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Local Supply Chains for Medicines and Medical Supplies in Kenya: Understanding the Challenges

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A Working Paper from the *Industrial Productivity, Health Sector Performance and Policy Synergies for Inclusive Growth* (IPHSP) research project

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1. Local Supply Chains for Medicines and Medicinal Supplies in Kenya: Understanding the Challenges

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Abstract

This Working Paper presents some findings from a research project on *Industrial Productivity and Health Sector Performance, collaborative* research by the African Centre for Technology Studies (ACTS), Nairobi; REPOA, Dar es Salaam; and The Open University, UK. The project aimed to identify opportunities for improved local industrial supply of medical products to strengthen Kenyan and Tanzanian health system performance. This working paper briefly outlines project methods and key concepts. It then summarises findings from health sector research in four Kenyan districts on the supply chains for selected essential medicines and supplies to facilities in the public, private and faith-based sectors and to private shops. The paper analyses strengths and weaknesses of the public and private supply chains into the health sector, as seen by health facility and pharmacy staff.

Keywords : essential medicines, medical supplies, availability, supply chains, Kenya

Acknowledgements

1. Introduction

This Working Paper presents some findings from an independent research project funded by the UK Economic and Social Research Council with financial support from UK DFID. This collaborative research project was implemented by the African Centre for Technology Studies (ACTS), Nairobi; REPOA, Dar es Salaam; and The Open University, UK. The project aimed to identify opportunities for improved local industrial supply of medical products to strengthen Kenyan and Tanzanian health system performance.

The project's target audience is researchers, policy makers and practitioners in both health and industrial sectors. The objective of the study in Kenya was to identify the extent to which improved supply of medicines and other essential supplies and equipment from local manufacturers into the health sector in Kenya could improve health system performance while contributing to industrial development.

This project Working Paper reports findings from health sector research during 2012-13. The supply chains of essential medicines and medical equipment and supplies from local industries and from imports into the health systems in Tanzania and Kenya were investigated, using in-depth case studies in four districts in each country. Shortages and unaffordability of these commodities are persistent causes of exclusionary and poor quality health care in low income Africa (WHO 2011). After explaining background and methodology (Sections 2 and 3), this paper outlines new findings (Section 4) on the supply chains for essential medicines and supplies and the availability of a tracer set of medicines and supplies in sample facilities and shops in Kenya . Finding in Section 4 include strengths and weaknesses of the public and private supply chains into the health sector, as seen by health facility and pharmacy staff. Section 5 concludes. A second working paper (Kariuki et al 2014)) builds on this paper, and examines the pattern of locally made vs. imported supplies in the different health sector supply chains in Kenya, and the views of health sector respondents on the scope and potential implications of increasing locally manufactured supplies.

Early findings from this project were presented at a Policy Dialogue workshop in Dar es Salaam, Tanzania in June 2013. The presentations at that workshop are available on the ACTS project website at http://www.acts-net.org/programmes-projects/projects?id=24

Findings from the project as a whole were presented in a workshop in Nairobi, Kenya in September 2014, and a workshop in Dar es Salaam in November 2014. Presentations from these events are available on the project website at http://iphsp.acts-net.org.

2. Background

The Kenyan health sector

About 78% of Kenyans live in rural areas, yet a disproportionate share of health facilities are located in urban areas. This disparity is reflected in data for access to health services such as the share of newborns delivered at health facilities in Kenya (World Bank, 2010). Moreover, centralization has remained core in Kenyan governance since its independence in 1963 , resulting in spatial inequalities during the entire period (KPMG, 2013).

It is against this background that the public sector health care services have been devolved, subsequent to the study described here. Devolution of budgets and decision making has been the main emphasis of Kenyan Constitution of 2010(Republic of Kenya 2014).The rationale for devolution is articulated in article 176 of the constitution. Kenyan public sector health services have recently been reorganised, with health care management of secondary and primary care devolved to the County level and below. Within the public sector, the government handles public sector national referral health facilities and health policy, while county government handles county public sector health services, including county health facilities and pharmacies; ambulance services; promotion of primary health care.

The national policy objective (MoMS&MoPHSn.d.) is a health care system organised on a tiered basis, with effective upward referral from innovative local community, through primary care, primary referral to hospital, and then upward to national specialist referral hospitals .All hospitals and lower level facilities (health centres and dispensaries) in public, non-profit and private sectors are intended to be included in this framework (MoMS&MoPHSn.d.:22; Republic of Kenya n.d.(a)). When the fieldwork reported here was undertaken, the devolution to County and sub-County health care management was incomplete.

The Kenyan health system includes a substantial public sector alongside a large and rapidly growing private sector (Republic of Kenya n.d.(b): 99). Recent data(Table 1) show that 50% of health facilities are owned and operated by central and local government, 11% by faith-based organisations (FBOs), with the other 39% privately owned. However the large hospitals remain generally in the public sector.

Table 1 Distribution of Health Facilities in Kenya by Type and Ownership, 2014
(number of facilities)

Facility type	MOH	FBO	Local authority	PRIVATE	TOTAL
Hospital	278	84	1	136	499
Nursing homes	00	10	00	191	201
Health centres	769	172	29	21	991
Dispensaries	3193	671	69	203	4136
clinics	13	32	9	2854	2908
Total	**4253**	**969**	**108**	**3405**	**8735**

Source :data derived from Health Management Information Systems 2014

In addition, there are large numbers of pharmacies and drug shops, which play an important role in patients' access to essential medicines (Wafula 2012 : 21). Data are poor (MoMS 2010:5, 17). Of 1167 registered pharmacies, most are concentrated in urban areas (Republic of Kenya 2010: 28). An estimated 6000 licensed and unlicensed specialised drug shops were estimated to be operating in 2008 (Wafula 2012: 22), and are important for medicines access in rural areas.

This study investigated the extent to which supplies of selected medicines, medical supplies, medical equipment and basic essential heath care commodities were available in health facilities and shops as well as seeking to understand the challenges faced when sourcing.

3. Methodology

3.1 Study design

This study employed a convergent parallel mixed methods design (Ozawa et al 2013, Njeru et al 2011), where the quantitative and qualitative data was collected concurrently to study the supply chains in the case study districts. Quantitative data collection and analysis was done using lists of 'tracer' essential medicines and other essential equipment and supplies to the health sector; and qualitative in-depth interviews concerning experience of supply chain successes and challenges

3.2 Sample selection

 The Kenyan study was conducted in three counties from December 2012 to March 2013. The counties were selected purposively to represent a wide range of income and health outcomes. They included two predominantly rural counties: District 1 on the Coast, with low incomes and poor health indicators, and District 2 in the Rift valley bordering Tanzania, which is rural, fairly remote, but not so poor as the Coastal district. District 2 on the Tanzanian border was chosen because we wanted to examine the supply chains in the two countries and see if they were integrated along the border area. The urban Districts 3 and 4, both in Nairobi, included one with relatively high incomes (District 4) selected to capture the higher end of the private health sector, and one with much lower incomes (District 3). The study was conducted at health facilities and drug distribution shops that were selected purposively. The health facilities included district hospitals, health centres, dispensaries and clinics whereas shops included pharmacies and drug shops: 34 health facilities and 21shops were sampled as shown in Table 2.

Table 2 Level / type of facility or shop by urban/rural location (number of facilities or shops)¹

Level / type of facility or shop	Ru-ral	Ur-ban	Total
Hospital	2	10	12
Clinic, medical centre	0	6	6
Health Centre	4	4	8
Dispensary	4	4	8
Pharmacy	2	11	13
Drug shop	4	4	8
Total	**16**	**39**	**55**

In each district, the *District Medical Officer* of *Health (DMOH)office was visited, to obtain a list of health facilities by the government, faith based organization and private sector. From the list in each sector, facilities in each category were identified and classified into: clinics, dispensaries,*

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1.   All tables are from project quantitative data unless otherwise stated. Percentages may not add to 100 because of rounding.

*health centres, nursing homes and hospitals).*Health facilities in all sectors, government, private and faith based, were sampled purposively, to include the district hospital, some lower-level government facilities and a range of non-government facilities that varied by district. Pharmacies and drug shops were randomly selected along main streets and also from interior of the district.

3.3 Research tools and study population

A questionnaire with checklists was employed to collect the quantitative data using 'tracer' lists of essential medicines and other essential equipment and supplies to the health sector. The semi-structured interview questionnaire included social-demographic questions, and an interview guide tailored to capture information on experiences, successes and challenges of medical supply chain. A total of 56study respondents were interviewed for the quantitative part of the study. Quantitative data collection entailed the use of tracer lists which were compiled on the basis of expert advice; Appendix Tables A1 and A2 list the items selected. In each facility and shop, information was collected, for each item, on availability on the shelves or in the wards, source of the item (manufacturer, country of manufacturer, and wholesale source if applicable), and price.

In total 58 in-depth interviews were undertaken with respondents including pharmacists, nurses, doctors and procurement officers. All the health facilities and shop interviews were carried out face-to-face. For the qualitative part of the study, where the main objective was to gain in-depth understanding of the supply chain and various factors that play a role in influencing behaviour and decisions. The data collection entailed in-depth interviews that were guided by open ended questions that allowed further prompting. The interview guide topics included: current price and quality issues; changes in availability and supply patterns; choice of suppliers with reasons; availability of working finance and problems of stock-outs; demand patterns and changes; impact of supply patterns for patients; processes and problems in procurement more generally; and finally experience of locally manufactured supplies as compared to manufactured imports in terms of product quality, cost, reliability and preferences of patients. In-depth interviews were conducted in each health facility and shop with respondents responsible and knowledgeable about procurement and supply issues.

3.4 Data analysis

On each survey form, the variables were cross-checked, cleaned and coded. Data on drug prices was calculated to get price per tablet/bottle. The data were imported into STATA for analysis using cross tabulations and other basic statistical analysis.

The qualitative analysis was conducted using NVivo 10.Data were transcribed by the research assistants combining the recordings and the notes. The data were coded and sorted into themes, then systematic analyses of information on various themes was carried out. The qualitative and quantitative data were triangulated using mixed methods methodology.

3.5 Ethical aspects

Scientific and ethical approvals were obtained from Kenyatta National Hospital Ethical Review Board prior to conducting the study. Before conducting the interviews, the purpose of the study was explained and it was made clear that participation in the study was voluntary and that the identity of the respondents would remain confidential. The respondents were also assured of protection against any form of victimisation. Upon receiving consent to participate in the study, the researcher

marked against the relevant responses "agreed". Collected information was kept in locked drawers to ensure confidentiality of the data, and processes on protected servers; data were anonymised before analysis.

4. **Findings**

4.1 Sourcing of medicines and medical supplies in all sectors

A total of 34 facilities and 21 shops were sampled as shown in Table 3. District 4, the wealthiest district, had the largest proportion of hospitals and clinics, reflecting the sampling frame for the districts; conversely the drug shops were found and sampled predominantly in Districts 1 and 2, the rural districts, and the lower income Nairobi District 3. Most of the lower level public health facilities sampled were in the rural areas. The private facilities, conversely, were mainly urban. Table 3 shows the district breakdown by sector of ownership; the private sector includes health facilities, pharmacies and drug shops, the public and FBO sectors contain only facilities.

Table 3 Sector of facility or shop, by district and urban/rural location (number of facilities/ shops)

District Sector	District 1 Coastal, rural	District 2 Other, Rural	District 3 Nairobi, low income	District 4 Nairobi, high income	Total
Public	4	5	3	2	14
FBO/NGO	1	2	4	3	10
Private	9	6	8	8	31
Total	**14**	**13**	**15**	**13**	**55**

4.1.1 Sourcingof medicines by public and faith-based sectors

The quantitative data indicate that the wholesale source for the medicines for the public facilities was largely KEMSA, whereas the private facilities and shops had bought medicines mainly from private wholesalers (Table 4).The only essential medicines that private facilities had obtained from the public sector were anti-retrovirals (ARVs) for the treatment of HIV/AIDS. The public facilities also sourced for a range of items by purchases from MEDS and private wholesalers.

Table 4 Wholesale source sector of tracer medicines, by sector of final use or sale (facility or shop) (percentage of all tracer medicines available by sector)

Wholesale sector	Sector of final use/ sale			Total
	Public	FBO/NGO	Private	
Public (KEMSA)	91.5	21.9	0.5	22.5
Non-profit (MEDS)	2.0	43.9	0	8.5
Private	6.5	34.2	99.5	69.1
Total	100	100	100	100

n=1015

The faith-based and NGO sector however had sourced the medicines from more varied sources: just less than half from MEDS, and substantial shares from KEMSA and from private wholesalers. The FBO/NGO facilities had bought the full range of tracer medicines from all wholesale sectors, except for ARVs, which had been sourced from KEMSA and the private sector only.

Public sector sourcing from KEMSA

The qualitative interviewing about procurement processes confirmed these findings, and also pointed up the time consuming and complex processes required to source items not acquired from KEMSA. The interviewing was undertaken at a period of transition in supply chains within Kenya, when some facilities were shifting from "push" systems – whereby KEMSA supplied kits of essential items – to "pull" ordering systems, while others had already moved to direct ordering ("pull"); patterns of delivery were also changing, and the facilities were also aware of a coming process of decentralisation and increased competition in public sector supply.

Some of the reported experiences with KEMSA as a supplier were the following.

KEMSA was regarded as providing good quality medicines:

> "KEMSA is actually supplying quality drugs…" (*Public dispensary District 2*)
>
> "The drugs are working". *(Public health centre, District 2)*

KEMSA's delivery system was also regarded as quite robust in some ways:

> The medicines are delivered right here; they are brought by a truck …. delivered by the driver. He is the one who will come with the documents you are supposed to sign. There is also another person they come with and even if they are not medical persons they know what is packed in all those cartons and you will go through the list with him and tick to confirm what is delivered. After [that] …, you will call back the number of the doctor who issued the drugs and confirm. *(Public health centre District 4)*

There were however many complaints concerning KEMSA's deliveries and stock-outs. Only one public sector facility interviewed (a dispensary in District 2) said that they had not experienced problems, saying "it is rare that they miss, most of the time we have them [required medicines]". Several others said there had been real efforts to improve supplies and meet delivery dates in the year before the interviews.

Late deliveries and stock-outs were common complaints. Some facilities were still receiving kits, and found that they sometimes arrived with items missing. These kits were part of the previous "push" systems that was being replaced by ordering. Those already ordering faced a number of problems, illustrated by the following comments.

> "Now [after moving to the "pull" system] what you order is what they give you, though it may not be the whole list of what you ordered". *(Public hospital District 2)*
>
> "At times KEMSA take a long time before they can supply and there is no specified period that they will come. At times we can even stay for almost even six months without getting these drugs". *(Public dispensary District 2)*

Some facilities allowed for these problems in their ordering plans:

> "Take for instance drugs like AL [first line anti-malarial medication]. We monitor how many patients use it on a monthly average. … So when budgeting [to make the order to KEMSA] we use the averages and multiply by three for the quarter then add a fourth month in order not to underestimate. … At times they deliver late so the one extra month buffer covers us"*(Public health centre District 1)*

Non-KEMSA sources of medicines in the public sector

Public sector facilities also borrowed supplies quite extensively from each other. A majority of lower level public facilities referred to this method of filling gaps in supply. The one public dispensary that said it was reasonably satisfied with KEMSA supplies nevertheless was engaged in borrowing and sharing networks:

> Interviewer: Is what you get from KEMSA sufficient to run this place?
>
> Respondent: Yes, depending on the workload it is somehow sufficient but if we run out we
>
> ask from the [local] District Hospital.
>
> Interviewer: And they share with you?
>
> Respondent: Yes they do…. we just go for it.
>
> Interviewer: Do you also share with the other facilities what you get?
>
> Respondent : Yes we normally share with the other facilities. Like now here we share with
>
> [a local] Health Centre. *(Public dispensary District 2)*

Others saw the process as more stressful, but confirmed its importance. One said that in some situations of shortage of supplies:

> We are forced to go to the other facilities … begging for drugs. Or we barter, if the other
>
> facility requires paracetamol, we may trade paracetamol for gloves or a similar arrangement.
>
> *(Public health centre District 1)*

The borrowing was common also in Nairobi:

> We can also source some medicine from [the local] District Hospital … They give us some
>
> to keep us moving…. they don't charge us. *(Public health centre District 4)*

Cash purchase from facility funds, or purchase by patients themselves of essential items were other methods of access to essential supplies. Public sector facilities had two main sources of cash for these purchases: the Health Sector Services Fund (HSSF) fund, and fees and charges at the facility. Both were key sources of access to supplies. The HSSF disbursed funds directly to health centres and dispensaries, to support improved delivery (Opwora et al 2011). The lower level facilities interviewed valued these funds and used them for a wide range of essential items: cleaning items such as detergents and mops; casual labour for security; essential missing drugs; transport for urgent referrals:

> KEMSA would only give what they have.   So a drug like Hydrocortisone is a very impor-
>
> tant drug here for emergency and when they don't give us we actually go back to the HSSF
>
> and buy*(Public health centre District 4)*

 In addition, HSSF allowed facilities to treat patients who were unable to pay for missing medication or supplies:

> We tell them to buy [but] some of them cannot afford. That is now where we try to squeeze
>
> out the HSSF fund. *(Public health centre District 3)*

Public hospitals had another source of funds, a Facility Improvement Fund (FIF), and public facilities also used user fees to purchase supplies. They did not always find it easy to find suppliers however, since they were often seeking supplies on credit and suppliers could be unwilling. Several public hospitals and large health centres commented on this problem, for example:

> We actually approached several suppliers and not all of them agreed to be paid through cheque. And again at times we can delay and not all of them would have accepted to extend their credit period. *(Public health centre District 2)*

The choice of suppliers was strongly influenced by price and by credit terms. Where suppliers tendered to join a suppliers' list, local firms were not always keen to tender:

> Sometimes there has been history of other suppliers supply and they are not being paid in time, and the hospitals hold so much of their money and they decide not to take up the tender. That could also be one of the reasons why those [suppliers] from around [here] shy off. (*Public hospital District 2*)

> OK, legally we are supposed to be paying our suppliers within 30 days as per the procurement act but you find because of our cash flow and our sources of financing the supply, we normally go beyond the 30 days, you find that our suppliers have to do with almost 90 days. *(Public hospital District 4)*

Staff also paid from their own pockets, for example for very urgent referral:

> You may at times be forced to use your own money and transfer the patient very fast. *(Public health centre District 4)*

Finally, purchase by patients themselves was widespread, and staff commented that patients rapidly learned which facilities were likely to have medication at different times, and where they would have to buy for themselves.

> If there are no drugs there are no patients and most of these patients we get cannot afford everything. Like now for the antibiotics we give, we charge them at a lower price. So when we do not have, those patients cannot afford them from the chemists and they would just go home without the drugs.*(Public health centre District 2)*

Facilities juggled limited HSSF funding against patients' ability and willingness to pay: here is a detailed example:

> For example, drugs like oxytocin that we use in the maternity section, lab reagents, gloves, gauzes, when they get finished, we buy. For a long time, we didn't have gloves, and I heard that even KEMSA didn't have them. … So we were buying for emergencies. But patients in the maternity were bringing their own…. Even right now, a woman coming to the maternity to deliver brings her own gloves… the stocks that are delivered are spared for emergencies or for lab use. Or for instance, a patient comes during odd hours, and they have not brought their own, we can't send them to go and purchase. So we use those. *(Public health centre District 1)*

Sourcing from MEDS

Mission for Essential Drugs and Supplies (MEDS) is a large non-profit faith-based wholesaler serving the faith-based health facilities in Kenya and also elsewhere in the region (MEDS 2013). Of the faith-based and secular (NGO) non-profit facilities interviewed about suppliers,half ordered over 90% of their supplies from MEDS; 40% ordered a proportion from MEDS; and only one (non-

faith-based) did not order from MEDS. Few MEDS-supplied medicines were thus found outside the FBO/NGO sector: 95% of medicines found in the study were on the shelves of the FBO/NGO facilities, and just 5% in the public sector. KEMSA medicines were found predominantly in the public facilities, but 18% of KEMSA medicines identified were in the FBO/NGO facilities.

Qualitative findings on MEDS indicated a good reputation reported by the majority of informants; however there were a few complaints. Facilities had a choice as to whether to use MEDS as a supplier or not, and all informants were asked their reasons for choice of supplier. The two main reasons given for reliance on MEDS by those who sourced mainly from them were price, first, and also reliance on their quality assurance. For example, this informant gave the following reasons for choosing to source from MEDS:

> "...Because of the prices. As you know our clinic is a non-profit-making organization. So if we buy medicine, like for example Paracetamol, MEDS will sell it to us at 50 cents so that we can give the patient at 1 Shilling. We wouldn't sell at 4 shillings, but if you buy from somewhere else they could sell to you at 3 shillings and you would not be able to sell it to the patients here. Yeah, that is the main reason why we buy from MEDS". *(Faith-based clinic, District 4)*

A general view from as expressed by many informants was that of Price as stated in the following quote:

> "Actually all the FBOs [Faith-based Organisations] get their medicines from MEDS. Because when we get from them it is much cheaper".*(Faith-based hospital District 2)*

MEDS was regarded as a way to get cheap – but not the cheapest – medicines that were also of reliable quality, while from other suppliers:

> "It can be cheap and not good quality". *(Faith-based health centre District 3)*
> "Their drugs are good, you can give to a patient and they get well". *(Faith-based dispensary District 3)*

There was awareness of MEDS' quality control capabilities:

> "They have a quality control laboratory. So most of the drugs they try them first in their laboratory". *(Faith-based hospital District 2)*

MEDS was also regarded as responsive to its clients on quality. For example, one facility had noticed that a test supplied seemed to be giving unlikely numbers of positives: they contacted MEDS, returned it, and then heard from MEDS that they had tested the item and had changed manufacturer for that test. Facilities noted that MEDS encouraged feedback on drug reactions. One faith-based dispensary said that when drug sellers came around to try to sell new drugs, the staff referred them to MEDS, saying if MEDS accepted the item then it would be considered.

Levels of availability of supplies were also said to be generally good, and MEDS could order items such as small equipment items for facilities if they did not hold them.

> They gave some credit : "we pay at the end of the month and they do not push us" *(faith-based clinic, District 4).*

Two facilities noted speed of delivery: two or three days from placing the order. MEDS allowed online ordering, and delivered to facility premises; larger orders took longer. There were sometimes

delays and stock-outs, requiring a wait while items were ordered; even then, facilities said that MEDS was communicative, warning of gaps in supplies and suggesting alternative items. Generally MEDS was said to deliver what was ordered. They were also said to warn when phasing out items from their lists, and to give reasons. "They are very reliable", one interviewee remarked.

This is a remarkably positive set of assessments. Faith-based facilities clearly felt that they were getting a responsive service and low priced and reliable drugs. For those facilities serving very low income populations, this was regarded as an important support for their service capabilities. All of these facilities were funding their services from fees and charges, plus some donations, so the cost of the supplies was a key determinant of their charges and hence the accessibility of their services.

Two of the faith-based facilities interviewed ordered from KEMSA as well as MEDS, using MEDS to fill in the relatively large gaps in the KEMSA order; in one case, just ARVs came from KEMSA. A third of those interviewed ordered more than half of their supplies from private wholesalers. They relied on established relationships with a few private wholesalers. In one case, a private local manufacturer was also a donor to the facility, as well as a direct supplier of medicines. Some were part of faith-based organisation networks that had established relationships with particular suppliers. The reasons why these facilities bought a lower proportion from MEDS was unclear, though the one non-profit facility buying nothing from MEDS was part of a large secular NGO with long established private supply chains.

4.1.2 Public and faith-based sectors' sourcing of medical supplies and equipment

These tracer supplies were very diverse, ranging from microscopes to bed sheets, and laboratory chemicals to protective gloves and disinfectant (Appendix Table A2). Furthermore, tracing their source and origin was more difficult than for the better-labelled tracer medicines. Table 5 shows that, of those items that could be traced to source, the public sector had sourced about two thirds from KEMSA, the rest being split between donations and private purchase. Half of the equipment items found and traced in the public sector had been donated and just 30% sourced from KEMSA. The FBO/NGO facilities had sourced one third each from MEDS and from the public sector, splitting the rest of the sources between KEMSA and direct donations (Table 5). Again the main donated items were equipment. The private shops and facilities sourced mainly from private wholesalers (Table 5), except for a few laboratory supplies donated and from the public sector.

Table 5 Wholesale source sector of other tracer supplies, by sector of final use or sale (facility or shop) (percentage of all tracer supplies available by sector)

Wholesale sector	Sector of final use/ sale			Total
	Public	FBO/NGO	Private	
Public (KEMSA)	64.8	19.9	2.1	29.9
Non-profit (MEDS)	0	35.4	0	8.3
Donations	14.6	8.7	3.0	8.7
Private	20.6	36.0	94.9	53.2
Total	100	100	100	100

n=596

The qualitative and quantitative findings show that the public sector wholesaler (KEMSA) also supplied many non-pharmaceutical items, such as gloves, syringes and bed sheets. However, most facilities said KEMSA did not supply a range of tracer items including laboratory reagents, and rarely medical equipment, as indicated in the following quotes.

"Nowadays the facility buys the reagents". *(Public health centre, District 2)*

"The gloves we get them from KEMSA, but the reagents we buy them". (*A different public health centre, District 2*)

"Since I came here I have never seen them [KEMSA} deliver stethoscopes". *(Public health centre, District 1)*

Some facilities had experienced problems in supply of non-pharmaceutical essentials:

"For a very long time we have not been receiving non pharms [non-pharmaceuticals], except on two occasions we might be receiving cotton wool and Jik [disinfectant]. *(Public health centre District 3)*

One public district hospital stated that only about 20% of their non-pharmaceutical supplies came from KEMSA, though the proportion of medicines supplied was much higher. A public health centre in District 4 concurred: for medical supplies, "normally you can order and you don't get it."

In addition to stock-outs, a second constraint on facilities' ordering from KEMSA was budgetary. Lower level facilities ordered through the local district pharmacist, generally based at the district hospital. The facilities had an allocation of funds at KEMSA, and this was drawn down when orders were put in, so those undertaking the procurement had to ensure they remained within budget over the year.

Note that donations are shown in Table 5 as a separate category, since medical equipment in particular had sometimes been provided directly by donors to facilities. Donor-funded medicines are however included in Table 4 according to their wholesale source, and were not separately identifiable; some donor-funded medical supplies may also similarly appear in Table 5 as MEDS or KEMSA supplies.

Public sector facilities had a number of sources and strategies to supplement KEMSA supplies Donations were confirmed as a key source of equipment, as the quantitative data suggested (Table 5). Some examples of the donors are.

"For instance these weighing machines…. some were donated by Magna, others by Mercy-Aid". *(Public health centre District 1)*

A public health centre in District 3 had mainly old equipment, but had also received items from GIZ, the German aid agency, and laboratory equipment from "the Maryland University" (probably Johns Hopkins). A public health centre in District 4 had a microscope and weighing machines donated by USAID.

Sometimes local communities invested. One community had a local tourism project that was used to supplement KEMSA-supplied medicines and also for equipment:

"The microscope was bought by the community because even that laboratory is a community project [i.e. built by the community]".*(Public dispensary District 1)*

4.1.3 Sourcing by private facilities and shops

The private sector informants included private facilities and also pharmacies and drug shops. The private facilities generally served better-off populations, but the pharmacies and drug shops were selling to patients across a very wide income range. These qualitative findings reveal that

price was a major consideration in sourcing medicines and other supplies across all categories interviewed. However this played out rather differently according to the clientele and the market they were supplying.

For shops serving low income customers, price was the dominant consideration.

> You know, price is what determines. So like currently I go to [a Nairobi wholesaler] because they are cheaper than the rest. *(Pharmacy District 2)*

This consideration overrode for this informant considerations such as a wide variety of supplies:

> Others like [another Nairobi wholesaler] have a broader variety … but [the preferred wholesaler] stocks the generics, and when they stock the branded ones they are on the higher side, costly. So I don't look at variety.*(Pharmacy District 2).*

Delivery was a common second criterion for choosing a wholesaler:

> The major reason we buy from them [is] …. because the prices are a little bit competitive and … then they deliver on time if you want something urgently then they will deliver on time *(Pharmacy District 3)*

Reliability was also important, and frustrations with incomplete or late deliveries, and resultant costs and hassle, caused retailers to shift suppliers:

> For example you make an order of about ten products and when they deliver you find eight but when you make the enquiry about the two they will tell you they packed all of it. And the main reason why I moved from [a previous supplier] is that, and it happened about three times. They packed less than what I had ordered and they have already charged, and getting them is also a problem.*(Drug shop District 2)*

Basic courtesy could also play a role:

> Their prices are low .. also, when you enter into the shop they are polite to you … the others you go [to] they are rough … [and] they give us offers *(Private clinic District 3)*

One interviewee summed up neatly the three most common considerations:

> We look at the supplier who offers us the best prices for the quantities we buy. … Efficiency of supply, the credit period and also the competitiveness of their prices: these are the three main things that inform me who to give my contracts.*(Private clinic District 1)*

The issue of credit, mentioned above, was alongside price a key consideration for many interviewees in the private sector. Many were relying on current cash flow to fund the next purchase, and trade credit terms were an important factor in sustaining their businesses.

> Like [a wholesaler] I have been with them ever since I started operating and I have an account with them.*(private Clinic District 2)*
> They give credit, sixty to ninety days. The pricing is also good; some suppliers are better priced in some products, so we have a choice.*(Private hospital District 1)*

Others had opted for cash because credit raised prices:

> By the way [a wholesaler] deals in 100% cash, they don't have credit. [a second wholesaler] does both cash and credit but I opted for cash again because there you can bargain discount even up to 20%*(Pharmacy District 2)*

Buyers were trying to keep transport costs down while ensuring rapid delivery.

> And they are my main supplier because they are very efficient, you place an order today and tomorrow morning is here. They use overnight serviceG4S transport and they don't charge you for transport costs. Their prices are also lower because they serve throughout the country. They even serve up to Lodwar and even Mombasa. So they have many clients compared to the rest and lower prices.*(Pharmacy District 2)*

Prices varied from day to day, which could mean shopping around:

> The factor which controls the price in the market : I can buy an item at 500 today, when I go back tomorrow the same place they say it's 600 … the same product, and I have budgeted for myself 500 …I have to go round and sometimes I come back without the item, so the main challenge in the market is the price. *(drug shop District 3)*

Prices for emergencies could be higher:

> Sometimes there is a delay is supply. Other times it is the cost of procurement if we have to get them urgently. Sometimes we ask the supplier to use a taxi and that adds to the cost for as much as five or six hundred shillings.*(Private hospital District 1)*

Discounts and range counted when making bulk orders for supplying local clinics:

> I go to [a wholesaler] because of the range, the vast range of goods, the discounts are very good. …. . .without the bonus, so I wouldn't go there, I would go to the other person.*(Pharmacy District 1)*
> Yes, like [wholesaler X] they deal directly with the Manufacturing Companies. There are certain Companies that give [wholesaler X] discount like say 10% and they will give us the same discount. But the moment there is a distributor in between they will now give us like 5%. (Private hospital District 4)

Reputation and quality however limited the extent to which some facilities chase the cheapest price:

> "…..when buying from the appointed distributor the discount counts. ….There are those who will give you 15%, others will give you 20% discount. So you will go to where you can maximize. But basically we normally buy directly from the manufacturers or appointed distributors. You see a hospital is very key in terms of ensuring high quality products. So we do not buy from briefcase or people who are not vetted. It is also good to buy from reputable organizations for the safety of the patients. And that is why our organization vets all our suppliers

A pharmacy emphasised reliability of supply from established suppliers:

> The main thing we look into when choosing the suppliers is their reliability of supply and the reliability of the stocks. Because so many people will start supplying and then in a

week's time they stop supplying.*(Pharmacy District 4)*

Getting tied into a relationship did however limit the extent to which a smaller private buyer can chase the best deal:

> Yes there are new suppliers in the market but the only thing is that you have to belong to a distributor/wholesaler because of the terms they offer to you. So it would also be very hard to change to another supplier unless you had issues. Again not unless those who come in have got very special products, different from what is already there in the market *(Drug shop District 4)*

Finally, it could be hard to judge quality, but buyers worried, and there were reports of changing supplier because of problems:

> .. there was a time we were buying very actively at [wholesaler Y] but very unfortunately we realized that at times they were repackaging drugs. So, on the outside you would get an expiry date which is completely different from the expiry date on the product inside……. So…. a client comes to complain, it is really bad for the business. It happened to a friend of mine and that is how we stopped doing business with them. (*Pharmacy District 2*)
> Determining which generic is the most cost effective is a challenge because the cost can be low but now the drug is not working well. *(Private clinic District 1)*

4.2 Availability of medicines and medical supplies in all sectors

In each shop and facility, data collection established whether each tracer item was available on the day of the visit, or was on order, or was never ordered...We would expect that the range of items held would be largest in hospitals – where virtually all our tracer essentials should be available – and smaller in the lower level facilities. We therefore present in this section our findings on availability of supplies by level of facility and type of shop, as well as by urban/rural location and by sector of ownership.

4.2.1 Hospitals

Table 6 shows that availability of the tracer essential medicines in public hospitals was around 60%, with another 17% on order. The faith-based hospitals had similar availability levels, but recorded a higher percentage of items that they did not order; in the private hospitals there was higher availability of the tracer essential medicines (Table 6).

Table 6: Availability of tracer medicines in hospitals, by sector (% of all tracers)

Facility sector	Availability			Total
	Available	On order	Never ordered	
Public	60.5	17.4	22.1	100
Faith-based	62.9	7.9	29.2	100
Private	75.9	7.6	16.5	100
Total	69.5	9.8	20.7	100

n=387

Availability of other supplies and equipment was higher in hospitals (Table 7), with little variation between sectors. The major equipment item unavailable was a CD4 machine for testing immune system levels in HIV treatment: only one hospital had one available and working.

Table 7: Availability of other tracer supplies and equipment in hospitals, by sector (% of all tracers)

Facility sector	Availability				Total
	Available	On order	Never ordered	Not work-ing	
Public	87.7	7.4	4.9	0	100
Faith-based	85.3	1.6	6.6	6.6	100
Private	83.9	4.7	11.2	1.2	100
Total	84.6	4.8	8.7	1.9	100

n=312

4.2.2 Lower level facilities

In the public sector, none of the lower level facilities had atenolol for hypertension or metformin for diabetes, and just one had omeprazole for stomach acid and ulcers: chronic illness medication was thus largely unavailable in the lower level public sector facilities. Half of the primary facilities were waiting for amoxicillin syrup for children and for ciprofloxacin, suggesting stock-out problems with anti-bacterials. About half stocked ARVs, and all but one had saline for drips. Less than half had oxytocin for post-partum haemorrhage. The faith-based facilities had higher stocks; the main items not held were ARVs. The private facilities held anti-bacterials and anti-malarials but were less likely to have ARVs or other chronic disease medication. Table 8 shows average levels of availability by sector.

Table 8: Availability of tracer medicines in clinics, health centres and dispensaries, by sector (% of all tracers)

Facility sector	Availability			Total
	Available	On order	Never ordered	
Public	47.5	16.8	35.7	100
Faith-based	67.2	8.7	24.2	100
Private	56.3	13.5	30.3	100
Total	55.4	13.6	31.0	100

n=648

The qualitative findings concurred on availability of medicines for chronic illnesses, and reveal that all but one of the public sector facilities interviewed stated that they had shortages and supply gaps; many struggled to find additional funds to fill gaps through private market purchase. Gloves were cited as in recurrent shortage. Antibiotics and chronic illness medicines (e.g. asthma, diabetes, hypertension) were also often in short supply, as were "injectables, like adrenaline, quinine injections":

> "Like now, the drugs for hypertension and diabetes, we hardly get them. So those ones we
> prescribe to the patients and they buy them from the chemists. … the antibiotics, we get them
> in smaller quantities, sometimes it doesn't last us for the three months before they supply
> again. … Sometimes KEMSA do not supply us with the injectables and because we admit

> patients we require those drugs. So when we do not get them from KEMSA, we just buy them
> from chemists." *(Health centre, District 2)*

There were a number of complaints about the range of medication that could be ordered, especially by lower level facilities, including second line injectables, chronic disease medication, and some emergency items:

> There are some drugs like those for treating hypertension, high blood pressure…   Even when
> we request they are not supplied. (Public health centre District 1)

This respondent thought their facility might be the wrong level to receive chronic disease medication, but was unsure. A public clinic had addressed this problem with KEMSA and the situation had improved:

> Sometimes we used to have asthma [in a patient] but we did not have the drugs to treat asth-
> ma, but now they have started bringing. We talked to the doctor and explained our situation.
> *(Public clinic District 4)*

Availability of other essential supplies and equipment was around 75% in lower level facilities (Table 9), with little difference between sectors, or between rural and urban areas. In the public sector, however, nearly half had no glucometer, and a third no microscope; over half were waiting for bandages, and a third to a half for various essential test kits.

Table 9: Availability of other tracer supplies and equipment in clinics, health centres and dispensaries, by sector (% of all tracers)

Facility sector	Availability			Total
	Available	On order	Never ordered	
Public	73.4	7.8	18.8	100
Faith-based	79.9	3.1	17.0	100
Private	76.6	3.2	20.2	100
Total	76.0	5.5	18.5	100

n=638

The qualitative findings reported however indicated that in lower income areas, requiring patients to buy medicines and gloves was likely to reduce access to essential treatment, and it also undermined staff morale. While a public clinic in District 4 said the supply of asthma drugs was improving, a public dispensary in District 3 still had shortages of this emergency drug. Two health centres had encountered the problem of antibiotic resistance and the need for more specialised antibiotics. One example given was brucellosis, for which patients would have to buy the antibiotics, which however would be unaffordable for many. A health centre interviewee serving a low income area of District 4 said "Sometimes you are forced to write a prescription to that patient [in cases of antibiotic resistance], but you see the patients we deal with are the less privileged people … we cannot order more expensive brands", so people may go untreated:

> "We don't have the essential drugs; it's really a major challenge knowing that we are dealing
> with poor people, people needing our care and people who rely on the government".*(Inter-
> viewee District 3, public dispensary)*

4.2.3 Shops

Table 10 shows availability in the pharmacies and drug shops. These did not stock ARVs. About half

the pharmacies also did not stock injectables such as penicillin, quinine and oxytocin. Strikingly, over half the drug shops and three of the pharmacies were waiting for the first line anti-malarial, artemether and lumefantrine, suggesting shortages in the private market.

Table 10: Availability of tracer medicines in pharmacies and drug shops, by sector (% of all tracers)

Type of shop	Availability			Total
	Available	On order	Never ordered	
Pharmacy	70.4	3.6	26.1	100
Drug shop	57.9	12.4	29.7	100
Total	66.4	6.4	27.2	100

n=658

For the other tracer items (Table 11), the shops and pharmacies had limited stocks. These were mainly basics: cleaning materials, bandages, gloves, syringes and needles, pregnancy test strips, thermometers. A few pharmacies held blood pressure machines and glucometers; very few other test kits were stocked.

Table 11: Availability of other tracer supplies and equipment inpharmacies and drug shops, by sector (% of all tracers)

Type of shop	Availability			Total
	Available	On order	Never ordered	
Pharmacy	29.1	1.9	69.0	100
Drug shop	23.0	4.1	73.0	100
Total	27.0	2.7	70.4	100

n=529

5. Concluding discussion: Health sector supply chains in Kenya

Health systems are large economic and social sectors, providing essential services to the population and employing large numbers of staff. The performance of health systems in Sub-Saharan Africa is however widely undermined by shortages of essential commodities and unaffordable prices (Leach et al 2005; Cameron et al 2009). The budgets for these commodities are large. Over one third of total Kenyan health expenditure was estimated to be spent on pharmaceuticals alone in 2006, an estimated total of USD 372 million, predominately private spending (MoMS 2010; Republic of Kenya 2010). Other essential medical supplies and equipment, laboratory inputs and basic supplies are less well documented than pharmaceutical procurement and supply.

Key determinants of the extent to which the health system provides for the population in need therefore include the performance of the supply chains that deliver essential commodities into the difference sectors, and the markets that determine prices, quality and availability of the commodities. Supply chain analysis traces the linkages and incentives by which a product is produced and delivered (Yadav 2007, 2006). Here we present views of the supply chains as seen from the health sector, while the final project research stage has examined the manufacturers' perspectives.

We have traced in this paper the existence of three supply chains to the Kenyan health sector. At the time of the research the procurement agents were (and remain) (1) the government organisation, KEMSA, the public sector procurement agency that at the time of the interviewing had full responsibility for medicines supply to public sector facilities; (2) MEDS, the non-profit procurement agency supplying at the time of the study chiefly the faith-based and NGO sector; and (3) private wholesalers. The decentralisation reforms have now allowed public facilities to diversify their supply sources (Yadav 2014). This paper has therefore described, compared and contrasted the three supply chains, and assessed aspects of each supply chain's organisation and performance, as perceived from the health facilities, pharmacies and drug shops at the time of the interviews in late 2012.

The data in Section 4 show that there is considerable segmentation of supply chains between government, independent non-profit, and private sectors. The private sector was buying almost exclusively from the private wholesalers/importers. The public facilities relied heavily but not exclusively on KEMSA, while the faith-based facilities sourced from MEDS, the private wholesalers and also KEMSA. A less segmented pattern was found for medical supplies, equipment and other essential supplies to the health sector, with the public facilities relying more on private purchase and donation. The data thus identify a number of interaction between the three supply chains.

Despite the strong reliance on KEMSA, the procurement processes as seen from the perspective of the public facilities were shown to be complex and diverse. The clinicians and other staff involved in procurement, generally alongside their clinical work, were trying to ensure adequate supplies. This meant juggling orders to KEMSA, assessing the best use of other funds from HSSF and FIF and from user fees, making decisions to require patients to buy supplies, and organising response to emergencies. The staff interviewed were dealing with a range of different wholesalers, including KEMSA, private wholesalers, and NGOs such as Supply Chain Management. They were worrying about quality and trying to manage credit terms and debt problems, while seeking donations and struggling with patients' resentments. Some were also increasingly anxious about the impact of performance assessment based on tests and vaccination coverage when they might not have the commodities to allow them to meet targets. The levels of stress involved in these complex procurement challenges were immense.

The rates of availability of medicines and supplies documented in Section 5 reflect these problems of supply and funding in the public sector, and also financial constraints in the FBO sectors. In the private sector they reflect specialisation among facilities and shops, as well as financial limitations in ordering, and the purchasing power of private sector customers. There are a number of reasons why hospitals, who would be expected to order all the tracer items, may not do so, in addition to financial constraints: for example, they may substitute other medicines or they may not offer the full range of treatments for which the medicines are used.

As a result of decentralisation, the pattern just described is shifting. Counties can source from outside KEMSA, and MEDS has seen demand rising as public sector facilities increase procurement through the non-profit independent wholesaler[2]. Kenya's experiment in creating public/non-profit/private competition at wholesale level for public sector procurement will be closely watched by other countries.

A second working paper from this project (Kariuki et al 2015) describes the pattern of purchasing by the wholesalers, pre-decentralisation, from local manufacturers and from importers, and health sector views on the extent to which more locally manufactured supplies could improve supply chain performance.

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2. Source: interviews

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Appendix

Table A1: Tracer medicines

Medicine name and strength	Dosage form	Usage
Artemether + Lumefantrine (AL/Alu: adult); 120+20mg	Tablet	Anti-malarial
Artemether + Lumefantrine (AL/Alu: child); 120+20mg	Tablet	Anti-malarial
Sulfadoxine + Pyrimethamine; (SP) 500+25mg	Tablet	Anti-malarial
Quinine; 600mg/2ml	Injectable	Anti-malarial
Amoxicillin (adult); 250mg/ 500mg	Tablet/capsule	Anti-bacterial
Amoxicillin syrup (child); 125mg/5ml	Syrup	Anti-bacterial
Benzyl penicillin 5000000IU (5MU)	Injectable	Anti-bacterial
Ciprofloxacin 250mg/ 500mg	Tablet/capsule	Anti-bacterial
Atenolol; 50mg/100mg	Tablet	Anti-hypertensive
Paracetamol; 500mg	Tablet	Anti-pain
Diclofenac; 50mg; 100mg	Tablet	Anti-inflammatory
Morphine 50mg/ 100mg per ml	Tablet	Anti-pain
Tenofovir + Lamivudine 300+150mg	Tablet	Anti-retroviral (HIV)
Nevirapine; 200mg	Tablet	Anti-retroviral (HIV)
Lopinavir/ Ritonavir 200mg/50mg	Tablet	Anti-retroviral (HIV)
Zidovudine; 300mg	Tablet	Anti-retroviral (HIV)
Oxytocin; 10 iu& 5iu per m	Injectable	Anti-haemorrhage
Metronidazole; 200mg/400mg	Tablet	Anti-amoeba
Fluconazole; 50mg/ 150mg/ 200mg	Tablet	Anti-fungal
Albendazole; 200mg/ 400mg	Tablet	Anti-worms
Mebendazole; 100mg	Tablet	Anti-worms
Omeprazole 20mg/ 40mg	Tablet	Anti-acid/ulcer
Clotrimazole cream; 1%	Cream	Anti-fungal
Ketoconazole 50mg	Tablet	Anti-fungal
Amitriptylline; 25mg	Tablet	Anti-depressant/ psychosis
Metformin 500mg or 850mg	Tablet	Anti-diabetic
Chlorpromazine;25mg; 100mg	Tablet	Anti-psychotic
Loperamide hydrochloride 2mg	Tablet	Anti-diarrhoea
Normal saline and 5% Dextrose (IV fluid)	Infusion	Rehydration

Table A2: Tracer medical equipment, and medical, laboratory and other supplies.

Medical equipment
Thermometer
Blood Pressure Machine
Microscope
Stethoscope
Foetoscope for midwifery
Glucometer
Weighing scales for paediatrics
CD4 machine
Medical supplies
Slides for the microscope
Strips for the glucometer
Sharps box
Clinical gloves
Gauze bandages
Crepe bandages
Syringes and needles
Hydrogen peroxide (H2O2)
Alcohol/Spirit for wound cleaning
Laboratory supplies
Urine test strips
Pregnancy test strips
Giemsa stain
Emulsion oil
Determine HIV test kit
Unigold HIV test kit
Bioline HIV test kit
Rapid diagnostic test for malaria
Widal reagent
EDTA tubes
Other essential supplies
Disinfectants (Hibitane or Savlon)
Mackintoshes/ plasticised sheeting
Bed net
Bed sheets
Mop or broom
Detergents