Medicine Prices, Availability and Affordability in Sudan

Report of a survey conducted in February – March 2013

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Abbreviations

Cap	capsule
GDP	Gross domestic product
HAI	Health Action International
OB	Originator brand
Inh	Inhaler
Inj	Injection
LPG	Lowest priced generic equivalent
MPR	Median price ratio
MSH	Management Sciences for Health
NHIF	National Health Insurance Fund
EML	Essential Medicines List
SDG	Sudanese Pound (local currency)
Susp	Suspension
Tab	Tablet
USD	United States dollars (also $)
WHO	World Health Organization

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Conflict of Interest Statement

None of the authors of this survey or anyone who had influence on the conduct, analysis or interpretation of the results has any competing financial or other interests.

Executive summary

Background: A field study to measure the price, availability, affordability of selected medicines was undertaken in Sudan in 17th February to 20th March 2013 using a standardized methodology developed by the World Health Organization and Health Action International.

Methods:

The survey of medicine prices and availability was conducted in six states: Khartoum, West Darfur, Gazeera, Sinnar, Red Sea and River Nile State. Data on 50 medicines was collected in 35 Health Insurance pharmacies (NHIF), 28 Revolving Drug Fund (RDF) and 36 private sector medicine outlets, selected using a validated sampling frame. Data was also collected on government procurement prices. For each medicine in the survey, data was collected for the originator brand and lowest priced generic equivalent (generic product with the lowest price at each facility). Medicine prices are expressed as ratios relative to Management Sciences for Health international reference prices for 2011 (median price ratio or MPR). Using the salary of the lowest-paid unskilled government worker, affordability was calculated as the number of days' wages this worker would need to purchase standard treatments for common conditions.

Key results:

Availability of medicines in the Health Insurance and private sector:

- Mean availability of originator brand and generic medicines is the NHIF sector was 3.7% and 68.1%, respectively, indicating that some patients must purchase medicines in the private sector. In this sector, the mean availability of originator brand and generic medicines was 14% and 83.9%, respectively. In RDF sector the mean availability of originator brand and generic medicines is 4.5% and 55.4% respectively.

Health Insurance procurement prices:

- In NHIF is purchasing medicines at prices higher than international reference prices, indicating a fair level of purchasing efficiency.

NHIF patient prices:

- Final patient prices for generic medicines in the public sector are about 2.98 times their international reference prices and 2.7 for RDF.
- NHIF patient prices for generic medicines are 62.4% more than those for public procurement, indicating high mark-ups in the NHIF distribution chain.
- While in RDF sector which is another public sector aimed to increase essential medicines accessibility patient prices for generic are 41.9% more than those for NHIF procurement, indicating fair mark-ups in RDF public.

Private sector patient prices:

- Final patient prices for originator brands and lowest priced generics in the private sector are about 4.24 and 2.9 times their international reference prices, respectively.
- When originator brand medicines are prescribed/dispensed in the private sector, patients pay about 46% more than they would for generics.
- Generic medicines were priced 9.9% higher in the private sector than in the RDF sector, but it is lower by 5.3% than the public sector.

Affordability of standard treatment regimens:

- In treating common conditions using standard regiments, the lowest paid government worker would need between 4.9 (Arthritis) and 0.1 (Anxiety) days' wages to purchase lowest priced generic medicines from the private sector. Some treatments were clearly unaffordable, e.g. the treatment of Adult respiratory infection with generic Ceftriaxone 1g injection in public sector, would cost 13.9 days' wages.

Conclusions:

The results of the survey show that the affordability, availability and price of medicines in Sudan should be improved in order to ensure equity in access to basic medical treatments, especially for the poor. This requires multi-faceted interventions, as well as the review and refocusing of policies, regulations and educational interventions.

Recommendations:

Based on the results of the survey, the following recommendations can be made for improving the availability, price and affordability of medicines in Sudan:

1. Control medicines prices
2. Improve government procurement and retail prices
3. Essential medicines should be on the top of priorities when supplying medicines in RDF and public sectors.
4. Medicines regulatory authorities if necessary to encourage local pharmaceutical agencies and manufactures to have regional stores.
5. Exempt essential medicines from government fees.
6. Dissemination of medicine prices to public will increase prices transparency.
7. Generic promotion, through public sectors including social health insurance scheme

Introduction

In February – March 2013, as partial fulfillment of master degree in health economics, this study conducted a nationwide study on the prices, availability, and affordability of a selection of medicines in Sudan. The main goals of the study were to document the prices, availability and affordability of medicines and compare them across products types (originator brands and generics), sectors, and other countries;

This study was conducted using the standardized methodology developed by the World Health Organization (WHO) and Health Action International (HAI). The WHO/HAI methodology is described in the manual *Measuring Medicine Prices, Availability, Affordability and Price Components* (WHO/HAI, 2008) and is accessible on the HAI website (http://www.haiweb.org/medicineprices).

The main objectives of the study were to answer the following questions:

- Is the public sector purchasing medicines efficiently in comparison with international reference prices?
- What is the availability of originator brand and generic medicines in the public, RDF and private sectors?
- What is the price of originator brand and generic medicines in the public, RDF and private sectors, and how does this compare with international reference prices?
- What is the difference in price of originator brand products and their generic equivalents?
- How affordable are medicines for the treatment of common conditions for people with low income?
- How do the prices of medicines in Sudan compare to those in other countries?

Country background

Sudan is a large sized country, covering an area of Xkm2. It is divided into 17 administrative states. The total population is 30,698,976 individuals, with the majority of population living in rural areas (66.8%) [Sudan Central Statistical Bureau]

Sudan is a low income country with a GDP of US $1866 (World Bank, 2011) per capita. Sudan is one of 26 low-income countries considered highly vulnerable to the global recession. It ranks 139 out of 177 countries based on Human Development Index, and 53 out of 88 developing countries in terms of Human Poverty Index (HPI). The incidence of poverty is high and there is considerable variation in poverty levels between and within states.70 percent of the population, contributing to 37 percent of GDP and 15 percent of total export earnings. Of the total labor force, approximately 70.6% of persons are unemployed.

Civil war, political instability and natural disasters have characterized the life in Sudan and hampered economic progress. Since 1999, Sudan began to work with foreign partners to exploit its lucrative oil fields. This has improved the growth in national income to an average of 7 percent per annum and ultimately has resulted in steady growth of the economy. Oil production has become an important source of government revenues contributing about 50 percent of the Government budget. Sudan house hold spending on health by income is 20% (NHA, 2008)

Life expectancy at birth is m/f 60/64 years, with 3.4% of the population over the age of 65 years (NHA, 2008). The major causes of morbidity are malaria, pneumonia, disease of respiratory system, diarrhea and gastroenteritis, acute tonsillitis, other disorder of urinary tract, essential hypertension, injuries involving multiple body regions, diabetes mellitus and disorder of digestive organ. While the major causes of mortality are malaria, pneumonia, septicemia, other heart disease , M. neoplasm, post procedural disorders of circulatory system, heart failure, acute renal failure, diabetes mellitus and diarrhea and gastroenteritis (NHA, 2008)

Health sector

In 2008, the per capita total expenditure on health was US$ 111 (2.1 - 2008). Approximately 6% of the GDP is spent on health. Of the total expenditure on health, 28.9% is government expenditures, which represents 8.7% of all government expenditures. A further/The remaining 71.1% of total expenditures on health is private expenditures, of which 64.3% are out-of-pocket expenditures. Percapita expenditure on medicine US$43.94 (NHA, 2008)

Table 1 Selected health indicators 2008

Total Health Expenditure (THE)	SDG 7,135,865,890	$ 3,398,031,376
Share of THE from GDP	6%	
Share of out-of-pocket health expenditure from THE	64.3%	
Total out- of – pocket health expenditure	4,585,980,410SDG	$ 2,183,800.195
Per capita out- of – pocket health expenditure	SDG 135	$ 71.14
Share of public sector health expenditure from THE	28.90%	
Share of MOH from THE	21.7 %	
Total Government Health Expenditure as percentage of Total Government Expenditure	8.7%	
Per-capita total health expenditure	232 SDG	111$
Total Expenditure for curative care.	5,992,264,921 SDG	2,853,459,486$
Share of curative care expenditure from THE	84%	
Per- capita expenditure on medicine	92.28 SDG	43.94$
Share of medicine expenditure from THE	39.7%	
Share of medicines from out-of-pocket expenditure	29%	
Share expenditure on PHC care expenditure from THE	6%	

[Source: National Health Account, 2008]

The public health sector is composed of 3 levels - tertiary hospitals, secondary hospitals and primary health care centers, rural health posts. At tertiary level most sophisticated health services (open heart surgery), they are mainly found in the capital, while secondary hospitals or regional hospitals where secondary health services at the level of specialist, and primary health care which provided at general practitioner care services at primary health centers. Approximately 37.3% (NHIF, 2012) of the population has health coverage through National Health Insurance Fund (NHIF). The public health sector is complemented by very slow progressing private sector, e.g. private clinics, hospitals, diagnostic centers.

Pharmaceutical sector

There are approximately 1.53 licensed pharmacy per 10,000 in the country. Sectors which dispense a substantial proportion of medicines to patients include the public sector (X%), the private sector (X%), the OTHER1 sector (X%), and the OTHER2 sector (X%). In some public health facilities public medicine outlets/private pharmacies sell medicines to patients

National Medicines (Drugs) Policy

In Sudan, a National Medicines Policy (NMP) document exists in official form. It was last updated in 2005. An implementation plan that sets out activities, responsibilities, budget and timeline is not in place; it is not updated.

Regulatory system

In Sudan, there is a formal medicines regulatory authority which is funded through unstable budget from the government/ fees from registration of medicines/other. Legal provisions are/are not in place requiring transparency and accountability and promoting a code of conduct in regulatory work. A medicines regulatory authority provides information on: legislation, regulatory procedures, prescribing information (such as indications, contraindications, side effects, etc.), authorized companies, and/or approved medicines.

Registration fees differ/do not differ between originator brands and generic equivalents, and differ/do not differ between imported and locally produced medicines

In Sudan, there are legal provisions for marketing authorization. A total of more than 7000 medicinal products have been approved for marketing. A list of all registered products not publicly accessible.

Legal provisions are in place for the licensing of manufacturers/wholesalers or distributors/importers or exporters of medicines,

A quality management system with an officially defined protocol for ensuring the quality of medicines is/is not in place in Sudan. Medicine samples are tested for medicines registration/post-marketing surveillance, In 2008 and 2009, 7536 samples were quality tested, with 816(10.8%) failing to meet quality standards. Regulatory procedures are in place for ensuring the quality of imported medicines.

Legal provisions are in place for the licensing and practice of pharmacy

There is no obligation to prescribe by generic name in the public or private sector.

Generic substitution is permitted in public/private pharmacies,

There are incentives to dispense generic medicines at public, but not at private pharmacies. However NHIF regulations, obligate public and private sectors to the generics, and the claims cannot be reimbursed when priced to brands.
There are provisions in the medicines legislation/regulations covering promotion and/or advertising of medicines.

Medicines supply system
Public sector procurement is not pooled at the national level (i.e. there isn't centralized procurement for the regions/provinces). However recently there are attempts to implement group purchasing to the all public sector, in 2012 NHIF and CMS sign a contract, in which CMS will be responsible for the process of supply channel to national health insurance (procurement and distribute to the states)

Public sector medicines procurement is the of individual public institutes, meaning that any public sector has it is own supply chain, e.g. the military , NHIF, RDF, Interior, Hospitals, each of these public institutes purchase in different prices according to the power and capacity of purchasing process. Same as for distribution of the medicines, any public institute has it is own means of distribution.
The following tender processes are used for public sector procurement:

- National competitive tender – only NHI, Military and CMS
- International competitive tender – Only CMS
- Negotiation / direct purchasing – Health Insurance Khartoum State, RDF Khartoum State

Public sector procurement is not limited to medicines on the Essential Medicines List (EML). There are/are no regulations for local preference in public sector procurement

Medicines financing

In 2008, the total public expenditure for medicines was 39.7% of the total health expenditure.

There is a national policy to provide some medicines free of charge (i.e. patients do not pay out-of-pocket for medicines) at public primary care facilities (emergency cases 24 hours). The following patients receive medicines for free:

- Patients who are admitted for emergency 24 hours.
- children under 5 years of age
- 1st line anti malaria treatment.
- Vaccinations
- While all patients covered by National Health Insurance Fund, pays only 25% of the medicines cost (only the medicines listed on the NHIF medicine list)

There is no national policy to provide medicines free of charge at public primary care facilities.

The following fees are commonly charged at primary care facilities: consultation fees/dispensing fees, percentage co-payments for medicines (NHIF clients).

Revenues from fees or the sale of medicines are occasionally used to pay the salaries or supplement the income of public health personnel in the same facility.

Neither prescribers in the public sector nor prescribers in the private sector dispense medicines.

In Sudan, some of the population has public health insurance, which covers all EM and other medicines, the list in NHIF subjected to update every two years. Few of the population has private health insurance, which covers all medicines.

Sudan does not have a policy covering medicine prices.

The government sets the price of all originator brand and generics products through mark-ups percentage to the original price at registration.

Sudan does not have a national medicine price monitoring system for retail/patient prices. There are/are no regulations mandating retail/patient medicine price information to be made publicly accessible. There are no official written guidelines on medicine donations that provide rules and regulations for donors and provide guidance to the public, private and/or NGO sectors on accepting and handling donated medicines.

Rational use of medicines

Sudan's Essential Medicines List (EML), last updated in 2007, contains 541 unique medicine formulations. The national EML is being used for public sector procurement/public insurance reimbursement. There is committee responsible for the selection of products on the national EML.

The health ministry produces national standard treatment guidelines (STG) for major conditions. However these guidelines were not enforced.

Antibiotics are frequently sold over the counter without a prescription, while injections are occasionally sold over the counter without a prescription.

Methodology

Overview

The survey of the prices, availability and affordability of medicines in Sudan was conducted using the standardized WHO/HAI methodology (WHO/HAI 2008). Data on the availability and final (patient) prices of medicines were collected in medicine outlets in the public, RDF and private sectors. Government procurement prices were also surveyed.

A total of 50 medicines were surveyed – 30 from the WHO/HAI core list (14 global medicines and 16 regional medicines), and 20 supplementary medicines selected at the country level. For each medicine in the survey, up to two products were monitored, namely:

- Originator brand (IB) - the original patented pharmaceutical product
- Lowest-priced generic equivalent (LPG) - the lowest-priced in the facility at the time of the survey.

All prices were converted to US dollars using the exchange rate (buying rate) on February 17, 2013 the first day of data collection, i.e. 1 USD = 6.5 SDG

Selection of medicine outlets

Sampling was conducted in a manner consistent with the WHO/HAI methodology, which has been shown through a recent validation study to yield a nationally representative sample[1].

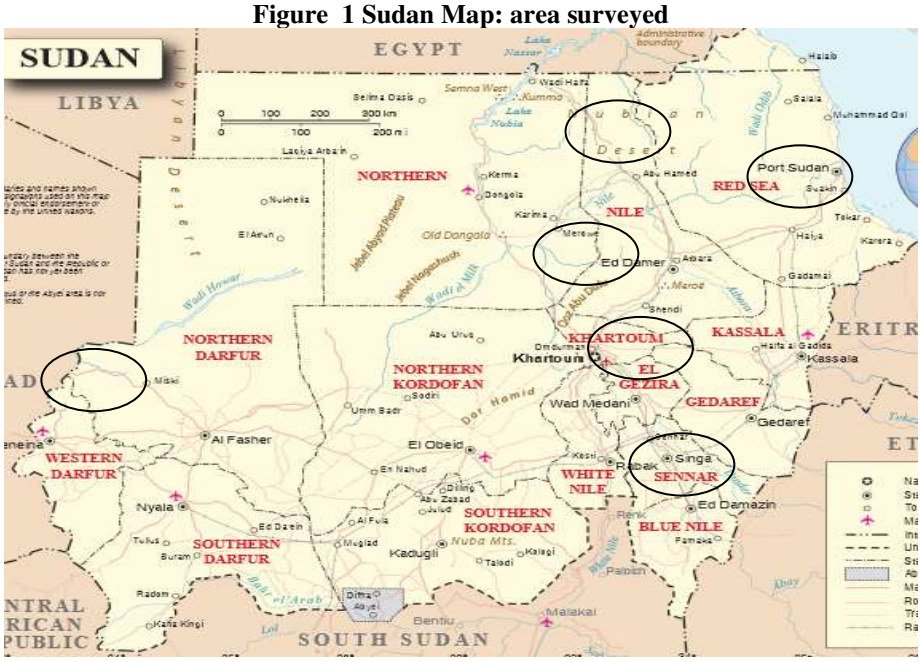
In the first step, six states were selected as "survey areas" for data collection. The major urban centre of Khartoum was selected as one survey area, and an additional five areas were chosen at random from those which could be reached within a one day's drive from Khartoum, but West Darfur which chosen from conflict areas group, it took 5 days travelling. This resulted in the following six survey areas:

1. Khartoum (major urban center)
2. West Darfur State

[1] The WHO/HAI sampling methodology was validated in 2005 when a medicine prices survey conducted in Peru. In this survey, a much larger selection of public and private medicine outlets, from a greater number of geographical regions, were included than is required in the standard sample. Results from the expanded sample were consistent with those from the standard sample, showing that the standard sampling frame is nationally representative.

3. Sinnar State
4. Gazeera State
5. River Nile State
6. Red Sea State

Figure 1 Sudan Map: area surveyed



In each survey area, the sample of public sector medicine outlets was identified by first selecting the main public hospital. An additional five public medicine outlets (e.g. hospital out-patient medicine outlets, dispensaries) per survey area were then selected at random from those within a 3 hour's drive from the main hospital. In Sudan, this selection was made from all public facilities (National Health Insurance Fund) expected to stock most of the medicines in the survey, namely secondary and primary health facilities. Six public medicine outlets in each of the five survey areas and five medicine outlet from the other last state, for a total of 35 public outlets. The private sector sample was identified by selecting the private sector medicine outlet closest to each of the selected public medicine outlets, yielding a total of 36 private outlets.

Other public sector was selected, Revolving drug fund (RDF), 28 medicines outlets were surveyed, maximum six and minimum three medicines outlets .

Note: Revise the above paragraph if the survey sample deviated from the sampling methodology (e.g. if more than 20 outlets were selected per sector)

Selection of medicines to be surveyed

The WHO/HAI methodology specifies a core list of 14 global medicines and 16 regional medicines to be surveyed, representing medicines commonly used in the treatment of a range of chronic and acute conditions. The methodology also includes the specific dosage form and strength that is to be collected for each medicine. This ensures that data on comparable products are collected in all surveys, thereby allowing international comparisons to be made.

In Sudan, 14 of the 14 global core medicines, and 16 of the 16 regional medicines, from the WHO/HAI core list were included in the survey.

An additional 20 supplementary medicines were selected at the country level for inclusion in the survey. Supplementary medicines were selected based on country. The full list of survey medicines is provided in Annex 1.

Data Collection

The survey team consisted of a survey manager, 6 area supervisors, 12 data collectors and 3 data entry personnel. Data collectors were all pharmacist. All survey personnel received training in the standard survey methodology and data collection/data entry procedures at a workshop held on all states separately. As part of the workshop, a data collection pilot test was conducted at public and private medicine outlets which did not form part of the survey sample.

Data collection took place between February 17 and March 20, 2013. Data collectors visited medicine outlets in pairs and collected information on medicine availability and price using a standard data collection form specific to the medicines being surveyed in Sudan. Area supervisors checked all forms at the end of each day of data collection, and validated the data collection process by collecting data at 20% of the medicine outlets and comparing their results with those of the data collectors. Upon completion of the survey the survey manager conducted a quality control check of all data collection forms prior to data entry.

Public procurement data was collected on the prices that the government pays to procure medicines. Data was collected for the same global, regional and supplementary medicines as surveyed in medicine outlets. Procurement data was obtained from 1 of recent procurement order(s) from the tender documents held by the NHIF and purchase orders from Health Insurance Khartoum State (HIKS).

Data Entry

Survey data was entered into the pre-programmed MS Excel *Workbook* provided as part of the WHO/HAI methodology. Data entry was checked using the 'double entry' and 'data checker' functions of the *Workbook*. Erroneous entries and potential outliers were verified and corrected as necessary.

Data Analysis

The availability of individual medicines is calculated as the percentage (%) of medicine outlets where the medicine was found. Mean (average) availability is also reported for the overall 'basket' of medicines surveyed. The availability data only refers to the day of data collection at each particular facility and may not reflect average monthly or yearly availability of medicines at individual facilities. The availability of individual medicines in the public sector was limited to those facilities where the medicine was expected to be available. For example, if a survey medicine is only provided through secondary or tertiary hospitals, the calculation of the medicine's % availability was limited to these facilities.

To facilitate cross-country comparisons, medicine prices obtained during the survey are expressed as ratios relative to a standard set of international reference prices:

$$\textit{Medicine Price Ratio (MPR)} = \frac{\textit{median local unit price}}{\textit{International reference unit price}}$$

The ratio is thus an expression of how much greater or less the local medicine price is than the international reference price e.g. an MPR of 2 would mean that the local medicine price is twice that of the international reference price. Median price ratios were only calculated for medicines with price data from at least 4 medicine outlets, except for procurement prices where a single data point was accepted. The exchange rate used to calculate MPRs was 1 US$ = 6.5 SDG; this was the commercial "buy" rate on the first day of data collection taken from the National Pharmacy and Poisons Board.

The reference prices used were the 2011 Management Sciences for Health (MSH) reference prices, taken from the International Drug Price Indicator Guide. These reference prices are the medians of recent procurement prices offered by for-profit and not-for-profit suppliers to international not-for-profit agencies for generic products. These agencies typically sell in bulk quantity to governments or large NGOs, and are therefore relatively low and represent efficient bulk procurement without the costs of shipping or insurance.

Price results are presented for individual medicines, as well as for the overall 'basket' of medicines surveyed. Summary results for the basket of medicines have been shown to provide a reasonable representation of medicines in the country and price conditions on the market. As averages can be skewed by outlying values, median values have been used in the price analysis as a better representation of the midpoint value. The magnitude of price and availability variations is presented as the interquartile range. A quartile is a percentile rank that divides a distribution into 4 equal parts. The range of values containing the central half of the observations, that is, the range between the 25^{th} and 75^{th} percentiles, is the interquartile range.

Finally, the affordability of treating 14 common conditions was assessed by comparing the total cost of medicines prescribed at a standard dose, to the daily wage of the lowest paid unskilled government worker (1.85 USD at the time of the survey). Though it is difficult to assess true affordability, treatments costing one days' wage or less (for a full course of treatment for an acute condition, or a 30-day supply of medicine for chronic diseases) are generally considered affordable.

Results

1. Availability of medicines on the day of data collection

Table 2 Mean availability of medicines on the day of data collection, public, RDF and private sectors

	Public Sector (n=35 outlets)		Private Sector (n=36 outlets)	RDF Sector (n=28 outlets)
	All medicines (n=49)	EML medicines only (n=45)	all medicines (n=50)	
Brand	3.7% (Std 9.9%)	4%	14.4%	4.5%
Lowest Price	68.1% (Std 25.7%)	68.2%	83.9%	55.4%

- Average availability of all survey medicines in the public sector was fair at 68.1% and 55% for RDF When analysis is limited to survey medicines listed on the national EML, public sector availability stays constant at 68.2%.for public, while it slightly increase for RDF to 55.4%.
- In the public sector, generics were the predominant product type available. Also the in the RDF.
- Average availability in the private sector was good at 83.9%. generics were the predominant product type available.
- In the private sector, medicine availability was higher than that of the two public sectors.

Annex 2 contains the availability of individual medicines in both public and private sectors. In the public sector, medicines with particularly low availability include Salbutamol inhaler (14.3%), Salbutamol syrup (14.3%), Simvastatin (0.0%). In the RDF sector, medicines with particularly low availability include Salbutamol inhaler (0.0%), Salbutamol syrup (0.0%), Simvastatin (0.0%). In the private sector, medicines with particularly low availability include Salbutamol inhaler (16.7%), Salbutamol syrup (16.7%), Simvastatin (0.0%)

Table Summary of availability in public sector Availability in public sector

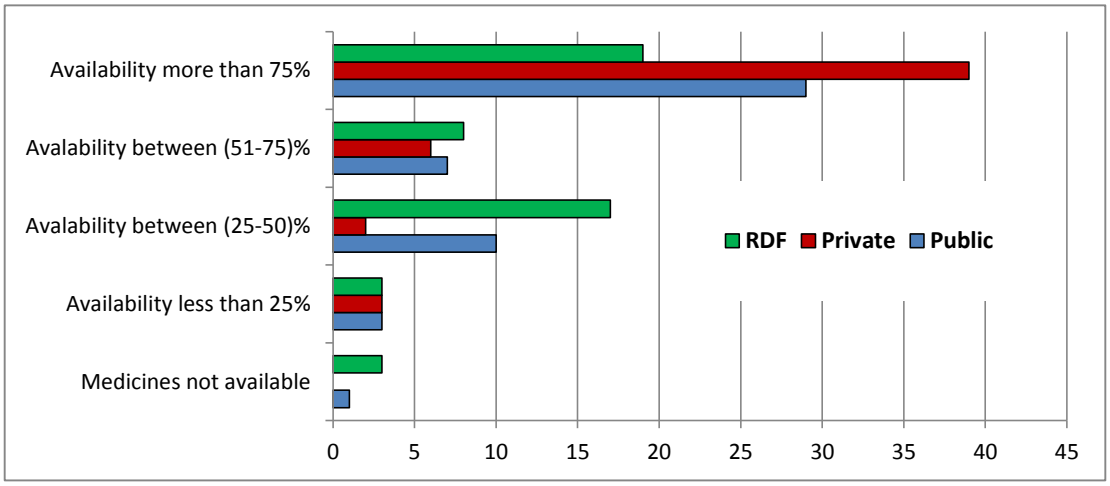
Table 3 Availability of individual medicines in the public sector

Medicines not found in any outlets	Simvastatin 20mg tablet
Medicines found in less than 25% of outlets	Salbutamol syrup Glibenclamide 5mg tablet Salbutamol inhaler
Medicines found in 25 to 50% of outlets	Chloramphenicol eye drops Nifedipine Retard 20mgtablet Ciprofloxacin 500mg tablet Metronidazole 500mg tablet Ranitidine 150mg tablet Hyoscine -N-Butylbromide Omeprazole 20mg tablet Ibuprofen 400mg tablet Metronidazole 250mg tablet Oral rehydration Salt
Medicines found in 50 to 75% of outlets	Dexamethasone injection Lisinopril 10mg tablet Atorvastatin 20mg tablet Cefixime 400mg capsule Norethiesterone 5mg tablet Amoxicillin +ClavulanicAcid1g Paracetamol tabs 500mg Furosemide 40mg tablet Metformin HCL 500mg tablet
Medicines found in over 75% of outlets Diazepam 5mg tablet Insulin, Neutral Soluble Amlodipine 5mg tablet Amoxicillin + Clavulanic Acid Atenolol 50mg tablet Diclofenac 25mg tablet Ferrous Sulphate + Folic acid Fluoxetine 20mg tablet Carbimazole 5mg tab Artemether+ Lumefantrine Artesunate 100mg tablet Azithromycin suspension Co-trimoxazole suspension Diclofenac 50mg tablet	Amitriptyline 25mg tablet Amoxicillin suspension Artemether injection Artesunate 50mg tablet Ceftriaxone injection 1g Adult cough preparation Beclomethasone inhaler Albendazole 200mg tablet Captopril 25mg tablet Carbamazepine 200mg tab Amoxicillin 500mg capsule Gliclazide 80mg tablet Paracetamol suspension

Table 4 Availability of individual medicines in Private sector

Medicines not found in any outlets		No medicine
Medicines found in less than 25% of outlets		Salbutamol syrup Salbutamol inhaler Simvastatin 20mg tablet
Medicines found in 25 to 50% of outlets		Paracetamol tabs 500mg Ranitidine 150mg tablet
Medicines found in 50 to 75% of outlets		Metronidazole 500mg tablet Norethiesterone 5mg tablet Nifedipine Retard 20mg tablet Omeprazole 20mg tablet Oral rehydration Salt Paracetamol suspension
Medicines found in over 75% of outlets	Cefixime 400mg capsule Chloramphenicol eye drops Ciprofloxacin 500mg tablet Diazepam 5mg tablet Diclofenac 25mg tablet Ferrous Sulphate + Folic acid Fluoxetine 20mg tablet Co-trimoxazole suspension Diclofenac 50mg tablet Dexamethasone injection Furosemide 40mg tablet Glibenclamide 5mg tablet Gliclazide 80mg tablet Hyoscine -N-Butylbromide Ibuprofen 400mg tablet Insulin, Neutral Soluble Lisinopril 10mg tablet Metformin HCL 500mg tablet Metronidazole 250mg tablet	Amitriptyline 25mg tablet Amoxicillin suspension Adult cough preparation Albendazole 200mg tablet Amoxicillin 500mg capsule Amlodipine 5mg tablet Amoxicillin + Clavulanic Acid Amoxicillin + Clavulanic Acid 2 Artemether injection Artesunate 50mg tablet Atenolol 50mg tablet Artemether+ Lumefantrine Artesunate 100mg tablet Azithromycin suspension Atorvastatin 20mg tablet Ceftriaxone injection 1g Beclomethasone inhaler Captopril 25mg tablet Carbamazepine 200mg tab Carbimazole 5mg tab

Figure 2 Summary of medicines availability in the three sectors



2. Public sector prices

2.1 Public sector procurement prices

Table 5 Public sector procurement - ratio of median unit price to MSH international reference price

Product type	Median MPR	25th percentile	75th percentile
Lowest price generic (n = 49 medicines)	1.84	1.16	3.24

Of the 50 medicines included in the survey, 49 generics were found in the public procurement sectors; the public sector is therefore procuring exclusively generic products. Based on the median MPRs, the public sector is procuring generics at 1.84 times their international reference prices. Thus, the government procurement agency is purchasing fairly efficient. The interquartile range shows moderate variation in median price ratios across individual medicines.

Annex 3 contains procurement prices for individual medicines.

Generic medicines being purchased at prices significantly less than international prices include Hyoscine -N-Butylbromide (0.88), Norethiesterone 5mg tablet (0.82), Oral rehydration Salt (0.81), Lisinopril 5mg tablet (0.79), Salbutamol syrup (0.65), Atorvastatin 20mg (0.63), Gliclazide 80mg tablet (0.56), Amlodipine 5mg tablet (0.56), Insulin soluble (0.43) and Artemether 80mg injection (0.36). Conversely, medicines for which the government is paying several times the international

reference price include Diclofenac 50mg (23.16), Ferrous Sulphate + folic acid (12.2) and Fluoxetine 20mg tab (8.06)

2.2 Public sector patient prices

Table 6 Public sector patient prices - ratio of median unit price to MSH international reference price

Product type	Median MPR	25th percentile	75th percentile
Originator brand (n = 3 medicines)	2.67	1.68	3.24
Lowest price generic (n = 49 medicines)	2.98	1.66	4.69

The results above show that in the public sector:

- Originator brand medicines are generally sold at 2.67 times their international reference price. Half of the originator brand medicines were priced at 1.68 (25th percentile) to 3.24 (75th percentile) times their international reference price; there is therefore moderate variation in MPRs across individual originator brand medicines in the public sector.
- Lowest price generic medicines are generally sold at 2.98 times their international reference price. Half of the lowest priced generic medicines were priced at 1.66 (25th percentile) to 4.69 (75th percentile) times their international reference price; there is therefore moderate variation in MPRs across individual generic medicines in the public sector.

Table 7 RDF sector patient prices - ratio of median unit price to MSH international reference price

Product type	Median MPR	25th percentile	75th percentile
Originator brand (n = 6 medicines)	1.88	1.09	3.89
Lowest price generic (n = 46 medicines)	2.70	1.88	4.24

The results above show that in the RDF sector:

- Originator brand medicines are generally sold at 1.88 times their international reference price. Half of the originator brand medicines were priced at 1.09 (25th percentile) to 3.89

(75th percentile) times their international reference price; there is therefore moderate variation in MPRs across individual originator brand medicines in the public sector.

- Lowest price generic medicines are generally sold at 2.70 times their international reference price. Half of the lowest priced generic medicines were priced at 1.88 (25th percentile) to 4.24 (75th percentile) times their international reference price; there is therefore moderate variation in MPRs across individual generic medicines in the public sector.

Annex 5 contains the median price ratios for individual medicines found in the public sector. Originator brand medicines priced several times higher than international reference prices include Carbimazole 5mg tablet (MPR = 3.81) and Salbutamol inhaler (MPR = 2.67). The 25th and 75th percentiles for individual medicines show that, for originator brands, prices not vary significantly between public sector medicine outlets. Lowest price generic medicines priced several times higher than international reference prices include Diclofenac 50mg tablet (MPR = 29.3), Ferrous sulphate + folic acid (MPR = 21.22), Ceftriaxone 1g injection (MPR = 12.96). The 25th and 75th percentiles for individual medicines show that, for generic medicines, prices vary significantly between public sector medicine outlets.

2.3 Comparison of patient prices and procurement prices in the public sector

Table 8 Median MPRs for medicines found in both public procurement and public sector medicine outlets

Product type	Median MPR Public Procurement	Median MPR Public Patient Prices	% difference patient prices to procurement
Lowest price generic (n = 49 medicines)	1.75	2.84	62.4%

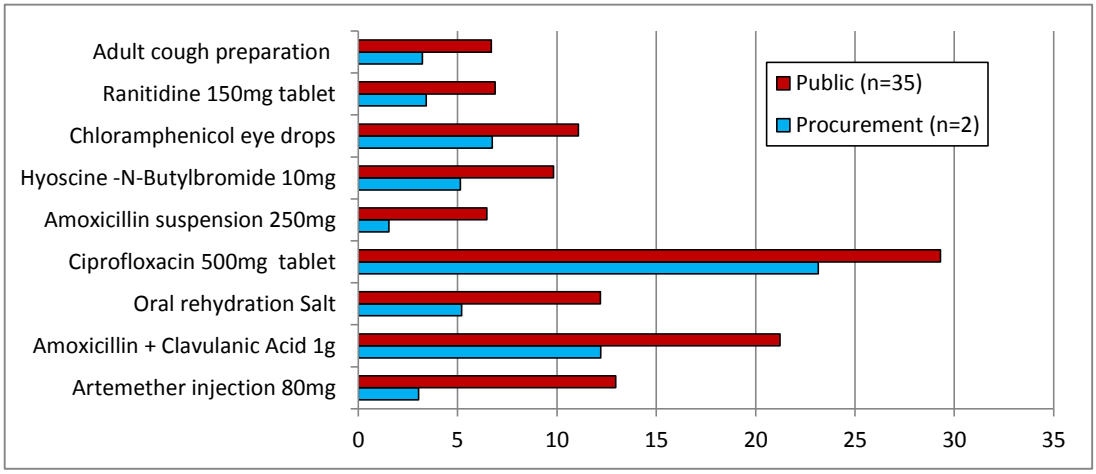
In the above table, only those medicines found in both public procurement and public sector medicine outlets were included in the analysis to allow for the comparison of purchase price to final patient price. Results show that final patient prices in the public sector are 62.4% higher than procurement prices for generic.

Table 9 Median MPRs for medicines found in both public procurement and RDF sector medicine outlets

Product type	Median MPR Public Procurement	Median MPR Public Patient Prices	% difference patient prices to procurement
Lowest price generic (n = 49 medicines)	1.84	2.61	41.9%

In the above table, only those medicines found in both RDF procurement and public sector medicine outlets were included in the analysis to allow for the comparison of purchase price to final patient price. Results show that final patient prices in the RDF sector are 41.9% higher than procurement prices for generic. Form results shown in two tables above, The RDF sector has lower mark-up when compared to other public sector, the difference in mark-up reached up to 20%.

Figure 3 Procurement prices and patient prices in the public sector: median price ratios for lowest priced generic medicines



3. Private sector patient prices

Table 10 Ratio of median unit price to MSH international reference price (median price ratio or MPR), median for all medicines found

Product type	Median MPR	25 %ile	75 %ile
Originator brand (n = 14 medicines)	4.24	3.32	8.18
Lowest price generic (n = 50 medicines)	2.90	2.01	5.18

The results above show that in the private sector:

- Originator brand medicines are generally sold at 4.24 times their international reference price. Half of the originator brand medicines were priced at 3.32 (25th percentile) to 8.18 (75th percentile) times their international reference price; there is therefore substantial variation in MPRs across individual originator brand medicines in the public sector.
- Lowest price generic medicines are generally sold at 2.9 times their international reference price. Half of the lowest priced generic medicines were priced at 2.01 (25th percentile) to 5.18 (75th percentile) times their international reference price; there is therefore substantial variation in MPRs across individual generic medicines in the private sector.

Annex 6 contains the median price ratios for individual medicines found in the private sector. Originator brand medicines priced several times higher than international reference prices include Atenolol 50mg tablet (MPR = 31.52), Paracetamol 500mg tablet (MPR = 13.08), Carbimazole 5mg tablet (MPR = 12.02). The 25th and 75th percentiles for individual medicines show that, for originator brands, prices vary significantly between private sector medicine outlets. Lowest price generic medicines priced several times higher than international reference prices include Diclofenac 50mg tablet (MPR = 27.13), Ferrous sulphate + folic acid capsule (MPR = 19.45), Artesunate 100mg tablet (MPR = 9.83). The 25th and 75th percentiles for individual medicines show that, for generic medicines, prices do not vary significantly between private sector medicine outlets.

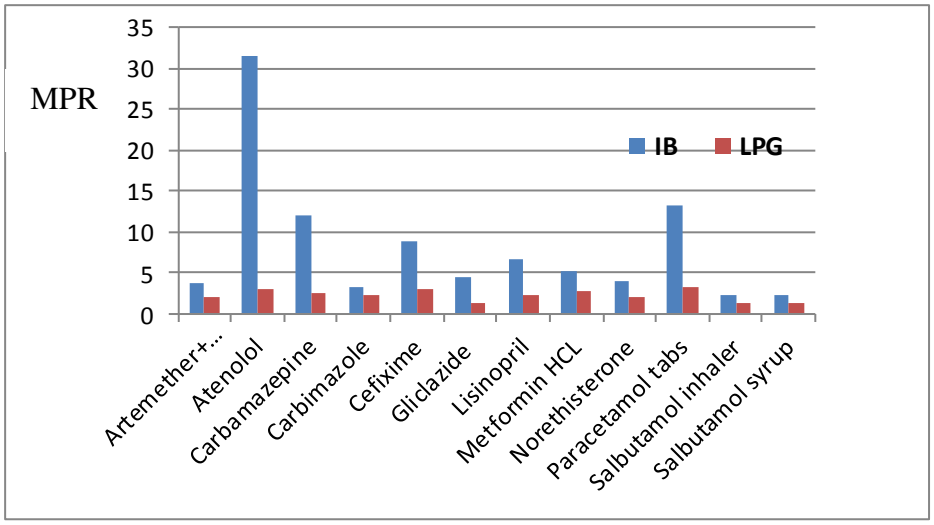
Table 11 Comparison of the prices of originator brands and generically equivalent products: Median MPRs for medicines found as both product types in private sector

Type (n = 14 medicines)	Median MPR	25 %ile	75 %ile
Originator brand	4.24	3.32	1.44
Lowest price generic	2.10	8.18	2.53

In the above table, only those medicines, for which both the originator brand and a generically equivalent product were found, were included in the analysis to allow for the comparison of prices between the two product types. Results show that in the private sector, originator brands

cost 100% more, on average, than their generic equivalents. Thus, patients are paying substantially more to purchase originator brand medicines when lower-cost generics are available.

Figure 4 Median price ratios for selected medicines, originator brand and generic equivalents, private sector



4. Comparison of patient prices in the public, private and RDF sectors

Table 12 Median MPRs for medicines found in both public and private sectors

Product type	Median MPR Public sector patient prices	Median MPR Private sector patient prices	% difference private to public
Originator brand (n = 3 medicines)	**2.67**	**2.14**	**-20.0%**
Lowest price generic (n = 49 medicines)	**2.98**	**2.82**	**-5.3%**

In the above table, only those medicines found in both public and private sector medicine outlets were included in the analysis to allow for the comparison of prices between the two sectors. Results show that final patient prices in the private sector are 20.0% and 5.3% lower than in the public sector for originator brands and generic equivalents, respectively.

Table 13 Median MPRs for medicines found in both private and RDF sectors

Product type	Median MPR RDF sector patient prices	Median MPR Private sector patient prices	% difference private to RDF
Originator brand (n = 6 medicines)	1.88	2.88	34.5%
Lowest price generic (n = 46 medicines)	2.70	3.00	9.9%

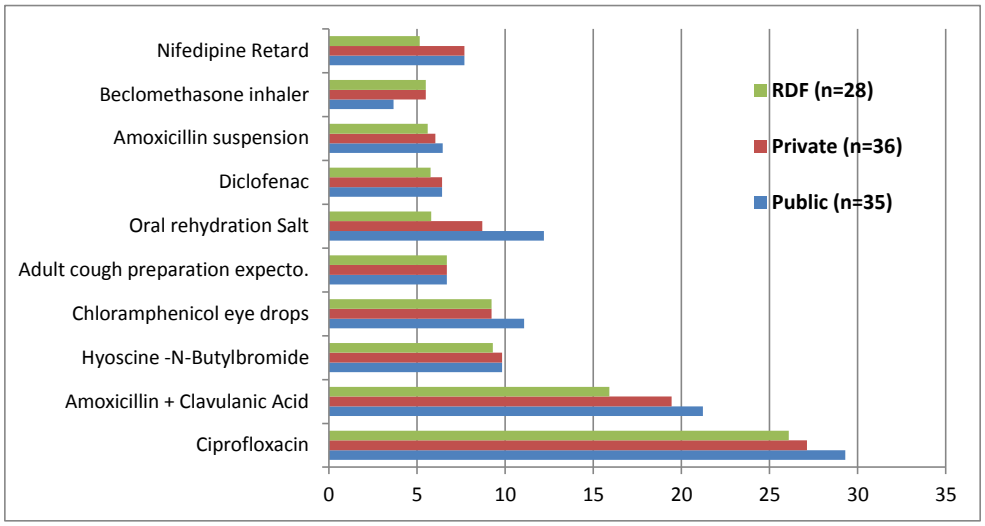
In the above table 9, only those medicines found in both RDF and private sector medicine outlets were included in the analysis to allow for the comparison of prices between the two sectors. Results show that final patient prices in the private sector are 34.5% and 9.9% higher than in the RDF sector for originator brands and generic equivalents, respectively. Given that overall availability of medicines in the RDF sector is low, patients are paying substantially higher prices to purchase medicines from the private sector.

Table 14 Median MPRs for medicines found in both public and RDF sectors

Product type	Median MPR RDF sector patient prices	Median MPR Public sector patient prices	% difference public to RDF
Originator brand (n = 6 medicines)	0.89	1.68	47.2%
Lowest price generic (n = 46 medicines)	2.70	3.05	11.3%

In the above table 10, only those medicines found in both RDF and public sector medicine outlets were included in the analysis to allow for the comparison of prices between the two types of public sectors to know the variation within one sector but different context. Results show that final patient prices in the public sector are 47.2% and 11.3% higher than in the RDF sector for originator brands and generic equivalents, respectively.

Figure 5 Median Price Ratios for selected lowest priced generic medicines in the public and private sector



MPR

Regional analysis

Comparison of prices and availability across the six regions surveyed

As shown in the table below, the median MPR for generics in the private sector differed significantly across the six regions surveyed (ANOVA test prove that there is significant different in prices between states). Overall, medicine prices were lowest in Khartoum State and highest in Wes Darfur State. Median MPRs for originator brands ranged from 2.82 (LOWEST MEDIAN MPR) in River Nile to 7.8 (HIGHEST MEDIAN MPR) in Gazeera State. Median MPRs for lowest price generics ranged from 2.61 (LOWEST MEDIAN MPR) in Khartoum State to 3.71 (HIGHEST MEDIAN MPR) in West Darfur State. However, due to the small sample size in each region (6 medicine outlets per sector, based on availability of the medicine in at least 4 of the 5), results should be interpreted with caution.

Table 15 Median MPRs per survey area, private sector (6 medicine outlets per survey area)

	River Nile	W. Darfur	Red Sea	Gazeera	Sinnar	Khartoum
Median MPR Originator brand	(2 meds) 2.82	(0 meds)	(6 meds) 4.9	(4 meds) 7.8	(2 meds) 7.02	(9 meds) 3.47
Median MPR Lowest price generic	(44 meds) 3.06	(36 meds) 3.71	(45 meds) 3.01	(41 meds) 2.84	(46 meds) 2.86	(45 meds) 2.61

The mean availability of survey medicines in the private sector ranged from 76.7% (LOWEST % AVAILABILITY) in West Darfur State and 88.7% (HIGHEST % AVAILABILITY) in Khartoum State for generic equivalents. For originator brands, mean availability was highest in Khartoum State (30.2%) and lowest in West Darfur (3.5%).

Table 16 Mean availability per survey area, private sector (5 medicine outlets per survey area)

	Mean availability					
	River Nile	**W. Darfur**	**Red Sea**	**Gazeera**	**Sinnar**	**Khartoum**
Originator brand	10.9%	3.5%	14.7%	15.9%	11.2%	30.2%
Lowest price generic	86.7%	76.7%	87.7%	79.3%	84.7%	88.7%

Table 17 Compare MPR in private sector to public sector and government procurement price

	R. Nile	**W. Darfur**	**R. Sea**	**Gazeera**	**Sinnar**	**Khartoum**
Difference private to public	20.6%	-10.3%	-12.5%	5.2 %	0.0%	- 14.6 %
Difference private to procurement	65.3%	122.8%	86.9%	76.0%	50.7%	33.8%

The result shown in the table the highest difference between private and government procurement prices found in West Darfur State (122.8%), while Khartoum State has lowest difference (33.8%), three states show higher public patent prices than the private sector prices by 14.6% (Khartoum), 12.5% (Red Sea) and 10.3% (West Darfur), State like Sinnar show no difference between the public and private sectors. However in Gazeera and River Nile the public Sector has lower prices than the private sector.

5. Affordability of standard treatment regimens

The affordability of treatment for 14 common conditions was estimated as the number of days' wages of the lowest-paid unskilled government worker needed to purchase medicines prescribed at a standard dose. For acute conditions, treatment duration was defined as a full course of therapy, while for chronic diseases, the affordability of a 30-days' supply of medicines was determined. The daily wage of the lowest-paid unskilled government worker used in the analysis was 12 SDG in local currency.

Table 18 Number of days' wages of the lowest paid government worker needed to purchase standard treatments

Disease condition and 'standard' treatment			Day's wages to pay for treatment		
Condition	Drug name, strength, dosage form	Treatment schedule	LPG - public sector	LPG - private sector	LPG- RDF sector
Asthma	Salbutamol 100 mcg/dose inhaler	1 inhaler of 200 doses	1.6	1.4	-
Diabetes	Glibenclamide 5 mg cap/tab	1 cap/tab x 2 x 30 days = 60	0.5	0.8	0.8
Hypertension	Atenolol 50 mg cap/tab	1 cap/tab x 30 days = 30	0.7	0.5	0.5
Hypertension	Captopril 25 mg cap/tab	1 cap/tab x 2 x 30 days = 60	3.3	3.3	2.0
Hypercholesterolemia	Simvastatin 20 mg cap/tab	1 cap/tab x 30 days = 30	2.1	2.0	1.5
Depression	Amitriptyline 25 mg cap/tab	1 cap/tab x 3 for 30 days = 90	2.3	2.3	1.5
Adult respiratory infection	Ciprofloxacin 500 mg cap/tab	1 cap/tab x 2 for 7 days = 14	1.2	1.2	1.1
Paediatric respiratory infection	Co-trimoxazole 8+40 mg/ml suspension	5ml twice a day for 7 days = 70 ml	0.4	0.5	0.4
Adult respiratory infection	Amoxicillin 500mg cap/tab	1 cap/tab x 3 for 7 days = 21	1.1	1.1	1.0
Adult respiratory infection	Ceftriaxone 1 g/vial injection	1 vial	13.9	3.8	3.0
Anxiety	Diazepam 5mg cap/tab	1 cap/tab x 7 days = 7	0.1	0.1	0.1
Arthritis	Diclofenac 50mg cap/tab	1 cap/tab x 2 x 30 days = 60	5.3	4.9	4.8
Pain/inflammation	Paracetamol 24mg/ml suspension	child 1 year: 120mg (=5ml) x 3 for 3 days = 45ml	0.3	0.3	0.3
Ulcer	Omeprazole 20mg cap/tab	1 cap/tab x 30 days = 30	2.7	2.5	2.3

The aaffordability of lowest price generics in the public sector was good for some conditions, with standard treatment costing a days' wage or less. Treatments costing over a days' wage of the lowest paid government worker include Adult respiratory tract infection using Ceftriaxone injection 1g (13.9 days' wage), Arthritis treated with Diclofenac 50mg tablet cost (5.3 days' wage) Asthma, Salbutamol inhaler (1.6 days' wages), Hypertension, captopril 25mg tablet (3.3. days' wages) and Hypercholesterolemia , Simvastatin 20mg tablet (2.1days' wages). However, given the fair availability of medicines in the public sector, many patients are forced to purchase medicines from the private sector.

In RDF other public sector the affordability of lowest price generics was for most of conditions. However some treatments are likely higher than one days' wage of lowest paid government worker.

In the private sector, the aaffordability of lowest price generics in the public sector was good for most conditions, with standard treatment costing a days' wage or less Treatments costing over a days' wage of the lowest paid government worker include Arthritis treated with 50mg Diclofenac 50mg tablet (4.9 days' wages), Adult respiratory tract infection treated with Ceftriaxone 1g injection (3.8 days' wages), Ulcer treated with Omeprazole 20mg cap/tab (2.5 days' wages) and Hypercholesterolemia treated with Simvastatin 20mg tablet (2.1 days' wages). The most affordable standard treatments were those for treating conditions like anxiety 0.1 days' wages) and pediatric respiratory tract infections (0.5 of days' wages).

When originator brand medicines are prescribed and dispensed in the private sector, several treatments cost well over one days' wage. For example, treating Asthma with Salbutamol inhaler costs 2.5 of days' wages (1.4 for generic), while treating Hypertension with Atenolol 50mg tablet costs 5.2 of days' wages (0.5 for the generic). And treating adult infection with Amoxicillin + Clavulonic acid 1g cost 9.2 days' wage (5.1 for the generic).

It should be noted that treatment costs refer to medicines only and do not include the additional costs of consultation and diagnostic tests. Further, many people in Sudan earn less that the lowest government wage; as such even treatments which appear affordable are too costly for the poorest

segments of the population. Finally, even where individual treatments appear affordable, individuals or families who need multiple medications may quickly face unmanageable drug costs. An example is provided below of a family where the father has diabetes and the child has asthma. If the family is earning the equivalent of the lowest-paid government worker's salary, total treatment costs are 2.1 days' wages in the public sector and 2.2 days' wages in the private sector if the lowest price generics are purchased.

Table 19 Affordability of treatment for a family with diabetes and asthma: Number of days' wages of the lowest paid government worker needed to purchase standard treatments

	LPG - public sector	LPG - private sector	LPG – RDF sector
Father - Glibenclamide	0.5	0.8	2.0
Child – salbutamol inhaler	1.6	1.4	
Total days' wages for one month treatment	2.10	2.20	--

Affordability to antimalarial treatment

Table 20 Days' wages required to purchase antimalria in Sudan

Items	Days' wages required for LPG					
	Public		**Private**		**RDF**	
	LPG	OB	LPG	OB	LPG	OB
Artesunate 100 mg	1.3	-	1.3	-	1.2	-
Artesunate 50mg tablet	1.0	-	0.8	-	0.8	-
Artemether 80mg injection	2.8	-	3.0	-	2.6	-
Artemether + Lumefantrine tablet	1.1	-	3.3	6	-	4.5

In the table above, the results shows that, antimalarial agents are less affordable, the day wage for treatment of malaria vary between 0.8 day wage (Artesunate 50mg the 1st line treatment of malaria in children) in private and RDF sectors to 3.3 days wage (Artemether + Lumefantrine tablet second line treatment of malaria in adult).

The originator brand of Artesunate + Lumefantrine when dispensed to patients in the private sector, they will pay 2.7 days wages more, when compared to LPG in the same sector, and 4.9 days' wages when compared to LPG in the public sector.

7. International comparisons

7.1 International comparisons of public sector procurement prices

Figure 6 Ratio of local price to international reference price for lowest priced generic Ranitidine, tablet, 150mg in 10 countries

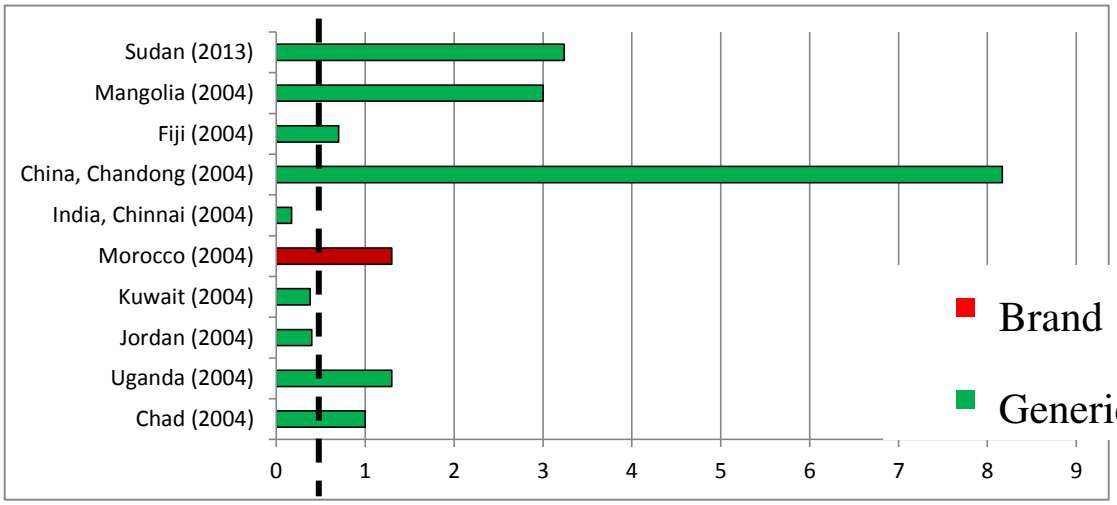
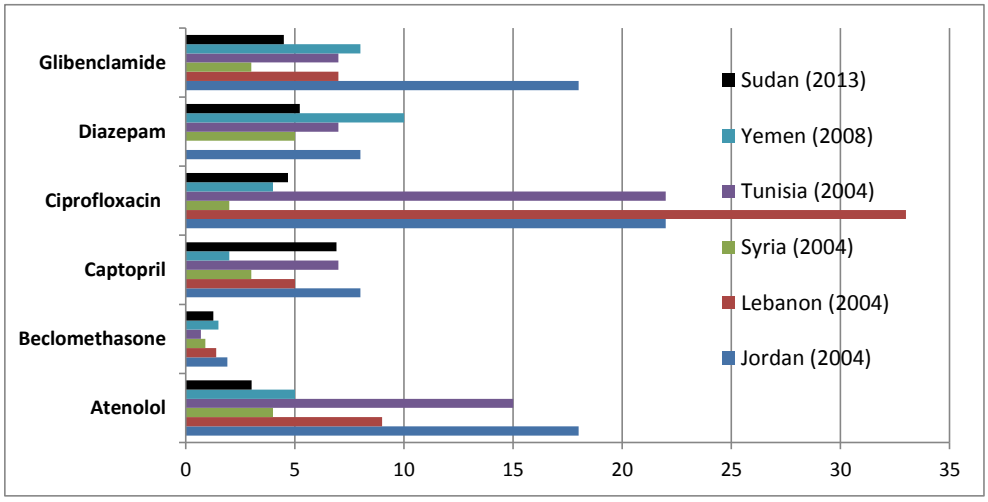


Figure 7 Ratio of local price to international reference price for lowest priced generic 6 medicines in 6 countries



Discussion

As partial fulfillment of master science degree on Health Economic and Health Care Management in Chulalongkorn University (WHO collaboration center of Health Economics) I carried out a nation-wide study to measure the availability and prices of 50 medicines in Sudan using an international standardized methodology. Results indicate that in the public sector, the procurement of medicines is relatively inefficient, as shown by purchase prices higher than, international reference prices. By the time these medicines are sold to patients, prices have increased by 62.4% as a result of add-on costs in the public sector distribution chain.

Availability of generic medicines in the public sector is fair. The average availability across all survey medicines was 68.1%, while the availability of medicines on the national EML was 68.2%.while for RDF (the other public sector) was 53.4% and 53.1% respectively.

- Medicines with particularly low availability in the public sector include Simvastatin 20mg tablet (0.0% availability), Salbutamol Inhaler (14.30% availability), Salbutamol syrup (14.30% availability).
- Originator brand medicines are rarely available in all sectors surveyed. However, this is only an issue where high quality generics are not available.

In the private sector, generics were the predominant product type found. Mean availability in the private sector was 83.9% for lowest price generic medicines and 14.4% for originator brands.

- Medicines with particularly low availability in the private sector include Simvastatin (13.0% availability), Salbutamol Inhaler (16.70% availability), Salbutamol syrup (16.70% availability)

Final patient prices for lowest price generic medicines in the public sector are high. Lowest price generic medicines were priced at 2.98 times their international reference price, while originator brand medicines were priced at 2.67 times their international reference price. Compared with the public sector, private sector patient prices were, on average, 20% and 5% lower for originator

brands and generic equivalents, respectively. Lowest price generic medicines were priced at 2.9 times their international reference price, while originator brand medicines were priced at 4.24 times their international reference price. However the private sector patient prices were, on average, 34.5% and 9.9% higher for originator brands and generic equivalent respectively when compare to RDF sector.

- These results show that patients are paying significantly less for medicines in the private sector than in the public sector. However RDF is lesser prices than the private sector. Given the low availability in the RDF sectors, this is a cause for concern.

Medicines were not found to be priced consistently with respect to their international reference price. In the public sector, 50% of lowest price generic medicines were priced between 1.66 (25^{th} %ile) and 4.69 (75th%ile) times their international reference price, while half of originator brand medicines were priced between 1.68(25th %ile) and 3.24(75th %ile) times their international reference price. In the private sector, half of lowest price generic medicines were priced between 2.01(25^{th} %ile) and 5.81(75^{th} %ile) times their international reference price, while half of originator brand medicines were priced between 3.32(25^{th} %ile) and 8.18(75^{th} %ile) times their international reference price. These disparities suggest substantial variation in procurement efficiency and/or price mark-ups between medicines.

The interquartile range for the median price ratios of individual medicines shows the variability in the medicine price across medicine outlets. In the public sector, results show a moderate amount of variation in price across outlets. In the private sector, a wide amount of variation in price across outlets is observed.

- The high degree of variability observed between outlets is likely the result of low market competition and/or the absence of price regulations.

In all sectors, the aaffordability of lowest price generics was fair for some conditions, only five condition were common in the three sectors to have cost less than one days' wage these were diabetes mellitus treated with Glibenclamide 5mg (0.5, 0.8, 0.8) days' wage, in public, private and RDF respectively, hypertension treated with Atenolol 50mg (0.7, 0.5, 0.5), Pediatric respiratory tract infection treated with Co-trimoxazole suspension (0.4, 0.5, 0.4) respectively, Anxiety treated

with Diazepam (0.1, 0.1, 0.1) days' wage and Pain /inflammation treated with Paracetamol suspension . In the public sector the days' wage range between 0.1 (anxiety treatment with diazepam) to 13.9 (Adult respiratory infection treated by Ceftriaxone 1g injection) , while in the private sector it ranging between 0.1 day wage (anxiety treated by diazepam) to 4.9 day wage (Arthritis treated with Diclofenac 50mg), RDF same like private conditions, but it range between 0.1 to 4.8 days' wages

It should be noted that many people in Sudan earn much less that the lowest government wage; as such even treatments which appear affordable are too costly for the poorest segments of the population. Given that 40 % of the population are living below the international poverty line of less than $1/day, even treatments which appear affordable are financially out-of-reach for a substantial number of people.

The results of the international comparison suggest that Sudan generally has comparable availability, greater prices, and better/similar/worse affordability, than the other countries included in the analysis.
More in-depth analysis, considering additional factors like size of the markets; capabilities of the national pharmaceutical manufacturing sector; the effect of taxes; duties and mark-ups at national and local levels; and economic indicators; is needed to reveal the reasons for variation between different countries. Such information can be useful for policymakers and governments in deciding whether any appropriate interventions can be made to make medicines more affordable and accessible in each country. Further studies and comparisons between high and low-income countries can also provide an evidence base for equity or differential pricing strategies by multinational manufacturers whereby less wealthy populations pay less than wealthier countries for essential medicines.

The results of this medicine price survey provide insight into the availability, price and affordability of medicines in Sudan. The use of the WHO/HAI medicine prices survey has allowed for the measurement of medicine prices and availability in a reliable and standardized way that enables valid international comparisons to be made. A further strength of the methodology are the multiple steps taken to ensure data quality: training of survey personnel

including a data collection pilot test; pairs of data collectors to cross-check results; double entry and verification of data into the computerized survey *Workbook*; data checker function in *Workbook* that identifies outlier or erroneous entries; and quality control checks at multiple stages.

Study results may be limited by the fact that data are inherently subject to outside influences such as market fluctuations and delivery schedules. In addition, the reliability of median price ratios is dependent on the number of supplier prices used to determine the median MSH international reference price of each medicine. In cases where very few supplier prices are available, or where there is no supplier price and the buyer price is used as a proxy, MPR results can be skewed by a particularly high/low international reference price. A further limitation is that availability is determined for the list of survey medicines, and therefore does not account for the availability of alternate strengths or dosage forms, or of therapeutic alternatives. Finally, the methodology does not include informal sectors, such as markets and general stores, as the quality of the medicines found in such sectors cannot be assured.

It is important to discuss the findings with respect to the policies and practices in the country. For example, if low priced generics show poor availability in the private sector it may be due to policies that do not support prescribing by INN name, do not permit generic substitution by pharmacists, do not provide incentives for pharmacists to dispense low priced generics, a lack of education to health professionals and people about quality testing of generics, etc. Discuss what may be the cause of high prices, low availability, and poor affordability.

Recommendations and conclusion

The results of this preliminary analysis suggest that a mix of policies need to be implemented to make medicines more affordable and available. Although further investigation is required to obtain a more in-depth understanding of the causes and consequences of medicine pricing and availability, the results of this survey provide broad directions for future research and action. It is therefore recommended that the following steps be taken to improve medicine prices, availability and affordability:

Based on the results of the survey, the following recommendations can be made for improving the availability, price and affordability of medicines in Sudan:

Medicines prices:

The prices disparities among states need to be regulated and controlled, meanwhile, medicines prices in Sudan need to be adjusted to the international reference prices to improve medicines affordability

(1) Control medicines prices
   a) Enforce price regulations at the states level, through State Miniseries of Health – pharmaceutical directorates.
   b) More studies should be conducted on overhead cost variation among states, to set-up clear markups and profit margin in all states.
   c) Assess the pricing policy in Sudan, and consider international reference pricing (benchmarking) as tool to adjust and control generic prices.
   d) Continuous monitoring of medicines prices to evaluate the effect of any interventions.

(2) Improve government procurement and retail prices
   a) Enforce public sector group purchasing of medicines, including all stakeholders.
   b) The pricing policy in the public sector need to be evaluated, specifically, those for National Health Insurance Fund.

Availability

Regarding the low retail price found in Revolving Drug Fund medicine outlets, this sector need to be strengthened and reorganized to achieve their missions toward improve access

1) Essential medicines should be on the top of priorities when supplying medicines in RDF and public sectors.
2) Medicines regulatory authorities if necessary to encourage local pharmaceutical agencies, local manufacturers and medicines suppliers to ease have stores in at least each state capital.

Affordability

To improve affordability, many factors can be considered. However, in this study, only medicine prices were assessed, there for options and opportunities to improve affordability can be summarized in:

1) Exempt essential medicines from government fees.
2) Dissemination of medicine prices to public will increase prices transparency.
3) Generic promotion, through public sectors including social health insurance scheme

This study has helped to provide broad insight into current issues related to the price, availability and affordability of key medicines for the treatment of common conditions. The results highlight priority areas for action for the Ministry of Health and others in improving access to affordable medicines. Broad debate and dialogue are now needed to identify how best different players can contribute to the prospect of enhancing accessibility and affordability to essential medicines.

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Annex 1: List of Core and Supplementary Medicines

List	No.	Disease	Name	Strength	Dosage form	Originator brand, Manufacturer
Global core list	1	Asthma	Salbutamol	100 mcg/dose	inhaler	Ventoline/GSK
	2	Diabetes	Glibenclamide	5 mg	cap/tab	Daonil/Sanofi-Aventis
	3	Cardiovascular disease	Atenolol	50 mg	cap/tab	Tenormin/AstraZeneca
	4	Cardiovascular disease	Captopril	25 mg	cap/tab	Capoten/BMS
	5	Cardiovascular disease	Simvastatin	20 mg	cap/tab	Zocor/MSD
	6	Depression	Amitriptyline	25 mg	cap/tab	Tryptizol/MSD
	7	Infectious disease	Ciprofloxacin	500 mg	cap/tab	Ciproxin/Bayer
	8	Infectious disease	Co-trimoxazole	8+40 mg/ml	suspension	Bactrim/Roche
	9	Infectious disease	Amoxicillin	500 mg	cap/tab	Amoxil/GSK
	10	Infectious disease	Ceftriaxone	1 g/vial	injection	Rocephin/Roche
	11	CNS	Diazepam	5 mg	cap/tab	Valium/Roche
	12	Pain/inflammation	Diclofenac	50 mg	cap/tab	Voltarol/Novartis
	13	Pain/inflammation	Paracetamol	24 mg/ml	syrup/susp	Panadol/GSK
	14	Ulcer	Omeprazole	20 mg	cap/tab	Losec/AstraZeneca
Regional core list	15		Albendazole	200 mg	cap/tab (	Zental
	16	Pead. Respiratory infection	Amoxicillin suspension	50 mg/ml	millilitre	Amoxil
	17	hyperlipidemia	Atorvastatin	20 mg	cap/tab	Lipitor
	18	Asthma	Beclomethasone inhaler	50 mcg/dose	dose	Becotide
	19	Epilepsy	Carbamazepine	200 mg	cap/tab	Tegretol
	20	Eye infection	Chloramphenicol eye drops	0.005	millilitre	Chloromycetin
	21	inflamtion	Dexamethasone injection	4 mg/ml	millitre	Decadron
	22	Psychotic disorder	Fluoxetine	20 mg	cap/tab	Prozac
	23	Diuretic, antihypertensive	Furosemide	40 mg	cap/tab	Lasix
	24	Diabetes	Gliclazide	80 mg	cap/tab	Diamicron
	25	Pain	Ibuprofen	400 mg	cap/tab	Brufen

	26	Antihypertensive	Lisinopril	10 mg	cap/tab	Zestril
	27	Diabetes	Metformin HCL	500 mg	cap/tab	Glucophage
	28		Metronidazole (2)	400 mg	cap/tap	Flagyl
	29	Antihypertensive	Nifedipine Retard	20 mg	cap/tab	Adalat Retard
	30	Ulcer	Ranitidine	150 mg	cap/tab	Zantac
Supplementary list	31	cough	Adult cough preparation		syrup	
	32	Antihypertensive	Amlodipine	5 mg	cap/tab	Norvasc
	33	Infections	Amoxicillin + Clavulanic Acid	250+125 mg	cap/tab	Augmentin
	34	Infections	Amoxicillin + Clavulanic Acid 2	875+125 mg	cap/tab	Augmentin
	35	Malaria in adult	Artemether injection	80 mg/ml	millilitre	
	36	Malaria in adult	Artemether+ Lumefantrine	20+120 mg	cap/tab	Coartem
	37	Malaria in adult	Artesunate	100 mg	cap/tab	
	38	Malaria in children	Artesunate 2	50 mg	cap/tab	
	39	upper respiratory infection in children	Azithromycin Sus	40 mg/ml	millilitre	Zithromax
	40	thyroid disorder	Carbimazole	5 mg	cap/tab	Neo-Mercazole
	41	infections	Cefixime	400 mg	cap/tap	Suprax
	42	inflammation/ pain	Diclofenac	25 mg	cap/tab	Voltaren
	43	supplimanrty	Fefol	200+0.4 mg	cap/tab	
	44	Antispasmodic	Hyoscine -N-Butylbromide	10 mg	cap/tab	Buscopan
	45	Diabetes	Insulin, Neutral Soluble	100 IU/ml	millilitre	Insulin Neutral
	46		Metronidazole	200 mg	cap/tab	Flagyl
	47	Hrmonal disorder	Norethisterone	5 mg	cap/tab	Primolut-N
	48	Rehyderation	ORS	1 PK/l litre	sachet	

	49	pain inflamation	Paracetamol tabs	500 mg	cap/tab	Panadol
	50	Asthma	Salbutamol syrup	0.4 mg/ml	millilitre	Ventoline

Annex 2. Medicine data collection form

Medicine Price Data Collection Form

Use a separate form for each medicine outlet

Date : _____ Survey area number :

_____

Name of town/village/district : _____

Name of medicine outlet (optional): _____

Medicine outlet unique survey ID (mandatory): _____

Distance in km from nearest town (population >50 000): _____

Type of medicine outlet :

q Public sector facility (specify level of care below):

- q Primary care facility
- q Secondary care facility
- q Tertiary care facility

q Private sector medicine outlet

q Other sector medicine outlet (please specify): _____

Type of price :

q Procurement price q Price the patient pays

Type of data:

q Sample outlet q back-up outlet q validation visit

Name of manager of the medicine outlet: _____

Name of person(s) who provided information on medicine prices and availability (if different from manager):

_____

Name of data collectors :

_____

_____

Verification

To be completed by the area supervisor at the end of the day, once data have been verified

Signed:_____ Date:_____

Medicine Price Data Collection Form

Lowest priced generic equivalent product: determined at facility

A	B	C	D	E	F	G	H	I	J
Generic name, dosage form, strength	**Medicine Type**	**Brand or product name(s)**	**Manufacturer**	**Available yes/no**	**Pack size recommended**	**Pack size found**	**Price of pack found**	**Unit price (4 decimal places)**	**Comments**
Adult cough preparation expecto. syrup	Originator brand				100			per syrup	no originator brand
	Lowest-priced generic				100			per syrup	
Albendazole 200 mg cap/tab (non-chew)	Originator brand	Zental	GSK		2			per cap/tab (non-chew)	
	Lowest-priced generic				2			per cap/tab (non-chew)	
Amitriptyline 25 mg cap/tab	Originator brand	Tryptizol	MSD		100			per cap/tab	
	Lowest-priced generic				100			per cap/tab	
Amlodipine 5 mg cap/tab	Originator brand	Norvasc	Pfizer		30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Amoxicillin 500 mg cap/tab	Originator brand	Amoxil	GSK		16			per cap/tab	
	Lowest-priced				16			per cap/tab	

	generic								
Amoxicillin + Clavulanic Acid 250+125 mg cap/tab	Originator brand	Augmentin	GSK		20			per cap/tab	
	Lowest-priced generic				20			per cap/tab	
Amoxicillin + Clavulanic Acid 2 875+125 mg cap/tab	Originator brand	Augmentin	GSK		14			per cap/tab	
	Lowest-priced generic				14			per cap/tab	
Amoxicillin suspension 50 mg/ml millilitre	Originator brand	Amoxil	GSK		75			per millilitre	
	Lowest-priced generic				75			per millilitre	
Artemether injection 80 mg/ml millilitre	Originator brand				8			per millilitre	no originator brand
	Lowest-priced generic				8			per millilitre	
Artemether+ Lumefantrine 20+120 mg cap/tab	Originator brand	Coartem	Novartis		24			per cap/tab	
	Lowest-priced generic				24			per cap/tab	
Artesunate 100 mg cap/tab	Originator brand				1			per cap/tab	no originator brand
	Lowest-priced generic				1			per cap/tab	
Artesunate 2 50 mg cap/tab	Originator brand				1			per cap/tab	no originator brand
	Lowest-priced generic				1			per cap/tab	
Atenolol 50 mg	Originator brand	Tenormin	AstraZeneca		30			per cap/tab	

cap/tab	Lowest-priced generic				30			per cap/tab	
Atorvastatin 20 mg cap/tab	Originator brand	Lipitor	Pfizer		30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Azithromycin suspension 40 mg/ml millilitre	Originator brand	Zithromax	Pfizer		15			per millilitre	
	Lowest-priced generic				15			per millilitre	
Beclomethasone inhaler 50 mcg/dose dose	Originator brand	Becotide	GSK		200			per dose	
	Lowest-priced generic				200			per dose	
Captopril 25 mg cap/tab	Originator brand	Capoten	Squibb		60			per cap/tab	
	Lowest-priced generic				60			per cap/tab	
Carbamazepine 200 mg cap/tab	Originator brand	Tegretol	Novartis		100			per cap/tab	
	Lowest-priced generic				100			per cap/tab	
Carbimazole 5 mg cap/tab	Originator brand	Neo-Mercazole	Amdipharm		30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Cefixime 400 mg cap/tap	Originator brand	Suprax	Sanofi-Aventis		8			per cap/tap	
	Lowest-priced generic				8			per cap/tap	
Ceftriaxone	Originator brand	Rocephin	Roche		1			per vial	

injection 1 g/vial vial	Lowest-priced generic				1			per vial	
Chloramphenicol eye drops 0.005 millilitre	Originator brand	Chloromycetin	Parke Davis		5			per millilitre	
	Lowest-priced generic				5			per millilitre	
Ciprofloxacin 500 mg cap/tab	Originator brand	Ciproxin	Bayer		10			per cap/tab	
	Lowest-priced generic				10			per cap/tab	
Co-trimoxazole suspension 8+40 mg/ml millitre	Originator brand	Bactrim	Roche		75			per millitre	
	Lowest-priced generic				75			per millitre	
Dexamethasone injection 4 mg/ml millitre	Originator brand	Decadron	MSD		1			per millitre	
	Lowest-priced generic				1			per millitre	
Diazepam 5 mg cap/tab	Originator brand	Valium	Roche		100			per cap/tab	
	Lowest-priced generic				100			per cap/tab	
Diclofenac 25 mg cap/tab	Originator brand	Voltaren	Novartis		30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Diclofenac 2 50mg cap/tab	Originator brand	Voltaren	Novartis		30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Ferrous	Originator brand				30			per cap/tab	no originator brand

Sulphate + Folic acid 200+0.4 mg cap/tab	Lowest-priced generic				30			per cap/tab	
Fluoxetine 20 mg cap/tab	Originator brand	Prozac	Eli Lilly		30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Furosemide 40 mg cap/tab	Originator brand	Lasix	Sanofi-Aventis		1000			per cap/tab	
	Lowest-priced generic				1000			per cap/tab	
Glibenclamide 5 mg cap/tab	Originator brand	Daonil	Sanofi-Aventis		100			per cap/tab	
	Lowest-priced generic				100			per cap/tab	
Gliclazide 80 mg cap/tab	Originator brand	Diamicron	Servier		100			per cap/tab	
	Lowest-priced generic				100			per cap/tab	
Hyoscine -N-Butylbromide 10 mg cap/tab	Originator brand	Buscopan	Bayer		100			per cap/tab	
	Lowest-priced generic				100			per cap/tab	
Ibuprofen 400 mg cap/tab	Originator brand	Brufen	Knoll		500			per cap/tab	
	Lowest-priced generic				500			per cap/tab	
Insulin, Neutral Soluble 100 IU/ml millilitre	Originator brand	Insulin Neutral	Novo Nordisk		10			per millilitre	
	Lowest-priced generic				10			per millilitre	
Lisinopril 10 mg	Originator brand	Zestril	AstraZeneca		30			per cap/tab	

cap/tab	Lowest-priced generic				30			per cap/tab	
Metformin HCL 500 mg cap/tab	Originator brand	Glucophage	Roche		50			per cap/tab	
	Lowest-priced generic				50			per cap/tab	
Metronidazole 200 mg cap/tab	Originator brand	Flagyl	Winthrop		500			per cap/tab	
	Lowest-priced generic				500			per cap/tab	
Metronidazole (2) 400 mg cap/tap	Originator brand	Flagyl	Winthrop		20			per cap/tap	
	Lowest-priced generic				20			per cap/tap	
Nifedipine Retard 20 mg cap/tab	Originator brand	Adalat Retard	Bayer		30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Norethisterone 5 mg cap/tab	Originator brand	Primolut-N	Bayer		30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Omeprazole 20 mg cap/tab	Originator brand	Losec	AstraZeneca		14			per cap/tab	
	Lowest-priced generic				14			per cap/tab	
Oral rehydration Salt 1 PK/l litre sachet	Originator brand				1			per sachet	no originator brand
	Lowest-priced generic				1			per sachet	
Paracetamol suspension 24 mg/ml millilitre	Originator brand	Panadol	GSK		60			per millilitre	
	Lowest-priced				60			per millilitre	

	generic								
Paracetamol tabs 500 mg cap/tab	Originator brand	Panadol	GSK		20			per cap/tab	
	Lowest-priced generic				20			per cap/tab	
Ranitidine 150 mg cap/tab	Originator brand	Zantac	GSK		30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Salbutamol inhaler 100 mcg/dose dose	Originator brand	Ventoline	GSK		200			per dose	
	Lowest-priced generic				200			per dose	
Salbutamol syrup 0.4 mg/ml millilitre	Originator brand	Ventoline	GSK		75			per millilitre	
	Lowest-priced generic				75			per millilitre	
Simvastatin 20 mg cap/tab	Originator brand	Zocor	MSD		30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	

Before leaving the facility :

Data collectors should check that the data collection form is legible, accurate and complete before leaving the facility and returning completed forms to the area supervisor. They should report any problems as soon as possible. They should also check to see whether at least half of the survey medicines were available, to determine whether a visit to a back-up facility is required.

Annex 3. Availability of individual medicines, public and private sector

Medicine Name	Medicine list	Medicines Availability in Outlets					
		Brand			Lowest Price		
		Public (n=35)	Private (n=36)	RDF (n=28)	Public (n=35)	Private (n=36)	RDF (n=28)
Adult cough preparation	Supplementary	0.0%	8.3%	0.0%	97.1%	100.0%	92.9%
Albendazole 200mg tablet	Regional	5.7%	50.0%	7.1%	94.3%	100.0%	92.9%
Amitriptyline 25mg tablet	Global	0.0%	0.0%	0.0%	100.0%	100.0%	85.7%
Amlodipine 5mg tablet	Supplementary				82.9%	100.0%	85.7%
Amoxicillin 500mg capsule	Global	0.0%	5.6%	0.0%	87.5%	100.0%	82.1%
Amoxicillin + Clavulanic Acid	Supplementary				82.9%	100.0%	82.1%
Amoxicillin + Clavulanic Acid 2	Supplementary	0.0%	16.7%	0.0%	62.5%	100.0%	82.1%
Amoxicillin suspension	Regional	0.0%	8.3%	0.0%	100.0%	100.0%	78.6%
Artemether injection	Supplementary	0.0%	0.0%	0.0%	100.0%	97.2%	82.1%
Artemether+ Lumefantrine	Supplementary	0.0%	8.3%	0.0%	77.1%	97.2%	82.1%
Artesunate 100mg tablet	Supplementary	0.0%	2.8%	0.0%	77.1%	97.2%	78.6%
Artesunate 50mg tablet	Supplementary	25.0%	36.1%	14.3%	100.0%	97.2%	75.0%
Atenolol 50mg tablet	Global	0.0%	0.0%	0.0%	82.9%	97.2%	71.4%
Atorvastatin 20mg tablet	Regional				68.6%	97.2%	64.3%
Azithromycin suspension	Supplementary	5.7%	63.9%	10.7%	77.1%	97.2%	57.1%
Beclomethasone inhaler	Regional	0.0%	2.8%	0.0%	97.1%	94.4%	85.7%
Captopril 25mg tablet	Global	0.0%	27.8%	0.0%	88.6%	94.4%	82.1%
Carbamazepine 200mg tab	Regional	0.0%	0.0%	0.0%	88.6%	94.4%	78.6%
Carbimazole 5mg tab	Supplementary	0.0%	5.6%	0.0%	80.0%	94.4%	78.6%
Cefixime 400mg capsule	Supplementary	0.0%	33.3%	0.0%	68.6%	94.4%	67.9%
Ceftriaxone injection 1g	Global	0.0%	5.6%	0.0%	100.0%	94.4%	64.3%
Chloramphenicol eye drops	Regional				48.6%	94.4%	39.3%
Ciprofloxacin 500mg tablet	Global	0.0%	8.3%	0.0%	45.7%	94.4%	35.7%
Co-trimoxazole suspension	Global	0.0%	8.3%	3.6%	77.1%	91.7%	82.1%
Dexamethasone injection	Regional	0.0%	2.8%	0.0%	71.4%	91.7%	82.1%
Diazepam 5mg tablet	Global	0.0%	0.0%	0.0%	85.7%	91.7%	78.6%
Diclofenac 25mg tablet	Supplementary	2.9%	5.6%	0.0%	82.9%	91.7%	78.6%
Diclofenac 50mg tablet	Global	2.9%	47.2%	17.9%	77.1%	91.7%	57.1%
Ferrous Sulphate + Folic acid	Supplementary	2.9%	25.0%	14.3%	82.9%	91.7%	42.9%
Fluoxetine 20mg tablet	Regional	0.0%	2.8%	0.0%	82.9%	91.7%	39.3%
Furosemide 40mg tablet	Regional	0.0%	2.8%	0.0%	54.3%	88.9%	50.0%

Glibenclamide 5mg tablet	Global	37.1%	19.4%	10.7%	14.3%	88.9%	32.1%
Gliclazide 80mg tablet	Regional	0.0%	0.0%	0.0%	87.5%	86.1%	35.7%
Hyoscine -N-Butylbromide	Supplementary				40.0%	86.1%	35.7%
Ibuprofen 400mg tablet	Regional	0.0%	36.1%	10.7%	37.1%	86.1%	28.6%
Insulin, Neutral Soluble	Supplementary	0.0%	2.8%	0.0%	85.7%	83.3%	67.9%
Lisinopril 10mg tablet	Regional	0.0%		0.0%	71.4%	83.3%	42.9%
Metformin HCL 500mg tablet	Regional	0.0%	0.0%	0.0%	51.4%	80.6%	50.0%
Metronidazole 250mg tablet	Supplementary				37.1%	80.6%	50.0%
Metronidazole 500mg tablet	Regional	0.0%	0.0%	0.0%	45.7%	75.0%	46.4%
Nifedipine Retard 20mg tablet	Regional	0.0%	0.0%	0.0%	48.6%	72.2%	25.0%
Norethiesterone 5mg tablet	Supplementary	28.6%	66.7%	64.3%	62.9%	72.2%	0.0%
Omeprazole 20mg tablet	Global	0.0%	13.9%	0.0%	40.0%	69.4%	25.0%
Oral rehydration Salt	Supplementary	2.9%	5.6%	0.0%	34.3%	63.9%	14.3%
Paracetamol suspension	Global	0.0%	8.3%	0.0%	87.5%	58.3%	25.0%
Paracetamol tabs 500mg	Supplementary	0.0%	0.0%	0.0%	62.5%	50.0%	21.4%
Ranitidine 150mg tablet	Regional	0.0%	0.0%	0.0%	42.9%	47.2%	25.0%
Salbutamol inhaler	Global	42.9%	25.0%	21.4%	14.3%	16.7%	7.1%
Salbutamol syrup	Supplementary	5.7%	61.1%	21.4%	20.0%	16.7%	0.0%
Simvastatin 20mg tablet	Global	0.0%	2.8%	0.0%	0.0%	13.9%	0.0%

Annex 4. Median Price Ratios, public sector procurement prices

No.	Medicine Name	Medicine Type	Median Price Ratio (MPR)	25%ile	75%ile
1	Adult cough preparation expecto.	Lowest Price	2.34	1.79	2.90
2	Albendazole	Lowest Price	5.20	4.78	5.62
3	Amitriptyline	Lowest Price	5.53	5.53	5.53
4	Amlodipine	Lowest Price	0.56	0.56	0.56
5	Amoxicillin	Lowest Price	1.47	1.47	1.47
6	Amoxicillin + Clavulanic Acid	Lowest Price	1.33	1.25	1.41
7	Amoxicillin + Clavulanic Acid 2	Lowest Price	1.01	1.00	1.02
8	Amoxicillin suspension	Lowest Price	1.29	1.20	1.38
9	Artemether injection	Lowest Price	0.36	0.34	0.37
10	Artemether+ Lumefantrine	Lowest Price	1.84	1.53	2.15
11	Artesunate	Lowest Price	5.14	5.02	5.27
12	Artesunate 2	Lowest Price	6.75	6.67	6.84
13	Atenolol	Lowest Price	6.14	3.85	8.43
14	Atorvastatin	Lowest Price	0.63	0.61	0.65
15	Azithromycin suspension	Lowest Price	2.06	2.06	2.06
16	Beclomethasone inhaler	Lowest Price	2.12	1.59	2.65
17	Captopril	Lowest Price	3.42	3.06	3.78
18	Carbamazepine	Lowest Price	1.84	1.49	2.19
19	Carbimazole	Lowest Price	4.85	3.79	5.91
20	Cefixime	Lowest Price	1.35	1.32	1.39
21	Ceftriaxone injection	Lowest Price	3.04	2.92	3.15
22	Chloramphenicol eye drops	Lowest Price	1.45	1.24	1.66
23	Ciprofloxacin	Lowest Price	1.98	1.80	2.16
24	Co-trimoxazole suspension	Lowest Price	1.47	1.23	1.70
25	Dexamethasone injection	Lowest Price	2.63	2.63	2.63

26	Diazepam	Lowest Price	3.31	3.23	3.39
27	Diclofenac	Lowest Price	3.24	3.18	3.29
28	Diclofenac 2	Lowest Price	23.16	23.16	23.16
29	Ferrous Sulphate + Folic acid	Lowest Price	12.20	10.34	14.06
30	Fluoxetine	Lowest Price	8.06	8.06	8.06
31	Furosemide	Lowest Price	3.61	3.41	3.81
32	Glibenclamide	Lowest Price	2.40	2.08	2.73
33	Gliclazide	Lowest Price	0.56	0.45	0.67
34	Hyoscine -N-Butylbromide	Lowest Price	0.88	0.87	0.88
35	Ibuprofen	Lowest Price	2.33	2.33	2.33
36	Insulin, Neutral Soluble	Lowest Price	0.43	0.39	0.47
37	Lisinopril	Lowest Price	0.79	0.75	0.82
38	Metformin HCL	Lowest Price	1.46	1.46	1.46
39	Metronidazole	Lowest Price	2.40	2.05	2.75
40	Nifedipine Retard	Lowest Price	2.28	2.22	2.35
41	Norethiesterone	Lowest Price	0.82	0.72	0.92
42	Omeprazole	Lowest Price	1.55	1.42	1.68
43	Oral rehydration Salt	Lowest Price	0.81	0.77	0.85
44	Paracetamol suspension	Lowest Price	1.46	1.31	1.60
45	Paracetamol tabs	Lowest Price	1.66	1.58	1.73
46	Ranitidine	Lowest Price	1.24	1.18	1.31
47	Salbutamol inhaler	Lowest Price	1.02	0.94	1.11
48	Salbutamol syrup	Lowest Price	0.65	0.61	0.70
49	Simvastatin	Lowest Price	1.16	1.16	1.16

Annex 5. Median Price Ratios, public sector patient prices

No.	Medicine Name	Medicine Type	Median Price Ratio (MPR)	25%ile	75%ile
1	Adult cough preparation expecto.	Lowest Price	2.98	2.48	3.47
2	Albendazole 200mg tablet	Lowest Price	12.19	10.89	12.19
3	Amitriptyline 25mg tablet	Lowest Price	7.69	5.13	8.97
4	Amlodipine 5mg tablet	Lowest Price	1.28	1.28	1.71
5	Amoxicillin 500mg capsule	Lowest Price	3.01	2.89	3.62
6	Amoxicillin + Clavulanic Acid	Lowest Price	2.70	2.70	3.13
7	Amoxicillin + Clavulanic Acid 2	Lowest Price	2.14	1.74	3.06
8	Amoxicillin suspension 250mg	Lowest Price	2.52	2.29	3.00
9	Artemether injection 80mg	Lowest Price	0.54	0.38	0.62
10	Artemether+ Lumefantrine	Lowest Price	0.67	0.60	1.44
11	Artesunate 100mg tablet	Lowest Price	9.83	9.59	9.83
12	Artesunate 50mg tablet	Lowest Price	11.07	8.31	11.07
13	Atenolol 50mg tablet	Lowest Price	4.02	3.02	4.52
14	Atorvastatin 20mg tablet	Lowest Price	1.53	1.27	2.29
15	Azithromycin suspension	Lowest Price	1.81	1.09	2.17
16	Beclomethasone inhaler	Lowest Price	1.27	1.25	1.49
17	Captopril 25mg tablet	Lowest Price	6.90	6.37	7.53
18	Carbamazepine 200mg	Lowest Price	2.40	2.00	3.21
19	Carbimazole 5mg tablet	Brand	3.81	3.31	4.45
20	Carbimazole 5mg tablet	Lowest Price	1.72	1.59	2.23
21	Cefixime 400mg capsule	Lowest Price	3.30	2.87	3.65
22	Ceftriaxone injection 1g	Lowest Price	12.96	7.71	15.18
23	Chloramphenicol eye drops	Lowest Price	3.08	3.08	3.33
24	Ciprofloxacin 500mg tablet	Lowest Price	4.69	4.69	5.63
25	Co-trimoxazole suspension	Lowest Price	2.01	1.87	2.21
26	Dexamethasone injection	Lowest Price	1.94	1.32	2.77
27	Diazepam 5mg tablet	Lowest Price	4.69	2.93	6.78

28	Diclofenac 25mg tablet	Lowest Price	6.69	5.43	6.69
29	Diclofenac 50mg tablet	Lowest Price	29.30	23.35	54.95
30	Ferrous Sulphate + Folic acid	Lowest Price	21.22	18.57	26.53
31	Furosemide 40mg tablet	Lowest Price	6.41	4.81	6.41
32	Glibenclamide 5mg tablet	Lowest Price	3.66	3.66	5.49
33	Gliclazide 80mg tablet	Lowest Price	1.47	1.11	2.09
34	Hyoscine -N-Butylbromide 10mg	Lowest Price	1.34	1.21	1.93
35	Ibuprofen 400mg tablet	Lowest Price	4.48	3.73	5.97
36	Insulin, Neutral Soluble	Brand	0.69	0.61	0.89
37	Insulin, Neutral Soluble	Lowest Price	0.72	0.72	0.72
38	Lisinopril 10mg tablet	Lowest Price	1.66	1.24	1.73
39	Metformin HCL 500mg tablet	Lowest Price	3.44	2.15	3.44
40	Metronidazole 250mg tablet	Lowest Price	3.91	2.61	5.22
41	Metronidazole 500mg tablet	Lowest Price	4.23	4.23	5.07
42	Nifedipine Retard 20mg tablet	Lowest Price	3.69	3.28	4.51
43	Norethiesterone 5mg tablet	Lowest Price	1.61	1.53	2.38
44	Omeprazole 20mg tablet	Lowest Price	6.46	6.03	7.43
45	Oral rehydration Salt powder	Lowest Price	1.47	1.11	1.47
46	Paracetamol suspension	Lowest Price	2.50	2.50	3.13
47	Paracetamol 500mg tabs	Lowest Price	3.14	3.14	3.14
48	Ranitidine 150mg tablet	Lowest Price	2.29	2.09	2.62
49	Salbutamol inhaler	Brand	2.67	2.10	2.85
50	Salbutamol inhaler	Lowest Price	1.35	1.30	1.42
51	Salbutamol syrup	Lowest Price	1.15	1.03	1.41
52	Simvastatin 20mg tablet	Lowest Price	2.17	2.17	2.48

Annex 6. Median Price Ratios, private sector patient prices

No.	Medicine Name	Medicine Type	Median Price Ratio (MPR)	25%ile	75%ile
1	Adult cough preparation expecto.	Lowest Price	2.98	2.48	3.47
2	Albendazole	Lowest Price	8.71	8.71	11.61
3	Amitriptyline	Lowest Price	7.69	6.41	9.23
4	Amlodipine	Lowest Price	1.35	1.28	2.14
5	Amoxicillin	Lowest Price	3.01	2.89	3.01
6	Amoxicillin + Clavulanic Acid	Lowest Price	2.21	1.90	2.76
7	Amoxicillin + Clavulanic Acid 2	Brand	3.37	3.36	3.57
8	Amoxicillin + Clavulanic Acid 2	Lowest Price	1.88	1.68	2.01
9	Amoxicillin suspension	Lowest Price	2.52	2.52	2.84
10	Artemether injection	Lowest Price	0.58	0.52	0.60
11	Artemether+ Lumefantrine	Brand	3.57	3.47	3.62
12	Artemether+ Lumefantrine	Lowest Price	1.98	1.98	2.06
13	Artesunate	Lowest Price	9.83	9.83	11.14
14	Artesunate 2	Lowest Price	9.23	8.54	11.07
15	Atenolol	Brand	31.51	28.01	35.42
16	Atenolol	Lowest Price	3.02	3.02	3.77
17	Atorvastatin	Lowest Price	1.05	0.97	1.70
18	Azithromycin suspension	Lowest Price	2.71	1.36	3.26
19	Beclomethasone inhaler	Lowest Price	1.27	1.22	1.43
20	Captopril	Lowest Price	6.90	5.84	8.49
21	Carbamazepine	Brand	12.02	11.06	12.82
22	Carbamazepine	Lowest Price	2.40	2.40	2.60
23	Carbimazole	Brand	3.31	3.18	6.71
24	Carbimazole	Lowest Price	2.23	1.91	2.54
25	Cefixime	Brand	8.69	8.60	10.00
26	Cefixime	Lowest Price	3.04	2.87	3.39
27	Ceftriaxone injection	Lowest Price	3.50	2.80	4.44

28	Chloramphenicol eye drops	Lowest Price	2.82	2.05	3.08
29	Ciprofloxacin	Lowest Price	4.69	4.69	5.16
30	Co-trimoxazole suspension	Lowest Price	2.41	2.01	2.41
31	Dexamethasone injection	Lowest Price	2.77	2.77	4.15
32	Diazepam	Lowest Price	5.22	2.61	5.22
33	Diclofenac	Lowest Price	6.69	5.02	6.69
34	Diclofenac 2	Lowest Price	27.13	21.98	27.47
35	Ferrous Sulphate + Folic acid	Lowest Price	19.45	15.92	24.54
36	Fluoxetine	Lowest Price	8.71	4.15	12.44
37	Furosemide	Lowest Price	6.41	4.81	6.41
38	Glibenclamide	Lowest Price	5.49	3.66	7.33
39	Gliclazide	Brand	4.51	4.51	4.92
40	Gliclazide	Lowest Price	1.29	0.86	1.47
41	Hyoscine -N-Butylbromide	Lowest Price	1.61	1.07	1.61
42	Ibuprofen	Lowest Price	4.48	4.48	5.97
43	Insulin, Neutral Soluble	Brand	0.77	0.72	0.86
44	Insulin, Neutral Soluble	Lowest Price	0.56	0.51	0.66
45	Lisinopril	Brand	6.64	5.55	9.47
46	Lisinopril	Lowest Price	2.24	1.46	2.84
47	Metformin HCL	Brand	5.16	5.16	6.02
48	Metformin HCL	Lowest Price	2.58	2.58	3.44
49	Metronidazole	Lowest Price	3.91	2.61	5.22
50	Metronidazole (2)	Lowest Price	5.07	4.23	6.13
51	Nifedipine Retard	Lowest Price	4.31	3.69	4.92
52	Norethisterone	Brand	3.97	2.69	4.02
53	Norethisterone	Lowest Price	1.95	1.70	2.04
54	Omeprazole	Lowest Price	6.03	5.17	6.46
55	Oral rehydration Salt	Lowest Price	2.21	1.47	2.21
56	Paracetamol suspension	Lowest Price	3.13	2.81	3.13
57	Paracetamol tabs	Brand	13.08	13.08	16.88

58	Paracetamol tabs	Lowest Price	3.14	3.14	3.14
59	Ranitidine	Lowest Price	1.96	1.96	2.45
60	Salbutamol inhaler	Brand	2.14	1.42	2.49
61	Salbutamol inhaler	Lowest Price	1.21	1.21	1.26
62	Salbutamol syrup	Brand	2.18	1.92	2.56
63	Salbutamol syrup	Lowest Price	1.28	1.28	1.54
64	Simvastatin	Lowest Price	2.07	1.81	2.39

Annex 7. Median Price Ratios, RDF sector patient prices

No.	Medicine Name	Medicine Type	Median Price Ratio (MPR)	25%ile	75%ile
1	Adult cough preparation expecto.	Lowest Price	2.48	2.23	2.98
2	Albendazole 200mg tablet	Lowest Price	5.81	5.81	7.98
3	Amitriptyline 25mg tablet	Lowest Price	5.15	5.13	6.67
4	Amlodipine 5mg tablet	Lowest Price	1.28	1.28	1.50
5	Amoxicillin 500mg capsule	Lowest Price	2.80	2.41	3.01
6	Amoxicillin + Clavulanic Acid 375mg	Lowest Price	2.51	2.37	2.70
7	Amoxicillin + Clavulanic Acid 1g	Lowest Price	1.89	1.81	1.98
8	Amoxicillin suspension 250mg	Lowest Price	2.17	1.89	2.49
9	Artemether injection 80mg	Lowest Price	0.50	0.45	0.52
10	Artemether+ Lumefantrine	Brand	2.68	2.68	3.35
11	Artesunate 100mg	Lowest Price	9.31	7.87	9.50
12	Artesunate 50mg tablet	Lowest Price	9.23	8.31	10.15
13	Atenolol 50mg tablets	Lowest Price	3.02	3.02	3.02
14	Atorvastatin 20mg tablet	Lowest Price	1.04	1.02	1.72
15	Azithromycin suspension	Lowest Price	1.27	0.90	2.71
16	Beclomethasone inhaler	Lowest Price	1.25	1.24	1.33
17	Captopril 25mg tablet	Lowest Price	4.24	3.55	4.77
18	Carbamazepine 200mg tablet	Lowest Price	1.60	1.60	2.40
19	Carbimazole 5mg tablet	Lowest Price	1.91	1.91	1.98
20	Cefixime 400mg capsule	Brand	8.95	8.85	8.95
21	Cefixime 400mg capsule	Lowest Price	2.87	2.69	3.04
22	Ceftriaxone injection 1g	Lowest Price	2.80	1.75	5.78
23	Chloramphenicol eye drops	Lowest Price	1.92	1.54	2.05
24	Ciprofloxacin 500mg tablet	Lowest Price	4.22	3.52	4.69
25	Co-trimoxazole suspension	Lowest Price	1.87	1.66	2.01
26	Dexamethasone injection	Lowest Price	3.46	1.38	3.46
27	Diazepam 5mg tablet	Lowest Price	2.61	2.61	2.61

28	Diclofenac 25mg tablet	Lowest Price	6.69	5.02	6.69
29	Diclofenac 50mg tablet	Lowest Price	26.10	21.98	26.72
30	Ferrous Sulphate + Folic acid	Lowest Price	15.92	15.03	16.80
31	Furosemide 40mg tablet	Lowest Price	5.77	4.81	6.41
32	Glibenclamide 5mg tablet	Lowest Price	5.49	3.66	7.33
33	Gliclazide 80mg tablet	Lowest Price	1.47	1.29	1.47
34	Hyoscine -N-Butylbromide	Lowest Price	1.21	1.07	1.61
35	Ibuprofen 400mg tablet	Lowest Price	4.48	3.73	4.48
36	Insulin, Neutral Soluble	Brand	0.69	0.66	0.92
37	Lisinopril 10mg tablet	Lowest Price	2.48	2.21	2.73
38	Metformin HCL 500mg tablet	Brand	4.30	4.30	4.30
39	Metformin HCL 500mg tablet	Lowest Price	2.79	2.15	4.30
40	Metronidazole 250mg tablet	Lowest Price	3.52	2.61	3.91
41	Metronidazole 500mg tablet	Lowest Price	4.23	3.59	5.07
42	Nifedipine Retard 20mg tablet	Lowest Price	3.38	3.08	4.31
43	Norethiesterone 5mg tablet	Lowest Price	2.00	1.61	2.04
44	Omeprazole 20mg capsule/tablet	Lowest Price	5.60	5.17	6.03
45	Oral rehydration Salt	Lowest Price	1.47	1.47	1.47
46	Paracetamol suspension	Lowest Price	2.50	2.38	3.28
47	Paracetamol tabs 500mg	Lowest Price	3.14	2.67	3.14
48	Ranitidine 150mg tablet	Lowest Price	1.96	1.80	2.29
49	Salbutamol inhaler	Brand	1.09	1.03	1.39
50	Salbutamol syrup	Brand	1.09	1.09	1.15
51	Salbutamol syrup	Lowest Price	0.99	0.87	1.28
52	Simvastatin 20mg tablst	Lowest Price	1.51	1.22	1.70