

**A Survey of Medicine Prices,
Availability, Affordability and
Price Components in
Shandong Province, China**

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Contents

Acknowledgements.....	3
Executive Summary.....	4
Abbreviations and Acronyms.....	8
Introduction.....	9
Methodology.....	12
Results	
Availability of medicines in the public and private sector.....	19
Prices of core medicines in the public sector.....	23
Prices of core medicines in the private sector.....	24
Prices of supplementary medicines in the public and private sector.....	26
Procurement prices in the public sector.....	27
Comparison of core medicine prices across both sectors.....	28
Price comparisons in the four regions surveyed.....	29
Affordability of standard treatments.....	30
Price components and cumulative mark-ups.....	32
Discussion.....	36
Conclusions and Recommendations	43
References.....	45
Annexes	
1. List of medicines surveyed.....	46
2. Percentage availability of medicines.....	47
3. National Pharmaceutical Sector Form.....	49
4. Medicine Price Data Collection Form.....	56

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Executive Summary

In October and November 2004 the Center for Health Management and Policy at Shandong University, China surveyed the price, availability, affordability and price components of 39 medicines in Shandong Province using a standardized methodology developed by WHO and Health Action International (HAI). Of these medicines, 24 were core medicines from the WHO/HAI list, and 15 were supplementary medicines many of which are used to treat HIV/AIDS. Data on the prices and availability of these medicines were collected in the public and private sectors in Jinan, the capital of Shandong province, and three other counties - Zhangqiu, Jinxiang and Ciping. Medicine price components were identified in the public and private sector. The affordability of standard treatments for a pre-selected list of common conditions was also assessed in both sectors, based on the number of days the lowest paid unskilled government worker would have to work to pay for the course of treatment.

The results showed that in Shandong, the availability of the surveyed medicines was extremely low in both the public and private sectors. In the public sector, innovator brand versions of 16 medicines were found (of 39 medicines surveyed) in at least one facility – the median availability was 0%. While 54% of generic medicines were available in at least one public hospital clinic, the median availability was only 5%. Seventeen innovator brands were found in at least one private pharmacy – only one more than the number found in the public hospitals. The median availability of innovator brands in the private sector was 0%. The median availability of generics in the private sector was only 5%. However, it should be noted that certain specialized medicines (some of which were surveyed) are not stocked in public hospitals and private pharmacies, and the strengths of some of the medicines surveyed are rarely used in Shandong.

In the survey, prices are expressed as Median Price Ratios (MPR) rather than actual prices. The MPR is the ratio of the local median unit price across the facilities surveyed to an international reference price. For core medicines, prices from the Management Sciences for Health International Drug Price Indicator Guide 2003 were used as the reference. For the supplementary medicines, Spanish manufacturers' prices were used as the reference. Ratios are used to gauge whether prices are high or low compared to an external standard.

In both the private and public sectors, considerable price differences were seen between innovator brands and generics for the core medicines. In the private sector, innovator brands were 14 times more expensive than lowest priced generics (and 24 times for the 4 core medicines where both the innovator brand and generics were found in the private pharmacies surveyed). In the public sector the difference was 4 times (for the 2 core medicines found in both forms, innovator brand and generic, the difference was over 9 times).

Of the core medicines found in both sectors, lowest priced generics were 30% cheaper in the private sector compared to the public sector (9 medicines), and innovator brands were about the same price in the two sectors (6 medicines).

Comparing public sector procurement prices and public sector patient prices for core medicines reveals that patients pay an additional 75% of the procurement price for generics (based on 10 medicines found in both sectors) and 22% for innovator brands (6 medicines).

Procurement prices of generics were efficient (when compared against MSH or Spanish prices), but innovator brands of core medicines (9 medicines) were over 6

times MSH prices (median MPR 6.3).

When looking at price components, cumulative mark-ups (from the manufacturer's price to the patient price) were 25-35% in the public sector, and 10-33% in the private sector. In the public sector, hospital mark-ups were the greatest contributor (hospital mark-ups up to 26% were observed). In the private sector the maximum observed wholesaler's mark-up was 3% (whether for innovator brands or generics), while in the public sector it was 10% for generics and 13% for innovator brands. Pharmacy mark-ups ranged from 4% - 25%. Sales tax of 3% applies in private retail pharmacies, and numerous taxes, including 17% VAT, are applied to imported medicines.

Treatment affordability was measured for a selection of common conditions. The results show that some treatments are unaffordable for ordinary citizens. If a patient with diabetes was treated using innovator brand rosiglitazone, a one month treatment course would cost 29 days' wages (13.33 Yuan per day). That is to say, a patient needs to spend a month's wage to buy just one medicine for a month's treatment. Even metformin, a much older medicine used to treat diabetes, was unaffordable for ordinary citizens – a months' course of the innovator brand purchased from a retail pharmacy would take nearly 11 days' wages. No generics were found in the private sector, and only 2 facilities in the public sector stocked a generic and 3 stocked the innovator brand. Clearly, the treatment of a chronic disease such as diabetes, where prices are high and availability is low, warrants urgent attention.

Based on the findings of this survey, we recommend:

- An extended and customised survey be undertaken to get a more comprehensive picture of medicine prices and availability
- The centralized public bidding mechanism (tender) for medicines should be

further strengthened, and generics of off-patent medicines purchased in order to decrease medicine prices in the public sector.

- An in-depth study of the medicine distribution process is needed, especially looking at factors influencing the purchasing and selling behaviour of wholesalers, and the setting of the manufacturer's selling price and the maximum patient price.
- VAT and other taxes should be removed for imported medicines.
- To improved access to medicines, patients should pay procurement prices in the public sector plus a nominal distribution cost. Hospitals should not be financed by medicine sales but through other mechanisms. Sales tax should be removed in the private sector.
- Greater acceptance and use of generic medicines (by health professionals and consumers) must be encouraged.
- The impact of policy changes should be measured by establishing a monitoring system to regularly monitor the price, availability and affordability of medicines.

Abbreviations and Acronyms

CIF	Cost, Insurance and Freight
EDL	Essential Drug List
HAI	Health Action International
IB	Innovator Brand
IRP	International Reference Price
LPG	Lowest Price Generic Equivalent
MPR	Median Price Ratio
MSH	Management Sciences for Health
MSP	Manufacturer's Selling Price
NA	Not Available
WHO	World Health Organization

Introduction

During the period of October to November 2004, a field study on measuring medicine prices and availability was conducted in Shandong Province, China. The study design was based on the standard methodology developed by the World Health Organization (WHO) and Health Action International (HAI) using a standard list of medicines (plus locally important supplementary medicines) to compare the prices and availability of medicines in different health sectors and regions in the province. The aim of the study was to provide a comprehensive picture of medicine prices in Shandong Province and to compare the prices, availability, affordability and price components in the public health sector and private retail pharmacies. The study was designed to answer the following questions:

- What are the prices people pay for innovator brands and generic equivalents, and how do these prices differ between the public sector and the private sector?
- What is the availability of the medicines surveyed in each sector?
- What price is the government paying for medicines and how does this compare with the price the patient pays?
- Do prices and availability vary in different counties of Shandong Province?
- What price components (eg taxes, mark-ups) make up the final price to the patient?
- How affordable are standard treatments for ordinary citizens in Shandong, China?

The Pharmaceutical Sector in Shandong Province

The pharmaceutical market developed quickly in the last decades in China. Western

medicines cost about 174.8 billion Yuan in 2004⁽¹⁾. In 2005 it was reported that there are about 5000 pharmaceutical factories and 16000 wholesalers with the characteristics of low technology and repeated investment⁽²⁾. In 2003 there were about 200000 retail pharmacies in China⁽³⁾. In 2004, the share of drug expenditure to outpatient's health expenditure in general public hospitals was about 53%; the proportion for inpatient expenditure was about 44% (China Pharmaceutical Economy Net), and most health expenditure was paid by out-of-pocket. In 2003, the total health expenditure in China was 658.4 billion Yuan; the proportion of out-of-pocket health expenditure was about 56 %⁽⁴⁾.

Shandong Province is in the eastern part of China with a population of nearly 0.1 billion people. The GDP per capita in 2002 was 11643 Chinese Yuan, but the distribution is very uneven. Shandong Province has 17 cities with Jinan as the capital (as shown in the map below). There are 139 counties (districts) and 1978 towns in Shandong.

There are at least two public hospitals in each county and one public health clinic in each town. Following the establishment of the Urban Employee Basic Health Insurance System in China in 1999, private retail pharmacies developed quickly. In 2003, China had about 200,000 retail pharmacies including 1216 chain pharmacies (according to statistics from the Chinese Medicine Commercial Association). Some retail pharmacies were selected as the targeted pharmacies of the social health insurance scheme. In Shandong the number of retail pharmacies is about 12000, with 1200 retail pharmacies in Jinan.



Map of China showing Shandong Province

Methodology

Objectives

- Measure medicine procurement prices in the public sector.
- Compare the prices people pay for medicines, and their availability, in the public sector (public hospital clinics) and the private sector (retail pharmacies)
- Compare prices and the availability of medicines in four regions of Shandong Province
- Compare local prices with international reference prices.
- Assess treatment affordability for a selection of common conditions
- Identify price components in the public and private sector

Sectors surveyed

Medicine prices, availability, affordability and price components were measured in the public sector (public hospital clinics) and the private sector (private retail pharmacies). In the public hospitals, two prices were surveyed: procurement prices paid by the government and prices paid by patients. In the private sector, the price paid by patients (retail price) was surveyed. In both sectors, the availability of the medicines on the day of data collection was measured.

Medicine selection

Initially 52 medicines were selected for inclusion in the survey - 30 core medicines from the WHO/HAI list and 22 supplementary medicines (many recommended by WHO as important medicines for treating HIV/AIDS). Following a pilot study, the list of medicines was modified as many medicines were not available at all and some of

the selected medicines did not have reference prices. Table 1 lists the WHO/HAI core medicines not surveyed and the reasons why.

Table 1 WHO/HAI core medicines not surveyed

Medicine	Dose form & strength	Reason for non-inclusion
Artesunate	100mg tabs	No malaria in Shandong
Fluphenazine decanoate	25mg/ml injection	Not permit to be used in general hospitals or sold in private pharmacies
Indinavir	400mg caps	These HIV medicines are not found in Shandong
Nevirapine	200mg tabs	
Zidovudine	100mg caps	
Sulfadoxine+Pyrimethamine	(25+500)mg tabs	No malaria in Shandong

A total of 39 medicines were included in the survey – 24 core medicines (Table 2) and 15 supplementary medicines (Table 3)

Table 2 Core medicines surveyed

Aciclovir 200mg cap/tab	Fluconazole 200mg cap/tab
Amitriptyline 25mg cap/tab	Fluoxetine 20mg cap/tab
Amoxicillin 250mg cap/tab	Glibenclamide 5mg cap/tab
Atenolol 50mg cap/tab	Hydrochlorothiazide 25mg cap/tab
Beclometasone 0.05mg/dose inhaler	Losartan 50mg cap/tab
Captopril 25mg cap/tab	Lovastatin 20mg cap/tab
Carbamazepine 200mg cap/tab	Metformin 500mg cap/tab
Ceftriaxone 1g injection	Nifedipine Retard 20mg tab
Ciprofloxacin 500mg cap/tab	Omeprazole 20mg cap/tab
Co-trimoxazole 8+40mg/ml suspension	Phenytoin 100mg cap/tab
Diazepam 5mg cap/tab	Ranitidine 150mg cap/tab
Diclofenac 25mg cap/tab	Salbutamol 0.1mg/dose inhaler

Table 3 Supplementary medicines surveyed

Amlodipine 5mg cap/tab	Ganciclovir 500mg injection
Atorvastatin 10mg cap/tab	Lisinopril 20mg cap/tab
Azithromycin 500mg cap/tab	Ofloxacin 200mg cap/tab
Candesartan 4mg cap/tab	Olanzapine 5mg cap/tab
Celecoxib 200mg cap/tab	Rosiglitazone 4mg cap/tab
Efavirenz 600mg cap/tab	Simvastatin 20mg cap/tab
Erythromycin 250mg cap/tab	Stavudine 40mg cap/tab
Esomeprazole 20mg cap/tab	

Annex 1 lists the 39 medicines surveyed showing the target pack sizes for each.

For each medicine, two types of product were surveyed:

- Innovator brand
- Lowest price generic equivalent

The innovator brand product and manufacturer was identified centrally and the lowest priced generic equivalent was identified in each facility surveyed.

Sampling areas and facilities

Prices and availability were measured in public hospitals and private pharmacies in the capital of Shandong province, Jinan. In addition, three other counties with different economic development were randomly selected, namely, Zhangqiu, Jingxiang and Chiping.

In each of the four areas, 5 public hospitals and 5 private pharmacies were selected for surveying. Table 4 summarizes the characteristics of the four areas.

Table 4 Characteristics of the selected survey areas

	Jinan	Zhangqiu	Jinxiang	Chiping
City/county	Capital city	High economic development	Middle economic development	Low economic development
Economic level	Developed area	Developed area	Middle level	Poor area
Public hospitals	2 tertiary	2 secondary	2 secondary	2 secondary

	hospitals 3 secondary hospitals	hospitals 3 township hospitals	hospitals 3 township hospitals	hospitals 3 township hospitals
Private pharmacies	5 private pharmacies nearest to the selected public hospitals			

Data collection

In the survey a standardized data collection form was used and data collectors were trained over two days to ensure reliability and consistency. A small pilot study was conducted as part of the training.

In Jinan, procurement prices and availability data was obtained from the Pharmaceutical Centralized Public Bidding Office. In the other three counties, procurement prices were obtained from each of the hospitals surveyed (as there was no centralized public bidding in these regions). At each public hospital we also checked the availability of the medicines and recorded the prices charged to patients. The prices and availability in private pharmacies were obtained by surveying the selected pharmacies.

The survey team, including the survey manager, visited the four regions consecutively. The survey team was divided into two groups in each region, with a supervisor allocated to each group. Data collection was completed in four weeks. Throughout the survey, coding was used to identify the public hospitals and private

retail pharmacies in order to maintain their anonymity.

Data collection for measuring affordability

The affordability of standard treatments was measured using the pre-selected conditions in the WHO/HAI manual. The treatment costs were calculated using the price data collected at the facilities. The daily wage of the lowest paid unskilled government worker (13.33 Chinese Yuan) was used to measure affordability.

Data collection for component prices

Medicine price components were surveyed in the capital Jinan in order to reveal mark-ups and other charges in the distribution chain.

Before commencing data collection, three medicines were chosen (based on their availability in the pilot study) for assessing price components in the public and private sector. In the field, we investigated components and prices back from the retail price to the manufacturer's selling price. The three medicines were:

- amoxicillin 250mg, pack of 24 capsules, the most sold generic equivalent product
- omeprazole 20mg, pack of 14 capsules, both the innovator brand and the most sold generic equivalent product. For the innovator brand (Losec by AstraZeneca), the active ingredient is imported and the final product is manufactured in China.
- losartan 50mg, pack of 7 tablets, innovator brand product. Although the patent (Medicine Administrative Protection, which is a special type of medicine patent protection in China) for losartan expired in June 2004, no generic equivalent medicine is available in China.

The most sold generic equivalent products were identified by interviewing key

personnel at the Jinan Pharmaceutical Company (one of the largest wholesalers in Jinan). Price component data was also sought via interviews at the largest public hospital and private retail pharmacy in Jinan. Patient (retail) and procurement prices, and mark-up data, were also sought from a randomly selected private retail pharmacy in Jinan.

While procurement prices paid by the hospital pharmacy were obtainable, the two retail pharmacies would not divulge what they paid for the three medicines. However, the Jinan Pharmaceutical Company, which supplied the medicines to the pharmacies, was willing to divulge their selling prices.

In China, no dispensing fee is applied in the public and private sectors. Transport costs of medicines from the manufacturer to wholesalers are included in the procurement price paid by wholesalers.

Numerous component costs apply to imported medicines. The duty tax is generally 4%, and VAT of 17% is charged. Another cost, the port fee, includes the inspection fee, the customs application fee, transportation and a storage fee. Importers usually get a professional company to apply to customs to import a medicine. The fee paid to the company is equal to 2% of the value of the imported medicines. By interviewing an official in the Bank of China, we ascertained that the importer pays a bank fee of 0.5% of the value of the imported goods in order to get the Letter of Credit. As we were unable to interview the manufacturer or importer of the imported medicine (losartan), we can only list these possible price components. However, we were able to obtain the procurement price from a wholesaler in Jinan.

Data entry

Following a check of the data collection forms by the supervisor and survey manager, unit prices were entered into the automated workbook provided by WHO/HAI (version 4.01). Prices were double-entered to ensure accuracy. The workbook's auto checker was also used to check the data.

Data analysis

Median Price Ratios

To aid national and international comparisons, in this survey price data is expressed as median price ratios rather than actual prices. The median price ratio (MPR) is the median unit price of the medicine across the facilities surveyed (in local currency) divided by the median international reference price (also in local currency). Therefore, a MPR of 3 means that the local medicine is three times the price of the international reference price.

International Reference Prices

For the core list of medicines, Management Sciences for Health (MSH) Drug Price Indicator Guide 2003 prices were selected as the most useful standard. The MSH reference prices are the medians of recent procurement or tender prices offered predominantly by not-for-profit suppliers to developing countries for multi-source products. As MSH prices were not available for most of the supplementary medicines, Spanish manufacturers' selling prices were used as the reference (prices supplied by WHO/HAI project member Carmen Peres-Casas). Spain is known to have relatively low manufacturers' selling prices.

Data for patient prices in the public and private sector was only included in the analysis where the medicine was found in at least 4 facilities.

Results

Availability of medicines in the public and private sector

Annex 2 lists the percentage availability of the core and supplementary medicines in both the public and the private sector. Availability was generally very low.

Candesartan, ciprofloxacin, co-trimoxazole suspension, efavirenz, and stavudine were not found at all. A further eight medicines (atenolol, azithromycin, fluconazole, ganciclovir inj, glibenclamide, lisinopril, ofloxacin and olanzapine), whether generics or innovator brands, were found in 10% or less of the 40 facilities surveyed.

Public sector

In the public sector, innovator brand versions of 16 medicines were found (out of 39 medicines surveyed) in at least one clinic. Of these, the availability across the facilities surveyed was very low. The innovator brand of diclofenac had the highest availability (45%). Table 5 shows the availability of innovator brands in the 20 public hospitals surveyed.

Table 5 Availability of innovator brands in the public sector

Availability	Medicine
Not found	aciclovir, amitriptyline, amoxicillin, atenolol, azithromycin, candesartan, captopril, ciprofloxacin, co-trimoxazole susp, diazepam, efavirenz, erythromycin, esomeprazole, ganciclovir inj, glibenclamide, hydrochlorothiazide, lisinopril, lovastatin, nifedipine retard, ofloxacin, phenytoin, ranitidine, stavudine
1- 20%	atorvastatin, carbamazepine, ceftriaxone inj, celecoxib, fluconazole, fluoxetine, losartan, metformin, olanzapine, salbutamol inhaler
21 - 50%	amlodipine, diclofenac, omeprazole, rosiglitazone, simvastatin beclometasone inhaler
Over 50%	none

For generics, the availability was slightly higher but still poor – 21 (54%) medicines were available in at least one public hospital clinic in generic form. Eight medicines (generic versions) showed 50% or higher availability – of these captopril, amoxicillin, ceftriaxone injection and hydrochlorothiazide were available in 80% or more to the 20 public hospitals surveyed - (see Table 6).

Table 6 Availability of any generic in the public sector

Availability	Medicine
Not found	aciclovir, atenolol, azithromycin, beclometasone inhaler, candesartan, carbamazepine, celecoxib, ciprofloxacin, co-trimoxazole susp, efavirenz, esomeprazole, fluconazole, lisinopril, losartan, olanzapine, rosiglitazone, stavudine, ofloxacin
1-20%	amitriptyline, amlodipine, atorvastatin, diazepam, diclofenac, erythromycin, fluoxetine, ganciclovir inj, glibenclamide, metformin, salbutamol inhaler, simvastatin
21-50%	lovastatin, nifedipine retard
51-79%	ranitidine, phenytoin, omeprazole
≥ 80%	amoxicillin, captopril, ceftriaxone inj, hydrochlorothiazide

Private sector

Seventeen innovator brands were found in at least one private pharmacy – only one more than the number found in the public hospitals. As can be seen in Table 7, only one innovator brand, diclofenac, had good availability (85%).

Table 7 Availability of innovator brands in the private sector

Availability	Medicine
Not found	amitriptyline, amoxicillin, atenolol, candesartan, captopril, ciprofloxacin, co-trimoxazole susp, diazepam, efavirenz, erythromycin, fluconazole, ganciclovir inj, glibenclamide, hydrochlorothiazide, lisinopril, lovastatin, nifedipine retard, ofloxacin, olanzapine, phenytoin, ranitidine, stavudine
1- 20%	aciclovir, atorvastatin, azithromycin, ceftriaxone inj, esomeprazole, fluoxetine, metformin, salbutamol inhaler
21 - 50%	amlodipine, beclometasone inhaler, carbamazepine, celecoxib,

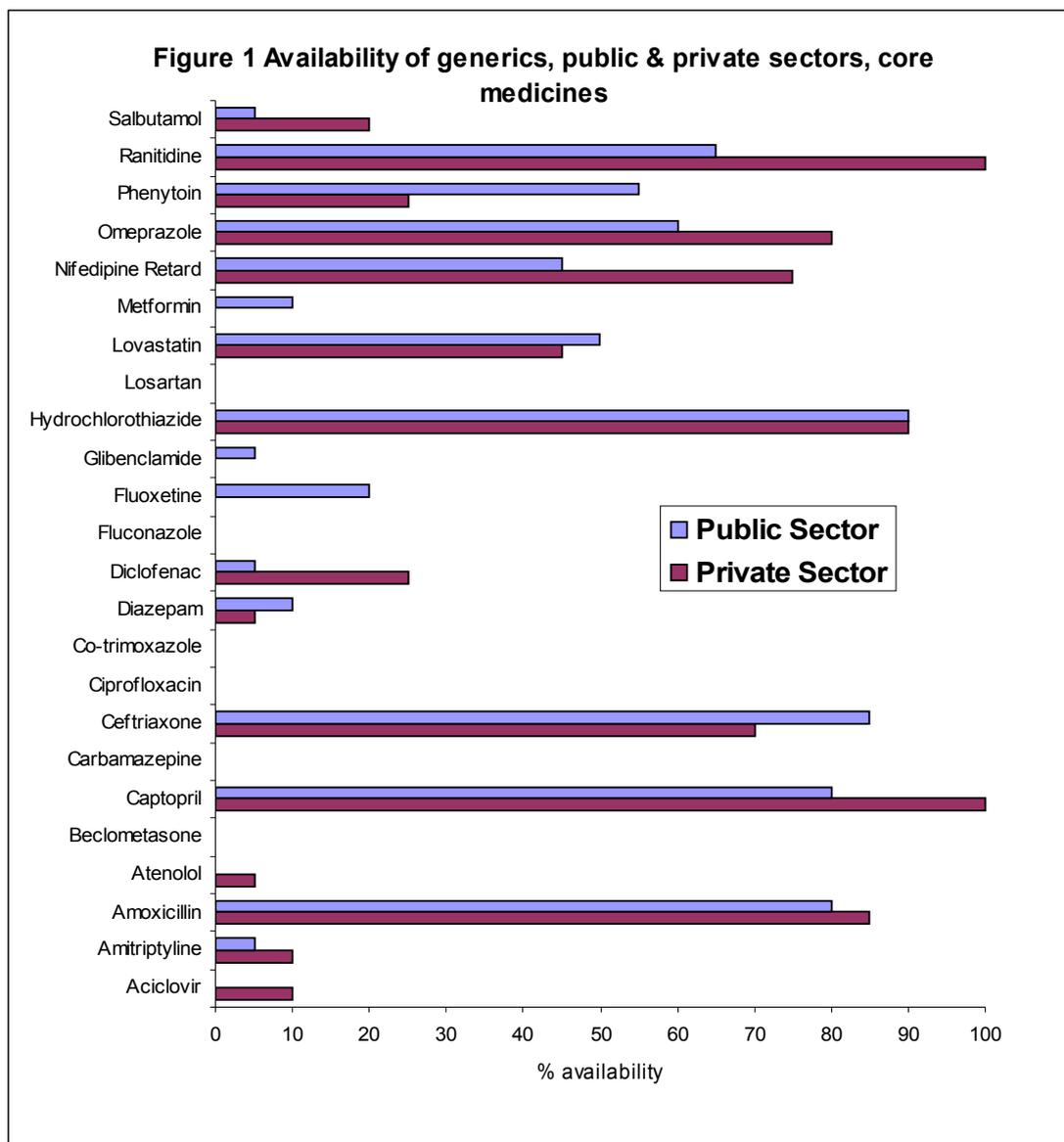
	losartan, omeprazole, rosiglitazone, simvastatin
51-79%	none
≥ 80%	diclofenac

The availability of generics in the private sector was variable. For 18 medicines (46%) no generics versions were found in any of the 20 private pharmacies surveyed. Availability was good (80% or more) for only 5 medicines - amoxicillin, hydrochlorothiazide, omeprazole, ranitidine (100%) and captopril (100%).

Table 8 Availability of any generic in the private sector

Availability	Medicine
Not found	atorvastatin, azithromycin, beclometasone inhaler, candesartan, carbamazepine, celecoxib, ciprofloxacin, co-trimoxazole susp, efavirenz, fluconazole, fluoxetine, ganciclovir inj, losartan, metformin, olanzapine, rosiglitazone, stavudine, simvastatin
1-20%	aciclovir, amitriptyline, amlodipine atenolol, diazepam, erythromycin, esomeprazole, glibenclamide, lisinopril, ofloxacin, salbutamol inhaler
21-50%	diclofenac, lovastatin, phenytoin
51-79%	ceftriaxone inj, nifedipine retard
≥ 80%	amoxicillin, captopril, hydrochlorothiazide, omeprazole, ranitidine

Figure 1 shows the availability of core medicines (generics only) in both the public and private sectors.



China's Essential Drug List

Of the core medicines, 19 are on the Essential Drug List (EDL) of Social Health Insurance issued by the Ministry of Labor and Social Security in 2000 (see Annex 2). In the public sector, the innovator brand of omeprazole had the highest availability - it was found in 5 out of 20 public hospitals. Of the generic equivalents, amoxicillin, captopril, ceftriaxone injection and hydrochlorothiazide were found in more than 80% of the facilities in the public sector.

Five of the supplementary medicines are on the Chinese EDL – amlodipine, azithromycin, erythromycin, rosiglitazone and simvastatin (see Annex 2). Four were found in at least one facility in the public sector and all in at least one private retail pharmacy, however, availabilities were generally low. The highest availability was rosiglitazone innovator brand (30%) in the public sector, and amlodipine innovator brand in the private sector (40%). Erythromycin (generic version only) was only found in 2 public hospitals and 3 private pharmacies.

The median availability of all EDL medicines surveyed was only 10% in both the public and private sector (generics).

Prices of core medicines in the public sector

In the public sector, the median of the median price ratios for innovator brands (6 core medicines) was 4 times the international reference prices (MSH 2003). Fifty percent of the innovator brand medicines were in the range of 1.71-7.28 times the reference prices. Table 9 summarizes the survey results.

The median of the median price ratios for the lowest price generic equivalents (10 core medicines) was 0.93 times the international reference price, with 50% of the medicines in the range of 0.69 to 2.88 times the reference prices.

Because of poor availability, comparisons between prices for the innovator brand and lowest price generic was only possible for two medicines in the public sector - ceftriaxone 1g injection and omeprazole 20mg tablets (see Table 10). The median

price ratio of the innovator brand of ceftriaxone injection was about 18 times higher than that of the lowest price generic found in the facilities surveyed. Omeprazole innovator brand was about 7 times more expensive than the generic equivalent. The price variation of the generic was greater than that of the innovator brand - 50% of generic omeprazole was in the range of 0.92 to 2.16 times the reference price compared to the narrower variation for the innovator brand (7.54 to 8.43 times the reference price).

Table 9 Summary of median price ratios, public sector, 24 core medicines (MSH)

	No. of core medicines found in 4+ facilities	Median of median price ratios	25 th percentile	75 th percentile
Innovator brand	6	4.09	1.71	7.28
Lowest price generic equivalent	10	0.93	0.69	2.88

Table 10 Examples of medicine price ratios in the public sector (MSH)

Generic name		Median price ratio	25 th percentile	75 th percentile
Ceftriaxone injection 1g	Innovator brand	5.89	5.66	7.31
	Lowest price generic equivalent	0.33	0.23	0.47
Omeprazole 20mg	Innovator brand	7.74	7.54	8.43
	Lowest price generic equivalent	1.09	0.92	2.16
Nifedipine Retard 20mg	Innovator brand	-	-	-
	Lowest price generic equivalent	4.51	4.47	4.98
Fluoxetine 20mg	Innovator brand	-	-	-
	Lowest price generic equivalent	21.28	18.61	22.40
Beclometasone 0.05mg/dose inhaler	Innovator brand	1.52	1.52	1.62
	Lowest price generic equivalent	-	-	-

Prices of core medicines in the private sector

In the private sector, only 9 innovator brand core medicines were found in 4 or more of the pharmacies surveyed. The median of the median price ratios for these 9 medicines was nearly 8 times the international reference price (Table 11). Of the 24 core medicines, only 11 generic equivalent medicines were found in 4 or more of the 20 private pharmacies surveyed. The median of the median price ratio was much lower than that of innovator brands (0.51 compared to 7.14). Therefore, innovator brands were 14 times more expensive than the lowest priced generics.

Table 11 Summary of median price ratios, private pharmacies, 24 core medicines (MSH)

	No. of core medicines found in 4+ facilities	Median of median price ratios	25 th percentile	75 th percentile
Innovator brand	9	7.14	2.35	10.94
Lowest price generic equivalent	11	0.51	0.29	1.11

Table 12 shows examples of median price ratios for individual core medicines in the private sector. The ‘brand premium’ (how much more expensive the innovator brand is compared to the lowest priced generic equivalent) range from 15 times (omeprazole) to about 75 times (diclofenac).

Table 12 Examples of medicine price ratios in private pharmacies (MSH)

Generic name		Median price ratio	25 th percentile	75 th percentile
Amoxicillin 250 mg	Innovator brand	-	-	-
	Lowest price generic equivalent	2.69	1.06	4.42
Ceftriaxone injection 1g	Innovator brand	5.95	5.01	6.19
	Lowest price generic equivalent	0.19	0.19	0.24
Diclofenac 25mg	Innovator brand	21.64	21.08	22.28
	Lowest price generic equivalent	0.29	0.24	0.33
Nifedipine Retard 20mg	Innovator brand	-	-	-
	Lowest price generic equivalent	4.13	3.57	4.32
Omeprazole 20mg	Innovator brand	7.98	7.98	8.43
	Lowest price generic equivalent	0.51	0.40	0.83

Prices of the supplementary medicines in the public and private sector

In the public sector, of the 15 medicines on the supplementary medicines list only 3 innovator brands and 2 generics were found in 4 or more facilities. The median of the median price ratios for the innovator brands was about 3 times the manufacturers' selling prices in Spain which were used as the reference. Fifty percent of the innovator brand medicines were in the range of 2.07-3.22 times the reference price. The median of the median price ratio of lowest priced generic equivalents was 1.5 times the manufacturers' selling price in Spain. Table 13 summarizes the survey results.

Table13 Summary of median price ratios, public sector, 15 supplementary medicines (Spain)

	No. of medicines found in 4+ facilities	Median of the median price ratios	25 th percentile	75 th percentile
Innovator brand	3	2.78	2.07	3.22
Lowest price generic equivalent	2	1.53	1.34	1.72

In the private sector, only 4 innovator brand medicines on the supplementary medicines list were found in 4 or more facilities. The median of the median price ratio was about 2 times the manufacturers' selling price in Spain. For the 3 innovator brand medicines common to both sectors, the medians of the median price ratios were almost identical (2.78 in public sector and 2.73 in private sector). In the private sector, no generic equivalents were found in at least 4 facilities. Table 14 summarizes the results.

Table 14 Summary of MPRs, private pharmacies, 15 supplementary medicines (Spain)

	No. of medicines found in 4+ facilities	Median of the median price ratios	25 th percentile	75 th percentile
Innovator brand	4	1.97	1.12	2.87
Lowest price generic equivalent	0	-	-	-

Procurement prices in the public sector

The median of the median price ratios of 9 innovator brand medicines on the core medicine list was 6.3 times the international reference prices (MSH), and fifty percent were in the range of 1.85 to 9.61 times the international reference prices (see Table 15). For procurement to be assessed as efficient, the median price ratios found should be around 1. The median MPRs for 15 lowest priced generics was a very efficient 0.62.

Table 15 Summary of procurement prices, public sector, 24 core medicines (MSH)

	No. of medicines	Median of the median price ratios	25 th percentile	75 th percentile
Innovator brand	9	6.30	1.85	9.61
Lowest price generic equivalent	15	0.62	0.34	3.13

For medicines on the supplementary list, the median of the median price ratios for 6 innovator brand medicines was 1.33 times the manufacturers' selling prices in Spain (see Table 16). For the five generics in the analysis, the median of median price ratios was nearly identical to the Spanish prices (0.96). Based on this price data, we assess the procurement for the generic supplementary medicines to be efficient.

Table 16 Summary of procurement prices, public sector, 15 suppl. medicines (Spain)

	No. of medicines	Median of the median price ratios	25 th percentile	75 th percentile
Innovator brand	6	1.33	1.21	2.16
Lowest price generic equivalent	5	0.96	0.18	0.99

Table 17 shows a comparison of public sector procurement prices and public sector patient prices. Six innovator brands (core medicines) were found in both sectors and 10 generics. The generics showed a much larger price difference (75%) compared to the innovator brands (22%). Comparisons have not been included for the supplementary medicines as few were found in both sectors.

Table 17 Comparison of median MPRs for procurement and patient prices, public sector, core medicines

	No. of medicines found in both sectors	Public Sector Procurement Prices Median MPRs	Public Sector Patient Prices Median MPRs	Ratio Public sector Patient Prices to Procurement Prices	% difference patient prices to procurement prices in the Public sector
Innovator brand	6	3.36	4.09	1.21	+21.6%
Lowest price generic equivalent	10	0.53	0.93	1.75	+75.4%

Comparison of core medicine prices across both sectors

Price variability exists between the public and private sectors for generic medicines (see Table 18). In Shandong Province, prices in the private were about 30% lower when comparing 9 lowest priced generic medicines found in both sectors. Prices for innovator brand medicines were nearly identical in both sectors.

Table 18 Comparison of median MPRs, core medicines, public and private sectors

	Public sector (n=20 outlets)	Private sector (n=20 outlets)	Number of medicines found in both sectors	% difference private sector to public sector
Brand	4.09	4.15	6	+1.6%
Lowest Price	0.77	0.52	9	-31.8%

The examples in Table 19 illustrate the situation using data for individual medicines found in both sectors. The median price ratios (MPR) of innovator brand medicines in the two sectors were only slightly different, but generic prices were generally much lower in the private sector compared to the public.

Table 19 Comparison of median price ratios in the public and private sectors (MSH)

Medicine name	Type	MPR in public hospital clinics	MPR in private pharmacies
Ceftriaxone injection 1g	Innovator brand	5.89	5.95
	Lowest price generic	0.33	0.19
Nifedipine Retard 20mg	Innovator brand	-	-
	Lowest price generic	4.51	4.13
Omeprazole 20mg	Innovator brand	7.74	7.98
	Lowest price generic	1.09	0.51

Price comparisons in the four regions surveyed

As the availability of medicines was generally low in Shandong Province, it was not possible to compare summary price ratio data across the regions. However it was possible to make regional comparisons for a few individual medicines found in at least 4 of the 5 facilities surveyed in each region. Table 20 compares median price ratios for 4 core medicines (lowest priced generics) across the four regions in the private sector and 1 core medicine in the public sector. Most showed similar prices across the four regions except amoxicillin and hydrochlorothiazide (private sector). In private pharmacies, the lowest priced generic amoxicillin was 4.5 times more

expensive in Zhangqiu than Jinxiang, and about 2.7 times more expensive in Jinan and Chiping (the poorest of the four regions) than in Jinxiang. Hydrochlorothiazide tablets (lowest priced generics) were about 2.4 times more expensive in private pharmacies in the capital Jinan than in pharmacies in the poorer regions of Jinxiang and Chiping.

Table 20 Regional comparisons of MPRs across the four regions surveyed (MSH)

Medicine	Jinan (n=5) MPR	Zhangqiu (n=5) MPR	Jinxiang (n=5) MPR	Chiping (n=5) MPR
<i>Private Sector</i>				
Amoxicillin 250mg lowest priced generic	2.69	4.28	0.96	2.56
Captopril 25mg lowest priced generic	0.18	0.16	0.14	0.12
Hydrochlorothiazide 25mg lowest priced generic	0.83	0.52	0.35	0.33
Ranitidine 150mg lowest priced generic	0.65	0.57	0.41	0.39
<i>Public Sector</i>				
Hydrochlorothiazide 25mg lowest priced generic	0.77	0.77	0.77	0.52

Affordability of standard treatments

Due to the poor availability of the core medicines, the affordability of standard treatment was measured for only 6 pre-selected conditions. Table 21 shows the affordability of these treatments in the public and private sectors. The monthly salary of the lowest paid unskilled government worker was 400 Chinese Yuan, i.e. 13.33 Chinese Yuan per day. For a course of innovator brand diclofenac to treat arthritis, a

patient would need to pay the equivalent of 4.5 day's wages of the lowest paid unskilled government worker to purchase one month's course of therapy from a public hospital. If the patient purchased the medicine from a private pharmacy, the cost expressed in days' wages would be 4.1 for innovator brand, and 0.1 for the lowest priced generic equivalent.

Table 21 Affordability of treating 6 conditions in the public and private sectors

Treatment	Type	Public sector		Private pharmacies	
		Median price (Yuan)	Day's wages	Median price (Yuan)	Day's wages
Diabetes: Metformin 500mg*3*30days	Innovator brand			144	10.8
	Lowest price generic				
Adult resp.infects: Amoxicillin 250mg*3*7 days	Innovator brand				
	Lowest price generic	4.20	0.3	7.98	0.6
Asthma: Salbutamol inhaler 0.1 mg/dose*200 doses	Innovator brand	36.45	2.7	37.50	2.8
	Lowest price generic			4.75	0.4
Peptic ulcer: Ranitidine 150mg*2*30 days	Innovator brand				
	Lowest price generic	8.6	0.6	5.9	0.4
Arthritis: Diclofenac 25mg*2*30days	Innovator brand	59.4	4.5	54.4	4.1
	Lowest price generic			0.72	0.1
Hypertension: Hydrochlorothiazide 25mg*1*30 days	Innovator brand				
	Lowest price generic	0.66	<0.1	0.45	<0.1

The affordability of treating two conditions with medicines from the supplementary

list was analyzed. Table 22 shows the treatment costs and days wages needed to pay for these treatments. For a one month course of innovator brand rosiglitazone to treat diabetes, a patient would need to pay the equivalent of 28.9 days' wages of the lowest paid unskilled government worker when purchasing the medicine in a public hospital. If the medicine was purchased from a private pharmacy, the lowest paid government worker would have to work slightly less to pay for the treatment, about 26 days' wages. For a one month course of innovator brand amlodipine to treat hypertension, the patient has to pay about 15 days' wages to purchase the medicine in a public hospital. If the patient is prescribed the lowest price generic equivalent medicine, 10 days' wages would be needed. If the patient purchases the innovator brand medicine in the private sector, the day's wages needed to pay for the treatment is slightly lower than that in public hospitals.

Table 22 Affordability of treating 2 conditions in public and private sectors (medicines from the supplementary list)

Treatment	Type	Public sector		Private pharmacies	
		Median price (Yuan)	Day's wages	Median price (Yuan)	Day's wages
Diabetes: Rosiglitazone 4mg*1*30days	Innovator brand	385.71	28.9	342.86	25.7
	Lowest price generic				
Hypertension: Amlodipine 5mg*1*30 days	Innovator brand	194.14	14.6	190.71	14.3
	Lowest price generic	133.07	10		

Price components and cumulative mark-ups

In the public sector, the price components collected in the field included the procurement price of wholesalers, the mark-up of wholesalers, the procurement price of hospitals, the mark-up of hospitals and the final price charged to the patient.

Table 23 summarizes the result of the price component survey in the public and private sectors. In the public sector, 'add-on' costs include the wholesale mark-up and

public hospital mark-up. For amoxicillin, the wholesaler mark-up to the public hospital was 10.33% and the public hospital mark-up was 14.05%. For omeprazole, the wholesaler's mark-up to the hospital was 13.70% for the innovator brand, while the wholesaler's markup for the generic equivalent was only 0.58%. For losartan (which does not have a generic equivalent in China), both the wholesale and hospital mark-ups were lower than for the other branded medicine in the components investigation (Losec). The cumulative markup for losartan was 24% compared to 35% for Losec (as shown in Table 24). This might be because losartan is new to the Chinese market and wholesalers are trying to build demand by keeping prices down. For the three medicines surveyed, the hospital mark-up was greater than the wholesale markup, ranging from 14.05% to 26.14%.

In the private sector, the mark-up of wholesalers to retail pharmacies was 3% except for Losec which was 2%. In the private sector, retail pharmacies pay a business tax of 3% when selling medicines. The retail pharmacy mark-up ranged from 4.51% to 25.69%. Losartan (innovator brand) had the lowest retail mark-up (4.51%) with the next lowest retail mark-up being 17.83% for omeprazole. As stated above, a possible reason is that losartan is a new medicine that only entered the Chinese market at the end of 1997 compared to the other three medicines which have been marketed for years, so it is not well known by health professionals and patients.

The 3% mark-up from wholesaler to retailer in the private sector is less than the mark-up in the public sector. The main reason is a government policy that restricts medicine manufacturers from supplying medicines directly to public hospitals. Most of the medicines in public hospitals are procured from provincial, prefecture and county wholesalers, and the trade costs (which includes transportation, sales commission fee etc) between wholesalers and public hospitals are higher. Usually trade costs are paid by wholesalers as part of their mark-up to public hospitals. In the survey we only managed to obtain the price of wholesalers selling to retail pharmacies – the pharmacies were unable to separate the manufacturer's price and the various mark-

ups.

Table 23 Medicine price composition in the public and private sectors

	Only generic equivalent	Innovator and generic		Only innovator brand in China
Medicine Name and	Amoxicillin	Losec	Omeprazole	Losartan
	(Generic)	(Innovator brand)	(Generic)	(Innovator Brand)
Local vs imported	Local	Local	Local	Imported
dose form and strength	250mg 24 caps	20mg 14 caps	20mg 7 caps	50mg 7 tab
Manufacturer	Zhuhai Liangbang Pharmaceutical Lt. Co	Astra Zeneca	Changzhou No.4 Pharmaceutical Lt. Co	MSD
Manufacturer's selling price (set by manufacturer)	12	140.72	48	-
Landed price (set by manufacturer)	-	-	-	42.39*
The procurement price paid by wholesalers	12	140.72	48	42.39
Public sector				
The mark-up of wholesalers to hospital	10.33%	13.70%	0.58%	6.16%
The procurement price of hospital	13.24	160	48.28	45
The mark-up of hospital	14.05%	18.75%	26.14%	17.11%
The retail price charged by the hospital	15.10	190	60.9	52.7
Private sector				
The mark-up of wholesalers to pharmacies	3%	2%	3%	3%
The procurement price of pharmacies	12.36	143.53	49.44	43.66
The regional tax paid by pharmacies	3%	3%	3%	3%
Procurement price including tax	12.73	147.84	50.92	44.97
The mark-up of pharmacies	25.69%	22.30	17.83%	4.51%
Actual retail price charged by the pharmacy	16	180.81	60	47
The maximum retail price set by government	16.1	217	64.7	56.4

*Note: we were informed that a number of component costs apply to imported medicines (duty tax 4%, VAT 17%, importer fee 2%, Letter of Credit fee 0.5% etc.) but we were not able to verify these with the manufacturer or importer of losartan. The landed price given here is set by the manufacturer for losartan. It includes the duty tax, VAT, importer fee, Letter of Credit fee etc.

Table 24 shows the cumulative percentage of add-ons to the MSP that results in the price that patients pay for the medicines surveyed in both the public and private sectors.

In the public sector, the innovator form of Losec has the highest cumulative add-ons, 35%, among the surveyed medicines. The cumulative percentage add-ons for the other products surveyed in the public sector averaged 25%. In the private sector, generic amoxicillin had 33% cumulative add-ons, compared with 26% add-ons in the public sector. Note that losartan in the private sector had the lowest cumulative mark-up of only 11%.

Table 24: Total cumulative markup from MSP to price selling to patient

Medicine Name	Amoxicillin (Generic)	Losec (Innovator)	Omeprazole (Generic)	Losartan (Innovator)
Public MSP/Landed price	12	140.72	48	42.39
Public final	15.10	190	60.9	52.7
% cumulative markups	26%	35%	27%	24%
Private MSP	12	140.72	48	42.39
Private final	16	180.81	60	47
% cumulative markups	33%	28%	25%	11%

Discussion

Availability and prices in the public and private sectors

The survey in Shandong, China showed low availability of medicines both in the public and private sectors. One explanation is that the strength of the medicines found in the field differed from the strengths recommended by the WHO/HAI survey manual. Due to ethnic differences between East and West, the strength needed for some medicines in China is generally lower than in western countries. For example, the recommended strength of atenolol tab was 50mg, but in the field we noted the 25mg products were much more commonly available. The same situation was found with ciprofloxacin 500mg (250mg), and fluconazole 200mg (100mg). Of the medicines surveyed, 24 were on the Chinese Essential Drug List. The median availability of these medicines in the public sector was only 10% (generics) - the same median availability was found in the private sector. The low availability of the surveyed medicines affected the robustness of the data. We should have included more medicines that are on the Essential Drugs List, and some commonly used medicines not on the Essential Drug List. However, even the availability of the supplementary medicines (chosen by the survey team due to their clinical importance) was low so clearly this issue needs to be addressed.

Within sectors, there were some large differences between innovator brand products and their generic equivalents. In the public sector, innovator brands (core medicines) were generally 4 times the price of the lowest priced generic equivalent products. For the supplementary medicines, the difference was less than 2 times but too few medicines were available for a robust analysis. In the private sector, innovator brands (core medicines) were 14 times the price of their generic equivalents when analyzing the 9 innovator brands and 11 generics found in 4 or more facilities. This difference

risers to 24 times if you only consider the 4 medicines found in both forms (innovator brand and generic equivalent).

Differences were found in the retail prices of generics in the public hospitals compared to the private retail pharmacies. The lowest priced generics found in the public sector were 30% more expensive than those for the same medicine in the private sector (MPR 0.77 public sector versus MPR 0.52 private sector). Public hospitals have a dominant position in the medicine supply chain. It has been estimated that about 80% of antibiotic medicines are sold in public hospitals ⁽⁵⁾. Before market economy reform, in a special medicine policy authorized by the government, hospitals were legally permitted to add 15% mark-up to the wholesale price in order to maintain the development of public hospitals. Due to the limited financial capability of the Chinese government, income from medicine sales became the major source of hospital funding. In the last ten years, the Chinese government has issued several policies aimed at lowering medicine prices. Research has shown that in the first half of 2004 retail prices decreased slightly, but the average price of medicines in hospitals remained 39.5% higher than in the retail pharmacies ⁽⁶⁾. The Chinese government needs to act to further control medicine prices so they drop to affordable levels. The prices of innovator brand medicines varied only slightly between the public and private sectors when analyzing the 6 products found in both sectors (MPR 4.09 public sector versus MPR 4.15 private sector). A reason could be that most of the innovator brand medicines surveyed are imported, therefore competition is limited. But for the generic medicines, there are lots of domestic manufacturers, competition is fierce, and private pharmacies have to lower prices in order to attract customers.

The Chinese Ministry of Health initiated the Pharmaceutical Centralized Public Bidding Procurement process in public hospitals in 2000. In October 2004 the Ministry issued a policy further regulating the bidding process - regulating that all

public hospitals above county level must be enrolled in the centralized tender, and over 80% of medicines in public hospitals should be procured through this centralized tender. Of the four survey sites, only in Jinan are medicines procured through the centralized tender. Medicines not listed in the centralized tender document can be procured by hospitals directly from wholesalers and/or manufacturers. The county and village hospitals in this survey were not enrolled in the pharmaceutical centralized tender, therefore they can procure the medicines they need from wholesalers or manufacturers directly. The survey results showed the median of the MPRs for innovator brands was about 6 times the reference prices and so procurement is far from efficient. There are two possible explanations for this - the medicine is patented so generic competition is not permitted or, as mentioned above, the medicines are procured locally rather than via the centralized tender. It is difficult to evaluate the efficiency of procurement using existing data. The median of the MPRs for procurement of core lowest priced generics was 0.62 times the international reference price (15 generics in analysis, MSH). This would indicate that the government's centralized tender or individual hospital procurement is efficient for generics. The main reason for this may be the competitiveness of the generic medicine market in China. Unfortunately these low procurement prices are not passed on to patients in the public sector.

The affordability of treatments

The results of the affordability analysis show that for arthritis, a patient needs to pay 4.5 days' wages to buy a one month course of innovator brand diclofenac from a public sector facility and slightly less (4.1 days) when buying in the private sector. If they purchased the lowest priced generic, the affordability decreases to 0.1 of a day in private pharmacies (only 1 public facility stocked generic diclofenac on the day of data collection). It is important to remember that this treatment cost only refers to the cost of purchasing the medicine - consultation fees and diagnostic tests

(approximately 40% of total health care expenditure ⁽²⁾) are additional.

If a patient with diabetes is treated using innovator brand rosiglitazone, a one month treatment course would cost 29 days' wages. That is to say, a patient needs to spend a month's wage to buy just one medicine for a month's treatment. Even metformin, a much older medicine used to treat diabetes, is unaffordable for ordinary citizens – a months' course of the innovator brand purchased from a retail pharmacy would take nearly 11 days' wages. No generics of metformin were found in the private sector, and only 2 facilities in the public sector stocked a generic and 3 stocked the innovator brand. Glibenclamide, another medicine used to treat diabetes, was only found in 1 facility in the public sector and 1 in the private sector. Clearly, the treatment of a chronic disease such as diabetes, where prices are high and availability is low, warrants urgent attention.

Medicine pricing policy in China and price components

Before July 2000, the prices of most medicines, including the ex-factory price, wholesale price and retail price, were set by the central or provincial government. Prices which were set by the manufacturer had to be registered at the provincial government agency. Government regulated the mark-up rate in the medicine distribution chain. The mark-up rate on the ex-factory price was 15% based on the production cost of manufacture declared to the government. The wholesalers mark-up when selling to hospitals and retail pharmacies could not exceed 20%, and hospitals and retail pharmacies could add only 15% mark-up on the basis of the procurement price.

In July 2000, the Chinese government reformed the drug pricing policy. According to the policy "The Regulation on Reforming the Administration of Medicine Price"

issued by State Planning and Development Commission (SPDC) in August 2000, two pricing methods are applicable: government pricing and market pricing. The government sets the price of the medicines on the Essential Drug List and some special medicines used in mental health, anaesthetics, immunization medicines, and family planning medicines. Prices of other medicines are set by the market: including the manufacturer's selling price, wholesaler price and retail price. However, the price has to be registered with the government price authority. The government abolished the setting mark-up rates of medicines in the distribution chain.

For the price of medicines set by government, the SPDC sets a maximum retail price, leaving retail pharmacies and public hospitals to set their own retail price – which cannot be higher than the maximum retail price. For medicines whose price is set by manufacturers, the retail price is set based on production costs, market supply and demand. The wholesalers, retail pharmacies and hospitals can set the actual selling price but it cannot exceed the retail price set by the manufacturer. The mark-ups charged by all in the distribution chain are generally regarded as commercial secrets. Usually the mark-up of wholesalers to hospitals is not fixed, and depends on sales volume. If a hospital purchases a very large amount of omeprazole they can ask the wholesalers to sell at a well discounted price. Because of this process of negotiation between wholesalers and public hospitals, the procurement price of the same product may be different in different hospitals (and hence the final patients price can also vary). Further in-depth research is needed on how the mark-ups of wholesalers to hospitals are set.

According to the survey data, the major add-on component cost in the public sector is the hospital mark-up. The public hospital sets their mark-up so that the final retail price to patients does not exceed the government's maximum retail price. Again, further investigation is needed on the procurement prices paid by hospitals and their profits.

Data from the State Planning and Development Commission in June 2004, showed the national average actual price from public hospitals was 39.5% higher than prices from private pharmacies. As Table 24 shows, the results of the small components survey do not fully support this. This might be because the number of medicines surveyed was too small to reflect the real price difference between public hospitals and private pharmacies. However, the price survey did show that the lowest priced generics found in the public sector were 30% more expensive than those for the same medicine in the private sector (MPR 0.77 public sector versus MPR 0.52 private sector).

The main reason public hospitals charges high medicine prices is that income from medicine sales is a major revenue source in public hospitals - governmental financial support accounts for only 50 percent of total hospital income.

Interviewing the wholesaler in Jinan gave us some interesting insights. The MSP set by manufacturers is usually much higher than the actual production costs. The government price authority does not have enough capacity to examine manufacturers' actual production costs, hence the maximum retail price set by government is based on the set MSP declared to the government by the manufacturer. Despite the fact that the wholesaler reported their procurement prices were identical to the manufacturer-set MSP, there is anecdotal evidence that the real procurement price of wholesalers is much lower than the manufacturer-set MSP. Therefore, the mark-ups of the wholesaler and retailer are greater than that allowed by the government so there exists an opportunity to lower the manufacturer-set MSP and the government-set maximum retail selling price. The data collected does suggest profits can be reduced in the medicine supply chain hence further research is needed.

In the survey we found a 3% business tax is levied on retail pharmacies. In China, the retail pharmacies are regarded as commercial facilities which are levied this kind of regional tax. Currently there are two main taxation options for retail pharmacies. One is a fixed tax regardless of income; the other option is tax levied on a certain percentage of business revenue, usually 3%.

The disordered medicine distribution system contributes to high medicine prices. In China, there are about 16000 licensed pharmaceutical wholesalers. Competition is fierce, but that does not necessarily result in lower wholesale mark-ups. As government regulation is inadequate, those in the medicine supply chain grab profits wherever they can. While the government recently introduced regulations on the maximum retail price of medicines on the Essential Drug List, the mark-up in the supply chain is negotiated between manufacturers and wholesalers, between wholesalers and hospitals or retail pharmacies. We do not believe that the mark-up data obtained in the survey reflects the true picture of what happens in the process of medicine distribution; we think that the wholesalers and retailers just told us what they wanted to.

Conclusions and Recommendations

In Shandong Province, the availability of the surveyed medicines was extremely low in both the public and private sectors. In both the private and public sectors, considerable price differences were seen between innovator brands and generics. In the private sector, innovator brands were 14 times more expensive than the lowest priced generic. In the public sector the difference was 4 times. Generic medicines were cheaper in the private sector compared to the public sector. Cumulative mark-ups (from the manufacturer's price to the patient price) were 24-35% in the public sector, and 11-33% in the private sector. In the public sector, hospital mark-ups were the greatest contributor (hospital mark-ups up to 26% were seen). Business tax is applied in the private sector. Medicines are often unaffordable for ordinary citizens. The treatment of a chronic disease such as diabetes, where prices are high, availability low and affordability poor, warrants urgent attention.

On the basis of the findings of the survey, the main recommendations are summarized as follows:

- 1) In order to more fully assess the availability of medicines, an extended and customised survey should be conducted at provincial, county and village levels. The list of medicines surveyed should include more from the Chinese Essential Drugs List.
- 2) An in-depth study of the medicine distribution process should be initiated to reveal the real picture of add-on costs. Distribution channels and their effect on prices should be studied, and factors influencing the purchasing and selling behaviour of wholesalers and retailers should be identified as well as the setting of the manufacturer's selling price and maximum retail price.
- 3) VAT and other taxes should be removed for imported medicines

- 4) The government should further develop its medicine pricing policy. In the public sector, the government should strengthen the pharmaceutical centralized public bidding mechanism (tenders) in order to lower medicine prices in the public sector. For off-patent medicines, less expensive generics should be purchased rather than more expensive innovator brands.
- 5) To improve access to medicines, patients should pay procurement prices in the public sector plus a nominal distribution cost. Hospitals should not be financed by medicine sales but through other mechanisms. Sales tax should be removed in the private sector.
- 6) Greater acceptance and use of generic medicines (by health professionals and consumers) must be encouraged.
- 7) The impact of policy changes should be measured by establishing a monitoring system to regularly monitor the price, availability and affordability of medicines.

This study, using basic indicators, does not give the complete picture of medicine pricing in Shandong Province, however, it does point to issues of poor availability, high prices of some medicines, and the lack of affordability of some treatments for common illnesses. Based on these preliminary findings, we hope an in-depth study will be conducted in order to develop medicine price policies that ensure the affordability of medicines for all.

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Annex 1 List of medicines surveyed

Med. No.	Medicine Name	Medicine Strength	Dosage Form	Target Pack Size	Core List
1	Aciclovir	200 mg	cap/tab	25	yes
2	Amitriptyline	25 mg	cap/tab	100	yes
3	Amlodipine	5 mg	cap/tab	100	no
4	Amoxicillin	250 mg	cap/tab	21	yes
5	Atenolol	50 mg	cap/tab	60	yes
6	Atorvastatin	10 mg	cap/tab	100	no
7	Azithromycin	500 mg	cap/tab	10	no
8	Beclometasone inhaler	0.05 mg/dose	dose	200	yes
9	Candesartan	4 mg	cap/tab	100	no
10	Captopril	25 mg	cap/tab	60	yes
11	Carbamazepine	200 mg	cap/tab	150	yes
12	Ceftriaxone injection	1 g/vial	gram	1	yes
13	Celecoxib	200 mg	cap/tab	60	no
14	Ciprofloxacin	500 mg	cap/tab	1	yes
15	Co-trimoxazole suspension	8+40 mg/ml	millilitre	70	yes
16	Diazepam	5 mg	cap/tab	100	yes
17	Diclofenac	25 mg	cap/tab	100	yes
18	Efavirenz	600 mg	cap/tab	60	no
19	Erythromycin	250 mg	cap/tab	21	no
20	Esomeprazole	20 mg	cap/tab	60	no
21	Fluconazole	200 mg	cap/tab	30	yes
22	Fluoxetine	20 mg	cap/tab	30	yes
23	Ganciclovir injection	500 mg/vial	vial	1	no
24	Glibenclamide	5 mg	cap/tab	60	yes
25	Hydrochlorothiazide	25 mg	cap/tab	30	yes
26	Lisinopril	20 mg	cap/tab	100	no
27	Losartan	50 mg	cap/tab	30	yes
28	Lovastatin	20 mg	cap/tab	60	yes
29	Metformin	500 mg	cap/tab	100	yes
30	Nifedipine Retard	20 mg	tab	100	yes
31	Ofloxacin	200 mg	cap/tab	21	no
32	Olanzapine	5 mg	cap/tab	100	no
33	Omeprazole	20 mg	cap/tab	30	yes
34	Phenytoin	100 mg	cap/tab	100	yes
35	Ranitidine	150 mg	cap/tab	60	yes
36	Rosiglitazone	4 mg	cap/tab	100	no
37	Salbutamol inhaler	0.1 mg/dose	dose	200	yes
38	Simvastatin	20 mg	cap/tab	100	no
39	Stavudine	40 mg	cap/tab	60	no

Annex 2 Percentage availability of medicines

Included on the Chinese EDL	Medicine Name	Innovator brand		Lowest price generic	
		Public	Private	Public	Private

<i>Core medicines</i>					
Yes	Aciclovir	0%	5%	0%	10%
Yes	Amitriptyline	0%	0%	5%	10%
Yes	Amoxicillin	0%	0%	80%	85%
Yes	Atenolol	0%	0%	0%	5%
No	Beclometasone inhaler	30 %	25%	0%	0%
Yes	Captopril	0%	0%	80%	100%
Yes	Carbamazepine	5%	25%	0%	0%
Yes	Ceftriaxone injection	20%	20%	85%	70%
Yes	Ciprofloxacin	0%	0%	0%	0%
No	Co-trimoxazole susp	0%	0%	0%	0%
Yes	Diazepam	0%	0%	10%	5%
No	Diclofenac	45%	85%	5%	25%
Yes	Fluconazole	5%	0%	0%	0%
No	Fluoxetine	15%	20%	20%	0%
Yes	Glibenclamide	0%	0%	5%	5%
Yes	Hydrochlorothiazide	0%	0%	90%	90%
No	Losartan	20%	30%	0%	0%
Yes	Lovastatin	0%	0%	50%	45%
Yes	Metformin	15%	20%	10%	0%
Yes	Nifedipine Retard	0%	0%	45%	75%
Yes	Omeprazole	25%	25%	60%	80%
Yes	Phenytoin	0%	0%	55%	25%
Yes	Ranitidine	0%	0%	65%	100%
Yes	Salbutamol inhaler	20%	20%	5%	20%
<i>Supplementary medicines</i>					
Yes	Amlodipine	25%	40%	20%	10%
No	Atorvastatin	10%	10%	20%	0%
Yes	Azithromycin	0%	5%	0%	0%
No	Candesartan	0%	0%	0%	0%
No	Celecoxib	10%	25%	0%	0%
No	Efavirenz	0%	0%	0%	0%
Yes	Erythromycin	0%	0%	10%	15%
No	Esomeprazole	0%	10%	0%	5%
No	Ganciclovir injection	0%	0%	10%	0%
No	Lisinopril	0%	0%	0%	5%
No	Ofloxacin	0%	0%	0%	5%
No	Olanzapine	10%	0%	0%	0%
Yes	Rosiglitazone	30%	25%	0%	0%
Yes	Simvastatin	25%	25%	5%	0%
No	Stavudine	0%	0%	0%	0%

Annex 3 National Pharmaceutical Sector Form

Date: **Oct 2004**

Population: **about 1.3 billion in China in 2003**

Rate of exchange (commercial “buy” rate) to US dollars on the first day of data collection:

8.2144

Sources of information: **Internet, Key informant interview, some national department such as Information Centre of State Food and Drug Administration**

General information on the pharmaceutical sector

Is there a formal National Medicines Policy document covering both the public and private sectors? Yes

Is an Essential Medicines List (EML) available? Yes

If yes, state total number of medicines on national EML: **1488 (913 chemical medicines and 575 Chinese traditional medicines)**

If yes, year of last revision: **2000 year**

If yes, is it (tick all that apply):

National

Regional

Public sector only

Both public and private sectors

Other (please specify):

If yes, is the EML being used (tick all that apply):

For registration of medicines nationally

Public sector procurement only

Insurance and/or reimbursement schemes

Private sector

Public sector

Is there a policy for generic prescribing or substitution? No

Are there incentives for generic prescribing or substitution? No

Public procurement¹

¹ If there is a public procurement system, there is usually a limited list of items that can be procured. Products procured on international tenders are sometimes registered in the recipient country only by generic names. Import permits to named suppliers are issued based on the approved list of tender

Is procurement in the public sector limited to a selection of essential medicines? No

If no, please specify if any other limitation is in force: No

Type of public sector procurement (tick all that apply):

International, competitive tender

Open

Closed (restricted)

National, competitive tender

Open

Closed (restricted)

Negotiation/direct purchasing

Are the products purchased all registered? Yes

Is there a local preference?²

Are there public health programmes fully implemented by donor assistance which also provide medicines? Yes

(e.g. TB, family planning, etc.)

If yes, please specify: **For TB World Bank Loan Project, which provides the anti-TB drugs and some essential test equipments, but the Project also asks the local government to match certain funding. Now it is the eighth WB Loan Project in China.**

Distribution³

Is there a public sector distribution centre/warehouse? Yes

If yes, specify levels: **Regional level**

Are there private not-for-profit distribution centres: No
e.g. missions/nongovernmental organizations?

If yes, please specify:

Number of licensed wholesalers: **16 thousand#**

Source: http://www.jx.xinhuanet.com/ztdj/2003-01/21/content_164794.htm

Retail

	Urban	Rural	Overall
Number of inhabitants per pharmacy (approx.)	NA	NA	6500 [#]
Number of inhabitants per qualified pharmacist (approx.)	NA	NA	6667*
Number of pharmacies with qualified pharmacists	NF	NF	21000 ^{&}
Number of medicine outlets with pharmacy technician	NA	NA	NA
Number of other licensed medicine outlets	NA	NA	NA

awards. An open tender is one that is publicly announced; a closed one is sent to a selection of approved suppliers.

² A local preference means that local companies will be preferred even if their prices are not the cheapest. Local preference is normally in the range of 10–20%.

³ The public sector often has a central storage and distribution centre which may have at least one sublevel. The private not-for-profit sector may be dominated by one type of NGO (e.g. church missions), but may also comprise others such as Bamako Initiative type projects, Red Cross or Red Crescent Society, Médecins Sans Frontières.

#In 2003, there were about 200000 retail pharmacies in China.

Source: Chinese medicine and commerce association

*In 1995, China started examinations and registering pharmacists. Up to the end of 2003, about 195000 pharmacist acquired the diploma of registered pharmacist. But most of them are working in hospitals; only about 21000 qualified pharmacists worked in retail pharmacies. In 2003, there are about 1.3 billion people in China.

Source: http://www.cpha.org.cn/html/content/add4/jyypx_zyys_115.htm.htm

Chinese medicine and commerce association

& According to governmental regulations, each pharmacy should have at least one registered pharmacist. At the end of 2003 there were about 21000 pharmacies with one registered pharmacist.

Private sector⁴

Are there independent pharmacies? Yes Number: **130000**

Are there chain pharmacies? Yes Number: **500**

Source: http://www.cpha.org.cn/html/content/add4/jyypx_zyys_115.htm.htm

Do doctors dispense medicines?⁵ No

Are there pharmacies or medicine outlets in health facilities? Yes

Financing

(Give approximate figures, converted to US dollars at current exchange rate: commercial “buy” rate on the first day of data collection)

Type of expenditure	Approximate annual budget (US dollars)
National public expenditure on medicines including government insurance, military, local purchases in past year	4.8 billion
Estimated total private medicine expenditure in past year (out of pocket, private insurance, NGO/mission)	7.2 billion
Total value of international medicine aid or donations in past year	NF

It is estimated in 2000, the medicine expenditure per cap is about 10 US\$ in China, about the population in 2000 is about 1.2 billion, the total medicine expenditure is about 12 billion US\$ in

4 Retail outlets may be called pharmacies, medicine outlets, drug stores, chemists, etc. They may be run/owned by a qualified pharmacist (with diploma) or another category: e.g. pharmacy technician, or a lay person with short training.

5 Many countries allow doctors to dispense and sell medicines.

China. And about 60% of medicine expenditure was out of pocket and paid by private insurance.

(source: <http://www.china.org.cn/chinese/zhuanti/pinggu/414486.htm>)

What percentage of medicines by value are imported? **12%**

Source: http://www.cpha.org.cn/html/content/add4/scts_yjyfz_2789.htm.htm

<http://www.genetide.com/news/ShowNews.asp?id=125760>

Government price policy

Is there a medicines regulatory authority? Yes
Is pricing regulated? Yes
Is setting prices part of market authorization/registration? Yes
Do registration fees differ between:

- Innovator brand and generic equivalents Yes
- Imported and locally produced medicines Yes

Source: Shandong FDA (phone communication). Innovator brand and imported medicines should be registered in the SFDA - the Food and Drug Administration at provincial level has no right to accept the registration.

Public sector

Are there margins (mark-ups) in the distribution chain? No

- Central medical stores %
- Regional store %
- Other store (specify) %
- Public medicine outlet %

Note: In China, the government regulates the maximum retail price. There is no specific regulation on mark-ups in the distribution chain. Mark-ups in the distribution chain depend on the distributors in different levels and on the drugs.

Are there any other fees or levies? No

Private retail sector

Are there maximum profit margins? No

If yes (if they vary, give maximum and minimum):

- Wholesale %
- Retail %

Is there a maximum retail price (sales price)? Yes
(If it varies, give maximum and minimum)

- Maximum:
- Minimum:

Note: Different drugs are set different maximum retail prices

Do patients pay professional fees (e.g. dispensing fee)? No

:

“Other” sector - NA in China

Insurance, risk-sharing or prepayment schemes

Are there any health insurance, risk-sharing or prepayment schemes or revolving medicine funds? Yes

If yes, please describe: **The Urban Employee Basic Health Insurance Scheme**
Are all medicines covered? No

If no, state which medicines are covered (e.g. EML, public health programmes):

Only the drugs in the EML are covered by the Scheme.

Are some patients / groups of patients exempted, regardless of insurance coverage? (e.g. children < X yrs, war veterans) Yes

According to the regulation of the Urban Employee Basic Health Insurance Scheme, All urban employees in public and private enterprises, civil servants and the retired employees are compulsorily enrolled. Self-employed and rural industrial workers may buy into the programme, but are not required to enroll. Workers’ dependants, including their children, are now excluded.

Estimated percentage of population covered **19% urban population.**

Is it official policy to supply all medicines free at primary health care level? No

If no, are some free? Yes

If yes, tick all that apply:

Tuberculosis

Malaria

rehydraton salts

Family planning

Others, please specify:

Are there official user charges/patient co-payments/fees? Yes

Are all medicines supplied free at hospitals? No

If no, are some free? No

Oral

药品价格调查表

调查日期_____

地区编码_____

城镇/乡村/街道名称_____卫生机构或药店名称_____

卫生机构或药店的编码_____机构距离最近城镇(人口数>50 000)的千米数_____

卫生机构的类型： 公立机构 私营零售药店 其他(请注明_____)

公立机构与私有非赢利机构部门中价格的类型： 采购价格 病人支付价格

机构管理者的姓名_____

提供药品价格信息与药品可用性信息的有关人员的姓名_____

资料搜集者姓名_____

核实

由地区监督者在每天工作结束时完成。

署名_____

日期_____

MEDICINE PRICE DATA COLLECTION FORM

Lowest price: determined at facility

A	C	D	E	F	G	H	I	J
Generic name, dosage form, strength	Brand name(s)	Manufacturer	Available tick ✓ for yes	Pack size recommended	Pack size found	Price of pack found	Unit price (4 digits)	Comments
Aciclovir tab 200 mg	Zovirax/	GSK 葛素威康		25			/tab	
Lowest price generic equivalent				25				
Amitriptyline tab 25 mg □ 酸阿米替林	Tryptizol/依拉	MSD 默沙		100			/tab	
Lowest price generic equivalent				100				
Amoxicillin caps/tab 250 mg	Amoxil/	SKB (GSK) 史克必成 (葛素威康)		21			/tab	
Lowest price generic equivalent								
Antenolol tab 50mg	Tenormin/天敏	AstraZeneca 阿斯利康		60			/tab	
Lowest price generic equivalent								
Beclometasone inhaler 50 mcg/dose 倍米松	Becotide/必可	GSK 葛素威康 葛素史克(重)有限公司		1 inhaler: 200 doses			/dose	
Lowest price generic equivalent				1 inhaler: 200 doses				
Captopril tab 25 mg	Capoten/□博通	BMS 百美施宝		60			/tab	
Lowest price generic equivalent				60				

A	C	D	E	F	G	H	I	J
Generic name, dosage form, strength	Brand name(s)	Manufacturer	Available tick ✓ for yes	Pack size recommended	Pack size found	Price of pack found	Unit price (4 digits)	Comments

Carbamazepine tab 200 mg	Tegretol/得理多	Novartis 北京		100	30 tab		/tab	
Lowest price generic equivalent								
Ceftriaxone inj 1 g powder □□曲松	Rocephin/□氏芬	Roche □氏 上海氏制有限公司		1 vial	1g		/vial	
Lowest price generic equivalent				1 vial				
Ciprofloxacin tab 500 mg □酸丙沙星	Ciproxin 悉欣	Bayer 拜		1			/tab	
Lowest price generic equivalent				1				
Co-trimoxazole paed suspension (8+40) mg/mL	Bactrim □方磺胺甲基异混	Roche □氏		100 mL			/mL	
Lowest price generic equivalent				100 mL				
Diazepam tab 5 mg 地西泮	Valium	Roche □氏		100			/tab	
Lowest price generic equivalent								
Diclofenac tab 25 mg 双芬酸	Voltarol/扶他林；	Novartis □□		100	30 tab		/tab	
Lowest price generic equivalent				100				
Fluconazole caps/tab 200 mg 氟康	Diflucan/大扶康	Pfizer □瑞		30			/tab	
Lowest price generic equivalent								
A	C	D	E	F	G	H	I	J
Generic name, dosage form, strength	Brand name(s)	Manufacturer	Available tick ✓ for yes	Pack size recommended	Pack size found	Price of pack found	Unit price (4 digits)	Comments
Fluoxetine caps/tab 20 mg □酸氟西汀片(□克)	Prozac/百解	Lilly 美国礼来制公司		30			/tab	
Lowest price generic equivalent				30				
Glibenclamide tab 5 mg 格列苯	Daonil/□降糖	HMR 赫美		60			/tab	

Lowest price generic equivalent				60				
Hydrochlorothiazide tab 25 mg □ □ □ □	Dichlotride	MSD 默沙		30			/tab	
Lowest price generic equivalent				30				
Losartan tab 50 mg □沙坦	Cozaar/科素	MSD 默沙		30	7 tab		/tab	
Lowest price generic equivalent				30				
Lovastatin tab 20 mg 洛伐他汀	Mevacor/美降之	MSD 默沙		60			/tab	
Lowest price generic equivalent				60				
Metformin tab 500 mg	Glucophage(格止)	施宝制有限公司		100	20tab		/tab	
Lowest price generic equivalent								
Nifedipine Retard tab 20 mg 硝苯地平	Adalat Retard 拜新同	Baye 拜耳		100			/tab	
Lowest price generic equivalent				100				
A	C	D	E	F	G	H	I	J
Generic name, dosage form, strength	Brand name(s)	Manufacturer	Available tick ✓ for yes	Pack size recommended	Pack size found	Price of pack found	Unit price (4 digits)	Comments
Omeprazole caps 20 mg	Losec/洛塞克	AstraZeneca 阿斯利康		30	14 caps		/caps	
Lowest price generic equivalent								
Phenytoin caps/tab 100 mg 苯妥英, 能停	Epanutin/大丁	Pfizer □瑞		100			/tab	
Lowest price generic equivalent				100				
Ranitidine tab 150 mg	Zantac/善胃得	GSK 葛素威康		60			/tab	
Lowest price generic equivalent				60				
Salbutamol inhaler 0.1 mg per	Ventoline/万托林	GSK 葛素威康		1 inhaler: 200	1 inhaler: 200		/dose	

dose				doses	doses			
Lowest price generic equivalent								
Amlodipine(氨地平)	Norvasc/□活喜	Pfizer □瑞制药有限公司		5mg	7 tab		/tap	
Lowest price generic equivalent				5mg				
Atorvastatin 阿妥伐他汀	Lipitor/立普妥	Pfizer □瑞		10mg	7 tab		/tap	
Lowest price generic equivalent				10mg				
Azithromycinb 阿奇霉素	Zithromax 希舒美	Pfizer/Pliva □瑞		500mg			/tap	
Lowest price generic equivalent				500mg				
Candesartan 坎地沙坦	Atacand	Astra Zeneca 阿斯利康		4mg			/tap	
Lowest price generic equivalent				4mg				
A	C	D	E	F	G	H	I	J
Generic name, dosage form, strength	Brand name(s)	Manufacturer	Available tick ✓ for yes	Pack size recommended	Pack size found	Price of pack found	Unit price (4 digits)	Comments
Celecoxi)	Celebrex/西葆	Pharmacia 法西		200mg			/tap	
Lowest price generic equivalent				200mg				
Efavirenz(依非 (EFV)	Sustiva/Stocri/施多宁	Merck (MSD/BMS) 默克		600mg			/tap	
Lowest price generic equivalent				600mg				
Erythromycin □霉素	Pantomicina	ABBOTT 雅培		250mg			/tap	
Lowest price generic equivalent				250mg				
Esomeprazole 艾司奥美拉	Nexium/耐信	Astra Zeneca 阿斯利康		20mg			/tap	
Lowest price generic equivalent				20mg				
Ganciclovir 更昔洛	Cymevene/□美	Roche □氏		500mg vial			/vial	
Lowest price generic				1vial				

equivalent								
Lisinopril □□普利片	Zestril/捷瑞	AstraZeneca 阿斯利康		20mg	14 tab		/tab	
Lowest price generic equivalent				20mg				
Ofloxacin 泰利必妥	Tarivid	Aventis (HMR) 赫美		200mg			/tab	
Lowest price generic equivalent				200mg				
Olanzapine 奥氮平	Zyprexa/再普	Lilly 礼来制公司		5mg	28 tab		/tab	
Lowest price generic equivalent				5mg				

A	C	D	E	F	G	H	I	J
Generic name, dosage form, strength	Brand name(s)	Manufacturer	Available tick ✓ for yes	Pack size recommended	Pack size found	Price of pack found	Unit price (4 digits)	Comments
Risperidone 利培	Risperdal/□思通	Janssen-Cilag 西安森制有限公司		3mg			/tab	
Lowest price generic equivalent				3mg				
Rosiglitazone □格列	Avandia/文迪雅	GSK 葛素史克(天津)有限公司		4mg	7tab		/tab	
Lowest price generic equivalent				4mg				
Simvastatin 辛伐他汀	Zocor 舒降之	Merck 杭州默沙		20mg	7 tab		/tab	
Lowest price generic equivalent				20mg				
Stavudine 司他夫定	Zerit/□瑞特	BMS 百美施宝		40mg			/tab	
Lowest price generic equivalent				40mg				