International Journal of Community Medicine and Public Health
Wambua MM et al. Int J Community Med Public Health. 2023 Nov;10(11):4253-4261
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20233459

Original Research Article

Determinants of immunization coverage among children aged between 12-23 months in Makueni County, Kenya

Meshach M. Wambua[1]*, Jackline M. Nyaberi[2], Francis W. Muregi[3]

[1]Department of Epidemiology and Biostatistics, School of Public Health, Mount Kenya University, Thika, Kenya
[2]School of Public Health, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya
[3]School of Biological Sciences, Mount Kenya University, Nairobi, Kenya

Received: 07 August 2023
Revised: 23 September 2023
Accepted: 27 September 2023

***Correspondence:**
Dr. Meshach M. Wambua,
E-mail: meshack2005@yahoo.com

ABSTRACT

Background: Globally, diseases that can be prevented through immunization claim the lives of more than 3 million individuals in the population, 1.5 million of whom are typically children under the age of five. Furthermore, vaccine-preventable diseases are to blame for about 3.5 million with disability worldwide. Only 86% of children worldwide have had vaccinations, making millions of youngsters susceptible to diseases that can be treated or prevented by administering vaccines. Immunization is the only effective way to prevent or treat certain disorders.
Methods: Descriptive cross-sectional design was used. Semi-structured questionnaires given by interviewers to mothers and other caretakers in particular households were used to gather the necessary data. Multi-stage sampling technique was employed to select the questionnaire respondents the study area, a sample size of 384 eligible participants was used to collect quantitative data.
Results: The study's findings showed that Makueni county had an 82% vaccination coverage rate. This was a sign that the county had fallen short of the goal set by the WHO. From the inferential statistics analysis, there were significant association between vaccine uptake and immunization in all the four objectives examined i.e., $p \leq 0.05$.
Conclusions: The study established that immunization coverage is high for children 23 months and below in Makueni County, with socio-demographic characteristics being the most important factor. It is advised that additional efforts be made to increase the uptake of immunization services. Along with improving their knowledge of child immunization, prenatal clinics should focus on improving the mothers' health-seeking behaviour.

Keywords: Immunization, Makueni county, Vaccine, WHO

INTRODUCTION

Immunization is a process that protects someone from contracting an infection by administering a vaccine. It is a proven public health tool of all the time in preventing life-threatening conditions worldwide and also key in achieving millennium development goals. According to previous studies, two to three million child deaths are prevented each year through immunizations of the children against diseases which can be eliminated or prevented through vaccinations which include diphtheria, pertussis, measles, poliomyelitis and tetanus.[1] Due to its importance, WHO in 2011 launched a global vaccine action plan (GVAP) spanning from 2011 to 2020 to ensure comprehensive utilization of immunization globally immunization is one of the best strategies in protecting children against many dangerous diseases which not only lead to disability but also death.[2] Since 2010, 116.2 million (85%) children received DPT and measles immunization in 2017 and this is the highest number ever reported globally.[3]

In an effort to avoid diseases that can be prevented by vaccination, the Kenyan Ministry of Health established the Kenya Expanded Program on Immunization (KEPI) in 1980. The program's principal objective was to guarantee the availability of immunization services to avoid the six major diseases that kill children during their youth, including polio, TB, measles, diphtheria, tetanus, and whooping cough.[4]

Statement of the problem

Globally in 2018, 86% of infants which is equivalent to 116.3 million received the three doses of DPT3.[2] It is estimated that in 2014, about 18.7 million children across the globe were not given the recommended diphtheria-pertussis-tetanus (DPT3) vaccine for the third dose as required. The global vaccine action plan (GVAP) had set a target to achieve immunization uptake of at least 90% in most countries and a target of 80% coverage of DPT3 in every district by 2015. The set target was only realized by 56 countries from the WHO member states which are 194 in number making an equivalent to 29%. The DPT3 uptake rose significantly from 74% in the year 2010 to 80% within the same period in the African continent with great disparities among countries. Most countries in Sub-Saharan Africa (SSA) achieved a DPT3 uptake of less than 50% while the immunization against the measles disease in the African region was 74% and this led to an estimated 48,000 deaths associated with measles being reported.[5,6]

In Kenya, 502,860 didn't receive any of the vaccinations required.[7] Moreover, 1.7 million children who were born from the year 2013 to 2017 didn't get all the scheduled vaccinations.[8] There have been high numbers recorded of unimmunized children despite numerous efforts and campaigns made towards actualization of full immunization coverage.

The high unimmunized numbers hinder the attainment of the set target by global vaccine action plan (GVAP) as per the set achievement in 2020 which is 90%. Non-utilization of vaccine uptake risks Kenya losing an average of 16 shillings for every unutilized shilling invested in immunization. This translates to an average of 44 shillings per child annually.[9]

Consequently, most of the unimmunized cases result to high numbers of disabilities, death and rise in morbidity cases among the children which eventually have lifetime implications for the country, families and communities. This exacerbates the health status of children hence dying without a chance of celebrating their 5th birth day. In Makueni County the immunization coverage has never achieved the 90% set target between the year 2014 to 2017. The highest coverage achieved was 86% while the lowest was 79% within the said reporting period. There were also over 7,000 children below 5 years who never received immunization against measles and penta in 2017 in Makueni County.[7]

Significance of the study

According to a study, it was estimated that over 2-3 million deaths globally were prevented through vaccination.[10] Immunization is hence a proven and an effective public health strategy for preventing life threatening conditions that lead to not only disability but also death and morbidity for children.[11]

Immunization is key for the attainment of SDG 3 clause 1 (end of preventable deaths to at least as low as 12 deaths per 1000 births of new-borns and to as low as 25 deaths per 1000 births of under five children). In Kenya, immunization is central to attainment of basic health care to all communities and is a strong pillar of universal health care envisaged in Kenya's vision 2030.

Immunization is key for the attainment of SDG 3 clause 1 (end of preventable deaths to at least as low as 12 deaths per 1000 births of new-borns and to as low as 25 deaths per 1000 births of under five children). In Kenya, immunization is central to attainment of basic health care to all communities and is a strong pillar of universal health care envisaged in Kenya's vision 2030. Kenya recorded a high number of unvaccinated children in 2017 of over half a million (502,860) this being a key indicator that the country is far behind attaining the anticipated target of 90% immunization coverage. It is therefore necessary to establish the gaps hindering full coverage for purposes of developing appropriate strategies to reach out all the eligible members of the society.

This study has explored existing factors that contribute to the uptake of routine immunizations of children who are aged between 12-23 months in the County of Makueni.

METHODS

Introduction

The chapter details the study design, study site, study period, study population, inclusion and exclusion criteria, sampling technique, data collection tools, validity, reliability and normality testing, data collection tools and techniques, data analysis and finally ethical considerations adopted in the study.

Study design

The quantitative data gathering techniques were singly used in this cross-sectional study design. The study methodology was chosen because it could determine the size of vaccination coverage gaps within a particular population.

Study period

Period of study was between March 2021 and March 2022.

Study site

The research was carried out in Makueni County within 3 Sub counties, Eastern region of Kenya, and is approximately 63kms from Nairobi, the capital city of Kenya.

Study population

The study's target population consisted of mothers and caregivers who were purposefully sampled from a group of villages in Makueni County.

Inclusion and exclusion criteria

The parents and other adults who looked after children aged 12 to 23 months and who resided in eligible homes in certain Makueni County communities were included in this study. The mothers and caregivers with children aged over 23 months were not part of the study. The young mothers and caregivers below 18 years of age without guardians to give consent were also excluded.

Sample size determination

Formula by Fisher et al was applied to determine the sample size, where the sample size n was determined by use of 95% confidence level, proportion in target population 0.5 and degree of accuracy (margin of error), set at (0.05).[12]

Sampling techniques

The county of Makueni, one of the counties in Kenya's Eastern region, served as the site of this study. There is currently insufficient knowledge regarding the variables affecting immunization status among infants between the ages of 12 and 23 months. The level of immunization coverage and factors affecting the use of immunization services provided in the county's health facilities should thus be examined in this study. The first stage of the study's multi-stage sampling procedure involved selecting three sub-counties at random from a total of six.

Validity of research instrument

The research tool was pretested using 10% of the sample size to ascertain clarity of the questions and find possible solutions to any problems depicted. Convergent validity was used and all the 10 variables for immunization uptake data of children aged 23 months in Makueni County examined were significant to the total an indication there was validity.

Reliability of research instrument

The internal consistency of the pilot data responses was measured using the Cronbach's Alpha. The calculated Cronbach's Alpha was 0.794 for immunization uptake data of children aged 23 months in Makueni County, which was above the accepted reliability threshold of 0.70.

RESULTS

Response rate

384 respondents in Makueni County who were either parents or caretakers of children between the ages of 12 and 23 months were the subject of this study. It was important to establish the response rate so as to know the number of questionnaires that were valid for analysis. Out of the 384 respondents who had been identified to participate in interview schedule, 371 responded to the interview. This represented 96.6% response rate. Mugenda et al claim that a turnout rate of 50% was adequate for data analysis and reporting; a rate of 60% was advised; and a rate of feedback of 70% or above was ideal. The 96.6% response rate was seen as excellent based on the premise.

Objective one: to determine the socio-demographic parameters influencing the vaccine uptake for kids between the ages of 12 and 23 months in Makueni County, Kenya

Table 1 below shows the socio-demographic breakdown of the survey respondents. Majority of the sampled respondents were females (96%, n=356) between the ages of 19 and 29 (64.2%, n=238), with higher education (38.8%, n=322), married (86.8%, n=322), and 13.2% (n=49) single. The findings also reveal that most respondents (59%, n=219) accessed a health facility at a radius of 0-5 kilometres and that most respondents (93%, n=345) were mothers of the majority of the male children (51%, n=189) under study.

Table 1: Socio-demographic characteristics.

Attribute	Category	Frequency	Percentage
Gender	Male	15	4.0
	Female	356	96.0
Age in years	Below 18	8	2.2
	19-29	238	64.2
	30-39	101	27.2
	40-50	24	6.5
Level of education	≤Primary	87	23.4
	Secondary	140	37.7
	Tertiary	144	38.8
Marital status	Married	322	86.8
	Single	49	13.2
Relationship to the child	Mother	345	93.0
	Father	24	6.5
Sex of the child	Male	189	50.9
	Female	182	48.5
Distance from health facility	0-5 km	219	59.0
	6-10 km	100	27.0
	11-15 km	45	12.1
	>15	7	1.8

Table 2 shows association analysis for sociodemographic traits and immunization status. The child's place in the family (p=0.002), ANC visits (p=0.000) and proximity to the medical facility (p=0.000) were all significantly associated to immunization status.

Table 3 shows the influence of (position of the child in the family, number of ANC visits and distance from health facility) on immunization status. Distance from health facility significantly influenced immunization status with an odds ratio of 0.148 an indication it had 14.8% influence.

Table 2: Associations for socio-demographic characteristics with immunization status.

Attribute	Statistics
Gender	χ^2=0.435, df=2, p=0.805
Age in years	χ^2=7.529, df=8, p=0.481
Level of education	χ^2=8.212, df=6, p=0.223
Marital status	χ^2=2.244, df=2, p=0.326
Relationship to the child	χ^2=0435, df=2, p=0.805
Sex of the child	χ^2=3.610, df=4, p=0.461
Position of the child in the family	χ^2=28.296, df=2, p=0.002**
Place of child birth	χ^2=8.044, df=6, p=0.235
Number of ANC visits	χ^2=110.926, df=8, p=0.000**
Distance from health facility	χ^2=36.730, df=8, p=0.000**

Note: ** p<0.01

Table 3: Influence of (position of the child in the family, number of ANC visits and distance from health facility) on immunization status.

Variables	B	Df	P value	Odds ratio (B)	Confidence Interval	
					Lower	Upper
Position of the child in the family	1.901	1	0.078	6.693	0.809	55.355
Number of ANC visits	-22.530	1	0.992	0.000	0.000	0.000
Distance to the health	-1.907	1	0.002**	0.148	0.044	0.498

Note: ** p<0.01

Objective two: to establish knowledge, attitude, and practice among mothers and caregivers of kids in Kenya's Makueni County who are between the ages of 12 and 23 months

Table 4 mothers' awareness level, attitudes, and actions regarding vaccine uptake for kids between the ages of 12 and 23. The majority of respondents (97%, n=360) were knowledgeable of existing vaccinations, and 43.1% (n=160) were knowledgeable of four available vaccines, and 51.2% (n=190) reported ANC visits as the source of information for immunization. Majority of participants (95.4%, n=354) were aware of vaccine preventable diseases for children, with 31.3% (n=116) of the respondents reporting knowing at least four vaccine preventable diseases in children. The majority of participants (70.5%, n=262) affirmed that they had received messages on immunization within the last month, although 25.9% (n=96) were unable to recall the sources of the information. The majority of participants (97.8%, n=363) strongly agreed on the necessity of vaccines for their children, with 97.3% (n=361) indicating vaccines to be safe for their children.

Results in Table 5 shows all factors examined were significantly associated with immunization status (p=0.000) with an exception of accessibility of messages.

Objective three: to identify the social, cultural, and economic determinants influencing the immunization rate for kids in Makueni County, Kenya, between the ages of 12 and 23 months

Table 6 shows the socio-cultural and economic factors influencing the immunization uptake for children between the ages of 12 and 23 months are described in the following descriptive data. The majority (34%, n=126) of the respondents reported that they were in casual employment, with 87.1% (n=323) indicating that the immunization services were easy to access. The majority of respondents (95.1%, n=353) were Christians, while 2.96% (n=11) were traditional believers, though the majority (96.8%, n=359) reported that their religion supports immunization.

Test of association (chi-square) and influence (binary logistic regression) Table 7 was used to conduct tests on the socio-cultural and economic determinants' variable categories to determine whether they were associated and

had influence with the result, which was determined to be immunization status. The results significant association between socio-cultural economic determinants (employment, accessibility to immunization, religion, religious support for immunization, awareness of children missing immunizations due to religious reasons, and adverse reactions to immunizations) and full employment status all with a $p<0.05$.

Table 4: Knowledge, attitude and practices for vaccine uptake.

Attribute	Category	n	%
Awareness of the vaccine preventable diseases for children	Yes	354	95.4
	No	17	4.6
Number of vaccines preventable diseases for children known	One disease	17	4.6
	Two diseases	24	6.5
	Three diseases	99	26.7
	Four diseases	116	31.3
	Five diseases	63	17.0
	Six diseases	43	11.6
	Seven diseases	9	2.4
Accessibility to immunization messages within the last one month	Yes	262	70.5
	No	109	29.5
Source of the messages	Radio	50	13.5
	Radio and television	80	21.6
	Radio and community meetings	52	14.0
	Community meetings	54	14.6
	Radio, television and community meetings	39	10.5
	None	96	25.9
Adequacy of the information	Yes	331	89.2
	No	40	10.8
Role of the mass media in immunization uptake	Yes	326	87.9
	No	45	12.1
Necessity of immunizations to protect children	Strongly agree	363	97.8
	Agree	2	0.6
	Disagree	1	0.3
Safety of the immunizations	Strongly disagree	6	1.6
	Strongly agree	361	97.3
	Agree	1	0.3
	Not sure	2	0.5
	Disagree	2	0.5
	Strongly disagree	5	1.3

Table 5: Association between knowledge, attitude, practice and immunization status.

Variables	Chi-square	df	Sig.	Variables	Chi-square	df	Sig.
Awareness of existing vaccinations	257.948	4	0.000**	Adequacy of the messaging	43.141	4	0.000**
Knowledge on the available vaccines	223.825	12	0.000**	Role of mass media in immunization uptake	52.966	2	0.000**
Source of information about vaccines	290.707	10	0.000**	Need for immunization	376.077	6	0.000**
Awareness on vaccine preventable diseases	158.617	4	0.000**	Immunizations are safe	377.723	8	0.000**
Number of vaccine preventable diseases	324.422	14	0.000**	Options to immunizations	66.168	12	0.000**
Knowledge of messages on immunizations	105.228	8	0.000**	Healthcare workers are customer friendly	161.004	8	0.000**
Accessibility of message	6.036	10	0.812	There are enough health facilities	108.435	8	0.000**

Note: ** $p<0.01$

Table 6: Social cultural and economic factors contributing to the uptake of immunizations for children aged 12-23 months in Makueni County, Kenya.

Socio-cultural and economic determinants			
Attribute	**Category**	**N**	**%**
Employment	Casual	126	34.0
	Contractual	37	10.0
	Permanent	40	10.8
	Self-employment	84	22.6
	House wife	84	22.6
Accessibility of immunizations	Difficult	41	11.1
	Very difficult	2	0.6
	Easy	323	87.1
	Very easy	5	1.3
Religion	Christian	353	95.1
	Traditional	11	2.96
	Muslim	6	1.6
Religion support for immunizations	Yes	359	96.8
	No	12	3.2
Awareness of a child who missed immunizations due to religious reasons	Yes	40	10.8
	No	331	89.2
Child's experience of adverse reactions due to immunizations	Yes	6	1.6
	No	358	96.5
	Not applicable	7	1.9

Table 7: Association and influence between socio-cultural economic determinants and immunization status.

Test of association		Test of influence			
Category	**Statistics**	**B**	**df**	**P value**	**Odds ratio**
Employment	χ^2=16.425, df=8, p=0.037*	0.202	1	0.025*	1.224
Accessibility to immunization	χ^2=117.27, df=8, p=0.000**	-0.300	1	0.148	0.741
Religion	χ^2=317.34, df=4, p=0.000**	-1.314	1	0.204	0.269
Religious support for immunization	χ^2=218.89, df=2, p=0.000**	0.361	1	0.784	1.434
Awareness of children missing immunization due to religious reasons	χ^2=42.73, df=2, p=0.000**	0.423	1	0.328	1.527
Adverse reactions due to immunizations	χ^2=371, df=4, p=0.000**	-1.807	1	0.295	0.164

Note: * p<0.05, ** p<0.01

When all the socio-cultural and economic variables were subjected to a binary logistic regression analysis, only employment was statistically significant p<0.05 and odds ratio of 1.224.

Objective four: To determine the health system determinants influencing the vaccine uptake among kids in Kenya's Makueni County between the ages of 12 and 23 months

Findings of the research Table 8, show that 97.3% (n=361) of respondents were satisfied with responses they got from health workers and a majority of 98% (n=363) of respondents were given enough information on immunization. According to the findings of the study, 81.4% (n=302) of the respondents who visited the health facilities received the scheduled immunizations for their children, with 38% (n=26) reporting that the vaccines were not available in the facilities as the reason for not getting immunized.

The results for test of association and influence Table 9 demonstrate significant relationship between immunization status and each of the categorical variables under consideration for association, as indicated by the value of p<0.01. Whereas, test of influence findings showed that three factors under this objective were statistically significant, with p<0.01. Three factors adequacy of information given at the child-welfare clinics, missed immunizations at the child welfare clinics and reasons as to why the child was not immunized influence full immunization status of children ≤23 months.

Table 8: Health system factors.

Variables	Category	Frequency	Percentage
Health workers friendliness	Yes	361	97.3
	No	10	2.7
Enough information given in child welfare clinic	Yes	363	97.8
	No	8	2.2
Visited the health clinic but the child was not immunized	Yes	69	18.6
	No	302	81.4
Reasons for missed opportunities	The vaccinator was absent	20	5.4
	Vaccines were not available	26	7.0
	Long waiting time	5	1.3
	Health workers were on strike	17	4.6
	Immunized	303	81.7

Table 9: Association and influence between health system factors and immunization status.

Test of association		Test of influence			
Category	**Statistics**	**B**	**df**	**P value**	**Odds ratio**
Health worker's friendliness	χ^2=290.28, df=4, p=0.000**	-4.148	1	0.001**	0.016
Enough information given in child welfare clinic	χ^2=26.97, df=2, p=0.000**	2.273	1	0.286	9.708
Missed immunization opportunity	χ^2=462.12, df=4, p=0.000**	3.801	1	0.000**	44.746
Reasons for missed immunization opportunity	χ^2=416.88, df=10, p=0.000**	1.087	1	0.000**	2.965

Note: ** p<0.01

DISCUSSION

Immunization is still utilized as a tactic to lessen the negative impacts of diseases all over the world. As of 2010, 85% of the world's population has received the necessary doses of the diphtheria, tetanus, and pertussis (DPT3) vaccination, an increase from 72% in 2000 and 20% in 1980.[14] However, many kids did not obtain the recommended vaccinations, which leads to around 1.5 million vaccine-preventable illness deaths annually.[15] Children who live in the poorest, most marginalized, and conflict-affected nations were the least immunized. communication channels and working environment.

Findings revealed that 82% of the children were fully immunized in comparison with the study conducted by Kioko et al in Machakos county which had 83% fully immunized.[16]

The results of the socio-demographic factors analysis show that women are more likely than men to be the primary caregivers for children, and that the higher the level of education, the more informed the caregivers become and the more likely they are to use immunization services due to their level of awareness.

Study findings for knowledge, attitudes, and practices of respondents indicates that there has been a lot of sensitizations to the general population on the existence of the children vaccines. The results show that the majority of the population is aware of at least four child vaccinations.

Findings indicate that socio cultural determinants have a bearing on immunization uptake; this could be attributed to religious institutions being some of the institutions of social control towards normal behaviour. The attitude that their religion supports immunization can be seen as one of the factors attributing to majority of the respondents having children who were fully immunized. The type of employment will affect the immunization status because there is a statistically significant correlation between employment and immunization status.

The study findings on health systems found that erratic vaccine distribution and supply, travel time to medical facilities, and damaged cold chains in some facilities were some of the major factors affecting immunization uptake. From the study, staff limitations and shortage compared to the catchment population in addition to strikes and other unrests affected the immunization uptake. The distance covered by the care givers to the health facilities was also a major factor. In some instances, the health care workers covered long distances for outreach services where the turnout was too low due to the delays along the way. These results concur with those of Tefera, who found that close families were more likely to have had all recommended vaccinations than those who lived farther away.[17]

The study had a number of limitations, including the fact that the information on immunization coverage was gathered retroactively and that mothers and other caregivers may not have been able to recall every detail of an immunization, particularly in cases when the immunization card was missing. The study did not cover mothers' attitudes, perceptions, or opinions towards immunization of children. Despite the aforementioned constraints, it is believed the results will be useful in providing current information on the status and obstacles to immunization coverage in Makueni County and the entire nation.

CONCLUSION

This study established that immunization coverage is high for children aged 12-23 months in Makueni County, with Socio-demographic characteristics being the most important factor.

The study's findings imply that knowledge, attitude, and behaviours, along with health systems, are determinants of vaccine uptake among children aged 12 to 23 months, along with sociocultural and sociodemographic characteristics. Study findings established that location of the kid in the household, the number of ANC visits attended, the travel time to the closest facility, and the specific socio-demographics are all factors that affect vaccine uptake.

Recommendations

To increase the number of children who receive vaccinations, it is advised to change mothers' health-seeking behaviours toward prenatal follow-up and improve mothers' knowledge of child immunization. Additionally, it is advised to strengthen outreach services, encourage community involvement, and actively work with local community-based health agents like the CHVs.

There is need to adopt communication strategies that can sensitize, educate and inform mothers and caregivers about childhood immunizations, vaccination sites and immunization schedules. It is recommended to introduce health education programs to community groups, community gatherings and mothers attending welfare clinics in addition to displaying posters and flyers so as to augment the information.

It is recommended that the right knowledge, attitude and practice be propagated among caregivers of children 12-23 months old in Makueni County. It is also recommended that the Government of Makueni County, Department of health puts a track on health systems (both infrastructure and policies).

ACKNOWLEDGEMENTS

I want to express my gratitude Mount Kenya University for its institutional support, which has always been available to me. I also want to thank Professor Francis Wamakima Muregi and Dr. Jackline Mosinya Nyaberi for helping, advising, and inspiring me while I put together my thesis.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Shrivastava SR, Shrivastava PS, Ramasamy J. WHO and UNICEF: Updates on immunization coverage and how can we improve upon? J Res Med Sci. 2015;20(12):1216.
2. WHO. World Health Statistics. Washington DC: WHO. 2018. Available from: https://www.who.int/data/gho/publications/world-health-statistics. Accessed on 21 May 2023.
3. Peck M, Gacic-Dobo M, Diallo MS, Nedelec Y, Sodha SS, Wallace AS. Global Routine Vaccination Coverage, 2018. Morb Mortal Week Rep. 2019;68(42):937-42.
4. MoH. National policy guidelines on immunization. Nairobi: MoH. 2013. Available from: http://guidelines.health.go.ke:8000/media/Immunization_Policy_Guidline.pdf. Accessed on 21 May 2023.
5. WHO. World Health Statistics. Washington DC: WHO. 2014. Available from: https://www.who.int/news/item/15-05-2014-world-health-statistics-2014. Accessed on 21 May 2023.
6. UNICEF. Annual Report Geneva. Geneva: UNICEF. 2014. Available from: https://www.unicef.org/reports/unicef-annual-report-2014. Accessed on 21 May 2023.
7. UNICEF, Kenya. Impact Report, Kenya 2014-2018. Nairobi: UNICEF. 2018. Available from: https://www.unicef.org/kenya/reports/impact-report-2014-2018. Accessed on 22 May 2023.
8. MoH, K. Kenya Health Workforce Report: The Status of Healthcare Professionals in Kenya, 2015. 2017. Available from: https://www.medbox.org/document/kenya-health-workforce-report-the-status-of-healthcare-professionals-in-kenya-2015. Accessed on 22 May 2023.
9. An assessment of Healthcare in Kenya under the devolved system by KIPPRA Special Paper No. 19, 2018. Available from: https://repository.kippra.or.ke/bitstream/handle/123456789/2095/an-assessment-of-healthcare-delivery-in-kenya-under-the-devolved-system-sp19.pdf?sequence=1&isAllowed=y. Accessed on 22 May 2023.
10. WHO. World Health Statistics. Geneva: WHO. 2015. Available from: https://www.who.int/docs/default-source/gho-documents/world-health-statistic-reports/world-health-statistics-2015.pdf. Accessed on 22 May 2023.

11. Philippe D, Jean-Marie OB, Marta TGD, Thomas C. Global immunization: Status, progress, challenges and future. BMC Int Health Hum Rights. 2009;9(Suppl 1):S2.
12. Fisher AA, Laing JE, Stoeckel JE, Townsend JW. Handbook for Family Planning Operations Research Design. New York: Population Council; 1998.
13. Mugenda OM, Mugenda AG. Research Methods, Quantitative and Qualitative Approaches. Nairobi: ACT Press; 2003.
14. Abdullahi MF. Factors contributing to the uptake of childhood vaccination in Galkayo District, Puntland, Somalia. Glob Health Act. 2020;13(1):1803543.
15. Say L, Chou D, Gemmill A, Tunçalp Ö, Moller AB, Daniels J, et al. Global causes of maternal death: a WHO systematic analysis. Lancet Glob Health. 2014;2(6):e323-33.
16. Kioko TN. Determinants of full vaccination among children aged 12-23 months in Katheka Kai location, Machakos County, Kenya. Nairobi: Jomo Kenyatta University. 2020.
17. Tefera YA, Wagner AL, Mekonen EB, Carlson BF, Boulton ML. Predictors and barriers to full vaccination among children in Ethiopia. Vaccines. 2018;6(2):22.

Cite this article as: Wambua MM, Nyaberi JM, Muregi FW. Determinants of immunization coverage among children aged between 12-23 months in Makueni County, Kenya. Int J Community Med Public Health 2023;10:4253-61.