

## Original Research Article

# Factors influencing availability of tracer essential medicines in selected health facilities in Nyeri County, Kenya

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## ABSTRACT

**Background:** Tracer essential medicines are drugs which fully fulfil a population's health requirements and ought to be always available allowing for a properly functioning health system all the time. They should be available in the appropriate dosage, adequate amounts and at assured quality at a price that many people and the community can easily afford.

**Methods:** Analytical cross-sectional study design was used. This study utilized a mixed method approach (qualitative, observation and quantitative).

**Results:** The study found out that artemether lumefantrine was the least available drug at 50% in all the sampled facilities with KEMSA cited as the main supplier of tracer essential medicines in these facilities. Policy formulation was done without any involvement of pharmacy in-charges and policies passed at the county management team merely passed onto the staff at the health facilities without their engagement.

**Conclusions:** With the roll out of UHC program, majority of the participants indicated an increase in the availability of essential drugs in Nyeri County hence the government should roll out the program countrywide. Health management and leadership teams in the county needs to engage the pharmacy in-charges during policy making and changes, provide efficient communication in the supply chain system, including proper inventory management systems and to enhance research of drugs and emerging diseases in the county.

**Keywords:** Analytical cross-sectional, Nyeri County, Policy formulation, Tracer medicines

## INTRODUCTION

Tracer medicines are drugs which fully fulfil a population's health requirements and ought to be always available allowing for a properly functioning health system all the time. They are chosen with a regard to evidence of efficacy, safety, cost effectiveness and public health relevance. These tracer essential medicines have to be regularly procured to avoid regular stock-outs.<sup>1</sup>

The availableness of tracer essential medicines in both private and the public sectors in some central African

countries with findings from analysis of 10 tracer essential medicines indicated poor availability in the different health system levels both in private and public health sectors.<sup>2</sup> As a result, a project named supply chains for community case management was designed to pinpoint factors in the supply chain which influence availability of medicine in sub-Saharan Africa.

According to a report done in Uganda which portrayed the public health system as unreliable, it was established that private pharmacies took this advantage in selling tracer essential medicines to the general public. Some of the existing gaps highlighted in the study were

procurement issues, weak regulatory enforcements and frequent stock-outs.<sup>3</sup>

Due to the large number of public health facilities in Kenya, sufficient and adequate supply of tracer essential medicines to these facilities has not been met.<sup>4</sup> Nyeri is one of the four pilot counties under Universal Health Coverage scheme which is part of the Big Four Agenda of the Kenya government. It is one of the counties with the high prevalence of non-communicable diseases in Kenya at 26%.<sup>5</sup> According to NCDs account for 27% of deaths in Kenya equivalent to 100,000 people per year. Over 55% result in hospital deaths.<sup>6</sup>

The frequent shortage of many tracer vital medicines experienced in many public care centers leave patients with little option than seek the essential medicines and services in private health facilities and pharmacies where the cost is very high.<sup>7</sup>

### **Problem statement**

Lack of crucial tracer medicines in many health facilities in Kenya greatly increases the mortality rates. The overall child mortality rate in Kenya is 121/1000 and majority of this is attributed to the lack of essential medicines in many health facilities.<sup>8</sup>

The state agency mandated by the Kenya government to procure and supply medicines to public health facilities is KEMSA. It has nine regional warehouses across the country with one being located in Nyeri County. The pharmacy in-charge in each health facility places an order through KEMSA online portal on a quarterly basis. This new ordering system from the older manual ordering process has fastened the delivery of tracer essential medicines to many health facilities. However, adequate supply of required medicines in these facilities has not been met with KEMSA facing problems of political interference, lack of autonomy and inadequate funding. KEMSA has a requisite transport system which ensures dispatch and delivery of the ordered medicines to the public health facilities. Another agency which supplies essential medicine to public health facilities as well as faith-based organizations is MEDS which is a Christian non-profit organization based in Nairobi (KHSSP 2013-2017).

Despite the renewed government's effort to improve the Universal Health Coverage (UHC) in Kenya which would in turn improve tracer essential medicines' availability in many public facilities, little assessment has been evaluated by the government or scholars to establish the challenges hindering availability of tracer essential medicines for quality health care service delivery in Nyeri County. Therefore, this study intended to bridge the knowledge gap by assessing the availability of tracer essential medicines and assessing the commodity management of these drugs in community care centers located within Nyeri County.

### **Significance of the study**

The study will be relevant because it will increase to the body of knowledge about factors that influence access to tracer vital medicines in selected public facilities in Nyeri County. Information obtained from the results of the study will be shared with the Nyeri County health system managers and it will form a basis for them to understand the factors affecting the tracer crucial medicines' availability in the county for future planning on the needs and expectations of various public health facilities. This information could be shared with UHC implementation team at the national level for adoption of the applicable policies during the roll out of the UHC program nationally.

## **METHODS**

### **Study design**

An analytical cross-sectional study design was used. This study involved a mixed method approach (qualitative, observation and quantitative). Qualitative data collection entailed conducting key informant interviews with the pharmacy in-charges who have particularly informed perspectives and first-hand knowledge about the available tracer essential medicines in their facilities and the factors that could influence availability of these tracer essential medicines. Quantitative data collection involved administration of survey questionnaire to the pharmacy personnel. An observational checklist was used during the study to confirm the available tracer essential medicines in selected facilities.

### **Target population**

All pharmacy in-charges and pharmacy staffs in all the selected facilities of each of the eight sub-counties in Nyeri County were targeted. The study targeted 93 pharmacy staffs in the selected health facilities in Nyeri County.

### **Sample size**

The largest facilities in each level (level one to level five) of every sub-county in Nyeri County were sampled as these were the main points of call for the sick in each sub-county and had an operational pharmacy. Pharmacy in-charges and pharmacy staffs in selected facilities in each of the eight sub counties in Nyeri County were targeted. Pharmacy staffs across all selected facilities were sampled as the sample size since they number was limited, hence a sample size of 93 respondents.

### **Sampling technique**

Purposive sampling was used since these were the people with first-hand knowledge about the available tracer essential medicines in their facilities and factors that influenced the availability of these tracer essential

medicines. Nyeri County is divided into eight sub-counties and data was collected in all the sub-counties. The selected facilities in the county were divided into level one to level five facilities using purposive sampling to make data collection more manageable and make the sampling process more practical. Purposive sampling was then used to select the largest facility in each level (level one to level five) facilities of every sub county in Nyeri County as these were the main points of call for the sick in each sub-county and had an operational pharmacy. All staffs handling the pharmacy in each selected facility were sampled.

#### Reliability test

The Cronbach's alpha coefficient was used to assess the reliability of instruments for internal consistency. Once the individual responses were entered into statistical

software (SPSS version 20), the Cronbach's alpha coefficient was calculated for all the items. A coefficient greater than 0.7 was acceptable but a coefficient below 0.7 was not tolerable for the data collection instruments, and this study adopted a Cronbach alpha of 0.75.

## RESULTS

### Objective one

Table 1 shows bivariate analysis carried out to check whether there exists any statistically significant association between respondent's socio-demographic characteristics and the availability of tracer essential medicines. Designation ( $p=0.001$ ) and academic qualification ( $p=0.002$ ) were shown to be statistically significant with the availability of tracer essential medicines.

**Table 1: Bivariate analysis.**

	Availability index		P value
	Adequate	Inadequate	
<b>Age of respondents (yrs)</b>			
<30	20 (64.5)	11 (35.5)	1.813 (3)
31-40	16 (61.5)	10 (38.5)	
41-50	8 (50)	8 (50)	
>51	1 (33.3)	2 (66.7)	
<b>Designation</b>			
Pharmacist	16 (100)	0 (0)	24.15 (4)
Pharm. tech	15 (68.2)	7 (31.8)	
Nurse	6 (25)	18 (75)	
Clinical officer	5 (50)	5 (50)	
Other	3 (75)	1 (25)	
<b>Academic qualification</b>			
Postgraduate	5 (100)	0 (0)	17.02 (4)
Degree	12 (100)	0 (0)	
Higher diploma	0 (0)	2 (100)	
Diploma	26 (49.1)	27 (50.9)	
Other	2 (66.7)	1 (33.3)	

**Table 2: Availability of tracer essential medicines in the selected health facilities sampled.**

No.	List of essential medicines	N	Percent of cases
1	Amoxicillin 250 mg capsule/tablet	93	100.00
2	Amoxicillin 125 mg/5 ml for oral liquid	88	94.60
3	Paracetamol 500mg tablet	93	100.00
4	Cotrimoxazole 480 mg tablet	91	97.80
5	Artemether lumefantrine 20/120 mg tablet	47	50.50
6	Benzyl penicillin 600 mg (1 MU) OR 3 gm (5 MU) vial	91	97.80
7	Epinephrine (Adrenaline <sup>^</sup> 1 mg/ml (as HCl or hydrogen tartrate) Injection	81	87.10
8	Oral Rehydration Solution (ORS) (low osmolality); WHO formula (in sachet for 500 ml)	93	100.00
9	Oxytocin injection 10 IU/ml in 1 ml ampoule	60	64.50
10	Retinol (Vitamin A) (as palmitate) capsules	90	96.80

Continued.

No.	List of essential medicines	N	Percent of cases
11	Water for injection 10 ml ampoule	93	100.00
12	Glucose injectable solution; hypertonic (10% OR 50%)	82	88.20
13	Syringe disposable 5 cc with needle 21 G sterile	93	100.00
14	Cotton wool, absorbent, 400 mg BP, white	93	100.00
15	Surgical gloves, size 7.5", Latex Sterile medium	85	91.40
16	Cotton, gauze plain 36" × 100 yds, 1500 gms BP weight white color, loosely woven and absorbent	93	100.00
17	Sodium hypochlorite 4-6% external solution	91	97.80
18	Chlorhexidine gluconate 5% solution or 7.1% gel	60	64.50
19	Tetanus toxoid vaccine; >40 IU/0.5 ml in 10-dose vial	93	100.00
20	Measles vaccine; live-attenuated, freeze-dried 10 × 0.5 ml dose vial	93	100.00

In agreement with the quantitative findings, qualitative findings also showed that artemether lumefantrine (AL) was the least available drug at 50%. Key informant interview respondents also acknowledged that AL was the least available essential medicine as the study area has a low prevalence of malaria hence the least stocked drug. Drawing rights was mentioned by a key informant as a factor to the availability of essential medicines. Many staff in the different health facilities complained of having a small drawing right hence so little to order and this could not sustain the needed orders due to the large numbers of patients visiting health facilities. *“There are several essential medicines that we don’t have. Availability becomes a challenge because of the drawing rights we are given to run us for 3 months and the amount we are supposed to budget for is less”* KII with a clinician at Ngorano Health Centre (Table 2).

**Objective two: human resource factors that influence availability of tracer essential medicines**

Inadequate human resource was highlighted as a challenge among health-care workers given the workload. This was evident in almost all the facilities visited and especially with the influx of patients after UHC program was rolled out in the county. This had resulted in staff working fewer hours than recommended in their facilities to avoid burn outs and staff not going for their annual leaves. *“Human resource is inadequate, we can’t be able to run for 24 hours, we need staff to work at night, go for offs and leave but this is not possible so the number should be increased to about 10 we have few pharmacists and two pharmaceutical technologists”*- respondent Othaya Sub County (Table 3).

**Table 3: Staff trained on commodity management.**

Trained on commodity management	Frequency	Percent
Yes	58	62.4
No	35	37.6
Total	93	100.0

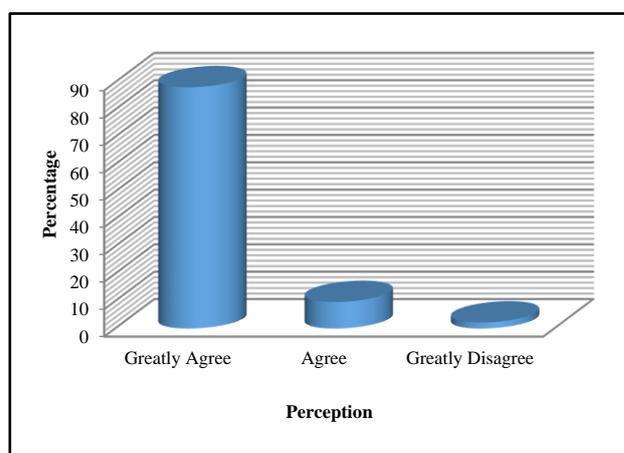
As illustrated from Table 3, every 6 out of 10 respondents (62.4%) in the survey had received training in

pharmaceutical commodity management while 37.6% had not.

**Table 4: Respondents who had attended a short course on commodity management.**

Attended short course on commodity management	Frequency	Percent
1-3 times	68	73.1
4-6 times	25	26.9
Total	93	100.0

From the data in Table 4, majority of the respondents (73.1%) had attended a short course on commodity management for not more than 3 times throughout their practice. Some respondents alluded that they had attended training on other areas but not commodity management while others had received training though not facilitated by the county or national government but by other private agencies. *“We have gone for different trainings, like last week we had a training on non-communicable diseases and one of the staffs went. Last month, we had a malaria training. The whole of last week was another training but none on commodity management”* KII with a pharmaceutical technologist in Wamagana Health center, Tetu sub-county.



**Figure 1: Need for health commodities management training in a health facility.**

Most of the respondents agreed that there was a need for commodity management training in a health facility. Only a few respondents greatly disagreed. Various key informants in the study had varied opinions on commodity training. For instance, a key informant at sub-county health facility attested that the majority of trainings done were disease-specific such as either malaria or HIV but not on essential medicines in particular. *“There is one that was done for pharmacy malaria treatment. The new guidelines for malaria treatment I can’t remember when exactly when, but it was this year”*- Pharmacist- Othaya Sub-county hospital (Figure 1).

**Table 5: Commodity management ensures efficient storage and distribution of essential medicines.**

	Frequency	Percent
<b>Greatly agree</b>	67	72.0
<b>Agree</b>	24	25.8
<b>Greatly disagree</b>	2	2.2
<b>Total</b>	93	100.0

About three quarter of the participants in the survey agreed that commodity management ensures efficient storage and distribution of essential medicines while only 2.2% did not agree with this (Table 5).

**Table 6: Perceptions on commodity management training and availability of tracer essential medicines.**

Crosstab		Availability index		OR (95% CI), P value	
		Adequate	Inadequate		
		N (%)	N (%)		
<b>There is need for health commodity management training in a health facility</b>	Greatly agree	41 (57.7)	30 (42.3)	1.165 (2)	0.559
	Agree	3 (75)	1 (25)		
	Greatly disagree	1 (100)	0 (0)		
		100.0%	0 (0)		
<b>Commodity management training improves quality of healthcare services</b>	Greatly agree	39 (58.2)	28 (41.8)	0.753 (2)	0.686
	Agree	5 (62.5)	3 (37.5)		
	Greatly disagree	1 (100)	0 (0)		
		100.0%	0.0%		
<b>Commodity management training ensures availability of essential medicines</b>	Greatly agree	33 (61.1)	21 (38.9)	2.42 (4)	0.659
	Agree	9 (56.3)	7 (43.8)		
	Neutral	2 (50)	2 (50)		
	Disagree	0 (0)	1 (100)		
	Greatly disagree	1 (100)	0 (0)		
	100.0%	0.0%			
<b>Commodity management training ensures efficient storage and distribution of essential medicines</b>	Greatly agree	33 (63.5)	19 (36.5)	2.32 (2)	0.315
	Agree	11 (47.8)	12 (52.2)		
	Greatly disagree	1 (100)	0 (0)		
		100.0%	0.0%		
<b>Commodity management training ensures rational use of essential drugs</b>	Greatly agree	30 (52.6)	27 (47.4)	4.74 (3)	0.192
	Agree	12 (75)	4 (25)		
	Neutral	2 (100)	0 (0)		
	Greatly disagree	1 (100)	0 (0)		
		100.0%	0.0%		

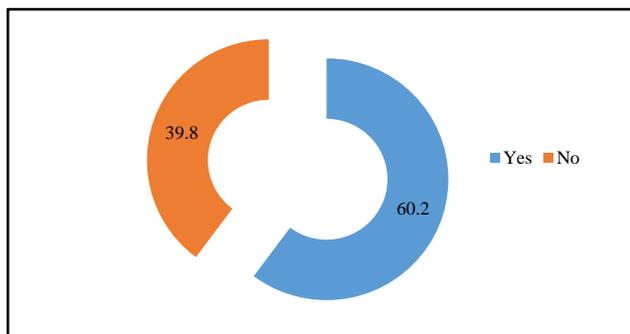
Based on the Likert scale responses, more than half of the respondents (57.7%) acknowledged the need for commodity management training in a health facility. A higher proportion of the respondents (58.2%) were in agreement that commodity management training improves the quality of healthcare services. Furthermore, the majority (5 out of 10) admitted that commodity management training ensures availability of essential medicines with 63.5% of respondents attributing commodity management training to ensuring efficient storage and distribution of essential medicines. About

half of the respondents in the study concurred that commodity management training ensures rational drug use of tracer essential medicines (Table 6).

**Objective three: health financing factors influencing availability of essential medicines**

60% of the respondents in the survey had information about the amount of budget allocation while 39.8% of the respondents had no information about the amount of budget allocated to their facilities. *“We were allocated*

K.sh 700,000 in the last quarter which is about 25-30% of the budget which I can say it is insufficient” KII with a nurse Karima dispensary (Figure 2).



**Figure 2: Information on budgetary allocation for essential medicines in your facility.**

Bivariate analysis was done to check if there exists any statistically significance between budgetary allocation and availability of tracer essential medicines. Budgetary allocation (p value=0.285) was not statistically significant with availability of tracer essential medicines (Table 7).

**Table 7: Association between health care financing and availability of tracer essential medicines.**

Budgetary allocation	Availability index		P value
	Adequate	Inadequate	
Yes	25 (54.3)	21 (45.7)	1.145 (1)
No	20 (66.7)	10 (33.3)	0.285

**Objective 4: perceptions on leadership and management factors that influence availability of tracer essential medicines**

*Devolution*

A key informant in this survey alluded that through devolution, there has been improvement in the supply of essential drugs at health facilities

“Since devolution, there is timely drug delivery and also patients are more satisfied because more drugs are supplied so they get drugs prescribed in the hospital. Supplies are received at 70% of the prescriptions we see. We have sufficient stock commodities unlike before devolution. After devolution, health care has become closer to citizens and more drugs are delivered to hospital as before devolution” KII with a nurse in Witima health center, Othaya sub-county.

*Policies governing drug supply*

With regards to policies on commodity supply, some of respondents were unaware of policy documents guiding the essential drug commodities at the county and national

level and even if present, there were no written documents to guide on the existing policies.

A respondent indicated that in-charges were not involved during policy making regarding drugs and commodity management at the county level. The policies were formulated at the county level and passed onto the staff at the facilities to be followed.

*Transport*

Transport was a significant factor in determining whether a health facility had a certain drug in stock or not. This was evidenced by the varying responses from the respondents. A key informant in one of the health facilities mentioned that management of transport logistics for drugs from the county store to the facilities was a big problem.

*Communication and planning*

Communication breakdown in the supply system was cited as a barrier towards having adequate stocks in the pharmacy. This communication breakdown led to staff placing orders to KEMSA with no idea of certain out of stock drugs with the supplier and only realized this upon drug delivery. This resulted in order fill rate reduction and consequently lowering availability of certain tracer essential medicines in health facilities.

*Supervision visits*

Health management team from the county and sub-county normally involved in supervision visits sometimes took long before visiting health facilities to check on the health delivery services. With few supervision visits, challenges including improper inventory management, inaccurate drug data collection due to technological problems (lack of an electronic inventory system) were not acted upon. This led to many human errors involved during drug ordering which in turn resulted in frequent stock outs and expiries.

*Technology*

Most health facilities visited during the survey were using manual methods of quantification, drug ordering, and data collection. Respondents urged the management to try and embrace technology and consider a proper data collection mechanism per facility to help establish the actual needs.

*Research*

Some respondent urged the health management team to enhance research within the county to cover even rare diseases which may arise from time to time. There was a case at a facility in Mukurweini sub-county and the respondent had this to say

*“Here we have a new disease, it’s called ‘myiasis’ whereby people come with live maggots buried in their skins. It starts like a painful boil and when you press to try and evacuate it, what emerges is a live maggot. It’s affecting even babies and one can even have like ten. The cases are common during rainy seasons and we have reported. More research should be done on this and we are also advising residents on proper hygiene”* KII with a clinician at Karaba health center.

#### *Standard operating procedures*

Regarding having standard operating procedures (SOPs) at the facilities, some respondents acknowledged that they knew about them but there were no written SOPs in some health facilities.

*“There are supposed to be there but we don’t have written ones though am aware of the SOPs”* KII with a health care worker in Kangocho dispensary.

#### *Managing expiries*

Regarding wastages and expiries, many health facilities noted this as a challenge due to accumulation of uncollected expired drugs in their stores. The county management team tasked with destruction of the expired drugs took a long time before collecting these expired drugs posing a severe danger to the staff and also occupying the inadequate space in the facilities.

#### *Lead time*

The average lead time for an order to reach the health facility once placed was dependent on the level of health facility. At referral facilities, the average lead time was 15 days as attested in the key informant interviews. Over-dependence of the health management team to source and procure drugs from one major supplier, KEMSA was seen as a factor in increasing the lead time.

## **DISCUSSION**

### *Availability of tracer essential medicines*

According to the data, artemether lumefantrine (AL) was the least available drug at 50%. This was attributed to the fact that the study area was not a malaria endemic zone hence the AL was least stocked. This is consistent with a study done in Kaliro district, Uganda where AL also had the highest percentage out of stock out at 51.6%.<sup>9</sup>

After health services were devolved in Kenya, there was an influx of patients visiting health facilities and this increased especially after introduction of UHC. Hence, many respondents felt the need to increase allocation of resources to provide the necessary drugs needed by the many patients visiting the facilities. This is in line with a pre- and post-devolution study done in Makueni County

which cited an overall influx of patients visiting the hospital and the need for increased funding.<sup>10</sup>

### *Human resource factors*

Human resource was highlighted by respondents as a major challenge towards availability of essential medicines in majority of the health facilities visited. These findings are consistent with other studies done in Mozambique where it was noted that stock-outs of essential medicines affected those living far from health facilities and especially those with few staff.<sup>11</sup>

### *Health financing factors*

60% of the respondents agreed to have knowledge regarding the budgetary allocation in their health facilities and termed it insufficient. Various respondents did not know their facility allocation but still thought it was not sufficient. This was consistent to a study conducted in Tanzania where authors attributed lack of adequate funding in the health sector contributing to shortages of adequately trained and skilled personnel whose skills are needed to effectively forecast, order and manage medicines stocks.<sup>12</sup>

Drawing rights which is the amount of money allocated to each facility per every quarter was seen as a challenge since it was too little to meet the facilities demands and in some facilities, the allocation used was previously what was used in the national government even before devolution. A study done in Tanzania reported similar results where delays in funds disbursement and rigid budget rules and inequitable patterns of resource distribution created localized shortages.<sup>12</sup>

### *Perceptions on leadership and management factors*

Health workers reported that citizens considered health care to have been brought closer home. However, some respondents were unaware of any policies guiding essential drugs with regard to ordering, storage and distribution. Policies were passed at the county management level then the information regarding any new or changed policy was passed down to the staff at the facilities to implement. This is in line with a study conducted in Tanzania where lack of transparency and performance oversight at central levels interact with behaviour at the local government level further undermining the functioning, planning and procurement systems.<sup>13</sup>

Transport logistics for drugs was a big problem since there were no enough transport vehicles and staff had to even rely on social media groups like WhatsApp to borrow and exchange out of stock drugs. This is in line with a study conducted in South Africa which found out that logistical bottlenecks in the medicines supply chain hampered availability of tracer essential medicines. In that study, authors found out that poor transport network

was cited by respondents as a hindrance factor towards accessibility of essential medicines.<sup>14</sup>

## CONCLUSION

The study established that with the introduction of UHC program there was an increase in availability of essential medicines in the facilities. However, as indicated by 50% of the respondents, AL was the least available drug. This was attributed to the low prevalence rate of malaria in the region.

Lack of enough pharmacy personnel in the facilities with some not even trained on commodity management was a contributing factor to lack of available tracer essential medicines. Most health workers (91%) were cognizant of the fact that there was need for commodity management training in the health facilities and 74.4% acknowledged that the training ensures availability of tracer essential medicines. Therefore, recruitment of skilled personnel is mandatory.

Inadequate and untimely budgetary allocations was a major factor influencing availability of tracer essential medicines with a small drawing right set for some facilities being seen as a hindrance to adequate stocking and ordering of essential medicines. There was need to allocate each facility a budget based on actual needs per facility rather than set drawing rights. The study exhibits a significant relationship between budgetary allocation and availability of tracer essential medicines in Nyeri County. The results reveal that budgetary allocation is statistically significant in determining the availability of tracer essential medicines in Nyeri County.

Health management and leadership factors had a part to play in ensuring availability of tracer essential medicines in the health facilities. Drug orders were supposed to be made based on the level of facility (level 1-level 5) but some respondents had no idea of any guiding policies in the county that govern the ordering and stocking. Policy formulation was done without any involvement of pharmacy in-charges and policies passed at the county management team merely passed onto the staff at the health facilities without their engagement. There was need for the health management team to ensure regular supervision visits to facilities, provide an efficient electronic data management and capture method regarding drugs, set up a drug therapeutics committee in every facility and lastly to enhance research within the county to even cover rare emerging diseases which may arise from time to time.

## Recommendations

The study shows that with the roll out of UHC program, majority of the participants indicated an increase in the availability of essential drugs in Nyeri County hence the government should roll out the program countrywide.

Commodity management training is crucial in ensuring rational drug use, minimized expiries, adequate stocking and proper storage and distribution which in turn translates to availability of tracer essential medicines. The county government should facilitate continuous commodity management trainings for health workers.

Majority of the participants cited budgetary allocation as a limiting factor towards availability of tracer essential medicines. Hence the county government should increase the health budgetary allocation to be able to procure these medicines in adequate quantities to make sure they are available to the many patients visiting the health facilities.

Human resource in almost all the sampled facilities was inadequate to meet the patients' demands. The county government should hire more staff to ensure service delivery is prompt and uninterrupted.

Lastly, health management and leadership teams in the county needs to engage the pharmacy in-charges during policy making and changes, provide efficient communication in the supply chain system, including proper inventory management systems and to enhance research of drugs and emerging diseases in the county.

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