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The Influence of Health Financing on Management of Health Products and Technologies in Selected Counties, Kenya

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Abstract

Health Products and Technologies (HPTs) are critical pillars of the health system and essential to achieving Kenya's Universal Health Coverage (UHC). UHC prioritizes access to high-quality medical care with minimal financial hardship. Despite efforts to enhance HPTs management, counties like Kisumu, Machakos, Nyeri, Kiambu, and Isiolo in Kenya face inefficiencies. This study aimed to determine the influence of health financing on the management of HPTs. The utilization management theory guided the research. The research was conducted in Kisumu, Kiambu, Machakos, Nyeri, and Isiolo counties, using the pragmatism paradigm to support a mixed-methods design. Quantitative data utilized a descriptive research design, while qualitative data employed an exploratory design. A census sampling method was used in the study where 141 staff managing HPTs at level 4 and 5 public health facilities were targeted. Participants were drawn from clinical, pharmacy, service delivery, and administration departments. Key informant interviews were conducted with County Directors of Health and County Pharmacists. Data collection involved pre-tested questionnaires and key informant interview guides to ensure validity and reliability. Quantitative data was analyzed using descriptive and inferential statistics, while qualitative data was thematically analyzed. The study adhered to research ethics throughout the investigation. The study found that the model explained 53.5 % (R Square value of 0.535) of the variance in the management of HPTs. This meant that the model had strong explanatory power, but there was still a significant portion of variance (46.5%) that was not accounted for by these predictors. The HPTs financing had a coefficient of 0.231 implying that, for every one-unit increase in financing, the management of HPTs is expected to increase by 0.231 units, assuming all other factors remain constant. This positive coefficient suggests that better financing is associated with improved management of HPTs. HPTs financing provided the lowest significant contribution of 0.206 (Beta=0.206; t=2.683; P=0.009). The study concluded that HPTs financing provides a statistically significant influence on the management of HPTs in public hospitals in Kenya.

Keywords: *Health, Financing; Management, Products, Technologies*

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1. Introduction

Health products are defined as medications, vaccines, and devices used in disease prevention, diagnosis, treatment, and rehabilitation, as well as surgical and medical procedures (Wang et al., 2020). Management of Health Products and Technologies (HPTs) primarily focuses on the selection and quantification of products, purchasing, warehousing, and distribution, quality management and responsible use of HPTs, waste management of HPTs, a supply chain management system, as well as monitoring, evaluation, and research for HPTs. For the public to receive high-quality healthcare services when they need them, an efficient health product and technology management ensures that the HPTs are consistently available at the Service Delivery Points (SDP) at the appropriate quality, right quantity, and at the right time (Feyisa et al., 2021). Since devolution, counties have witnessed some improvements in the availability and affordability of health products, driven by decentralized financing, supply chain management reforms, and strategic partnerships. However, challenges like limited human resource capacity and inconsistencies in funding allocations, out stock of essential medicines and diagnostics continue to persist and still need to be addressed for sustainable improvements.

1.1 Problem Statement

Access to essential health products and technologies remains a persistent challenge in Kenya, particularly under the devolved system of governance. Variations in county-level capacities have led to inconsistencies in the availability, affordability, and quality of HPTs, undermining the overall effectiveness of healthcare delivery. Despite national policies and investments, many counties face systemic inefficiencies rooted in institutional issues such as weak health financing mechanisms, fragmented supply chain management, poor inventory control, inadequate human resources, and underutilized health information systems. These institutional challenges have a direct impact on how HPTs are managed, yet limited research has been conducted to comparatively assess these dynamics across counties. This study seeks to fill that gap by examining how key institutional determinants influence the management of health products and technologies focusing specifically on availability, affordability, and quality across multiple counties in Kenya. The findings will help inform targeted interventions and policy decisions aimed at improving access to essential health technologies nationwide.

1.2 Objective

To determine the influence of financing on the management of Health Products and Technologies in selected Counties, in Kenya.

2. Literature Review

Insufficient financing for health is one major challenge affecting health care services across the globe (Yamey et al., 2019). According to the WHO (2020), sustainable financing is a major factor that affects access to essential medicines, in addition to rational drug selection, reasonable prices, and dependable health and supply chain systems (Kabaniha et al., 2020). However, there is widespread concern about the uneven distribution of health products and technologies across medical care facilities globally (Abousheishaa et al., 2020) one predicament faced by health systems managers and administrators is ensuring the availability of sufficient funds and the sustainable budgeting to HPTs. Similarly, management of HPT funds has been proven concentrated in large hospitals that are located mainly in urban centers

or large and medium-sized cities across the globe. According to Tama et al. (2022), Health care facilities rely widely on imperative factors such as finances, which all play a role in ensuring the availability of HPTs to patients, and healthcare workers in the facilities can conduct mandates and duties expected from them. Finances play a universal driving role in the upgrade of healthcare systems and procuring the needed HPTs in the right quantities. Thus, the lack of enough funds has proved to be detrimental to patient's health and the performances of healthcare workers across hospitals. According to Varasteh et al. (2022), the administration of health products and technologies, and more specifically, the delivery of vital medical services, is significantly impacted by HPT finance in the Iranian province of Isfahan's healthcare facilities. The study conducted in Iran aimed at assessing the availability of health resources such as finances, warehouses to store medical equipment and medicines, and finally available trained workers in selected healthcare centers across the country to manage the health finances.

Another quantitative research conducted in China by Baek et al. (2018) revealed that a shortage of health financing caused by the increasing population across the country leads to a medical crisis when the demand for healthcare services subsequently exceeds the supply of medical products and technologies supported by the available health finances. Without effective financial protection mechanisms for healthcare costs, the fundamental human right to health cannot be upheld because of the severe economic, emotional, and physical effects caused by the absence of such systems (Fatima et al., 2018). Despite the rise in demand for medical services, Gong et al. (2020) report that major healthcare systems around the world have financial difficulties. This would jeopardize their ethical frameworks, equality, and fairness across their workplaces. Health finances are required to be readily available for all healthcare facilities to ensure that low mortality rates and morbidity arts to be achieved.

Management of medical technologies in developing countries, especially across Africa, has been paralyzed by poor allocation of funds, and support from local and national governments. Non-Government Organizations and local/ national governments should thereby work towards the achievement of fair quality medical care. To identify various factors that affect the efficient provision of medical care services and their management in various counties throughout the nation, (Karanja et al., 2018) conducted a qualitative study across healthcare facilities in Kenya. The study showed that health facilities in Kenya's marginalized regions, particularly in the North, not only face a shortage of funding but also inadequate administration of the monies that are available. Gitobu et al. (2018) conducted a follow-up investigation in Machakos County to ascertain the effects of limited resources on the administration of medical supplies and technologies. Healthcare services in the county found that although most hospitals had trained nurses, they had trouble finding certified pharmacists who had the necessary skills to manage health commodities and technologies because of a shortage of funding. Furthermore, citing the nation's recent inflation, both the local and national governments have been hesitant to provide sustainable funding to healthcare facilities (Hossain et al., 2019). The country's mortality and morbidity rates have risen as a result.

Temmerman, (2019) recommends that hospitals should have an outlined annual budget that encompasses all possible resources required in the health facilities including equipment, and medicines to ensure effective management of health products and technologies. This is to ensure that workers conduct their mandates effectively and make quality therapeutic decisions

needed for proper management of the hospitals and delivery of effective medical care (Moshiro et al., 2018). Underpinned by Tama et al. (2018) other resources such as warehouses or drug stores have been widely ignored by healthcare management. The argument is that lack of funds to procure such leads to unprecedented challenges in the storage of health commodities, and they should thereby ensure that such finances are set up for hospitals to offer effective HPT management.

Leadership plays a crucial role in the management of Health Products and Technologies for advancing UHC because it ensures the establishment and maintenance of the systems for the system's organization, finance, and regulation as well as those for facilitating coordination, participation, and accountability. Effective leadership has to do with how hospital administrators support mentoring and oversight in various departments dealing with the management of HPTs in healthcare facilities, as well as policy and legal modeling on health commodity security in healthcare facilities, to achieve effective management of health products and technologies (Fursman, 2020), ensuring that HPTs are efficiently managed and that they are accessible and affordable to everyone, regardless of their socioeconomic status. Studies on the leadership culture at healthcare facilities focusing on medical products, vaccines, and technologies have been carried out in Asian nations. According to a qualitative study on health facilities in Asia, there are several leadership parameters that make it difficult to manage health technologies and medical commodities, amongst them, poor communication skills (Nicola et al., 2020). Communication skills are important for effective leadership in the management of HPTs for UHC. Good communication skills can ensure that there is effective communication between different stakeholders involved in the management of HPTs. Effective communication can facilitate the sharing of information, ideas, and knowledge among different stakeholders, including health professionals, policymakers, and patients. Effective communication can also help to build trust and rapport among stakeholders, which is essential for successful collaboration. According to Sharma et al. (2020) in a study conducted in Indian hospitals, communication skills are critical in creating a shared vision, ensuring that all stakeholders are aligned, and facilitating the exchange of information between teams. In addition, in another study in the United Nations, effective communication can help to promote transparency, which is essential in managing health products and technologies (Pilgrim & Bohnet-Joschko, 2019).

3. Methodology

The study took place in Kisumu, Kiambu, Machakos, Nyeri, and Isiolo counties to determine the influence of financing on the management of health products and technologies in selected Counties, in Kenya. The research was anchored on the Pragmatism paradigm because it is basically based on the existing body of knowledge that is fixed, observable, and objective as well as multiple, socially constructed by individuals. Pragmatists believe that the nature of knowledge is both quantifiable (objective knowledge) using scientific research as well as gained through in-depth understanding (Park et al., 2020). Pragmatist's beliefs are both single and multiple.

A descriptive cross-sectional research design and interviews, both anchored by the pragmatism paradigm, were used in the study. Staff dealing with the management of health products and technologies directly or indirectly at the service delivery in level 4 and 5 public health facilities in Kisumu, Nyeri, Isiolo, Kiambu, and Machakos Counties were the study's target group. The

study also targeted the county health management team from the selected counties as the key informants. The interview schedule was used to collect data. Pretesting of the data collection tools was conducted at Kajiado County. A census sampling method was used in the study where 141 staff managing HPTs at level 4 and 5 public health facilities were targeted. Key informant interviews were conducted with the County Health Management Team. Ethical considerations were considered.

4. Results and Discussion

Descriptive statistic results for the study variables are provided in this section. The specific descriptive statistics analysed included frequencies, percentages, mean, and standard deviation. Mean value less than three (M<3) indicated disagreement (Samejima, 2016). The mean value of three (M=3) indicated moderate agreement while, a mean value greater than three (M>3) indicated positive agreement (Samejima, 2016). Further, Standard Deviation (SD) less than one confirmed less variability in the scores.

4.1 Financing factors influencing the management of HPT

The study sought the main financial factors influencing the management of HPTs in public hospitals.

Table 1: Financing factors influencing the management of HPT

County	Amount of Budgetary Allocation	Frequency of funds allocation	Frequency of funds disbursement	Rate if budget absorption	N	Pearson Chi-Square	P Value
Kiambu	10(76.9%)	1(7.7%)	2(15.4%)	0(0.0%)	13	9.183	0.687
Isiolo	13(92.9%)	0(0.0%)	1(7.1%)	0(0.0%)	14		
Machakos	27(73.0%)	1(2.7%)	7(18.9%)	2(5.4%)	37		
Kisumu	19(82.6%)	1(4.3%)	3(13.0%)	0(0.0%)	23		
Nyeri	18(94.7%)	0(0.0%)	1(5.3%)	0(0.0%)	19		
Total	87(82.1%)	3(2.8%)	14(13.2%)	2(1.9%)	106		

The results indicated that across the counties, the amount of budgetary allocation was overwhelmingly perceived as the most critical factor affecting the management of HPTs, 87(82.1%). Nyeri County had the highest proportion of respondents (94.7%) citing budgetary

allocation as a critical factor. Frequency of Funds Allocation was considered by only 3(2.8%) of respondents; Kiambu, Machakos, and Kisumu percentages (7.7%, 2.7%, and 4.3%, respectively). Frequency of Funds Disbursement was viewed as an important factor by 14(13.2%) of respondents, with Machakos County reporting the highest proportion (18.9%) while Nyeri County had the lowest views (5.3%). The rate of Budget Absorption was considered by only 1.9% (2 out of 106) of respondents as a factor affecting HPT management. Only respondents from Machakos County identified this factor, indicating that it was not seen as a major concern in other counties. The Chi-Square test results suggested that there was no significant variation in these perceptions across the different counties, implying that these views were relatively uniform regardless of the county (χ^2= 9.183, p-value = 0.687).

During the key interviews on how financing is structured for health products and technologies, the respondents recorded that funding for HPTs comes from own source revenue, the Health Budget, as well as government disbursements. One of the officers in the interview (KI1) pointed out that:

> "*… The county uses the facility improvement fund to finance health products, with funds generated at hospitals ring-fenced for use at source. Health products are financed from health budgets, own source revenue (FIFs), and county allocations. HPTs are financed through county allocations, MOH allocation for program items, and donations. HPTs are mainly for essential medicines and medical supplies, while HPTs for malaria, HIV, TB, and family planning programs are held centrally by the national government. Funding for HPTs comes from the FIF and the Health Budget, as well as own revenue and government disbursements…" (KII, Female, 001, 4th May, 2024).*

Further, interviews were conducted to assess the health financing factors influencing HPTs. Key respondent number two suggested that:

> *"… Factors affecting HPTs include insufficient allocated funds, pharmacy staff shortages, limited real-time visibility, difficult terrain, delays in fund disbursements, poor record-keeping practices, lack of ICT support, nomadic lifestyle, and infrastructural challenges. Expired supplies disposal and redistribution are not funded. Insufficient funding for HPTs and management systems can result in stock-outs due to budget constraints…" (KII, Male, 002, 4th May, 2024).*

The study established that health financing is a critical factor affecting the availability of quality and affordable health products and technologies. The results concurred with those of Shangala (2020) that, insufficient budgetary allocations significantly hindered the effective management of health projects in Nairobi City County. Similarly, in Uganda, Kiwanuka et al. (2021) observed that budgetary constraints were the primary challenge in managing health service delivery, further reinforcing the importance of adequate financial resources. However, a study by Mboera et al. (2021) in Tanzania disagreed, suggesting that while budgetary allocation is important, the frequency of funds disbursement plays a more critical role in ensuring timely execution of health programs, indicating that factors other than budget allocation may be more influential in some contexts (Mboera et al., 2021).

The study established how the facilities received budget allocation.

Table 2: Frequency of Budgetary Allocation to Health Facilities

County	Quarterly	Yearly	Half Yearly		Pearson Chi-Square	P Value
Kiambu	12(92.3%)	1(7.7%)	0(0.0%)	13	23.346	0.003
Isiolo	6(42.9%)	7(50.0%)	1(7.1%)	14		
Machakos	30(81.1%)	5(13.5%)	2(5.4%)	37		
Kisumu	21(91.3%)	2(8.7%)	0(0.0%)	23		
Nyeri	19(100.0%)	0(0.0%)	0(0.0%)	19		
Total	88(83.0%)	15(14.2%)	3(2.8%)	106		

The study found that the majority of health facilities 88(83.0%) received their budgetary allocation quarterly, while 14.2% received it yearly, and only 2.8% received it half-yearly. The Pearson Chi-Square statistic indicated a statistically significant difference in the distribution of budgetary allocation frequencies across the counties (χ^2= 23.346; p-value = 0.003). This implied that the frequency with which health facilities received their budgetary allocation significantly varies by county. This variability suggested that some counties might have more consistent budgetary processes than others, which could impact the management and operations of health facilities in those regions including timely procurement of HPTs.

The findings agreed with those of Nagaraj and Deepalakshmi (2020) in Nigeria that health facilities receiving quarterly allocations had better operational efficiency compared to those receiving funds less frequently. Similarly, in Ghana, Nsiah et al. (2022) observed that irregular budget disbursement led to disruptions in healthcare service delivery, aligning with the study's findings of variability in budget allocation frequencies affecting facility management (Nsiah et al., 2022). However, a study by Chilunjika et al. (2024) in Zimbabwe disagreed, arguing that while budget frequency is important, the total amount of funding received plays a more crucial role in determining the effectiveness of health facility operations, suggesting that budget consistency alone may not be sufficient to ensure optimal management (Chilunjika et al., 2024).

4.2 Accuracy of budget estimates for health products and technologies

Table 3: Confidence in the accuracy of budget estimates

County	Not Confident	Slightly Confident	Moderately Confident	Very Confident	Extremely Confident	N	Chi-Square	P Value
Kiambu	2(15.4%)	2(15.4%)	3(23.1%)	5(38.5%)	1(7.7%)	13	20.756	0.188
Isiolo	3(21.4%)	4(28.6%)	5(35.7%)	1(7.1%)	1(7.1%)	14		
Machakos	6(16.2%)	9(24.3%)	19(51.4%)	3(8.1%)	0(0.0%)	37		
Kisumu	3(13.0%)	5(21.7%)	6(21.7%)	9(39.1%)	0(0.0%)	23		
Nyeri	2(10.5%)	3(15.8%)	9(47.4%)	5(26.3%)	0(0.0%)	19		
	16(15.1%)	23(21.7%)	42(39.6%)	23(21.7%)	2(1.9%)	106		

The results showed how respondents from different counties rated their confidence in the accuracy of budget estimates for HPTs. The Pearson Chi-Square test assessed whether there was a statistically significant difference in confidence levels across the counties. The study revealed that most respondents 42(39.6%) across all counties are "Moderately Confident" in the accuracy of budget estimates for HPTs, followed by those who are "Slightly Confident" and "Very Confident." Overall, most respondents in Kiambu were either "Moderately Confident" or "Very Confident" about the accuracy of budget estimates, with fewer respondents at the extremes of confidence. In Isiolo, confidence is more evenly distributed across the lower and middle levels, with the majority being either "Moderately Confident" or "Slightly Confident." Additionally, most respondents in Machakos county were moderately confident 51.4% (19 respondents) with fewer respondents expressing either very low or very high confidence. Like Kiambu, Kisumu has a higher proportion of respondents who are "Very Confident," 39.1% (9 respondents) with no respondents feeling "Extremely Confident." In Nyeri, most respondents are "Moderately Confident," with some also being "Very Confident," 47.4% (9 respondents), and none reporting extreme confidence. Therefore, among the five counties, Kiambu and Kisumu counties have ensured the accuracy of budget estimates compared to Machakos, Nyeri, and Isiolo counties. The statistical analysis indicated that these variations in confidence levels across the counties were not statistically significant, suggesting that the confidence in budget estimate accuracy is consistent across regions (χ^2=20.756; P=0.188).

Most of the staff involved in the management of health products and technologies lack confidence in the accuracy of the budgetary allocation for health products and technologies. Musabi et al. (2020) found similar confidence levels in budget estimate accuracy for health products in Nakuru County, with most respondents being moderately confident. Similarly, Otieno et al. (2020) reported comparable results in Mombasa County, noting a consistent distribution of confidence across different levels (Otieno et al., 2020). However, Kosgei (2020)

presents contrasting evidence from Uasin Gishu County, where a significantly higher proportion of respondents expressed extreme confidence in budget estimate accuracy, diverging from the patterns observed in this study.

Table 4: Kruskal-Wallis H Test Results

Ranks				Test Statistics	
Description	County	N	Mean Rank	Kruskal-Wallis H	P Value
Timely disbursement of funds affects the management of Health	Kiambu	13	72.62	9.182	.057
	Isiolo	14	61.71		
	Machakos	37	48.68		
	Kisumu	23	47.78		
	Nyeri	19	50.68		
Stakeholders' involvement	Kiambu	13	60.08	10. 673	.030
	Isiolo	14	47.79		
	Machakos	37	44.59		
	Kisumu	23	68.48		
	Nyeri	19	52.42		
Confidence in the accuracy of budget estimates	Kiambu	13	63.46	5.883	.208
	Isiolo	14	45.61		
	Machakos	37	46.80		
	Kisumu	23	59.37		
	Nyeri	19	58.45		
Fairness and appropriateness of budget allocations	Kiambu	13	57.04	2.538	0.638
	Isiolo	14	43.18		
	Machakos	37	57.23		
	Kisumu	23	52.74		
	Nyeri	19	52.34		
Budget allocations alignment	Kiambu	13	47.92	6.478	.166
	Isiolo	14	37.86		
	Machakos	37	54.81		
	Kisumu	23	57.70		
	Nyeri	19	61.21		
Efficiency of absorbing allocated budgets	Kiambu	13	60.08	8.425	0.077
	Isiolo	14	43.79		
	Machakos	37	46.00		
	Kisumu	23	57.37		
	Nyeri	19	66.08		
Disbursement process aligns with the planned budget timelines	Kiambu	11	40.50	9.148	0.057
	Isiolo	9	27.78		
	Machakos	29	38.79		
	Kisumu	18	46.97		
	Nyeri	17	53.18		
Level of satisfaction with the	Kiambu	13	44.42	15.534	0.004

Ranks				Test Statistics	
Description	County	N	Mean Rank	Kruskal-Wallis H	P Value
clarity of communication regarding funds disbursement	Isiolo	14	29.82		
	Machakos	37	54.00		
	Kisumu	23	63.89		
	Nyeri	19	63.61		
Believe improvements in health financing system	Kiambu	13	73.81	28.745	0.000
	Isiolo	14	68.82		
	Machakos	37	57.92		
	Kisumu	23	27.78		
	Nyeri	19	50.84		

The table summarized the results of a Kruskal-Wallis H test, a non-parametric statistical test used to compare the mean ranks between groups. The test determined if there were statistically significant mean differences between the groups by the counties. The study revealed that Kiambu county had the highest mean value in the timely disbursement of funds affecting the management of health (72.62), followed by Isiolo (61.71), Machakos (48.68), Kisumu (47.78), Nyeri (50.68). However, there was no statistically significant difference in the perception of how timely disbursement of funds affects the management of health across the counties (Kruskal-Wallis H: 9.182, P-Value: .057).

In terms of the effectiveness of stakeholders' involvement in the planning and budgeting the health, Kisumu County depicted the highest mean rank compared to other counties; Kisumu (68.48), Kiambu (60.08), Nyeri (52.42), Isiolo (47.79), Machakos (44.59). This implied that Kisumu County involves stakeholders in the planning and budgeting for health products and technologies other than Kiambu County, Nyeri County, Isiolo, and Machakos County. The mean rank was a statistically significant difference in stakeholder involvement in the budgeting process across the counties, suggesting that the perception of stakeholder involvement varied meaningfully between the regions (Kruskal-Wallis H= 10.673, P-Value: .030).

The study observed that Kiambu County observed budget estimate accuracy (mean=63.46), followed by Kisumu (59.37), Nyeri (58.45), and Machakos (46.80) while Isiolo County (45.61) had low means in observing the accuracy in budget estimates. Nevertheless, the mean differences in the confidence in the accuracy of budget estimates among the counties were not significant with a p-value greater than 0.05 (Kruskal-Wallis H= 5.883, P-Value: .208).

Machakos County (57.23) had the highest means in fairness and appropriateness of budget allocations, Kiambu (57.04), Kisumu (52.74), Nyeri (52.34), and Isiolo (43.18). Notwithstanding, the p-value was well above 0.05, indicating no significant difference in the perceived fairness and appropriateness of budget allocations across the counties (Kruskal-Wallis H=2.538, P-Value= 0.638).

The study also found that Nyeri County (61.21) had budget allocations aligned with the priorities and needs of HPT management followed by Kisumu (57.70), Machakos (54.81), Kiambu (47.92), Isiolo (37.86). Their mean difference in perception of budget alignment was not statistically significant (Kruskal-Wallis H= 6.478, P-Value: .166).

The means ranks showed that Nyeri (66.08) topped in efficiency of absorbing allocated budgets compared to other counties under investigation; Kiambu (60.08), Isiolo (43.79), Machakos (46.00), Kisumu (57.37). Nevertheless, there was a non-significant difference in the efficiency of absorbing allocated budgets across the counties (Kruskal-Wallis H: 8.425, P-Value: 0.077).

Nyeri (53.18) had aligned the disbursement process with the planned budget timelines, followed by Kisumu (46.97), Kiambu (40.50), Machakos (38.79), Isiolo (27.78). The p-value of 0.057 suggested a trend towards significance, but it was not quite below or equal to the conventional alpha of 0.05 threshold, indicating no statistically significant difference in how the disbursement process aligned with planned budget timelines across the counties (Kruskal-Wallis H: 9.148, P-Value: 0.057).

The study revealed that Kisumu (63.89) and Nyeri (63.61) counties had comparative mean ranks in ensuring clarity of communication regarding funds disbursement while Machakos (54.00), Kiambu (44.42) and Isiolo (29.82) had lower level of communication clarification respectively. The p-value of 0.004 indicates a statistically significant difference in the level of satisfaction with the clarity of communication regarding funds disbursement across the counties, with some counties reporting significantly higher satisfaction than others (Kruskal-Wallis H: 15.534, P-Value: 0.004).

In terms of whether improvements in the health financing system could positively impact HPT management, the study identified, that Kiambu (73.81) and Isiolo (68.82) counties could improve the greatest, followed by Machakos (57.92), Nyeri (50.84) and Kisumu (27.78) with Kisumu having the lowest potential for improvement among the counties assessed. The p-value of 0.000 indicates a highly statistically significant difference in the belief in improvements in the health financing system across the counties, suggesting strong variability in how different regions perceive changes in the system (Kruskal-Wallis H = 28.745, P-Value: 0.000). In essence, the data suggested that some counties, particularly Kiambu and Isiolo, viewed the potential impact of health financing improvements on HPT management more positively than others, and these differences are not due to random chance but are statistically significant.

In agreement with the findings, Kilimo et al. (2022) highlighted that the involvement of stakeholders in the planning and development of health systems is crucial for effective health service delivery, with higher engagement leading to improved health outcomes similar to Kisumu County's higher mean rank in stakeholder involvement (Kilimo et al., 2022). Furthermore, Allen (2023) emphasized the significance of clear communication regarding fund disbursement in the management of health projects, aligning with the significant differences observed in communication clarity across counties in this study (Allen, 2023). However, contrary to the findings, a study by Shangala (2020) in Nairobi County argued that the timely disbursement of funds does not always correlate with better health management outcomes, suggesting that other factors such as leadership and infrastructure play more critical roles (Shangala, 2020).

4.3 Financing for Health Products and Technologies

The study determined the responses on financing of HPTs in public hospitals.

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Table 5: Respondents' Opinions on HPTs Financing in Public Hospitals

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	M	STD.DEV
The amount of budget allocated for HPTs affects the availability of HPTs.	5(4.7%)	6(5.7%)	11(10.4%)	18(17.0%)	66(62.3%)	4.28	1.128
Funds allocated for HPT are spent strictly on procurement and management of HPT	6(5.7%)	7(6.6%)	32(30.2%)	34(32.1%)	27(25.5%)	3.66	1.103
Sources of funding for HPT are reliable and sustainable.	15(14.2%)	27(25.5%)	38(35.8%)	23(21.7%)	3(2.8%)	2.75	1.031
Sustainable financing is a major factor that affects the availability of essential HPT	5(4.7%)	4(3.8%)	10(9.4%)	21(19.8%)	66(62.3%)	4.35	1.051
Health Financing plays a universal driving role in improving access to 4 health products and Tech2logies.	3(2.8%)	4(3.8%)	11(10.4%)	20(18.9%)	68(64.2%)	4.4	1.983
Funds allocated for HPTs are completely absorbed for the provision of HPTs for each allocation.	7(6.6%)	13(12.3%)	34(32.1%)	27(25.5%)	25(23.6%)	3.51	1.157
The rate of budgetary absorption for funds allocated for HPTs is a crucial aspect in the management of HPTs	2(1.9%)	2(1.9%)	14(13.2%)	33(31.1%)	55(51.9%)	4.32	.846
There are institutional factors that affect the absorption of the budget allocated for HPTs.	3(2.8%)	8(7.5%)	23(21.7%)	41(38.7%)	31(29.2%)	3.88	.992

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	M	STD.DEV
Funds allocated for the financing of HPTs is specifically used for that purpose and 2t diverted to any other use within or outside the facility.	8(7.5%)	17(16.0%)	29(27.4%)	27(25.5%)	25(23.6%)	3.44	1.204
The budgeting process for HPTs is participatory and involves stakeholders dealing with the management of HPTs.	10(9.4%)	12(11.3%)	27(25.5%)	30(28.3%)	27(25.5%)	3.51	1.229
Funds allocated for HPTs are released in a timely manner without delays.	24(22.6%)	25(23.6%)	29(27.4%)	22(20.8%)	6(5.7%)	2.64	1.205
The health facility has no outlined annual budget that encompasses all possible resources required in the management of Health products and technology	34(32.1%)	30(28.3%)	21(19.8%)	12(11.3%)	9(8.5%)	2.40	1.292
Suppliers for health Products and Technologies are paid within the agreed terms outlined in the LPO/supply 4ment.	22(20.8%)	20(18.9%)	29(27.4%)	20(18.9%)	15(14.2%)	2.87	1.331
The facility experiences frequent stock out of HPTs due to inadequate allocation of finances.	5(4.7%)	11(10.4%)	22(20.8%)	27(25.5%)	41(38.7%)	3.83	1.191

A significant majority of respondents (79.3%) strongly agreed that the amount of budget allocated for HPTs affects their availability (mean = 4.28; standard deviation =1.128). This indicated a strong consensus that budget allocation is crucial for ensuring the availability of HPTs. Further, most respondents (82.1%) agreed or strongly agreed that sustainable financing was a major factor in ensuring the availability of essential HPTs, with a high mean of 4.35 and a standard deviation of 1.051. This underscored the critical importance of sustainable financial resources in maintaining HPT availability. The study also revealed that there was strong

agreement (83.1%) that health financing plays a universal role in improving access to health products and technologies, with a mean of 4.41 and a standard deviation of 0.983. This reflects a broad consensus on the centrality of financial support in enhancing healthcare access. A significant majority (83%) agreed or strongly agreed that the rate of budgetary absorption was crucial in managing HPTs, with a mean of 4.32 and a standard deviation of 0.846. This indicated a strong belief in the importance of effectively utilizing allocated funds within the stipulated time frame.

On the other hand, the concerns regarding the timely payment of suppliers (39.7%), with a mean of 2.87 and a standard deviation of 1.331, suggested delays in fulfilling financial obligations, which could impact the supply chain. Also, many respondents (60.4%) disagreed or strongly disagreed that their facility had an outlined annual budget encompassing all resources required for managing HPTs, with a mean of 2.40 and a standard deviation of 1.292. This indicates a lack of comprehensive budgeting in many facilities. A substantial number of respondents (39.7%) disagreed or strongly disagreed that the sources of funding for HPTs were reliable and sustainable, reflected by a mean of 2.75 and a standard deviation of 1.031. This pointed to concerns regarding the long-term viability of current funding sources. Addressing these issues required targeted interventions to streamline financial processes and ensure the efficient use of allocated resources.

The key respondents responded that they have financial challenges.

"…Factors affecting HPT management include long lead times, bureaucracy, transportation issues, insufficient budgets, erratic supply of key products, unsupported upfront payments from suppliers, and funding for supply chain activities. Lack of overall visibility and human resources.
Lack of an electronic system to assist in quantification, selection, and inventory management is one of the major challenges. Inadequate storage warehouses for HPTUs. Inadequate staff, inadequate inventory management systems, pilferage, unaccountability of HPTs, long procurement lead times, and the absence of a standard county store. The counties are experiencing frequent stockouts and a low fill rate from KEMSA, the primary government agency responsible for drug supplies. Either, financial allocation for commodity purchases, pilferage, and theft are some of the other challenges…" **(***KII, Male, 003, 24th June, 2024***).**

4.4 Diagnostic Tests Results

Diagnostic tests were conducted to ensure that appropriate statistical tests were applied in the analysis to ensure precision in estimations.

Shapiro-Wilk Test is appropriate with cases above 50 (n=106). The study conducted the normality test for all variables.

Table 6: Shapiro-Wilk Test of dependent variable

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Dependent variable	Statistic	df	Sig.	Statistic	df	Sig.
HPTs Management	.074	106	.181	.979	106	.090

a. Lilliefors Significance Correction

The results depicted a Shapiro-Wilk test statistic of .979. The closer this value is to 1, the more likely the data is normally distributed. The p-value > 0.05 indicated non-significant values, suggesting that there is no significant deviation from normality. The degree of freedom provided the number of observations in the data sets. Therefore, the scores on the dependent variable were normally distributed, which guided the researcher to apply parametric techniques.

A multicollinearity test was conducted to determine the level of interrelationship among the independent variables.

Table 7: Multicollinearity test

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
(Constant)	-6.025	5.198		-1.159	.249		
Financing	.231	.086	.206	2.688	.008	.794	1.259

a. Dependent Variable: Management of HPTs

Source: Field data (2024)

From the analysis, all the tolerance values for all independent variables were less than 1.0 and greater than 0.1 while all Variance Inflation Factor values were greater than 1.0 and less than 10 implying that there was no violation of the assumption of multicollinearity among the independent variables.

4.5 Correlation Analysis

Bivariate Pearson product-moment correlation analysis was used to measure the strength and direction of the relationship between independent variables and dependent variables. Further, the analysis assessed whether the associations reached statistical significance or not.

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Table 8: Correlations

		Y	X2
Y	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	106	
X1	Pearson Correlation	.423**	1
	Sig. (2-tailed)	.000	
	N	106	106

Y=HPTs management; X1=HPTs financing

The study revealed that all the predictor variables had positive and significant associations with the criterion variable. In particular, HPTs financing positive, moderate, and significant association with the management of HPTs (r=.423**, n=106, P=0.000). The results implied that higher levels of financing are associated with better management of HPTs and the relationship would be unlikely to be due to random variation in the sample.

4.6 Regression Analysis

The study evaluated the fit and performance of regression models. Model summary was crucial for understanding how well the models explained the variability in the dependent variable based on the independent variables.

Table 9: Model Summary

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.732[a]	.535	.512	4.886	.535	23.029	5	100	.000
2	.732[b]	.536	.507	4.908	.000	.092	1	99	.762

The R Square value of 0.535 indicated that 53.5% of the variance in the management of HPTs was explained by the five predictors in Model 1. This meant that the model had moderate to strong explanatory power, but there was still a significant portion of variance (46.5%) that was not accounted for by these predictors. This was a very high proportion, indicating that the model was very effective at predicting the dependent variable and that the chosen independent variables were appropriate and sufficient for explaining the dependent variable.

Table 10 Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2748.818	5	549.764	23.029	.000[b]
	Residual	2387.267	100	23.873		
	Total	5136.085	105			
2	Regression	2751.031	6	458.505	19.032	.000[c]
	Residual	2385.054	99	24.091		
	Total	5136.085	105			

The results represented ANOVA test for two regression models predicting the management of HPTs. The F-statistic was lower for Model 2 (19.032) compared to Model 1 (23.029). This

reduction suggested that adding the leadership culture variable does not improve the model as much as the original set of predictors did. However, despite the slight decrease in the F-statistic, the model remained statistically significant, with a p-value of 0.000, indicating good fitting for the data in explaining the variation in the dependent variable.

Agreeing with the results, Inastrilla (2022) argued that while adding variables such as leadership to regression models could potentially enhance predictive power, it does not always lead to substantial improvements, especially if the original predictors already strongly explain the variance in the dependent variable (Inastrilla, 2022). Similarly, Lahariya (2020) found that introducing additional variables in a model sometimes results in a lower F-statistic without significantly enhancing the model's overall explanatory power, as observed in their study on technology management (Lahariya, 2020). On the other hand, contrary to these findings, Khatoon (2020) suggested that the inclusion of leadership as a predictor often enhances model performance in predicting management outcomes, indicating that the effectiveness of additional variables may depend on the specific context of the research (Khatoon, 2020).

The study estimated the standardized weights before introducing the moderating effect of new predictors to test the individual unique contribution towards the total variance in dependent measure. This would enable the study to understand whether the individual predictive ability of the variables is moderated by entering leadership variables in the model.

Table 11: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-6.025	5.198		-1.159	.249
	X1	.231	.086	.206	2.688	.008

a. Dependent Variable: HPT Management

HPTs financing provided the lowest significant contribution of 0.206) (Beta=0.206; t=2.688; P=0.008).

4.7 The Regression Weights After Entering the Mediating Variable in the Model

The study estimated the individual predictor's significant contribution to the total variance on dependent measures after introducing the institutional leadership culture as a mediating variable.

Table 12: The regression weights after entering the mediating variable in the model

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-6.025	5.198		-1.159	.249
	Financing	.231	.086	.206	2.688	.008
2	(Constant)	-7.021	6.171		-1.138	.258
	Financing	.231	.086	.206	2.683	.009
	Leadership Culture	.023	.077	.021	.303	.762

a. Dependent Variable: Management of HPTs

The HPTs financing had a coefficient of 0.231 implying that, for every one-unit increase in financing, the management of HPTs is expected to increase by 0.231 units, assuming all other factors remain constant. This positive coefficient suggests that better financing is associated with improved management of HPTs. HPTs financing provided the lowest significant contribution of 0.206 (Beta=0.206; t=2.683; P=0.009).

5. Conclusion

The study concluded that HPTs financing provides a statistically significant influence on the management of HPTs in public hospitals in Kenya.

6. Recommendations

Recommendation County governments should prioritize increasing fiscal discipline by ensuring that monies allocated for the purchase of HPTs are used strictly for that purpose. The County government to ensure timely authorization of AIEs for the purchase of HPTs. The health facilities should adopt transparent budgeting and involve all the key stakeholders in financial allocation to increase accountability and timely payment of suppliers. The counties also rationalize and increase the budget allocated for HPTs to ensure that public hospitals have sufficient financial resources to manage HPTs effectively. Further, it is recommended that the process of funds disbursement be streamlined to ensure that allocated budgets reach the hospitals on time. This would enable better planning and utilization of funds, reducing the risk of shortages or delays in HPTs management. Counties should invest in capacity-building initiatives to enhance the financial management skills of healthcare administrators. This would improve the efficiency with which allocated budgets are absorbed and utilized, ensuring that funds are directed towards critical needs without wastage. The study advises the county government to implement a system for regular monitoring and evaluation of how funds are utilized in the management of HPTs. This would help identify inefficiencies and areas for improvement, ensuring that financial resources are used optimally. Further, counties should consider increasing the frequency of budget allocation to align more closely with the operational needs of public hospitals. More frequent disbursements could help address the dynamic needs of HPT management, ensuring the continuous availability of essential health products and technologies.

From a practical perspective, the findings highlighted the need for hospitals to focus on strengthening specific areas that significantly impact HPT management. Practitioners should prioritize the following:

Promote strict fiscal discipline where financial resources allocated for the procurement of HPTs are used for that purpose.
Diversification of health financing including engagement with donors and generation of own revenue through establishment of revolving fund drug unit for sustainability.

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