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in Southern Brazil: a study of public and  
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## **Abstract**

This paper evaluates medicine prices, their availability and affordability in Brazil, considering the differences across three types of medicines on the market (originator brands, generics and similar medicines) and different types of facilities (private pharmacies, public sector pharmacies and “popular pharmacies”), using an established methodology. Data on prices and availability of 50 medicines (originator brand, lowest-priced generic and similar medicines) were collected from public, private and popular pharmacies (N=56) across six cities in Southern Brazil. Median prices obtained are divided by international reference prices to derive the median price ratio (MPR). In the private sector, prices were 8.6 MPR for similar medicines, 11.3 MPR for generics and 18.7 MPR for originator brands, respectively. Mean availability was 65%, 74% and 48% for originator brands, generics and similars, respectively. The number of working days needed to pay for a complete medicine treatment (affordability) varied considerably between medicines aimed at treating acute and chronic diseases and by type of medicine. In the public sector, the mean availability of similar medicines was 2-7 times higher than that of generics. The mean overall availability in the public sector ranged from 68.8% to 81.7%. In “popular pharmacies”, mean availability was greater than 90% in all cities. This analysis finds that availability of medicines in the public sector does not meet the challenge for supplying essential medicines to the entire population, as stated in the Brazilian constitution. This has unavoidable repercussions for affordability, particularly amongst the lower socio-economic strata. Policies targeted to reduce the prices of the generics need to be implemented in Brazil, as well as making them more widely available. Popular pharmacies may help overcome the lack of medicines in the public sector, but the limited number of medicines distributed in these facilities is of concern.

**Keywords:** Drugs; Generics; Drug costs; Developing countries; National Health Programs; Pharmaceutical policy; Brazil

## 1. Background

Although access to medicines in Brazil is relatively high<sup>5, 31</sup>, major socioeconomic differences are observed<sup>5</sup>. Despite poor families receiving more medicines free of charge from government-funded sources than the better-off, around 25.5% of the medicines obtained by the bottom income quintile of the population are paid for entirely out-of-pocket<sup>5</sup>.

Overall, Brazilian families spend 9.0% of their household income on health, and medicines account for the largest proportion of all health expenses<sup>35</sup>; 31.5% of monthly health expenses and 2.0% of monthly family income were shown to be spent on medicines purchased out-of-pocket<sup>3</sup>. A similar situation was previously reported in Estonia, among others<sup>39</sup>. Although the majority of the Brazilian population uses the Universal Health System (SUS) which should cover medicines from a select list, 25% of all families pay for private health insurance<sup>36</sup>, which in Brazil does not cover the costs of medicines used in ambulatory care.

Medicine access relates both to affordability and availability (available stock of essential medicines in pharmacies). Availability, particularly in the public sector, is an issue of considerable concern in Brazil. Recent research, using data from across the country, found that for 71% of medicines the availability of generics was below 10%<sup>28</sup>. International evidence, using data from 36 low and middle-income countries, showed that in the public sector, availability ranged from 29 to 54% and prices for private patients were 9 to 25 times higher than international reference prices for generics and 20 times higher for originator products<sup>17</sup>.

Taking into account that both the availability of medicines, particularly in the public sector, and their price in the private sector are important determinants of access to medicines, this study aims to investigate medicine prices, availability and affordability in the Brazilian state of Rio Grande do Sul, located in the South of the country. Particular attention is given to the three types of medicines available in Brazil, notably originator brands, generics and similar medicines and the different types of facilities (private pharmacies, public sector pharmacies and pharmacies from the programme “Farmácia Popular do Brasil”, referred to as “popular pharmacy”). The paper adds to the current knowledge by exploring the effect of (a) type of facility and (b) type of medicine on availability, prices and affordability in Brazil.

Section two discusses medicines coverage in the Brazilian context. Section three describes the methods used in data collection and analysis, whereas section four presents the main results of the analysis. Sections five and six discuss the findings and present conclusions and pharmaceutical policy implications, respectively.

## 2. Coverage of medicines in the Brazilian context

Health care in Brazil is largely publicly financed. Since 1988, Brazil has a universal health system (SUS), which is committed to providing health care to the population at no cost, including the distribution of a list of medicines considered to be essential

(National List of Essential Medicines) for all. In principle, availability of medicines from this list in the public sector should be 100%.

In 2007, total national health expenditure reached R\$224.5 billion (US\$ 96.5 billion)<sup>i</sup>, which represents 8.4% of the gross domestic product (GDP). The per capita figure was R\$1,159 (US\$498.4). The users paid 57.4% of these expenses (4.8% of GDP), whereas 41.6% were paid for by the Brazilian government (3.5% of GDP). The remaining 0.1% was paid for by non-profit organizations. Out-of-pocket expenditure on medicines reached R\$44.8 (US\$19.3) billion in 2007. This figure represents 35% of all families' health expenses for the same period. The government spent 1.9% of GDP on ambulatory medicine purchases. This figure does not include vaccines and medicines dispensed in hospitals. In 2007, families spent 10 times more money on medicines than the government<sup>22</sup>.

With the publication of the National Medicines Policy in 1998<sup>16</sup>, several programs were launched aiming to guarantee medicine access to the population. Therefore, governmental expenses on medicines increased both in absolute terms and as a proportion of health expenditure. A recent study showed that government expenditure on medicines in 2007 was 3.2 times higher than in 2002, and the proportion of expenditure of medicines on total government health expenditure increased from 5.4% to 10.7% over the same period<sup>37</sup>.

All Brazilian citizens are eligible for receiving medicines included in the national list of essential medicines free of charge through the public health system. The list covers medicines aimed at treating the most prevalent diseases in the country. The public health facilities, in general, have a "pharmacy" or "dispensary". Following consultation with a physician, patients can go directly to the pharmacy with a prescription, and receive for free the medicines prescribed, provided they are available. If the medicines are targeted to treat chronic diseases, the prescription is valid for further allocations when the amount provided is finished. Some medicines subject to special control (e.g. antipsychotics) are only dispensed at designated public pharmacies. In addition, the government provides medicines for treating rare diseases or medicines targeting small patient groups, e.g. Crohn's disease, hepatitis B and C, free of charge. This occurs with high cost medicines, when they process follows the criteria established in clinical protocols and therapeutic guidelines from the Ministry of Health<sup>13</sup>.

Charging patients for medicines is strictly prohibited in the public system. The government obtains essential medicines through tenders, in which the cheapest medicine is selected, and usually the contract lasts for one year.

It has been shown that approximately 50% of the population living in the catchment area of a primary health care unit receives medicines free of charge from the public sector, 40% purchase their medicines out-of-pocket and 10% obtain them free from other sources (donation or reimbursement from private health insurance)<sup>5</sup>.

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<sup>i</sup> The exchange rate used was US\$ 0.43 to each Brazilian Real in 25-11-2008. (<http://www4.bcb.gov.br/pec/conversao/Resultado.asp?idpai=convmoeda>)

Although in theory the SUS should be able to provide essential medicines free to the entire population, medicines are often not available when needed. Studies carried out in Brazil have shown that, on average, 40% of the medicines prescribed in primary health care were not available when needed<sup>29,34</sup>. The authors mention serious problems in planning and logistics for drug procurement and distribution. These problems may lead to interruptions in supply, potential waste due to “expired” medicines, and high expenditures for low-priority medicines.

Taking into account that reimbursement for medicine expenses is very rare by Brazilian private health insurance plans, expenses on medicines paid for out-of-pocket directly impact family budgets and may result in catastrophic expenditures<sup>2</sup>.

If medicines are not available in public sector facilities, patients purchase them out-of-pocket in the private market, which may also lead to excessive out-of-pocket spending. A study carried out in the Rio Grande do Sul state showed that 12% of the population spent more than 40% of their “capacity to pay” (defined as average monthly household income adjusted for food expenditure) on health; half of these health expenditures were on medicines<sup>2</sup>.

In order to compensate for these limitations in the availability of free medicines in the public sector, the Brazilian government launched the “popular pharmacy” programme in 2004, financed by the Ministry of Health. The programme sells medicines at low prices to the population, particularly those who use private health facilities but who have difficulty in buying their medicines in private pharmacies<sup>11</sup>. There are two types of popular pharmacies<sup>10</sup>: First, there are exclusive popular pharmacies (EPPs) are run by the state, city governments, universities or other health-related institutions. In these pharmacies, medicines from a list comprising 95 medicines selected on the basis of the most commonly prevailing health problems in Brazil or which are expensive for individuals to acquire, are sold at cost prices; Second, there are those which are run in partnership with private pharmacies using a system of co-payments, created in 2006 as a means to expand the popular pharmacy program. In these facilities the government covers 90% of the price whereas the patient pays the remaining 10%, but only a list of anti-hypertensive, anti-diabetic and contraceptive medicines are sold in this way.

There are crucial differences in the operation of public and private facilities, apart from the source of funding of drugs (publicly funded vs. out of pocket). With regards to the private sector, medicine dispensing has some unique characteristics. Whereas regulation clearly states which medicines can be sold without a prescription<sup>9</sup>, in reality, consumers can purchase medicines without a prescription even in the case of antibiotics, antidiabetics, antihypertensives and antiinflammatory agents, among others<sup>4</sup>. Although the law requires that every pharmacy has a pharmacist present at all times, several outlets do not follow the rule and employ pharmacists who are rarely present in the facility. A study of 595 pharmacies in the South of Brazil, showed that in 12.6% of all visits a pharmacist was not present<sup>21</sup>.

There are some reasons why people opt to use private health facilities, apart from not being able to find a drug in public facilities. For example, better-off individuals who are covered by private insurance, in general, opt not to use public facilities because of both access problems and the feeling that public facilities are not as good as private ones. In

addition, public facilities are located mainly in poor areas distant from the central part of the cities.

There are three types of medicines available in the Brazilian market: originator brands, generics and similar medicines<sup>6</sup>. All generic medicines must be commercialized with no brand. Generics are medicines which are interchangeable with the originator brand (subject to the standard bioequivalence and bioavailability tests)<sup>7</sup>. Similar medicines are all the others available on the market. This type of medicine is comparable to “branded generics”<sup>25</sup> described in the international literature. Branded generics are generics whose manufacturers launch them with a particular brand name, which can be a ‘fantasy’ or invented name (protected by trademark law), or the name of the manufacturer followed by the name of the molecule<sup>25</sup>. Until recently, similar medicines were required to undergo bioequivalence, but not bioavailability tests. The current legislation requires them to undergo both tests<sup>8</sup>.

Currently, similar medicines are frequently cheaper than “generics” because they do not undergo bioequivalence and bioavailability tests with the originator. Although legislation stipulates that they should undergo these tests, there is a transition period enabling them to be on the market without these tests. This transition period expires at the end of 2014.

In summary, lack of availability of medicines in the public sector may lead to (a) out-of-pocket expenditures, which can unnecessarily compromise families’ budgets; or (b) incomplete drug treatments, which may compromise one’s health.

### 3. Methods

#### *Methodology*

The paper uses the WHO/HAI methodology<sup>40</sup> to study price levels, availability and affordability of medicines in the Southern Region of Brazil. This methodology enables researchers to investigate the (a) prices people pay for key medicines<sup>ii</sup>; (b) variability of prices and availability of medicines in different market segments (public, private and other medicine outlets); (c) differences in prices and availability between originator brands and generics; and (d) affordability of medicines among “ordinary”<sup>iii</sup> people<sup>40</sup>.

The methodology relies on conducting surveys, whose key design elements are: (a) data collection takes place in six areas of a selected country or state (in the case of large countries, like Brazil); (b) the survey includes pharmacy outlets from both the public and private sectors; (c) up to 50 medicines are surveyed; (d) data on prices and availability of medicines are obtained by data collectors during visits to the selected pharmacy outlets; (e) for each medicine and pharmacy outlet, data are collected on the originator brand and the lowest-priced generic.

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<sup>ii</sup> Key medicines are those suitable and used for international comparisons (global and regional list) or commonly used therapeutic alternatives to those which are part of the global and regional list.

<sup>iii</sup> Ordinary people are defined as the lowest-paid unskilled government worker.

### *Study area*

The current study has drawn data from the southern region of Brazil (“South”), which is one of five geographical regions of the country (South, Southeast, Midwest, Northeast and North). The South Region consists of three states (Parana, Santa Catarina and Rio Grande do Sul). The sample used in this study was drawn from the state of Rio Grande do Sul, which has a total population of 10.5 million, representing 5.7% of the country’s total population <sup>24</sup>.

Data were collected from six cities within the state: (a) the state capital (Porto Alegre, 1.4 million inhabitants); (b) two cities in the Southern part of the state (Pelotas and Bagé), which are the poorest in the state; (c) one city in the metropolitan area of the state capital (São Leopoldo); (d) one city in the richest part of the state (Caxias do Sul); and (e) one city in the central region of the state (Santa Cruz do Sul). The total population of these six cities represents one quarter of the state’s total population.

The state of Rio Grande do Sul ranks 6<sup>th</sup> in the country (out of 26 states) in terms of gross domestic product (GDP), with a GDP per capita above the national average of R\$13,720 (US\$5,900) per capita. Poverty and income inequality are below the national average <sup>23</sup>. GDP varies considerably across the six study cities, with three having a GDP per capita below the national and state average (São Leopoldo, Pelotas and Bagé) while the remaining three (Porto Alegre, Santa Cruz do Sul e Caxias do Sul) are above these averages <sup>23</sup>. The proportion of individuals below the poverty threshold was under 30% in all cities (below the national average of 36.5%) <sup>24</sup>.

### *Sampling*

The sampling for the survey reflected all ambulatory types of pharmacy outlets. In each of the six cities, four public sector facilities with pharmacies were randomly selected from a list of all public sector facilities that dispense medicines in each city. The only exception was São Leopoldo, where only two health facilities dispensed medicines ( $n_{ph}=22$ ). Five private pharmacies per city were also selected and were matched to the public sector facilities based on their proximity to them ( $n_{pp}=30$ ). In addition, all EPPs ( $n_{epp}=4$ ) were included in the study. The total sample size was  $N=56$ . Pharmacies were visited only once, and interviewers requested to see the packaging of all medicines surveyed. All pharmacies agreed to take part in the study and a written informed consent form was signed prior to data collection.

### *Data collection and medicines*

Data were collected from the beginning of November 2008 to the end of January 2009. Prices and availability of 50 medicines were investigated. Of these, 29 medicines were part of the WHO/HAI global and regional core lists, whereas the remainder, the supplementary list, were selected from the national (RENAME) and municipal (REMUME) lists of essential medicines<sup>14</sup>. Medicines from the global core list are to be included in all medicine price surveys, in order to enable international comparisons. The regional core list is study-specific and accounts for regional differences in medicine

usage, but still allows for cross-country comparisons within the same broad geographical region. The supplementary list of 21 medicines is selected at the country level considering local particularities. The REMUME is part of the RENAME list, following the local epidemiological profile and is obtained directly from the health secretariats of each city. The 50 medicines selected correspond to 12.6% of the 342 medicines that were part of the national essential list (RENAME) in 2008. The names of all medicines included in each list (global, regional and supplementary list) are presented in Table 1.

Antidepressants, anti-epileptics and anxiolytics are subject to controlled dispensing and are distributed by a restricted number of pharmacies. Due care was exercised to include as many of these pharmacies in the sample as possible.

For each selected medicine, data for the following variables were obtained: availability at each sampled outlet, patient price for the originator brand, the lowest-priced generic and the lowest-priced similar medicine.

#### *Outcome variables*

The study endpoints comprised three measures: availability, medicine prices and affordability. Availability was defined as the proportion of pharmacies in which the medicines were available at the time of the survey. The mean availability percentage was calculated as the average percentage value from all medicines. Prices were presented as median price ratios (MPR). The MPR is the ratio of a medicine's median price across outlets divided by the Management Science for Health (MSH) median international reference price for the year preceding the survey (2007)<sup>27</sup>. Affordability was estimated as the number of days that the lowest-paid unskilled government worker earning the minimum monthly wage would need to work in order to purchase a complete course of treatment in a private pharmacy. The gross minimum monthly wage in Brazil in the end of 2008 was R\$415 (US\$178.50); after excluding 8% for national insurance contributions, the adjusted value was R\$381.80 (US\$165)<sup>15</sup>.

#### *Data analysis*

Data entry and analyses were performed using the computerized Excel<sup>R</sup> WHO/HAI Medicine Pricing Workbook, enhanced for the purpose of including originator brands, generics and similar medicines, thus taking into account the peculiarities of the Brazilian context<sup>iv</sup>.

MPRs in private pharmacies were only calculated if the medicine was available on, at least, four facilities. In the case of popular pharmacies, due to the small sample size, calculations of MPR were performed if the medicine was available in at least one facility. Median price differences across the three types of medicines included only medicines for which the pair was found in at least one facility.

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<sup>iv</sup> All collected data (price and availability) were entered in the workbook, consolidated and summarized. Data were entered twice in order to avoid entry errors. Based on the unique feature of the Brazilian medicines market, comprising originators, generics and similar medicines, three workbooks were analyzed: originator brands vs. generics, originator brands vs. similars, and generics vs. similars.

In order to estimate the mean availability of medicines in the EPPs, only 36 medicines were included in this part of the analysis, as the remaining 14 were not commercially available in this type of facility. To avoid underestimation of availability of generic medicines, all cases in which generics were not available in the Brazilian market were excluded from the calculations of availability.

#### 4. Results

Table 1 describes all medicines studied in terms of pharmacological groups, their presence or not in the Brazilian list of essential medicines (RENAME) and availability of the three types of medicines in the public and private sectors. Out of the 50 medicines studied, 43 are part of RENAME. The following medicines, which come either from the global or from the regional list, are neither part of RENAME nor REMUME: atorvastatin 10mg tab, clotrimazole 10mg/g cr, ibuprofen 400mg cap and sinvastatin 20mg tab.

Table 2 shows the mean proportion of availability in the public sector. As expected, no originator brands were found in public sector facilities. Mean availability of similar medicines was 2-7 times greater than that of generics; this difference was larger in the poorest cities (São Leopoldo, Pelotas and Bagé) compared to the wealthier ones. Availability, independently of the type of medicine (generic or similar), was 78.3% in Porto Alegre, 71.5% in Santa Cruz, 76.4% in Caxias do Sul, 80.3% in São Leopoldo, 68.8% in Pelotas and 81.7% in Bagé.

Mean availability of lowest-priced generics was lowest in popular pharmacies of the two poorest cities (São Leopoldo e Bagé) and availability of lowest-priced similar medicines was lower in the two wealthier ones (Porto Alegre e Caxias do Sul) (Table 3). No originator brands were found in popular pharmacies. Mean availability, independently of the type of medicine (generic or similar), was greater than 90% in all cities: 91.6% in Porto Alegre, 91.6% in Caxias do Sul, 97.2% in São Leopoldo and 97.3% in Bagé. In relation to prices, the values were very similar for the lowest-priced similar medicines, but ranged from 2.6 to 4.1 MPR for the lowest-priced generics.

Table 4 presents data on the availability of medicines and prices in the private sector. Mean availability of originator brands ranged from 48 to 91%; equivalent figures were 63 to 88% for lowest-priced generics and 39 to 55% for lowest-priced similar medicines. The availability of originator brands was higher in the two poorest cities (Pelotas and Bagé). Overall, mean availability was 65%, 74% and 48% for originator brands, generics and similar medicines, respectively. In terms of MPR, values ranged from 8.6 for lowest-priced similar medicines to 18.7 for originator brands; MPR was 11.3 for lowest-priced generics.

Taking into account all cities together, the price of both generics and similar medicines is roughly half the price of originator brands (Figure 1). The greatest difference between similar medicines and originator brands was found in Bagé (similar medicines were 62% cheaper than originator brands) whereas the smallest difference was found in São Leopoldo (generics were 40% cheaper than originator brands).

The price difference recorded between originator brand and generics or similar medicines have significant implications for affordability (Figure 2). A seven-day treatment with originator brand ciprofloxacin 500mg would cost 13.7 days of salary; the equivalent figures were 2.2 and 1.9 days for similar and generic medicines. For a seven-day treatment with amoxicillin 500mg, the values are 3.4 (originator brand) and 1.1 and 1.2 days (similar and generic medicines). For a 30-day diabetes treatment with glibenclamide 5mg, the differences were very small (values around 1.0 day for similar and generic medicines and 1.5 for originator brand). A 30-day ulcer treatment with ranitidine 150mg would cost 9.2 (originator brand) and 3.3 and 3.0 days (generics and similar medicines respectively). The originator medicine for a 30-day treatment for asthma (salbutamol inhaler, 200 doses) would cost 2.1 (originator brand) and 1.6 days (similar medicine). No generics are available for salbutamol inhaler in the Brazilian market.

## 5. Discussion

Our results suggest, first, that prices of generics and similar medicines are, on average, half those of originator brands. The MPR for all medicines (brands, generics and similars) was found in all cases to be significantly greater than one, indicating that prices in Brazil are higher than international reference prices. Public sector availability of generics or similar medicines is lower than expected and, consequently, patients resort more often to purchasing medicines in private pharmacies, where availability is higher, but prices are high and patients have to pay fully out-of-pocket, thus impacting affordability.

In private sector pharmacies, generics were the most likely medicines to be available, followed by originator brands and similar medicines. Because reimbursement of medicines is very rare in Brazil, private pharmacies typically try to offer all types of medicines, so that consumers from all social classes are able to obtain their medicines. In the recent past, generics accounted for only a small proportion of the medicines market in Brazil<sup>4</sup>, because people were more likely to buy either the cheapest medicine (usually a similar) or the originator brand based on the belief that the latter were of better quality than generics or similar medicines. In recent years, the market share of generics has increased significantly both in absolute terms and in comparison with originator brands and similar medicines<sup>32</sup>.

Mean availability of generics in the private sector was 73.8%, a figure comparable to those observed in the Americas, Eastern Mediterranean, Europe and Southeast Asia and higher than those in Africa or Western Pacific, whereas mean availability of originator brands (64.8%) was similar to that found in upper middle income countries (61.8%)<sup>17</sup>. Private sector MPRs were lowest for the similar medicines, a finding consistent with previous research<sup>28</sup>.

Availability of medicines in the public sector was at or above 69% in all cities, and was slightly lower than availability investigated in another study<sup>30</sup>. Placing our availability findings in an international context we find that availability in Brazil is lower than that

of Sudan (82%)<sup>18</sup>, but higher than that in Malaysia (5-40%, depending on the medicine)<sup>1</sup>, India (0-30%, depending on the region of the country)<sup>26</sup> and Chinese rural areas (38.9%)<sup>41</sup>.

Still, our findings on availability are poor considering that all Brazilian citizens should have access to all essential medicines free of charge, a right which is constitutionally protected<sup>12</sup>. The lack of several medicines in the public sector forces patients to purchase their medicines out-of-pocket in private sector outlets and may lead to catastrophic health expenses<sup>2</sup> and/or undertreatment<sup>34</sup>.

Our affordability findings varied by therapeutic class and type of medicine and are attributable to poor availability in the public sector. Although the lowest-paid unskilled government worker salary was used as a measure of affordability it is likely that a significant part of the population earns less<sup>17</sup>. In Brazil, 32.8% of the population live below the poverty line of US\$1 per day<sup>24</sup>. For these people, any out-of-pocket expense related to medicines could be catastrophic.

Availability of generic medicines in the public sector was 9-23% in all cities studied, whilst availability of similar medicines was 56 – 70%. These are comparable to those in other regions of the country, where similar medicines are more widely available (86.4%) than generics (25%)<sup>28</sup>.

The different levels of availability observed in each city may partly reflect two trends; first, decentralization of the Brazilian public health system, whereby municipalities fund a proportion of medicines directly out of their budgets; and second, differences in medicines distribution, where supply of public sector facilities is often problematic (inadequate quantities, problems with frequency and time of distribution, and inefficient stock control, among others)<sup>20,30</sup>.

The availability of medicines which are part of the list of the popular pharmacies was high (>90% in all cities). Similar results have been described in other regions of the country<sup>19</sup>. As in public sector facilities, similar medicines are also more frequently available than generics in popular pharmacies. Retail prices in popular pharmacies are standardized, and, therefore, differences observed across cities reflect the fact that different medicines were available in each facility, thus resulting in a different mean value. Popular pharmacies, in theory, may represent an important additional source of access to medicines for the population, given that prices are much lower than those observed in private pharmacies. Yet, the number of popular pharmacies is low and the list of medicines provided is limited. The fact that a high proportion of the users of the programme are also SUS users – 39.2% according to a recent study<sup>33</sup> - suggests that the lack of medicines in the public system is a reality, and patients often need to use popular pharmacies in order to obtain essential medicines, which should be supplied free by the government.

The highest median price difference between originator brand and the lowest-priced generic was 60%. Between 2000 to 2004, when generic medicines were launched in Brazil, the mean price difference between generics and originator brand products was 40% but this tended to increase over time<sup>38</sup>. Both types of medicines presented absolute

increases in their prices, but the increase in the price of the originator brand was relatively higher than that of the generic equivalent(s)<sup>38</sup>.

An analysis of different types of medicines suggests low availability of antidepressants, anti-epileptics and anxiolytics in the public system. This could be explained by the way these medicines are dispensed. Because their dispensing is tightly regulated, they are available in specific facilities in some cities. If we consider only the facilities which are able to distribute these medicines, availability ranges from 75 to 100%.

The analysis is not without limitations. Caution should be exercised when extrapolating our data to the national level because there may be regional differences in public and private sector availability of medicines across the different regions of the country. Such differences may reflect different priorities in health care given the different profiles of morbidity outside the study region. Still, our results compare well with other studies conducted in Brazil. There may be differences in prices between this region and other regions in the country, partly because of differences in sales taxes, but these are marginal and are unlikely to affect our comparisons with other national-level evidence. Because the proportion of informal work varies considerably across regions of the country, care should be exercised when extrapolating our affordability findings to the national level. Finally, there are inherent limitations relating to the WHO/HAI methodology but these have been discussed elsewhere<sup>17</sup>.

## **6. Conclusions and pharmaceutical policy implications**

High prices, poor availability in public sector facilities and low affordability suggest a number of policy implications for the Brazilian government. First, it needs to maintain its commitment of providing a list of essential medicines free of charge at public facilities, aiming to fulfill the target of 100% availability for this list of medicines. Second, the participation of generic products in the market needs to be increased and their prices reduced further, through better tendering processes, so that generics become cheaper than similar products. Although generics and similar medicines are alternatives to originator brands, they are also 8.6 - 11.3 more expensive than international reference prices. Therefore, an overall reduction in medicine prices should be a key priority. In order to achieve this, reductions in taxes and duties on medicines, and margin regulations in the supply chain could be considered. Policy measures used in developed country settings and evidence on their performance could be used in the Brazilian context<sup>25</sup>. Third, the routines of acquisition, stock and distribution of medicines in the public sector need to be re-evaluated, ensuring adequate and timely distribution of essential medicines. The use of information and communication technologies should be prioritized. Fourth, if the government continues to be unable to provide for free all essential medicines needed by the population, it is necessary to expand the popular pharmacy programme, by increasing the number of facilities and the number of medicines available. Alongside that, the quantity and quality of information available to patients about prices should also improve. Finally, the private market requires tighter regulation, so that only OTC medicines are dispensed without a prescription.

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**Table 1.** List of the medicines investigated (N=50) according to therapeutic classes, methodology list belonged to, presence in the Brazilian list of essential medicines (RENAME) and in the Popular Pharmacy Programme, and mean % availability in the public and private sector of the three types of medicines (originator brand, similar medicines and generics). Sample of six cities from the Rio Grande do Sul state, Brazil, 2008-9.

Therapeutic class	Medicine	Methodology list	RENAME 2008	Popular pharmacy	Mean % availability							
					Public <sup>1</sup>			Private				
					N <sup>2</sup>	Generic	Similar	N <sup>3</sup>	Generic	N <sup>4</sup>	Similar	Originator brand
Analgesic	Paracetamol 500 mg tab	Supplementary	Yes	Yes	5	77.8	11.1	12	46.7	14	60.0	60.0
Anthelmintic	Mebendazole 20 mg/ml susp	Supplementary	No	Yes	6	9.1	86.4	16	83.3	30	50.0	83.3
Antidepressant	Amitriptyline 25 mg tab <sup>5</sup>	Global	Yes	Yes	6	4.5	27.3	10	86.7	6	53.3	70.0
	Fluoxetine 20 mg cap <sup>5</sup>	Regional	Yes	No	1	0	25.0	11	93.3	11	70.0	26.7
Antidiabetic	Glibenclamide 5 mg tab	Global	Yes	Yes	6	0	100.0	7	73.3	15	70.0	83.3
	Metformin 850 mg tab	Regional	Yes	Yes	6	22.7	77.3	17	90.0	14	56.7	90.0
Antiepileptic	Carbamazepine 200 mg tab <sup>5</sup>	Supplementary	Yes	Yes	6	4.5	27.3	11	86.7	6	13.3	66.7
	Clonazepam 2mg tab <sup>5</sup>	Regional	Yes	No	2	0	25.0	5	43.3	5	16.7	93.3
	Phenytoin 100 mg tab <sup>5</sup>	Regional	Yes	Yes	6	22.7	9.1	3	60.0	3	3.3	93.3
Antifungic	Miconazole 20 mg/g cr	Supplementary	Yes	No	5	56.6	16.7	9	83.3	10	16.7	33.3
	Nystatin 100,000 UI/ml susp	Supplementary	Yes	Yes	4	57.5	0	9	90.0	16	30.0	63.3
Antihypertensive	Amlodipine 5 mg tab	Regional	Yes	No	0	-	-	16	76.7	14	46.7	36.7
	Atenolol 50 mg tab	Global	Yes	No	0	-	-	17	90.0	13	76.7	76.7
	Captopril 25 mg tab	Global	Yes	Yes	6	18.2	81.8	16	86.7	35	76.7	36.7
	Enalapril 10 mg tab	Regional	Yes	Yes	3	0	66.6	15	86.7	29	93.3	60.0
	Methyldopa 250 mg tab	Supplementary	Yes	Yes	5	0	83.3	4	70.0	16	40.0	70.0
	Nifedipine 10mg tab	Supplementary	Yes	No	5	0	59.0	0	0	5	36.7	66.7
	Propranolol 40 mg tab	Supplementary	Yes	Yes	6	0	100.0	8	80.0	20	63.3	73.3
	Verapamil 80 mg tab	Supplementary	Yes	Yes	4	12.5	71.3	8	90.0	6	26.7	70.0
Antiinfective	Amoxicillin 500 mg tab	Global	Yes	Yes	6	31.8	68.2	23	100.0	28	60.0	56.7
	Amoxicillin 50 mg/ml susp	Regional	Yes	Yes	6	0	90.9	14	93.3	12	53.3	63.3
	Azithromycin 500 mg tab	Regional	Yes	Yes	1	0	25.0	10	73.3	19	86.7	26.7
	Benzylpenicillin-benzathin 1200000 U.I./vial inj	Supplementary	Yes	Yes	6	0	77.3	0	0	2	0	90.0
	Cefalexin 500 mg tab	Supplementary	Yes	Yes	5	33.3	22.2	13	86.7	16	16.7	60.0

...continuation of table 1.

Therapeutic class	Medicine	Methodology list	RENAME 2008	Popular pharmacy	Mean % availability							
					Public <sup>1</sup>			Private				
					N <sup>2</sup>	Generic	Similar	N <sup>3</sup>	Generic	N <sup>4</sup>	Similar	Originator brand
Antiinfective	Cefalexina 50 mg/ml susp	Supplementary	Yes	Yes	5	22.2	44.4	7	83.3	11	30.0	40.0
	Ceftriaxone 1g/vial inj	Global	Yes	No	0	-	-	9	66.7	3	23.3	20.0
	Ciprofloxacin 500mg tab	Global	Yes	Yes	1	0	25.0	15	80.0	21	66.7	33.3
	Co-trimoxazole 80+400mg tab	Supplementary	Yes	Yes	6	9.1	77.3	1	26.7	28	73.3	86.7
	Co-trimoxazole 8+40mg/ml susp	Global	Yes	Yes	6	0	72.7	3	66.7	28	53.3	93.3
	Clotrimazole 10 mg/g cr	Regional	No	No	0	-	-	12	66.7	18	43.3	96.7
	Doxycycline 100 mg tab	Supplementary	Yes	Yes	3	0	91.6	1	50.0	7	36.7	53.3
	Erythromycin 500 mg tab	Supplementary	Yes	Yes	6	0	86.4	0	0	10	53.3	63.3
	Erythromycin 50 mg/ml susp	Supplementary	Yes	Yes	6	0	77.3	0	0	7	30.0	53.3
	Metronidazole 250 mg tab	Supplementary	Yes	Yes	5	38.9	27.8	3	63.3	16	20.0	73.3
	Metronidazole 400 mg tab	Regional	Yes	No	2	37.5	25.0	2	73.3	4	33.3	86.7
Antiinflammatory	Bec lometasone 250 mcg/dose inhaler	Regional	Yes	No	3	0	0	0	0	1	10.0	46.7
	Dic lofenac sodium 50 mg tab	Global	No	No	1	0	75.0	9	76.7	36	93.3	90.0
	Ibuprofen 400 mg cap	Regional	No	No	0	-	-	0	0	0	0	0
	Prednisone 5 mg tab	Supplementary	Yes	Yes	5	11.1	88.9	10	90.0	10	60.0	93.3
Antithrombotic agent	Acetylsalicylic acid 100mg tab	Supplementary	Yes	Yes	6	18.2	86.4	5	76.7	8	86.7	86.7
Anxiolytic	Diazepam 5 mg tab <sup>5</sup>	Global	Yes	Yes	2	0	25.0	3	70.0	7	46.7	70.0
Cardiac therapy	Digoxin 0,25 mg tab	Supplementary	Yes	Yes	6	40.9	63.6	3	73.3	9	46.7	73.3
Diuretic	Furosemide 40 mg tab	Regional	Yes	Yes	6	0	100.0	6	70.0	17	76.7	93.3
	Hydrochlorothiazide 25 mg tab	Regional	Yes	Yes	6	9.1	95.5	5	56.7	5	83.3	90.0
Drug for acid related disorder	Omeprazole 20 mg cap	Global	Yes	Yes	4	0	82.5	10	86.7	37	90.0	46.7
	Ranitidine 150 mg tab	Regional	Yes	Yes	1	0	100.0	12	76.7	27	43.3	43.3
Drug for obstructive airway disease	Salbutamol 100mcg/dose inhaler	Global	Yes	No	2	0	52.5	0	0	3	63.3	86.7
	Salbutamol xar 2mg/5ml syrup	Supplementary	No	Yes	6	45.5	31.8	11	80.0	21	10.0	73.3
Lipide modifying agent	Atorvastatin 10 mg tab	Regional	No	No	0	-	-	0	0	1	20.0	53.3
	Simvastatin 20 mg tab	Global	No	Yes	0	-	-	7	70.0	15	93.3	33.3

<sup>1</sup> No originator brand was located in the public sector <sup>2</sup> Out of the six cities studied, in how many the medicine was part of the list of essential medicines <sup>3</sup> Number of generics available in the market

<sup>4</sup> Number of similar medicines available in the market <sup>5</sup> Medicines subject to especial control. In some cities, they are distributed in specific pharmacies only

**Table 2.** Mean availability (%) of medicines<sup>1</sup> in the public sector (n=22 facilities). Sample of six cities from the Rio Grande do Sul state, Brazil, 2008-9.

City	N	Lowest-priced generic		Lowest-priced similar	
		Mean % <sup>2</sup>	SD % <sup>3</sup>	Mean %	SD %
Porto Alegre	30	23.3	41.9	55.8	41.9
Santa Cruz do Sul	38	14.5	31.6	59.9	39.7
Caxias do Sul	35	17.1	32.5	60.7	39.4
São Leopoldo	33	13.6	31.3	69.7	43.2
Pelotas	32	8.9	21.0	61.7	39.6
Bagé	26	11.5	27.6	70.2	38.1

<sup>1</sup>Only medicines included in the list of essential medicines within each city were included in this analysis

<sup>2</sup>Mean availability %

<sup>3</sup>Standard deviation %

**Table 3.** Availability and price of the 36 medicines dispensed by the Popular Pharmacy (n=4 facilities). Sample of six cities from the Rio Grande do Sul state, Brazil, 2008-9.

City	Lowest-priced generic				Lowest-priced similar	
	n <sup>1</sup>	Price	Availability	n	Price	Availability
		MPR <sup>2</sup> (Min - Max)	Mean % (SD)		MPR (Min - Max)	Mean % (SD)
Porto Alegre	8	3.63 (1.30 - 11.41)	22.2 (42.2)	25	2.61 (0.33 - 15.17)	69.4 (46.7)
Caxias do Sul	8	2.88 (1.30 - 11.41)	22.2 (42.2)	25	2.61 (0.33 - 15.17)	69.4 (46.7)
São Leopoldo	7	2.64 (1.30 - 11.41)	19.4 (40.1)	28	2.86 (0.33 - 15.17)	77.8 (42.2)
Bagé	6	4.12 (1.30 - 11.41)	16.7 (37.8)	29	2.61 (0.33 - 15.17)	80.6 (40.1)
Total	10	2.88 (1.30 - 11.41)	20.1 (35.8)	31	2.64 (0.33 - 15.17)	74.3 (38.0)

<sup>1</sup> Number of medicines included in the analysis of the MPR

<sup>2</sup> MPR= Median price ratios (= median prices / IRP) → IRP = International reference prices (MSH, 2007)

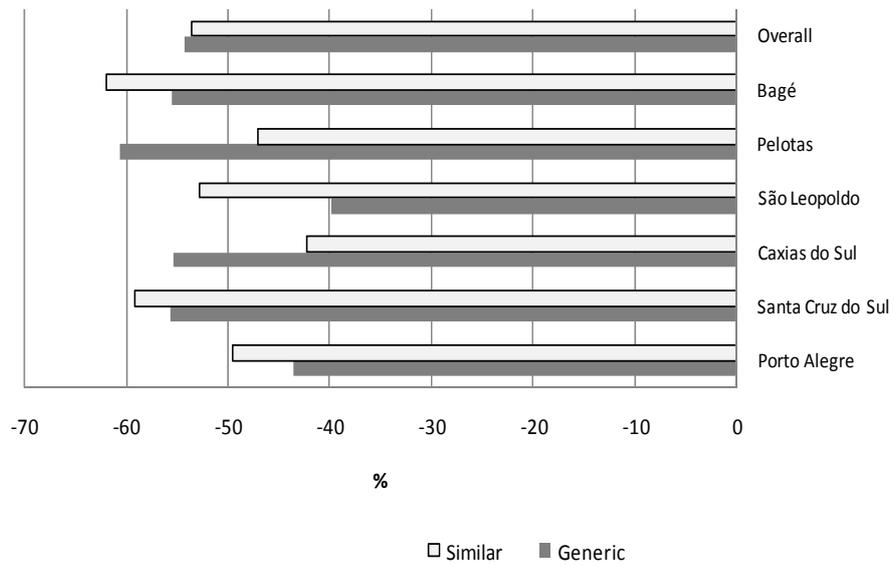
**Table 4.** Availability of medicines and prices in the private sector (n=30 pharmacies). Sample of six cities from the Rio Grande do Sul state, Brazil, 2008-9.

City	Originator brand			Lowest-priced generic			Lowest-priced similar		
	N <sup>1</sup>	MPR <sup>2</sup> (min - max)	Availability (SD) <sup>3</sup>	n	MPR (min - max)	Availability (SD)	n	MPR (min - max)	Availability (SD)
Porto Alegre	23	17.06 (2.70 - 94.58)	57.6% (37.6%)	21	9.97 (0.93 - 34.36)	63.3% (28.6%)	18	15.61 (3.17 - 37.87)	54.4% (33.1%)
Santa Cruz do Sul	18	25.99 (2.60 - 87.57)	57.6% (30.1%)	11	9.88 (0.85 - 37.76)	68.8% (22.8%)	23	18.34 (1.88 - 32.49)	39.2% (32.8%)
Caxias do Sul	17	30.63 (2.70 - 94.68)	58.0% (23.3%)	25	11.33 (0.93 - 48.92)	71.2% (25.6%)	14	12.40 (1.86 - 37.48)	47.2% (30.4%)
São Leopoldo	15	29.40 (4.90 - 66.45)	48.4% (28.3%)	17	8.42 (0.85 - 33.93)	65.6% (26.3%)	17	8.18 (2.75 - 38.82)	52.0% (31.6%)
Pelotas	35	19.08 (2.70 - 107.47)	75.6% (26.9%)	34	9.76 (0.87 - 48.95)	85.6% (25.3%)	10	9.36 (2.94 - 22.37)	41.2% (27.5%)
Bagé	46	16.73 (1.32 - 162.53)	91.0% (15.7%)	39	9.55 (0.36 - 49.82)	88.4% (20.6%)	20	8.81 (1.26 - 36.45)	54.8% (33.3%)
All	49	18.66 (1.36 - 168.41)	64.8% (22.8%)	42	11.32 (0.84 - 54.94)	73.8% (18.8%)	45	8.60 (1.11 - 38.84)	48.1% (26.8%)

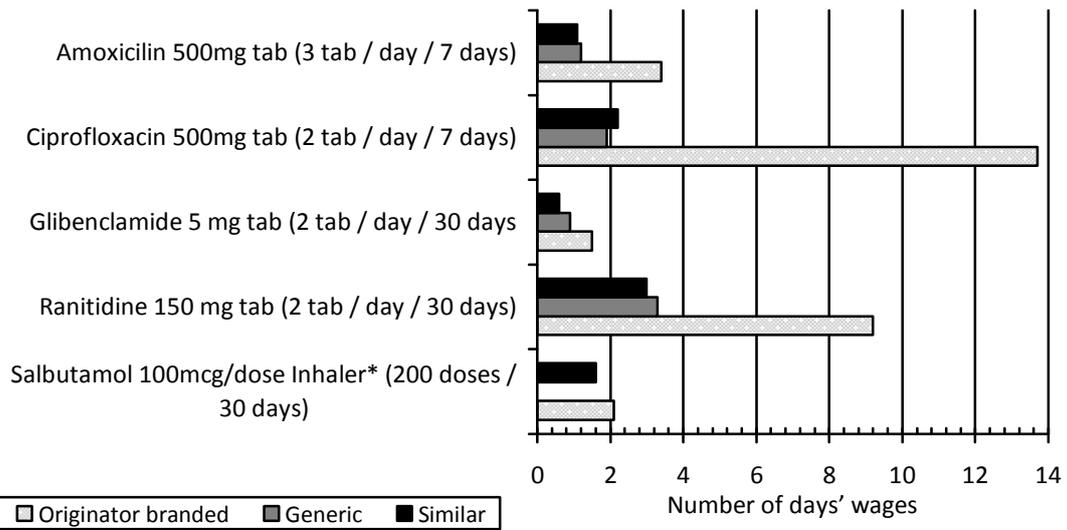
<sup>1</sup> N = Total number of medicines included in the analysis. To calculate the MPR, we only included medicines which were available on at least four facilities.

<sup>2</sup> MPR= Median price ratios (= median prices / IRP) → IRP = International reference prices (MSH, 2007)

<sup>3</sup> Mean availability % (standard deviation)



**Figure 1.** Median price difference (%) of generic and similar medicines in relation to originator brand medicines in the private sector for matched pairs of medicines available on at least one facility. Sample of six cities from the Rio Grande do Sul state, Brazil, 2008-9.



**Figure 2.** Affordability (%) of generic, originator brand and similar medicines using a list of selected medicines. Sample of six cities from the Rio Grande do Sul state, Brazil, 2008-9.

\* Generic medicines of the salbutamol 0.1 mg/dose inhaler were not available at the time of data collection.

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