WHO/HAI Project on Medicine Prices and Availability

Peru Validation Study Report

Jeanne Madden, PhD

Instructor, Harvard Medical School, Boston, USA
Consultant, WHO/HAI Project on Medicine Prices and Availability

November 2006

TABLE OF CONTENTS

The author gratefully acknowledges the individual contributions of Dennis Ross-Degnan, Margaret Ewen, Pierrick Gonnet, and David Moberg to the creation of this report, the advisors and survey managers to date of the WHO/HAI Medicine Prices Project for their work developing the current methodology, and the entire Peru survey team, in particular Edson Meza, for their tremendous effort implementing the special validation survey.

EXECUTIVE SUMMARY

In the fall of 2005, a study team in Peru conducted a standard WHO/HAI Medicine Prices survey along with two major survey design expansions – i.e., of the medicines targeted and the types of outlets in the sample – for the purpose of conducting a validation exercise for the WHO/HAI project. By including, in this one survey, comprehensive data on all products in three key therapeutic classes, plus dozens of additional pharmacy outlets that are normally excluded from the standard sampling frame, we sought to assess whether the usual target medicines list and outlet sample approach are methodologically adequate.

Overall, the results from the Peru validation exercise confirm the strength and appropriateness of the WHO/HAI approach. Findings for therapeutic alternatives to the WHO/HAI core list medicines were generally similar to findings for core list medicines, except that most alternatives played relatively small roles in the Peruvian marketplace. Findings for more remote outlets were comparable to the findings for the standard sample outlets. Indeed, there appeared to be little association between outlet location and the price or availability of medicines.

The large volume of price and availability data gathered in Peru permits the conduct of a range of new types of analyses and a much clearer snapshot of a medicines market than is ordinarily possible from a WHO/HAI survey. Nevertheless, none of the findings from this special survey in Peru are inconsistent with the broader work of the project to date, nor do they raise particular concerns about the current standard WHO/HAI methodology. Rather, they point to opportunities and offer examples for more in-depth exercises in the future. New analyses that were possible using the Peru data include: comparison of the competing therapies offered in the private and public sector; comparison of originator versus branded generic versus INN generic prices; array of alternate therapies offered at different outlets; distribution properties of price observations; and, association of price variation with other factors.

The following are specific notable findings from the Peru validation exercise:

- The private medicines market in Peru supplies a broad selection of medicines, often including a range of therapeutic alternatives and many competing product versions for each medicine.

- For many medicines in Peru, there is a wide range of market prices among product versions, ranging from originators at the high end to INN generics on the far less expensive end, plus branded generics in between. Brand premiums range from about 30% to 1500%. By shifting from the products that dominate the marketplace (i.e., the "most found") to less expensive generic versions, many patients could pay less.

- The originator brand and LPG (lowest priced generic) median price measures typically demarcate the full range of prices in the market, and are therefore essential to the WHO/HAI methodology. Nevertheless it is also useful to understand what medicines patients are actually buying. Therefore, the information value of a "most sold / most found" measure should be considered, possibly as an optional module for adding to a standard WHO/HAI survey.

- Private sector Median Price Ratios (MPRs) in Peru were quite high, ranging from about 2 to 20 for generics and 10 to 50 for originators, suggesting the potential for better management and

efficiency within this sector, as well as better government oversight of it. Reforms may allow more patients to access necessary therapies.

- The public sector in Peru has a far more limited selection of medicines than does the private sector, but MPRs in the public sector indicate that current purchasing mechanisms and management are appropriate. Public sector patient MPRs in the three expanded therapeutic categories never exceeded 2, and were often less than 1. Clearly patients can obtain medicines at lower cost in the public sector.

- Availability of medicines purchased by the public sector is fair. Improvements should be made where possible, but those medicines on the limited list of therapies in these three classes that are purchased by the public sector were available 48%-87% of the time.

- In the targeted therapeutic categories, almost all originator brands and many generics on the private market are beyond the reach of patients with modest incomes. One month of treatment for chronic illnesses in private pharmacies costs anywhere from ~½ a day's wages to ~3 weeks wages, with most results in the range of 4-10 days. By contrast, the public sector medicines in Peru generally cost under ½ a day's wages. (These public sector results were somewhat better than other public sector results for Peru's main survey medicines list.)

- Comparing the WHO/HAI core target medicines list to what medicines were most widely found in Peru's public and private sector, as well as to what international reference prices are available for use, we can conclude that, at least for the three therapeutic categories studied, the WHO/HAI list is an appropriate methodological tool.

- From outlet to outlet, the array of medicines offered within these therapeutic categories ranges from quite limited to quite extensive.

- The evidence from Peru did not support the hypothesis that originator price in an outlet is related to the presence of generic products, or vice versa. However, more data and effort are needed to answer this and related outlet-level questions. These analyses could be conducted using data already collected and aggregated from WHO/HAI Medicine Prices country surveys.

- In addition to the large differentials between the median prices of different product versions, there is often a wide range of prices from one outlet to the next for specific products. This variation in retail price appears to be wider for those products at the less expensive end of the market.

- There was no strong or consistent evidence of price or availability differences among the geographic regions sampled regions (public or private), or among outlets that were nearer to or farther from urban centers, or among private outlets nearer to or farther from public outlets. Nothing in this single-country validation exercise suggests the need for altering the usual WHO/HAI outlet sampling approach.

- The Peru data confirm that medicine price and availability data are naturally skewed with observations clustered at one or both extremes (rather than randomly or normally distributed). This finding supports the decision to use medians rather than means in WHO/HAI Medicine Prices analyses.

METHODOLOGY AND GOALS

In October and November of 2005, the Regional Coordinating Office of Health Action International for Latin America and the Caribbean (AIS-LAC) carried out a Medicine Prices survey in Peru, using the WHO/HAI methodology (see http://www.haiweb.org/medicineprices/). However, the 2005 Peru survey design expanded upon the standard methodology in several ways, as part of a planned exercise to evaluate the standard methodology. Specifically, additional outlets of different types were added to the outlet sample, and many more medicine products were added to the basket of products for which data were collected.

The AIS-LAC team in Peru was asked to carry out this challenging activity as a follow-up to their successful management of one of the WHO/HAI medicine prices pilot surveys, in 2002. Results from the 2002 pilot survey in Peru can be obtained on the aforementioned HAI website.

Standard WHO/HAI Sample Design

A standard WHO/HAI Medicine Prices survey must sample at least 20 patient outlets in the private pharmacy sector and 20 in the public clinic sector. Each set of 20 are to include 5 in each of 4 distinct geographic regions. The regions should include the main metropolitan area and 3 other regions within a day's journey from the main center. In the public sector, the main public facility in each region is sampled, and 4 additional clinics randomly sampled from within 3 hours of the regional center. In the private sector, the closest private pharmacy to each of the 5 sampled public facilities are sampled. The outlet sample is meant to ensure that the survey data are fairly representative of the true pharmaceutical price picture in a country, while at the same time being more convenient and feasible to carry out than a true random sample in both sectors. Many survey teams to date have added outlets to this minimum sampling requirement, as finances permit, and a larger sample creates more opportunities for comparing subgroups of outlets and greater confidence when presenting results.

WHO/HAI surveys also collect data on public medicines procurement prices – usually a single set of prices obtained at central level. If there is a third sector of patient outlets (such as mission or NGO), it is sampled using a design similar to that for the private retail sector.

Survey teams visit public and private outlets that serve patients and ask about the availability and price of a list of products targeted by the survey. The basic list starts with 30 essential medicines that are commonly found in most countries, identified by the WHO/HAI project. Each medicine on the list is specifically defined in terms of dosage form and strength, and each has a corresponding international reference price from the MSH price indicator guide (see http://erc.msh.org/). By adhering to this standard list, it is easy to compare results between country surveys. Individual survey teams may elect to drop a few items if they know in advance that the medicines are not found or used in their countries. In addition, surveyors often decide to add medicines of local significance. A total of 50 medicines can be accommodated by the customized Excel workbook that is used for data entry and analysis. For each medicine, price and availability information on 2 versions is collected at outlets: the originator brand version and the lowest-priced generic version in each outlet.

Concerns about the Standard Sample Design

The sample design described above is well-grounded in the existing literature and field experience of community-level research on medicines in non-industrialized countries. Nevertheless, its adequacy for the purposes of the Medicine Prices project is unproven. The special Peru validation survey is intended to provide the project information about other types of data that are normally missed when the

standard WHO/HAI design is used, and to evaluate the extent to which the standard design may lead to inaccurate assessments of the medicines situation in countries that conduct surveys. Specific concerns about the standard design include the following:

- By selecting outlets that are relatively easy to access, the standard sample design may lead to biased or unrepresentative results. For example, when more remote outlets are excluded, the sample may underestimate median prices and overestimate availability in the country as a whole.
- The proximity of the private outlets to public outlets may also deliver unrepresentative results. Selecting the retail shops closest to public outlets could, for example, push national price estimates below true prices, if there is more competition between these shops and the typically less expensive public sector. Or, pharmacies close to public outlets may cater to particular prescribing patterns found in the public sector, thereby affecting results about product availability. Public outlets may more likely to be located in areas inhabited by particular socioeconomic classes. Proximity to government outlets could also result in stricter government oversight and compliance with pharmacy regulations.
- The list of targeted medicines may be too limited. A longer medicines list would be more cumbersome to survey, but may better represent the local market. Even with the variety of medicine targeted by WHO/HAI and the flexibility offered by the local supplemental list, some important aspects of the medicines market could be overlooked. Also, the appearance of only about 2 medicines in each class may fail to capture market dynamics among sets of close therapeutic substitutes.
- The focus on only 2 product versions may be insufficient. By collecting data on only the originator brand and lowest priced generic, an often large range of additional generic versions is ignored, potentially limiting investigators' ability to fairly characterize medicine prices and availability.

Special Validation Survey Approach

To address the concerns above, the special Peru survey sought data that would not normally be included in a survey with the standard design, in addition to a standard sample, so that results for different types of outlets could be compared, and results from a wider range of medicines could be evaluated.

In terms of the outlet sample, the validation plan called for adding two more regions, to be randomly selected from beyond a day's journey from the capital area. In addition, within each region, two additional public outlets were to be selected, from areas beyond 3 hours of the main public facility. This design would result in 7 public outlets in each of 6 regions. The private sector sample would then include the nearest retail pharmacy to each of the public outlets. In addition to those 7 private outlets, 3 more retail pharmacies were to be selected, each within the official catchment area of 3 of the already-sampled public outlets (i.e., the main facility, one of the <3 hour clinics, and one of the >3 hour clinics), but as far away as possible from the public outlet. This design would expand the survey sample from 20 to 42 public outlets and from 20 to 60 private pharmacies.

The design of the special validation exercise also called for the collection of price data on all versions of all medicines within 3 therapeutic categories (in their main dose strength). This meant that for each medicine we would know the prices of every available brand and generic version, as well as therapeutic alternatives.

Peru's Survey Sample

The Peru survey sample design was expanded beyond this planned validation exercise to include 52 public facilities and 96 private pharmacies, a total sample more than twice as large as the standard sample. The extra outlets stem from a stipulation in the standard methodology that whenever an outlet has fewer than 50% of the medicines on the target list in stock (or its sublist of drugs approved for public sector purchase), an additional outlet of the same type should be added, to ensure that poor availability will not result in so few price observations that reliable price estimates cannot be obtained.

The extra-large sample size strengthens the Peru findings, and will be particularly useful in future statistical analyses, to be based on all WHO/HAI Medicine Prices surveys to date, which will investigate the related question of whether the overall sample size in the standard WHO/HAI methodology is adequate, especially under conditions of low medicines availability (which effectively reduces the final sample) and sizable variation among price observations.

The Peru team has noted that it was difficult to find locations suitable to meet the requirements of the design. Many remote areas have public facilities but no private pharmacies, and thus were rejected in favor of other areas having both types. Public facilities in those rejected areas could be different from those that wound up in the sample, and thus there is another source of potential bias, both in the standard survey design and in the even more demanding validation design.

Regions Excluded from Peru Sample

The simplified map of Peru to the right shows the regions that were excluded prior to selection of the regions to be surveyed. Three regions (Tumbes, Puno, and Tacna) were excluded because of concerns that international smuggling of medicines might influence prices and availability in ways different from the effect of remoteness, which was the goal of the survey. Four regions (Loreto, Madre de Dios, Amazonas, and Moquegua) were excluded because of concerns that there would be an insufficient number of private outlets more than 3 hours from the main city in each region.

Regions Selected for the Peru Sample

The second map of Peru, shown here to the left, shows the regions selected randomly for the survey sample from the required strata. The six regions include: the capital Lima; three regions within a day's journey of the capital (Lambayeque, Ayacucho, and Cerro de Pasco); and, two regions beyond a day's journey from the capital (Ucayali and San Martín).

Collection of public procurement data was conducted largely according to the standard methodology. In Peru, most public sector medicines are purchased at the central level, and others by regional tertiary facilities. Thus, in the Peru survey, there were 7 sets of procurement prices: one from the central Ministry of Health, and 6 others from the main hospitals in the 6 sampled regions.

The Peru team and WHO/HAI project selected 3 important therapeutic categories for the more comprehensive (i.e., all versions of all medicines) data collection activity: ACE inhibitors, anti-ulcerants, and non-insulin medications used for diabetes treatment. Working with national registry data, a customized 27-page data collection form was created, including not only the standard WHO/HAI target list of medicines but also every registered medicine, by name and manufacturer, within the 3 special therapeutic categories. The form also had additional space for other medicines found in the field, given that medicines on the national registry change frequently and there are information delays in the system. Surveyors visited sample outlets and obtained price information for all available medicines on the survey list. Prices pertaining to the standard survey (including the WHO/HAI core list plus 8 supplementary medicines chosen for Peru) were entered into the standard Excel workbook, and prices for all medicines in the 3 special therapeutic categories were entered into a separate, new workbook developed for the validation exercise.

RESULTS

The Peru survey results and analyses presented in this report reflect the two dimensions along which the Peru survey was an expansion of the standard WHO/HAI sample – expansion into additional types of medicine products that are available on the local market and expansion into more remote geographical areas. Accordingly, we will look at comparisons and variation both across available products and across geographic space.

Private Sector Medicines Found in Target Therapeutic Categories

The Peru team identified 7 single chemical entities in the ACE inhibitor category that are registered for marketing in Peru. Six of these were found in private pharmacies during survey field work (see Table 1). However, ramipril was never found. Similarly, data were collected on 7 anti-ulcerant medicines, but an eighth registered medicine, rabeprazole, was available in none of the pharmacies sampled. All of the eight registered anti-diabetic agents were found at least once in the survey.

Prices were collected for all generic versions stocked by the sample pharmacies (in the main strength used). Some medicines were found in only a single product version (e.g., cimetidine, with one branded generic appearing in the survey), while there seemed to be a highly competitive market for other medicines (e.g., one originator, 21 branded generics, and 18 INN generic versions of omeprazole).

Medicines in Table 1 are listed in the order they were collected in the field. Within each therapeutic category, the most commonly used and found medicines, including those on the WHO/HAI core list, are at the top in alphabetical order, followed by medicines less frequently found on the market, also in alphabetical order.

Table 1: Private sector unit prices for all medicines in the selected therapeutic categories

	Median unit price in local currency					
	originator	all available branded generics	all available INN generics	most found product in survey	most found generic in survey	lowest priced generic in shop
ACE INHIBITORS						
* Captopril tab 25 mg	1.48	0.37	0.20	1.48	0.20	0.20
Enalapril tab 10 mg	3.26	1.80	0.20	0.20	0.20	0.20
Cilazapril tab 2.5 mg	3.77	--	--	3.77	--	--
Fosinopril tab 10 mg	4.55	--	--	4.55	--	--
Lisinopril tab 10 mg	3.36	2.22	--	2.30	2.30	2.23
Quinapril tab 10 mg	4.88	--	--	4.88	--	--
ANTI-ULCERANTS						
Lansoprazole tab 30 mg	5.64	2.20	1.70	1.80	1.80	1.65
* Omeprazole tab 20 mg	6.47	3.00	0.50	0.50	0.50	0.50
* Ranitidine tab 150 mg	1.79	0.70	0.25	1.20	1.20	0.25
Cimetidine tab 400 mg	--	1.34	--	1.34	1.34	1.34
Esomeprazole tab 20 mg	4.72	3.43	--	4.72	3.77	3.43
Famotidine tab 40 mg	--	--	1.22	1.22	1.22	0.87
Pantoprazole tab 40 mg	--	4.57	--	4.84	4.84	4.53
ANTI-DIABETIC AGENTS						
* Glibenclamide tab 5 mg	--	0.80	0.20	0.80	0.80	0.21
* Metformin tab 500 mg	0.80	0.63	0.50	0.80	0.57	0.57
Chlorpropamide tab 250 mg	1.00	--	--	1.00	--	--
Gliclazide tab 80 mg	1.62	--	--	1.62	--	--
Glimepiride tab 4 mg	4.13	3.20	--	4.13	3.20	3.20
Glipizide tab 5 mg	--	0.91	--	0.91	0.91	0.91
Pioglitazone tab 30 mg	10.38	5.80	--	10.38	5.80	5.80
Rosiglitazone tab 4 mg	7.96	4.09	--	7.96	4.09	4.09

* *These medicines are on the WHO/HAI core list*

Private Sector Prices for Target Therapeutic Categories

Table 1 summarizes the unit prices found for different types of products, in the local currency, Peruvian nuevos soles. Originators are products from unique manufacturers who held the first patent for the medicine in Peru. Branded generics are other versions sold with both the generic or INN

medicine name and a proprietary product name on the label. The median price in Table 1 is across all versions and outlets; a product that appears in multiple shops has more influence on the statistic than a product appearing only once. INN generic products list only the generic medicine name and the manufacturer on the label, and again, there may be many distinct INN products within one medicine.

The "most found generic" is a single generic product that was found in more shops than any other generic. (In the case of famotidine, there was a tie, and the median price is the median across all observations of either product.) Earlier in the WHO/HAI Medicines Prices project, there was a measure of "most sold generic". After debate about whether this should be defined at national level or outlet level, it was eventually defined as a single product in a country, the generic with the highest volume sales nationally. Peru's survey did not identify the nationally "most sold" generics of each medicine, but the "most found" can perhaps serve here as a rough proxy measure of "most sold". The "most found product" is a similar measure, but can represent either an originator or a generic. The "lowest priced generic" or LPG is a standard WHO/HAI measure. The LPG product version is identified separately at each outlet. Thus, usually, its median combines price information for products from several different manufacturers.

Having so many product versions of each medicine in the special Peru validation allows for interesting new comparisons. Looking at the median unit price results, it appears that the "most found product" is sometimes the originator (captopril) and sometimes a generic (enalapril). Even "most found generics" exhibit a range of market behavior. For ranitidine, the "most found generic" median price is higher than the branded generic median, and nearly 5 times as high as the LPG median. Whereas with omeprazole, the "most found generic" median price matches the INN generics median price and the LPG median price. When medicines of both types (and their price results) are available, originators are always more expensive than branded generics as a group, and branded generics are always more expensive as a group than INN generics as a group. Sometimes these differences in median are less than two-fold. Other times, they are as great as nine-fold (e.g., for the two groupings of generic enalapril).

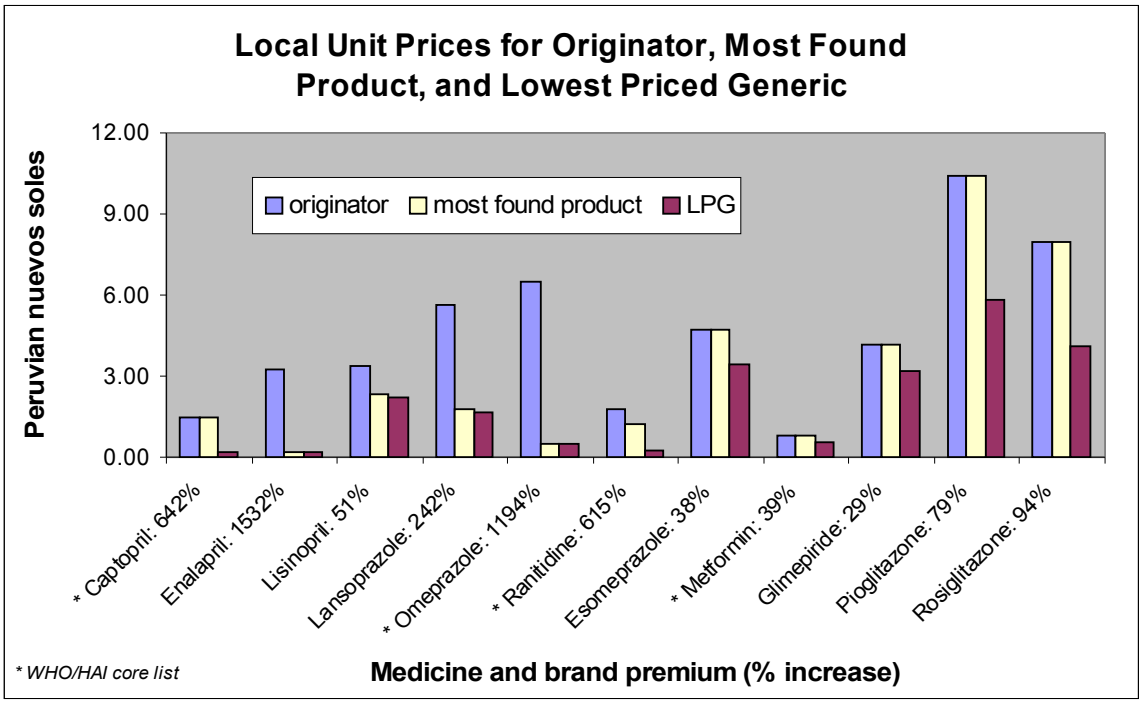
Key Lessons

- **The private medicines market in Peru includes a broad selection of medicines**
- **There appears to be strong generic competition, with lower prices, for most medicines in Peru**
- **Prices for different versions of particular medicines vary widely, from product version to product version**
- **Consistently , originators are the most expensive, INN generics are the least expensive, and branded generics are in between**
- **LPG prices are a good reflection of INN generic prices as a group**
- **Originators and LPGs serve as a good bracket around the price spectrum in the market**
- **Tracking the most popular version (most sold or most found) reveals interesting data that is qualitatively different from that for the originator and LPG alone**
- **The most popular version may turn out to be either a high end or low end product**
- **Future WHO/HAI surveyors may benefit if able to use an optional MSG add-on module**

Private Sector Brand Premiums and MPRs

Figure 1 presents graphically brand premiums that can be extracted from Table 1, with the actual percentage difference (median originator price as an "increase" over median LPG price) included along the horizontal axis. Unit prices are used as the basis in Figure 1 rather than MPRs because MSH reference prices are not available for all the medicines. Figure 1 demonstrates that brand premiums range widely, and do not appear to be associated with particular therapeutic groups. Medicines with no INN versions found in the survey appear to have lower brand premiums, which might be expected as the LPGs would all be branded products, which tend to be more expensive. Glibenclamide is the most widely available anti-diabetic agent in Peru, but no originator was identified for that country. Nevertheless, one branded generic version (Glidiabet) was far more commonly found than any other generic (in 59 shops versus 17 for the next-most found), and its median price was 300% percent over the LPG median. This product thus behaves as a "brand", and illustrates that very high brand premiums are seen among the anti-diabetic agents as well. "Most found product" versions of each medicine have also been included in Figure 1, illustrating how these presumably high sales volume items may be similar in price to either the originator or the LPG.

Figure 1: Private sector brand premiums in three therapeutic categories



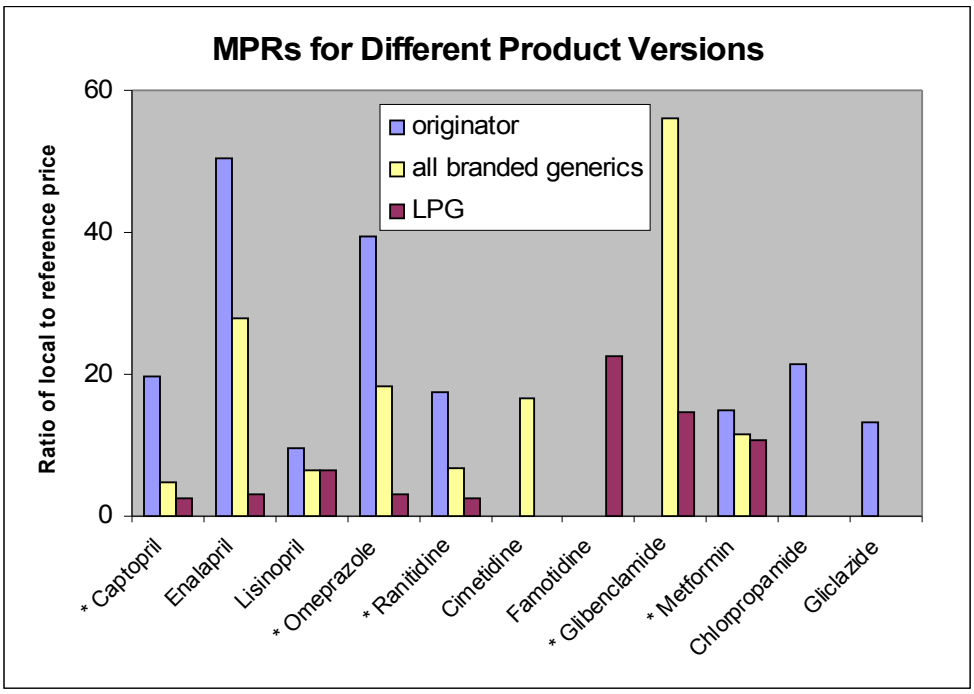
For those medicines which have corresponding MSH reference prices, we have calculated Median Price Ratios (MPRs, or median local unit price and divided by the reference price converted into local currency, see Table 2). MPRs are an indication of the "reasonableness" of local prices and the efficiency of local markets. Local retail prices would not be expected to be as low as international bulk generic supply prices. Those medicines in the range of MPR= 2 or 3 in Table 2 appear to be reasonable. Retail prices that surpass 5, on the other hand, suggest that less expensive medicines should be an achievable goal for the private sector this country, while still ensuring profits for businesses along the supply chain. Figure 2 shows the same MPR data in graphical form.

Table 2: Median Price Ratios in the private sector, for target therapeutic categories

	Median Price Ratios (MPRs)		
	originator	all branded generics	lowest priced generic in shop
ACE INHIBITORS			
* Captopril tab 25 mg	19.7	4.9	2.7
Enalapril tab 10 mg	50.5	27.8	3.1
Lisinopril tab 10 mg	9.7	6.4	6.4
ANTI-ULCERANTS			
* Omeprazole tab 20 mg	39.3	18.2	3.0
* Ranitidine tab 150 mg	17.6	6.9	2.5
Cimetidine tab 400 mg	--	16.7	--
Famotidine tab 40 mg	--	--	22.4
ANTI-DIABETIC AGENTS			
* Glibenclamide tab 5 mg	--	56.1	14.7
* Metformin tab 500 mg	14.9	11.7	10.7
Chlorpropamide tab 250 mg	21.4	--	--
Gliclazide tab 80 mg	13.2	--	--

* *WHO/HAI core list*

Figure 2: Median Price Ratios in the private sector, target therapeutic categories



Key Lessons

- **The size of "brand premiums" varies widely from medicine to medicine (~30%-1500%)**
- **Private sector MPRs ranged from about 2 to 20 for generics and 10 to 50 for originators**
- **MPR results from the targeted and expanded therapeutic categories survey are roughly comparable to MPR results from the main WHO/HAI survey in Peru, in the private sector**
- **MPRs and brand premiums indicate potential for improving prices for Peruvian patients**
- **Lack of reference prices limits analyses for the less common therapeutic alternatives**

Public Sector Prices for Target Therapeutic Categories

Comparable unit price and MPR data for the public sector are presented in Table 3. No originator brand medicines were available to patients or purchased by the public sector, but there were often several different generic products for each medicine, including branded generics and INN generics. For medicines with both generic types found, the branded generics as a group were almost always more expensive (ranitidine was the lone exception). Clearly the range of medicines available in the three target therapeutic categories was far more narrow in the public sector than in the private sector, with only 5 chemical entities versus 21 found in retail pharmacies.

Table 3: Unit prices and Median Price Ratios in the public sector, target therapeutic categories

	Median local unit price			MPRs		
	branded generics	INN generics	lowest priced generic	branded generics	INN generics	lowest priced generic
Patient Prices						
* Captopril tab 25 mg	0.13	0.02	0.02	1.7	0.3	0.3
Enalapril tab 10 mg	0.05	0.04	0.04	0.8	0.6	0.6
* Omeprazole tab 20 mg	0.15	0.20	0.15	0.9	1.2	0.9
* Ranitidine tab 150 mg	0.12	0.15	0.15	1.2	1.5	1.5
* Glibenclamide tab 5 mg	--	0.02	0.02	--	1.4	1.3
Procurement Prices						
* Captopril tab 25 mg	--	0.02	0.02	--	0.2	0.2
Enalapril tab 10 mg	0.04	0.03	0.03	0.6	0.4	0.4
* Omeprazole tab 20 mg	0.10	0.09	0.10	0.6	0.5	0.6
* Ranitidine tab 150 mg	--	0.10	0.10	--	0.9	0.9
* Glibenclamide tab 5 mg	--	0.02	0.02	--	1.3	1.3

* *WHO/HAI core list*

Public procurement prices should ideally be quite close to international reference prices (i.e., MPR of about 1), with a small increase to account for procurement generally reflecting CIF (cost plus insurance and freight) while the reference prices are FOB ("free on board", i.e., before shipping and shipping insurance). Peru's procurement prices in these therapeutic categories, as shown in Table 3, suggest that public sector procurements are quite well managed. Only one medicine, glibenclamide, has an MPR over 1, and that increase is not unreasonable.

If we divide prices to patients in the public sector by public procurement prices, we can estimate the mark-ups within the public sector that patients face. Based on results for LPG versions, these mark-ups range from 0% to 60%.

Key Lessons

- **The public sector in Peru has a much more limited selection of medicines within each therapeutic category surveyed, compared to the private sector**
- **Comparison of Peru's procurement prices to reference prices suggests efficient procurement**
- **Public sector patient MPRs in these three therapeutic categories never exceeded 2, and were often less than 1**
- **Public sector MPR results from the target expanded therapeutic categories survey are on the low end compared to MPR results from the main WHO/HAI survey in Peru, which included a wider array of medicines**

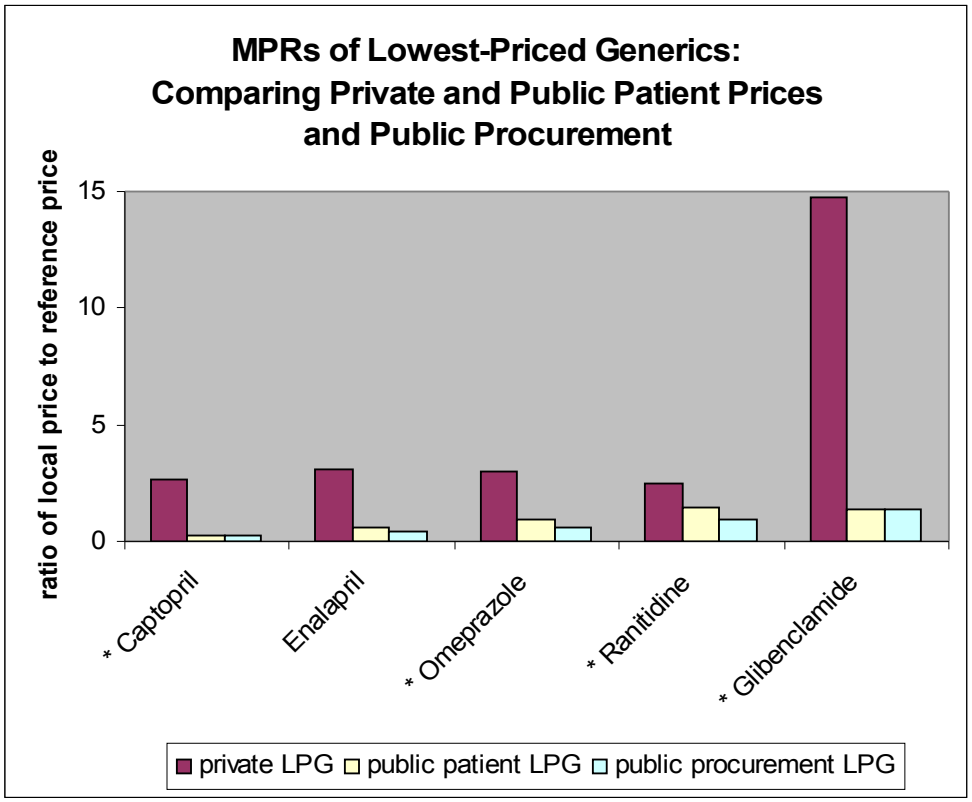
Private v. Public Sector Price Comparisons

Results for the private sector and public sector, for medicines appearing in both sectors, are compared in Figure 3. The graph shows only the LPG category, because originator prices in the private sector are so much higher than private generic prices that results for public generics would barely be visible. If one examines Figure 2 and Figure 3, one can get a sense of the great reduction in price scale when going from private sector originators to public sector generics. The Excel spreadsheet designed for the special Peru validation calculates ratios that compare each defined version across sectors (not shown). The "most found product" in each sector could be any type of brand or generic, and appears in more outlets than any other. For captopril, the private-public ratio of patient prices for the "most found product" is 74.2, meaning that patients pay more than 74 times as much for the most available equivalent version in the private sector as they do in the public sector. On the other hand, the "most found" omeprazole product is only 3.3 times more in the private sector as in the public sector.

Key Lesson

- **Public sector patient prices are far lower than those for equivalent medicines in the private sector**

Figure 3: Comparison of MPRs for lowest-priced generics in private and public outlets and public procurements



Private Sector Affordability in Target Therapeutic Categories

Table 4 and Figure 4 present the Peru price results from the private sector in terms of medicine affordability. Affordability is more meaningful than unit or tablet price. The quantity of each medicine is scaled up to a typical month's usage for the main indication, using the WHO Defined Daily Dose metric. Then the local price for this monthly quantity is converted into the days' wages needed to purchase it, based on the daily wage of the lowest paid government worker. This wage is an easily identifiable amount that reflects a modest income. In a developing country such as Peru, many people work only informally and have incomes far lower. A recent estimate of the percentage of full-time workers aged 25-40 earning below minimum wage in Peru was 42.9% [Source: 2002 data in "Efectos del salario mínimo en el mercado laboral peruano", Banco Central de Reserva del Perú].

In the private sector affordability results, we can observe that if a patient purchases generics from a private pharmacy, he or she may require less than a half a day of wages for a month's treatment (e.g., enalapril). On the other hand, some medicines, even in generic versions, will cost a third of a month's salary or more (e.g., esomeprazole, pioglitazone, rosiglitazone). As has already been seen with unit price and MPR results above, treatment with originator brands is typically much more expensive.

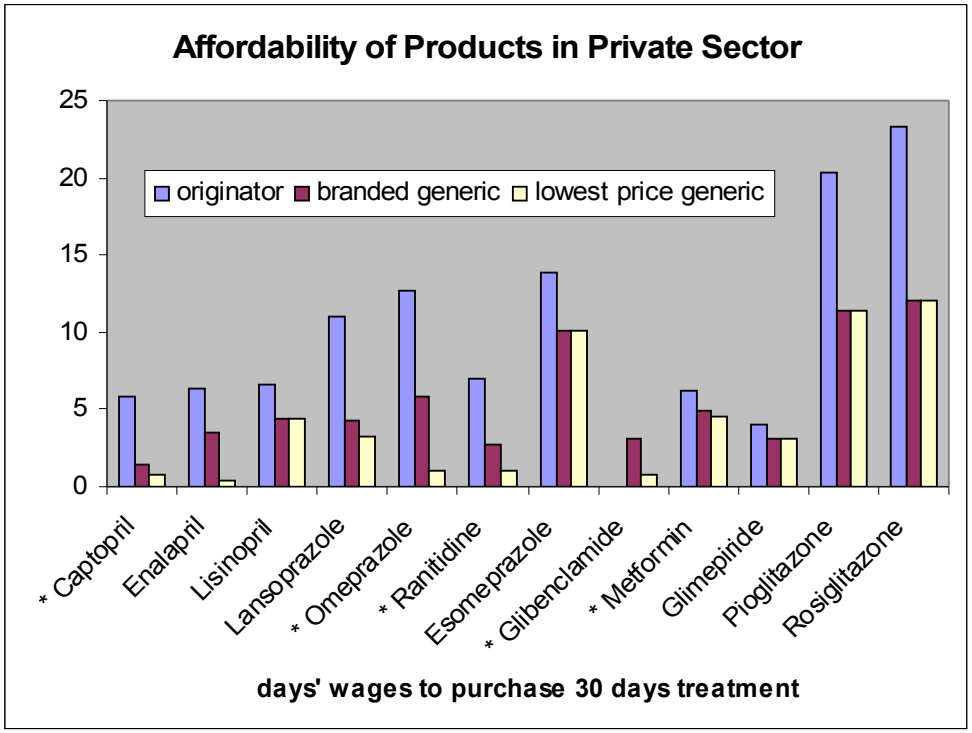
Table 4: Affordability of private pharmacy treatment in three therapeutic categories

	Affordability: days' wages to purchase 30 days of treatment		
	originator	branded generics	lowest price generic
ACE INHIBITORS			
* Captopril tab 25 mg	5.8	1.4	0.8
Enalapril tab 10 mg	6.4	3.5	0.4
Cilazapril tab 2.5 mg	7.4	--	--
Fosinopril tab 10 mg	13.4	--	--
Lisinopril tab 10 mg	6.6	4.3	4.4
Quinapril tab 10 mg	14.3	--	--
ANTI-ULCERANTS			
Lansoprazole tab 30 mg	11.0	4.3	3.2
* Omeprazole tab 20 mg	12.7	5.9	1.0
* Ranitidine tab 150 mg	7.0	2.7	1.0
Cimetidine tab 400 mg	--	5.2	5.2
Esomeprazole tab 20 mg	13.9	10.1	10.1
Famotidine tab 40 mg	--	--	1.7
Pantoprazole tab 40 mg	--	8.9	8.9
ANTI-DIABETIC AGENTS			
* Glibenclamide tab 5 mg	--	3.1	0.8
* Metformin tab 500 mg	6.2	4.9	4.5
Chlorpropamide tab 250 mg	2.9	--	--
Gliclazide tab 80 mg	6.3	--	--
Glimepiride tab 4 mg	4.0	3.1	3.1
Glipizide tab 5 mg	--	3.6	3.6
Pioglitazone tab 30 mg	20.3	11.4	11.4
Rosiglitazone tab 4 mg	23.4	12.0	12.0

* *WHO/HAI core list*

[The WHO DDD was selected for the affordability analyses in this report, not the treatment regimens from the WHO Model Formulary or the British National Formulary, which are the standard sources for the WHO/HAI project. The advantages of the WHO/DDD were: a single "regimen" defined per medicine, and data for every medicine of interest in this exercise. A caveat is that DDDs "regimens" for different medicines are not necessarily interchangeable in the real clinical world. The WHO Defined Daily Doses in milligrams for the medicines in Peru's three featured therapeutic categories are as follows: captopril 50mg; enalapril 10mg; cilazapril 2.5mg; fosinopril 15mg; lisinopril 10mg; quinapril 15mg; lansoprazole 30mg; omeprazole 20mg; ranitidine 300mg; cimetidine 800mg; esomeprazole 30mg; famotidine 40mg; pantoprazole 40mg; glibenclamide 10mg; metformin 2000mg; chlorpropamide 375mg; gliclazide 160mg; glimepiride 2mg; glipizide 10mg; pioglitazone 30mg; rosiglitazone 6mg. Readers who wish to compare 2005 affordability in Peru to other surveyed countries should consider these DDD amounts and convert Table 4 figures over to WHO/HAI standard regimens, or consult the main country report from the 2005 Peru survey.]

Figure 4: Affordability in private sector of treatments in target therapeutic categories



Public Sector Affordability

Table 5 shows comparable results for treatment affordability through the public health facilities in Peru. Of the 5 treatments found widely available, 4 cost less than a half a day's wage (and 3 less than an hour's wage), while ranitidine treatment cost 0.6 days' wages.

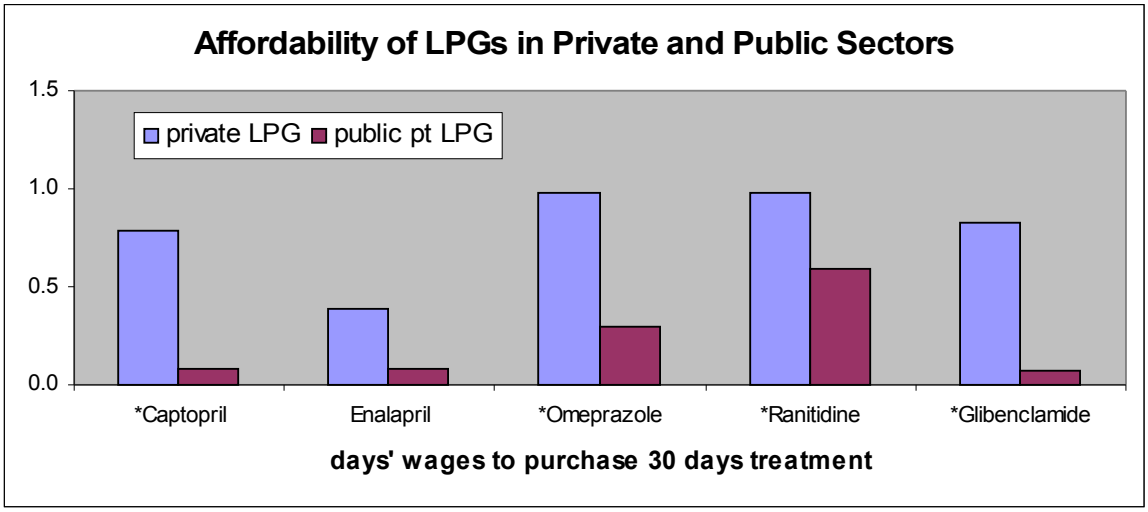
Table 5: Affordability of treatments in public sector outlets

Affordability: days' wages to purchase 30 days of treatment	
Medicine	Public patient LPG
* Captopril tab 25 mg	0.1
Enalapril tab 10 mg	0.1
* Omeprazole tab 20 mg	0.3
* Ranitidine tab 150 mg	0.6
* Glibenclamide tab 5 mg	0.1

* *WHO/HAI core list*

Figure 5 is quite similar to Figure 3, comparing graphically results for LPG versions in the private and public sector, this time in terms of treatment affordability. These 5 treatments are always more affordable in the public sector, costing as little as 1/8th as much for some medicines.

Figure 5: Comparison of LPG treatment affordability in private and public sector



Key Lessons

- **Almost all originator brands and many generics on the private market are beyond the reach of patients with modest incomes**
- **Treatment for chronic illnesses in private pharmacies costs anywhere from ~½ a day's wages to ~3 weeks wages, with most results in the range of 4-10 days**
- **Compared to the main survey results (which are based on more common medicines), the expanded medicines survey revealed more examples of expensive (i.e., unaffordable) outliers in the private sector**
- **Public sector medicines in Peru are generally affordable, with most treatments costing less than ½ a day's wages**
- **Compared to the main survey results (which are based on a wider array of medicines, and included at least 3 public sector treatments costing more than ½ a day's wages, one of those at 1.2 days), the expanded medicines survey had more affordable public sector results**

Availability of Products in the Private and Public Sector

Generally, in WHO/HAI Medicine Prices surveys, advantages of the public sector with respect to lower prices are typically accompanied by major problems with respect to availability. Low prices are not helpful if the medicines are not there, and patients are often forced into the private sector and its higher prices.

In Peru, we have noted already that many ACE inhibitors, anti-ulcerants, and anti-diabetic agents are available only in the private sector. Table 6 gives details about product availability in both the private and public sector in Peru. For those medicines that are available somewhere in the public sector, availability is not poor, but rather, middling to good. Captopril had the highest availability, appearing in 87% of surveyed public facilities. Its therapeutic alternative, enalapril, had the lowest availability at

48%. The other 3 medicines found in the public sector (omeprazole, ranitidine, and glibenclamide) were all 63% available.

Notably, the medicines that are available only in the private sector are not widely available there. Lansoprazole was the lone exception. It is not found in the public sector, but it was in private pharmacies, in at least some version, 60% of the time. The other 15 medicines found in private but not public outlets were available in only 1% to 25% of outlets.

Six medicines in the special therapeutic categories component of this validation are on Peru's Essential Medicines List or EML: the 5 mentioned earlier (captopril, enalapril, omeprazole, ranitidine, and glibenclamide) as well as metformin. Metformin, which was not found in the public sector, presents an unusual situation. While the other EML medicines are listed on Peru's EML in the same strength in which they were surveyed here, Peru's EML lists metformin in the 850mg strength. However, suppliers of 850mg strength metformin are rare, and an informal survey by the Peru survey team indicated that metformin 850mg is generally not available in the public sector. Metformin 500mg, which is more widely used in the country, was selected for this validation study. The remaining 15 medicines in Table 6 are not on Peru's EML in any strength and therefore there would be no expectation that they would be available in public sector facilities.

Table 6: Number of products found and overall medicine availability in private and public sectors, three therapeutic categories

	Availability of Distinct Products in Sector						
	Private Retail Pharmacies					Public Facilities	
	number of distinct manufactured products found in survey			percentage of outlets with any product version	average number of product choices per outlet	number of distinct generics found in survey	percentage of outlets with any product version
	originator	branded generics	INN generics				
ACE INHIBITORS							
* Captopril tab 25 mg	1	3	15	100%	1.9	11	87%
Enalapril tab 10 mg	1	7	14	83%	1.3	7	48%
Cilazapril tab 2.5 mg	1	--	--	6%	0.1	--	0%
Fosinopril tab 10 mg	1	--	--	1%	0.0	--	0%
Lisinopril tab 10 mg	1	3		10%	0.2	--	0%
Quinapril tab 10 mg	1	--	--	10%	0.1	--	0%
ANTI-ULCERANTS							
Lansoprazole tab 30 mg	1	4	8	60%	1.1	--	0%
* Omeprazole tab 20 mg	1	21	18	95%	2.0	4	63%
* Ranitidine tab 150 mg	1	7	18	85%	1.6	6	63%
Cimetidine tab 400 mg	--	1	--	4%	0.0	--	0%
Esomeprazole tab 20 mg	1	2	--	13%	0.2	--	0%
Famotidine tab 40 mg	--	--	2	1%	0.0	--	0%
Pantoprazole tab 40 mg	--	4	--	25%	0.4	--	0%
ANTI-DIABETIC AGENTS							
* Glibenclamide tab 5 mg	--	3	9	88%	1.5	2	63%
* Metformin tab 500 mg	1	2	1	19%	0.3	--	0%
Chlorpropamide tab 250 mg	1	--	--	23%	0.2	--	0%
Gliclazide tab 80 mg	1	--	--	6%	0.1	--	0%
Glimepiride tab 4 mg	1	1	--	18%	0.2	--	0%
Glipizide tab 5 mg	--	1	--	2%	0.0	--	0%
Pioglitazone tab 30 mg	1	1	--	5%	0.1	--	0%
Rosiglitazone tab 4 mg	1	1	--	4%	0.1	--	0%

* *WHO/HAI core list*

Table 6 shows that some medicines appear to have a great deal of competition on the private market (that is, within that single chemical entity, e.g., captopril, enalapril, ranitidine, omeprazole), while many others are found in only 1 or 2 product versions. At the outlet level, the variety of products on the private market translates into an average across all private outlets of never more than 2 products per outlet, but of course there is great variety in the breadth of the selection offered from one outlet to the next. More details on private outlet product selection are available in Appendix G.

Table 7 disregards the issue of distinct product versions, and presents data on private outlet selection in terms of distinct chemical entities. Table 7 shows which of the 6 medicines that are available in more than half of private outlets (i.e., captopril, enalapril, lansoprazole, omeprazole, ranitidine, and glibenclamide) were found, how often, and in what combinations with each other and with the less common "other" medicines.

Table 7: Array of medicine alternatives available at different private pharmacy outlets, for three therapeutic categories

	Number of private pharmacies with this combination (total n=96)
ACE INHIBITORS	
Captopril + enalapril	65
Captopril only	16
Captopril, enalapril, + 1 other	8
Captopril, enalapril, + 2 to 4 others	7
ANTI-ULCERANTS	
Lansoprazole, omeprazole, + ranitidine	30
Omeprazole + ranitidine	23
Lansoprazole, omeprazole, ranitidine, + others	22
Omeprazole only	9
Ranitidine only	4
Lansoprazole + omeprazole	4
Omeprazole, ranitidine, others (no lansoprazole)	2
Lansoprazole + ranitidine	1
Lansoprazole, omeprazole, others (no ranitidine)	1
ANTI-DIABETIC AGENTS	
Glibenclamide only	53
Glibenclamide + 1 other	13
Glibenclamide + 2 to 3 others	12
Glibenclamide + 4 to 7 others	6
No medicines in this class	12

Key Lessons

- **The private sector provides a range of medicines in the target therapeutic groups, but enalapril and lansoprazole were the only commonly available products not on the WHO/HAI core list**
- **Metformin is on the WHO/HAI core list, but not very common in Peru's private sector**
- **In the public sector, enalapril was the only important product not on the WHO/HAI list**
- **Results (earlier in report) for enalapril and lansoprazole were not qualitatively different from core list medicine results**
- **At least for the three therapeutic categories studied, the WHO/HAI core list appears well selected and adequate for the purposes of Medicine Prices analyses**
- **Availability of medicines purchased by the public sector is fair**
- **For the key medicines in these therapeutic categories, many manufacturers compete in the private sector with distinct product versions**
- **From outlet to outlet, the array of medicine alternatives offered within these therapeutic categories ranges from limited to extensive**

Association of Price and Availability of Originators and Generics

Table 8 addresses the question of whether the presence of generics appears to affect the private pharmacy prices of the originator and, vice versa, whether the presence of the originator affects the price of the generics available in the outlet. For each medicine surveyed in the 3 special therapeutic categories and which appeared in both originator and generic forms, outlet prices have been separated out into the group of outlets that had: the generic form but not the originator; the generic and the originator; and, the originator but not the generic. Results are compared to see whether there is evidence of a relationship between the selection and prices offered. In each outlet with generics offered, the median price among all the generics offered for a given chemical entity was used in this calculation.

Table 8: Prices of originator and generic products in each other's presence and absence

Medicine	Product type, circumstance	number of outlets where occurring	median local unit price	Ratio of generic prices: [with originator] over [no originator]	Ratio of originator prices: [with generic] over [no generic]
Captopril	originator, with generic available	32	1.48		
	originator, with no generic	--			
	generic, with originator available	32	0.20		
	generic, with no originator	64	0.20	1.0	
Enalapril	originator, with generic available	12	3.26		
	originator, with no generic	--			
	generic, with originator available	12	0.40		
	generic, with no originator	68	0.25	1.6	
Lisinopril	originator, with generic available	3	3.26		
	originator, with no generic	3	3.52		0.9
	generic, with originator available	3	2.12		
	generic, with no originator	4	2.48	0.9	
Lansoprazole	originator, with generic available	14	5.64		
	originator, with no generic	--			
	generic, with originator available	14	2.00		
	generic, with no originator	44	1.83	1.1	
Omeprazole	originator, with generic available	5	6.47		
	originator, with no generic	--			
	generic, with originator available	5	2.01		
	generic, with no originator	86	0.50	4.0	
Ranitidine	originator, with generic available	12	1.79		
	originator, with no generic	--			
	generic, with originator available	12	0.49		
	generic, with no originator	70	0.32	1.5	
Esomeprazole	originator, with generic available	4	4.88		
	originator, with no generic	8	4.72		1.0
	generic, with originator available	4	3.60		
	generic, with no originator	--			
Metformin	originator, with generic available	6	0.78		
	originator, with no generic	10	0.80		1.0
	generic, with originator available	6	0.61		
	generic, with no originator	2	0.94	0.7	

The results presented in Table 8 are not conclusive. In the column with the ratios between generics sold in shops where the originator is available and shops where it is not, 3 of the ratios are approximately 1, suggesting no difference. In 3 other cases, the generic prices are higher when the

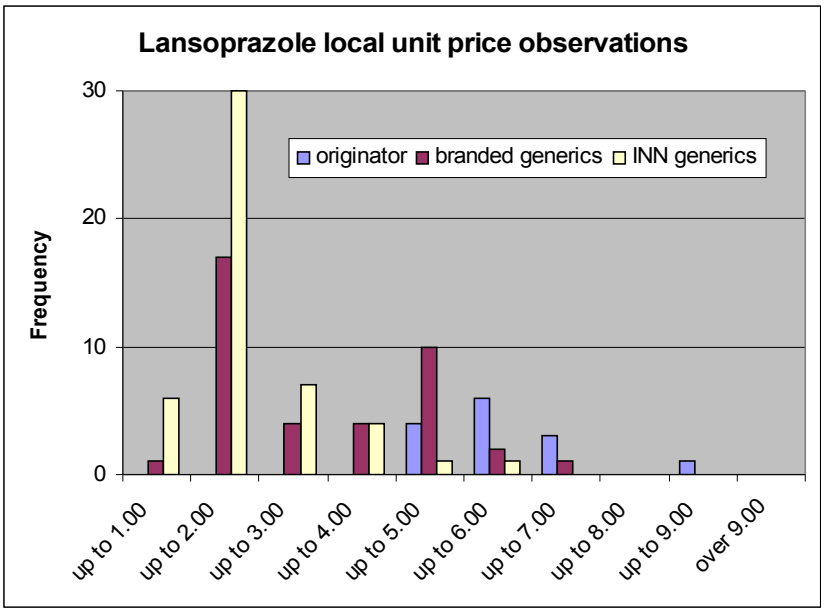
originator is present, and in 1 final case, those generics were less expensive (based on only a few price observations). More data are needed to answer definitively whether the presence of an expensive originator is associated with higher generic prices. It is possible that retailers may raise generic prices closer to the originator price, or offer only more expensive generics, in order to maximize their revenue while still offering customers options that are a bargain relative to the originator. Or, the association could be more indirect: higher prices on generics may be related to other characteristics of the type of shop that sells originator brands.

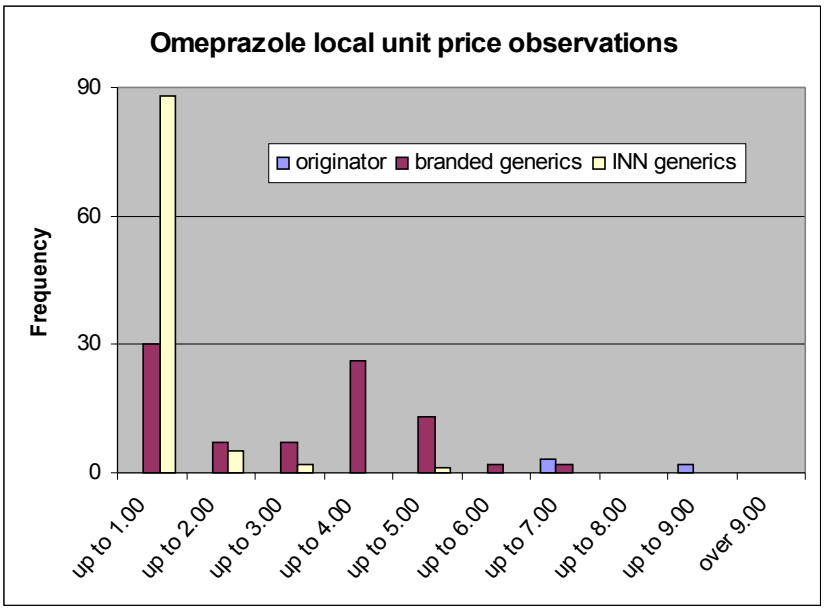
In Peru, there is considerable generic competition. There were few examples of medicines where we could compare originator prices with and without generic presence, and the number of shops contributing data to these analyses were also few. All 3 examples yielded ratios close to 1, suggesting no difference in price for the originators when generics are available and when they are not.

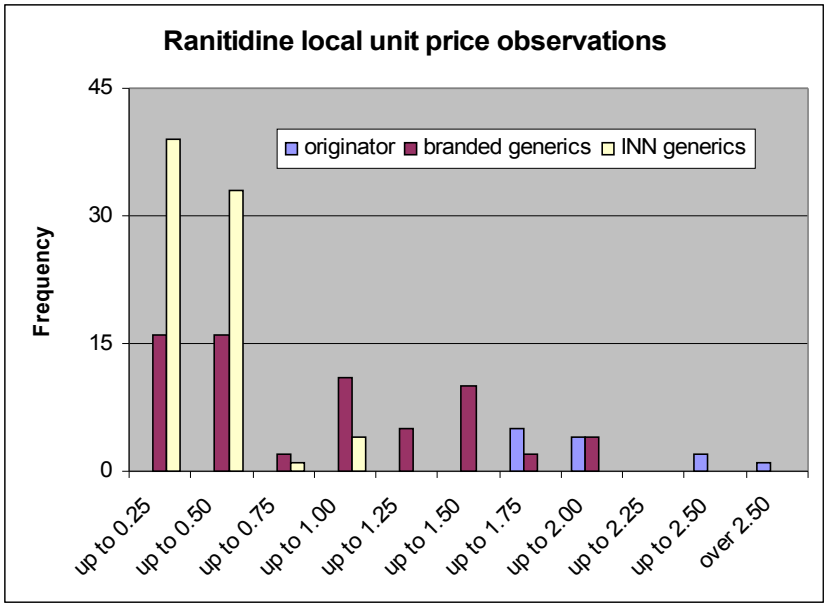
Private Sector Price Variation for Target Therapeutic Categories

Figures 6a, 6b, and 6c show the distribution of prices at private sector outlets for the 3 most widely available anti-ulcerant medicines. Each product found in each outlet contributes one datapoint to the results. The figures demonstrate the wide variation of prices in Peru. Originator prices occupy the high end of the price spectrum for each of these 3 medicines, and INN generics dominate the lower end. Branded generics, on the other hand, have prices that appear to span broadly from high to low. It may be that some branded generics are marketed and priced much like originators, whereas others are geared to compete with the INN generics.

Figures 6a, 6b, and 6c: Range and variation of private sector prices for single chemical entities in the anti-ulcerant category







Comparable price range results for ACE inhibitors and anti-diabetic agents are included in Appendix A. Appendix B presents the price ranges for individually manufactured product versions in the 3 target therapeutic categories. It is clear that not only the originator but also many generic products are found at different outlets with very different prices.

Appendix C addresses the question of whether the availability of individual product versions is associated with their median price. In theory, at least, less expensive products could be more popular and widespread, or alternatively, private pharmacies may gravitate toward offering the more expensive and possibly more lucrative products. However, the evidence from this survey does not support the idea of either a negative or positive association.

Appendix D explores the question of whether the median price of an individual product is related to the extent to which prices for that one product vary from private outlet to outlet. The originators and

highest priced branded generics seem to have relatively low price variability. The INN generics, which have lower prices generally, show a wider range of variability. That is, some INN products have greatly varying prices, while others' prices do not vary much.

Key Lessons

- **The Peru evidence did not support the speculation that originator price in an outlet is related to the presence of generic products, or vice versa**
- **Nevertheless, more data are needed to answer this question, and such an analysis could be done with data from the main WHO/HAI Medicine Prices surveys of many countries**
- **Prices for different version of medicines differ widely from each other**
- **For individual products found on the market, prices also often vary widely from outlet to outlet**
- **There is more variation in retail price for individual products that are at the lower-priced end of the market**

Geographic Variation in Results for Main Survey Medicines, Private Sector

The final 4 tables below do not include data from the special therapeutic categories survey in Peru. Tables 9, 10, 11, and 12 are based on the WHO/HAI core list of 30 medicines and the 8 additional supplementary medicines chosen by the Peru team for the main survey. The emphasis of the analyses below is on comparing results for outlets in different areas of Peru.

[Peru's supplementary list includes: amoxicillin 500 mg cap, clotrimazole 500 mg vaginal tab, chlorphenamine 4 mg cap, co-trimoxazole 800/160 mg tab, erythromycin 500 mg cap, fluconazole 150 mg cap, ibuprofen 400 mg cap, metronidazole 500 mg cap.]

Table 9 presents results from the main survey of medicine prices in Peru's private sector by geographic region. The first 4 columns of results contain data for the types of regions included in a standard WHO/HAI survey, whereas the final 2 columns are regions added to Peru's survey for the purpose of methodological validation and are especially remote from the capital. For the MPR results in the upper half of the table, only surveyed medicines that were available in at least 3 outlets in each region are included in the analysis. The comparisons are therefore among identical baskets of medicines. The median MPR observation for each region's basket is given, along with lower and upper limits of a 95% confidence interval around the median. (See http://www.math.unb.ca/~knight/utility/MedInt95.htm.)

[For example, there were 23 LPG medicines out of the 38 surveyed that were found in sufficient number in each region for inclusion in the analysis. The MPR for each LPG medicine in each region was calculated. Then the MPRs for each region's set of 23 were arrayed in order of magnitude, and the middle observation was identified as the median MPR. The 7^{th} and 17^{th} observations in the array form the confidence interval, and the probability that this interval does not cover the true median is 0.0347.]

There are two ways to evaluate these results. Evidence that prices are different in two regions would include a situation where their confidence intervals do not overlap (a fairly strong test) and one where the median MPR for one region lies outside the confidence interval for the other region (a weaker test).

[Medians are often considered awkward to analyze, present, and discuss, but also often necessary when data are neither normally nor randomly distributed. Cost data, which are the foundation of the WHO/HAI Medicine Prices work, tend to be positively skewed (i.e., with many low value observations and some higher outliers) rather than randomly distributed or bell-shaped. Therefore, the WHO/HAI methodology has used medians instead of means since the beginning of the project. The graphs in Appendix E indicate that this decision was apt, because both price results and availability results in Peru are highly skewed. MPRs across medicines are positively skewed, and availability rates across medicines are distributed in a U-shape, with both zero results and very high results common. When we looked at 10 individual products with large numbers of datapoints, their outlet prices were also positively skewed.]

The confidence intervals for the LPG MPR results by region in Table 9 all clearly overlap. The upper bound in Region B is particularly low, and two other regions (A and D) have medians that are just above Region B's confidence interval. This suggests that LPG prices in Region B may be lower than in the other 2 regions, but the evidence is not strong. For the originator MPRs, based on equivalent sets of 12 medicines priced in each of the 6 regions, there is no evidence of a difference in prices by region.

Regional analyses of medicines availability in the private sector are based on all 38 surveyed medicines. In this way, the baskets are equivalent across regions, and even availability rates for infrequently available medicines contribute to the analyses. Once again, there is no evidence of differences between regions in terms of availability of generics. For originators, it is notable that Region B's upper bound is identical to Region F's lower bound (even before rounding). In addition, Region F's median MPR fall above the confidence intervals for 3 other regions (B, C, and E). Originator availability may be genuinely higher in Region F.

Table 10 divides private sector outlets into several other subgroupings. In the first pair of results columns, "normal sample" refers to what would be surveyed using the standard WHO/HAI sampling method. There are 32 outlets in this group, which is more than the minimum required, but this occurred in Peru because they had to add more outlets when some had too low availability, which is a standard method. The 64 outlets included in the "expansion sites" group include: outlets in Regions E and F; outlets beyond 3 hours of the main regional hospital in all regions; and, private pharmacies identified as the "farthest from the public clinic" within some public clinic catchment areas throughout the survey. Obviously, both the normal sample and the expansion sites are a mix of different types of pharmacies – with each group including some capital city outlets, some in smaller cities, and some in quite rural places. Nevertheless, this side-by-side comparison allows one to quickly assess whether results from a standard sample differ from results from a sample of outlets always excluded from a standard sample. There is no evidence that these two samples differ in terms of LPG prices, originator prices, or LPG availability. As for originator availability, the confidence intervals for the two samples overlap substantially, but the median for the expansion sites is almost a full percentage point over the confidence interval for the normal sample (before rounding). The results suggest that originator availability may be higher in the places in Peru represented by the expansion survey sites.

The next 3 columns in Table 10 divide outlets into urban areas (<=30 minutes travel time from the nearest town of population 50,000+; 43 outlets included), semi-urban areas (>30 and <=2 hours from a town; 23 outlets), and rural areas (> 2 hours from a town; 30 outlets). Again, the evidence suggests no differences in LPG and originator prices or LPG availability. However, again, the evidence suggests possible differences in originator availability. Urban and rural median availability is higher than the upper bound on median availability for the semi-urban areas.

The final two columns contain results for 18 private pharmacies nearest to public clinics and 21 pharmacies farthest from the same clinics. (Additional "near" pharmacies in other locations for which no corresponding "far" pharmacies were sampled are excluded from these analyses.) We found no evidence that prices or availability are different for these types of pharmacies.

Geographic Variation in Results for Main Survey Medicines, Public Sector

Tables 11 and 12 are comparable analyses for the public sector. In Table 11, we see no differences in public sector procurement prices among the 6 regions. Patient prices in the public sector, however, appear to be higher in Region D than other regions. The median MPR among 18 LPGs in Region D is higher than the upper confidence interval bound of any other region, and the lower bound in Region D is higher than two other upper bounds (in Regions A and C, before rounding).

In terms of medicines availability, Region E is a possible low outlier, as 3 other regions (A, C and F) have medians higher than E's upper bound. Nevertheless, all of the confidence intervals overlap, so the evidence of a difference in availability is not very strong. There was no evidence of difference in prices or availability when public sector patient prices were compared between normal sample sites and expansion sites, or when results from urban, semi-urban, and rural sites were compared.

Table 9: Private sector MPR and availability results by region, core and supplementary medicines list

	Region A (capital)	Region B (within 1 day)	Region C (within 1 day)	Region D (within 1 day)	Region E (remote, > 1 day)	Region F (remote, > 1 day)
Median Price Ratio results	*For matching sets of 23 lowest-priced generics*					
median MPR value for LPGs	**5.9**	**3.7**	**5.6**	**6.0**	**4.1**	**4.3**
confidence interval for MPRs: lower bound	2.6	2.2	3.0	3.4	2.8	2.5
upper bound	9.3	5.8	10.6	13.9	9.2	7.0
	For matching sets of 12 originator brands					
median MPR value for originators	**18.5**	**17.9**	**22.3**	**20.9**	**18.2**	**19.0**
confidence interval for MPRs: lower bound	9.0	8.2	7.1	10.7	10.2	9.6
upper bound	32.5	31.7	45.0	42.3	34.8	37.0
Medicines availability results	*For all 38 LPGs in survey*					
median percentage available for LPGs	**68%**	**61%**	**56%**	**73%**	**47%**	**55%**
conf. interval for availability: lower bound	21%	16%	6%	36%	31%	26%
upper bound	86%	89%	88%	91%	81%	89%
	For all 38 originators in survey					
median percentage available, originators	**14%**	**11%**	**6%**	**14%**	**13%**	**26%**
conf. interval for availability: lower bound	0%	5%	0%	0%	13%	16%
upper bound	29%	16%	18%	27%	19%	32%

Table 10: Private sector MPR and availability results for different outlet samples, core and supplementary medicines list

	Normal sample	Expansion sites	Urban	Semi-urban	Rural	Nearest to HC	Farthest from HC
Median Price Ratio results	*29 matched LPGs*		*29 matched LPGs*			*30 matched LPGs*	
median MPR value for LPGs	**6.0**	**6.0**	**5.1**	**5.2**	**6.7**	**5.6**	**5.2**
confidence interval for MPRs: lower bound	3.0	2.7	2.7	2.7	3.0	3.3	2.7
upper bound	12.3	10.6	9.7	11.6	10.6	11.1	9.0
	28 matched originators		*20 matched originators*			*28 matched originators*	
median MPR value for originators	**22.9**	**23.9**	**17.8**	**19.2**	**20.6**	**26.2**	**24.3**
confidence interval for MPRs: lower bound	13.8	15.7	12.8	12.8	14.1	16.5	14.5
upper bound	66.5	58.6	32.5	34.8	52.9	56.9	60.3
Medicines availability results	*All 38 LPGs in survey*		*All 38 LPGs in survey*			*All 38 LPGs in survey*	
median percentage available for LPGs	**72%**	**52%**	**63%**	**57%**	**62%**	**64%**	**62%**
conf. interval for availability: lower bound	16%	23%	26%	17%	17%	28%	29%
upper bound	91%	86%	91%	78%	87%	89%	90%
	All 38 originators		*All 38 originators in survey*			*All 38 originators*	
median percentage available, originators	**9%**	**16%**	**17%**	**9%**	**18%**	**17%**	**26%**
conf. interval for availability: lower bound	6%	9%	12%	0%	7%	11%	10%
upper bound	16%	23%	21%	13%	23%	28%	38%

Table 11: Public sector MPR and availability results by region, core and supplementary medicines list

	Region A (capital)	Region B (within 1 day)	Region C (within 1 day)	Region D (within 1 day)	Region E (remote, > 1 day)	Region F (remote, > 1 day)
Median Price Ratios -- public procurement	*For matching sets of 12 lowest-priced generics*					
median MPR value for LPGs	**1.1**	**1.1**	**0.9**	**1.0**	**1.0**	**1.2**
confidence interval for MPRs: lower bound	0.5	0.8	0.7	0.7	0.7	0.8
upper bound	1.4	1.6	1.4	1.6	1.6	1.6
Median Price Ratios -- public facility patient prices	*For matching sets of 18 lowest-priced generics*					
median MPR value for LPGs	**1.1**	**1.3**	**1.2**	**2.6**	**1.3**	**1.4**
confidence interval for MPRs: lower bound	0.8	0.8	0.8	1.5	0.9	0.9
upper bound	1.5	1.6	1.5	5.8	2.0	1.9
Medicines availability in public health facilities	*For all 38 lowest-priced generics in survey*					
median percentage available for LPGs	**71%**	**44%**	**64%**	**45%**	**29%**	**71%**
conf. interval for availability: lower bound	0%	11%	0%	10%	0%	8%
upper bound	100%	78%	100%	80%	57%	83%

Table 12: Public sector MPR and availability results for different outlet samples, core and supplementary medicines list

	Normal sample	Expansion sites	Urban	Semi-urban	Rural
Median Price Ratios -- public facility patient prices	*24 matched LPGs*		*21 matched LPGs*		
median MPR value for LPGs	**1.4**	**1.7**	**1.5**	**1.2**	**1.5**
confidence interval for MPRs: lower bound	0.9	1.1	0.9	0.9	1.0
upper bound	3.0	2.2	2.0	1.9	2.0
Medicines availability in public health facilities	*All 38 LPGs in survey*		*All 38 LPGs in survey*		
median percentage available for LPGs	**50%**	**54%**	**57%**	**56%**	**57%**
conf. interval for availability: lower bound	13%	7%	13%	13%	5%
upper bound	88%	79%	83%	88%	81%

Additional Results Regarding Geographic Variation

Appendix F presents additional comparisons of private sector price and availability results by outlet location for the key individual medicine products in the 3 target therapeutic categories. There are no statistical tests because we did not summarize across different medicines to create median MPRs or their confidence intervals, and there were generally too few datapoints to calculate medians across outlets.

There appear to be no consistent regional patterns across medicines, except that some of the more infrequently available anti-diabetic agents seem especially likely to be found in Regions E and F, which is unexpected because these regions are especially remote.

In the second table in Appendix F, both prices and availability appear to be better on the whole in the urban areas as compared to the semi-urban and rural areas. No such pattern was obvious from the main part of the Peru survey (Table 10), although there may be a weak, non-significant trend in that direction.

Appendix G presents data on the number of distinct ACE inhibitor, anti-ulcerant, and anti-diabetic products available in private sector outlets of different types. (Different manufacturers' versions of the same medicine count as different products.) There do not appear to be major differences among the urban, semi-urban, and rural areas sampled. When we plotted shops individually, no semi-urban shop offered 20 or more products in these 3 categories, while 2 rural shops and 9 urban shops did.

Summarizing across findings for the outlet subsample analyses, we find no consistent strong pattern of price or availability differences by outlet location. The findings of difference that approach significance are isolated: e.g., Region F may have higher originator availability, but this was not true for the other remote region, Region E. So we cannot make a general conclusion about remote regions. Likewise, semi-urban outlets had the lowest availability rates in this survey, but we cannot venture a general statement about distance to outlets, because if this finding is real, then both the least distant outlets (i.e., urban) and the most distant (rural) have relatively high availability, which is not a clear message. It seems likely that in Peru, at least, even though great variations can be found in the medicines market, location by itself does not explain these variations.

Key Lessons

- **We did not find strong or consistent evidence of price or availability differences among sampled regions, or among nearer and more remote facilities**
- **This lack of a clear pattern in price and availability by location was the result in both private and public sectors**
- **The experience in Peru suggests that, given the inconvenience of visiting the more remote outlets, changing the standard sampling approach is not justified**
- **Medicine price and availability data are typically skewed, rather than randomly or normally distributed, and this finding supports the decision to use medians rather than means in analyses**

CONCLUSIONS

A special validation exercise for the WHO/HAI Medicine Prices methodology was conducted in Peru in the fall of 2005. The overall design of the validation consisted of a major expansion of one portion of the standard target medicines list (with an exhaustive survey of 3 important therapeutic categories – collecting price and availability data on all medicines and all product versions in those categories), in addition to a major expansion of the standard outlet sample (by visiting several types of more remote outlets that would ordinarily be overlooked in a WHO/HAI survey). Data collected via these paired expansions was compared with standard survey data collected at the same time, to determine whether the present WHO/HAI methods are adequate to meet the project's goal of characterizing prices and availability of medicines in a country. Also, we took opportunities inherent in the large amounts of unique data collected in Peru to conduct new types of analyses, in search of further insights about medicines markets.

The findings from the expansions validation were generally quite consistent with the simultaneous standard survey in Peru. Both demonstrate reasonable public sector MPRs, very high private sector MPRs and brand premiums, and great variation among private sector results for different outlets and medicines.

The WHO/HAI target medicines list ("core list") already includes the medicines that are the most widely available in Peru in each of the three therapeutic categories in the validation – captopril, omeprazole, and glibenclamide – in addition to ranitidine, which is also clearly a leading therapy in Peru. Enalapril and lansoprazole are also evidently major therapies used in Peru, but are not WHO/HAI core list medicines. Metformin is on the WHO/HAI core list, but is less important in Peru. All other medicines found in the three categories in Peru were infrequently found, and many have no corresponding MSH reference prices. Findings for the core medicines and the alternative medicines in the validation were not qualitatively different. Therefore, we can surmise that (based on the experience in Peru in these three therapeutic categories,) the WHO/HAI core list of medicines seems to be well selected and adequate for the purposes of Medicine Prices surveys.

With information on so many medicine product versions in the validation, we were able to create a number of summary measures in addition to the standard originator median and (outlet-identified) lowest priced generic median. We also examined the medians among branded and INN generic observations, and medians for the (survey-wide) most found product and most found generic versions. These last two are presumably similar to the old WHO/HAI measure known as "most sold generic", which could be identified either nationally or at outlet level. The results for the LPG median and the INN generic median were practically the same and, as expected, the originator and LPG tend to bracket the price spectrum, with the branded generic median always falling somewhere in between. The "most found/sold" measures provide a separate perspective, reflecting popularity or market dominance, and this type of measure is both important and not easy to predict. Therefore, while the complexity and burden of collecting data on the "most sold" justify the recent decision to drop it from the standard WHO/HAI methodology, it may still be worth including a measure of this type in an optional add-on module to the standard WHO/HAI survey.

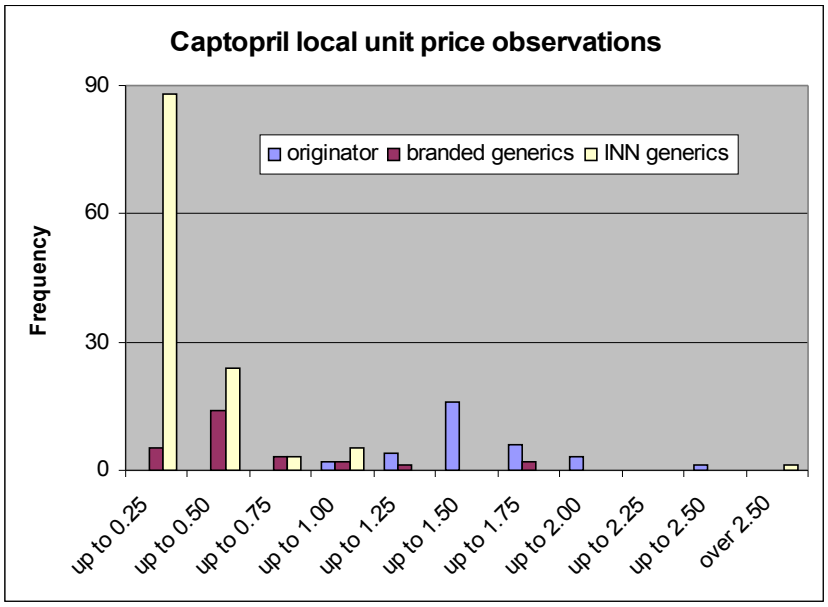
(The "most sold" product is often difficult to survey. Much depends on the country circumstances and how much access a survey team has to market information. Ideally, the product is identified in advance from sales data which is sometimes available from IMS or a similar source, or by way of inquiries with experts, distributors, or a sample of retailers. However, the product may be different in different sectors, especially private versus public. Therefore, a project-level or local decision would need to be made as to whether to use a different "most sold" in each sector, or to define a "nationally most sold" that may be irrelevant in some sectors. A separate option would be to define this measure

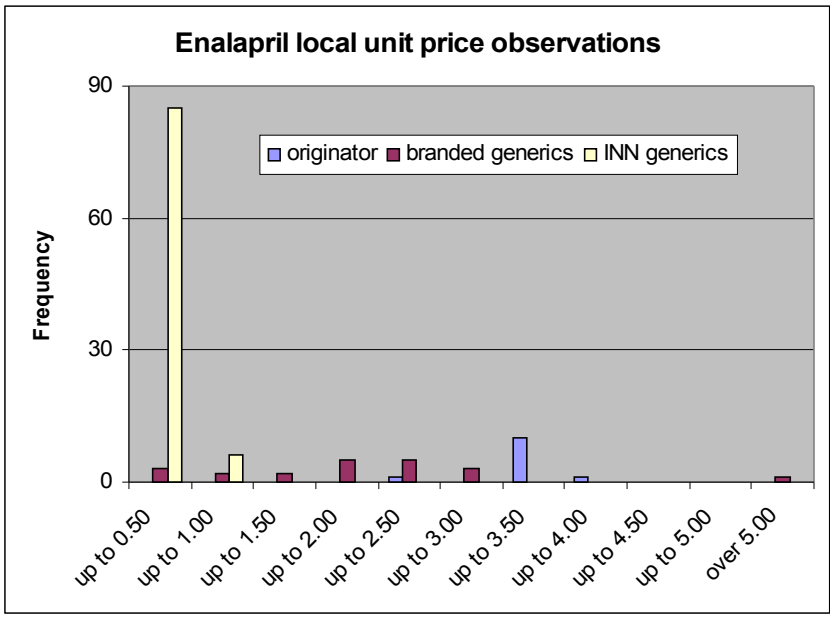
at the outlet level – i.e., to ask at each surveyed outlets which product is the most sold, and obtain the price. The measure used in this validation report, the "most found", is a third and even more difficult option, because it can only be identified after collection of data on the full spectrum of product versions offered at all surveyed outlets. In terms of analysis, a future "most sold" measure could be handled an optional add-on module in two ways: the WHO/HAI Excel workbook could be altered to include this option, or survey teams could simply use an expanded paper field data collection form and then enter the data into an extra copy of the standard Excel workbook.)

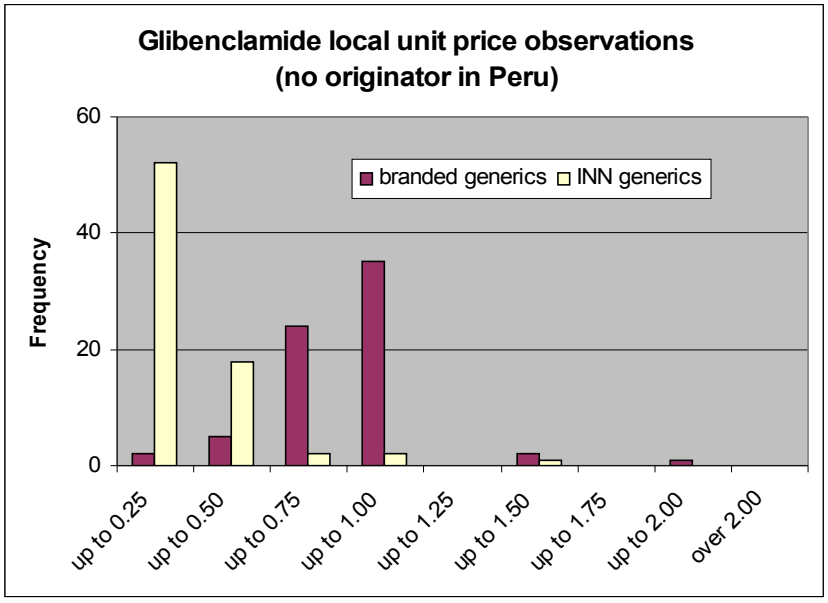
Sampling additional outlets from more remote locations in Peru did not lead to findings of important differences in results by location. Somewhat surprisingly, location does not appear to be a major driver of the undeniably striking patterns of variation in price and availability seen in Peru. Therefore, given the added inconvenience and cost of visiting such outlets, altering the standard WHO/HAI sampling approach is not justified by this validation exercise. The current standard sampling approach appears to be adequate. Nevertheless, this validation was conducted in only a single country, and location could be a more important driver in other places. Distance to facility (from the nearest town of 50,000+) is a required data element in the current standard methodology that is reportedly seldom collected. More emphasis should be placed on the importance of collecting this information, and on conducting analyses of the possible association between distance and price (and between distance and availability). These analyses are important both for the country surveys themselves and for the project at large, to provide additional validation for the WHO/HAI sampling approach.

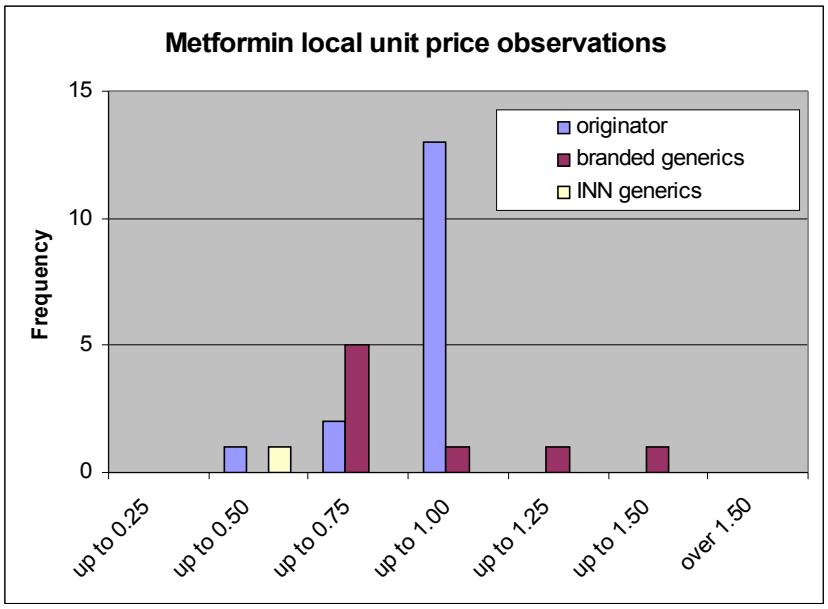
APPENDICES

Appendix A: Range and variation of private sector prices for single chemical entities in the ACE inhibitor and anti-diabetes agent categories

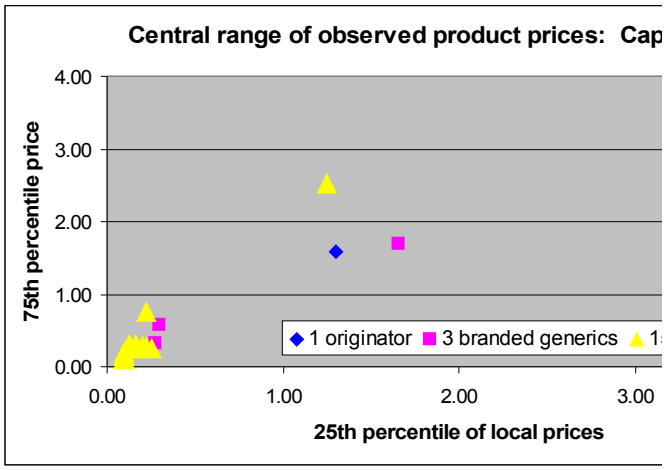


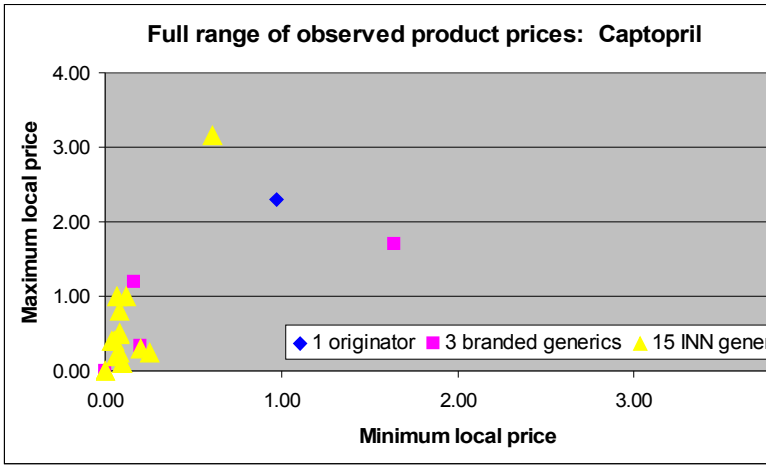

Enalapril local unit price observations
Frequency
90
60
30
0
originator
branded generics
INN generics
up to 0.50
up to 1.00
up to 1.50
up to 2.00
up to 2.50
up to 3.00
up to 3.50
up to 4.00
up to 4.50
up to 5.00
over 5.00

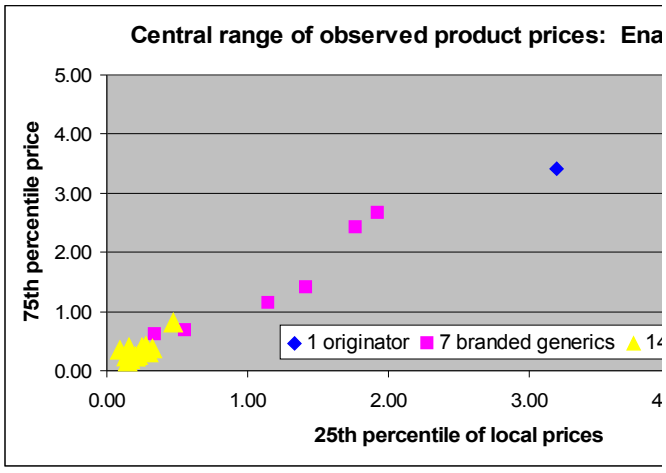

Glibenclamide local unit price observations
(no originator in Peru)
Frequency
60
40
20
0
branded generics
INN generics
up to 0.25
up to 0.50
up to 0.75
up to 1.00
up to 1.25
up to 1.50
up to 1.75
up to 2.00
over 2.00

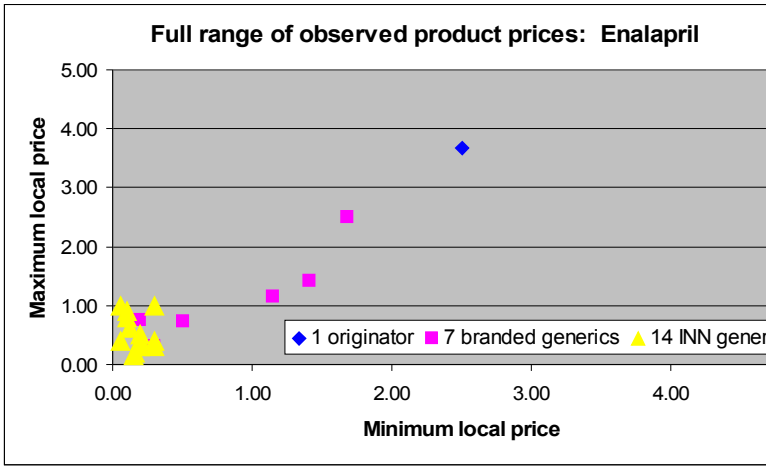

Metformin local unit price observations
Frequency
15
10
5
0
originator
branded generics
INN generics
up to 0.25
up to 0.50
up to 0.75
up to 1.00
up to 1.25
up to 1.50
over 1.50

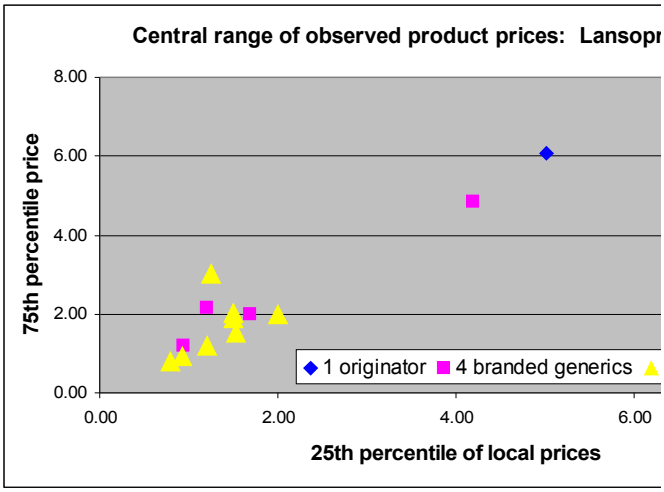
Appendix B: Variation in prices for individual medicine products in the private sector

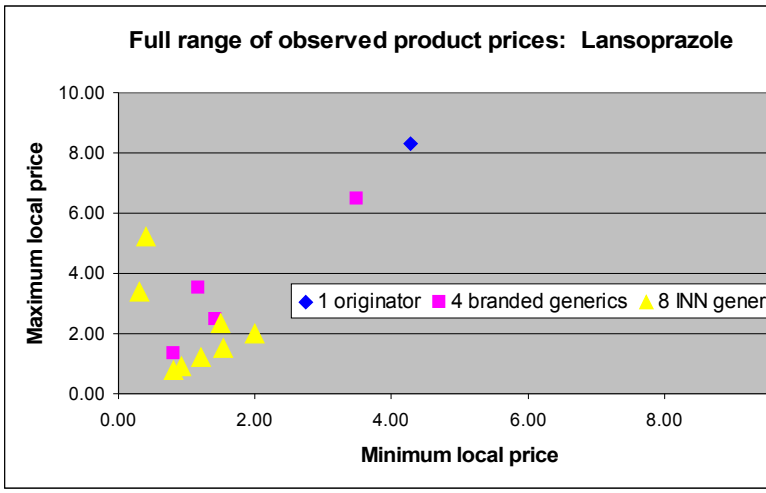


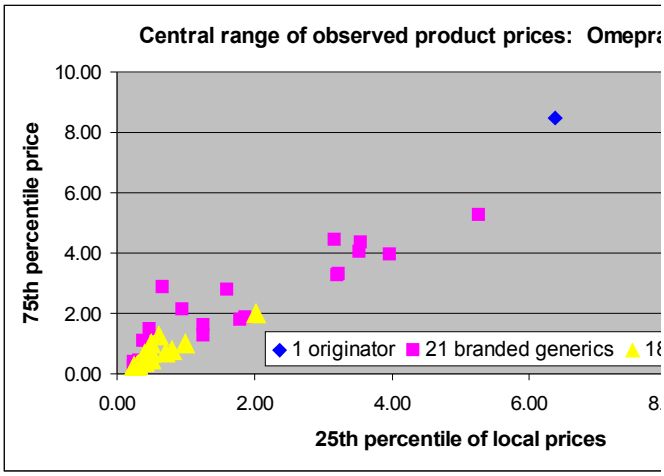


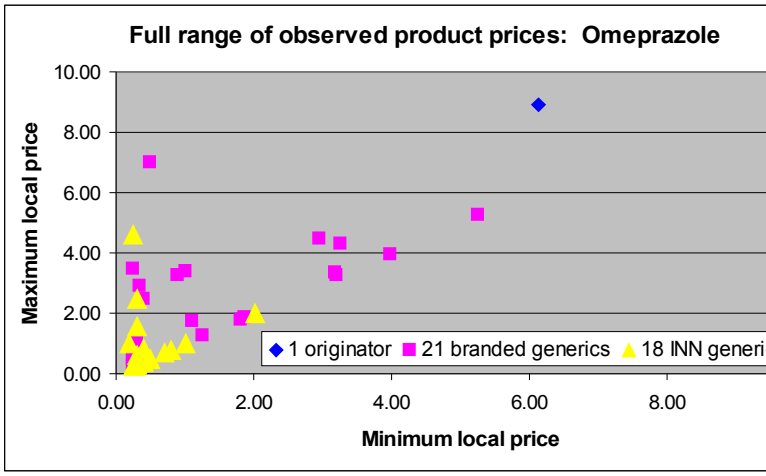


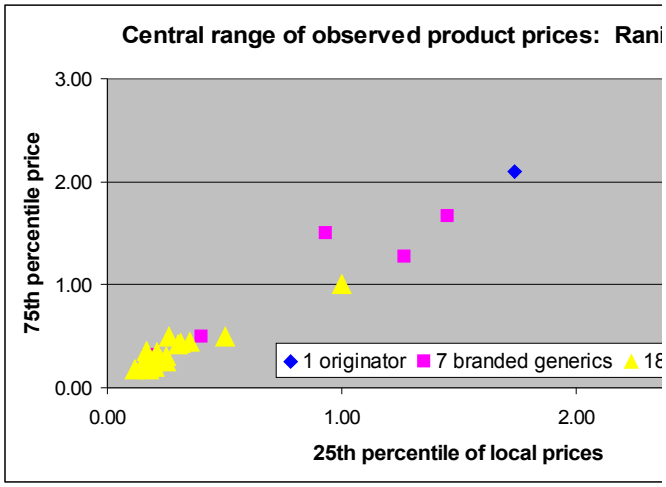


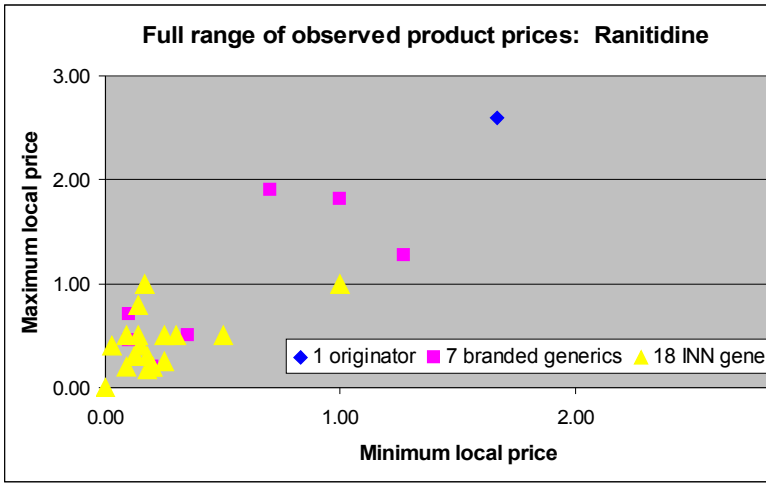

Central range of observed product prices: Lansopr
75th percentile price
8.00
6.00
4.00
2.00
0.00
0.00
2.00
4.00
6.00
25th percentile of local prices
1 originator
4 branded generics

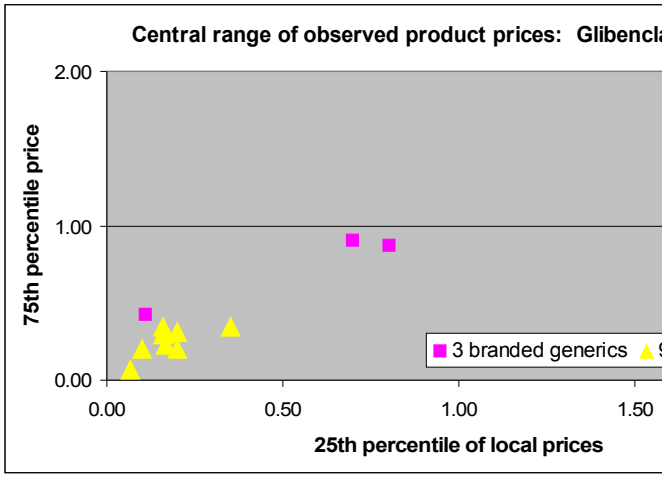

Full range of observed product prices: Lansoprazole
Maximum local price
10.00
8.00
6.00
4.00
2.00
0.00
0.00
2.00
4.00
6.00
8.00
Minimum local price
1 originator
4 branded generics
8 INN gener

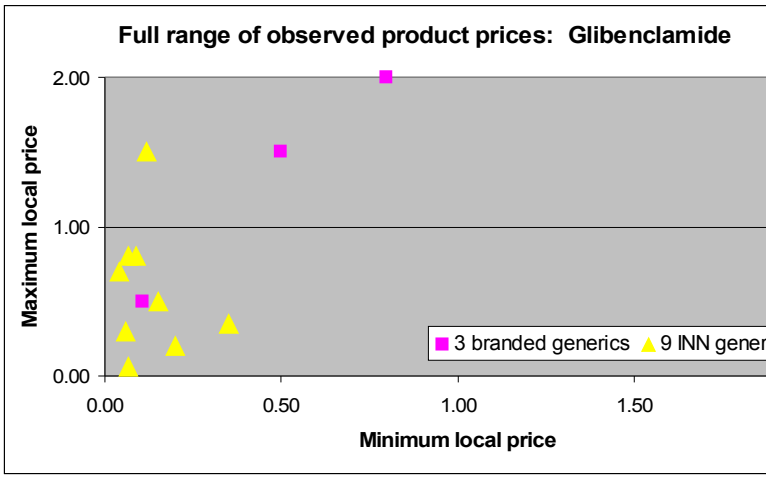

Central range of observed product prices: Omepra
75th percentile price
10.00
8.00
6.00
4.00
2.00
0.00
0.00
2.00
4.00
6.00
25th percentile of local prices
1 originator
21 branded generics

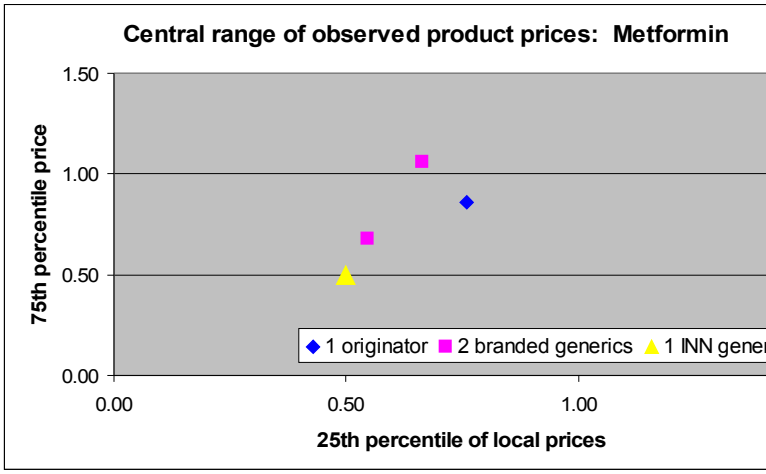

Full range of observed product prices: Omeprazole
Maximum local price
10.00
8.00
6.00
4.00
2.00
0.00
0.00
2.00
4.00
6.00
8.00
Minimum local price
1 originator
21 branded generics
18 INN generi

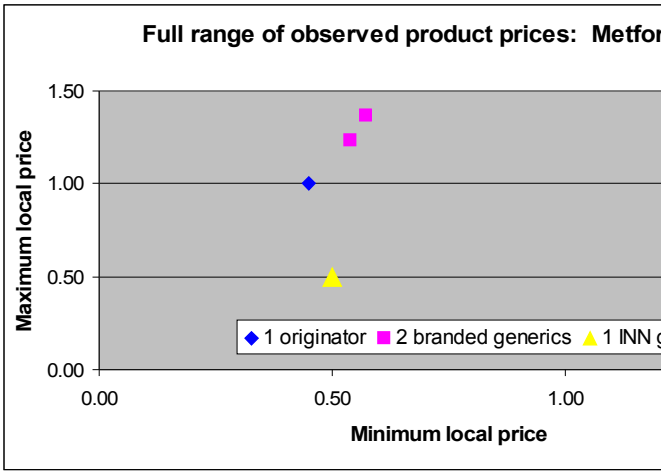

Central range of observed product prices: Rani
3.00
2.00
1.00
0.00
75th percentile price
0.00
1.00
2.00
25th percentile of local prices
1 originator
7 branded generics
18


Full range of observed product prices: Ranitidine
3.00
2.00
1.00
0.00
Maximum local price
0.00
1.00
2.00
Minimum local price
1 originator
7 branded generics
18 INN gene

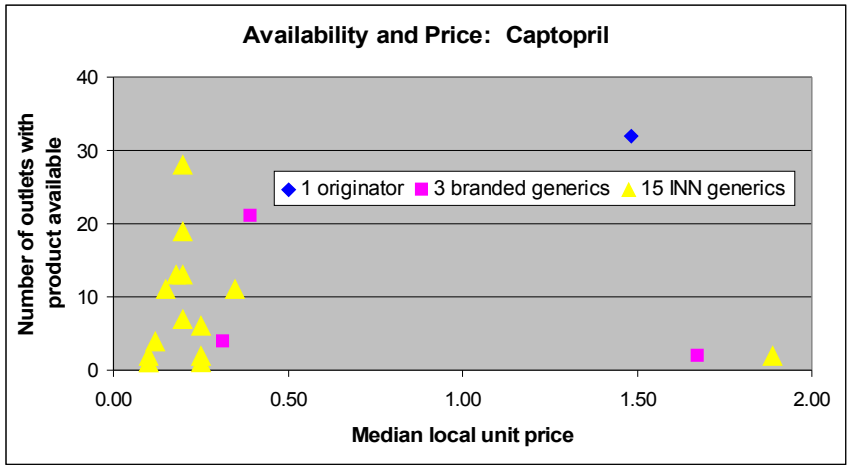

Central range of observed product prices: Glibencl
2.00
1.00
0.00
75th percentile price
0.00
0.50
1.00
1.50
25th percentile of local prices
3 branded generics

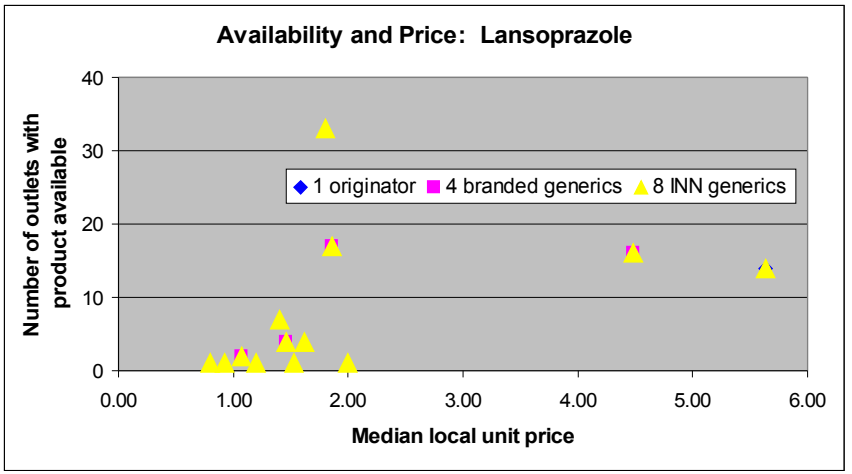

Full range of observed product prices: Glibenclamide
2.00
1.00
0.00
Maximum local price
0.00
0.50
1.00
1.50
Minimum local price
3 branded generics
9 INN gener

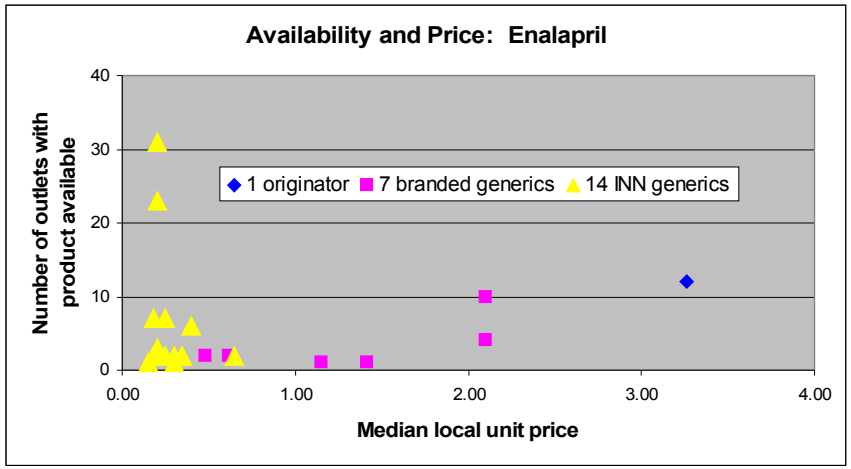

Central range of observed product prices: Metformin
1.50
1.00
0.50
0.00
75th percentile price
0.00
0.50
1.00
25th percentile of local prices
1 originator
2 branded generics
1 INN gener

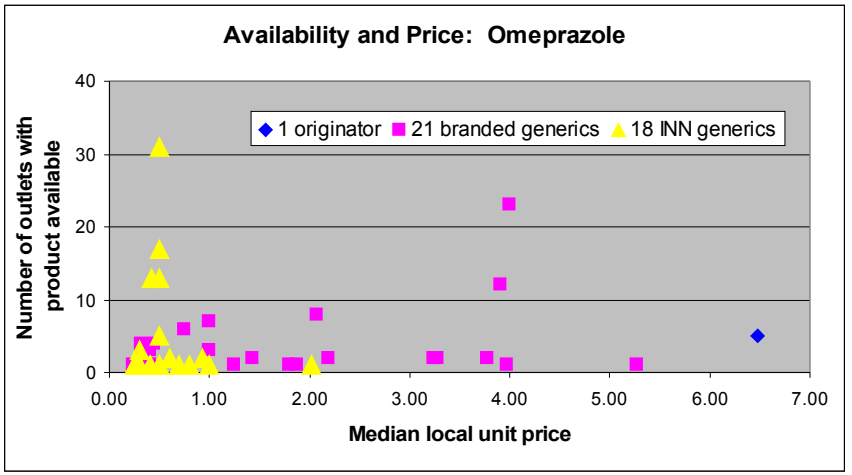

Full range of observed product prices: Metfor
Maximum local price
1.50
1.00
0.50
0.00
0.00
0.50
1.00
Minimum local price
1 originator
2 branded generics
1 INN

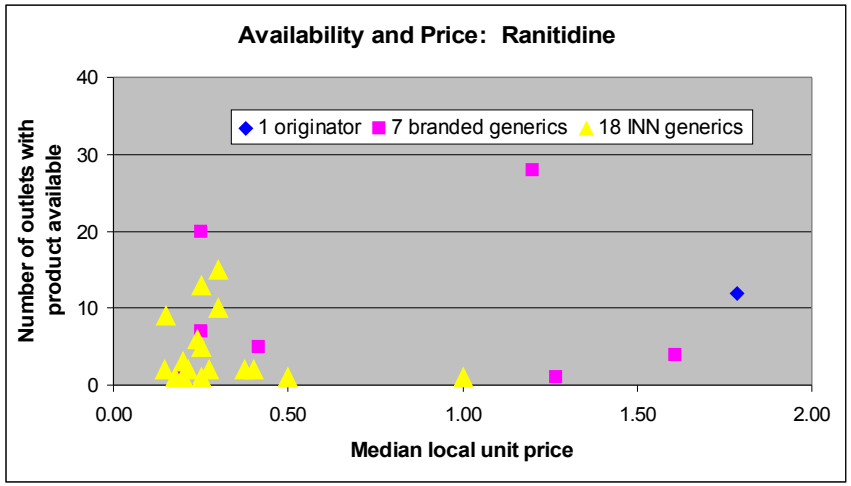
Appendix C: Examination of relationship between medicine availability and price in private pharmacies

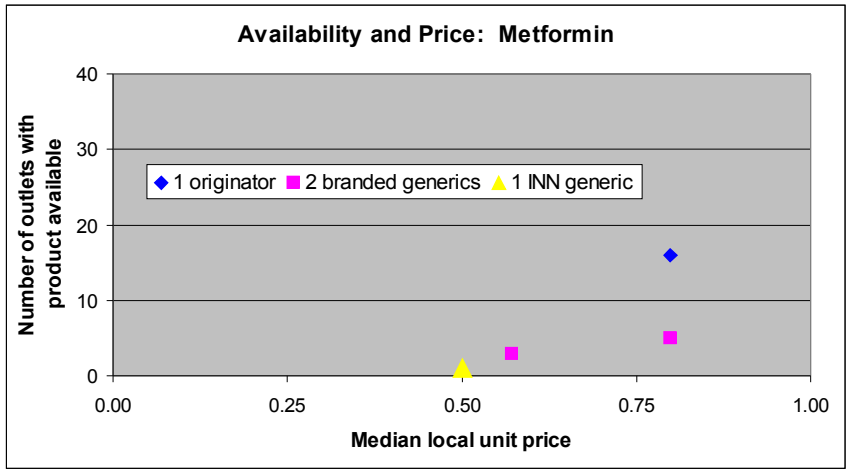

Availability and Price: Captopril
Number of outlets with product available
40
30
20
10
0
0.00
0.50
1.00
1.50
2.00
Median local unit price
1 originator
3 branded generics
15 INN generics

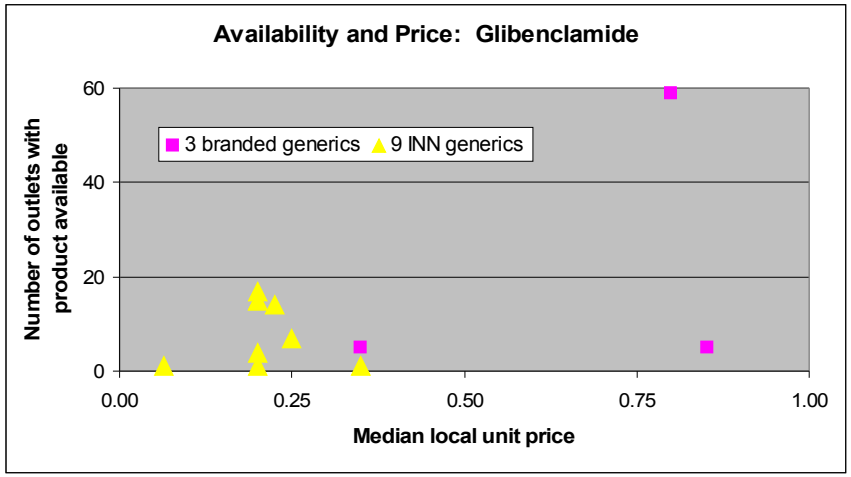

Availability and Price: Lansoprazole
Number of outlets with product available
40
30
20
10
0
0.00
1.00
2.00
3.00
4.00
5.00
6.00
Median local unit price
1 originator
4 branded generics
8 INN generics


Availability and Price: Enalapril
Number of outlets with product available
40
30
20
10
0
0.00
1.00
2.00
3.00
4.00
Median local unit price
1 originator
7 branded generics
14 INN generics

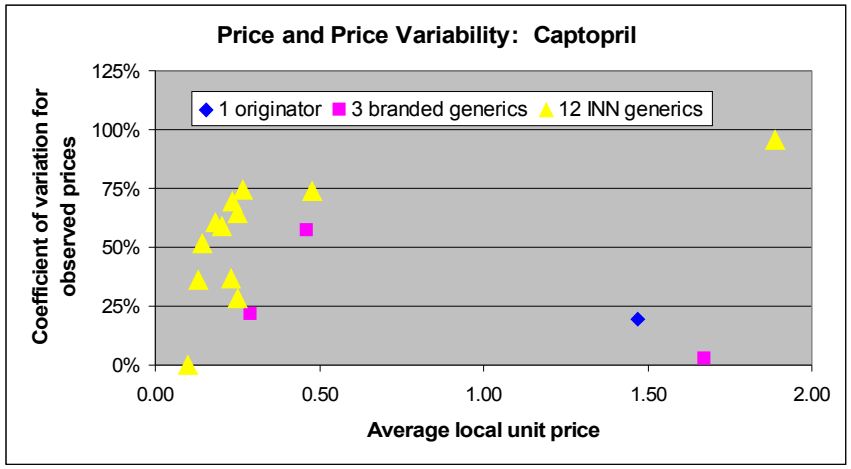

Availability and Price: Omeprazole
Number of outlets with product available
40
30
20
10
0
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
Median local unit price
1 originator
21 branded generics
18 INN generics

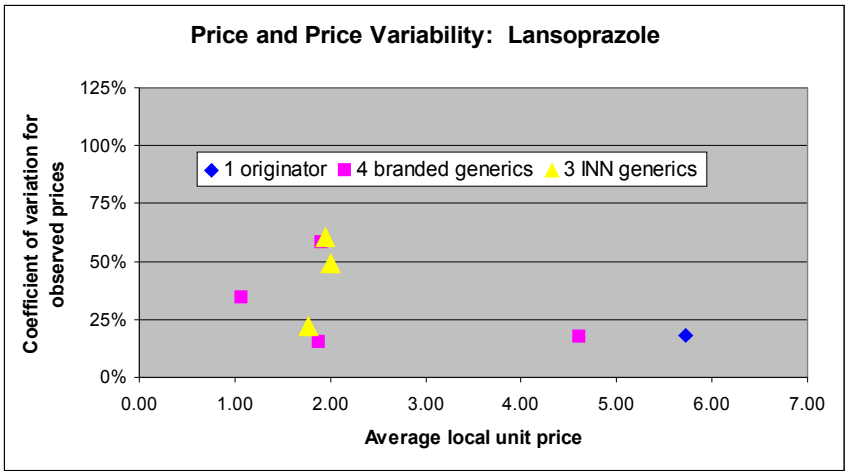

Availability and Price: Ranitidine
Number of outlets with product available
40
30
20
10
0
1 originator
7 branded generics
18 INN generics
0.00
0.50
1.00
1.50
2.00
Median local unit price

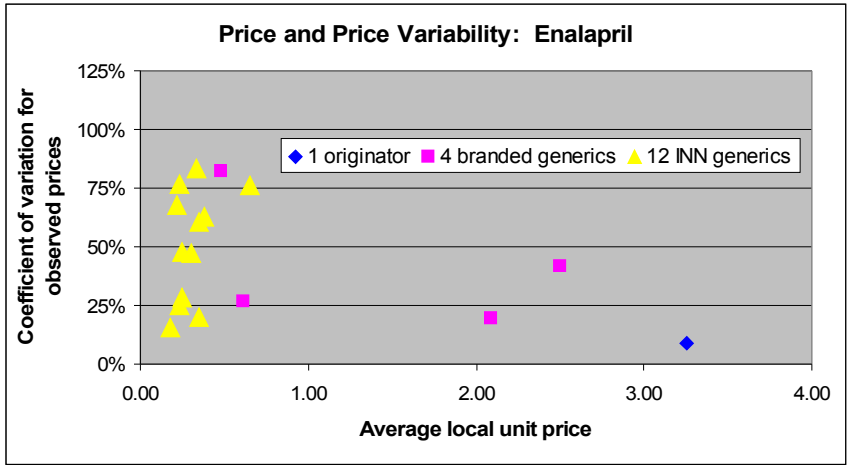

Availability and Price: Metformin
Number of outlets with product available
40
30
20
10
0
1 originator
2 branded generics
1 INN generic
0.00
0.25
0.50
0.75
1.00
Median local unit price

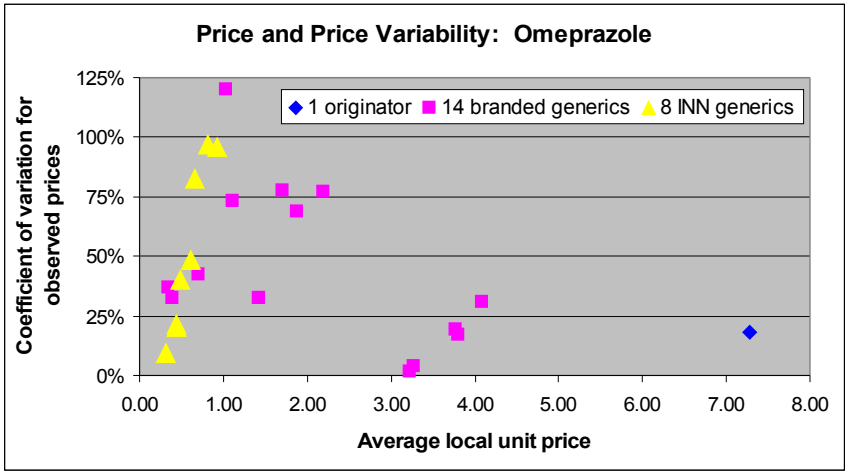

Availability and Price: Glibenclamide
Number of outlets with product available
60
40
20
0
3 branded generics
9 INN generics
0.00
0.25
0.50
0.75
1.00
Median local unit price

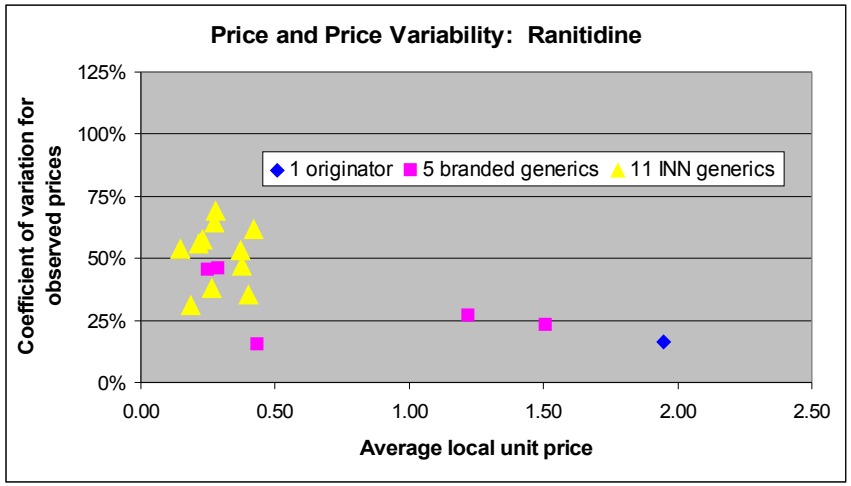
Appendix D: Examination of relationship between private pharmacy price and variability in price

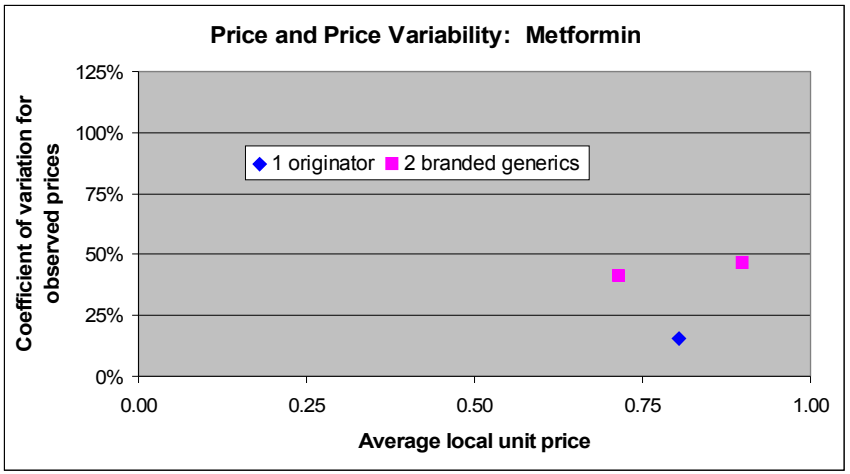

Price and Price Variability: Captopril
Coefficient of variation for observed prices
125%
100%
75%
50%
25%
0%
1 originator
3 branded generics
12 INN generics
0.00
0.50
1.00
1.50
2.00
Average local unit price

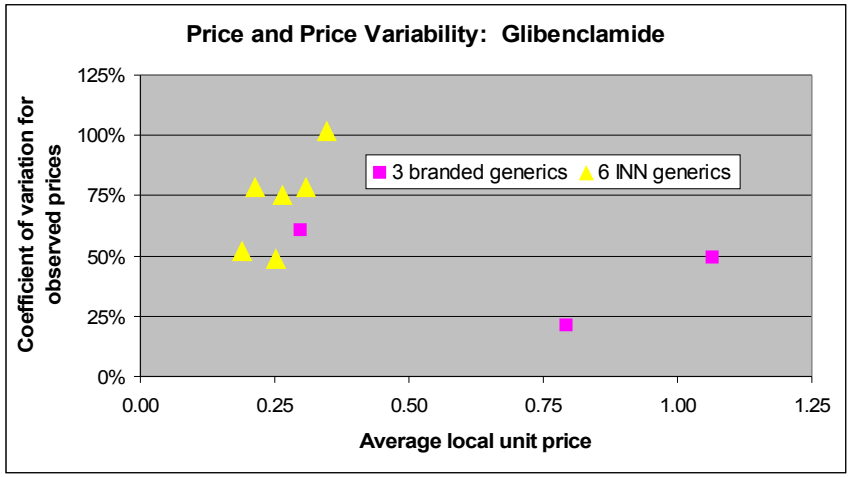

Price and Price Variability: Lansoprazole
Coefficient of variation for observed prices
125%
100%
75%
50%
25%
0%
1 originator
4 branded generics
3 INN generics
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
Average local unit price


Price and Price Variability: Enalapril
Coefficient of variation for observed prices
125%
100%
75%
50%
25%
0%
1 originator
4 branded generics
12 INN generics
0.00
1.00
2.00
3.00
4.00
Average local unit price

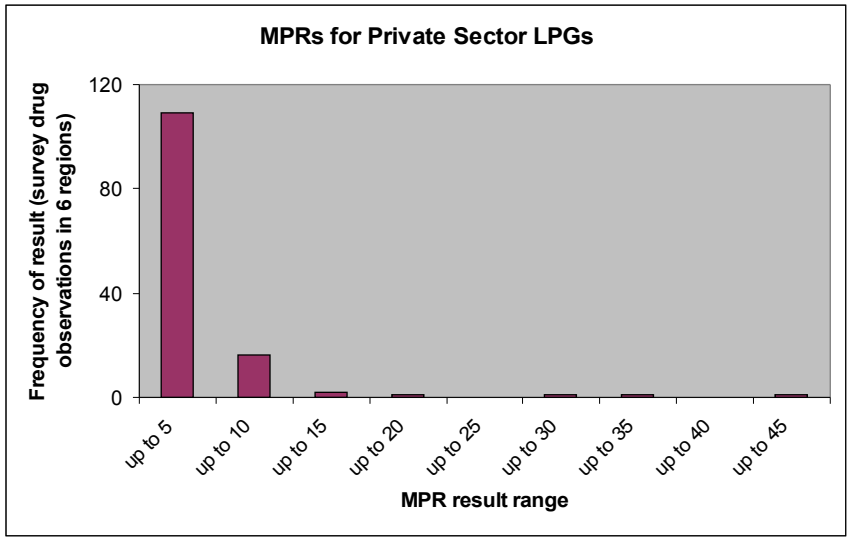

Price and Price Variability: Omeprazole
Coefficient of variation for observed prices
125%
100%
75%
50%
25%
0%
1 originator
14 branded generics
8 INN generics
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
Average local unit price

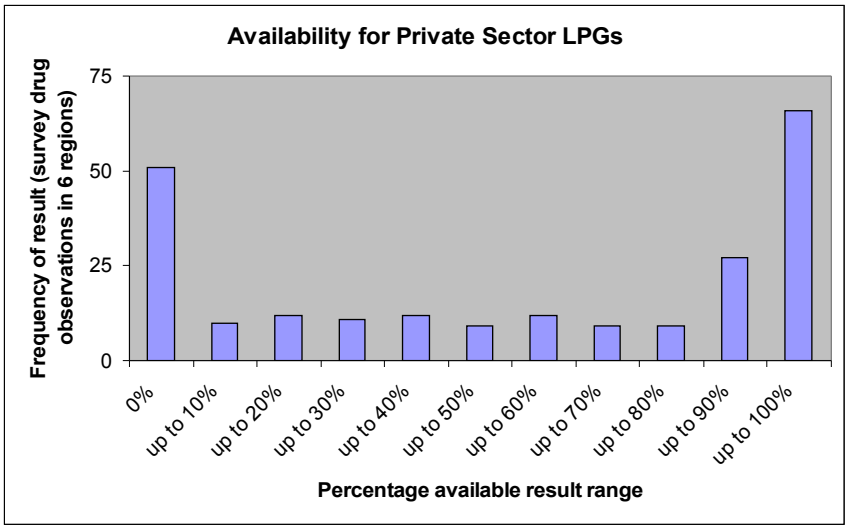

Price and Price Variability: Ranitidine
Coefficient of variation for observed prices
125%
100%
75%
50%
25%
0%
1 originator
5 branded generics
11 INN generics
0.00
0.50
1.00
1.50
2.00
2.50
Average local unit price

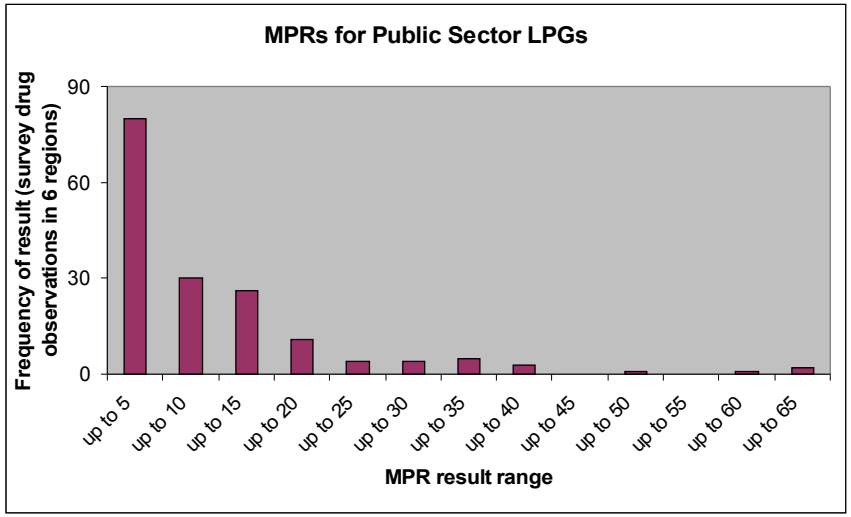

Price and Price Variability: Metformin
Coefficient of variation for observed prices
125%
100%
75%
50%
25%
0%
1 originator
2 branded generics
0.00
0.25
0.50
0.75
1.00
Average local unit price

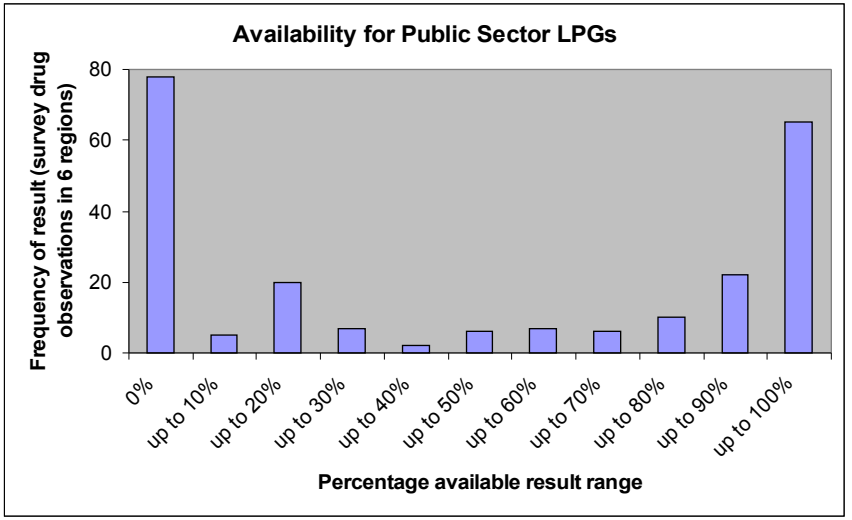

Price and Price Variability: Glibenclamide
Coefficient of variation for observed prices
125%
100%
75%
50%
25%
0%
3 branded generics
6 INN generics
0.00
0.25
0.50
0.75
1.00
1.25
Average local unit price

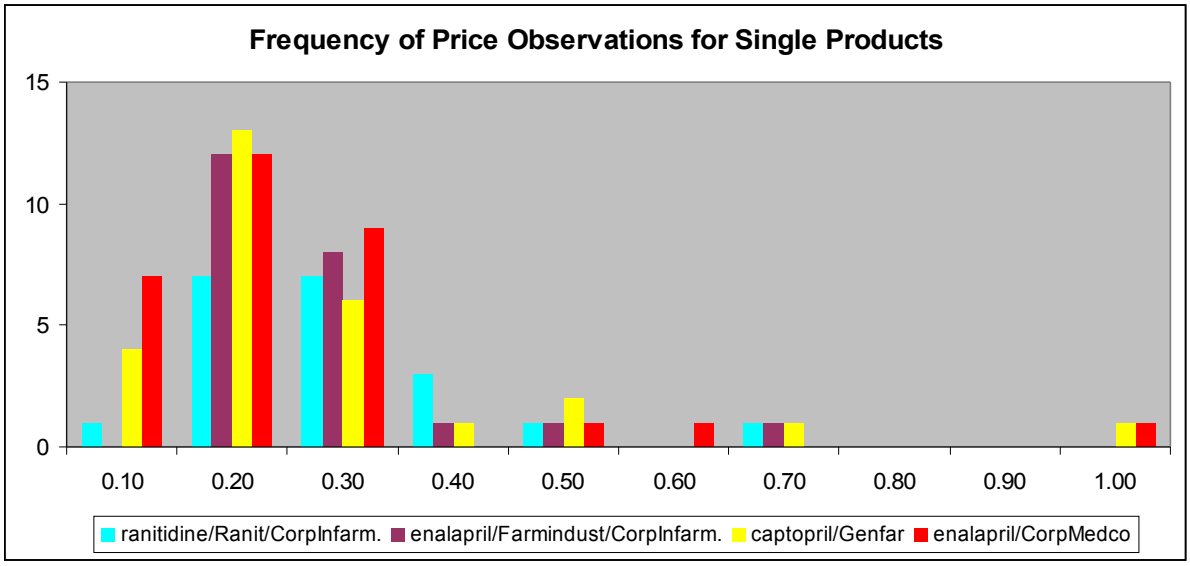
Appendix E: Skewness in MPR and availability results

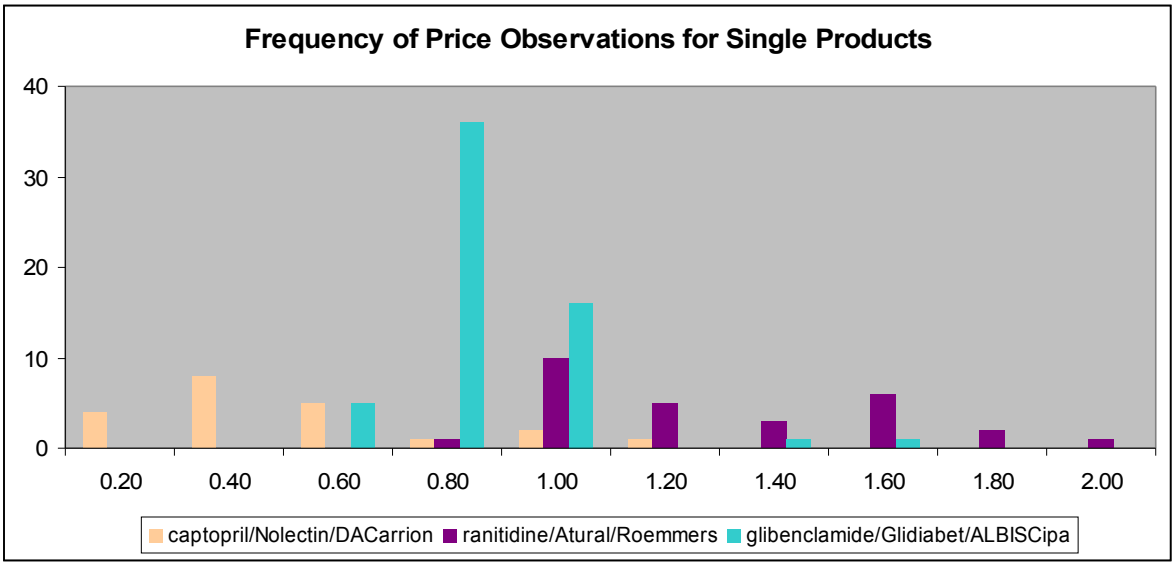

MPRs for Private Sector LPGs
Frequency of result (survey drug observations in 6 regions)
120
80
40
0
up to 5
up to 10
up to 15
up to 20
up to 25
up to 30
up to 35
up to 40
up to 45
MPR result range

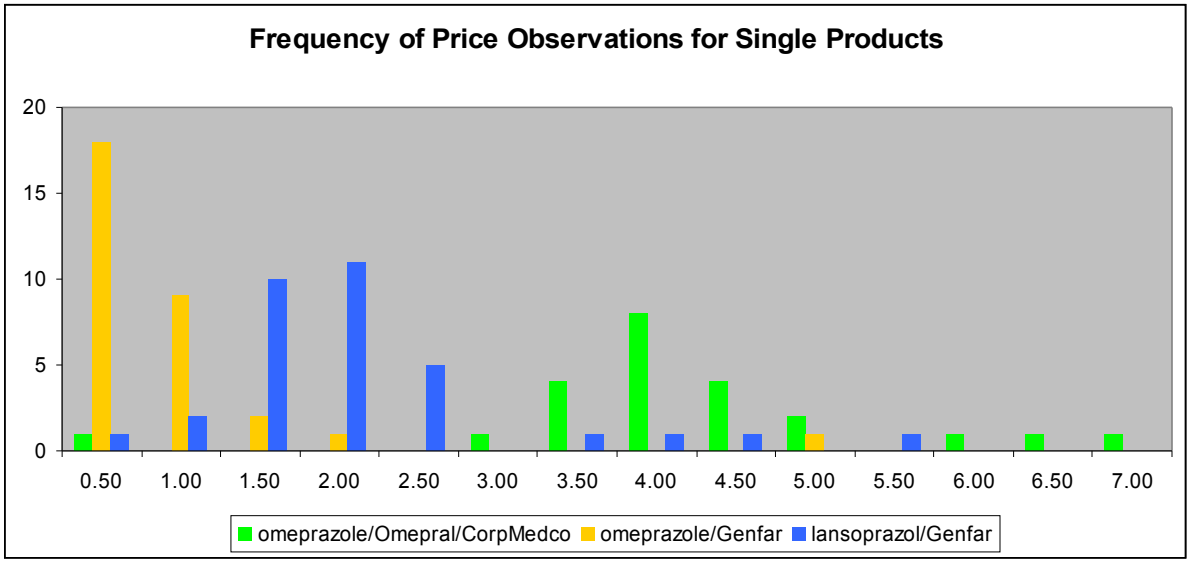

Availability for Private Sector LPGs
Frequency of result (survey drug observations in 6 regions)
75
50
25
0
0%
up to 10%
up to 20%
up to 30%
up to 40%
up to 50%
up to 60%
up to 70%
up to 80%
up to 90%
up to 100%
Percentage available result range


MPRs for Public Sector LPGs
Frequency of result (survey drug observations in 6 regions)
90
60
30
0
up to 5
up to 10
up to 15
up to 20
up to 25
up to 30
up to 35
up to 40
up to 45
up to 50
up to 55
up to 60
up to 65
MPR result range


Availability for Public Sector LPGs
Frequency of result (survey drug observations in 6 regions)
80
60
40
20
0
0%
up to 10%
up to 20%
up to 30%
up to 40%
up to 50%
up to 60%
up to 70%
up to 80%
up to 90%
up to 100%
Percentage available result range


Frequency of Price Observations for Single Products
15
10
5
0
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.90
1.00
ranitidine/Ranit/CorpInfarm.
enalapril/Farmindust/CorpInfarm.
captopril/Genfar
enalapril/CorpMedco


Frequency of Price Observations for Single Products
40
30
20
10
0
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
1.80
2.00
captopril/Nolectin/DACarrion
ranitidine/Atural/Roemmers
glibenclamide/Glidiabet/ALBISCipa


Frequency of Price Observations for Single Products
20
15
10
5
0
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
5.50
6.00
6.50
7.00
omeprazole/Omepral/CorpMedco
omeprazole/Genfar
lansoprazol/Genfar

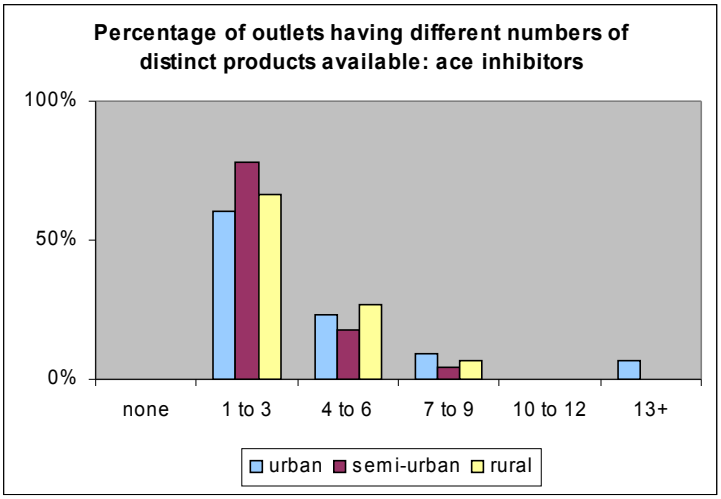
Appendix F: Private sector MPR and availability results for individual medicines in three therapeutic categories, various subsamples of outlets

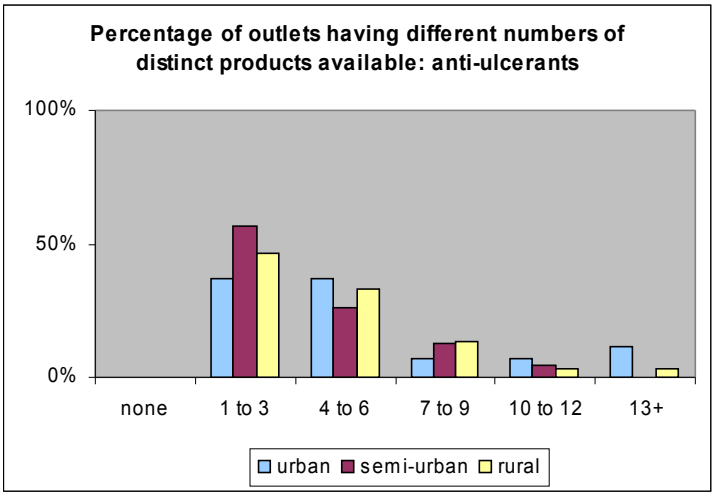
MEDICINE	PRODUCT	FULL STUDY		REGION A		REGION B		REGION C		REGION D		REGION E		REGION F	
		med. unit price	outlet avail.	med. unit price	outlet avail.	med. unit price	outlet avail.	med. unit price	outlet avail.	med. unit price	outlet avail.	med. unit price	outlet avail.	med. unit price	outlet avail.
ACE INHIBITORS															
Captopril tab 25 mg	IB: Capoten, BMS	**1.48**	33%	**1.40**	36%	**1.30**	58%	**1.80**	12%	**1.70**	27%	**1.58**	31%	**1.50**	32%
Captopril tab 25 mg	MSG: captopril, Genfar	**0.20**	29%	**0.18**	14%	**0.18**	11%	**0.25**	59%	**0.35**	36%	**0.25**	19%	**0.20**	37%
Captopril tab 25 mg	LPG: captopril	**0.20**	100%	**0.20**	100%	**0.10**	100%	**0.25**	100%	**0.30**	100%	**0.20**	100%	**0.15**	100%
Enalapril tab 10 mg	IB: Renitec, MSD	**3.26**	13%	**3.50**	21%	**3.09**	16%			**3.40**	9%	**3.23**	13%	**3.30**	16%
Enalapril tab 10 mg	MSG: enalapril, Corp Medco	**0.20**	32%	**0.25**	50%	**0.18**	47%			**0.75**	18%	**0.10**	19%	**0.20**	53%
Enalapril tab 10 mg	LPG: enalapril	**0.20**	83%	**0.20**	93%	**0.20**	100%	**0.28**	82%	**0.50**	64%	**0.30**	56%	**0.20**	95%
Cilazapril tab 2.5 mg	IB: Inhibace, Roche	**3.77**	6%			**3.60**	5%	**3.77**	6%			**3.70**	13%	**4.51**	11%
Fosinopril tab 10 mg	IB: Monopril, BMS	**4.55**	1%									**4.55**	6%		
Lisinopril tab 10 mg	IB: Zestril, AstraZeneca	**3.36**	6%			**3.09**	5%	**3.66**	12%			**3.26**	6%	**3.46**	11%
Lisinopril tab 10 mg	MSG: Acerdil, Pharma/Recalc/Lafi/Farmind	**2.30**	7%	**2.26**	14%	**2.47**	11%			**2.65**	9%	**2.37**	6%	**2.14**	5%
Lisinopril tab 10 mg	LPG: lisinopril	**2.23**	7%	**2.26**	14%	**2.47**	11%			**2.65**	9%	**1.68**	6%	**2.14**	5%
Quinapril tab 10 mg	IB: Accupril, Pfizer	**4.88**	10%	**3.64**	14%	**4.00**	16%	**5.00**	6%	**5.20**	9%	**5.04**	13%	**4.83**	5%
ANTI-ULCER MEDS															
Lansoprazol tab 30 mg	IB: Ogastro, Abbott/Takeda	**5.64**	15%	**6.00**	21%	**4.50**	11%	**4.98**	6%	**8.30**	9%	**4.93**	6%	**5.85**	32%
Lansoprazol tab 30 mg	MSG: lansoprazol, Genfar	**1.80**	34%	**2.00**	36%	**1.50**	5%	**1.50**	47%	**2.20**	64%	**2.00**	38%	**1.68**	32%
Lansoprazol tab 30 mg	LPG: lansoprazol	**1.65**	60%	**1.95**	57%	**1.53**	58%	**1.50**	65%	**1.85**	73%	**1.85**	63%	**1.60**	53%
Omeprazol tab 20 mg	IB: Losec, AstraZeneca	**6.47**	5%			**6.37**	5%	**6.14**	6%			**7.70**	13%	**8.48**	5%
Omeprazol tab 20 mg	MSG: omeprazol, Genfar	**0.50**	32%	**1.00**	7%	**0.50**	5%	**0.50**	35%	**1.00**	64%	**1.00**	38%	**0.50**	53%
Omeprazol tab 20 mg	LPG: omeprazol	**0.50**	95%	**0.50**	100%	**0.40**	89%	**0.40**	94%	**0.50**	100%	**0.46**	88%	**0.50**	100%
Ranitidine tab 150 mg	IB: Zantac, GSK	**1.79**	13%	**1.82**	7%	**2.06**	11%	**1.73**	6%	**2.40**	27%	**1.71**	13%	**1.77**	16%
Ranitidine tab 150 mg	MSG: Atural, Roemmers	**1.20**	29%	**1.20**	36%	**1.25**	42%	**0.93**	24%	**1.45**	18%	**0.95**	19%	**1.35**	32%
Ranitidine tab 150 mg	LPG: ranitidine	**0.25**	85%	**0.23**	86%	**0.23**	95%	**0.30**	100%	**0.30**	91%	**0.20**	75%	**0.25**	68%
Cimetidine tab 400 mg	only generic: Ulcimet, Colliere	**1.34**	4%	**1.50**	7%	**1.17**	5%							**1.29**	11%
Esomeprazol tab 20 mg	IB: Nexium, QS/AstraZeneca	**4.72**	13%	**5.33**	21%	**4.34**	11%	**4.90**	6%			**4.43**	6%	**5.00**	26%
Esomeprazol tab 20 mg	LPG: esomeprazol	**3.43**	4%	**3.14**	14%	**3.43**	5%					**3.43**	6%		
Famotidine tab 40 mg	LPG: famotidine	**0.87**	1%											**0.87**	5%
Pantoprazol tab 40 mg	LPG: pantoprazol	**4.53**	25%	**4.55**	43%	**3.36**	26%	**4.56**	6%	**5.80**	27%	**2.09**	19%	**5.09**	32%
ANTI-DIABETIC MEDS															
Glibenclamide tab 5 mg	MSG: Glidiabet, ALBIS/Cipa	**0.80**	61%	**0.70**	71%	**0.80**	79%	**0.80**	59%	**0.90**	64%	**0.88**	25%	**0.80**	68%
Glibenclamide tab 5 mg	LPG: glibenclamide	**0.21**	88%	**0.20**	79%	**0.25**	100%	**0.50**	88%	**0.45**	91%	**0.20**	63%	**0.15**	100%
Metformin tab 500 mg	IB: Glucophage, Merck	**0.80**	17%	**0.80**	36%	**0.85**	16%	**0.75**	6%			**0.88**	13%	**0.76**	26%
Metformin tab 500 mg	LPG: metformin	**0.57**	8%	**0.55**	21%	**0.68**	5%					**1.30**	13%	**0.56**	11%
Clorpropamide tab 250 mg	IB: Diabinese, Pfizer	**1.00**	23%	**1.00**	21%	**1.08**	32%	**0.78**	6%	**0.95**	36%	**0.99**	13%	**1.08**	32%
Gliclazide tab 80 mg	IB: Diamicron, QS/Profarma	**1.62**	6%	**1.75**	14%	**1.61**	11%					**1.59**	6%	**1.64**	5%
Glimepiride tab 4 mg	IB: Amaryl, Aventis	**4.13**	18%	**4.32**	29%	**4.50**	21%	**4.55**	12%	**7.00**	9%	**3.07**	13%	**4.45**	21%
Glimepiride tab 4 mg	LPG: glimepiride	**3.20**	1%									**3.20**	6%		
Glipizide tab 5 mg	MSG: Minidiab, Pfizer/PCVenezuela	**0.91**	2%									**1.11**	6%	**0.71**	5%
Glipizide tab 5 mg	LPG: glipizide	**0.91**	2%									**1.11**	6%	**0.71**	5%
Pioglitazone tab 30 mg	IB: Actos, Abbott/Takeda	**10.38**	5%			**10.38**	5%	**11.54**	6%			**10.40**	6%	**7.71**	11%
Pioglitazone tab 30 mg	LPG: pioglitazone	**5.80**	1%									**5.80**	6%		
Rosiglitazone tab 4 mg	IB: Avandia, GSK	**7.96**	4%			**7.77**	5%					**0.99**	6%	**8.15**	11%
Rosiglitazone tab 4 mg	LPG: rosiglitazone	**4.09**	1%			**4.09**	5%								

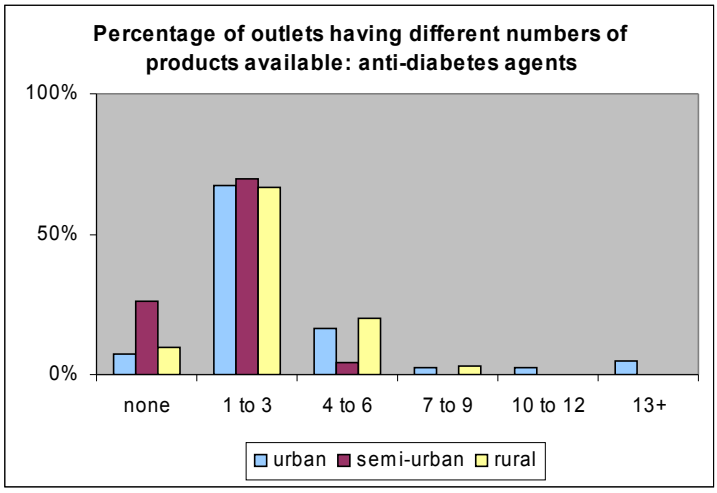
MEDICINE	PRODUCT	STD. SAMPLE		EXPANSION		URBAN		SEMI-URBAN		RURAL		NEAR TO HC		FAR FROM HC	
		med. unit price	outlet avail.	med. unit price	outlet avail.	med. unit price	outlet avail.	med. unit price	outlet avail.	med. unit price	outlet avail.	med. unit price	outlet avail.	med. unit price	outlet avail.
ACE INHIBITORS															
Captopril tab 25 mg	IB: Capoten, BMS	**1.30**	28%	**1.50**	42%	**1.40**	50%	**1.45**	26%	**1.60**	30%	**1.28**	33%	**1.50**	52%
Captopril tab 25 mg	MSG: captopril, Genfar	**0.20**	25%	**0.20**	35%	**0.20**	26%	**0.18**	26%	**0.25**	43%	**0.20**	39%	**0.20**	33%
Captopril tab 25 mg	LPG: captopril	**0.20**	100%	**0.20**	100%	**0.19**	100%	**0.20**	100%	**0.20**	100%	**0.20**	100%	**0.15**	100%
Enalapril tab 10 mg	IB: Renitec, MSD	**3.28**	8%	**3.24**	19%	**3.28**	21%	**3.17**	13%	**3.48**	7%	**3.17**	17%	**3.28**	33%
Enalapril tab 10 mg	MSG: enalapril, Corp Medco	**0.20**	36%	**0.20**	30%	**0.20**	45%	**0.23**	35%	**0.20**	33%	**0.20**	39%	**0.20**	33%
Enalapril tab 10 mg	LPG: enalapril	**0.20**	87%	**0.20**	79%	**0.23**	90%	**0.23**	78%	**0.20**	77%	**0.20**	83%	**0.20**	90%
Cilazapril tab 2.5 mg	IB: Inhibace, Roche	**3.77**	6%	**3.77**	7%	**3.77**	14%					**3.69**	11%	**3.77**	14%
Fosinopril tab 10 mg	IB: Monopril, BMS	**4.55**	2%			**4.55**	2%					**4.55**	6%		
Lisinopril tab 10 mg	IB: Zestril, AstraZeneca	**3.26**	6%	**3.41**	7%	**3.29**	10%	**4.00**	4%	**3.52**	3%	**3.18**	11%	**3.41**	14%
Lisinopril tab 10 mg	MSG: Acerdil, Pharma/Recalc/Lafi/Farmind	**2.30**	6%	**2.44**	9%	**2.37**	12%			**2.23**	3%	**2.30**	17%	**2.44**	19%
Lisinopril tab 10 mg	LPG: lisinopril	**2.03**	6%	**2.44**	9%	**2.30**	12%			**2.23**	3%	**2.03**	17%	**2.44**	19%
Quinapril tab 10 mg	IB: Accupril, Pfizer	**4.95**	8%	**4.66**	14%	**4.88**	19%	**4.50**	4%			**4.94**	17%	**4.66**	29%
ANTI-ULCER MEDS															
Lansoprazol tab 30 mg	IB: Ogastro, Abbott/Takeda	**6.00**	9%	**5.57**	20%	**4.98**	12%	**6.00**	9%	**5.70**	23%	**4.83**	11%	**5.14**	24%
Lansoprazol tab 30 mg	MSG: lansoprazol, Genfar	**1.90**	34%	**1.70**	35%	**1.71**	37%	**2.00**	30%	**1.68**	33%	**2.00**	39%	**1.78**	48%
Lansoprazol tab 30 mg	LPG: lansoprazol	**1.63**	53%	**1.65**	70%	**1.50**	70%	**2.00**	43%	**1.88**	60%	**2.00**	67%	**1.70**	90%
Omeprazol tab 20 mg	IB: Losec, AstraZeneca	**6.42**	4%	**8.48**	7%	**6.47**	7%			**7.54**	7%	**6.42**	11%	**7.31**	10%
Omeprazol tab 20 mg	MSG: omeprazol, Genfar	**0.50**	32%	**0.50**	30%	**0.50**	30%	**0.50**	22%	**0.70**	43%	**1.00**	39%	**0.50**	38%
Omeprazol tab 20 mg	LPG: omeprazol	**0.50**	96%	**0.50**	93%	**0.40**	95%	**0.40**	91%	**0.50**	97%	**0.50**	100%	**0.40**	100%
Ranitidine tab 150 mg	IB: Zantac, GSK	**1.89**	11%	**1.77**	13%	**1.74**	21%	**2.00**	4%	**2.10**	7%	**1.74**	11%	**1.73**	24%
Ranitidine tab 150 mg	MSG: Atural, Roemmers	**1.00**	21%	**1.20**	39%	**0.95**	30%	**1.50**	30%	**1.40**	27%	**1.00**	28%	**1.20**	52%
Ranitidine tab 150 mg	LPG: ranitidine	**0.28**	81%	**0.25**	91%	**0.23**	88%	**0.25**	74%	**0.30**	90%	**0.25**	94%	**0.20**	100%
Cimetidine tab 400 mg	only generic: Ulcimet, Colliere	**1.79**	4%	**0.84**	4%	**0.68**	5%			**1.95**	7%	**1.17**	6%	**0.84**	10%
Esomeprazol tab 20 mg	IB: Nexium, QS/AstraZeneca	**4.77**	11%	**4.71**	13%	**4.53**	14%	**4.70**	9%	**5.16**	13%	**4.43**	17%	**4.71**	19%
Esomeprazol tab 20 mg	LPG: esomeprazol	**3.43**	6%	**2.84**	2%	**3.43**	7%			**2.84**	3%	**3.43**	17%	**2.84**	5%
Famotidine tab 40 mg	LPG: famotidine			**0.87**	2%	**0.87**	2%							**0.87**	5%
Pantoprazol tab 40 mg	LPG: pantoprazol	**4.46**	19%	**4.57**	30%	**4.35**	33%	**4.60**	13%	**5.00**	23%	**3.78**	22%	**4.53**	48%
ANTI-DIABETIC MEDS															
Glibenclamide tab 5 mg	MSG: Glidiabet, ALBIS/Cipa	**0.80**	58%	**0.71**	65%	**0.80**	63%	**0.80**	43%	**0.78**	73%	**0.70**	61%	**0.72**	71%
Glibenclamide tab 5 mg	LPG: glibenclamide	**0.25**	89%	**0.20**	86%	**0.20**	93%	**0.25**	74%	**0.20**	90%	**0.32**	94%	**0.20**	90%
Metformin tab 500 mg	IB: Glucophage, Merck	**0.79**	11%	**0.80**	23%	**0.78**	19%	**0.85**	9%	**0.80**	20%	**0.89**	22%	**0.78**	29%
Metformin tab 500 mg	LPG: metformin	**0.57**	9%	**0.57**	7%	**0.63**	14%	**0.50**	4%	**0.57**	3%	**0.68**	17%	**0.57**	14%
Clorpropamide tab 250 mg	IB: Diabinese, Pfizer	**1.10**	17%	**1.00**	30%	**0.97**	30%	**1.10**	4%	**1.04**	27%	**0.94**	17%	**0.92**	38%
Gliclazide tab 80 mg	IB: Diamicron, QS/Profarma	**1.59**	6%	**1.75**	7%	**1.60**	9%	**1.75**	4%	**1.90**	3%	**1.60**	22%	**1.64**	5%
Glimepiride tab 4 mg	IB: Amaryl, Aventis	**4.01**	15%	**4.50**	21%	**4.10**	26%			**4.70**	20%	**3.98**	22%	**4.30**	29%
Glimepiride tab 4 mg	LPG: glimepiride	**3.20**	2%			**3.20**	2%					**3.20**	6%		
Glipizide tab 5 mg	MSG: Minidiab, Pfizer/PCVenezuela	**1.11**	2%	**0.71**	2%	**0.91**	5%					**1.11**	6%	**0.71**	5%
Glipizide tab 5 mg	LPG: glipizide	**1.11**	2%	**0.71**	2%	**0.91**	5%					**1.11**	6%	**0.71**	5%
Pioglitazone tab 30 mg	IB: Actos, Abbott/Takeda	**10.38**	6%	**10.16**	5%	**10.38**	12%					**10.39**	11%	**10.16**	10%
Pioglitazone tab 30 mg	LPG: pioglitazone	**5.80**	2%			**5.80**	2%					**5.80**	6%		
Rosiglitazone tab 4 mg	IB: Avandia, GSK	**7.77**	6%	**8.14**	2%	**7.96**	9%					**4.38**	11%	**8.14**	5%
Rosiglitazone tab 4 mg	LPG: rosiglitazone	**4.09**	2%			**4.09**	2%					**4.09**	6%		

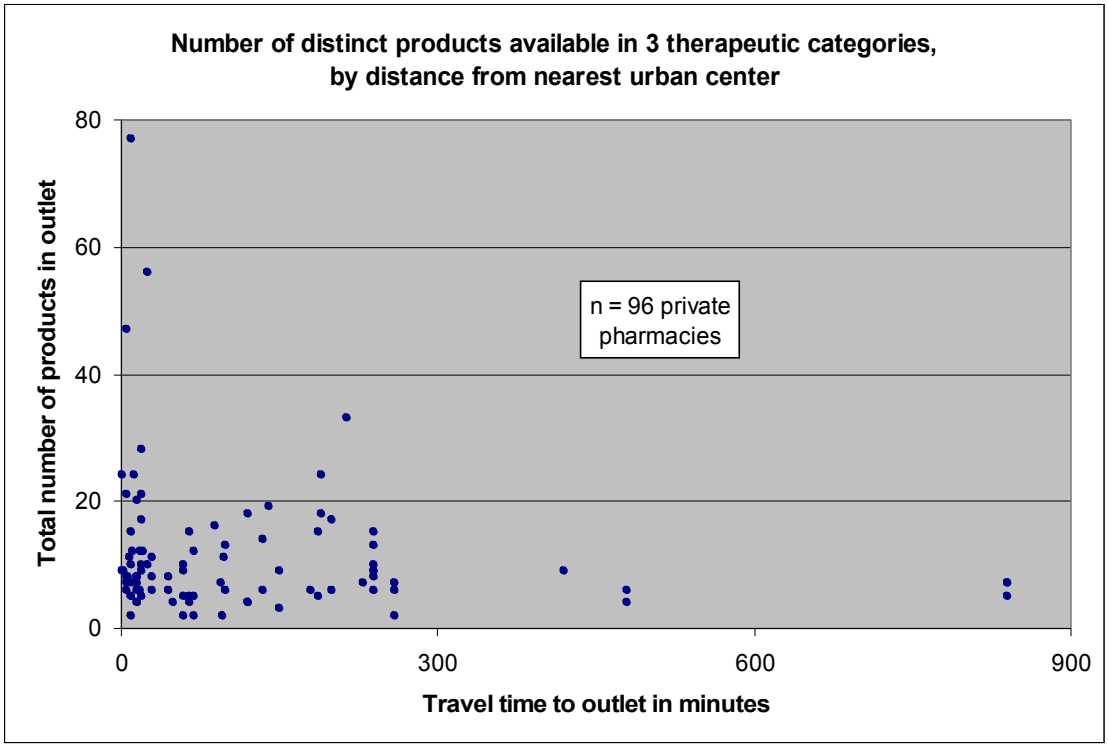
Appendix G: Examination of relationship between distance to private pharmacy outlet and product availability

	number of outlets with product count, by therapeutic category								
	ace inhibitors			anti-ulcerants			anti-diabetes agents		
number of distinct products available	urban	semi-urban	rural	urban	semi-urban	rural	urban	semi-urban	rural
none	0	0	0	0	0	0	3	6	3
1 to 3	26	18	20	16	13	14	29	16	20
4 to 6	10	4	8	16	6	10	7	1	6
7 to 9	4	1	2	3	3	4	1	0	1
10 to 12	0	0	0	3	1	1	1	0	0
13+	3	0	0	5	0	1	2	0	0






Percentage of outlets having different numbers of products available: anti-diabetes agents
100%
50%
0%
none
1 to 3
4 to 6
7 to 9
10 to 12
13+
urban
semi-urban
rural


Number of distinct products available in 3 therapeutic categories, by distance from nearest urban center
Total number of products in outlet
80
60
40
20
0
n = 96 private pharmacies
0
300
600
900
Travel time to outlet in minutes