, Person responsible for ordering, Person responsible for determining FP commodities quantitates, Responsibility for transportation of commodities, and Use of ICT to manage the Supply Chain.

Table 1.2 shows the results of the binary logistics regression analysis. From the analysis, Region and Frequency of resupplies are the only independent variables that yielded a significant association with the dependent variable. Specifically, the results show that health facilities in Eastern region have an odds of 0.127 ($p<0.05$, [CI 0.023 – 0.694]), those in Nyanza region have an odds of 0.175 ($p<0.05$, [CI 0.031 – 0.974]), while those in Western region have an odds of 0.095 ($p<0.01$ [CI 0.017 – 0.531]) of experiencing a stock out of family planning commodities. This is more than 80 percent lower than health facilities in Nairobi region. At the same time, facilities that receive their resupplies every 3 months had an odds of 0.198 ($p<0.5$, [CI 0.041 – 0.955]) of experiencing a stock out. This is about 80 percent lower compared to health facilities that receive commodities resupply every 2 weeks.

Table 1: Crosstab of Stock Outs Experience in the Last 3 Months by Various Supply Chain Management Fact

		Experienced Stock Out in the Last 3 Months			
Independent Variables	**Categories**	**No**	**Yes**	**Chi-Square Test p-value**	**N (Weighted)**
SDP Level of Care	Level 2	12.6%	87.4%	0.194	421
	Level 3	18.8%	81.3%		80
	Level 4 and above	20.7%	79.3%		29
SDP Managing Authority	Government	19.1%	80.9%	0.000	299
	Private for Profit	8.3%	91.7%		180
	Private NOT for Profit	3.8%	96.2%		52
Residence	Urban	12.1%	87.9%	0.375	182
	Rural	14.9%	85.1%		349
Region	Nairobi	5.9%	94.1%	0.005	51
	Central	10.8%	89.2%		83
	Coast	11.1%	88.9%		54
	Eastern	20.4%	79.6%		98
	North Eastern	25.0%	75.0%		16
	Nyanza	15.2%	84.8%		66
	Rift Valley	8.0%	92.0%		125
	Western	29.7%	70.3%		37
Main Source of Regular FP Commodities Supplies	KEMSA	19.8%	80.2%	0.005	222
	MoH (National/County)	10.1%	89.9%		168
	Private/Others	9.2%	90.8%		130
Distance to Nearest Warehouse	Less than 25 Kms	11.3%	88.7%	0.148	300
	25 - 50 Kms	15.7%	84.3%		51
	Above 50 Kms	17.6%	82.4%		176
Duration Between Order and Supply	Less than 2 weeks	8.4%	91.6%	0.002	237
	2 weeks - less than 2 months	15.0%	85.0%		107
	0 - 4 months	23.5%	76.5%		115
	More than 4 months	14.5%	85.5%		69
Frequency of Resupplies	Once every 2 weeks	6.6%	93.4%	0.000	91
	Once every Month	9.4%	90.6%		138
	Once every 3 months	21.1%	78.9%		227
	Once every 6-12 months	7.8%	92.2%		64
Person Determining Quantities of FP	SDP Staff Member	15.5%	84.5%	0.060	426
	Other Person	8.2%	91.8%		98
Persons Responsible for Ordering	Pharmacist	17.3%	82.7%	0.258	81
	Nurse	14.7%	85.3%		326
	Dcotor/Clinical Officer/Other	9.8%	90.2%		123
Responsibility for Transportation of Supplies	Government (National/County	16.3%	83.7%	0.502	86
	SDP	11.4%	88.6%		167
	Suppliers/Others	14.5%	85.5%		276
Use of ICT for Supply Chain Management	Use ICT	16.5%	83.5%	0.388	109
	Don't Use ICT	13.3%	86.7%		421
Use of Logistics Form	Logistics Form Used	16.8%	83.2%	0.001	368
	Logistics Form NOT Used	6.1%	93.9%		147
	Total	13.9%	86.1%		530

Table 2: Odds Ratio for 'Stock Outs Experience in the Last 3 Months' by Various Supply Chain Management

		95% Confidence Intervals for Odds			
Independent Variables	**Categories**	**Sig**	**Odds**	**Lower**	**Upper**
SDP Level of Care	Level 2 (Reference)	0.996	1.000		
	Level 3	0.941	0.971	0.443	2.127
	Level 4 and above	0.976	1.020	0.272	3.826
SDP Managing Authority	Government (Reference)	0.185	1.000		
	Private for Profit	0.376	1.693	0.528	5.433
	Private NOT for Profit	0.074	4.513	0.865	23.535
Residence	Urban (Reference)		1.000		
	Rural	0.223	1.652	0.737	3.704
Region	Nairobi (Reference)	0.016	1.000		
	Central	0.357	0.440	0.077	2.517
	Coast	0.192	0.305	0.051	1.817
	Eastern	0.017	0.127	0.023	0.694
	North Eastern	0.069	0.154	0.020	1.158
	Nyanza	0.047	0.175	0.031	0.974
	Rift Valley	0.384	0.484	0.095	2.476
	Western	0.007	0.095	0.017	0.531
Main Source of Regular FP Commodities Supplies	KEMSA (Reference)	0.865	1.000		
	MoH (National/County)	0.793	0.880	0.337	2.296
	Private/Others	0.800	1.178	0.332	4.185
Distance to Nearest Warehouse	Less than 25 Kms (Reference)	0.355	1.000		
	25 - 50 Kms	0.163	0.492	0.181	1.333
	Above 50 Kms	0.429	0.745	0.360	1.544
Duration Between Order and Supply	Less than 2 weeks (Reference)	0.765	1.000		
	2 weeks - less than 2 months	0.867	1.113	0.318	3.889
	0 - 4 months	0.630	0.727	0.199	2.660
	More than 4 months	0.848	0.865	0.198	3.779
Frequency of Resupplies	Once every 2 weeks (Reference)	0.033	1.000		
	Once every Month	0.069	0.285	0.074	1.100
	Once every 3 months	0.044	0.198	0.041	0.955
	Once every 6-12 months	0.687	0.677	0.102	4.503
Person Determining Quantities of FP	SDP Staff Member (Reference)		1.000		
	Other Person	0.349	1.595	0.600	4.239
Persons Responsible for Ordering	Pharmacist (Reference)	0.971	1.000		
	Nurse	0.819	1.111	0.449	2.750
	Dcotor/Clinical Officer/Other	0.934	1.045	0.366	2.987
Responsibility for Transportation of Supplies	Government (Reference)	0.459	1.000		
	SDP	0.432	0.623	0.191	2.030
	Suppliers/Others	0.748	1.147	0.496	2.654
Use of ICT for Supply Chain Management	Use ICT (Reference)		1.000		
	Don't Use ICT	0.255	1.536	0.733	3.219
Use of Logistics Form	Logistics Form Used (Reference)		1.000		
	Logistics Form NOT Used	0.073	2.152	0.931	4.975

5. Discussion, Conclusion and Recommendations

Studies have shown that lack of family planning commodities at health facility level negatively affects the practice of contraception, increases the unmet need for family planning, and at times leads to unplanned pregnancies. Information on determinants of stock outs of family planning commodities is scarce with very few studies addressing this concern. Stock out of family planning commodities is common among health facilities in many countries and Kenya is no exception. About 9 in every 10 health facilities reported stock out of at least one family planning commodity in the 3 months prior to the 2015 Kenya Health Facility Assessment survey. Stock outs were common in Level 2, private sector, facilities that get their supplies within 2 weeks of ordering, and those that do not use logistics forms.

Available studies on causes of stock out of family planning commodities point to several supply chain related factors such as use of 'push system', poor supply chain planning and requisitioning process, inaccurate demand forecasting, limited provider input into the supply chain process, and delays in procurement. Results from this study show that the frequency of resupply of commodities and other supplies is the only supply chain related determinant of stock out of family planning commodities in addition to the location of the health facilities in term of region. Other supply chain related factors such as Main Source of Regular FP Commodities Supplies, Distance to Nearest Warehouse, Duration Between Order and Supply, Person Determining Quantities of FP Commodities for Resupply, Persons Responsible for Ordering Supplies, Responsibility for Transportation of Supplies, Use of ICT for Supply Chain Management, and Use of Logistics Form are not determinants of stock outs. Given these results, the study failed to confirm the null hypothesis.

Based on the findings of this study, it is recommended that health facilities be encouraged to restock their supplies every 3 months (quarterly). In addition further research needs to be undertaken to establish the factors in Western, Nyanza, and Eastern that make these regions less likely to experience a stock out of family planning commodities. The results of this research could inform both policy and programmes in the other regions of the country.

6. References

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