

INSULIN PRICES PROFILE

April 2016



acciss 
Addressing the Challenge and Constraints
of Insulin Sources and Supply

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Acronyms

ACCISS	Addressing the Challenge and Constraints of Insulin Sources and Supply
ARV	Antiretroviral
DDD	Defined Daily Dosage
EML	Essential Medicines List
GCC	Gulf Cooperation Council
GDP	Gross Domestic Product
GDPpc	Gross Domestic Product per capita
HAI	Health Action International
HIV/ AIDS	Human Immunodeficiency Virus / Acquired Immune Deficiency Syndrome
IDF	International Diabetes Federation
IIF	International Insulin Foundation
LMIC	Low and Middle-Income Countries
MSH	Management Sciences for Health
NCD(s)	Non-communicable diseases
UHC	Universal Health Coverage
UK	United Kingdom
UN	United Nations
US	United States of America
USD	United States Dollar
UNRWA	United Nations Relief and Works Agency for Palestine Refugees in the Near East
WHO	World Health Organization
WHO AFRO	World Health Organization African Regional Office

Executive Summary

In mid-2015, a time series analysis was conducted on Management Sciences for Health (MSH) *International Drug Price Indicator Guide* insulin supplier and buyer prices, and a survey was conducted on insulin prices i.e. government procurement prices and volumes, patient prices and affordability (in the public and private sectors), and reimbursement prices.

Methodology

MSH insulin prices from 1996 to 2013 were obtained for both suppliers and purchasers from the online *International Drug Price Indicator Guide*. Prices were standardised to 10ml 100IU/ml insulin and adjusted using the US Department of Labor Bureau of Labor Statistics consumer price index and adjusted to 1996 prices. To enable comparisons, MSH prices were also analysed for six non-communicable (NCD) medicines and three medicines to treat HIV/AIDS. Government procurement prices of insulins were collected from national medicine procurement officers in 26 countries and two organizations (Gulf Cooperation Council, GCC and United National Relief and Works Agency for Palestine Refugees, UNRWA). Requests for patient prices were made directly to people who have undertaken WHO/HAI price surveys, members of various networks and via listserv requests. Prices were provided for 43 countries.

Reimbursement prices were obtained from publicly accessible databases for national social insurance schemes. Data were obtained from 28 countries. Procurement prices were adjusted, according to the INCO term, to cover costs to the national central store. All prices were standardized to 10ml of 100IU/ml insulin in US dollars. Where more than one price was recorded for a product, the mean price was taken. Based on median prices, affordability was expressed as the number of days the lowest paid unskilled government worker would have to work to buy 10ml of insulin.

Findings

MSH supplier and buyer prices

Between 1996 and 2013, prices of 11 different suppliers were listed and purchases were made by 18 countries and the Organisation of Eastern Caribbean States. Both the supplier list and the buyer list included 4 human insulins. Overall, the median supplier and buyer prices were \$5.30 and \$4.31, respectively. While in some years the range in supplier and buyer prices was wide, median prices of each were fairly steady over the 17 years. Buyers in the WHO AFRO region, and those from low- and lower-middle income countries, had median prices above the overall median price for 7 and 8 years, respectively. The buyer price for insulin in cartridges was about three times the price of insulin in vials. There was little difference in median buyer prices for the different types of human insulin.

Government procurement prices

Human insulins were more often procured and lower priced (median \$5.99) than analogues (\$34.20). UNRWA (\$2.92) and GCC prices (\$4.20) for human insulin were lower than the median national prices. Procurement prices varied across countries e.g. regular/isophane (premixed) 30/70 insulin ranged from \$2.24 in Pakistan to \$32.00 in the Kyrgyz Republic. Prices also varied by presentation. Across the five insulin types with the most price points (aspart, glargine, isophane, regular and premixed 30/70), vials (\$5.84) were lower priced than cartridges (\$17.93) and prefilled pens (\$27.31). Significant savings would result in some countries if they only purchased human insulin e.g. Iran would save \$49 million. Of the insulins purchased, 89 percent by volume were human insulins and 60% were purchased in

vials. Premixed 30/70 insulin accounted for 41 percent of the purchases, and Novo Nordisk products had the largest percentage of total volume (44 percent).

Patient prices and affordability

Across the countries, median patient prices in the public sector were \$7.64 for human insulin and \$45.03 for analogues. A similar picture was seen in the private sector with analogues higher priced (\$39.35) than human insulins (\$16.65). For human insulin, median prices were highest in high-income countries in the public (\$35.77) and private (\$21.69) sectors. They were lowest in upper-middle income countries in the public sector (\$6.17), and in low-income countries in the private sector (\$8.00). In both sectors, some large price variations were seen across the countries e.g. premixed 30/70 insulin ranged from \$2.16 (Sri Lanka) to \$36.47 (Germany) in the public sector, and \$3.72 (Venezuela) to \$39.08 (New Zealand) in the private sector. Some large price variations for brands of human insulin were seen even within a country economic level e.g. in the private sector, both Insulatard® and Humulin R® ranged from about \$6-\$50 across five low- and lower-middle income countries, respectively. For analogue insulins, median prices were highest in high-income countries in the public (\$49.31) and private (\$44.28) sectors. Prices were lowest in lower-middle income countries in the public sector (\$25.69) and private sector (\$23.57). As with human insulins, some large price variations were seen across the countries e.g. glargine ranged from \$16.60 (Vietnam) to \$112.93 (China) in the public sector, and \$8.32 (India) to \$196.46 (Venezuela) in the private sector.

Insulins were largely unaffordable for those on low incomes. On average, they were less affordable in the private sector compared to the public sector, and analogues were less affordable than human insulins. Mean affordability in the public sector was 2.5 days' wages for human insulins, and 7.5 day's wages for analogues. In the private sector, it was 3.5 and 9.5 days' wages for human and analogues insulins, respectively. In a number of countries, all insulins required more than 3 days' wages even when purchased in the public sector.

Reimbursement prices

The median reimbursement price for human and analogue insulins was \$19.14 and \$27.90, respectively. In the few countries reimbursing animal insulin, the median price was \$65.67. Median prices of human insulins ranged from \$17.75 (premixed 30/70) to \$22.94 (premixed 15/85). For analogues, median prices ranged from \$24.52 (glulisine) to \$49.88 (degludec).

Insulin price components

No data was found on insulin price components in the pharmaceutical supply chain (mark-ups, tariffs, taxes and other charges). Cumulative mark-ups for other medicines were four percent -1695 percent (median 51 percent), with some very high levels in some lower-income countries.

Conclusion

Over time, median MSH prices did not vary substantially, however, there were variations between different WHO Regions and World Bank country income groups, with WHO AFRO and lower-income countries paying more for insulin than other regions and income groups. This shows that differential pricing programmes may not be having the desired impact. Different insulin types and strengths did not seem to impact price, but cartridges were one of the drivers increasing the costs of insulin for health systems and individuals. Insulin was higher priced than other NCD medicines, showing more must be done to contain insulin prices.

The survey showed that prices of human and analogue insulins vary by type, presentation, brand and country for government procurement prices, patient prices and reimbursement prices. Overall, across all three price types, human insulins were lower priced than analogue insulins, and vials were lower priced than cartridges and pens. Governments need to do more

to make insulin affordable.

Purchasing human rather than analogue insulins would result in significant savings for some governments. Further savings would be possible if vials were purchased rather than pens and cartridges. Procurement prices varied substantially for different brands of the same insulin type which offers further opportunities for cost-savings, which would result in treating more people without any increase in expenditure. Countries were paying high reimbursement prices for both human and analogue insulins. Agencies should use their purchasing power to bring insulin prices down, without shifting any costs to people on insulin.

Price components need to be studied to identify all the charges that contribute to the final patient price of human and analogue insulins.

1. Introduction

1.1 ACCISS Study

Today, approximately 100 million people around the world need insulin, including all people living with type 1 diabetes and between 10- 25 percent of people with type 2 diabetes. Although insulin has been used in the treatment of diabetes for over 90 years, globally more than half of those who need insulin today still cannot afford and/or access it. Without insulin, people living with type 1 diabetes will die. Many more will suffer from diabetes-related complications, like blindness, amputation and kidney failure, and, ultimately, premature death.

There are many complex issues that affect access to this life-saving medicine, creating inequity and inefficiency in the global insulin market. These issues include the global insulin market domination by three multinational manufacturers, import duties affecting the price insulin entering different countries, and mark-ups, taxes and other charges in the public and private sector supply chains that affect the final patient price.

The innovative global study, Addressing the Challenge and Constraints of Insulin Sources and Supply (ACCISS), sets out to identify the causes of poor availability and high insulin prices and develop policies and interventions to improve access to this essential medicine, particularly in the world's most under-served regions. The three-year study involves a unique group of leading international experts as members of the study's advisory and technical groups. ACCISS is co-led by Margaret Ewen at Health Action International, David Beran from Geneva University Hospitals and the University of Geneva, and Richard Laing from Boston University School of Public Health.

The study will be carried out in three phases. The first phase was mapping the global insulin market from various angles including trade issues, patents on insulin, market issues (including which pharmaceutical companies manufacture and distribute insulin) prices, trade issues, tariffs and taxes on insulin, and current initiatives to improve access to insulin. This profile on insulin prices is a result of the mapping work in phase one, and is one of several profiles on the global insulin market to be published. All profiles can be accessed on the ACCISS Study section of HAI's website: <http://haiweb.org/what-we-do/accss/>.

1.2 The Insulin Prices Profile

Background

One of the six key elements of a health system is to ensure equitable access to essential medicines of assured quality, safety, efficacy and cost-effectiveness, and that they are utilised in a scientifically sound and cost-effective way.(1) The voluntary target established by the WHO Global Action Plan for the Prevention and Control of NCDs 2013-2020 (GAP) is "80% availability of the affordable basic technologies and essential medicines, including generics, required to treat major NCDs in both public and private facilities."(2) In setting this target, WHO did not define the term 'affordable'. This WHO target has already been reached in many settings for medicines to treat HIV/ AIDS, malaria and tuberculosis and also for vaccines, but data presented in the Global Status Report on NCDs 2014 shows that this target for NCDs is far from being achieved for NCD medicines.(3)

Work by the International Insulin Foundation (IIF) in Kyrgyzstan, Mali, Mozambique, Nicaragua, the Philippines, Vietnam and Zambia found a variety of barriers to insulin access, one of which was its overall price in comparison to other medicines. Insulin costs on average

US\$ 4.20 per month for treatment, which is up to 74 times higher, priced than for other treatment courses of medicines for NCDs.(4-14) In addition, for example, in Mali and Mozambique insulin was present at only 20 percent of the facilities where it should have been meaning that availability was an issue as well as affordability.(15) The factors causing poor insulin availability are present both at global and national levels and cannot be addressed in isolation. Therefore it is important to understand the path of insulin from “production” to “administration” in order to improve access.(16)

A snapshot survey carried out in 2010 by Health Action International (HAI) found that, across 60 countries, the full price a person would pay for a 10ml vial of soluble human insulin in the private sector ranged from \$1.55 in Iran to US\$76.69 in Austria - a difference of almost 5000 percent. Average prices for brands manufactured by two companies were similar within most WHO regions except in Europe (EURO) and South East Asia (SEARO), with one company’s insulin being 60 percent higher priced than its competitors in Europe but costing 40 percent less in SEARO.(17) The survey noted the dominance of two manufacturers with little competition identified. Across the WHO regions the average price of insulin from one company doubled from \$15 per vial in SEARO to \$32 in EURO. The variation for the other main manufacturer was found to be slightly less with an average of \$15 in the Eastern Mediterranean Region (EMRO) to \$25 in the Americas (AMRO). Insulin vials from other manufacturers had an average price of \$3 in SEARO to \$23 in the AMRO.

Data from medicine price and availability surveys undertaken in LMICs from 2008, using the WHO/HAI methodology, found that some governments purchase insulin at higher prices than those available on the international market.(18, 19) The range across 10 surveys, three insulin types (regular, isophane and premixed 30/70) and product types (originator brands and biosimilars) was 0.33 to 5.87 times the MSH international reference price (price per vial from US\$ 2.55 to US\$ 48.25). In the public sector in countries where people pay for insulin out-of-pocket, the range was 0.67 – 1.44 times the international reference price (price per vial US\$4.59 to US\$11.12). In the private sector the range was 0.56- 3.85 times the international reference price (price per vial US\$5.03 to US\$28.86). In the public sector, the lowest paid unskilled government worker would have to work from 0.4 days to 6.2 days to pay for one 10ml vial, whereas in the private sector it was 0.4 days to 5.0 days.

Clearly the price of this life-saving medicine matters – particularly to people having to pay for insulin out-of-pocket. It also matters to governments and insurers when paying for insulin.

Objective

The objective of this study was to collect and analyse current insulin prices, from publicly available price databases or from national key informants, to ascertain price levels and price variations across different formulations, presentations, countries etc.

Data was collected on:

- Management Sciences for Health (MSH) *International Drug Price Indicator Guide* supplier and buyer prices
- Government procurement prices and volumes procured
- Patient prices and insulin affordability
- Reimbursement prices
- Price components in the pharmaceutical supply chain

MSH is a non-profit organisation established in 1971.(20) Since its establishment it has worked in over 150 countries to develop health systems focusing on improving quality, availability and affordability of health services. One of the tools developed by MSH is the

International Drug Price Indicator Guide. The Guide provides a variety of prices from different sources including pharmaceutical suppliers, international development agencies and governments. The Guide allows for comparison of prices of medicines of assured quality and is used as a reference in many approaches looking at access to medicines including the WHO/HAI methodology. The Guide therefore is an essential resource for those procuring medicines as it allows a gauge of the prices available on the international market. Uses include determining the prices of different medicines, comparison of prices paid compared to those available on the international market (the MSH price is often referred to as the International Reference Price or IRP) and for planning purposes.(21) The Guide includes all medicines from the WHO's Model Essential Medicines List.

The data in this report was collected from April 2015 to August 2015. Further insulin price surveys will be undertaken in 2016 as part of the ACCISS Study. They will include assessing insulin availability in the public and private sectors, and assessing price components in the pharmaceutical supply chain (mark-up's, tariffs, taxes and other costs). Please note that the ACCISS Study has also published a report on tariffs and taxes on insulin. It can be access from the HAI website <http://haiweb.org/what-we-do/acciss/>.

2. Methodology

2.1 Data Collection and Entry

MSH Supplier and Buyer Prices

The MSH International Drug Price Indicator Guide lists prices from two sources i.e. suppliers and buyers. Suppliers fall into two categories (1) international development agencies providing medicines to countries or programmes, including for example the United Nations Population Fund (UNFPA); and (2) those who supply medicines directly to customers. Buyers (purchasers) include mainly public sector agencies responsible for the purchase of medicines through international tenders.

Using the online version of the International Drug Price Indicator Guide, prices for insulin from 1996 to 2013 were obtained for both suppliers and purchasers. Data from 1996 to 2010 had been previously extracted from the database in 2011. Prices from 2011 to 2013 were extracted from the database in early 2015.

To compare changes in insulin prices over time, prices for some other medicines to treat NCDs as well as for HIV/ AIDS were obtained from the Guide. These other medicines were:

- Atenolol 50 mg (anti-hypertensive)
- Hydrochlorothiazide 25 mg (anti-hypertensive)
- Lamivudine 150mg (HIV/ AIDS)
- Metformin 500mg (Type 2 diabetes)
- Nevirapine 200mg (HIV/ AIDS)
- Salbutamol 200 dose inhaler (asthma)
- Simvastatin 20 mg (lipid lowering agent)
- Tamoxifen 20 mg tablet (cancer)
- Zidovudine 100mg (HIV/ AIDS)

Government procurement prices and volumes procured

Between May and August 2015, requests to key national informants (e.g. medicine procurement officers) to provide data were made via various listservs (e-drug, e-lek, e-med, drug-info) and by direct email to those who had conducted price surveys using the WHO/HAI methodology. Members of various networks, such as HAI and the Ecumenical Pharmaceutical Network (EPN), were asked to provide names and email addresses of national informants who we could contact.

Informants were asked about insulins being purchased in the current tender (or through some other means), brand/trade name, manufacturer, strength, presentation (eg. pen, cartridge, vial), volume of insulin per pen/ cartridge/ vial, pack size, pack price, currency, International Commercial (INCO) term, and the annual quantity purchased. This information was sought for insulin procured centrally (such as through a national tender) and/or for insulin purchased at the provincial/regional/ state level.

To aid data collection, instructions and data collection forms were provided in English, French, Spanish and Russian. Non-responders were sent follow-up reminder emails after 2-3 weeks of receiving the initial request.

Data was entered by informants into a multi-language Excel 2013 database developed for this survey.

Patient prices

In June and July 2015, requests for insulin patient prices were made to:

- listservs including e-drug, e-lek, e-med, and drug-info
- people who provided data in HAI's 2011 global insulin price check
- HAI members and contacts, ACCISS project members and others
- networks including American Youth Understanding Diabetes Abroad (AYUDA), Young Professionals Chronic Diseases Network (YP-CDN), and EPN

People were asked to collect full patient prices for each insulin found in stock in two medicine outlets i.e. their nearest public hospital and their nearest private retail pharmacy. If insulin was provided free-of-charge to outpatients in the public hospital, then they were asked only to identify the insulins in stock. In the private retail pharmacy, full patient prices were requested (not patient co-payments). In addition, people were asked to record the daily wage of the lowest paid unskilled government worker so that affordability could be assessed.

To aid data collection, instructions and data collection forms were provided in English, French, Spanish and Russian. Data was sought on the country, town, daily wage of the lowest paid unskilled government worker, sector (public or private), brand/trade name, manufacturer, strength, presentation, volume of insulin, pack size, full patient price per pack.

Reminder emails were lodged on e-drug and sent to various networks.

Data was entered into a multi-language Excel 2013 database developed for this survey.

Reimbursement prices

Between April and August 2015, reimbursement prices were collected from publically accessible price databases for national social insurance schemes.

Data was initially collected from websites listed on HAI's list of national medicine price databases. Google searches were then undertaken by country to identify reimbursement price databases using various keywords (such as national health insurance, ministry of health, drug agency, drug reimbursement list). Note: for some countries identification of databases was not possible, or the data could not be used, due to language difficulties.

Data was collected for each insulin being reimbursed, its brand/trade name, manufacturer, formulation, strength, presentation, volume of insulin, pack size, pack price, currency, taxes (value-added taxes (VAT) or goods and services taxes (GST)), and the reimbursement level (eg. percentage of price reimbursed, set amount in local currency). Patient co-payments were also collected and any other prices available on the website (eg. manufacturers selling price).

Price components in the pharmaceutical supply chain

The final patient price is based on the manufacturers selling price and 'add-ons' in the supply chain such as tariffs, taxes, mark-ups and other costs. To date, no national price component studies have been undertaken for insulin products so accurate data on the contribution of add-on costs to the final patient price of insulin is unavailable.

To gain some understanding of the impact of these add-ons on patient prices, price component data from surveys in 26 countries (30 surveys), undertaken from 2004-2013 using the WHO/HAI methodology, for various medicines, were used to assess what the add-ons may be for insulin. For 11 countries, price components were recorded for the public sector and private sector. For three countries, data was only given for the public sector. For 12 countries data was only given for the private sector. The data was for a mix of medicines (to treat acute and chronic conditions), product types (originator brands and generics), and imported and locally manufactured products.

Note: Tariffs and taxes on insulin are discussed in the ACCISS profile report drafted by Warren Kaplan.

2.2 Data Checking

Insulin procurement price data and patient price data were checked for completeness and consistency. Where formulations, strengths, pack sizes, prices or any other data were unclear, clarifications were requested from the data provider. Data were excluded from the analyses if clarifications were not received.

2.3 Data Analysis

In all the analyses, prices were standardized by converting the volume of insulin and units per ml to 10ml of 100IU/ml insulin. Where more than one price point was recorded per country, the mean was taken.

Microsoft Excel 2013 and SAS 9.4 were used to conduct the analyses of government procurement prices and volumes, reimbursement prices, and patient prices.

For analyses stratified by World Bank income group (low-, lower middle-, upper middle- and high-income countries), 1 July 2015 World Bank income group classifications were used. Data from the Cook Islands were excluded in these analyses as it is not classified by the World Bank. Exchange rates used for converting local currencies to United States Dollars (USD) were obtained from Oanda.com.

MSH supplier and buyer prices

Using the online version of the MSH International Drug Price Indicator Guide, both supplier prices and buyer prices for insulin (adjusted to 10ml of 100IU/ml) from 1996 to 2013 were obtained. MSH prices are in USD so no currency adjustments were needed.

Where any anomalies were found in the data from 1996 to 2010, prices listed in the 2010 Guide were used in the analyses. For anomalies in prices from 2011-2013, prices in the 2013 Guide were used.

Analyses included an assessment of price changes over time, between different types of insulin and strengths (40IU/ml and 100IU/ml), as well as by WHO Region, World Bank Income Group and selected purchasers. In addition, insulin price changes over time were compared with price changes for nine other NCD medicines.

All prices were adjusted using the US Department of Labor Bureau of Labor Statistics consumer price index and adjusted to 1996 prices.

Government procurement prices and volumes

All prices were converted to USD using the exchange rate on 1 July of the tender year. For tenders covering multiple years, the rate of exchange on 1 July of the first year of the tender was used.

Procurement prices were adjusted to take into account the INCO term that applied to the purchase. For transactions with the INCO term “Free on Board” (FOB), 10 percent was added to the price. This was based on the 10 percent shipping costs estimated in the 2015 edition of Management Sciences for Health’s (MSH) International Drug Price Indicator Guide. For transactions with INCO term “Cost, Insurance and Freight” (CIF) and “Carriage Paid To” (CPT), 5 percent was added to the procurement price. No adjustments were made where the

price was “Delivery Duty Paid” (DDP). For seven countries, the INCO term was not provided. In these cases, no adjustments were made.

In countries where prices were provided for both national and regional procurements, only national data were included in the analysis. Where only sub-national data was provided (such as Finland where procurement prices for reported for one hospital), prices were analysed as a national estimate (but not the volume data). Pooled procurement data involving multiple countries (GCC and UNRWA) were analysed separately.

In the analysis of the volume of insulin purchased, the number of vials, pens or cartridges was multiplied by the volume in each to give millilitres of insulin which was converted to 10ml. For purchases over multiple years, the total volume was divided by the number of years to obtain the annual volume purchased.

Using median, mean, range (minimum and maximum), the types of insulin procured, the price for 10 ml, and the volume of insulin purchased were described by World Bank Income group.

The association between volumes purchased and the procurement price for the various types of insulin was examined, plus the procurement price and GDP, and the procurement price and GDP per capita.

Patient prices

Using exchange rates on the day of data collection, patient prices in the public and private sector of each country were converted to USD for 10ml of 100IU/ml insulin.

In countries where more than one price was given for an insulin product in a sector, the mean was used in the analyses.

It must be remembered that patient prices were collected from a single medicine outlet therefore should not be considered representative of the country. The exceptions were some of the countries in the Middle East (Lebanon, Egypt, Jordan, UAE, Saudi Arabia, Bahrain) where patient prices are set and WHO/HAI price surveys have shown there is no price variability across outlets. In these countries, patient prices in this analysis are representative of the country.

The affordability analysis was based on the WHO/HAI methodology i.e. expressed as the number of days the lowest paid unskilled government worker has to work to purchase 10ml of 100IU/ml insulin (approximately 30 days’ supply).

Using mean, median, and ranges, the types of insulin found in the public and private sectors and the patient price per 10 ml were analysed by World Bank income group and by brand.

The association between patient price (public and private sector) and GDP and GDP per capita was examined.

Reimbursement prices

Using exchange rates on the day of data collection, reimbursement prices were converted to USD for 10ml of 100IU/ml insulin.

Of the 28 countries where reimbursement prices were obtained, all were for national social insurance schemes except in Belgium (private not-for-profit) and The Netherlands (private).

Patient copayments, deductibles, and scaling reimbursement schemes were excluded from the analysis. Some reimbursement prices included sales taxes or value-added taxes. In these cases, the amount in local currency of these taxes was deducted from the reimbursement price so all reimbursement prices in the analyses excludes these taxes.

Annex 10 describes the reimbursement price for each country in the analysis.

Using mean, median, mode and ranges, the types of insulin and the price for 10 ml of 100IU/ml insulin were analysed by World Bank Income group and manufacturer.

The association between reimbursement prices and GDP and GDP per capita was also examined.

Price components in the pharmaceutical supply chain

Data was only used from countries where the CIF/MSP price was quoted and mark-ups were recorded as percentage of value (for fixed fees it was unclear how these were calculated). For countries where a range of mark-ups was quoted (for wholesalers, pharmacies etc.), the lowest and highest for each were used. The data was not stratified e.g. by sector, type (originator brand or generic), or whether imported or locally produced.

The price of insulin used was the median MSH buyer price for the period 1996-2013 i.e. US\$ 5.48. Using this data the cumulative mark-ups were calculated, and the contribution of the base price and add-ons to the final patient price. The total cost was calculated using Defined Daily Doses (DDD) for insulin in order to show the burden of these supply chain costs for health systems and individuals.

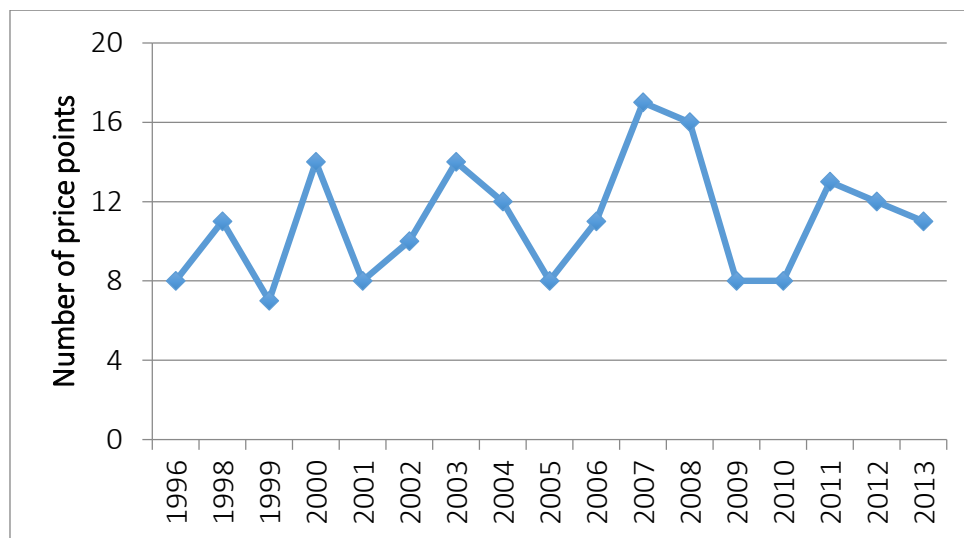
3. Results

3.1 MSH Insulin Supplier and Buyer Prices

3.1.1 Insulin Supplier Prices

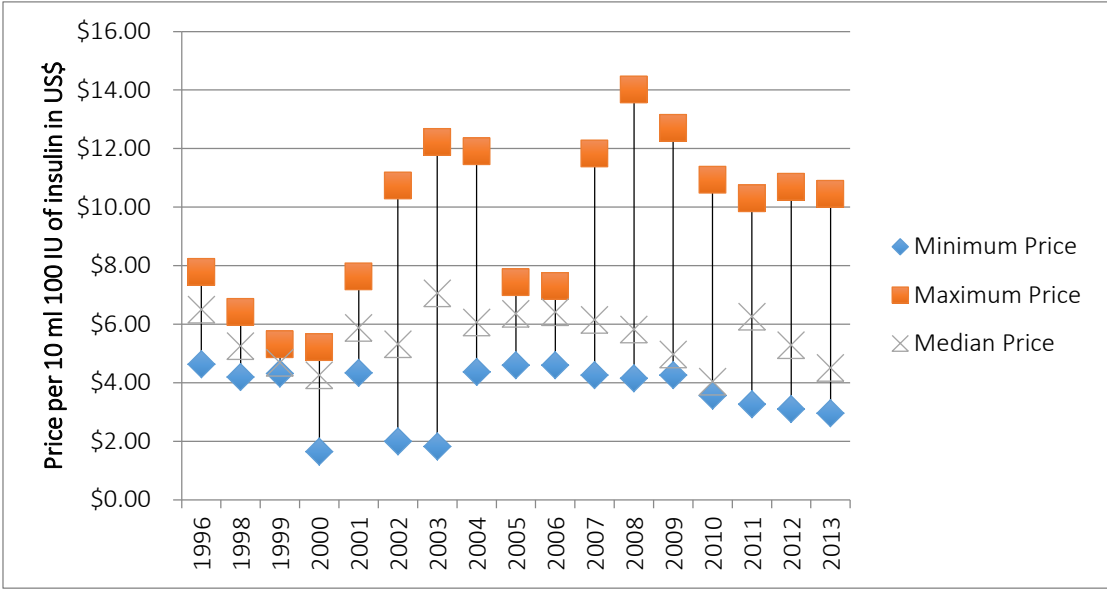
Eleven different suppliers provided insulin prices during the period 1996-2013. Four different types of insulin were listed i.e. lente, isophane, regular and regular/isophane (mixed). The most commonly listed type of insulin was regular at 41.0 percent of all insulin prices listed by suppliers. Of the 188 insulins listed by suppliers over the 17-year period, 135 were for 10ml 100IU presentations. The number of supplier price points, across the four insulin types, for each year are presented in Figure 1.

Figure 1. Number of supplier price points per year.



Other presentations included 10ml 40IU/ml and 100IU/ml insulin in 1.5ml and 3ml cartridges. The overall median price per 10ml 100IU vial equivalent was \$5.30 (range \$1.64-\$14.01). The data presented Figure 2 shows the range of prices for insulin of all types from 1996-2013.

Figure 2. Range of adjusted supplier prices of all types of insulin per 10ml 100IU vial from 1996-2013.



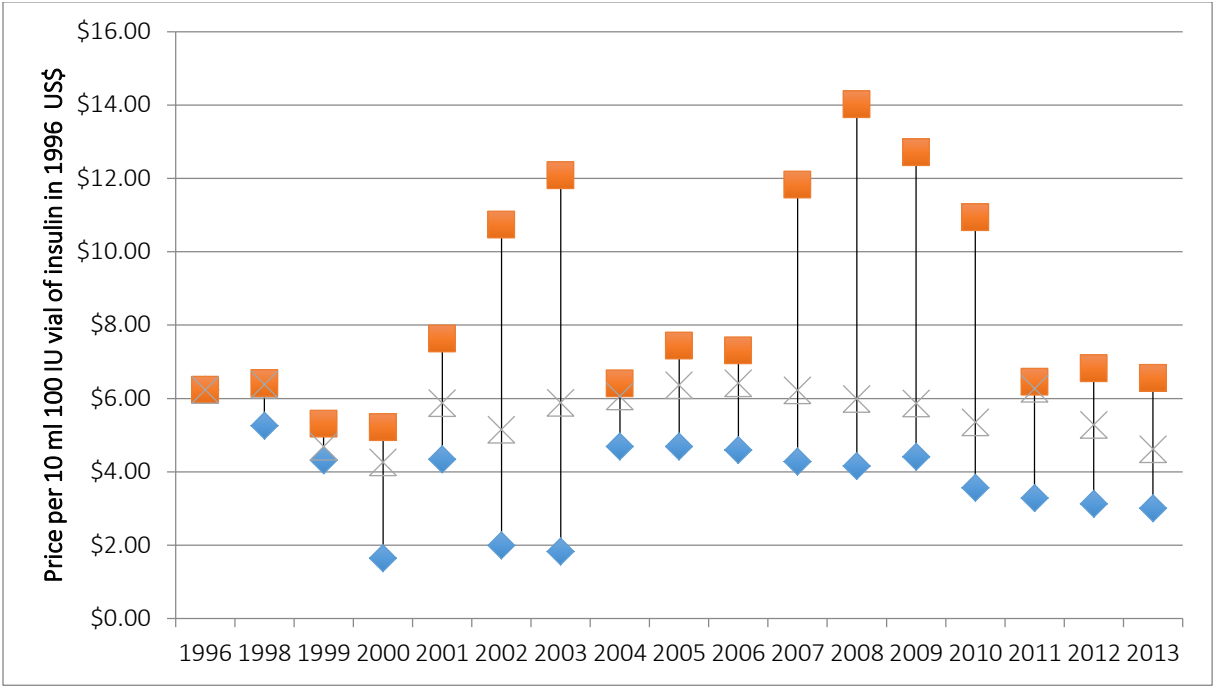
The data shows quite a wide range of insulin prices in some years. For example, in 2003 the maximum price was 6.7 times more than the minimum price. In looking at the data disaggregated by the four different types of insulin over the time of analysis, a wide range of prices were seen with the maximum price of regular, isophane, and regular/ isophane insulin being 8.5 times more than the minimum price as shown in Table 1.

Table 1. Comparison of adjusted supplier prices, USD, for 10ml 100IU, by insulin type 1996-2013.

Insulin type	Median USD	Maximum USD	Minimum USD	Ratio Maximum/Minimum
Lente	5.25	12.07	3.67	3.3
Regular	5.82	14.01	1.64	8.5
Isophane	5.30	14.01	1.64	8.5
Regular/ isophane	5.28	14.01	1.64	8.5

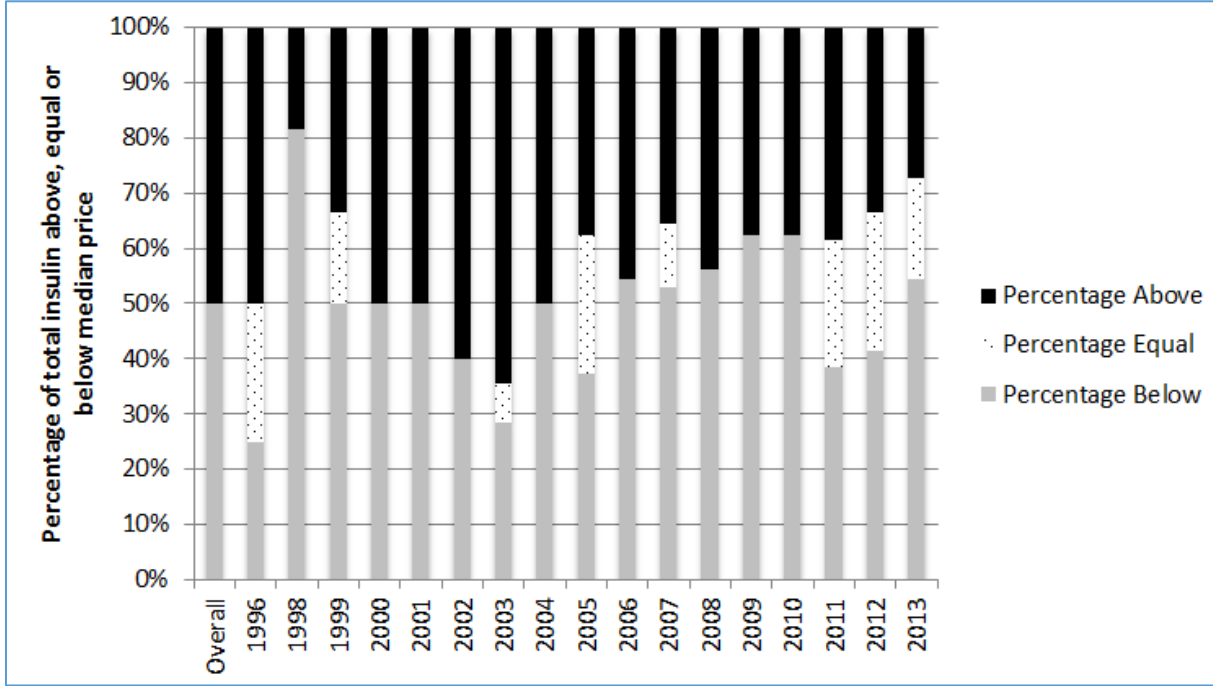
Regular insulin was the most commonly listed insulin. The range of prices per year for this type of insulin is given in Figure 3. The median price was not so variable over the 17 years, whereas the maximum and minimum prices vary substantially.

Figure 3. Range of adjusted supplier prices for regular insulin, USD, 10ml 100IU, from 1996-2013.



To get a closer look at the variation in prices of insulin, the frequency of prices above, below or equal to the median were calculated (Figure 4). In 6 out of the 17 years, prices were 50 percent or above that of the median price.

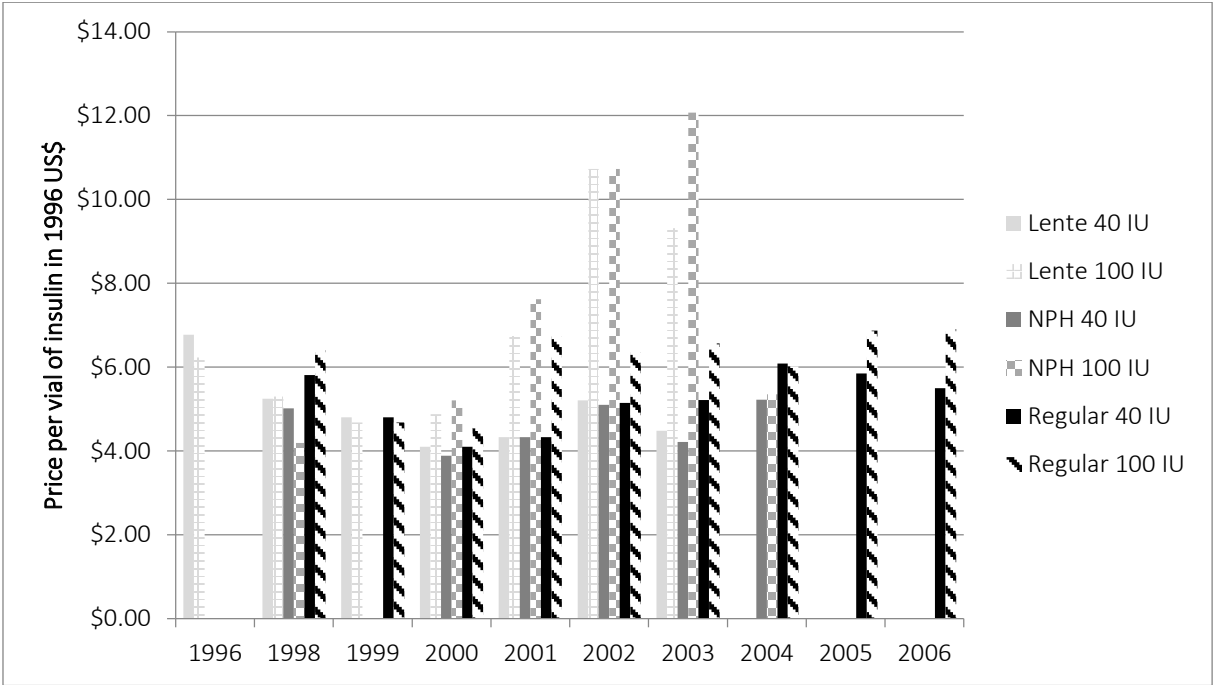
Figure 4. Frequency of insulin prices below, equal or above the median price from 1996-2013.



Comparing 40IU/ml and 100IU/ml vials in the years when these two strengths were listed (Figure 5) shows that in some years 40IU insulin was cheaper for some types of insulin than

the higher strength, but in other years the opposite was seen. In the most recent year (2013), for both lente and regular insulin, 40IU regular was higher prices than 100 IU.

Figure 5. Adjusted supplier prices per vial, USD, 40IU and 100IU insulin, by insulin type in years when both were listed.

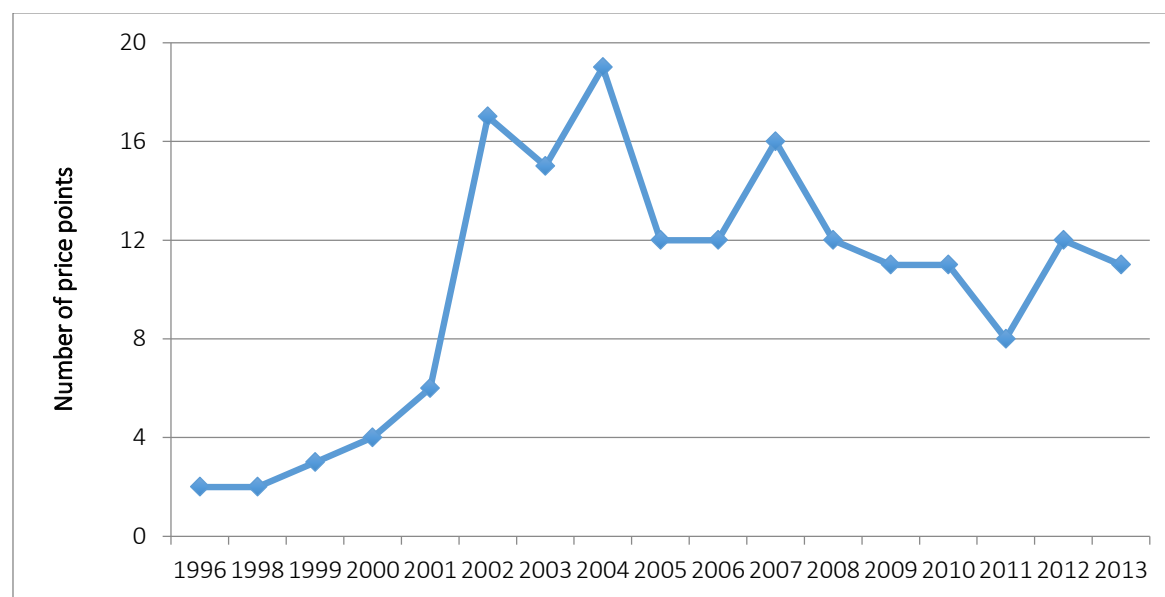


Another comparison looked at insulin supplied in a cartridge versus a vial. This was only available for mixed insulin. Median prices of insulin in cartridges were 1.47 to 3.51 times higher than in vials. Overall, the median price of mixed insulin in vials was \$5.28 (range \$2.95-\$14.01) compared to \$11.07 for the cartridge (range \$10.29-\$12.12). Based on the Defined Daily Dosage (DDD) of 40 units of insulin and overall prices, the price range would be \$23.94-\$204.55.

3.1.2 Insulin Buyer Prices

Insulin prices from eighteen countries and the Organisation of Eastern Caribbean States (see Annex 1), between 1996 and 2013, were listed in the Guide. As with supplier prices, four insulins were purchased i.e. lente, isophane, regular and regular/isophane (mixed). A total of 173 human insulin prices were provided by the countries, with the most common insulin being regular at 41.0 percent of the total. Figure 6 shows the number of buyer price points for each year across the four insulin types.

Figure 6. Number of buyer price points per year.



Vials containing 10ml 100IU insulin were the most common strength and presentation purchased representing 91.3 percent of overall insulin. Other presentations included 5ml vials, 40IU 10ml vials and both 1.5 ml and 3ml 100IU cartridges. In high-income countries, the purchase of insulin in cartridges was more common. Different regions and income groups purchased different types of insulin in varying proportions. For example, regular insulin was more commonly purchased in the World Health Organization Eastern Mediterranean Region (WHO EMRO) and low-income countries compared to isophane in upper-middle income countries (as shown in Table 2).

Table 2. Numbers of buyers and types of insulin by WHO Region and World Bank Income Group.

WHO Region/World Bank Group	Number of buyers	Number of purchases	Most common insulin purchased (percentage of total)	Percentage of total purchases as 10 ml 100 IU vials
WHO AFRO	8	59	Regular (44.1%)	89.8%
WHO EMRO	2	16	Regular (50.0%)	100%
PAHO*	9	98	Isophane (48.4%)	90.8%
Total	19	173	Regular (41.0 %)	91.3 %
Low-income countries	5	28	Regular (50.0%)	78.6%
Lower-middle income countries	7	49	Regular (44.9%)	95.9%
Upper-middle income countries	5	43	Isophane (53.5%)	100%
High-income countries*	2	53	Regular (37.7%)	86.8%
Total	19	173	Regular (41.0 %)	91.3 %

* Includes the Organisation of Eastern Caribbean States Pharmaceutical Procurement Service; WHO AFRO – African Region; WHO EMRO - Eastern Mediterranean Region; PAHO – Pan American Region/ Americas

The overall median procurement price was \$4.31 (range \$1.01-18.12) for a 10ml 100IU equivalent. The highest median price was 1.49 times higher than that of the lowest median

price, however the largest annual range between the highest and lowest price was 9.09 in 2002. Figure 7 shows the range of adjusted prices for all insulin types across the 17 years.

Figure 7. Range of adjusted buyer prices, USD, all insulin types, 10ml 100IU vial from 1996-2013.

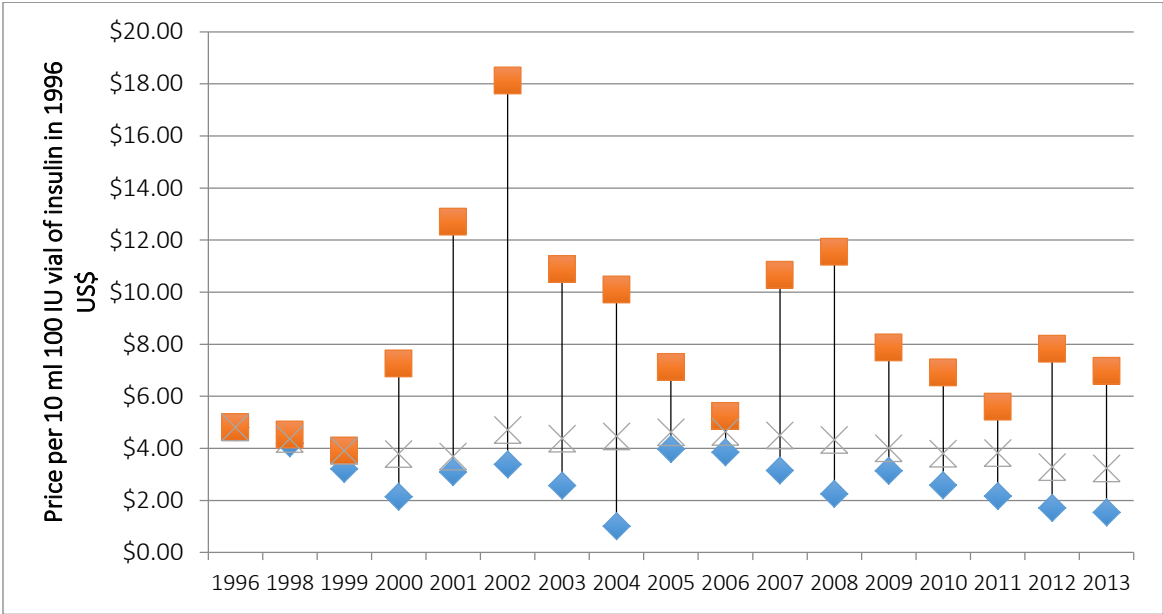
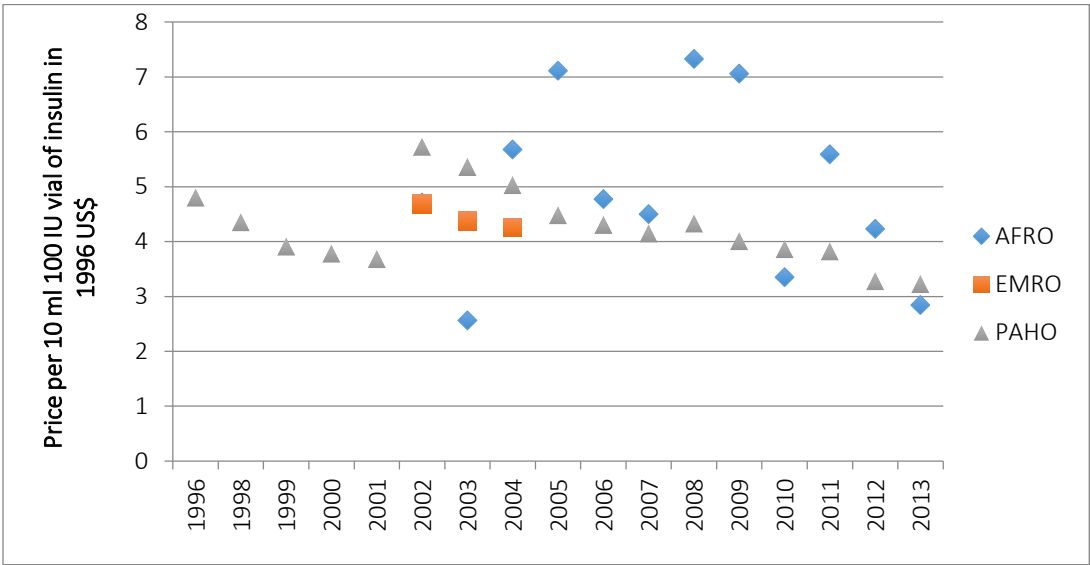


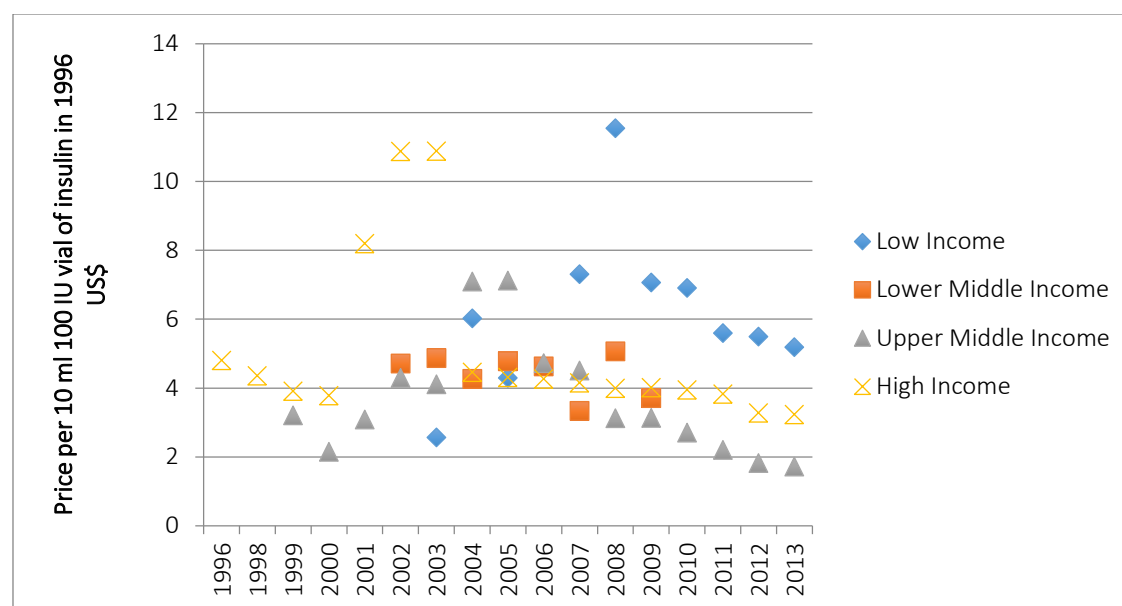
Figure 8 shows median buyer prices of all insulins by WHO region. Detailed figures showing the range of prices by region are given in Annex 2. Overall, median prices in the WHO AFRO region were higher in 8 of the 17 years compared to median prices in the EMRO and PAHO regions.

Figure 8. Adjusted median buyer prices, USD, all insulin types, 10ml 100IU, from 1996-2013 by WHO region.



Buyer prices by World Bank Income Group show that for 7 years low-income countries were paying the highest median price per vial of insulin (Figure 9). More in-depth analyses by World Bank Income Group are given in Annex 2.

Figure 9. Adjusted median buyer prices, USD, all insulin types, 10ml 100IU, from 1996-2013 by World Bank Income Group.



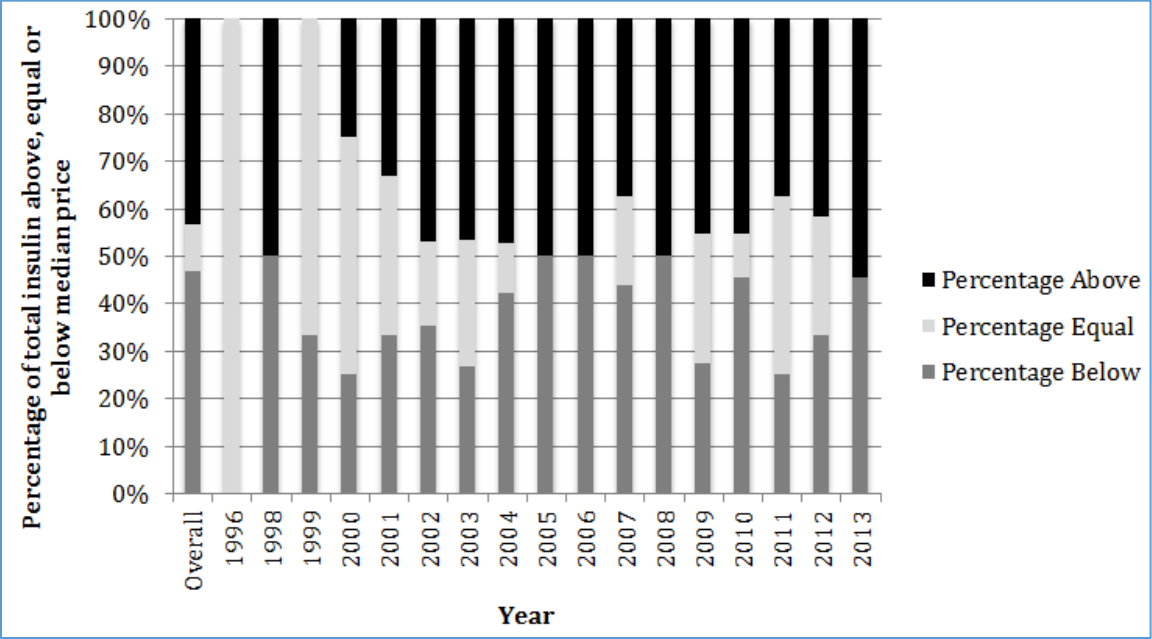
Overall, these data show large variations between the highest and lowest prices over the whole time period as detailed in Table 3. The WHO AFRO region buyers and those from low- and lower-middle income countries have median prices above the overall median price.

Table 3. Adjusted buyer prices, USD, by WHO Region and World Bank Income Group from 1996-2013.

WHO Region / World Bank Income Group	Price USD 10 ml 100 IU			Ratio Max/ Min
	Median	Maximum	Minimum	
Overall	4.31	18.12	1.01	17.94
WHO AFRO	4.72	11.54	1.01	11.43
WHO EMRO	4.37	7.18	3.66	1.96
PAHO	4.04	18.12	1.53	11.84
Low-income	6.90	11.54	2.54	4.54
Lower-middle income	4.65	12.54	1.01	12.42
Upper -middle income	3.13	7.11	1.53	4.65
High-income	4.01	18.12	3.23	5.61

Figure 10 shows the frequency of buyer prices below, equal or above the median price by year and overall. Figures showing the stratification by WHO region, and World Bank Income Group, are given in Annex 3. The data shows variations in the price of insulin over the 17 years.

Figure 10. Frequency of insulin buyer prices below, equal or above the median price from 1996-2013.



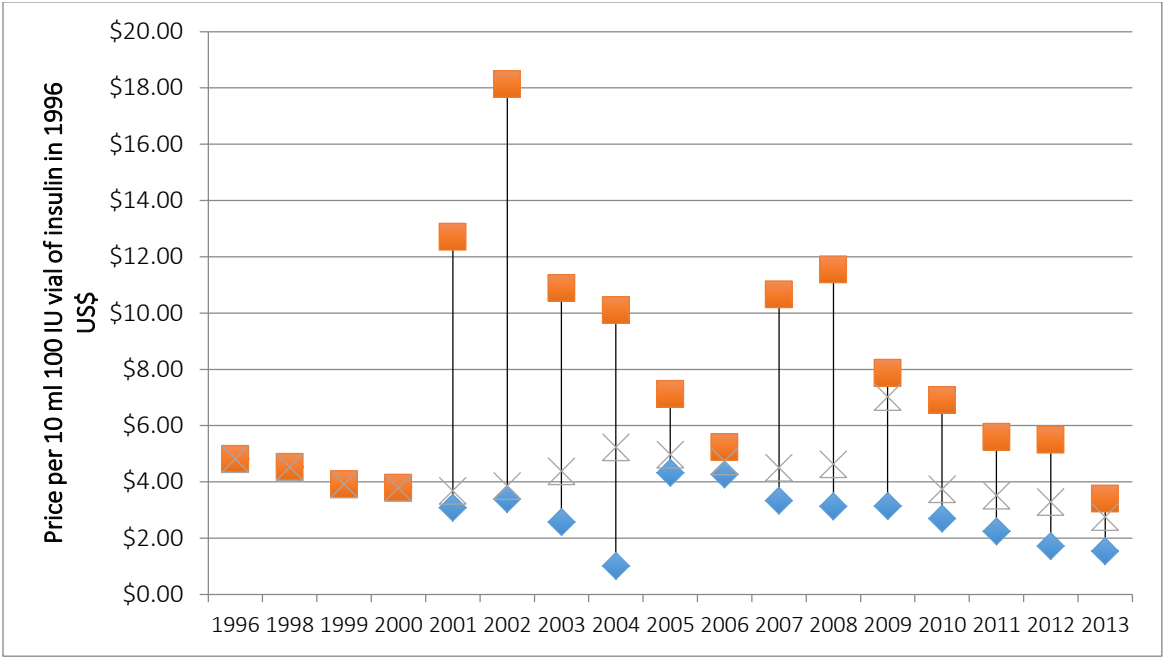
Across the different types of insulin purchased, the overall median price per 10ml 100IU equivalent in a cartridge was \$12.70, which was 2.98 times more than the median price of vials. Median overall buyer prices for 40IU 10ml vials were 2.12 times more than 100IU 10ml vials, with the median price for a 40IU vial equal to \$8.98 versus \$4.23 for a 100IU vial. Comparisons of the different types of insulin are presented in Table 4. A large variation is seen in these data and the high price ratios are due to the purchase of insulin in cartridge form.

Table 4. Comparison of adjusted buyer prices, USD, by insulin formulation from 1996-2013.

Insulin type	Price USD 10 ml 100 IU			Ratio Max/ Min
	Median	Maximum	Minimum	
Lente	6.82	18.12	1.01	17.94
Regular	4.37	18.12	1.01	17.94
Isophane	4.04	12.54	1.01	12.42
Regular/ isophane	4.06	10.88	1.92	5.67

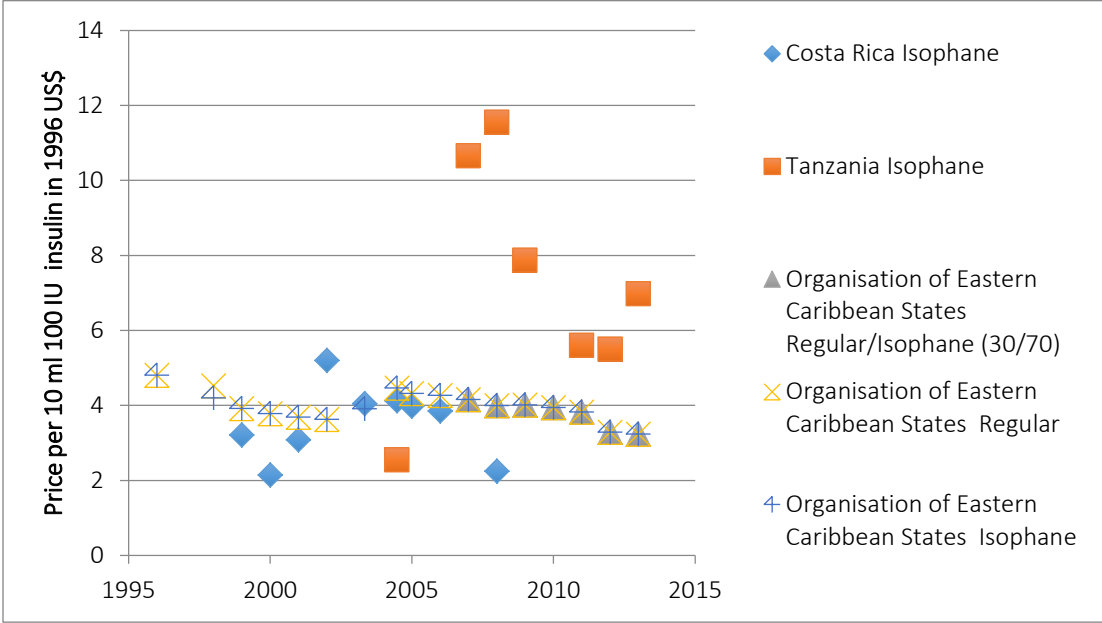
As regular was the most commonly purchased insulin, the range of prices per year for this insulin is shown in Figure 11. As with former analyses, this shows that although median prices are quite similar a wide range of prices were present.

Figure 11. Range of adjusted buyer prices, USD, for regular insulin 10ml 100IU vial from 1996-2013.



As there appears to be variations in the price of insulin over time, a closer analysis of individual purchasers was undertaken. All buyers with data points for at least 7 of the years were included in the analysis, and changes in the price of the insulin they bought (all types and formulations combined) were assessed. Costa Rica (nine years) and Tanzania (seven years) were the only two countries included in the dataset; both had data for isophane only. The Organisation of Eastern Caribbean States had data for three types of insulin for seven, 16 and 17 years. This data, presented in Figure 12 shows that Tanzania paid the highest price for insulin in six out of seven years where data were available and had the largest fluctuations in price compared to Costa Rica and the Organisation of Eastern Caribbean States.

Figure 12. Country trends for adjusted price, USD, of insulin 10ml 100IU vial from 1996-2013.



As can be seen in Table 5, Tanzania had the highest median and maximum price for insulin across the years, in addition to the largest difference between maximum and minimum prices.

Table 5. Comparison of adjusted prices, USD, for selected buyers from 1996-2013.

Country and insulin type	Price USD 10 ml 100 IU			Ratio Max/Min
	Median	Maximum	Minimum	
Costa Rica - isophane	3.84	5.19	2.14	2.43
Tanzania - isophane	6.97	11.54	2.54	4.54
Organisation of Eastern Caribbean States - regular/isophane 30/70	3.94	4.15	3.23	1.28
Organisation of Eastern Caribbean States - regular	3.97	4.80	3.23	1.49
Organisation of Eastern Caribbean States -isophane	3.94	4.80	3.23	1.49
Overall	3.98	11.54	2.14	5.39

Ultimately these vials will be used to treat individuals; therefore the cost per individual as well as the cost to the health system is important. Prices over the 17-year period for a year’s supply of insulin ranged from \$14.75 to \$264.55 (based solely on the buyer price). This range was due to the use of insulin in cartridge form. Should a person use insulin in cartridges rather than vials, they may need to pay 17.94 times more for their insulin. For each country the mean annual cost based on the DDD was calculated using median prices overall for insulin distinguishing between type and presentation (see Annex 4). Annex 4 also shows the cost of a year’s supply of insulin in comparison to GDP per capita and the total cost of insulin per country. This was based on data from the International Diabetes Federation (IDF) assuming 10 percent of people with type 2 diabetes would use insulin and that the number of cases of type 1 diabetes in 0-14 year olds represents 15 percent of total with 85 percent being over 14 years of age.(44). These costs of insulin per year represent as low as 0.2 percent of per capita GDP to 13.4 percent. It should be noted that the prices quoted by MSH are not those for individuals, and within different health systems the price to the individual may be less if

the country subsidises or provides the medicine for free, or higher if mark-ups through the system increase the final patient price.

3.2 MSH Insulin Prices Compared to Other Medicines

In order to compare prices and put insulin in the wider context of access to medicines, selected NCD medicines and medicines for HIV/ AIDS were also included in the analysis. For comparison purposes, DDDs (based on buyer prices) were used as this gives an overall evaluation of the price of treatment for the different medicines.

Table 6 details the overall minimum, maximum and median costs as well as the ratio of the highest and lowest overall price. Insulin had the lowest ratio between the highest and lowest prices, and had the fourth highest median price (after three HIV/ AIDS medicines). Compared to other treatments for NCDs, insulin was 2.46 to 44.99 times higher priced.

Table 6. Adjusted buyer prices, USD, based on DDDs, for 1 year's treatment with selected medicines.

Medicine	Price USD for 1 year's treatment			Ratio max/min
	Median	Maximum	Minimum	
Insulin	63.22	70.08	47.16	1.49
Metformin	19.86	29.35	9.49	3.09
Salbutamol	12.70	26.72	8.47	3.16
Tamoxifen	25.73	51.47	17.16	3.00
Zidovudine	119.36	1270.20	58.91	21.56
Lamivudine	42.54	1664.40	15.99	104.11
Nevirapine	45.48	3204.70	11.75	272.67
Simvastatin	15.96	365.18	7.39	49.41
Atenolol	4.55	8.21	2.06	3.99
Hydrochlorothizide	1.41	3.31	0.79	4.20

This difference in insulin prices versus other NCD medicines was also seen when looking at the overall range of prices. Insulin has the smallest range over the period of analysis as shown in Figure 13. This data is presented using the median prices at logarithmic base 10 for easier presentation. For the ARVs, there is a clear trend of decreasing prices. For example, the percentage change in price for nevirapine was 12926 percent from the first to the last median price reported, while the change was 48 percent between these prices for insulin (Figure 14).

As these changes are hard to see due to the wide range of overall prices, Figure 15 presents these with median prices at logarithmic base 10. Over the time period, all ARVs and simvastatin were at one point higher priced than insulin, but at the end of the analysis only zidovudine remained higher priced than insulin with all other treatments priced below the price of insulin.

Figure 13. Price ranges of DDDs for selected medicines (adjusted prices at Log base 10).

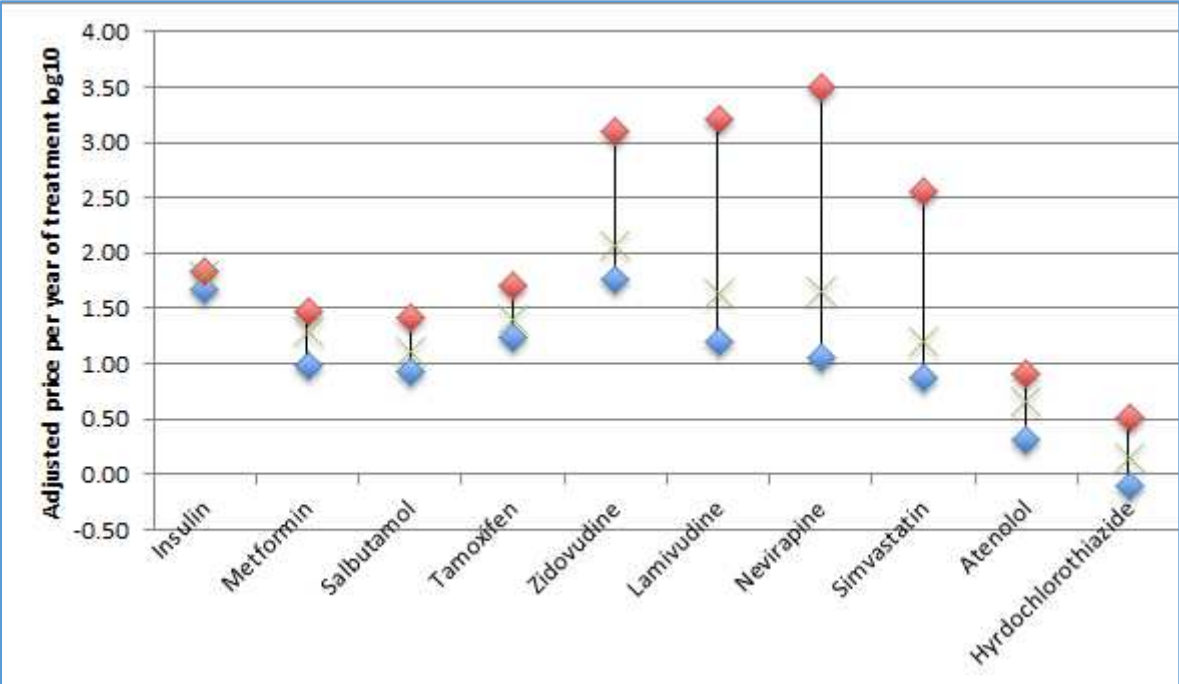


Figure 14. Trends in median adjusted prices, USD, for selected NCD medicines.

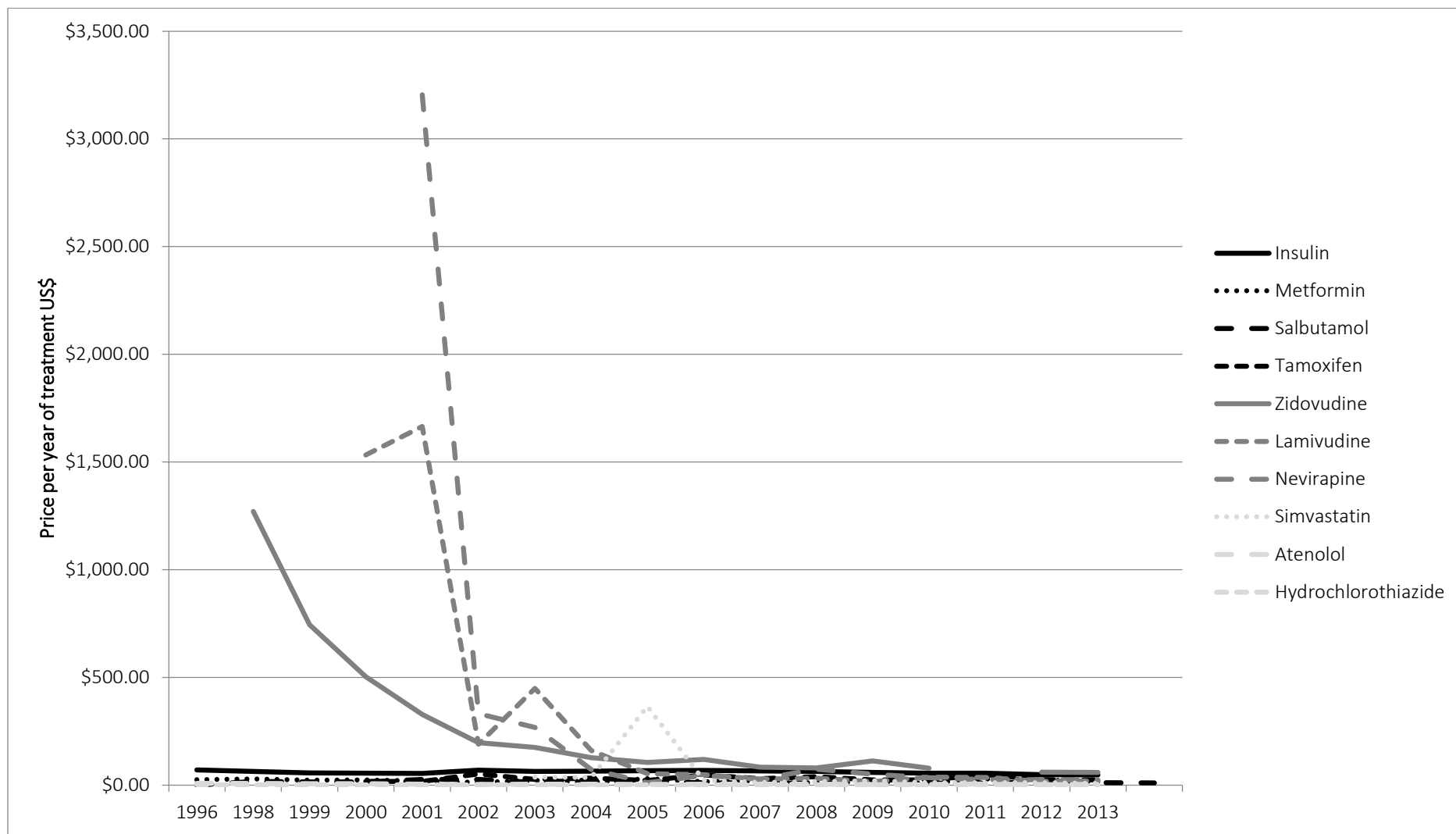
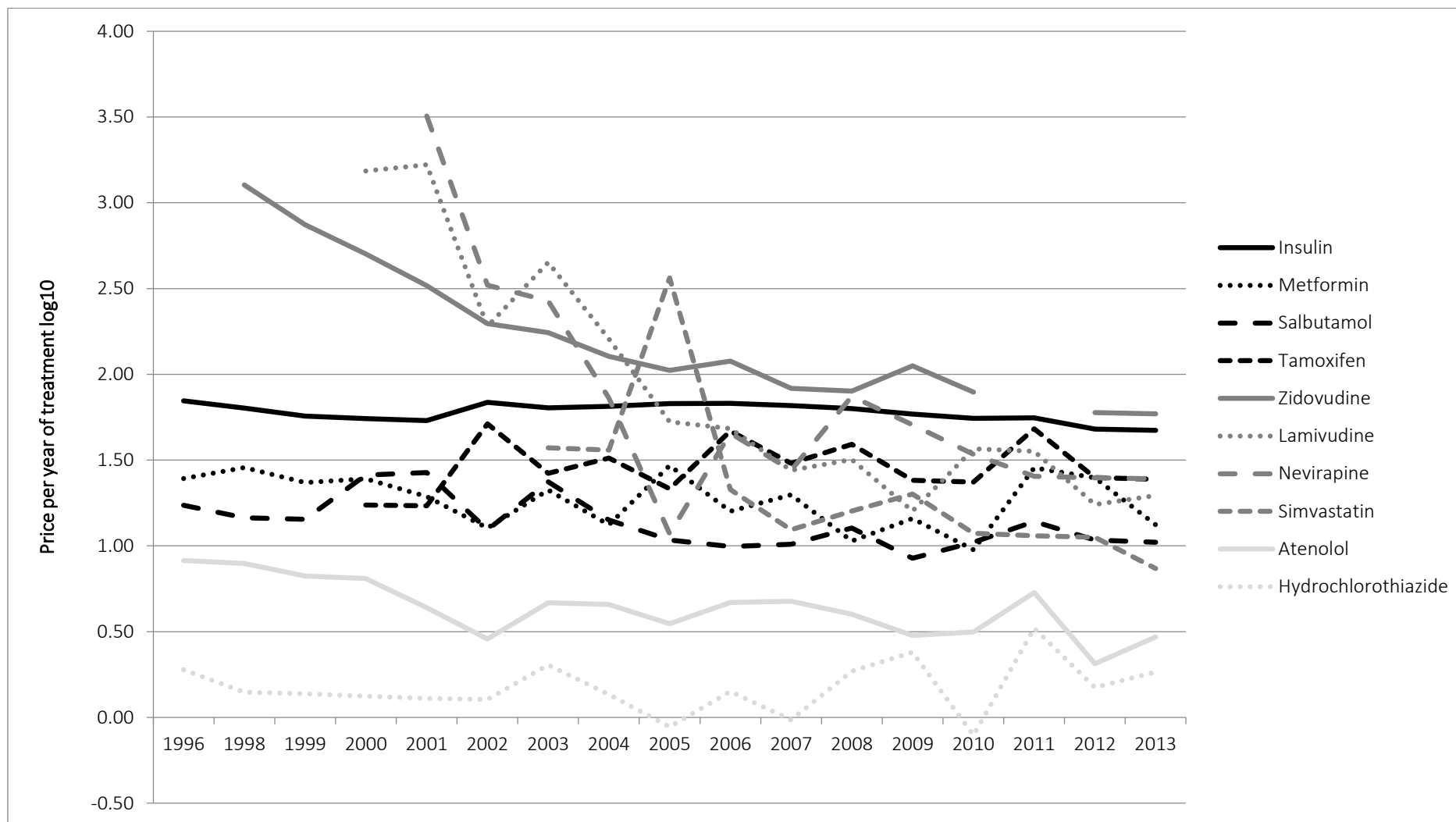


Figure 15. Trends in median prices for selected NCD medicines (adjusted prices at Log base 10).



3.3 Government Insulin Procurement Prices and Volumes

Government procurement prices were collected from 28 sources. Four were low-income countries, 11 were lower-middle income countries, seven were upper-middle income countries, and three were high-income countries. In addition, procurement prices were received from the Cook Islands (not considered a country by the World Bank), the United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA), and the Gulf Cooperation Council (GCC) which procures medicines for Saudi Arabia, Oman, Kuwait, United Arab Emirates, Qatar, and Bahrain. Note: Cook Islands data were included in the country analyses except when stratified by World Bank income level.

Across the countries and organisations, the tender/procurement dates ranged from 2012 to 2015 (some were tenders spanning several years). No adjustments were made for CPI.

Annex 1 lists the sources of procurement prices.

3.3.1 Price Analysis by Insulin Type

Across the study countries, 14 types of insulin were purchased. Six were human insulin i.e. isophane, lente, regular, and regular/isophane (mixed) in various ratios. Eight were analogues i.e. aspart, aspart/protamine, detemir, glargine, glulisine, lispro and lispro/protamine in two ratios. For the two organisations, GCC and UNRWA purchased 11 and three types of insulin, respectively. UNRWA only purchased human insulins.

Table 7 below shows the median and mean procurement prices for 10ml 100IU/ml per insulin type. Across the countries, the analogue insulins detemir, glargine, and aspart/protamine 30/70 had the highest median prices (\$55.58, \$43.19 and \$30.47 respectively). Regular, isophane and regular/isophane 30/70 human insulin had the lowest median procurement prices of \$5.99. The price of 10ml of insulin varied from \$2.24 for regular and regular/isophane insulins in Pakistan to \$81.67 for glargine in Micronesia. Except for glulisine and both lispro/protamine mixes, GCC and UNRWA prices were lower than the median country prices.

Table 7. Government procurement prices, USD, per 10ml 100IU by insulin type.

Insulin type	National procurement prices 10 ml 100 IU				GCC procurement prices (USD)		UNRWA procurement prices (USD)	
	Median	Mean	Range	N	Mean & Median	N	Mean & Median	N
Human insulins	5.99	9.41	2.24-43.51	69	4.20	4	2.92	3
Isophane	5.99	8.81	2.30-30.67	21	2.82	1	2.92	1
Lente Zinc Suspension	12.29	12.29		1				
Regular	5.96	9.31	2.24-43.51	26	5.58	2	2.92	1
Regular/Isophane 30/70	5.99	8.75	2.24-32.00	19	2.82	1	2.92	1
Regular/Isophane 40/60	21.86	21.86		1				

Regular/Isophane 50/50	21.86	21.86		1				
Analogue insulins	34.20	35.69	6.88-81.67	26	26.01	14		
Aspart	27.00	29.42	24.91-35.78	5	19.36	2		
Aspart/Protamine 30/70	30.47	30.32	24.18-36.16	4	24.77	1		
Detemir	55.58	53.79	43.67-62.14	3	37.50	2		
Glargine	43.19	47.82	36.89-81.67	7	39.42	2		
Glulisine	14.78	14.78	6.88-22.67	2	20.67	1		
Lispro	28.68	30.04	28.37-33.08	3	19.34	2		
Lispro/Protamine 25/75	21.86	21.86	21.86	1	24.53	2		
Lispro/Protamine 50/50	21.86	21.86	21.86	1	22.50	2		
All insulins	9.44	16.60	2.24-81.67	95	Mean 21.53 Median 23.52	18	2.92	3

N = number of countries (except for GCC and UNRWA where n = number of price points)

3.3.2 Price Analysis by Country for Selected Human Insulins

Table 8 gives the mean procurement price for each country that purchased isophane, regular and regular/isophane 30/70 insulins (the insulins with the greatest number of price points). For isophane, the highest price (\$30.67) was paid by the small Pacific nation of Tuvalu while the lowest price was in Tanzania (\$2.30). Tuvalu was also paying the highest price for regular insulin, with Pakistan paying the lowest price (\$2.24). For regular/isophane 30/70 the price varied from \$2.24 in Pakistan to \$32.00 in the Kyrgyz Republic.

Table 8. Mean procurement price, USD, for isophane, regular and regular/isophane 30/70 by country.

Country	Procurement price, USD, for 10ml 100 IU		
	Isophane	Regular	Regular/Isophane 30/70
Afghanistan		4.46	
Burkina Faso	5.77	5.92	5.97
Cook Islands	5.50	5.50	5.50
Dominican Republic	2.42	2.66	2.48
El Salvador	3.36	3.41	
Finland	22.06	19.90	
Ghana		9.44	9.44
Iran	4.36	4.36	4.36
Jordan		9.14	
Kyrgyz Republic	6.51	6.51	32.00
Lao PDR	5.99	5.99	5.99
Malaysia	5.09	5.34	5.29
Micronesia	14.29	14.24	13.74
Moldova	12.45	12.45	12.45
Mozambique	3.25	3.25	3.25

New Zealand	14.45	20.64	20.64
Pakistan		2.24	2.24
Philippines	5.46	4.88	5.46
Solomon Islands	9.19	4.94	5.99
South Africa	6.89	6.89	6.30
Sudan	3.34	3.34	3.34
Suriname	12.34	12.34	12.34
Tanzania	2.30	2.30	
Turks and Caicos		18.90	
Tuvalu	30.67	43.51	
Vanuatu	9.40	9.40	9.40

Government procurement prices of the human insulin products purchased in the small Pacific countries are shown in Table 9. Some large price variations were seen across the nations, even when volumes procured were similar. For example, Micronesia paid \$14.29 a vial for Humulin N[®] (425 vials) whereas Tuvalu paid substantially more at \$30.67 (500 vials). A similar picture was seen for Humulin R. The Cook Islands, which imports insulin from New Zealand distributors, paid \$5.50 a vial for Mixtard[®] (100 vials) whereas Vanuatu purchased five times the number of vials as the Cook Islands but paid a substantially higher price at \$9.40 a vial.

Table 9. Government procurement prices, USD, and volumes, human insulin types, Pacific Island nations.

Country	Isophane			Regular			Regular/Isophane 30/70		
	Brand, Manufacturer	Price vial USD	No. vials	Brand, Manufacturer	Price vial USD	No. vial	Brand, Manufacturer	Price Via USD	No. vials
Cook Is.	Protaphane [®] , Novo Nordisk	5.50	1000	Actrapid [®] , Novo Nordisk	5.50	150	Mixtard 30/70, Novo Nordisk	5.50	100
Micronesia	Humulin N, Eli Lilly	14.29	425	Humulin R, Eli Lilly	14.24	270	Humulin 30/70 [®] , Eli Lilly	13.74	71
Solomon Is.	Protaphane, Novo Nordisk	9.19	500	Wosulin R [®] , Wockhardt	4.94	3000	Wosulin 30/70 [®] , Wockhardt	5.99	1500
Tuvalu	Humulin N, Eli Lilly	30.67	500	Humulin R, Eli Lilly	43.51	200			
Vanuatu	Protaphane Novo Nordisk	9.40	500	Actrapid, Novo Nordisk	9.40	500	Mixtard 30/70, Novo Nordisk	9.40	500

3.3.3 Price Analysis by World Bank Income Group

For the human insulins, the median price was highest in high-income countries and lowest in low-income countries, as shown in Table 15. However, for isophane and regular/isophane insulins, median prices were higher in lower-middle income countries compared to upper-middle income countries. For the analogues, median prices tended to be inversely related to the country income group (except for glulisine). For example, aspart was \$26.09, \$29.56 and \$35.78 in high-, upper-middle and lower-middle income countries respectively.

Table 15. Government procurement prices, USD, for insulin types by country income group.

Insulin type	World Bank country income group	Price in USD 10 ml 100 IU				N
		Median	Average	Max	Min	
<i>Human insulins</i>						
Isophane	High	18.25	18.25	22.06	14.45	2
	Upper-middle	5.99	10.30	30.67	2.42	6
	Lower-middle	7.47	7.84	14.29	3.34	10
	Low	3.25	3.77	5.77	2.30	3
Lente Zinc Suspension	Lower-middle	12.29	12.29	12.29	12.29	1
Regular	High	19.90	19.81	20.64	18.90	3
	Upper-middle	6.89	12.03	43.51	2.66	7
	Lower-middle	5.99	6.95	14.24	2.24	11
	Low	3.86	3.98	5.92	2.30	4
Regular/ Isophane 30/70	High	20.64	20.64	20.64	20.64	1
	Upper-middle	5.29	6.15	12.34	2.48	5
	Lower-middle	7.54	9.97	32.00	2.24	10
	Low	4.61	4.61	5.97	3.25	2
<i>Analogue insulins</i>						
Aspart	High	26.09	26.09	27.00	25.19	2
	Upper-middle	29.56	29.56	34.20	24.91	2
	Lower-middle	35.78	35.78	35.78	35.78	1
Aspart/Protamine 30/70	High	26.73	26.73	26.73	26.73	1
	Upper-middle	29.19	29.19	34.20	24.18	2
	Lower-middle	36.16	36.16	36.16	36.16	1
Detemir	High	43.67	43.67	43.67	43.67	1
	Lower-middle	58.86	58.86	62.14	55.58	2
Glargine	High	45.81	45.81	48.44	43.19	2
	Upper-middle	38.43	38.43	39.96	36.89	2
	Lower-middle	46.31	55.41	81.67	38.26	3
Glulisine	High	22.67	22.67	22.67	22.67	1
	Upper-middle	6.88	6.88	6.88	6.88	1
Lispro	High	28.52	28.52	28.68	28.37	2

	Lower-middle	33.08	33.08	33.08	33.08	1
Lispro/Protamine 25/75	High	21.86	21.86	21.86	21.86	1
Lispro/Protamine 50/50	High	21.86	21.86	21.86	21.86	1

N = number of countries

3.3.4 Correlation between Procurement Price and GDP/GDPpc

Spearman correlation coefficient was used to assess if there was a linear association between the procurement price of insulin and GDP, and the procurement price and GDP per capita. Plots of significant correlations are shown in Annex 7. The analysis was limited to insulin types with at least eight price points. There was a moderate negative correlation between price and GDP for regular/isophane 30/70 ($r=-0.52$, $p = 0.029$). However, when testing for price versus GDP per capita, only a moderate positive correlation was found for regular insulin ($r=0.45$, $p = 0.027$)

There was no correlation between price and GDP for any brand of insulin. Across the insulin brands purchased, Actrapid ($r=0.79$, $p<0.01$) and Protaphane ($r=0.76$, $p=0.028$) showed a strong positive correlation between price and GDP per capita.

3.3.5 Price Analysis by Presentation for Selected Human and Analogue Insulins

Insulins with at least eight price points across the countries were stratified by the presentation i.e. vials, pens and cartridges. The results are presented in Table 10. Across the five insulin types, the median price of vials was lower (\$5.84) than pens (\$27.31) and cartridges (\$17.93). For glargine and aspart, median prices were similar for all three presentations.

Table 10. Government procurement prices, USD, by presentation for insulins with eight or more price points

Insulin type	Prices (USD) Vial 10 ml 100 IU			Prices (USD) Pen 10 ml 100 IU			Prices (USD) Cartridge 10 ml 100 IU		
	Median (Range)	Mean	N	Median (Range)	Mean	N	Median (Range)	Mean	N
Aspart	23.09	23.09	1	27.30 (24.91-34.20)	28.43	4	26.24 (25.63-35.78)	29.22	3
Glargine	48.44 (39.94 - 81.67)	56.68	3	39.96 (36.57 - 48.44)	41.00	5	46.31 (43.21 - 48.44)	45.98	3
Isophane	5.50 (2.09 - 30.67)	7.45	19	17.27 (10.32-24.22)	17.27	2	15.30 (5.09 - 19.90)	12.94	7
Regular	5.22 (2.09 - 43.51)	8.19	24	9.33 (8.33 - 10.32)	9.33	2	15.75 (5.09 - 21.86)	13.99	7
Regular/ Isophane 30/70	5.89 (2.09 - 19.42)	7.16	16	8.40	8.40	1	15.75 (5.29 - 32.00)	16.07	5
All five insulins	5.84 (2.09 - 81.67)	10.25	63	27.31 (8.33 - 48.44)	27.17	14	17.93 (5.09 - 48.44)	19.78	25

N = number of countries

All of the insulin types purchased by UNRWA (isophane, regular and regular/isophane 30/70) were in vials. As shown in Table 11, UNRWA paid \$2.92 a vial for isophane, regular, and regular/isophane insulin which was about 47 percent lower than median country price. UNRWA was also paying less than median MSH prices for suppliers and buyers (vials) for the most recent year where the data was analysed (2013). UNRWA's price was about 60 percent less than the MSH supplier price for isophane, 61 percent less for regular, and 40 percent less for regular/isophane 30/70. Compared to MSH buyer prices, UNRWA paid about 14 percent, 42 percent and 31 percent less for isophane, regular, and regular/isophane 30/70 insulin, respectively.

Table 11. Comparison of UNRWA procurement prices with median country and median MSH 2013 prices for vials.

Insulin type	UNRWA price 10 ml USD	Median country price 10 ml USD	Median MSH supplier price 10 ml 2013 USD*	Median MSH buyer price 10 ml 2013 USD**
Isophane vials	2.92	5.50	7.37	3.41
Regular vials	2.92	5.22	7.53	5.04
Regular/Isophane 30/70 vials	2.92	5.89	4.85	4.23

*Includes 10% for shipping costs **Prices were adjusted based on the INCO term for each purchase where known

GCC procurement prices of selected insulin types and presentations are listed in Table 12. The price of pens was higher than the price for vials for the two insulins where both presentations were procured (glargine and regular insulin). With the exception of glargine in a pen, GCC prices of pens and vials were lower than the median price for the corresponding presentations purchased by the countries. For vials of isophane, regular and regular/isophane insulins (where the number of price points were highest for the country dataset), GCC prices were about 50 percent below the country prices. GCC prices were lower than MSH supplier and buyer prices for the three human insulins.

Table 12. GCC procurement prices, USD, selected insulin types and presentations with median country and MSH 2013 prices.

Insulin type	GCC		Countries		MSH median supplier 2013 USD	MSH median buyer 2013 USD
	Median price USD	N	Median price USD	N		
Glargine						
Pen	42.03	1	39.96	5		
Vial	36.80	1	48.44	3		
Isophane						
Vial	2.82	1	5.50	19	7.37	3.41
Regular						
Pen	8.33	1	9.33	2		
Vial	2.82	1	5.22	24	7.53	5.04
Regular/Isophane 30/70						
Vial	2.82	1	5.89	16	4.85	4.23

N = number of countries (except GCC n=number of price points)

3.3.6 Price Analysis by Brand

Table 13 shows the brands of insulin procured by countries and their median and mean prices. The highest priced brand of human insulin was Penmix® (\$ 21.86). The lowest priced brand of human insulin was Insuget R® and Insuget 30/70® (both had a median price of \$2.06). Based on median prices, isophane ranged from \$2.42 for Insulex N® to \$14.94 for Humulin N, regular insulin ranged from \$2.06 for Insuget R® to \$17.33 for 14.24 for Humulin R®, and regular/isophane 30/70 ranged from \$2.06 for Insuget 30/70® to \$21.86 for Penmix. Amongst brands of analogue insulins, Levemir® (determir), manufactured by Novo Nordisk had the highest median price (\$55.58) while Apidra® (glulisine), manufactured by Sanofi, had the lowest median price at \$14.78. It must be remembered that for some brands there were few price points.

Table 13. Procurement prices, USD, of insulin brands procured by countries.

Insulin	Brand	Manufacturer	Price in USD 10 ml 100 IU				N
			Median	Mean	Max	Min	
<i>Human insulins</i>							
Isophane	Biosulin N®	Kharazmi	6.31	6.31	8.26	4.36	2
	Humulin N	Eli Lilly	14.29	14.94	30.67	6.97	5
	Insugen N®	Biocon	5.85	5.85	5.99	5.72	2
	Insulatard	Novo Nordisk	4.57	4.32	5.80	2.30	4
	Insulex N	Biocon	2.42	2.42			1
	Insuman N®	Sanofi	4.38	4.38			1
	Lansulin N®	Exir	4.36	4.36			1
	Lupinsulin N®	MJ Biopharma	5.46	5.46			1
	Novolin N®	Novo Nordisk	7.85	7.85	12.34	3.36	2
	Protaphane	Novo Nordisk	9.19	10.30	22.06	3.25	9
	Vitasulin N®	Vitane	4.36	4.36			1
Lente Zinc Susp.	Humulin L®	Eli Lilly	12.29	12.29			1
Regular	Actrapid	Novo Nordisk	5.82	8.09	20.64	2.30	15
	Biosulin R®	Kharazmi	6.31	6.31	8.26	4.36	2
	Humulin R	Eli Lilly	14.24	17.84	43.51	6.97	7
	Insugen R®	Biocon	5.99	5.99			1
	Insuget R	Getz	2.06	2.06			1
	Insulex R®	Biocon	2.66	2.66			1
	Insuman R®	Sanofi	5.48	5.48	6.58	4.38	2
	Jusline R®	Julphar	4.46	4.46			1
	Lansulin R®	Exir	4.36	4.36			1
	Novolin R®	Novo Nordisk	12.34	12.34			1
	Vitasulin R®	Vitane	4.36	4.36			1
	Wosulin R®	Wockhardt	4.94	4.94			1
Regular/ Isophane	Actraphane	Novo Nordisk	4.73	4.73	6.21	3.25	2

30/70	30/70®						
	Humulin 30/70®	Eli Lilly	13.74	17.13	32.00	6.97	5
	Insugen 30/70®	Biocon	5.99	5.99			1
	Insuget 30/70®	Getz	2.06	2.06			1
	Insuman Comb 30/70®	Sanofi	6.48	5.94	6.58	4.77	3
	Lansulin 30/70®	Exir	4.36	4.36			1
	Lupinsulin 30/70®	MJ Biopharma	5.46	5.46			1
	Mixtard 30/70	Novo Nordisk	5.92	8.73	19.42	2.42	8
	Novolin 30/70®	Novo Nordisk	12.34	12.34			1
	Penmix 30®	Novo Nordisk	21.86	21.86			1
	Recomulin 30/70®	Biocon	2.48	2.48			1
	Wosulin 30/70®	Wockhardt	5.99	5.99			1
Regular/ Isophane 40/60	Penmix 40®	Novo Nordisk	21.86	21.86			1
Regular/ Isophane 50/50	Penmix 50®	Novo Nordisk	21.86	21.86			1
Analogue insulins							
Aspart	NovoRapid®	Novo Nordisk	27.00	29.42	35.78	24.91	5
Aspart/Protamine 30/70	NovoMix 30/70®	Novo Nordisk	30.47	30.32	36.16	24.18	4
Detemir	Levemir	Novo Nordisk	55.58	53.80	62.14	43.67	3
Glargine	Lantus®	Sanofi	43.19	47.82	81.67	36.89	7
Glulisine	Apidra	Sanofi	14.78	14.78	22.67	6.88	2
Lispro	Humalog®	Eli Lilly	28.68	30.04	33.08	28.37	3
Lispro/Protamine 25/75	Humalog Mix 25®	Eli Lilly	21.86	21.86			1
Lispro/Protamine 50/50	Humalog Mix 50®	Eli Lilly	21.86	21.86			1

N = number of countries

3.3.7 Price Analysis by Brand and Presentation for selected Human and Analogue Insulins

Insulin brands with at least two price points per presentation, across at least two different presentations, were stratified by vial, pen and cartridge (see Table 14). For Actrapid, Humulin 30/70, NovoRapid and Protaphane vials were lower priced than pens and cartridges. For Humulin N cartridges were lower priced than vials, and for Lantus pens were lower priced than vials and cartridges. Again, it must be remembered that for some presentations the data is based on only a few price points.

Table 14. Procurement prices, USD, by presentation for brands with a minimum of four price points.

Brand	Presentation	Price in USD 10 ml 100 IU/ml				N
		Median	Mean	Max	Min	
Actrapid	Vial	4.79	5.75	19.42	2.09	12
	Pen	10.32	10.32			1
	Cartridge	17.93	14.93	21.86	5.80	5
Humulin 30/70	Vial	13.02	13.11	19.42	6.97	4
	Cartridge	26.93	26.93	32.00	21.86	2
Humulin N	Vial	13.95	16.38	30.67	6.97	4
	Cartridge	11.82	11.82	15.30	8.33	2
Lantus	Vial	48.44	56.68	81.67	39.34	3
	Pen	39.96	41.00	48.44	36.57	5
	Cartridge	46.31	45.98	48.44	43.21	3
NovoRapid	Vial	23.09	23.09			1
	Pen	27.30	28.43	34.20	24.91	4
	Cartridge	26.24	29.22	35.78	25.63	3
Protaphane	Vial	5.50	6.82	13.59	2.09	7
	Pen	17.27	17.27	24.22	10.32	2
	Cartridge	17.93	17.71	19.90	15.30	3

N = number of countries

3.3.8 Annual Procurement Volumes

A total of 15,520,169 x 10ml of insulin was purchased by the countries (n=25) who reported volumes in the year of the latest tender (Table 16). Human insulins, which overall were lower priced compared to analogues (as shown in Table 7), accounted for 89 percent of the total volume of insulin purchased.

Table 16. Annual volumes purchased by countries.

Insulin	Volume procured x 10 ml	Proportion of total insulin procured
Human (n=94)	13,847,165	89%
Analogue (n=23)	1,673,004	11%

N = number of data points

Table 17 presents the ranked total volume of each brand of insulin purchased by the countries up to 1 percent of total volume. Premixed insulins (30/70) accounted for about 41 percent of all

purchases, with Mixtard 30/70, Insuman Comb 30/70 and Actraphane 30/70 having the highest volumes purchased.

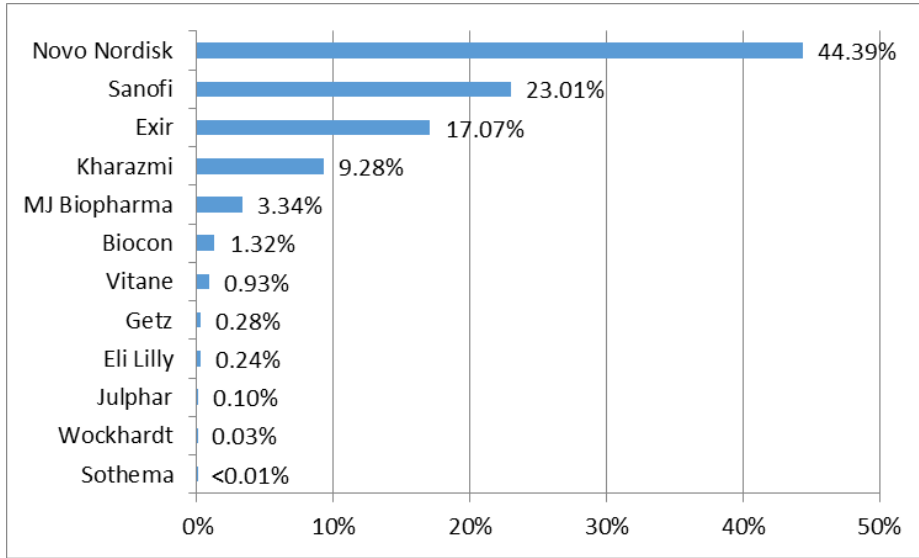
Table 17. Volume of insulin procured by brand.

Brand	Manufacturer	Volume (x10 ml)	Proportion of total volume procured (%)	N
Mixtard 30/70	Novo Nordisk	2293333	14.78	8
Insuman Comb 30/70	Sanofi	1771379	11.41	3
Actraphane 30/70	Novo Nordisk	1582645	10.20	3
Lansulin N	Exir	1400000	9.02	1
NovoMix 30/70	Novo Nordisk	865984	5.58	3
Biosulin N	Kharazmi	800000	5.15	1
Lansulin R	Exir	800000	5.15	1
Actrapid	Novo Nordisk	785466	5.06	14
Lantus	Sanofi	725827	4.68	8
Biosulin R	Kharazmi	640000	4.12	1
Insuman N	Sanofi	547538	3.53	1
Protaphane	Novo Nordisk	531171	3.42	10
Insuman R	Sanofi	521294	3.36	2
Lansulin 30/70	Exir	450000	2.90	1
Insulatard	Novo Nordisk	442399	2.85	4
Biosulin R	MJ Biopharma	326414	2.10	1
Novolin N	Novo Nordisk	203500	1.31	5
Biosulin N	MJ Biopharma	163807	1.06	1

N = number of data points

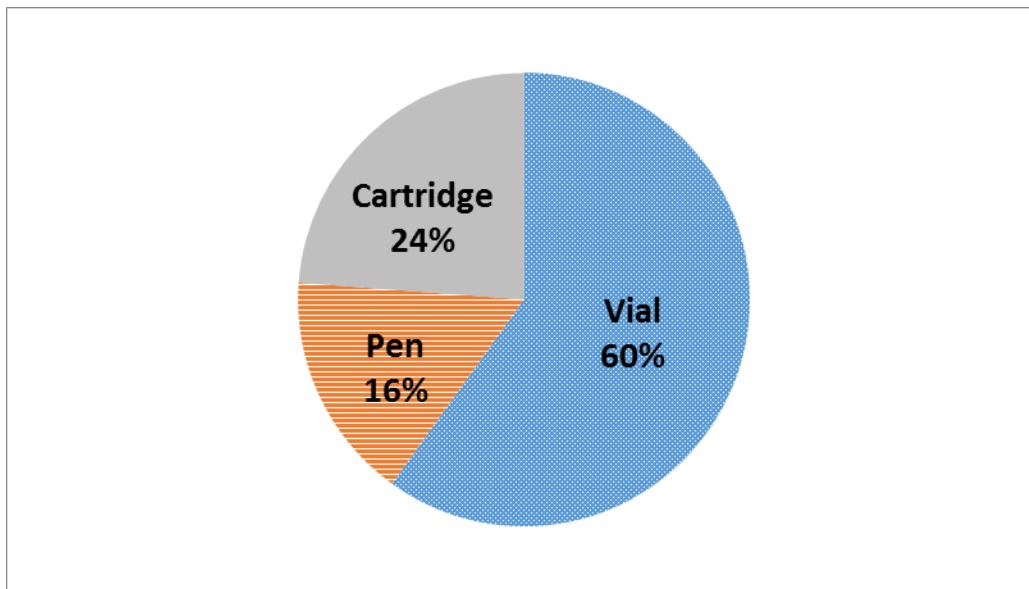
Figure 16 shows the total volume of insulin procured by manufacturer. Novo Nordisk has the highest market share in terms of volume among the study countries, accounting for 44 percent of the total volume of insulins purchased. This was followed by Sanofi (23 percent) and Exir (17 percent). The concentration of insulin manufacturers is skewed, with the top four accounting for 93 percent of the total volume of purchases.

Figure 16. Proportion of total volume of insulins purchased by manufacturer.



Sixty percent of the total volume of insulin purchased by the countries was in vials (Figure 17). Insulin in pens had the lowest proportion of total volume of insulin purchased (16 percent).

Figure 17. Percentage of total volume of insulin purchases by presentation.



3.3.9 Correlation between Procurement Price and Volume of Purchase

As the data was not normally distributed, the Spearman rank correlation coefficient was used to determine if there was a linear association between price and volume of purchase at $\alpha=0.05$ significant level. This test was performed for all insulin types and brands with at least 8 data

points. The correlations plots are shown in Annex 7. There was significant evidence of a moderate negative association between price and volume for isophane insulin ($r = -0.68$, $p < 0.01$), moderate negative association for regular insulin ($r = -0.66$, $p < 0.01$), and moderate negative association for regular/isophane 30/70 ($r = -0.54$, $p = 0.02$).

We also tested for an association between the price and volume of each brand of insulin and found no significant correlation for Actrapid or Protaphane

In Table 18, the procurement price and annual volumes procured were compared for Actrapid vials. As can be seen, purchasing greater volumes did not always result in lower prices. Pakistan paid only 10 cents more per 10ml than Tanzania, but purchased less than a tenth of the volume, and the price paid by the government of Vanuatu was about four times the price in South Africa but they purchased a smaller amount.

Table 18. Procurement price (USD) versus volume for Actrapid vials.

Country	Annual volume purchased x10 ml	Price USD 10 ml 100 IU
Cook Islands	150	5.50
Vanuatu	500	9.40
Philippines	9970	4.88
Pakistan	13200	2.42
Mozambique	17600	3.25
Kyrgyz Republic	62000	4.69
Sudan	80000	3.34
South Africa	157270	2.09
Tanzania	175000	2.30

3.3.10 Potential Savings from Procuring Only Human Insulin

Table 19 shows potential annual savings for the governments in four countries if they procured human insulin only rather than their current mix of human and analogue insulins. Iran purchased three analogues i.e. glargine, aspart and aspart/protamine. If human insulins were purchased rather than these analogues, a saving of \$ 49 million USD would be possible. The Dominican Republic procured one analogue (glulisine). If this was replaced with human insulin at \$2.47 a vial, then savings would be about \$23,000. For Moldova, if the three analogues procured were replaced with human insulin at the weighted mean price of \$7.18 a vial, savings of \$ 48,000 would be possible. If the government of the Kyrgyz Republic replaced the five analogue insulins procured with human insulin at \$4.93 a vial, they would save about \$420,000.

Table 19. Potential savings from procuring human insulin only in Iran, Dominican Republic, Moldova and Kyrgyz Republic.

	Iran	Dominican Republic	Moldova	Kyrgyz Republic
<i>Human insulin</i>				
Volume purchased vials	4235000	200400	13104	189500
Total cost USD	\$ 18,479,846	\$ 495,405	\$ 94,110	\$ 933,442

<i>Analogue insulin</i>				
Volume purchased vials	1569000	5200	1333	11250
Total cost USD	\$ 56,029,008	\$ 35,786	\$ 58,087	\$ 477,694
<i>Human & analogue insulins</i>				
Volume purchased vials	5804000	205600	14437	200750
Total cost USD	\$ 74,508,854	\$ 531,191	\$ 152,197	\$ 1,411,136
Procuring human insulin only				
Weighted mean price human insulin USD	\$ 4.36	\$ 2.47	\$ 7.18	\$ 4.93
Volume purchased vials	5804000	205600	14437	200750
Total cost USD	\$ 25,305,440	\$ 508,259	\$ 103,682	\$ 988,857
Savings USD	\$ 49,203,414	\$ 22,932	\$ 48,515	\$ 422,278

3.4 Insulin Patient Prices in the Public and Private Sector

In total, 923 data points were collected. Excluding 50 where the insulin was supplied free-of-charge in the public sector, the patient price analysis was based on 871 price points across 43 countries (public and private sector). Annex 1 lists the 43 countries and sectors where data was collected, by World Bank Income Group. Of these, 8 were low-income countries, 14 were lower-middle income countries, 11 were upper-middle income countries and 10 were high-income countries.

The public sector provided insulin for free to all people in two high-income countries (Argentina and England), four upper-middle countries (Colombia, Ecuador, Malaysia, and South Africa) and three low-income countries (El Salvador, Malawi and Uganda).

Table 20 shows the distribution of human, analogue and animal insulins found in each sector per country income group. In both sectors the percentage of analogue insulins found increased as the wealth of the countries increase. In the private sector of the high-income countries there were more reports of analogue insulins found compared to human insulins.

Table 20. Mean percentage of insulin types found (human, analogue, animal), public and private sector.

World Bank Income Group	Public Sector			Country Income level	Private Sector		
	Human	Analogue	Animal		Human	Analogue	Animal
High	58.4%	40.9%	0.7%	High	45.4%	53.8%	0.8%
Upper-middle	64.1%	35.9%	0.0%	Upper-middle	50.7%	49.3%	0.0%
Lower-middle	80.9%	19.1%	0.0%	Lower-middle	62.7%	37.3%	0.0%
Low	100.0%	0.0%	0.0%	Low	73.3%	26.7%	0.0%

Table 21 shows the number of brands found per country (for any insulin type). On average more brands were found in the private sector than in the public sector.

Table 21. Number of insulin brands found in the public and private sector per country income group.

World Bank Income Group	Public Sector				Private Sector			
	Median	Mean	Range	N	Median	Mean	Range	N
High-income	12	13	3-26	4	15	16	5-34	10
Upper-middle	5	7	2-18	8	10	12	2-22	11
Lower-middle	3	6	2-14	9	7	7	1-17	14
Low-income	2	2	1-3	6	3	4	1-7	9

N=number of countries

Patient Prices of Animal Insulin

Few prices were reported for animal insulins. Porcine insulin was reported in the public sector in England where it was provided free-of-charge. Bovine insulins were found in the private sector of Argentina. Prices were \$23.00 for Betasint N[®] and \$19.24 for Betasint R[®] (10 ml of 100 iu/ml insulin).

3.4.1 Summary Patient Prices for Human and Analogue Insulins

Tables 22 and 23 list the median, mean and range of patient prices across all countries for human, analogue and bovine insulins, in the public and private sectors, for 10ml 100IU insulin. In the public sector, the median price for human and analogue insulins was \$7.64 and \$45.03, respectively. Bovine insulin was not reported in the public sector. Prices were also lower for human insulin in the private sector (\$16.65) compared to animal (bovine, \$21.12) and analogue insulin (\$39.35).

The range of prices for each insulin type was large. Analogues in the public and private sectors ranged from \$6.41-\$124.90 and \$5.89-\$250.73, respectively.

Table 22. Overall patient prices in the public sector for human and analogue insulins.

Human insulins				Analogue insulins			
N	Median USD	Mean USD	Range USD	N	Median USD	Mean USD	Range USD
51	7.64	12.28	2.16-36.70	37	45.03	42.56	6.41-124.90

Table 23. Overall patient prices in the private sector for human, analogue and bovine insulins.

Human insulins				Analogue insulins				Animal insulins			
N	Median USD	Mean USD	Range USD	N	Median USD	Mean USD	Range USD	N	Median USD	Mean USD	Range USD
125	16.65	16.66	1.67-50.57	170	39.35	46.70	5.89-250.73	2	21.12	21.12	19.24-23.00

3.4.2 Patient Prices for Human Insulin by Type

Table 24 shows median and mean patient prices of insulin types by sector. For the three insulins with the greatest number of price points, all had lower median prices in the public sector compared to the private sector i.e. isophane (\$8.33 vs \$15.73), regular (\$6.51 vs \$15.12) and regular/isophane 30/70 (\$6.23 vs \$15.97).

Table 24. Patient prices, USD, human insulins, public and private sector by insulin type.

Insulin type	Prices (USD) 10 ml 100 IU across countries							
	Public sector				Private sector			
	Median	Mean	Range	N	Median	Mean	Range	N
Isophane	8.33	11.07	2.35-35.52	15	15.73	16.54	1.67-17.74	34
Lente Zinc Suspension	8.34	8.34		1	9.51	11.86	7.11-16.76	5
Regular	6.51	9.86	2.35-35.27	17	15.12	15.31	2.48-46.44	33
Regular/Isophane 10/90	-	-	-	-	21.69	21.69		1
Regular/Isophane 15/85	36.02	36.02		1	36.02	36.02		1
Regular/Isophane 20/80	-	-		-	21.69	21.69		1
Regular/Isophane 25/75	36.02	36.02		1	18.44	18.85	6.46-36.02	5
Regular/Isophane 30/70	6.23	10.10	2.16-36.47	14	15.97	16.15	3.72-39.07	35
Regular/Isophane 40/60	-	-		-	23.20	27.99	21.69-39.08	3
Regular/Isophane 50/50	35.49	35.49		1	21.69	19.91	6.92-36.70	5
Ultralente	-	-		-	16.74	16.74		1

N = number of countries

3.4.3 Patient Prices for Human Insulin by World Bank Income Group

Patient prices for human insulins in the public and private sectors varied across country income groups as shown in Table 25. In high-income countries, the median price in the public sector (\$35.77) was higher than in the private sector (\$21.69). The opposite was seen in upper-middle income countries where the median price was higher in the private sector (\$18.45) compared to the public sector (\$6.17). Across lower-middle income countries, patient prices were lower in the public sector (\$6.59) compared to the private sector (\$8.91). In low-income countries, the median price in the public sector (\$6.51) was lower than in the private sector (\$8.00). However, it must be remembered that the number of countries in the public and private sector datasets differed.

Table 25. Patient prices, USD, human insulins, public and private sector per country income group.

Human insulin type and World Bank Income Group	Public Sector				Private Sector			
	Median USD	Mean USD	Range USD	N	Median USD	Mean USD	Range USD	N
High-income	35.77	30.16	12.54-36.70	8	21.69	23.52	3.13-47.74	37
Isophane	24.13	24.13	12.75-35.52	2	19.46	22.08	3.13-47.74	10
Lente					16.74	16.74		1
Regular	23.91	23.91	12.54-35.27	2	19.34	22.72	3.78-46.64	7
Regular/Isophane 10/90					21.69	21.69		1
Regular/Isophane 15/85	36.02	36.02		1	36.02	36.02		1
Regular/Isophane 20/80					21.69	21.69		1
Regular/Isophane 25/75	36.02	36.02		1	36.02	36.02		1
Regular/Isophane 30/70	36.47	36.47		1	19.00	22.01	3.72-39.08	8
Regular/Isophane 40/60					23.20	27.99	21.69-39.08	3
Regular/Isophane 50/50	36.70	36.7		1	23.20	27.20	21.69-36.70	3
Ultralente					16.74	16.74		1
Upper-middle income	6.17	13.99	2.66-34.45	12	18.45	18.07	4.20-32.61	31
Isophane	5.22	11.89	2.66-34.45	4	20.75	17.79	4.20-24.08	9
Lente					16.76	16.76		1
Regular	5.15	11.07	2.66-31.33	4	17.88	17.02	4.20-23.03	10
Regular/Isophane 25/75					19.03	19.03	18.45-19.61	2
Regular/Isophane 30/70	6.24	13.91	4.20-31.29	3	18.30	19.44	13.44-32.61	9
Regular/Isophane 50/50	34.29	34.29		1				
Lower-middle income	6.59	6.65	2.16-13.01	22	8.91	10.96	1.80-31.31	40
Isophane	9.31	9.42	2.35-13.01	6	8.01	9.50	1.68-21.94	10
Lente	8.34	8.34		1	9.19	8.60	7.11-9.51	3
Regular	6.59	6.67	2.35-13.01	8	9.36	12.46	2.48-31.31	11
Regular/Isophane 25/75					10.08	10.08	6.46-13.70	2
Regular/Isophane 30/70	5.89	5.24	2.16-8.12	7	10.68	11.86	4.06-27.94	12
Regular/Isophane 50/50					8.99	8.99	6.93-11.06	2
Low-income	6.51	7.89	5.06-10.86	9	8.00	12.56	6.14-	17

							50.57	
Isophane	6.51	7.4	5.06-10.64	3	9.50	17.15	6.14-50.57	6
Regular	6.51	7.4	5.06-10.64	3	6.59	7.77	6.14-11.59	5
Regular/Isophane 30/70	10.64	8.86	5.06-10.86	3	10.96	11.95	6.14-20.67	6

N= number of countries

3.4.4 Correlation Between Patient Prices and GDP/GDPpc for Human Insulin

Spearman correlation in the public sector was calculated for insulin types with more than eight data points (isophane, regular and regular/isophane 30/70) and compared with GDP and GDP per capita. Correlation plots are shown in Annex 7. In the public sector a correlation of $r=0.58$ ($p<0.01$) was found for isophane when compared to GDP, and a correlation of $r=0.50$ ($p<0.05$) was found for regular insulin. These show a moderate but significant correlation for the median patient price and GDP. For GDP per capita, no significant correlations were found for isophane, regular or regular/isophane 30/70.

In the private sector no significant correlation was found between price and GDP. For GDP a correlation of 0.27 ($p=0.113$) was found for isophane, for regular insulin a correlation was found of 0.30 ($p=0.094$), and for regular/isophane 30/70 a correlation was found of 0.28 ($p=0.109$). This means that with $\alpha=0.05$ no significant correlations were found. Comparing prices and GDP per capita gave moderate and significant correlations of 0.49 ($p=0.003$), 0.53 ($p=0.001$) and 0.53 ($p=0.012$) for the three insulins respectively.

3.4.5 Patient Prices for Human Insulin by Country

Table 26 shows mean patient prices by country, in the public and private sectors, for the three human insulins with the most price points i.e. isophane, regular and regular/isophane 30/70. In most countries, patient prices in the public sector were lower than in the private sector. In a few countries prices were identical or similar across the sectors (e.g. Iran, Mali, Russia, Germany) or higher in the public sector for some or all of the three insulins (e.g. China, Senegal). It must be remembered that the data for most countries is not representative but is what a person would have to pay in that outlet on that day.

Table 26. Mean patient prices, USD, for isophane, regular and regular/isophane 30/70, public and private sector, by country.

Country	Mean patient price, USD, 10 ml 100 IU human insulins					
	Public Sector			Private Sector		
	Isophane	Regular	Regular/Isophane 30/70	Isophane	Regular	Regular/Isophane 30/70
High-income countries						
Argentina				39.49	32.84	
Bahrain				16.28	17.01	15.97
England				21.74		21.12
Germany	35.52	35.27	36.47	35.52	35.27	36.47

New Zealand				27.14		39.08
Russia	12.75	12.54		12.70		
Saudi Arabia				16.65	16.65	16.65
Spain				22.68	20.85	26.18
UAE				17.19	19.34	16.89
Venezuela				3.13	3.48	3.72
Upper-middle income countries						
China	34.45	31.33	31.29		24.93	29.63
Colombia					9.59	
Dominican Republic	2.66	2.66		20.86	23.03	
Ecuador				20.89	19.00	18.00
Grenada	6.24	6.11	6.24	13.77		13.77
Iran	4.20	4.20	4.20	4.20	4.20	4.20
Jordan				17.28	16.76	18.30
Lebanon				15.70	15.21	13.44
Malaysia				22.61	22.90	32.61
Mexico				20.75	13.98	21.36
South Africa				24.08	20.62	23.63
Lower-middle income countries						
Egypt				4.06	3.59	4.06
El Salvador				21.94	25.87	27.94
Ghana				15.73	17.70	21.47
India				5.27	4.68	5.84
Indonesia	13.01	13.01				
Kenya		4.39	4.28		9.36	13.38
Lao PDR	6.23	6.23	6.23	7.39	6.29	6.29
Pakistan				5.50	5.50	4.75
Philippines	8.33	6.95	7.64		31.31	12.72
Senegal	2.35	2.35	2.35	1.68	2.48	5.94
Sri Lanka		2.36	2.16			17.56
Sudan	8.78	8.78	8.12	11.66	12.04	13.75
Vietnam	9.31	9.31	5.89	13.17	18.27	
Zambia				8.64		8.64
Low-income countries						
Burundi	10.64	10.64	10.64	12.42	11.59	10.77
Cambodia			10.86			
Ethiopia				50.57		
Malawi						11.14
Mali	6.51	6.51		6.59	6.59	16.48
Guinea	5.06	5.06	5.06	6.52	6.52	6.52
Uganda				6.14	6.14	6.14

Zimbabwe				20.67	8.00	20.67
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3.4.6 Patient Prices for Human Insulin by Brand

Annexes 8 and 9 list the mean patient prices in the public and private sectors by brand. It must be noted that for many brands there were few price points (particularly in the public sector).

Table 27 shows prices for brands of human insulin where there were at least ten data points across at least three income groups in the private sector. Median prices of these brands in the public sector were higher than prices in the private sector in high-income countries and upper-middle income countries. In lower-middle income countries, median prices were lower in the public sector compared to the private sector for all brands except Humulin N (\$10.67 vs \$9.51, respectively). In low-income countries, median prices were similar in both sectors for Actrapid and Insulatard, and higher in the public sector for Mixtard 30.

Some large price variations for insulin brands were seen across countries within a country economic level e.g. in the private sector, Insulatard ranged from \$6.53 to \$50.57 across five low-income countries, Humulin R ranged from \$5.92 to \$49.89 across five lower-middle income countries, and Humulin N ranged from \$3.17 to \$34.95 across eight high-income countries.

Looking at the correlation between GDP and patient prices, in the private and public sector, brands with at least five price points across all countries were selected for public sector data and at least eight data points for private sector data. Correlation plots are shown in annex 7. Spearman correlation was used, for GDP and GDP per capita values were not normally distributed. Taking into account $\alpha = 0.05$, significant correlation was found for Humulin R ($r=0.9$, $p=0.037$) in the public sector. In the private sector, a significant correlation for Actrapid ($r=0.48$, $p = 0.046$) and Insulatard ($r=0.70$, $p=0.002$) were found.

When analysing the correlation between GDP per capita and brand price, a significant correlation was found for Actrapid in the public sector ($r=0.96$, $p<0.001$). For the private sector prices for Actrapid ($r=0.80$, $p<0.001$), Mixtard 30 ($r=0.74$, $p<0.001$) and Insulatard ($r=0.61$, $p=0.01$) were significant correlated to GDP per capita.

Table 27. Patient prices, USD 10ml 100IU, selected brands of human insulin, public and private sectors.

Brands Human Insulin	Public Sector				Private Sector			
	Median USD	Mean USD	Range USD	N	Median USD	Mean USD	Range USD	N
High-income countries								
Actrapid	23.64	23.64	11.49-35.79	2	22.50	22.50	17.01-35.79	5
Humulin 30	36.02	36.02		1	20.67	20.67	3.64-39.08	8
Humulin N	34.95	34.95		1	18.88	18.88	3.17-34.95	8
Humulin R	34.84	34.84		1	19.13	19.13	3.17-34.84	5
Insulatard					20.78	20.78	17.84-23.72	5

Mixtard 30					21.73	21.73	17.01-29.87	4
Upper-middle income countries								
Actrapid					17.81	18.76	14.66-23.82	3
Humulin 30	34.29	34.29		1	22.96	23.82	19.00-30.37	4
Humulin N					20.86	22.08	16.70-31.79	7
Humulin R	34.45	34.45		1	21.33	21.79	19.00-26.53	6
Insulatard					17.39	17.28	13.47-20.97	3
Mixtard 30					20.50	25.36	13.47-42.12	3
Lower-middle income countries								
Actrapid	5.76	5.72	2.36-9.01	4	11.60	11.26	5.23-17.70	5
Humulin 30	6.34	6.34		1	16.62	15.82	4.84-26.67	5
Humulin N	10.67	10.67	8.34-13.01	2	9.51	11.67	4.06-25.11	5
Humulin R	8.34	8.24	3.39-13.01	3	9.51	19.39	5.92-49.89	5
Insulatard	9.01	7.72	2.35-11.79	3	10.40	10.04	1.68-14.87	4
Mixtard 30	4.61	5.76	2.16-11.79	6	11.14	11.46	4.84-18.51	6
Low-income countries								
Actrapid	6.51	7.40	5.06-10.64	3	6.59	7.77	6.14-11.59	5
Insulatard	6.51	7.40	5.06-10.64	3	6.59	16.45	6.53-50.57	5
Mixtard 30	10.64	8.86	5.06-10.86	3	8.65	9.98	6.14-16.48	4

N=number of countries

3.4.7 Patient Prices for Analogue Insulin by Type

In the public sector, median prices of analogues ranged from \$28.44 for glulisine to \$47.85 for lispro/protamine 50/50 although this was based on limited data. In the private sector, median prices ranged from \$31.99 for aspart to \$86.19 for degludec.

Table 28. Patient prices, USD, analogue insulins, public and private sectors.

Insulin type	Prices (USD) 10 ml 100 IU across countries							
	Public sector				Private sector			
	Median	Mean	Range	N	Median	Mean	Range	N
Aspart	39.70	36.89	18.24-50.40	5	31.99	35.59	10.35-116.06	24
Aspart/Protamine 30/70	39.70	36.81	7.33-54.42	5	36.13	40.84	16.35-120.45	21
Aspart/Protamine 50/50	46.36	46.6		1	34.91	37.10	31.78-46.78	4
Aspart/Protamine 70/30	-	-		-	34.91	37.10	31.77-46.78	4

Degludec	-	-	-	-	86.19	94.08	85.42-110.62	3
Detemir	41.57	54.62	10.42-124.90	4	58.09	66.28	10.36-250.73	19
Glargine	42.95	46.81	16.60-112.93	8	54.92	53.75	8.32-196.46	29
Glulisine	28.44	39.38	6.41-83.91	5	34.78	41.75	5.88-96.60	15
Lispro	35.62	36.04	24.65-48.28	4	33.40	38.19	10.35-108.64	21
Lispro/Protamine	-	-	-	-	39.93	39.93	-	1
Lispro/Protamine 25/75	46.37	42.11	30.63-49.33	3	39.37	47.56	19.78-106.62	15
Lispro/Protamine 50/50	47.85	47.85	46.37-49.33	2	40.93	49.80	22.62-116.13	14

N = number of countries

3.4.8 Patient Prices for Analogue Insulin by World Bank Income Group

Patient prices per sector and country income group are shown in Table 29. Across the analogues, median prices in the public sector were higher than in the private sector in high-, upper-middle and lower-middle income countries. No low-income country reported the sale of an analogue in the public sector.

In the public sector, median prices decreased as the wealth of the countries decreased i.e. \$49.31 in high-income countries, \$46.37 in upper-middle income countries, and \$25.69 in lower-middle income countries. In the private sector, patient prices decreased from high-income countries (\$44.28) to \$23.57 in lower-middle income countries, however, low-income countries were paying a higher price (\$34.81).

Table 29. Patient prices, USD 10ml 100IU, analogue insulins, public and private sectors per income group.

Insulin type	Public Sector				Private Sector			
	Median USD	Mean USD	Range USD	N	Median USD	Mean USD	Range USD	N
High-income countries	49.31	47.00	18.24-83.91	12	44.28	56.46	21.68-250.73	75
Aspart	33.77	33.77	18.24-49.31	2	37.23	43.90	21.68-116.06	9
Aspart/Protamine 30/70	49.31	49.31		1	41.46	49.49	30.37-120.45	8
Aspart/Protamine 50/50					34.91	37.10	31.78-46.78	4
Aspart/Protamine 70/30					34.91	37.10	31.78-46.78	4
Degludec					110.62	110.62		1
Detemir	56.64	56.64		1	58.12	77.76	29.89-250.73	8
Glargine	53.27	53.27	48.20-58.33	2	56.98	74.55	44.54-196.46	9
Glulisine	56.17	56.17	28.44-83.91	2	38.67	57.32	28.03-96.60	7
Lispro	36.47	36.47	24.65-48.28	2	36.39	48.92	25.06-108.64	10
Lispro Protamine NPL					39.93	39.93		1
Lispro/Protamine 25/75	49.33	49.33		1	39.37	57.48	31.77-106.62	7
Lispro/Protamine 50/50	49.33	49.33		1	42.79	58.61	31.77-116.13	7
Upper-middle income	46.37	55.96	25.83-	13	39.59	44.97	13.38-	54

countries			124.90				120.82	
Aspart	45.05	45.05	39.70-50.40	2	37.33	36.69	24.59-49.96	7
Aspart/Protamine 30/70	47.06	47.06	39.70-54.42	2	39.70	38.15	29.23-46.37	7
Aspart/Protamine 50/50	46.36	46.36		1				
Degludec					85.80	85.80	86.19-85.42	2
Detemir	124.90	124.90		1	60.79	66.58	35.39-120.82	6
Glargine	40.87	59.88	25.83-112.93	3	55.29	54.96	31.62-109.67	9
Glulisine	53.28	53.28		1	33.18	32.60	22.89-39.48	6
Lispro	46.37	46.37		1	34.98	32.01	13.38-47.70	6
Lispro/Protamine 25/75	46.37	46.37		1	40.82	40.73	25.62-53.55	6
Lispro/Protamine 50/50	46.37	46.37		1	38.23	41.29	26.90-57.72	5
Lower-middle income countries	25.69	23.29	6.41-45.03	12	23.57	29.78	5.89-73.49	33
Aspart	26.81	26.81		1	16.72	24.47	10.36-52.36	5
Aspart/Protamine 30/70	20.32	20.32	7.33-33.30	2	20.31	28.13	16.72-52.39	5
Detemir	18.46	18.46	10.42-26.50	2	42.95	42.44	10.36-73.49	4
Glargine	26.70	29.45	16.60-45.03	3	16.72	29.20	9.62-59.04	9
Glulisine	15.64	15.64	6.41-24.87	2	14.73	14.73	5.89-23.57	2
Lispro	24.87	24.87		1	26.59	27.62	10.59-46.72	4
Lispro/Protamine 25/75	30.63	30.63		1	33.29	33.29	19.79-46.80	2
Lispro/Protamine 50/50					40.29	40.29	22.62-57.95	2
Low-income countries					34.81	42.83	10.35-120.00	8
Aspart					22.28	26.66	10.35-47.33	3
Aspart/Protamine 30/70					54.00	54.00		1
Detemir					68.00	68.00		1
Glargine					65.18	65.18	10.35-120.00	2
Lispro					10.35	10.35		1

N= number of countries

3.4.9 Correlation between Patient Prices and GDP/GDPpc for Analogue Insulin

Spearman correlation analyses were performed for analogue prices against GDP and GDP per capita. Correlation plots are shown in annex 7. In the public sector, only glargine had more than eight data points. For GDP, a correlation of $r=0.79$ ($p=0.021$) was found. However when plotting this data against the GDP per capita the correlation was not significant $r=0.62$ ($p=0.102$).

In the private sector, eight analogues were included in the analysis. Correlations and p-values for these data are given in Table 30. For the correlation between insulin price and GDP only lispro/protamine 25/75 gave a significant correlation. For GDP per capita, aspart, glargine and lispro gave significant correlations.

Table 30. Correlations for analogue insulins and their p-values in the private sector.

Insulin type	Correlation GDP	p-value	Correlation GDPpc	p-value
Aspart	0.33	0.11	0.42	0.04*
Aspart/Protamine 30/70	0.14	0.56	0.27	0.23
Detemir	-0.20	0.41	0.08	0.73
Glargine	0.25	0.20	0.47	<0.01*
Glulisine	0.25	0.37	0.55	0.04*
Lispro	0.09	0.70	0.50	0.02*
Lispro/Protamine 25/75	0.60	0.02*	0.23	0.41

Lispro/Protamine 50/50	0.32	0.27	0.20	0.48
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*significant

3.4.10 Patient Prices for Analogue Insulin by Country

Table 31 shows mean patient prices for three analogues (aspart, glargine and lispro), in the public and private sectors, by country. While few prices were recorded in the public sector, large variations were seen across the countries. For example, glargine ranged from \$16.60 in Vietnam to \$112.93 in China. Wide price variations across countries were also seen in the private sector e.g. glargine was \$8.32 in India and \$196.46 in Venezuela.

Table 31. Mean patient price, USD, for aspart, glargine and lispro, public and private sector, by country.

Country	Mean patient price USD 10ml 100IU analogue insulins					
	Public Sector			Private Sector		
	Aspart	Glargine	Lispro	Aspart	Glargine	Lispro
High-income countries						
Argentina						108.64
Bahrain				37.23	54.63	31.18
England				27.63	44.54	27.56
Germany	49.31	58.33	48.28	49.31	58.33	48.28
New Zealand				44.28	84.52	51.14
Russian Federation	18.24	48.20	24.65	21.68	50.17	25.06
Saudi Arabia				31.78	55.81	29.51
Spain				27.79	56.98	33.40
UAE				39.33	69.48	39.37
Venezuela				116.06	196.46	95.01
Upper-middle income countries						
China	50.40	112.93	46.37	49.96	109.67	
Colombia					31.62	13.38
Dominican Republic		25.83				
Ecuador				26.67	42.00	38.33
Iran	39.70	40.87		39.70	40.87	
Jordan				32.21	56.95	34.60
Lebanon					55.29	35.37
Malaysia				46.37	56.82	
Mexico				37.33	65.20	47.70
South Africa				24.59	36.27	22.70
Lower-middle countries						
El Salvador					54.92	46.72
Ghana				16.72	16.72	
India				16.36	8.32	10.59
Indonesia	26.81	26.70	24.87	52.36	58.97	

Kenya					26.61	23.95
Senegal				26.57		
Sri Lanka					13.45	29.22
Sudan		45.03			59.04	
Vietnam		16.60			9.62	
Zambia				10.36	15.12	
Low-income countries						
Guinea				10.35	10.35	10.35
Malawi				22.28		
Zimbabwe				47.33	120.00	

3.4.11 Patient Prices for Analogue Insulin by Brand

Comparing median patient prices for brands of analogue insulin in the public and private sector shows a more varied picture (Table 32). In high-income countries, median prices were similar in the two sectors except for Apidra which was lower priced in the private sector (\$38.67 vs \$56.17). In upper-middle income countries, prices were higher in the public sector for Apidra (\$53.28 vs \$31.57), Humalog (\$46.37 vs \$34.98), Levemir (\$124.90 vs \$60.79), NovoMix 30 (\$47.06 vs \$39.70) and NovoRapid (\$45.05 vs \$37.33) compared to the private sector. Lantus was higher priced in the private sector. Lower-middle income countries had higher prices in the public sector for Apidra (\$15.64 vs \$14.73), Lantus (\$26.70 vs \$16.72) and NovoRapid (\$26.81 vs \$16.72). In the private sector of low-income countries, Levemir, Lantus and NovoMix 30 were higher priced than the more wealthy countries.

Taking into account $\alpha=0.05$, analysing the Spearman correlation between GDP and analogue brand prices a significant correlation in the public sector was seen for Lantus ($r=0.79$, $p = 0.021$), and NovoMix 30 ($r = 0.90$, $p = 0.037$). In the private sector, a correlation was found for Humalog Mix 25 ($r=0.5$, $p=0.019$). Analysing the brand price against the GDP per capita showed significant correlation in the public sector for NovoMix 30 ($r=0.9$, $p = 0.037$). In the private sector significant correlations were found for Apidra ($r=0.54$, $p=0.47$), Humalog ($r = 0.5$, $p = 0.021$), Lantus ($r = 0.50$, $p = 0.005$) and NovoRapid ($r=0.42$, $p=0.040$). Correlation plots are shown in Annex 7.

Table 32. Patient prices, USD 10ml 100IU, selected brands of analogue insulin, public and private sectors.

Brands analogue insulins	Public Sector				Private Sector			
	Median USD	Mean USD	Range USD	N	Median USD	Mean USD	Range USD	N
High-income countries								
Apidra	56.17	56.17	28.44-83.91	2	38.67	57.32	28.03-83.91	7
Humalog	36.47	36.47	24.65-48.28	2	36.39	48.92	25.06-108.64	10
Lantus	53.27	53.27	48.20-58.33	2	56.98	74.55	44.54-196.46	9
Levemir	56.64	56.64		1	58.12	77.76	29.89-250.73	8
NovoMix 30	49.31	49.31		1	41.46	49.49	30.38-120.45	8
NovoRapid	33.77	33.77	18.24-49.31	2	37.23	43.9	21.68-116.06	9

Upper-middle income countries								
Apidra	53.28	53.28		1	31.57	32.16	22.89-39.48	5
Humalog	46.37	46.37		1	34.98	32.01	13.38-47.70	6
Lantus	40.87	65.23	25.83-128.99	3	55.29	56.57	31.62-124.09	9
Levemir	124.90	124.9		1	60.79	66.58	35.39-120.82	6
NovoMix 30	47.06	47.06	39.70-54.42	2	39.70	38.15	29.23-46.37	7
NovoRapid	45.05	45.05	39.70-50.40	2	37.33	36.69	24.59-49.96	7
Lower-middle income countries								
Apidra	15.64	15.64	6.41-24.87	2	14.73	14.73	5.89-23.57	2
Humalog	24.87	24.87		1	26.59	27.62	10.59-46.72	4
Lantus	26.70	29.45	16.60-45.03	3	16.72	28.93	8.32-59.04	9
Levemir	18.46	18.46	10.42-26.50	2	42.95	42.44	10.36-73.49	4
NovoMix 30	20.32	20.32	7.33-33.30	2	20.31	28.13	16.35-52.39	5
NovoRapid	26.81	26.81		1	16.72	24.47	10.36-52.36	5
Low-income countries								
Humalog					10.35	10.35		1
Lantus					65.18	65.18	10.35-120.00	2
Levemir					68.00	68.00		1
NovoMix 30					54.00	54.00		1
NovoRapid					22.28	26.66	10.36-47.33	3

N = number of countries

3.4.12 Patient Prices by Presentation, Human and Analogue Insulins

An analysis of prices by presentations was not possible for the public sector due to insufficient data, so was undertaken for private sector patient prices only. To compare prices per presentation, data across all income groups were pooled and the median, mean and range were calculated (see Table 33). For each type of human insulin, median patient prices of vials were lower than those of pens and cartridges. Where cartridges and pens were found for human insulins, prices were lower for cartridges except for regular/isophane 15/85 where both pens and cartridges were \$36.02. There were more price points for analogues sold as cartridges or pens compared to vials. For the five analogues with prices for vials, only two (aspart and lispro/protamine 25/75) had lower prices compared to both pens and cartridges. For the other three analogues, pens were lower priced for glargine, and cartridges were lower priced for glulisine and lispro.

Table 33. Patient prices, USD, per insulin type by presentation, private sector.

Insulin type	Prices (USD) 10 ml 100 IU Vial				Prices (USD) 10 ml 100 IU Pen				Prices (USD) 10 ml 100 IU Cartridge			
	Median	Mean	Range	N	Median	Mean	Range	N	Median	Mean	Range	N
Human Insulins												
Isophane	13.85	15.19	1.68-50.57	32	29.84	27.95	8.64-35.99	8	21.74	23.11	4.22 - 54.42	17
Lente	9.51	11.12	7.11-16.74	3					12.97	12.97	9.19-16.76	2
Regular	13.42	14.32	2.48-41.06	32	23.70	21.67	3.75-35.52	4	21.09	23.16	2.96-51.83	12
Regular/Isophane	14.43	14.33		1	31.22	31.22		1	19.42	19.42		1

10/90												
Regular/Isophane 15/85					36.02	36.02		1	36.02	36.02		1
Regular/Isophane 20/80	14.43	14.33		1	31.22	31.22		1	19.42	19.42		1
Regular/Isophane 25/75	12.96	12.96	6.46-14.04	3	36.02	36.02		1	24.56	24.71	13.70-36.02	4
Regular/Isophane 30/70	12.72	12.72	3.72-36.17	29	32.28	29.58	8.64-39.08	8	20.28	22.85	4.22-39.08	15
Regular/Isophane 40/60	14.43	14.43		1	29.63	29.63	28.04-31.22	2	19.42	25.62	18.36-39.08	3
Regular/Isophane 50/50	11.06	11.06	6.93-14.43	3	31.22	32.21	28.04-37.37	3	19.42	24.60	18.36-36.02	3
Ultralente	16.74	16.74		1								
Analogue Insulins												
Aspart	26.16	27.50	20.81-41.99	7	34.78	38.71	10.35-123.94	21	32.22	37.17	14.73-100.29	14
Aspart/Protamine 30/70					39.05	41.95	16.72-120.45	19	30.60	33.07	14.72-48.61	9
Aspart/Protamine 50/50					35.88	39.81	33.58-53.91	4	31.77	33.80	29.98-39.66	3
Aspart/Protamine 70/30					35.88	39.81	33.58-53.91	4	31.77	33.80	29.98-39.66	3
Degludec					86.19	93.90	85.42-110.08	3	98.95	98.95	86.19-111.71	2
Detemir					57.68	64.80	10.36-250.73	16	60.55	63.35	33.78-120.82	8
Glargine	58.77	60.64	24.23-77.67	16	52.19	58.18	8.32-222.75	24	56.15	58.99	8.32-188.97	14
Glulisine	35.53	50.50	13.80-222.22	10	35.72	42.38	5.89-91.32	14	29.00	36.59	18.19-101.87	11
Lispro	31.78	34.69	20.39-49.59	13	41.89	45.56	5.86-108.64	12	30.50	31.89	12.95-53.86	16
Lispro/Protamine NPL									39.93	39.93		1
Lispro/Protamine 25/75	31.93	33.33	16.95-52.78	6	46.22	54.66	28.37-108.86	10	38.31	41.49	22.52-95.15	11
Lispro/Protamine 50/50					47.14	56.21	26.90-116.13	10	39.08	44.16	22.62-93.08	11

N= countries

Two brands of insulin were selected to compare patient prices by country when sold as vials, pens and/or cartridges i.e. Actrapid and Lantus. Table 34 gives the data for Actrapid where more than one presentation was recorded per country. Prices were lowest for vials in all countries except India where the mean price for pens was lower (\$3.75 for pens, \$5.96 for vials). In low-income countries only vials were reported for Actrapid so were not included in the Table.

Table 34. Mean patient price, USD, for Actrapid by country and presentation, private sector.

Mean price USD 10 ml 100 IU Actrapid	Presentation		
Countries	Vial	Pen	Cartridge
High-income countries			
Bahrain	15.78		18.23
Germany		35.79	35.79
Saudi Arabia	17.32		18.36
Spain	16.59	28.76	
UAE	16.74		20.42
Upper-middle income countries			
Jordan	15.78		19.83
Lebanon	13.47		15.85
South Africa	21.30		26.34
Lower-middle income countries			
India	5.96	3.75	
Sudan	9.51		22.24

The data for Lantus showed a different picture as seen in Table 35. For high-income countries, prices were lowest for vials in UAE and Venezuela only. For Spain prices were the same for each presentation (\$56.98) and pens and cartridges had the same price in England and New Zealand. Across the six upper-middle income countries, cartridges or pens were lower priced than vials in five countries. South Africa was the only country where prices were given for all three presentations; cartridges had the lowest price and vials the highest. India was the only lower-middle income country where the price of more than one presentation was provided. Prices for cartridges and pens were the same in this country. For low-income countries only pens were reported hence no countries were included in the Table.

Table 35. Mean patient price, USD, for Lantus by country and presentation, private sector.

Mean price USD 10 ml 100 IU Lantus	Presentation		
Countries	Vial	Pen	Cartridge
High-income countries			
Bahrain	62.20	51.13	57.59
England	47.66	42.98	42.98
Germany	64.40	57.45	56.19
New Zealand		84.52	84.52
Saudi Arabia	58.66	52.67	56.10
Spain	56.98	56.98	56.98

UAE	67.11	71.06	68.70
Venezuela	177.67	222.75	188.97
Upper-middle income countries			
Colombia	32.19		31.04
Ecuador	43.00	40.00	
Jordan	61.09	52.81	
Lebanon	58.88	51.71	
Mexico	61.58	67.01	
South Africa	40.65	37.47	33.48
Lower-middle income countries			
India		8.32	8.32

Figures 18 and 19 show the frequency of vials, pens and cartridges found in the public and private sectors, stratified for each country income group. In both the public and private sectors, as the wealth of the countries increased, the percentage of vials found decreased, and the percentage of cartridges found increased.

Figure 18. Frequency of vials, pens and cartridges found in the public sector by country income level.

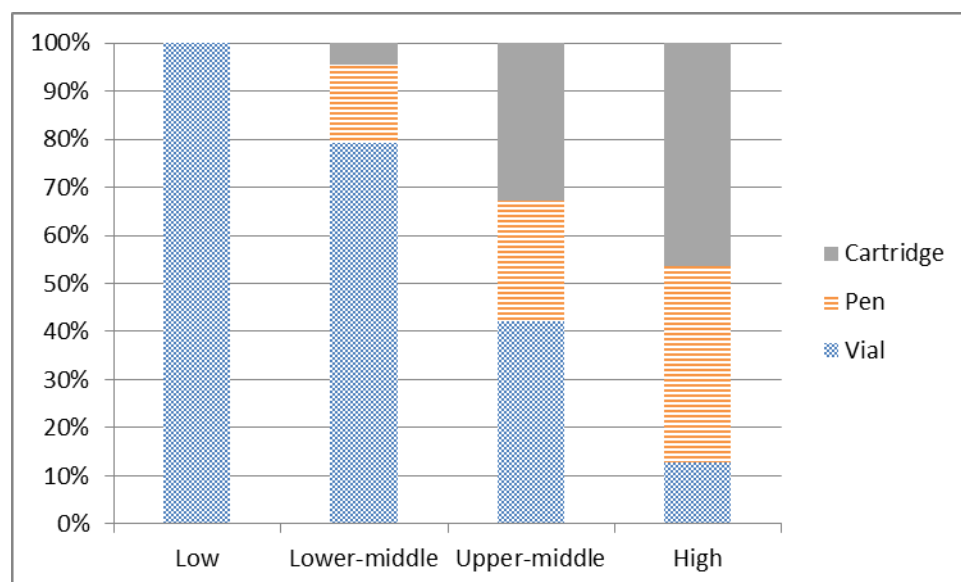
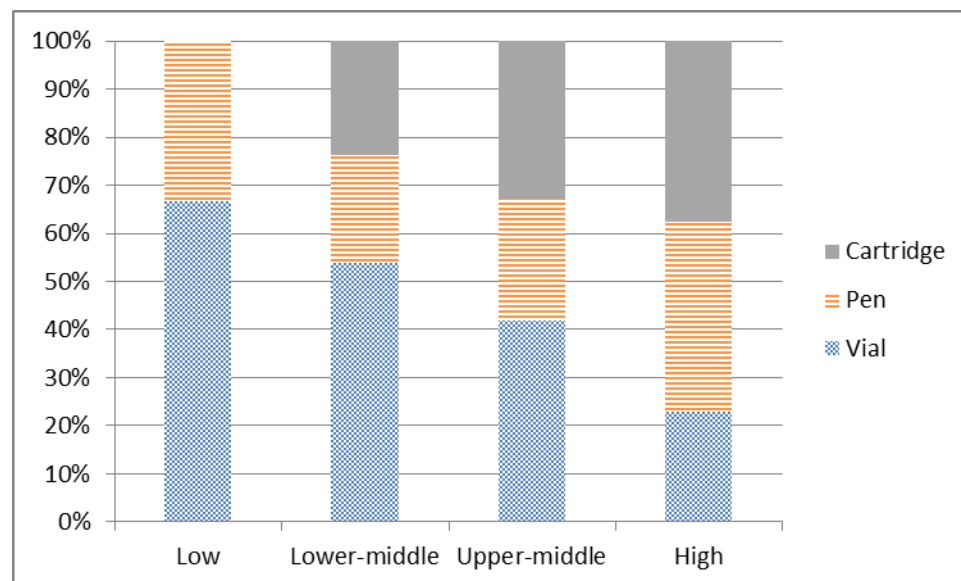


Figure 19. Frequency of vials, pens and cartridges found in the private sector by country income level.



3.5 Government Mark-ups in the Public Sector

Table 36 shows differences (mark-ups) between government procurement prices and public sector patient prices where the same brands and presentations were found. The highest mark-up was 89.53 percent in Sudan on Insulatard and Actrapid (both human insulins). In Iran a 10 percent mark-up was seen on human insulins and a higher mark-up on analogue insulins.

Table 36. Mark-ups in the public sector.

Country	Brand	Manufacturer	Insulin Type	Mark up
Sudan	Insulatard	Novo Nordisk	Isophane	89.53%
	Actrapid	Novo Nordisk	Regular	89.53%
Lao PDR	Insugen 30/70	Biocon	Regular/Isophane 30/70	9.47%
	Insugen R	Biocon	Regular	9.47%
	Insugen N	Biocon	Isophane	9.47%
Iran	Lansulin R	Exir	Regular	10.00%
	Lansulin N	Exir	Isophane	10.00%
	NovoRapid	Novo Nordisk	Aspart	32.54%
	NovoMix 30/70	Novo Nordisk	Aspart/Protamine 30/70	32.54%
	Lantus	Sanofi	Glargine	26.50%
	Biosulin R	Kharazmi	Regular	10.00%
	Biosulin N	Kharazmi	Isophane	10.00%
	Lansulin 30/70	Exir	Regular/Isophane 30/70	10.00%

	Vitasulin R	Vitane	Regular	10.00%
	Vitasulin N	Vitane	Isophane	10.00%
Philippines	Actrapid	Novo Nordisk	Regular	37.00%

3.6 Insulin Affordability in the Public and Private Sector

The affordability of insulin is expressed as the number of days the lowest paid unskilled government worker would have to work to pay for 10ml of 100IU/ml insulin. Affordability was assessed in public sector facilities (where people have to pay out-of-pocket for insulin) and private pharmacies, based on the median patient price. In countries where patients pay a co-payment, affordability was based on the full patient price.

The public sector provided insulin free-of-charge to all people in two high-income countries (Argentina and England), four upper-middle countries (Colombia, Ecuador, Malaysia, and South Africa) and two low-income countries (Malawi and Uganda).

In some countries, patient prices were reported but not the daily wage of the lowest paid unskilled government worker. Where we were unable to obtain the wage, affordability was not assessed.

Affordability of Animal Insulin

Porcine insulin (Actrapid) was reported in the public sector in England where it is supplied free-of-charge. For bovine insulin, prices of two brands, Betasint NPH and Betasint R, made by Beta Laboratories, were received from Argentina. The lowest paid unskilled government worker in Argentina would have to work 1.3 days to buy a vial of Betasint NPH and 1.1 days for Betasint R insulin.

3.6.1 Summary Affordability for Human and Analogue Insulins

Tables 37 and 38 give the overall affordability of insulin types per sector. In the public sector, an average of 2.5 days' wages was needed to buy 10ml human insulin whereas 7.5 days' wages was needed to buy analogues. Insulin was less affordable in the private sector. Human and analogue insulins required 3.5 and 9.5 days' wages, respectively. Animal insulin was more affordable than human or analogue insulins but this was based on only two data points.

Table 37. Mean affordability (days' wages) of human and analogue insulins in the public sector.

Human insulins			Analogue insulins		
N	Mean DWs	Range DW	N	Mean DW	Range DW
42	2.5	0.5-6.2	26	7.5	1.0-19.1

DW = number of days' wages

Table 38. Overall affordability of human, analogue and animal insulin in the private sector.

Human insulins			Analogue insulins			Animal insulins		
N	Mean DW	Range DW	N	Mean DW	Range DW	N	Mean DW	Range DW
86	3.5	0.2-48.9	113	9.5	0.3-77.9	2	1.2	1.1-1.3

DW = number of days' wages

3.6.2 Affordability by World Bank Income Group, Public Sector

Table 39 shows the affordability of human and analogue insulins in the public sector of 16 countries. Affordability was poorest for detemir in upper-middle income countries (17.3 days' wages). The most affordable insulins were regular (upper-middle income countries) and regular/isophane (lower-middle income countries) at 1.8 days' wages. Based on average prices and the WHO/HAI position that spending more than 1 day's income per month on family medicine needs could be considered unaffordable, all insulins would be unaffordable for those on low wages.

For high-income countries, the analysis included data from Russia only. For human insulins the affordability was similar for isophane and regular insulin at 3.5 and 3.4 days' wages respectively. Analogues were far less affordable at 13.1 days' wages for glargine and 7.7 days' wages for glulisine.

Across the upper-middle income countries (China, Grenada and the Dominican Republic) regular insulin was the most affordable human insulin (1.8 days' wages) and regular/isophane was the least affordable (2.6 days' wages). The affordability of analogues ranged from 6.4 days' wages for lispro and lispro/protamine to 17.3 days' wages for detemir.

Across the lower-middle income countries (Indonesia, Kenya, Laos, Philippines, Senegal, Sri Lanka, Sudan and Vietnam), regular and isophane insulins were slightly less affordable than in upper-middle income countries. The most affordable insulin was regular/isophane (1.8 days' wages) and the least affordable was lente (3.5 days' wages). Analogues ranged from 3.8 days' wages for glulisine to 9.5 days' wages for glargine.

Across the low-income countries (Burundi, Mali, Cambodia and Guinea), affordability was similar for the three human insulins i.e. regular and isophane (both 3.5 days' wages) and regular/isophane (3.8 days' wages).

Note: the number of data points for analogues in the public sector was low so the data should be used with caution.

Table 39. Affordability (days' wages) for 10ml 100IU/ml in the public sector by insulin type.

Insulin type	High-income countries (n=1)			Upper-middle income countries (n=3)			Lower-middle income countries (n=8)			Low-income countries (n=4)		
	Mean DW	Range DW	N	Mean DW	Range DW	N	Mean DW	Range DW	N	Mean DW	Range DW	N
<i>Human insulins</i>	3.4	3.4-3.5	2	2.3	0.5-4.8	8	2.1	0.7-3.7	22	3.6	1.7-6.2	9
Isophane	3.5		1	2.0	0.5-4.8	3	2.2	0.7-3.7	6	3.5	1.7-6.2	3
Lente							3.5		1			
Regular	3.4		1	1.8	0.5-4.3	3	2.1	0.7-3.7	8	3.5	1.7-6.2	3
Regular/Isophane				2.6	0.7-4.5	2	1.8	0.7-3.4	7	3.8	2.6-6.2	3
<i>Analogue</i>	8.1	5.0-	4	7.5	4.6-	8	6.3	1.0-	12			

<i>insulins</i>		13.1			15.7			19.1				
Aspart	5.0		1	7.0		1	7.0		1			
Aspart/Protamine				7.0		1	4.9	1.1-8.7	2			
Detemir				17.3		1	4.3	1.6-6.9	2			
Glargine	13.1		1	10.1	4.6-15.7	2	9.5	2.6-19.1	3			
Glulisine	7.7		1	7.4		1	3.8	1.0-6.5	2			
Lispro	6.7		1	6.4		1	6.5		1			
Lispro/Protamine				6.4		1	8.0		1			

DW = number of days' wages; *N* = number of countries

3.6.3 Affordability by Insulin Type, Brand and Country, Public Sector

Within an income level, affordability was highly variable across countries. For example, in the upper-middle income group the affordability of isophane in the public sector ranged from 0.5 days' wages in the Dominican Republic to 4.8 days' wages in China (Xi'an). In the lower-middle income countries, the range for isophane was 0.7 days' wages in the Philippines to 3.7 days' wages in Sudan. For glargine, affordability ranged from 2.6 – 19.1 days' wages in Vietnam and Sudan, respectively. Table 40 gives affordability in the public sector per country for each insulin type (human and analogue). Note: all strengths were included for the regular/isophane insulins.

Table 40. Mean affordability of insulin in the public sector by country.

Insulin Type	No. of days wages' needed to buy 10ml 100 IU insulin, public sector by country															
	High		Upper-middle				Lower-middle						Low			
	RU	CH	DO	GD	IN	KE	LA	PH	SE	LK	SD	VN	BI	KH	ML	GN
Human insulins																
Isophane	3.5	4.8	0.5	0.7	3.4		2.5	0.7	1.2		3.7	1.4	6.2		1.7	2.6
Lente											3.5					
Regular	3.4	4.3	0.5	0.7	3.4	1.7	2.5	0.7	1.2	2.1	3.7	1.4	6.2		1.7	2.6
Regular/Isophane		4.5		0.7		1.7	2.5	0.7	1.2	1.9	3.4	0.9	6.2	2.5		2.6
Analogue insulins																
Aspart	5.0	7.0			7.0											
Aspart/Protamine		7.0			8.7							1.1				
Detemir		17.3			6.9							1.6				
Glargine	13.1	15.7	4.6		7.0						19.1	2.6				
Glulisine	7.7	7.4			6.5							1.0				
Lispro	6.7	6.4			6.5											
Lispro/Protamine		6.4			8.0											

RU Russian Federation; *CH* China; *DO* Dominican Republic; *GD* Grenada; *IN* Indonesia; *KE* Kenya; *LA* Lao PDR; *PH* Philippines; *SE* Senegal; *LK* Sri Lanka; *SD* Sudan; *VN* Vietnam; *BI* Burundi; *KH* Cambodia; *ML* Mali; *GN* Guinea

Affordability in the public sector was also variable across countries for the identical product (although in some cases the presentation may have differed). Table 41 gives examples for some brands of human and analogue insulins. The two brands of human insulins with the greatest number of data points were Actrapid and Mixtard 30. The affordability of Actrapid varied from 0.6 days' wages in the Philippines to 6.2 days' wages in Burundi. For Mixtard 30, the range was 0.8 days' wages in Vietnam to 6.2 days' wages in Burundi. For the analogues, Lantus had the greatest number of data points. The affordability of Lantus varied from 2.6 days' wages in Vietnam to 19.1 days' wages in Sudan.

Table 41. Mean affordability of selected insulin brands, public sector, by country.

Brand	No. of days wages' needed to buy 10 ml 100 IU insulin, public sector by country													
	High	Upper-middle			Lower-middle						Low			
	RU	CN	DO	ID	KE	PH	SE	LK	SD	VN	BI	KH	ML	GN
Human Insulins														
Actrapid Novo Nordisk	3.1				2.1	0.6		2.1	3.8		6.2		1.7	2.6
Humulin 30 Eli Lilly		4.8							2.7					
Humulin N Eli Lilly				3.4					3.5					
Humulin R Eli Lilly		4.8		3.4	1.3				3.5					
Insulatard Novo Nordisk							1.2		3.8		6.2		1.7	2.6
Mixtard 30 Novo Nordisk					1.7		1.2	1.9	3.8	0.8	6.2	2.5		2.6
Analogue insulins														
Apidra Sanofi	7.7	7.4		6.5						1.0				
Humalog Eli Lilly	6.7	6.4		6.5										
Humalog Mix 25 Eli Lilly		6.4		8.0										
Humalog Mix 50 Eli Lilly		6.4												
Lantus Sanofi	13.1	17.9	4.6	7.0					19.1	2.6				
Levemir Novo Nordisk		17.3		6.9						1.6				
NovoMix 30 Novo Nordisk		7.5		8.7						1.1				
NovoMix 50® Novo Nordisk		6.4												

RU Russia; CN China; DO Dominican Republic; ID Indonesia; KE Kenya; SE Senegal; LA Lao PDR; LK Sri Lanka; SD Sudan; VN Vietnam; BI Burundi; KH Cambodia; ML Mali; GN Republic of Guinea

3.6.4 Affordability by World Bank Income Group, Private Sector

In the private sector, the analysis included 33 countries. Overall, as shown in Table 42, the most affordable insulin was regular/isophane in the high-income countries (0.8 days' wages). The least affordable insulin was detemir in the lower-middle income group (24.0 days' wages).

For the four human insulins, as the wealth of the countries increased the insulins became more affordable. That said, even in high-income countries some human insulins were over the WHO/HAI threshold of affordability (more than 1 days' wages needed to buy 10ml). Overall, in high-income countries, affordability for the human insulins ranged from 0.8 – 1.3 days' wages for regular/isophane and isophane, respectively. Analogues were far less affordable ranging from 6.6 days' wages for lispro to 18.2 days' wages for detemir. Prices (and hence affordability) reported from Venezuela were very high which skewed the mean values for the analogues.

In upper-middle countries a similar picture was seen. Human insulins ranged from an average of 2.6 (regular) to 3.0 days' wages (regular/isophane). Analogues were less affordable. They ranged from 5.2 - 19.7 days' wages for aspart and degludec, respectively.

On average, in lower-middle income countries regular/isophane was the least affordable human insulin (4.2 days' wages) and isophane was the most affordable (2.9 days' wages). The most affordable analogue was glulisine (1.7 days' wages), with detemir the least affordable (24.0 days' wages).

In low-income countries, regular insulin was the most affordable of the human insulin (3.2 days' wages) and isophane was the least affordable (11.1 days' wages). The affordability of analogues ranged from 5.3 – 8.7 days' wages for lispro and glargine, respectively.

Table 42. Mean affordability in the private sector by insulin type.

Insulin type	High-income countries (n=7)			Upper-middle income countries (n=7)			Lower-middle income countries (n=12)			Low-income countries (n=7)		
	Mean DW	Range DW	N	Mean DW	Range DW	N	Mean DW	Range DW	N	Mean DW	Range DW	N
Human insulins	1.2	0.2-3.5	16	2.8	1.2-4.8	16	3.4	0.8-13.7	30	6.6	0.8-48.9	17
Isophane	1.3	0.2-3.5	7	2.7	1.5-4.8	5	2.9	0.8-7.6	9	11.1	1.7-48.9	6
Lente							3.0	1.3-4.0	3			
Regular	1.3	0.6-2.7	4	2.6	1.2-4.1	6	3.2	0.9-8.6	9	3.2	0.8-6.8	5
Regular/Isophane	0.8	0.2-1.2	5	3.0	1.5-4.9	5	4.2	1.1-13.7	9	4.9	2.1-10.0	6
Analogue insulins	10.4	0.3-77.9	37	7.8	1.7-16.8	25	11.3	1.1-64.2	32	7.4	4.8-14.0	8
Aspart	7.5	0.3-36.0	6	5.2	2.3-8.6	4	8.6	3.5-13.7	5	8.0	4.8-14.0	3
Aspart/Protamine	8.2	0.3-37.4	5	6.8	4.1-10.3	3	13.4	4.8-30.5	5	5.5		1
Degludec				19.7		1						

Detemir	18.2	0.5-77.9	5	11.8	5.7-16.8	3	24.0	1.9-64.2	4	6.9		1
Glargine	13.5	0.5-61.0	6	8.5	3.6-15.0	5	9.4	1.5-25.0	9	8.7	5.3-12.2	2
Glulisine	9.4	1.1-30.0	4	5.4	3.2-8.0	3	1.7	1.1-2.4	2			
Lispro	6.6	0.3-29.5	7	5.3	1.7-11.0	3	10.4	1.9-25.5	4	5.3		1
Lispro/ Protamine	10.5	0.5-34.6	4	7.6	3.7-12.8	3	8.8	5.8-12.2	3			

N = number of countries

3.6.5 Affordability by Insulin Type, Brand and Country, Private Sector

Table 43 shows the affordability of isophane, regular and regular/isophane insulin (all strengths) in the private sector by country. Isophane showed poorest affordability in Ethiopia at 48.9 days' work. Regular insulin showed the poorest affordability in Ghana at 8.6 days' wages. Regular/isophane insulin was least affordable in Sri Lanka (13.7 days' wages) and Malawi (10 days' wages).

Table 43. Affordability of selected human insulins, private sector, by country.

Country		No. of days' wages to buy 10 ml 100 IU human insulin, private sector		
		Isophane	Regular	Regular/Isophane
High	Argentina	2.8	2.7	
	England	0.2		0.2
	New Zealand	0.4		0.5
	Russia	3.5		
	Saudi Arabia	0.6	0.6	0.8
	Spain	0.9	0.9	1.1
	Venezuela	1.0	1.1	1.2
Upper-middle	China		3.5	4.1
	Colombia		1.2	
	Dominican Republic	3.7	4.1	
	Ecuador	1.8	1.6	1.5
	Grenada	1.5		1.5
	Malaysia	2.0	2.0	2.9
	Mexico	4.8	3.2	4.9
Lower-middle	El Salvador	2.2	2.6	2.8
	Ghana	7.6	8.6	
	India	1.0	0.9	1.2
	Kenya		3.7	5.3
	Lao PDR	3.0	2.5	2.5
	Pakistan	1.3	1.3	1.1
	Senegal	0.8	1.2	2.9
	Sri Lanka			13.7
	Sudan	4.9	5.1	5.3
	Vietnam	2.0	2.8	
Zambia	3.0		3.0	
Low	Burundi	7.3	6.8	6.3
	Ethiopia	48.9		
	Malawi			10.0
	Mali	1.7	1.7	4.3
	Guinea	3.3	3.3	3.3
	Uganda	3.3	3.3	3.3
	Zimbabwe	2.1	0.8	2.1

Table 44 shows the affordability of analogue insulins in the private sector by country. Some countries showed very poor affordability e.g. in Sri Lanka affordability ranged from 11.7 days' wages for glargine to 64.2 days' wages for detemir. Venezuela, a high-income country, showed very poor affordability for analogues (over 30 days' wages), but better affordability for human insulins (1-1.2 days' wages).

Table 44. Mean affordability of analogue insulins, private sector, by type and country.

Country		No. of days wages' needed to buy 10 ml 100 IU analogue insulin, private sector							
		Aspart	Aspart/Prot.	Degludec	Detemir	Glargine	Glulisine	Lispro	Lispro/Prot.
High	Argentina						5.0	6.3	5.8
	England	0.3	0.3		0.5	0.5		0.3	
	New Zealand	0.6	0.6			1.1		0.7	0.5
	Russia	5.9			8.1	13.6		6.8	
	Saudi Arabia	1.2	1.2		2.2	2.1	1.1	1.1	1.2
	Spain	1.2	1.5		2.4	2.4	1.4	1.4	
	Venezuela	36.0	37.4		77.9	61.0	30.0	29.5	34.6
Upper - middle	China	6.9	6.0		16.8	15.2			6.4
	Colombia					4.0	4.9	1.7	
	Ecuador	2.3				3.6	3.2	3.2	3.7
	Malaysia	2.8	4.1		5.7	5.0			
	Mexico	8.6	10.3	19.7	13.0	15.0	8.0	11.0	12.8
Lower-middle	El Salvador					5.5	2.4	4.7	5.8
	Ghana	8.1	8.1			8.1			
	India	4.8	4.8		1.9	1.5	1.1	1.9	
	Indonesia	13.7	13.7		14.0	15.4			12.2
	Kenya					10.6		9.5	6.9
	Senegal	13.1	10.0		15.9				
	Sri Lanka		30.5		64.2	11.7		25.5	
	Sudan					25.0			
	Vietnam					1.5			
Low	Zambia	3.5				5.2			
	Malawi	14.0							
	Guinea	5.3				5.3		5.3	
	Zimbabwe	4.8	5.5		6.9	12.2			

In the private sector, affordability was variable across countries for specific brands (as was seen in the public sector). Table 45 gives examples of the affordability of some brands of human insulin. For example, Insulatard (made by Novo Nordisk) ranged from 0.2 days' wages in England to 48.9 day's wages in Ethiopia. Humulin 30 (Eli Lilly) showed a range of affordability from 0.2 days' wages in England to 14.5 days' wages in Sri Lanka.

Table 45. Mean affordability of human insulin, private sector, for selected brands.

Human insulin brands		No. of days wages' needed to buy 10 ml human insulin, private sector					
		Actrapid	Humulin 30	Humulin N	Humulin R	Insulatard	Mixtard 30
High	England		0.2	0.2		0.2	
	New Zealand		0.5	0.4			
	Saudi Arabia	0.7	0.6	0.6	0.6	0.7	0.7
	Spain	0.9	0.9	0.9	0.7	0.9	1.2

	Venezuela		1.1	1.0	1.0		
Upper-middle	Dominican Rep.			3.7	4.1		
	Ecuador			1.7	1.7		
	Malaysia		2.0	2.1	2.0	1.8	3.7
	Mexico		7.0	7.3	6.1		
	El Salvador		2.7	2.5	2.5		
Lower-middle	Ghana	8.6		6.7		8.6	
	India	1.0					1.2
	Kenya	4.6			2.8		6.8
	Pakistan	1.4	1.2	1.4	1.4	1.4	1.2
	Senegal					0.8	2.9
	Sri Lanka		14.5				16.2
	Sudan	6.7	4.0	4.0	4.0	6.3	6.7
	Burundi	6.8				7.3	6.3
Low	Ethiopia					48.9	
	Mali	1.7				1.7	4.3
	Guinea	3.3				3.3	3.3
	Uganda	3.3				3.3	3.3
	Zimbabwe	0.8					

Affordability was also variable across countries for brands of analogue insulin, as shown in Table 46. For example, the affordability of Levemir (Novo Nordisk) was 0.5 to 77.9 days' wages in England and Venezuela, respectively. Humalog (Eli Lilly) showed a similar wide range of 0.3 to 29.5 days' wages in these two countries as did Lantus (Sanofi) at 0.5 to 61 day's wages.

Table 46. Mean affordability of analogue insulin, private sector, by brand.

Analogue insulin Brands		No. of days wages' needed to buy 10 ml analogue insulin, private sector					
		Apidra	Humalog	Lantus	Levemir	NovoMix 30	NovoRapid
High	Argentina	5.0	6.3				
	England		0.3	0.5	0.5	0.3	0.3
	New Zealand		0.7	1.1		0.6	0.6
	Russia		6.8	13.7	8.1		5.9
	Saudi Arabia	1.1	1.1	2.1	2.2	1.2	1.2
	Spain	1.5	1.4	2.4	2.4	1.5	1.2
	Venezuela	30.0	29.5	61.0	77.9	37.4	36.0
Upper-middle	China			17.2	16.8	6.0	6.9
	Colombia	4.9	1.7	4.0			
	Ecuador	3.3	3.3	3.6			2.3
	Malaysia			5.0	5.7	4.1	2.8
	Mexico		11.0	15.0	13.0	10.3	8.6
Lower-middle	El Salvador	2.4	4.7	5.5			
	Ghana			8.1		8.1	8.1
	India	1.1	2.0	1.5	1.9	4.8	4.8
	Indonesia			15.4	14.0	13.7	13.7
	Kenya		9.5	9.6			
	Senegal				15.9	10.0	13.1
	Sri Lanka		25.5	11.7	64.2	30.5	
	Sudan			25.0			
	Vietnam			1.5			
	Zambia			5.2			3.5

Low	Malawi						14.0
	Guinea		5.3	5.3			5.3
	Zimbabwe			12.2	6.9	5.5	4.8

3.7 Reimbursement Prices

Insulin reimbursement prices were obtained from 28 predominantly high-income countries (Table 47). The only low-income country for which data was obtained was Tanzania. In all of these countries, the government sets reimbursement prices for insulin. With the exception of Belgium and the Netherlands, health insurance providers (payers) in the study countries were public institutions. See Annex 10 for information on insulin reimbursement in the study countries, and patient contributions where known.

Table 47. Study countries by World Bank income group.

Income group	Number of countries in the analyses
High	23
Upper-middle	2
Lower-middle	2
Low	1

Table 48 lists the overall median, mean and range of reimbursement prices for human, analogue and animal (bovine) insulin. The prices for bovine insulin were highest with a median price of \$65.67, although only two countries (Australia and Finland) reimbursed this insulin type. Human insulin had the lowest median price (\$19.14), with analogues at \$27.90.

Table 48. Reimbursement prices for human, analogue and bovine insulin.

Insulin type	Price for 10 ml 100 IU insulin in USD			N
	Median	Mean	Range	
Human	19.14	20.27	10.23-37.52	108
Analogue	27.90	31.30	14.18-84.80	204
Animal	65.67	66.16	64.24-69.04	4

3.7.1 Reimbursement Prices by Insulin Type, Human and Analogue Insulins

Table 49 lists the types of insulin reimbursed across countries and the median and mean reimbursement prices. Median reimbursement prices ranged from \$17.75 for regular/isophane 25/75 to \$49.88 for degludec. The reimbursement price range for each type of insulin was wide. For example, the reimbursement price for aspart ranged from about \$17 in Poland to \$85 in Argentina (all were NovoRapid brand made by Novo Nordisk).

Regular and isophane insulins were reimbursed in all 28 countries while regular/isophane 30/70 and 25/75 were reimbursed in 22 and 12 countries respectively. The remaining six human insulins were reimbursed in less than 10 countries. The analogue insulins were reimbursed in 19

to 25 countries except degludec and the 50/50 and 70/30 strengths of aspart/protamine which were reimbursed in fewer than 10 countries.

Table 49. Insulin types and reimbursement prices .

Insulin type	Reimbursement price, 10 ml 100 IU, in USD				N
	Median	Mean	Maximum	Minimum	
<i>Human insulins</i>					
Isophane	19.29	20.71	37.52	10.23	28
Lente	21.18	21.18	30.64	11.72	2
Regular	18.80	19.38	32.19	10.40	28
Regular/Isophane 10/90	20.50	20.50	20.50	20.50	1
Regular/Isophane 15/85	22.94	24.19	28.56	21.07	3
Regular/Isophane 20/80	18.27	18.27	19.33	17.21	2
Regular/Isophane 25/75	17.75	20.47	30.83	15.34	12
Regular/Isophane 30/70	18.08	19.61	30.70	10.40	22
Regular/Isophane 40/60	18.70	18.70	20.14	17.26	2
Regular/Isophane 50/50	22.44	22.52	30.37	15.78	8
<i>Analogue insulins</i>					
Aspart	26.43	29.20	84.80	17.29	25
Aspart/Protamine 30/70	27.76	28.23	42.25	17.29	23
Aspart/Protamine 50/50	26.24	26.85	40.61	17.29	8
Aspart/Protamine 70/30	28.19	29.38	40.61	22.41	5
Degludec	49.88	52.45	69.46	37.49	5
Detemir	43.12	43.12	64.32	28.02	23
Glargine	41.48	41.03	57.49	25.61	24
Glulisine	24.52	24.86	46.70	14.18	24
Lispro	25.53	27.20	43.53	17.29	25
Lispro/Protamine 25/75	27.43	27.50	42.49	17.29	23
Lispro/Protamine 50/50	26.71	26.08	36.56	17.29	19

3.7.2 Correlation Between Reimbursement Prices and GDP/GDPpc, Human and Analogue Insulins

Correlation analyses were performed for GDP and GDP per capita against the price per insulin type. Correlation plots are shown in Annex 7. Because of the distribution of both the GDP and the GDP per capita values, the correlation analyses were performed using Spearman correlation. For the correlation between insulin type and GDP no correlation was found. For the correlation between type and GDP per capita a significant correlation was found for glulisine ($r = 0.49$, $p = 0.015$), isophane ($r = 0.44$, $p = 0.019$), and regular insulin ($r = 0.56$, $p = 0.002$).

Reimbursement prices of insulin types stratified by presentation (vial, pen, cartridge) are listed in Annex 11. Table 50 gives the prices for insulin types with the most price points. For all insulin

types (human and analogue) the reimbursement price for a vial was lower than pens and cartridges, except for glargine and glulisine where they were very similar.

Table 50. Reimbursement prices, USD 10ml 100IU, by insulin type and presentation.

Insulin Type	Presentation	Reimbursement price USD 10 ml 100 IU				N
		Median	Mean	Min	Max	
<i>Human insulins</i>						
Isophane	Vial	15.61	17.32	9.39	31.38	20
	Pen	22.25	24.12	15.78	47.62	24
	Cartridge	20.19	21.79	13.60	44.59	23
Regular	Vial	14.81	16.92	9.39	32.17	21
	Pen	20.58	21.81	15.00	30.80	13
	Cartridge	19.81	21.35	14.30	41.30	23
Regular/Isophane 25/75	Vial	16.42	17.01	8.26	28.45	6
	Pen	19.63	21.87	15.78	30.88	10
	Cartridge	19.97	21.20	15.78	30.88	10
Regular/Isophane 30/70	Vial	16.42	16.08	9.39	24.21	15
	Pen	19.63	24.51	16.74	33.04	12
	Cartridge	20.39	21.41	14.30	30.53	18
<i>Analogue insulins</i>						
Aspart	Vial	23.22	24.70	18.80	36.97	15
	Pen	28.50	31.82	21.10	90.35	22
	Cartridge	25.86	27.99	17.29	79.25	21
Glargine	Vial	41.85	41.91	36.26	48.13	10
	Pen	41.96	40.78	25.61	51.57	24
	Cartridge	41.33	41.30	25.61	63.42	23
Glulisine	Vial	22.74	24.42	5.04	66.44	19
	Pen	25.47	25.45	16.46	38.14	23
	Cartridge	24.62	24.36	16.46	35.50	22
Lispro	Vial	22.78	24.87	17.72	43.53	17
	Pen	28.97	29.10	18.56	40.89	20
	Cartridge	25.50	25.09	15.60	36.53	22

N= number of countries

3.7.3 Reimbursement Prices by Brand, Human and Analogue Insulins

Table 51 lists insulin reimbursement prices by brand. For human insulins, Betalin NPH had the highest median price at \$43.81. Insulin Bio NPH, Insulin Bio Regular and Insulin Mix 30/70

had the lowest reimbursement price (\$6.96). Although there were few price points for bovine insulins, they had the highest median prices when compared to human and analogue insulins. The reimbursement prices for the three brands of bovine insulin were from \$64.24-\$69.04. Tresiba (degludec) had the highest median price (\$49.88) among analogue insulins while Apidra (glulisine) had the lowest median price (\$24.52).

Across the dataset, there was only one brand per insulin type reimbursed for the analogue insulins. Human insulins, on the other hand, had an average of 5.5 brands per insulin type reimbursed. They ranged from one brand each for 10/90 and 15/85 strengths of regular/isophane insulin to 13 brands for isophane insulin.

The top 15 most commonly reimbursed brands are listed in Table 51 with the prices across the countries. Of these, eight were analogue insulins and seven were human insulin. The most commonly reimbursed brands were NovoRapid (median price \$26.43) and Humalog (\$25.53), both analogues, and Humulin N (\$20.67) which is a human insulin. See Annex 12 for prices of all brands found.

Table 51. Reimbursement prices, USD, top 15 most commonly reimbursed insulin brands.

Brand	Insulin type	Manufacturer	Reimbursement prices USD 10 ml 100 IU				N
			Median	Mean	Min	Max	
NovoRapid	Aspart	Novo Nordisk	26.43	29.20	17.29	84.80	25
Humalog	Lispro	Eli Lilly	25.53	27.20	17.29	43.53	25
Humulin N	Isophane	Eli Lilly	20.67	21.67	10.29	39.20	25
Apidra	Glulisine	Sanofi	24.52	24.86	14.18	46.70	24
Lantus	Glargine	Sanofi	41.48	41.03	25.61	57.49	24
Levemir	Detemir	Novo Nordisk	43.12	43.12	28.02	64.32	23
Humalog Mix 25	Lispro/Protamine 25/75	Eli Lilly	27.43	27.50	17.29	42.49	23
Humulin R	Regular	Eli Lilly	18.48	18.97	10.29	32.41	23
NovoMix 30	Aspart/Protamine 30/70	Novo Nordisk	27.76	28.23	17.29	42.25	23
Actrapid	Regular	Novo Nordisk	18.61	19.75	13.14	32.17	21
Insulatard	Isophane	Novo Nordisk	20.25	22.63	12.66	36.70	20
Humalog Mix 50	Lispro/Protamine 50/50	Eli Lilly	26.71	26.08	17.29	36.56	19
Humulin 30	Regular/ isophane 30/70	Eli Lilly	20.19	20.20	10.29	30.71	18
Insuman Basal®	Isophane	Sanofi	18.68	19.81	14.48	30.47	17
Mixtard 30	Regular/ isophane 30/70	Novo Nordisk	18.83	20.46	12.41	30.59	17

N = number of countries

Brands with more than eight price points were included in a correlation analysis of price against GDP and GDP per capita. Correlation plots are shown in Annex 7. For GDP against price, a

significant correlation was found for Humulin 30 ($r=0.51$, $p=0.030$). Yet for GDP per capita against price, Humulin 30 showed no significant correlation, and only a correlation was found for Apidra ($r=0.48$, $p=0.019$).

3.7.4 Reimbursement Prices by Presentation, Human and Analogue Insulins

Annex 13 lists reimbursement prices for each brand by presentation. Table 52 shows this data for the top 15 brands that were reimbursed. For the human insulins, median prices of insulin in vials were lower than cartridges and pens, and cartridges were lower priced than pens. For analogues, median prices of vials were lower than pens and cartridges, except for Lantus where they were about the same price. Cartridges were lower priced than pens except for Lantus and Levemir where they were about the same price.

Table 52. Reimbursement price for the top 15 insulin brands by presentation.

Brand	Presentation	Reimbursement price USD 10 ml 100 IU				N
		Median	Mean	Maximum	Minimum	
<i>Human insulins</i>						
Actrapid	Vial	14.94	16.59	32.17	11.72	12
	Cartridge	19.81	20.90	30.54	14.30	17
	Pen	21.40	24.16	31.05	20.05	3
Humulin N	Vial	17.09	18.05	27.94	10.29	14
	Cartridge	20.62	22.64	44.78	14.05	18
	Pen	24.35	24.78	39.20	15.89	15
Humulin R	Vial	17.82	18.49	32.41	10.29	14
	Cartridge	19.67	20.49	30.34	14.05	16
	Pen	29.53	29.53	30.69	28.36	2
Humulin 30	Vial	14.59	17.05	24.21	10.29	9
	Cartridge	20.64	21.99	32.27	16.22	14
	Pen	24.40	23.95	30.88	17.76	7
Insulatard	Vial	15.92	17.19	31.38	11.72	12
	Cartridge	20.24	22.83	37.54	13.60	17
	Pen	26.64	27.93	47.62	16.55	12
Insuman Basal	Vial	14.72	16.00	28.05	8.26	6
	Cartridge	18.43	20.19	30.61	14.05	13
	Pen	19.55	21.00	30.46	14.91	15
Mixtard 30	Vial	14.03	14.66	20.41	11.72	8
	Cartridge	22.06	21.73	30.25	14.30	11
	Pen	23.99	26.14	33.04	20.90	7
<i>Analogue insulins</i>						
Apidra	Vial	22.74	24.42	66.44	5.04	19
	Cartridge	24.62	24.36	35.50	16.46	22

	Pen	25.47	25.45	38.14	16.46	23
Humalog	Vial	22.78	24.87	43.53	17.72	17
	Cartridge	25.50	25.09	36.53	15.60	22
	Pen	28.97	29.10	40.89	18.56	20
Humalog Mix 25	Vial	21.65	21.65	22.78	20.52	2
	Cartridge	25.49	24.75	31.53	17.29	18
	Pen	28.47	29.32	42.49	21.66	20
Humalog Mix 50	Cartridge	25.47	25.25	36.56	17.29	17
	Pen	28.08	27.64	36.56	22.67	14
Lantus	Vial	41.85	41.91	48.13	36.26	10
	Cartridge	41.33	41.30	63.42	25.61	23
	Pen	41.96	40.78	51.57	25.61	24
Levemir	Cartridge	43.39	44.19	69.49	31.35	18
	Pen	43.12	43.43	59.16	28.02	21
NovoMix 30	Cartridge	26.11	26.41	43.12	17.29	18
	Pen	28.25	29.66	41.37	21.19	21
NovoRapid	Vial	23.22	24.70	36.97	18.80	15
	Cartridge	25.86	27.99	79.25	17.29	21
	Pen	28.50	31.82	90.35	21.10	22

3.7.5 Reimbursement Prices by World Bank Income Group

Table 53 compares reimbursement prices by country income groups. For the more commonly reimbursed insulins, such as isophane and regular insulin, median prices appear to decrease as the wealth of the countries decrease, however, this is based on few price points.

Table 53. Insulin reimbursement prices by World Bank income level.

Insulin type	World Bank Income level	Reimbursement price USD 10 ml 100 IU				N
		Median	Mean	Maximum	Minimum	
Human insulins						
Isophane	High	20.27	22.09	37.52	10.23	23
	Upper-middle	16.36	16.36	17.76	14.97	2
	Lower-middle	13.83	13.83	17.27	10.40	2
	Low	11.34	11.34	11.34	11.34	1
Lente	High	21.18	21.18	30.64	11.72	2
Regular	High	19.52	20.62	32.19	11.02	23
	Upper-middle	16.22	16.22	17.62	14.83	2
	Lower-middle	12.58	12.58	14.77	10.40	2
	Low	10.73	10.73	10.73	10.73	1
Regular/ Isophane 10/ 90	High	20.50	20.50	20.50	20.50	1
Regular/ Isophane 15/ 85	High	22.94	24.19	28.56	21.07	3
Regular/ Isophane 20/ 80	High	18.27	18.27	19.33	17.21	2

Regular/ Isophane 25/ 75	High	19.03	21.22	30.83	15.34	10
	Upper-middle	16.72	16.72	17.76	15.68	2
Regular/ Isophane 30/ 70	High	20.06	20.43	30.70	12.57	17
	Upper-middle	17.16	17.16	17.76	16.56	2
	Lower-middle	13.83	13.83	17.27	10.40	2
	Low	22.06	22.06	22.06	22.06	1
Regular/ Isophane 40/ 60	High	18.70	18.70	20.14	17.26	2
Regular/ Isophane 50/ 50	High	22.94	23.48	30.37	17.26	7
	Upper-middle	15.78	15.78	15.78	15.78	1
Analogue insulins						
Aspart	High	26.17	29.17	84.80	17.29	22
	Upper-middle	26.05	26.05	27.62	24.49	2
	Lower-middle	36.12	36.12	36.12	36.12	1
Aspart/ Protamine 30/ 70	High	27.77	28.04	42.25	17.29	20
	Upper-middle	26.99	26.99	27.62	26.36	2
	Lower-middle	34.48	34.48	34.48	34.48	1
Aspart/ Protamine 50/ 50	High	26.24	26.85	40.61	17.29	8
Aspart/ Protamine 70/ 30	High	28.19	29.38	40.61	22.41	5
Degludec	High	49.88	52.45	69.46	37.49	5
Detemir	High	42.59	42.41	64.32	28.02	20
	Upper-middle	43.69	43.69	46.05	41.33	2
	Lower-middle	56.26	56.26	56.26	56.26	1
Glargine	High	41.48	40.95	57.49	25.61	21
	Upper-middle	38.81	38.81	38.97	38.64	2
	Lower-middle	47.35	47.35	47.35	47.35	1
Glulisine	High	24.63	25.60	46.70	17.24	21
	Upper-middle	22.50	22.50	24.59	20.40	2
	Lower-middle	14.18	14.18	14.18	14.18	1
Lispro	High	25.35	27.03	43.53	17.29	22
	Upper-middle	26.33	26.33	27.52	25.15	2
	Lower-middle	32.71	32.71	32.71	32.71	1
Lispro/ Protamine 25/ 75	High	27.36	27.34	42.49	17.29	20
Lispro/ Protamine 25/ 75	Upper-middle	26.45	26.45	27.43	25.47	2
	Lower-middle	32.99	32.99	32.99	32.99	1
Lispro/ Protamine 50/ 50	High	26.71	26.04	36.56	17.29	17
	Upper-middle	26.39	26.39	27.31	25.47	2

3.7.6 Reimbursement Prices by Country

Annex 14 gives reimbursement prices for each brand by country. Table 54 list prices per country for the top 3 most commonly reimbursed brands i.e. NovoRapid (Novo Nordisk), Humalog

(Lilly) and Humulin N (Lilly) insulins, respectively. NovoRapid ranged in price from \$17.29 in Poland to \$84.80 in Argentina. Humalog ranged from \$17.29 in Poland to \$43.53 in Argentina. Humulin N ranged from \$14.34 in Sweden to \$39.20 in Iceland.

Table 54. Reimbursement prices, USD 10ml 100IU, for NovoRapid, Humalog and Humulin N by country.

Country	Reimbursement price USD 10 ml 100 IU		
	NovoRapid	Humalog	Humulin N
Argentina	84.80	43.53	36.36
Australia	27.36	27.36	22.74
Austria	31.74	31.27	26.21
Belgium	25.92	28.51	23.95
Croatia	23.77	23.77	16.55
Czech Republic	20.02	20.02	20.32
Denmark	35.42	33.20	25.45
Estonia	32.12	29.25	22.49
Finland	25.53	25.53	24.35
France	27.92	23.73	24.03
Germany	Not listed	Not listed	30.33
Iceland	38.63	38.74	39.20
Ireland	27.06	27.65	20.06
Latvia	28.67	25.18	20.67
Morocco	36.12	32.71	22.19
Netherlands	22.41	22.94	18.84
Norway	25.09	21.68	Not listed
Poland	17.29	17.29	17.29
Romania	24.49	27.52	15.38
Serbia	27.62	25.14	17.76
Slovak Republic	21.81	21.19	16.22
Slovenia	22.43	22.43	20.98
South Korea	26.43	41.63	18.83
Spain	24.55	23.86	16.87
Sweden	21.08	18.38	14.34
UAE	31.64	27.57	10.29

3.8 Overall Comparison of Prices for Selected Human and Analogue Insulins

Table 55 gives an overview of prices for the five price types included in this report, for three human insulins and three analogue insulins (any presentation). These six insulins generally had the largest number of price points. The human insulin are isophane, regular and regular/isophane 30/70. The analogue insulins are aspart, glargine and lispro.

For the three human insulins, median government procurement prices were lowest and reimbursement prices were highest. Reimbursement prices were higher than patient prices. This observation should be interpreted with caution as the countries differed for each price type and most reimbursement prices were reported from high-income countries.

For the analogue insulins, median prices for aspart were highest for public sector patient prices and lowest for government procurement prices. For glargine, reimbursement prices were lowest and private sector patient prices were highest. For lispro, median prices were lowest for public sector patient prices and highest for private sector patient prices.

Table 55. Median, mean and ranges of prices, for all four price types for six insulins.

Insulin type	MSH supplier prices 20 14			MSH buyer prices 20 14			Government procurement prices*			Patient prices public sector			Patient prices private sector			Reimbursement prices		
	Median	Range	N	Median	Range	N	Median	Range	N	Median	Range	N	Median	Range	N	Median	Range	N
Isophane	8.83	7.71-9.96	2	3.60	2.23-10.35	4	5.77	2.30-30.67	2	8.33	2.35-35.52	15	15.73	1.68-50.57	3	19.29	10.23-37.52	28
Regular	8.83	4.37-10.61	4	4.92	2.39-8.84	4	5.75	2.24-43.51	2	6.51	2.35-35.27	17	15.21	2.48-35.27	3	18.80	10.40-32.19	28
Regular/ Isophane 30/70	4.33		1	3.60	2.40-4.80	2	5.98	2.24-32.00	21	6.23	2.16-36.47	14	15.97	3.72-39.08	3	18.08	10.40-29.28	22
Aspart	-			-			26.09	19.36-35.78	6	39.70	18.24-50.40	5	31.99	10.35-116.06	2	26.43	17.29-84.80	25
Glargine	-			-			41.57	36.89-81.67	8	42.95	16.60-112.93	8	54.92	8.32-196.46	2	41.48	25.61-57.49	24
Lispro	-			-			28.52	19.34-33.08	4	35.62	24.65-48.28	4	33.40	10.35-108.64	21	25.53	17.29-43.53	25

*N = number of countries; *includes UNRWA and GCC procurement prices*

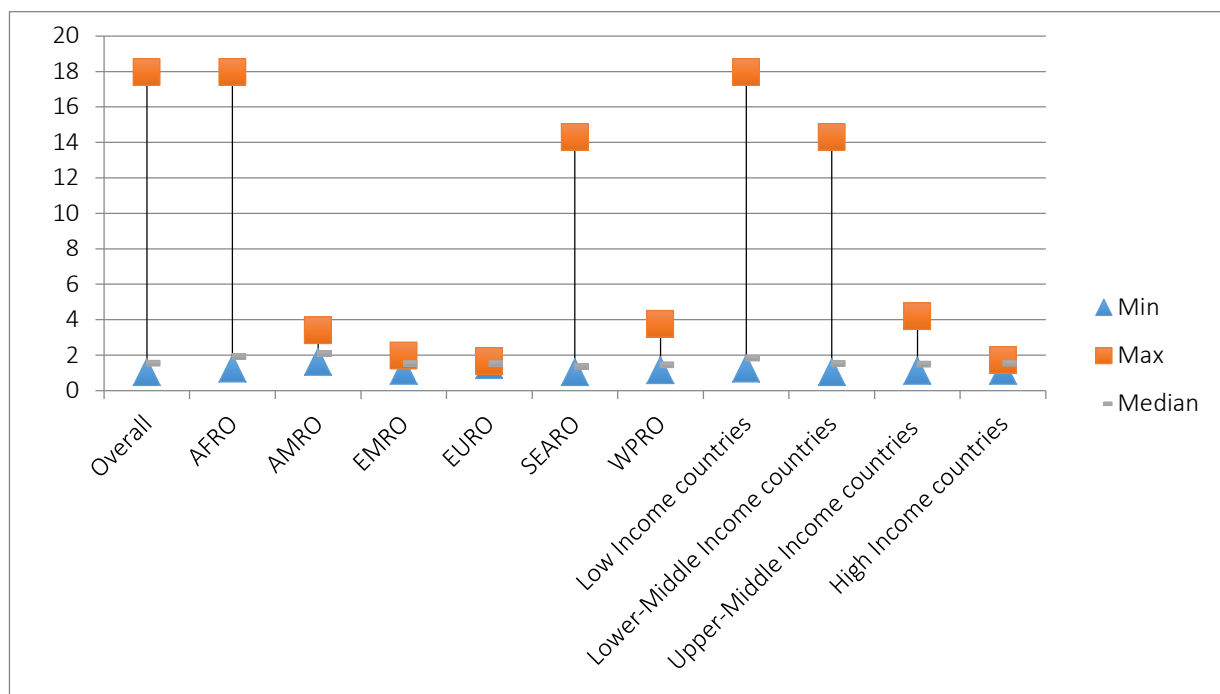
3.9 Price Components in the Pharmaceutical Supply Chain

Final patient prices are composed of the manufacturer’s selling prices and other add-on charges in the supply chain including tariffs, taxes, mark-ups and other costs. Tariffs on insulin are discussed in an ACCISS report drafted by Warren Kaplan. In this report the focus is on cumulative add-ons, rather than those of individual components.

Across the 26 countries in the analysis, the price for a vial of insulin was 1.04 to 17.95 times higher (4 percent-1695 percent) when add-ons were applied to the base (CIF/ MSP). The median was 1.51 times higher (or 51 percent). The greatest increase of 1695 percent was in the private sector in Uganda. The data shows that in low- and lower-middle income countries (as well as in AFRO and SEARO) there are outliers in terms of add-ons (Figure 20). That said even in high-income countries, where the smallest range of add-ons were seen, individuals would be paying an extra \$2.96 per vial or \$41.43 per year due to the supply chain costs.

This translates overall to a year’s supply of insulin costing a median price of \$118.02 (range \$79.79-\$1,377.08). Therefore an additional \$14.03 to \$1,311.32 (median \$52.26) is being paid by health systems or individuals for their insulin due to mark-ups, taxes, tariffs and other costs in the supply chain.

Figure 20. Ratio of final patient price to base price by WHO region and World Bank Income.



Eye-popping add-ons in El Salvador

In 2006, a WHO/HAI price survey in El Salvador shown some phenomenal mark-ups were being applied in the private sector. Importer/distributor mark-ups for imported generics were 74 percent -1700 percent and pharmacy mark-ups were 30 percent-1227 percent. Other charges included a 5 percent customs duty for imported medicines from non-FTA countries, and 13 percent VAT. Cumulative add-ons went as high as 6800 percent. Unfortunately add-ons were not measured for insulin.

Annex 15 shows the contribution of the base price (MSH median buyer price for insulin) and the add-ons to the final patient price. In the public sector in almost all the countries, the largest contributor to the patient price was the base price. In the private sector, the greatest contribution was the base price in most countries but with some notable exceptions e.g. in Peru add-ons were 70 percent of the final price and in Uganda they were up to 94 percent.

The findings from these analyses must be used with caution. Many surveys were conducted 10 years ago making the data outdated, mark-ups and other charges can vary across product types, whether imported or locally produced, and mark-ups will vary in unregulated markets. As well, some of the data provided by countries were official mark-up rates rather than based on actual buying and selling prices in the field

What must also be remembered is that add-ons are cumulative and applied to the manufacturers' selling price, so the higher this price the higher the final patient price. Also a higher percentage mark-up on a lower priced product may result in a lower patient price (making it more affordable) than a lower percentage mark-up on a higher priced product.

To gain a better understanding of price components for insulin, national field studies in selected countries will be undertaken in 2016 as part of the ACCISS Study.

4. Discussion

MSH supplier and buyer prices

In countries such as Mali, Mozambique and Zambia government healthcare expenditure is equivalent to \$28, \$14 and \$36 per person per year respectively at average exchange rates.(22) With the median buyer price for insulin on MSH's *International Drug Price Indicator Guide* being \$ 4.31, and assuming that a person with type 1 diabetes would need 13 vials of insulin per year, this would be equivalent to 2.0, 4.0 and 1.6 times what Mali, Mozambique and Zambia spend per person per year on healthcare. Overall, in different countries where studies using a standardized rapid assessment protocol have been carried out, the average public sector procurement price varied from \$4.10 in Mozambique in 2003 to \$8.40 in Kyrgyzstan in 2009.(15) Both Mozambique and Zambia accessed a differential pricing scheme developed by one of the leading insulin manufacturers which supplies insulin to the governments of least developed countries at a price not exceeding 20 percent of the average price in North America, Europe, and Japan.(8) Through this scheme, the price of insulin purchased by both national health systems was between \$ 4.30 and \$4.60 per 10ml 100IU vial including freight costs. Data from HAI also found that some governments purchase insulin at higher prices than those available on the international market.(19) The range found in 10 studies for a variety of insulin formulations was 0.33 to 5.87 times the international reference price (price per 10ml from \$2.55 to \$48.25).

Data from this analysis confirms the high price of insulin as well as a wide range of prices for both suppliers and buyer within given years. However, median prices over the period of analysis for both suppliers and buyers do not seem to vary substantially. Variation was seen between different WHO regions and country income groups with AFRO and lower-income countries paying more than other regions and income groups. In comparing different types of insulin and strengths, these do not seem to have an impact on price, whereas insulin in cartridge form does at about 3 times more than insulins in vials.

Converting all this data to DDDs shows the potential cost to the health system or individual. The range of these costs is from \$37.08 to \$ 334.11 per person per year representing costs of 0.2 percent to 13.4 percent percent of GDP per capita. In looking at possible total expenditure for a country, Tanzania could be spending as much as \$253,994,232 per year on insulin, equivalent to per capita health spending of about 2 million people or 4 percent of its total population.

In comparing insulin to other medicines, insulin had the lowest ratio of high to low prices, showing smaller variations in price compared to other medicines. Compared to other treatments for NCDs insulin was 2.46 to 44.99 times more. Although the different ARV treatments started off at higher prices, they dropped in price substantially over time. In the end, only one ARV was higher priced than insulin for a course of treatment. This may be because 'generics' for insulin are not common on the market (unlike chemical entities) as the process in the production of these molecules is as important as the final product. Each step in the manufacturing process may impact the end molecule and its "equivalence" or not to the original protein. Because of this, clinical and regulatory requirements are more complex than for generic small molecule medicines. Issues around inter-changeability also exist, hence, further complicate the uptake of these products.(23) The biosimilar market is significantly increasing with many biological products coming off patent.(24) It is estimated that in Europe biosimilar insulins could offer savings of 20-30 percent in comparison with the originator product, and decreases in prices

from 12-51 percent have been seen on the originator once a biosimilar is introduced.(25,26) Another challenge specific to insulin and other biological molecules is that, unlike ARVs or other medicines, the production of biosimilar insulin is a more complex issue especially from a regulatory perspective. Part of the issue is that, unlike chemical entities, it is difficult to produce an exact “copy” of a biological product.(25)

MSH prices are calculated based on a varying number of prices and do not take into account any impact on the price reported e.g. special agreements with certain purchasers, differential pricing, and quantities purchased. Supplier and/or buyer prices for some medicines are based on only one price point (and hence less reliable) whereas others may have many. Comparing insulin with other treatments using DDDs does not take into account that the actual need for insulin or these other medicines may vary from person to person. That said, DDDs can be used as an average treatment regimen and the MSH data provides a unique dataset where the price of medicines can be compared over time.

Overall this data shows that in comparison to other medicines the price of insulin has not substantially changed over 17 years and that in different regions of the world different prices are applied with these being higher in lower income settings.

Government procurement prices

The International Insulin Foundation listed medicines procurement and supply as one of the 11 areas that need to be addressed to effectively manage the burden diabetics (27). Our study has shown that government procurement prices of insulin vary within insulin types, brands and presentations, and across countries. Overall, median price of analogue insulins were more than 5 times the median price of human insulins, and insulins in cartridges and pens were higher priced than insulins in vials. Prices of different insulin types, and brands of the same insulin type, could also vary substantially across countries. Procurement prices varied even in situations where countries purchased similar volumes of the same brand and presentation. Several factors may be responsible for these wide variations in price, including inefficient procurement practices, differential pricing by industry, and the lack of economies of scale to attract lower prices (27,28)

Wide price variations present opportunities for cost-savings on insulin purchases, which would result in governments being able to treat more people without any increase in expenditure. Based on the findings from this survey, some countries would save a considerable amount of money if they purchased human insulin rather than analogues. For example, the government of Iran could save over \$49 million if it purchased only human insulins. This would require overcoming a number of factors, including the influence of pharmaceutical companies, patient preferences, and prescriber preferences. (29) This may also call for changes in the healthcare system, including instruments for promoting the rational and cost-effective use of medicines including standard treatment guidelines. In addition to switching to human insulin, based on our findings countries would make savings by purchasing human insulins in vials rather than prefilled pens and cartridges. Syringes and needles would be needed but they are low priced.

UNRWA and GCC procurement prices were substantially lower than median country prices. UNRWA paid a little under half the country price for three human insulins (despite buying relatively small quantities) and less than the GCC and 2013 MSH median buyer and supplier prices. Pooling orders among its member countries and using formularies are factors that have resulted in GCC savings millions of dollars on medicine purchases (30). Where a correlation

analysis was possible, purchasing greater volumes did result in lower prices. There was a significantly negative correlation between procurement price and volume for isophane, regular, and regular/isophane 30/70 insulins where buying larger quantities resulted in lower prices. However, pooled procurement alone may not always lead to low prices. (31) The CEO of Novo Nordisk has stated that developing countries pay too much for insulin because of relatively small orders and few manufacturers bidding for tenders.(32) He proposed that the WHO buy low-cost diabetes treatments in bulk on behalf of the poorest countries to ensure they get the lowest price.

Governments and others that reliably pay for purchases will likely attract lower prices. As well, governments need to consider other procurement strategies, such as price negotiations, to bring insulin prices down. Least developed countries should negotiate with companies offering differential prices for human insulin.

Procurement price transparency is also important. In response to budget constraints and facing increased demand for medicines (predominantly to treat diabetes and cardiovascular disease), UNRWA's medicine procurement processes and prices were assessed in 2011. (33,34) This included comparing UNRWA's procurement prices with Jordan's Joint Procurement Department, GCC, MSH and IDA Foundation. Many of the recommendations were implemented, including negotiating prices of selected medicines including insulin. This resulted in a reduction in insulin prices.

About 90 percent of the total volume purchased in the study countries was for human insulin and more than half were vials. Given that overall human insulin and insulin in vials were lower priced than analogues and cartridges and prefilled pens, this may represent a trend towards cost-savings. More human insulins were purchased in low-income countries compared to high-income countries. Two additional trends emerged from our analysis of insulin procurement volumes. First, when volumes were stratified and ranked by brand, the top three brands were Mixtard, Insuman Comb and Actraphane (all regular/ isophane 30/70). This strength of premixed insulin accounted for 41 percent of total volume purchased. This indicates a relatively higher demand for regular/isophane 30/70 compared to other insulin types (which is unsurprising being a mix of fast- and intermediate-acting insulin). Secondly, Novo Nordisk had the highest market share by volume, and accounted for just less than half of the total volume of insulins purchased. Four (out of the 12) manufacturers (Novo Nordisk, Sanofi, Exir and Kharazmi) accounted for 93 percent of the total volume of purchases. Exir and Kharazmi have factories in Iran, although Kharazmi recently ceased manufacturing insulin. Literature suggests Eli Lilly, Sanofi, and Novo Nordisk supplies 90 percent of the world's insulin (35). A market highly concentrated among just a few suppliers does not auger well for the competition needed to bring prices down as seen with other medicine.

Patient prices

The median number of insulin brands found in both the public and private sectors increased from low- income countries to high-income countries. A key factor was the higher number of analogue insulins found in higher income countries. About one half of the insulins found in the private sector in upper- middle and high-income countries were analogues, compared to one-fourth in low-income countries. The wide adoption of analogue insulins and the concomitant withdrawal of human insulin has been reported in the literature (36).

Because of profit-making incentives, the private sector is expected to have higher patient prices compared to the public sector (although WHO/HAI price surveys have shown that in some countries, such as China, patient prices in the public sector are higher than in the private sector). This was the case for overall median prices of human insulin. Some large price variations were seen in each sector across the countries e.g. regular/isophane 30/70 ranged from \$2.16-\$36.47 and \$2.48-\$46.44 across countries in the public and private sectors, respectively. For analogues, overall median prices were higher in the public sector compared to the private sector. Even larger price variations across countries were seen for analogues e.g. glargine ranged from \$16.60-\$112.93 in the public sector and \$8.32-\$196.46 in the private sector. High patient prices in the private sector, and poor availability in the public sector, have been identified as barriers to access to insulin. (37)

Similar to the findings for government procurement prices, for each type of human insulin, median patient prices of vials were lower than those of prefilled pens and cartridges in the private sector (there was insufficient data for analyse the public sector). An unsurprising finding was that in both the public and private sectors, as the wealth of the countries increased, the percentage of vials found decreased, and the percentage of cartridges increased.

The fact that animal insulins were reported in only two countries, Argentina and England, is confirmation that these insulins are difficult to access.

The mark-ups calculated in the public sector, from procurement price to patient price, varied from 9.47 percent to 89.53 percent across four countries. If governments are serious about improving the affordability of life-saving medicines such as insulin, then they should not use the sales of medicines to make money. In 2016, as part of the ACCISS Study, insulin price component surveys will be conducted in six or so countries (public and private sectors) to better understand how mark-ups, tariffs, taxes and other charges in the pharmaceutical supply chain impact the final patient price.

Affordability

As used in the WHO/HAI methodology, the affordability of insulin was expressed as the number of days the lowest paid unskilled government worker would have to work to pay for 10ml of 100IU insulin. Insulin was provided free-of-charge in public sector facilities in several study countries. Across the countries where people have to pay out-of-pocket, on average 2.5-3.5 days' wages are needed each month to buy human insulin in the public and private sectors respectively, making it unaffordable for those on low incomes. Other studies have confirmed that patients have to spend several days' wages to pay for insulin. (38) Analogue insulins were even less affordable requiring, overall, about 7 day's wages in the public and private sectors respectively. Buying detemir would require a massive 77 and 64 days' wages when purchased in the private sector in Venezuela and Sri Lanka respectively, making it completely out-of-reach for those on low wages. Based on the WHO/HAI recommendation that spending more than 1 day's wages per month could be considered unaffordable, even the most affordable insulin type - regular insulin - would not be affordable. Additional costs, such as consultation fees, glucose monitoring etc. make insulin even less affordable. As well, people needing insulin may have comorbidities requiring additional medication or other members of the household requiring medicines. Also in many countries a large proportion of the population may be earning less than the government worker so the true level of insulin affordability may be worse than reported here.

In assessing patient prices and affordability, it must be remembered that the findings may not be representative except in countries where patient prices are set. However, the prices are what a person has to pay at the pharmacy and facility on that day.

Reimbursement prices

Only five of the 28 countries from which we collected reimbursement prices were low- and middle- income countries. This is likely because we used publicly available data and there are less national health insurance systems in low- and middle-income countries.

In most of the countries, reimbursement prices were listed by brand of insulin (except in Ghana). Analogue insulins had only one brand per insulin type compared to human insulins which had, on average, 5.5 brands per insulin type. The situation will change with analogues as many are now off patent or reaching the end of their patent period. Interestingly, not all high-income countries reimburse analogue insulins. Germany, in the top 5 pharmaceutical markets in the world, stopped reimbursing analogue insulins in 2007.(39)

Human insulins had the lowest median reimbursement prices \$19.14, about \$9 less than the median price for analogues (\$27.90). The median price for bovine insulin was far higher at \$65.67 but only four countries reimbursed this insulin type. When stratified by insulin type and presentation, human insulins consistently had lower reimbursement prices compared to analogues. The high reimbursement prices of analogues have been demonstrated in other studies. (40) Our findings show that despite the high price of analogues, 7 out of the 10 most commonly reimbursed brands were analogue insulins, and analogues were reimbursed in 25 of the 28 countries in the dataset. This finding is consistent with the increased adoption of analogue insulins reported in literature (28,41). This increased adoption may be a corollary to increased marketing of analogue insulins by industry and uptake.

As with government procurement prices and patient prices, there were wide variations in reimbursement prices of brands. For example, the highest mean price for Aspart was four times more than the lowest price. By presentation, the highest reimbursement price for regular insulin in cartridges was five times its lowest price. Generally, median reimbursement prices for insulin in vials were lower compared to insulins in the other presentations. The reasons for the wide variations seen in reimbursement prices may reflect differential pricing by industry, differences in pricing policies of countries, and other factors.

Due to the low number of low- and middle-income countries, we could not make any effective comparison between reimbursement prices and country income level. However, it is worth noting the median reimbursement prices for isophane and regular insulin decreased with decreasing wealth of the countries.

This study shows that overall reimbursement prices are far higher than overall government procurement prices for both human and analogue insulins. This indicates that national insurance systems may not be using their great potential to leverage lower prices. That said, when looking to reduce prices it is important that insurance systems do not shift costs to people on insulin.

5. Conclusions

We have observed very wide variations in government procurement prices, patient prices and reimbursement prices for insulins across countries. Interventions to reduce insulin prices should consider the root causes of these price variations. It is worth conducting further research to understand the factors that are responsible for high prices and wide variations. This research should focus on government procurement practices and their effects on insulin prices, differential pricing by manufacturers, and insulin price components (mark-ups, tariffs, taxes etc). The low UNRWA procurement price for insulin show that by using the right approach to product selection, supplier prequalification, transparency, and price negotiation significant savings are possible.

Globally, over 90 percent of insulin by volume is supplied by three companies. This does not auger well for the market competition needed to drive down prices and make insulin more affordable. High prices of analogues is concerning, especially as the use of analogues is increasing. There is the need to encourage market competition, both for human and analogue insulins. Human insulins are all off patent so that is not a barrier to market entry. For the analogues, most are either off patent, or about to come off patent, so that will be less of a barrier than in the past. Regulatory issues (i.e. the assessment of biosimilars) may be a barrier. The ACCISS Study has identified a number of insulin manufacturers, in addition to Novo Nordisk, Lilly and Sanofi. Most of them supply in their country of manufacturer, and one or two other countries. In 2016, the ACCISS Study intends to investigate the reasons why these companies are not marketing more widely, including any regulatory barriers. In 2015, Lilly received marketing authorization from the EMA and US FDA to market its biosimilar glargine Basaglar (the first EMA and FDA authorization for a biosimilar analogue insulin). In the UK, Basaglar has a list price of 15 percent lower than the price of Sanofi's Lantus.(42)

Human insulins were lower priced than analogues, and insulin in vials were lower priced than insulin in cartridges and pens. To improve access, especially for those in low- and middle-income countries, and the poor in high-income countries, is vital that Novo Nordisk, Lilly and Sanofi continue to manufacture human insulins in vials. Governments must buy insulin in sufficient quantity to ensure availability in public sector outlets, and provide insulin free-of-charge to patients, or pass on low procurement price to make insulin more affordable. Governments must also control insulin prices in the private sector.

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Annex 1. Countries and price types in the analyses

Prices are in USD for 10ml 100IU insulin

Country	Insulin buyers in MSH Guide 1996-2013	Government procurement price	Patient price		Reimbursement price	
			Public sector	Private sector	Public sector	Private sector
Low-income countries						
Afghanistan		✓				
Burkina Faso		✓				
Burundi			✓	✓		
Cambodia			✓			
Ethiopia	✓			✓		
Guinea			✓	✓		
Malawi	✓		✓ free	✓		
Mali			✓	✓		
Mozambique		✓				
Rwanda	✓					
Tanzania	✓	✓			✓	
Uganda	✓		✓ free	✓		
Zimbabwe				✓		
Lower-middle income countries						
Egypt			✓ free	✓		
El Salvador	✓	✓	✓ free			
Ghana	✓	✓ ¹		✓	✓	
Guatemala	✓					
Honduras	✓					
India				✓		
Indonesia			✓	✓		
Kenya			✓	✓		
Kyrgyz Republic		✓				
Lao PDR		✓ ²	✓	✓		
Micronesia		✓ ³				
Moldova		✓				
Morocco					✓	
Nicaragua	✓					
Pakistan		✓		✓		
Philippines		✓	✓	✓		
Senegal			✓			
Solomon Islands		✓				
Sri Lanka			✓	✓		
Sudan	✓	✓	✓	✓		
Yemen	✓					
Vanuatu		✓				
Vietnam			✓	✓		
Zambia				✓		
Upper-middle income countries						
China			✓	✓		
Colombia			✓ free	✓		
Costa Rica	✓					
Cuba						
Dominican Rep.	✓	✓	✓	✓		

Country	Insulin buyers in MSH Guide 1996-2013	Government procurement price	Patient price		Reimbursement price	
			Public sector	Private sector	Public sector	Private sector
Ecuador			✓free	✓		
Grenada			✓	✓		
Iran		✓	✓	✓		
Jordan		✓		✓		
Lebanon				✓		
Malaysia		✓	✓free	✓		
Mexico				✓		
Namibia	✓					
Peru	✓					
Romania					✓	
Serbia					✓	
South Africa	✓	✓	✓free	✓		
Suriname		✓				
Tuvalu		✓				
High-income countries						
Argentina			✓free	✓	✓	
Australia					✓	
Austria					✓	
Bahrain				✓		
Barbados	✓					
Belgium						✓NFP
Croatia					✓	
Czech Republic					✓	
Denmark					✓	
Estonia					✓	
Finland		✓ ⁴			✓	
France					✓	
Germany			✓	✓	✓	
Iceland					✓	
Ireland					✓	
Latvia					✓	
Netherlands						✓
New Zealand		✓		✓		
Norway					✓	
Poland					✓	
Russia			✓	✓		
Saudi Arabia				✓		
Slovak Republic					✓	
Slovenia					✓	
South Korea					✓	
Spain				✓	✓	
Sweden					✓	
Turks and Caicos Is.		✓				
UAE				✓	✓	
UK			✓free	✓		
Venezuela				✓		
Other						
Cook Islands		✓				
Gulf Cooperation		✓				

Country	Insulin buyers in MSH Guide 1996-2013	Government procurement price	Patient price		Reimbursement price	
			Public sector	Private sector	Public sector	Private sector
Council (GCC)						
Organisation of Eastern Caribbean States	✓*					
UNRWA		✓				

1 Regional procurement data

2 Data from 5 central hospitals

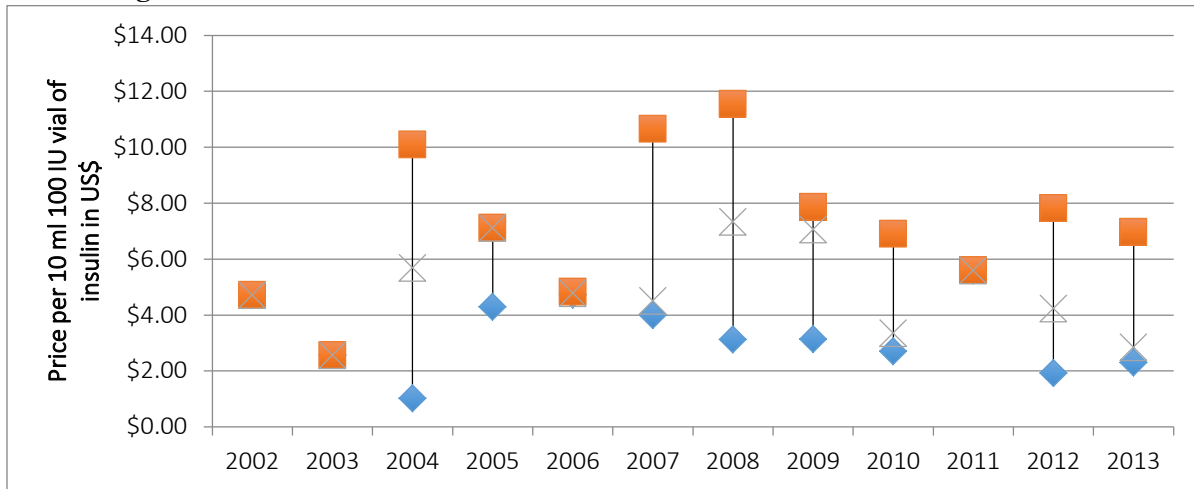
3 Data from Yap state hospital

4 Data from Helsinki and Uusimaa hospital district

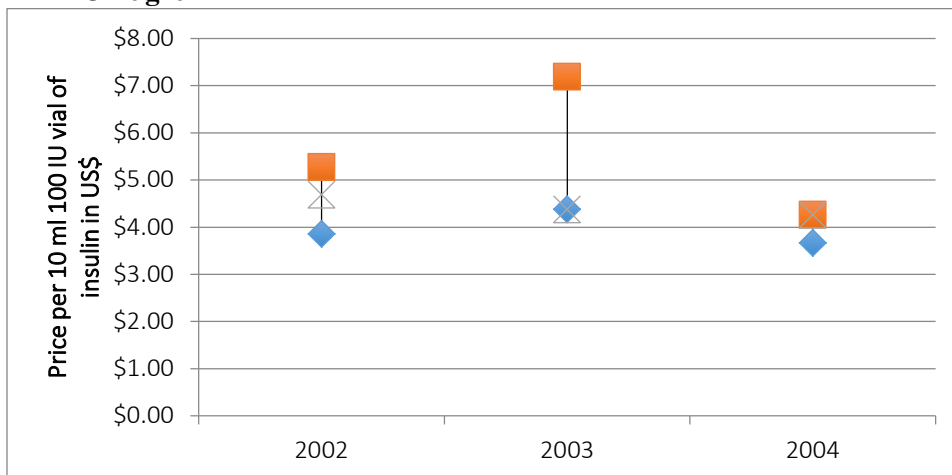
*Considered a high-income country in the analyses, based on the average GDP per capita of Member States

Annex 2. Ranges of MSH insulin adjusted buyer prices, all types of insulin per 10 ml 100 IU vial, 1996-2013, by WHO Region and World Bank Income Group

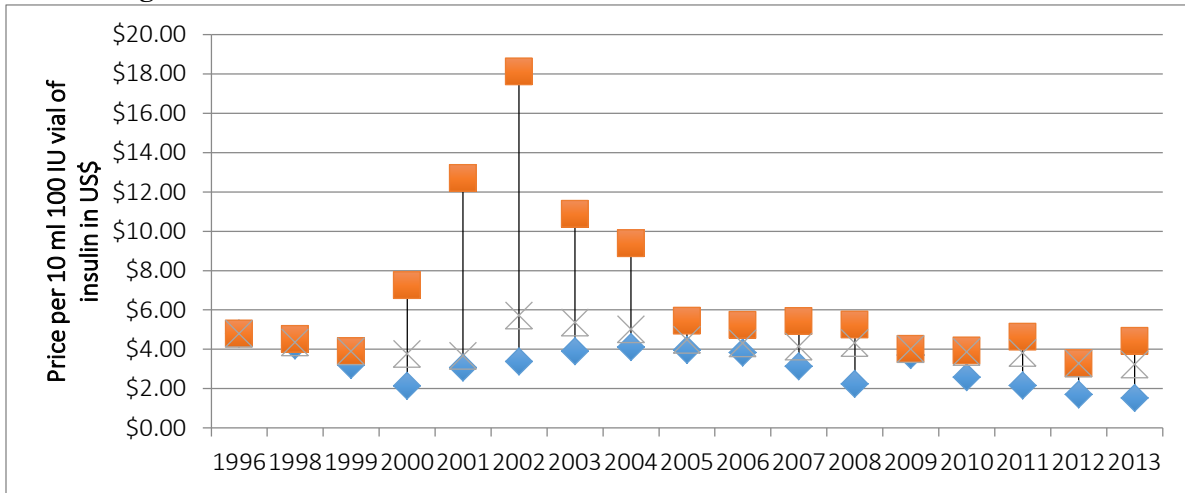
AFRO region



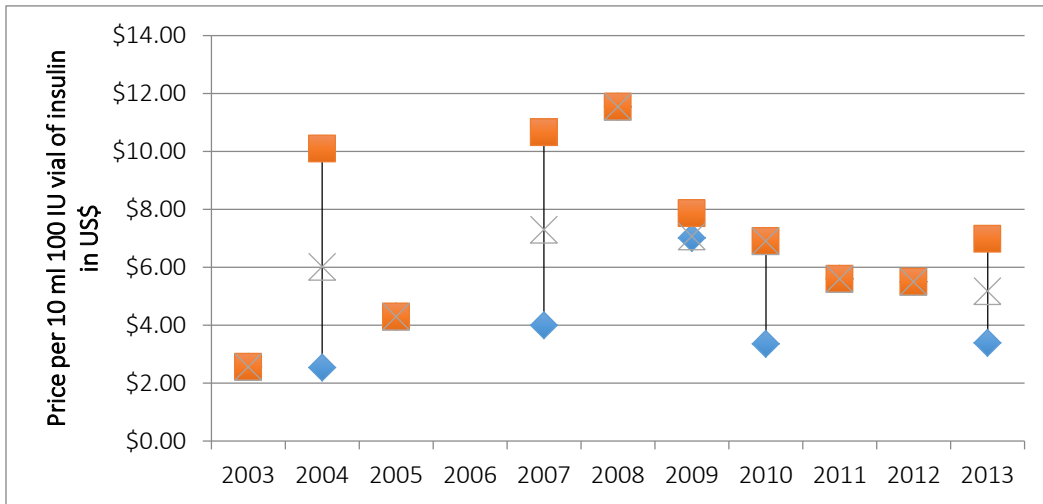
EMRO region



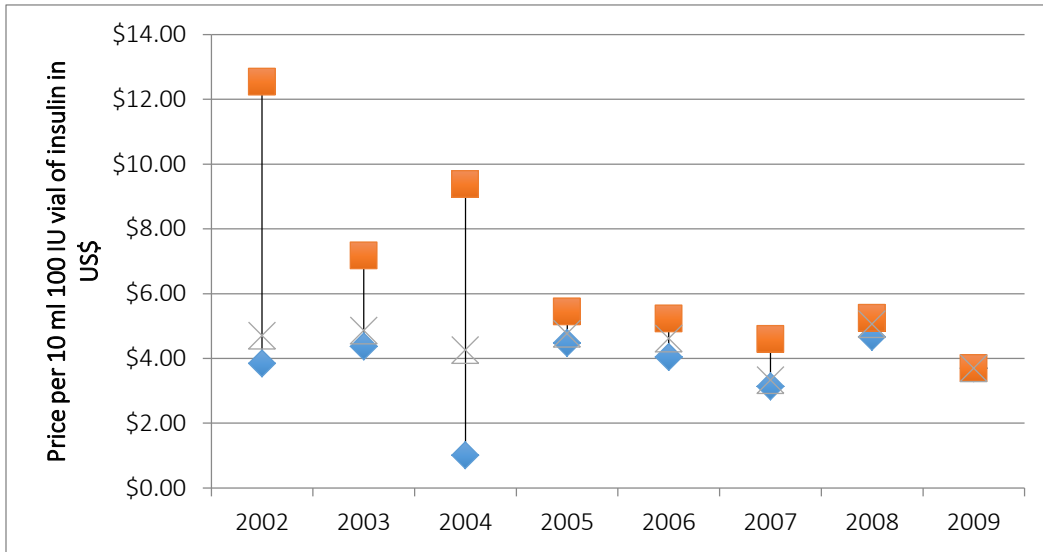
PAHO region



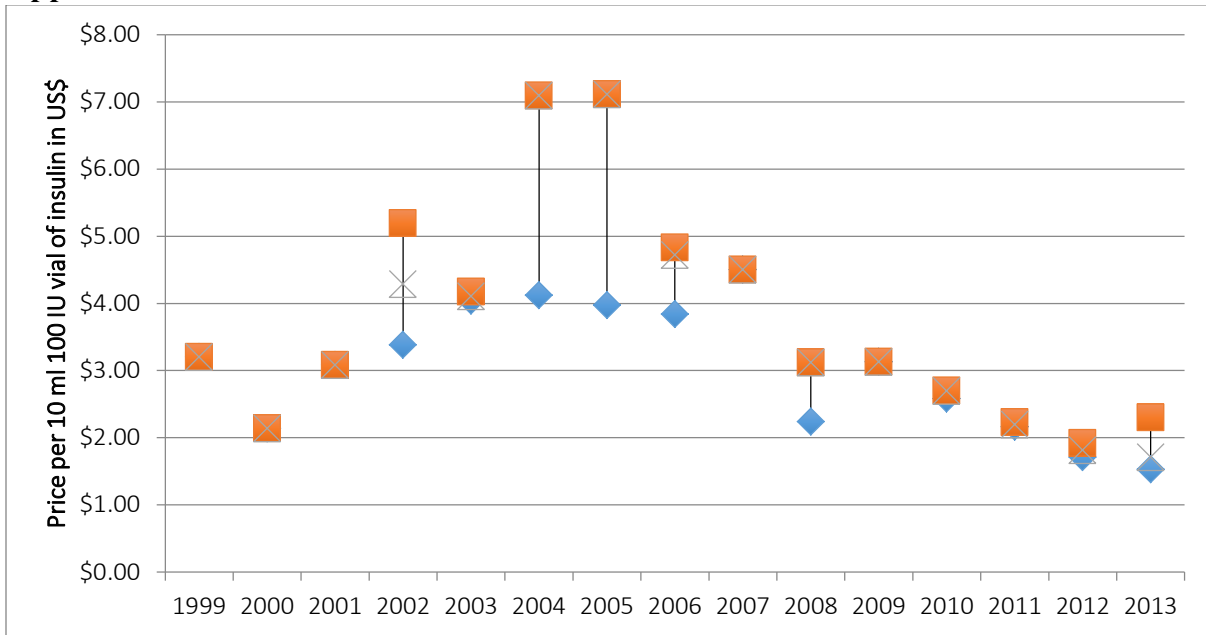
Low-income countries



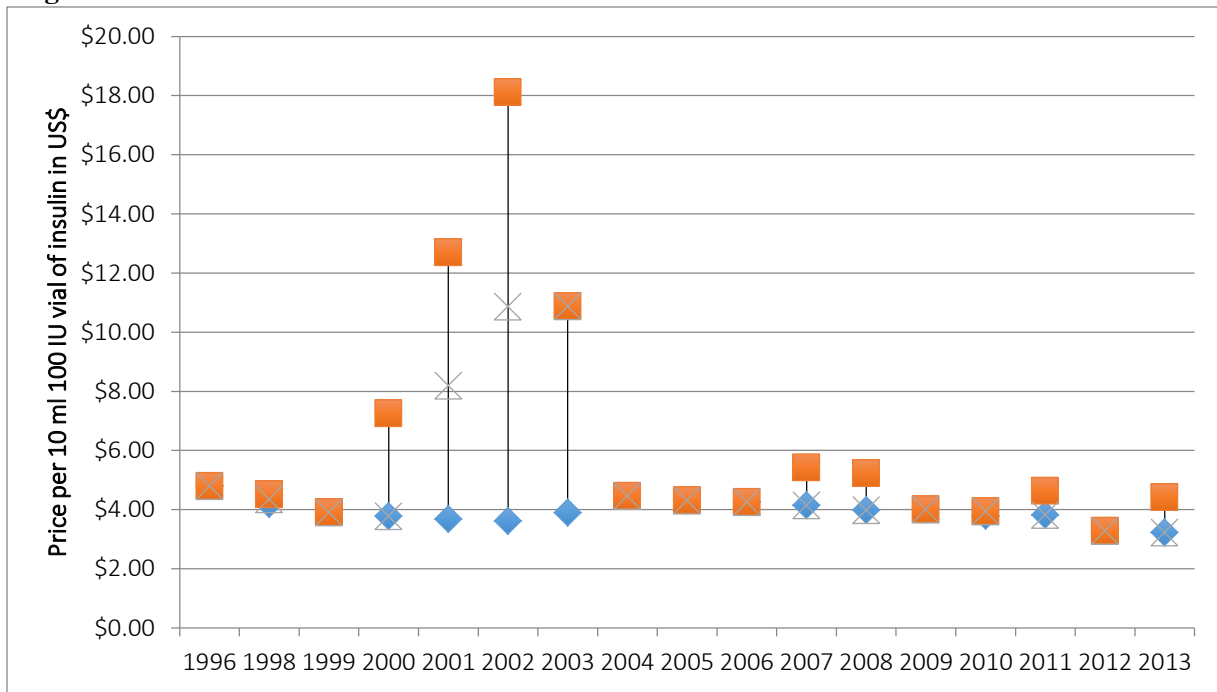
Lower-middle income countries



Upper-middle income countries

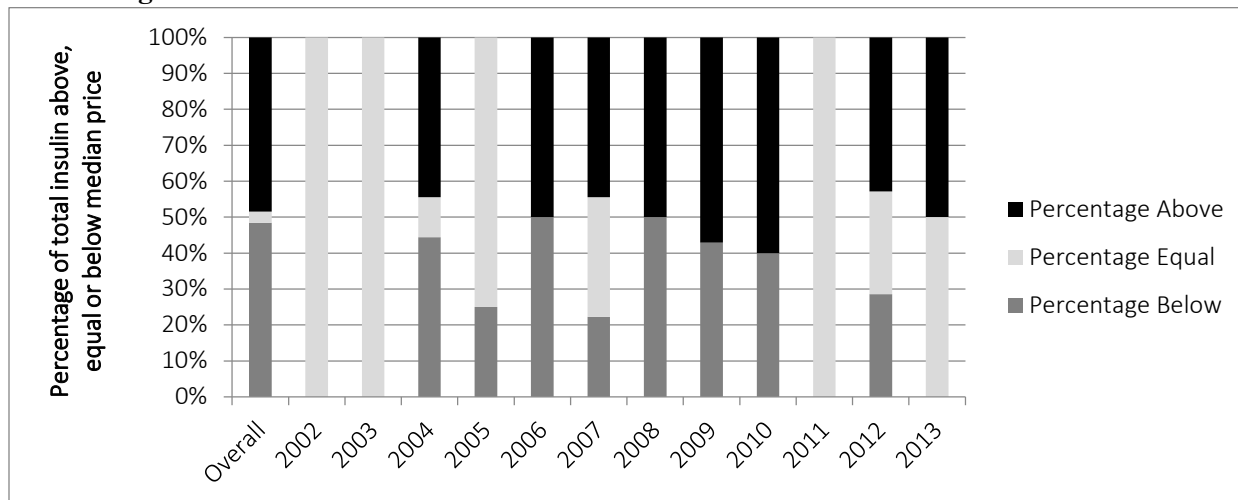


High-income countries

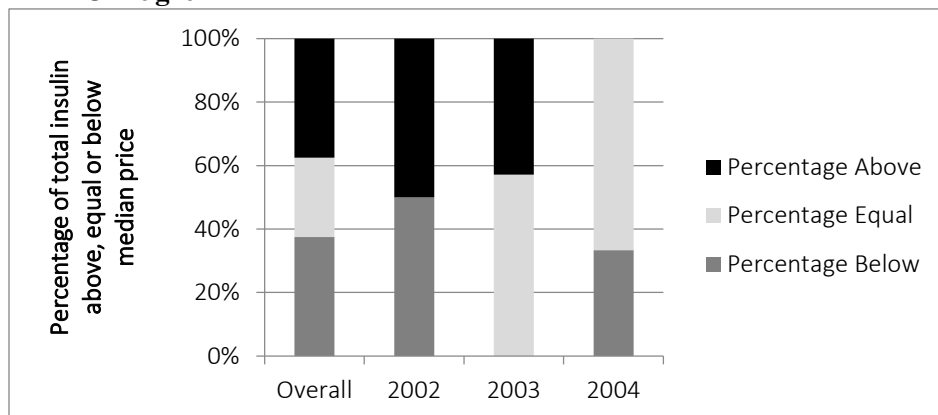


Annex 3. Frequency of MSH insulin adjusted buyer prices below, equal or above the median price, 1996-2013, by WHO region and World Bank Income Groups

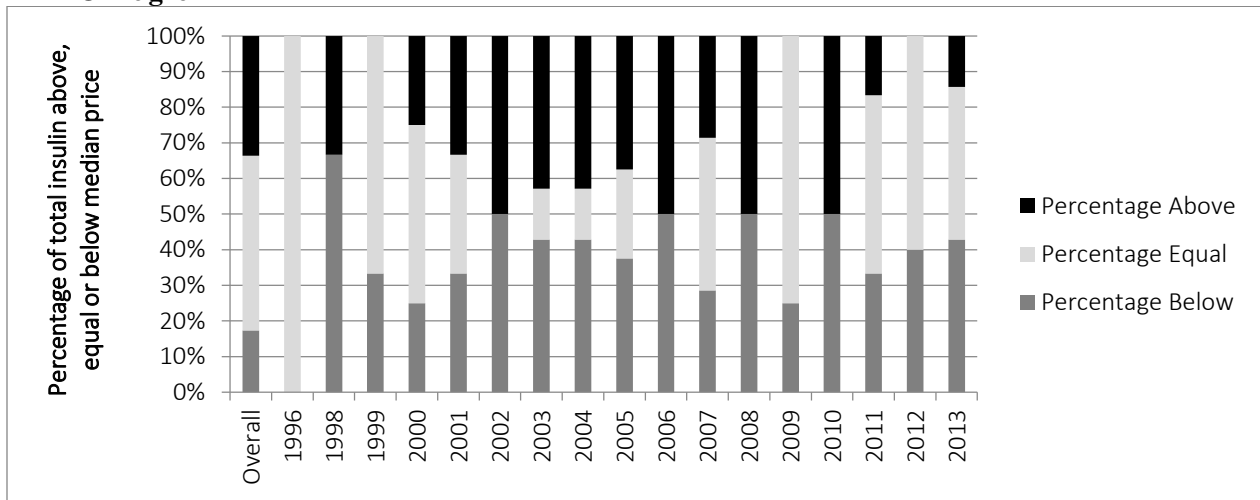
AFRO region



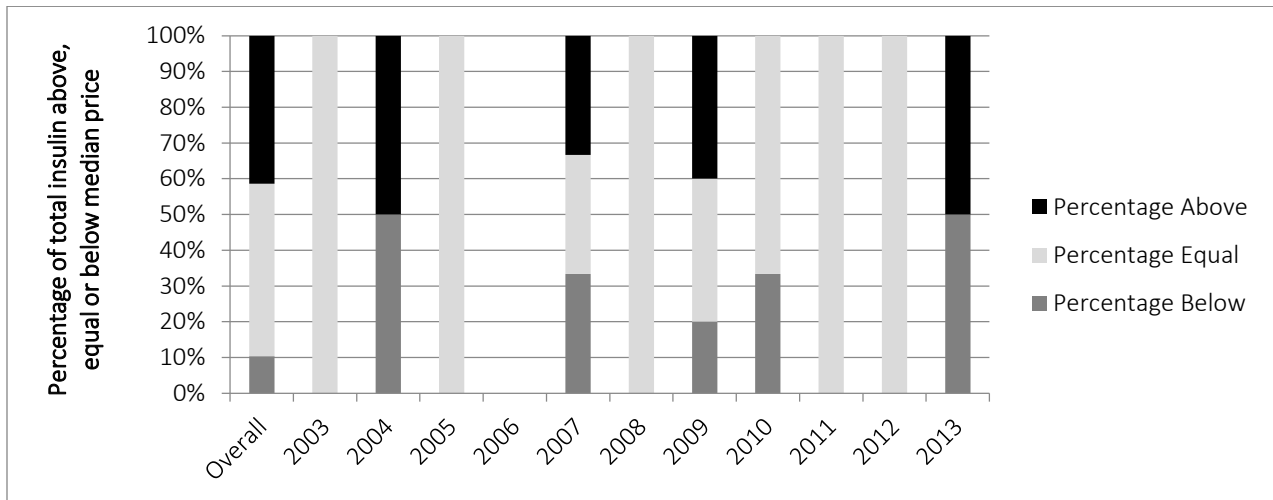
EMRO Region



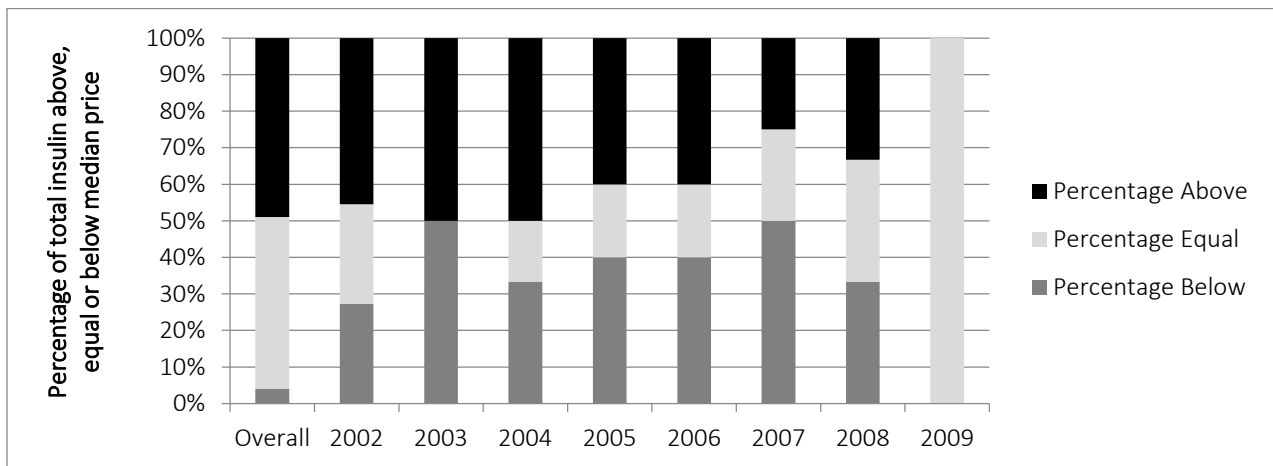
PAHO Region



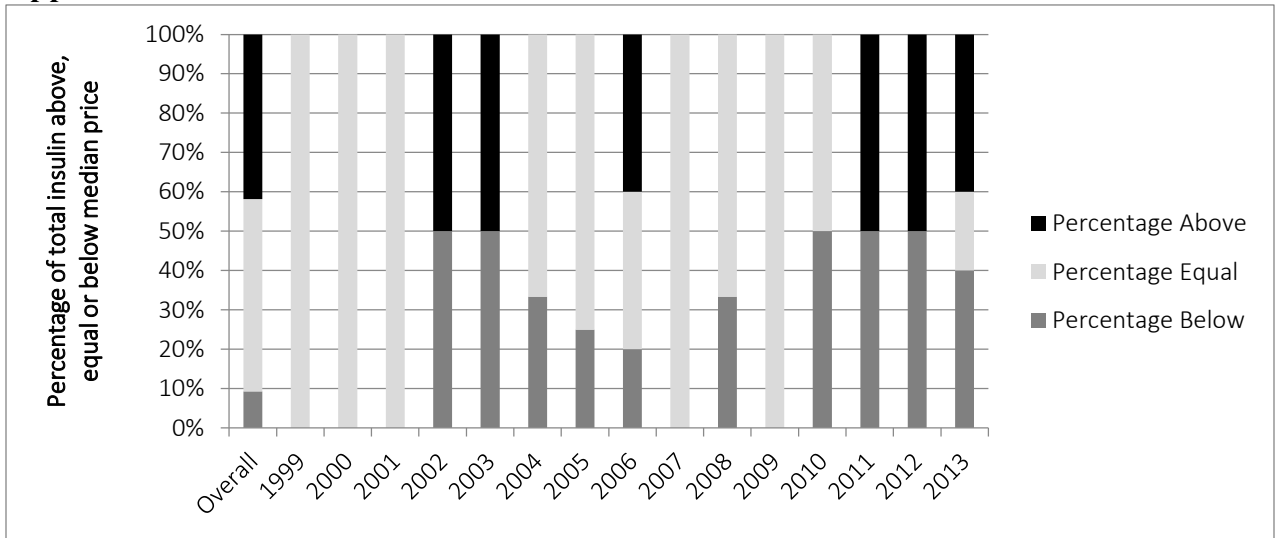
Low-income countries



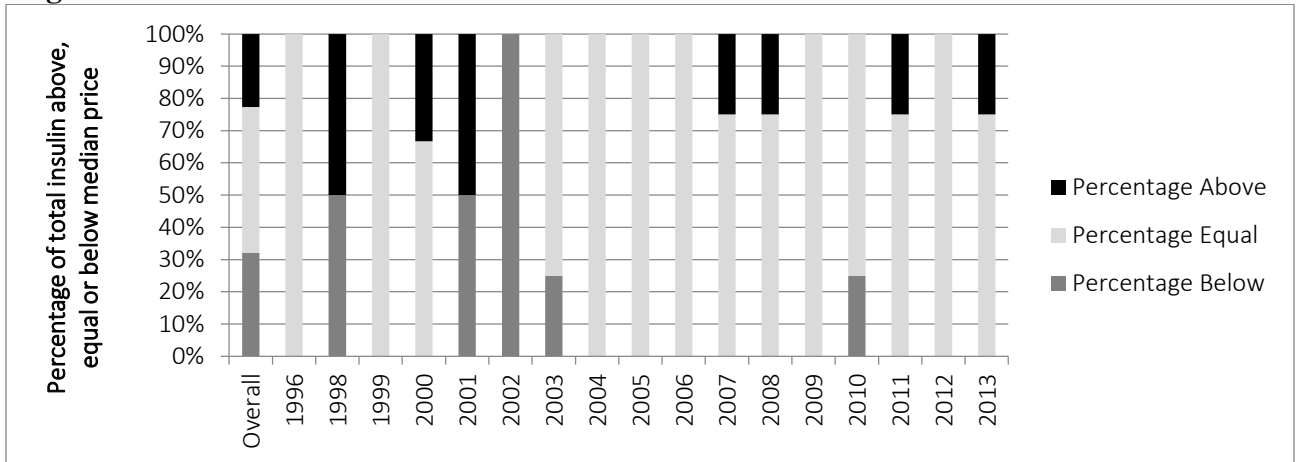
Lower-middle income countries



Upper-middle income countries



High-income countries



Annex 4. Mean annual adjusted price (DDD in USD), percentage of per capita GDP spent on insulin per person, number of people requiring insulin and total cost of insulin in each country

Buyer	Type	Presentation and strength	Mean annual price for DDD	Percentage of GDPpc for insulin	No. people requiring insulin	Total cost USD
Barbados	Lente	Cartridge 100IU	\$185.42	1.2%	33,270	\$6,168,868
		Vial 100IU	\$67.60	0.4%	33,270	\$2,248,965
	Regular/ isophane	Cartridge 100IU	\$158.85	1.0%	33,270	\$5,284,825
		Regular	Cartridge 100IU	\$185.42	1.2%	33,270
			Vial 100IU	\$79.28	0.5%	33,270
Costa Rica	Isophane	Vial 100IU	\$56.06	0.4%	230,331	\$12,913,277
	Regular	Vial 100IU	\$49.35	0.4%	230,331	\$11,366,374
Dominican Republic	Isophane	Vial 100IU	\$28.25	0.2%	687,232	\$19,414,991
	Regular	Vial 100IU	\$28.76	0.2%	687,232	\$19,766,167
El Salvador	Isophane	Vial 100IU	\$69.64	0.9%	349,251	\$24,322,538
	Regular	Vial 100IU	\$133.66	1.7%	349,251	\$46,681,936
Ethiopia	Lente	Vial 100IU	\$62.63	4.5%	1,870,942	\$117,184,581
Ghana	Lente	Vial 100IU	\$41.76	1.0%	453,611	\$18,940,981
	Regular/ isophane	Vial 100IU	\$61.76	1.5%	453,611	\$28,014,108
		Isophane	Vial 100IU	\$61.76	1.5%	453,611
	Regular	Vial 100IU	\$114.03	2.9%	453,611	\$51,723,448
Guatemala	Isophane	Vial 100IU	\$68.04	0.9%	681,493	\$46,366,058
	Regular	Vial 100IU	\$76.65	1.1%	681,493	\$52,236,438
Honduras	Isophane	Vial 100IU	\$54.02	1.2%	277,124	\$14,970,238
Malawi	Lente	Vial 100IU	\$104.83	13.4%	376,115	\$39,427,383
	Regular	Vial 100IU	\$104.83	13.4%	376,115	\$39,427,383
Namibia	Lente	Vial 100IU	\$103.51	1.1%	61,621	\$6,378,636
	Regular/ isophane	Vial 100IU	\$70.52	0.7%	61,621	\$4,345,390
		Isophane	Vial 100IU	\$87.02	0.9%	61,621
	Regular	Vial 100IU	\$65.70	0.7%	61,621	\$4,048,500
Nicaragua	Isophane	Vial 100IU	\$62.20	1.3%	354,960	\$22,077,092
	Regular	Vial 100IU	\$64.46	1.4%	354,960	\$22,880,367
Org. Eastern Caribbean States	Regular/ isophane	Vial 100IU	\$57.52	0.3%	99,010	\$5,695,451
	Isophane	Vial 100IU	\$57.89	0.3%	99,010	\$5,731,590
	Regular	Vial 100IU	\$57.52	0.3%	99,010	\$5,695,451
Peru	Isophane	Vial 100IU	\$24.97	0.2%	827,638	\$20,662,810
Rwanda	Lente	Vial 100IU	\$101.54	6.9%	236,366	\$24,001,313

Buyer	Type	Presentation and strength	Mean annual price for DDD	Percentage of GDPpc for insulin	No. people requiring insulin	Total cost USD
	Regular	Vial 100IU	\$ 100.74	6.8%	236,366	\$ 23,811,511
South Africa	Regular/ isophane	Vial 100IU	\$ 42.49	0.3%	2,785,317	\$ 118,336,978
South Africa	Isophane	Vial 100IU	\$ 45.63	0.4%	2,785,317	\$ 127,080,088
	Regular	Vial 100IU	\$ 30.81	0.2%	2,785,317	\$ 85,804,476
Sudan	Lente	Vial 100IU	\$ 88.26	2.6%	1,445,590	\$ 127,583,437
	Regular/ isophane	Vial 100IU	\$ 90.89	2.7%	1,445,590	\$ 131,382,447
	Regular	Vial 100IU	\$ 88.26	2.6%	1,445,590	\$ 127,583,437
Tanzania	Lente	Vial 40IU	\$ 92.71	3.8%	1,724,169	\$ 159,847,708
	Isophane	Vial 100IU	\$ 101.76	3.3%	1,724,169	\$ 175,454,886
	Regular	Vial 100IU	\$ 80.88	4.4%	1,724,169	\$ 139,457,685
		Vial 40IU	\$ 147.31	6.0%	1,724,169	\$ 253,994,232
Uganda	Isophane	Vial 100IU	\$ 53.58	7.3%	631,359	\$ 45,720,493
	Regular	Vial 100IU	\$ 58.98	3.5%	631,359	\$ 37,240,079
Yemen	Regular/ isophane	Vial 100IU	\$ 61.83	1.6%	730,016	\$ 45,137,619
	Isophane	Vial 100IU	\$ 63.00	1.6%	730,016	\$ 45,990,278
	Regular	Vial 100IU	\$ 57.82	1.5%	730,016	\$ 42,206,605

* No data on type 1 or type 2 diabetes in Montserrat; No data on type 1 diabetes for British Virgin Islands, Anguilla and Martinique

Annex 5. Mean government procurement prices, USD 10 ml 100 IU, for each insulin type per country

Insulin type	Country	Mean price USD	N
Human insulins			
Isophane	Burkina Faso	5.77	2
	Cook Islands	5.50	1
	Dominican Republic	2.42	1
	El Salvador	3.36	1
	Finland	22.06	2
	GCC	2.82	1
	Iran	4.36	3
	Kyrgyz Republic	6.51	2
	Lao PDR	5.99	1
	Malaysia	5.09	2
	Micronesia	14.29	1
	Moldova	12.45	2
	Mozambique	3.25	1
	New Zealand	14.45	4
	Philippines	5.46	1
	Solomon Islands	9.19	1
	South Africa	6.89	3
	Sudan	3.34	1
	Suriname	12.34	2
	Tanzania	2.30	1
Tuvalu	30.67	1	
UNRWA	2.92	1	
Vanuatu	9.40	1	
Lente Zinc Suspension	Ghana	12.29	1
Regular	Afghanistan	4.46	1
	Burkina Faso	5.92	1
	Cook Islands	5.50	1
	Dominican Republic	2.66	1
	El Salvador	3.41	1
	Finland	19.90	1
	GCC	5.58	2
	Ghana	9.44	2
	Iran	4.36	3
	Jordan	9.14	1
	Kyrgyz Republic	6.51	2
	Lao PDR	5.99	1
	Malaysia	5.34	3
	Micronesia	14.24	1

Insulin type	Country	Mean price USD	N
	Moldova	12.45	2
	Mozambique	3.25	1
	New Zealand	20.64	4
	Pakistan	2.24	2
	Philippines	4.88	1
	Solomon Islands	4.94	1
	South Africa	6.89	3
	Sudan	3.34	1
	Suriname	12.34	2
	Tanzania	2.30	1
	Turks and Caicos	18.90	1
	Tuvalu	43.51	1
	UNRWA	2.92	1
	Vanuatu	9.40	1
Regular/Isophane 30/70	Burkina Faso	5.97	2
	Cook Islands	5.50	1
	Dominican Republic	2.48	1
	GCC	2.82	1
	Ghana	9.44	2
	Iran	4.36	1
	Kyrgyz Republic	32.00	1
	Lao PDR	5.99	1
	Malaysia	5.29	2
	Micronesia	13.74	1
	Moldova	12.45	2
	Mozambique	3.25	1
	New Zealand	20.64	4
	Pakistan	2.24	2
	Philippines	5.46	1
	Solomon Islands	5.99	1
	South Africa	6.30	3
	Sudan	3.34	1
	Suriname	12.34	2
	UNRWA	2.92	1
Vanuatu	9.40	1	
Regular/Isophane 40/60	New Zealand	21.86	1
Regular/Isophane 50/50	New Zealand	21.86	1
Analogue insulins			
Aspart	Finland	27.00	2
	GCC	19.36	2
	Iran	34.20	1
	Kyrgyz Republic	35.78	1

Insulin type	Country	Mean price USD	N
	Malaysia	24.91	1
	New Zealand	25.19	3
Aspart/Protamine 30/70	GCC	24.77	1
	Iran	34.20	1
	Kyrgyz Republic	36.16	1
	Malaysia	24.18	1
	New Zealand	26.73	1
Detemir	Finland	43.67	2
	GCC	37.50	2
	Kyrgyz Republic	62.14	1
	Moldova	55.58	1
Glargine	Finland	43.19	2
	GCC	39.42	2
	Iran	36.89	1
	Kyrgyz Republic	46.31	1
	Malaysia	39.96	1
	Micronesia	81.67	1
	Moldova	38.26	2
	New Zealand	48.44	3
Glulisine	Dominican Republic	6.88	1
	GCC	20.67	1
	New Zealand	22.67	3
Lispro	Finland	28.37	1
	GCC	19.34	2
	Kyrgyz Republic	33.08	1
	New Zealand	28.68	2
Lispro/Protamine 25/75	GCC	24.53	2
	New Zealand	21.86	1
Lispro/Protamine 50/50	GCC	22.50	2
	New Zealand	21.86	1

Annex 6. Government procurement prices, USD for 10 ml 10 0 IU insulin, in each country by brand and presentation

Brand	Manufacturer	Presentation	Country	Mean procurement price USD
Human insulins				
Actraphane 30/70®	Novo Nordisk	Pen	South Africa	10.32
		Vial	Mozambique	3.25
			South Africa	2.09
Actrapid®	Novo Nordisk	Cartridge	Finland	19.90
			Jordan	9.14
			Malaysia	5.80
			Moldova	17.93
			New Zealand	21.86
		Pen	GCC	8.33
			South Africa	10.32
		Vial	Burkina Faso	5.92
			Cook Islands	5.50
			GCC	2.82
			Kyrgyz Republic	4.69
			Malaysia	5.84
			Mozambique	3.25
			New Zealand	19.42
			Pakistan	2.42
			Philippines	4.88
			South Africa	2.09
			Sudan	3.34
			Tanzania	2.30
Vanuatu	9.40			
Biosulin N®	Kharazmi	Vial	Iran	4.36
	MJ Biopharma / Adcock Ingram	Cartridge	South Africa	8.26
Biosulin R®	Kharazmi	Vial	Iran	4.36
	MJ Biopharma / Adcock Ingram	Cartridge	South Africa	8.26
Humulin 30/70®	Eli Lilly	Cartridge	Kyrgyz Republic	32.00
			New Zealand	21.86
		Vial	Ghana	12.29
			Micronesia	13.74
			Moldova	6.97
Humulin L®	Eli Lilly	Vial	New Zealand	19.42
			Ghana	12.29
Humulin N®	Eli Lilly	Cartridge	Kyrgyz Republic	8.33
			New Zealand	15.30

Brand	Manufacturer	Presentation	Country	Mean procurement price USD
		Vial	Micronesia	14.29
			Moldova	6.97
			New Zealand	13.59
			Tuvalu	30.67
Humulin R®	Eli Lilly	Cartridge	New Zealand	21.86
		Pen	Kyrgyz Republic	8.33
		Vial	Ghana	12.29
			Micronesia	14.24
			Moldova	6.97
			New Zealand	19.42
			Turks and Caicos	18.90
			Tuvalu	43.51
Insugen 30/70®	Biocon	Vial	Lao PDR	5.99
Insugen N®	Biocon	Vial	Burkina Faso	5.72
			Lao PDR	5.99
Insugen R®	Biocon	Vial	Lao PDR	5.99
Insuget 30/70®	Getz	Vial	Pakistan	2.06
Insuget R®	Getz	Vial	Pakistan	2.06
Insulatard®	Novo Nordisk	Cartridge	Malaysia	5.80
		Vial	Burkina Faso	5.82
			GCC	2.82
			Sudan	3.34
			Tanzania	2.30
Insulet Mix 30®	Sothema	Vial	Burkina Faso	5.92
Insulex N®	Biocon	Vial	Dominican Republic	2.42
Insulex R®	Biocon	Vial	Dominican Republic	2.66
Insuman Comb 30/70®	Sanofi	Cartridge	Malaysia	4.77
		Pen	South Africa	6.48
		Vial	Ghana	6.58
Insuman N®	Sanofi	Cartridge	Malaysia	4.38
Insuman R®	Sanofi	Cartridge	Malaysia	4.38
		Vial	Ghana	6.58
Jusline R®	Julphar	Vial	Afghanistan	4.46
Lansulin 30/70®	Exir	Vial	Iran	4.36
Lansulin N®	Exir	Vial	Iran	4.36
Lansulin R®	Exir	Vial	Iran	4.36
Lupinsulin 30/70®	MJ Biopharma	Cartridge	Philippines	5.46
Lupinsulin N®	MJ Biopharma	Vial	Philippines	5.46
Mixtard 30/70®	Novo Nordisk	Cartridge	Malaysia	5.80
		Vial	Burkina Faso	6.03
			Cook Islands	5.50

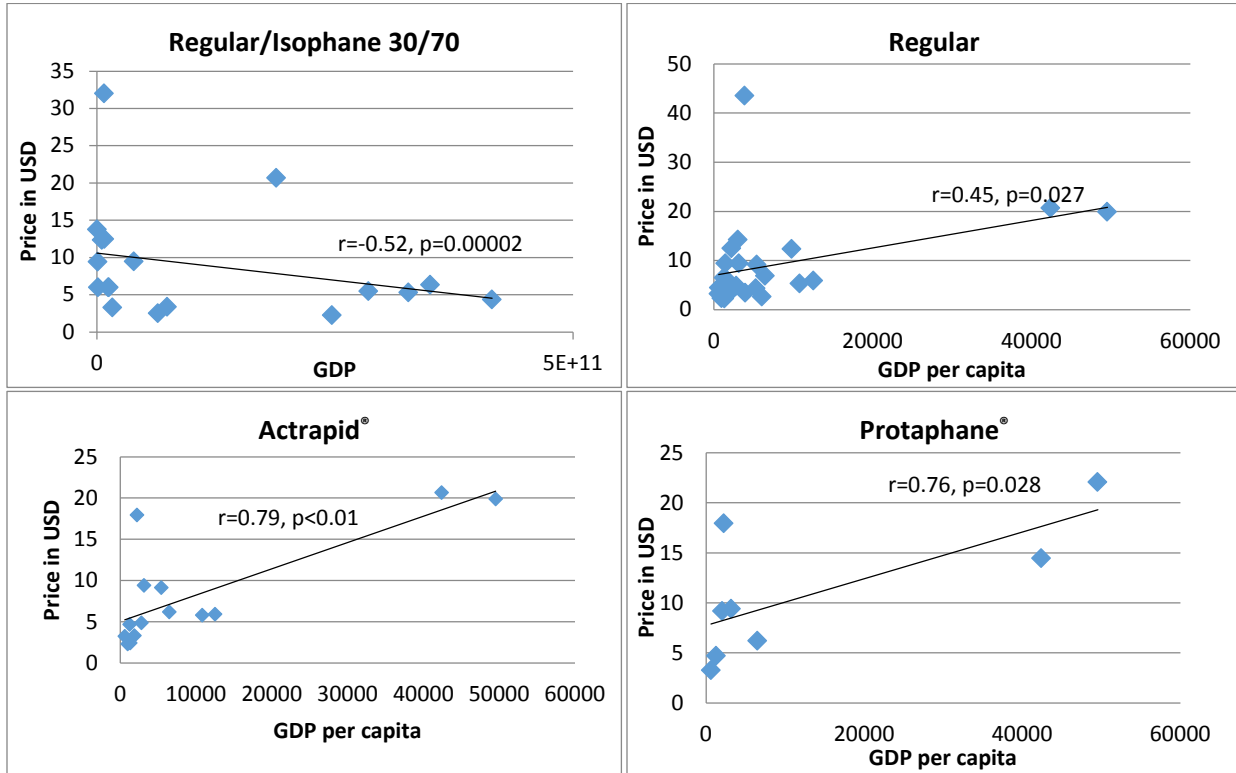
Brand	Manufacturer	Presentation	Country	Mean procurement price USD
			GCC	2.82
			Moldova	17.93
			New Zealand	19.42
			Pakistan	2.42
			Sudan	3.34
			UNRWA	2.92
			Vanuatu	9.40
Novolin 30/70®	Novo Nordisk	Cartridge	Suriname	15.75
		Vial	Suriname	8.93
Novolin N®	Novo Nordisk	Cartridge	Suriname	15.75
		Vial	El Salvador	3.39
		Vial	Suriname	8.93
		Vial	UNRWA	2.92
Novolin R®	Novo Nordisk	Cartridge	Suriname	15.75
		Vial	Suriname	8.93
			UNRWA	2.92
Penmix 30®	Novo Nordisk	Cartridge	New Zealand	21.86
Penmix 40®	Novo Nordisk	Cartridge	New Zealand	21.86
Penmix 50®	Novo Nordisk	Cartridge	New Zealand	21.86
Protaphane®	Novo Nordisk	Cartridge	Finland	19.90
			Moldova	17.93
			New Zealand	15.30
		Pen	Finland	24.22
			South Africa	10.32
		Vial	Cook Islands	5.50
			Kyrgyz Republic	4.69
			Mozambique	3.25
			New Zealand	13.59
			Solomon Islands	9.19
			South Africa	2.09
Vanuatu	9.40			
Recomulin 30/70®	Biocon	Vial	Dominican Republic	2.48
Vitasulin N®	Vitane	Vial	Iran	4.36
Vitasulin R®	Vitane	Vial	Iran	4.36
Wosulin R®	Wockhardt	Vial	Solomon Islands	4.94
Wosulin 30/70®	Wockhardt	Vial	Solomon Islands	5.99
Analogue insulins				
Apidra®	Sanofi	Cartridge	New Zealand	23.61
		Pen	Dominican Republic	6.88
			GCC	20.67
			New Zealand	22.20

Brand	Manufacturer	Presentation	Country	Mean procurement price USD
Humalog®	Eli Lilly	Cartridge	Kyrgyz Republic	33.08
			New Zealand	30.51
		Pen	Finland	28.37
			GCC	24.53
		Vial	GCC	14.14
New Zealand	26.85			
Humalog Mix 25®	Eli Lilly	Cartridge	GCC	24.53
			New Zealand	21.86
		Pen	GCC	24.53
Humalog Mix 50®	Eli Lilly	Cartridge	GCC	22.50
			New Zealand	21.86
		Pen	GCC	22.50
Lantus®	Sanofi	Cartridge	Finland	43.21
			Kyrgyz Republic	46.31
			New Zealand	48.44
		Pen	Finland	43.16
			GCC	42.03
			Iran	36.89
			Malaysia	39.96
			Moldova	36.57
		Vial	New Zealand	48.44
			GCC	36.80
Micronesia	81.67			
Moldova	39.94			
Levemir®	Novo Nordisk	Cartridge	Finland	43.67
			Kyrgyz Republic	62.14
		Pen	Finland	43.67
			GCC	41.00
			Moldova	55.58
		Vial	GCC	34.00
		NovoMix 30/70®	Novo Nordisk	Cartridge
Pen	GCC			24.77
	Iran			34.20
	Malaysia			24.18
	New Zealand			26.73
NovoRapid®	Novo Nordisk	Cartridge	Finland	25.63
			Kyrgyz Republic	35.78
			New Zealand	26.24
		Pen	Finland	28.37
			GCC	24.77

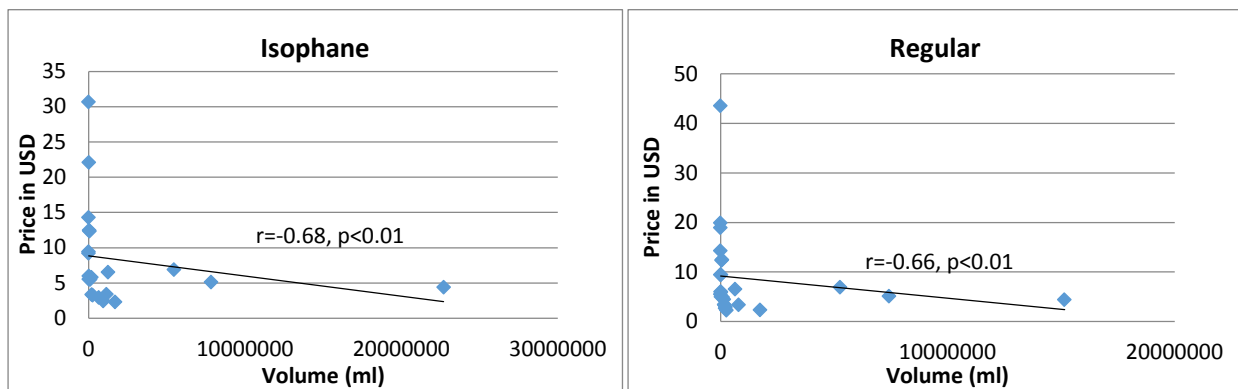
Brand	Manufacturer	Presentation	Country	Mean procurement price USD
			Iran	34.20
			Malaysia	24.91
			New Zealand	26.24
		Vial	GCC	13.95
			New Zealand	23.09

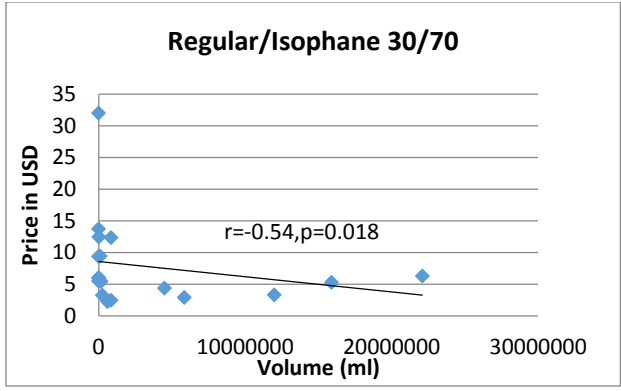
Annex 7. Significant correlation plots for government procurement prices, patient prices and reimbursement prices

Government procurement prices for insulin types and brands versus GDP and GDP per capita

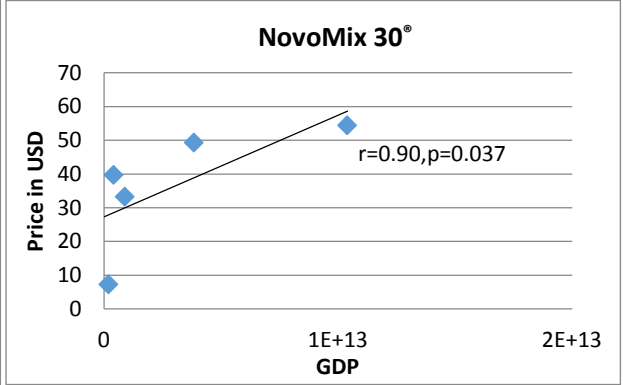
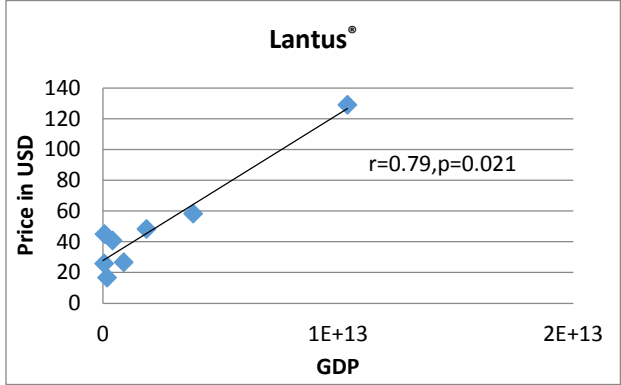
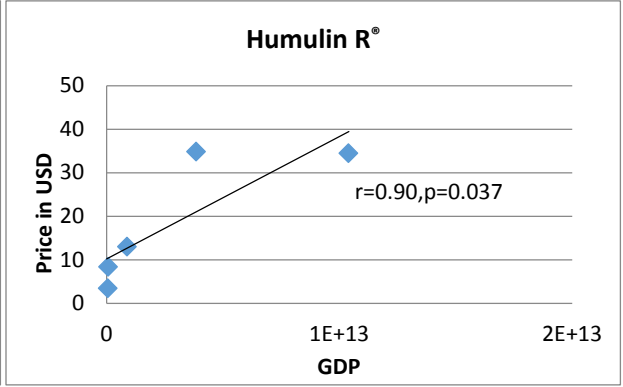
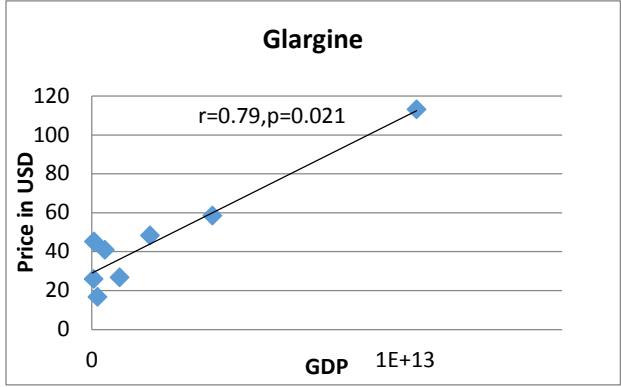
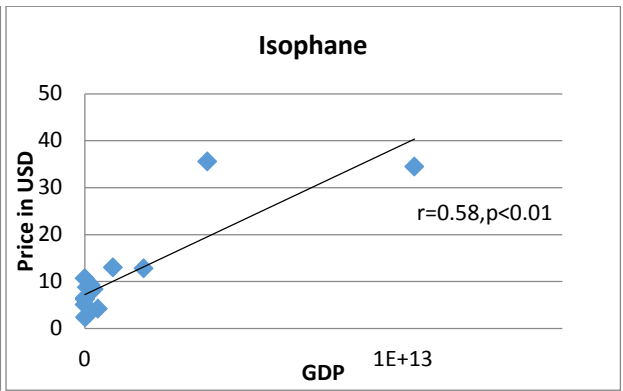
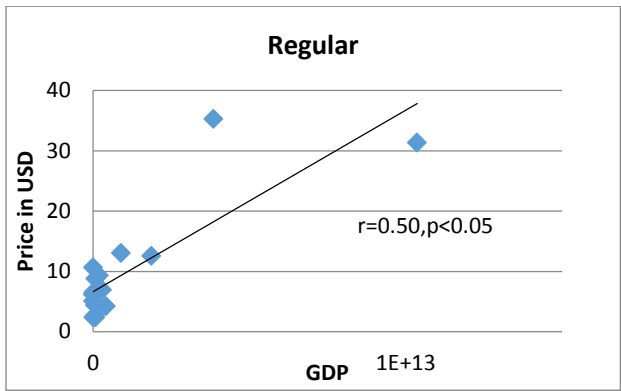


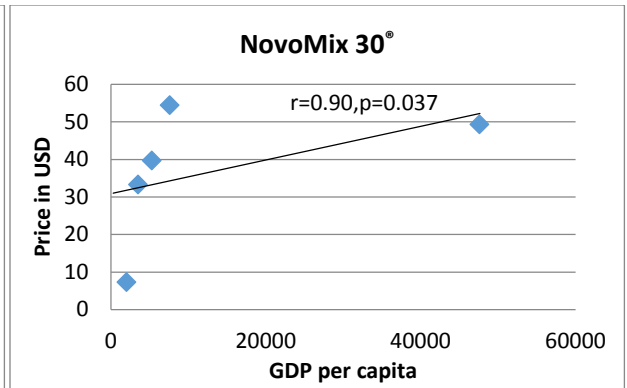
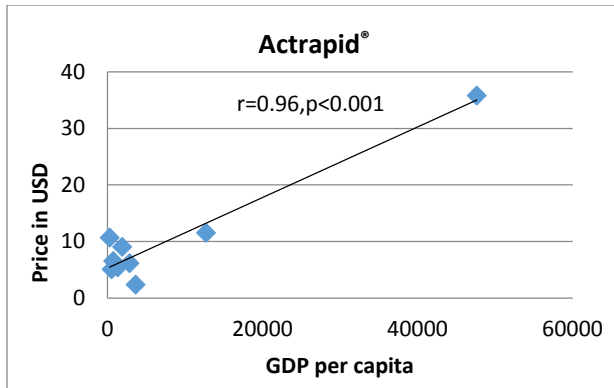
Government procurement prices for insulin types and brands against volume



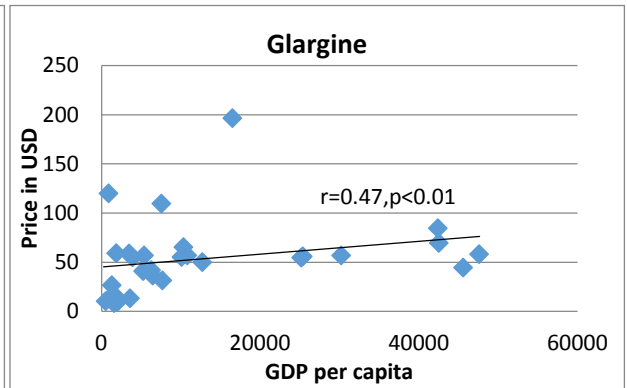
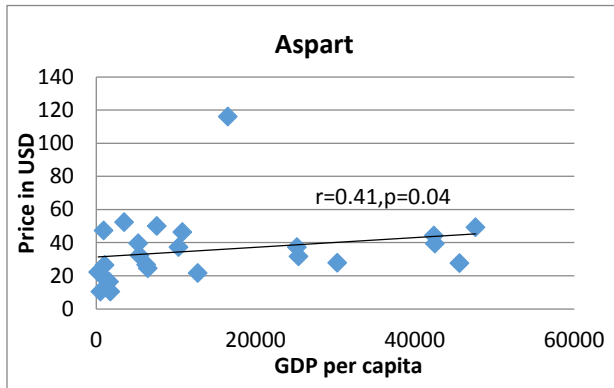
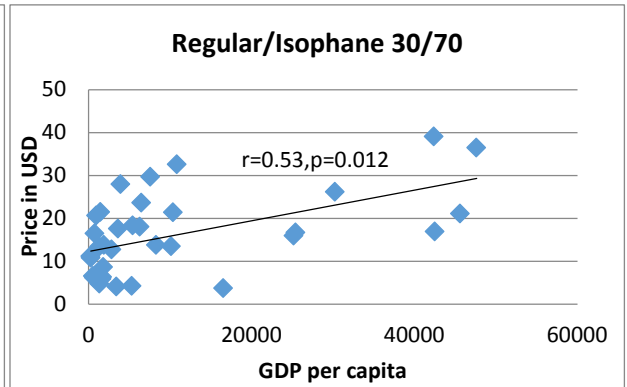
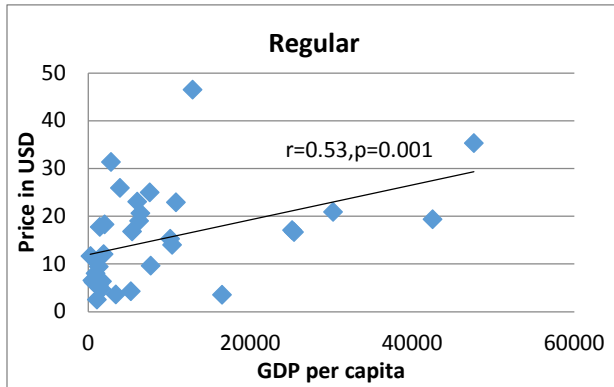
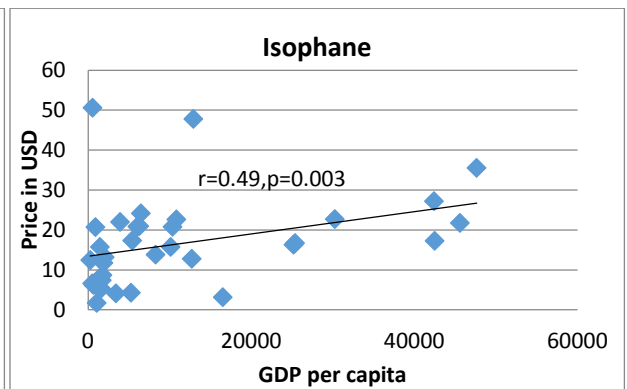
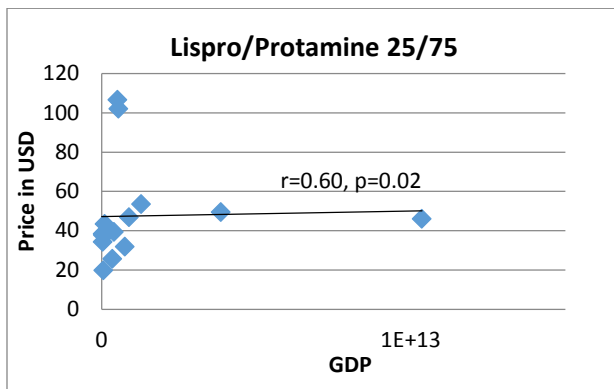


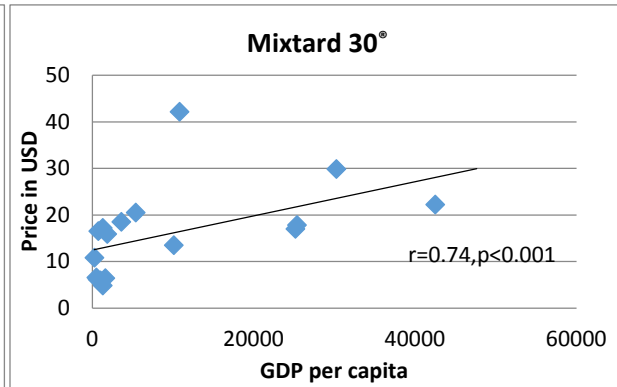
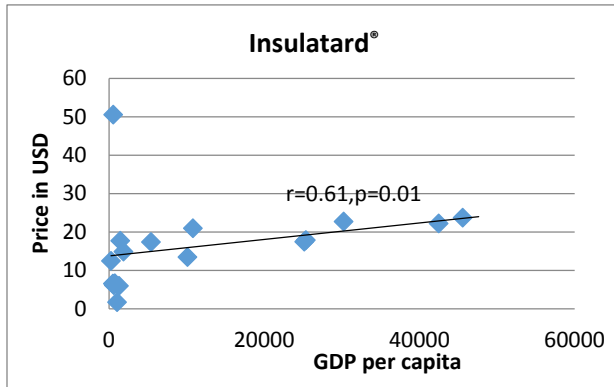
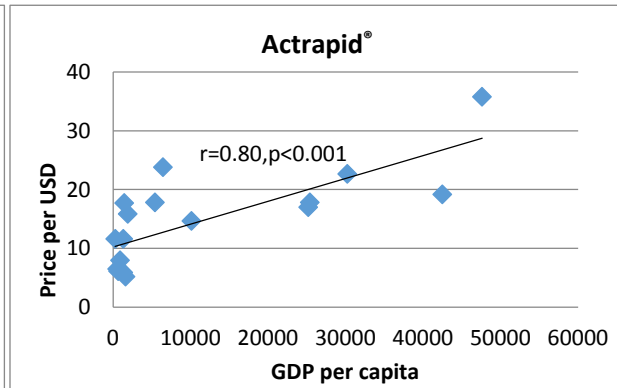
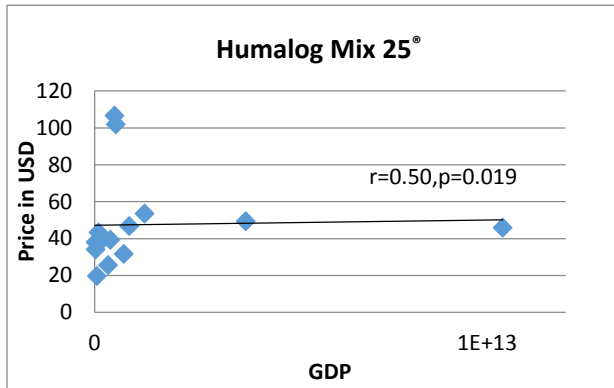
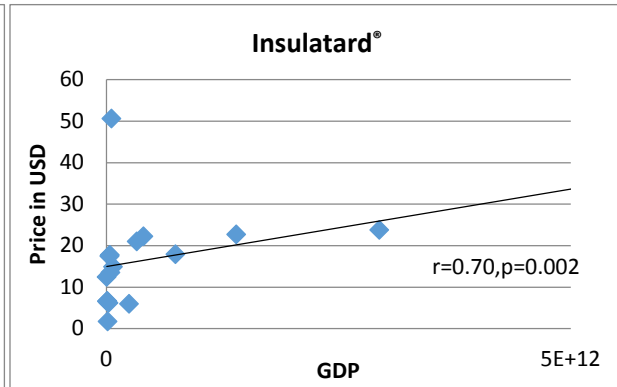
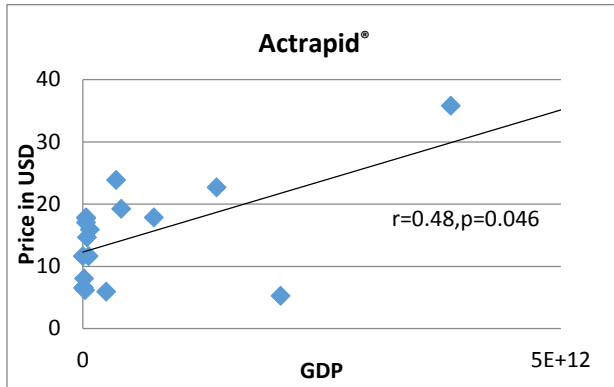
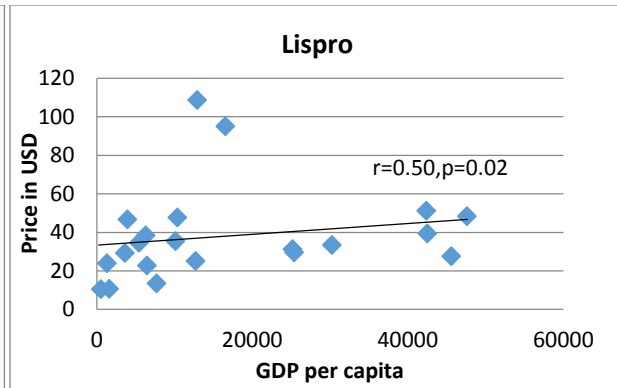
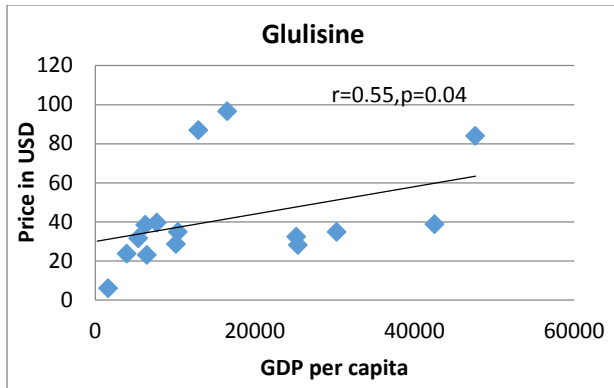
Public sector patient prices for insulin types and brands against GDP and GDP per capita

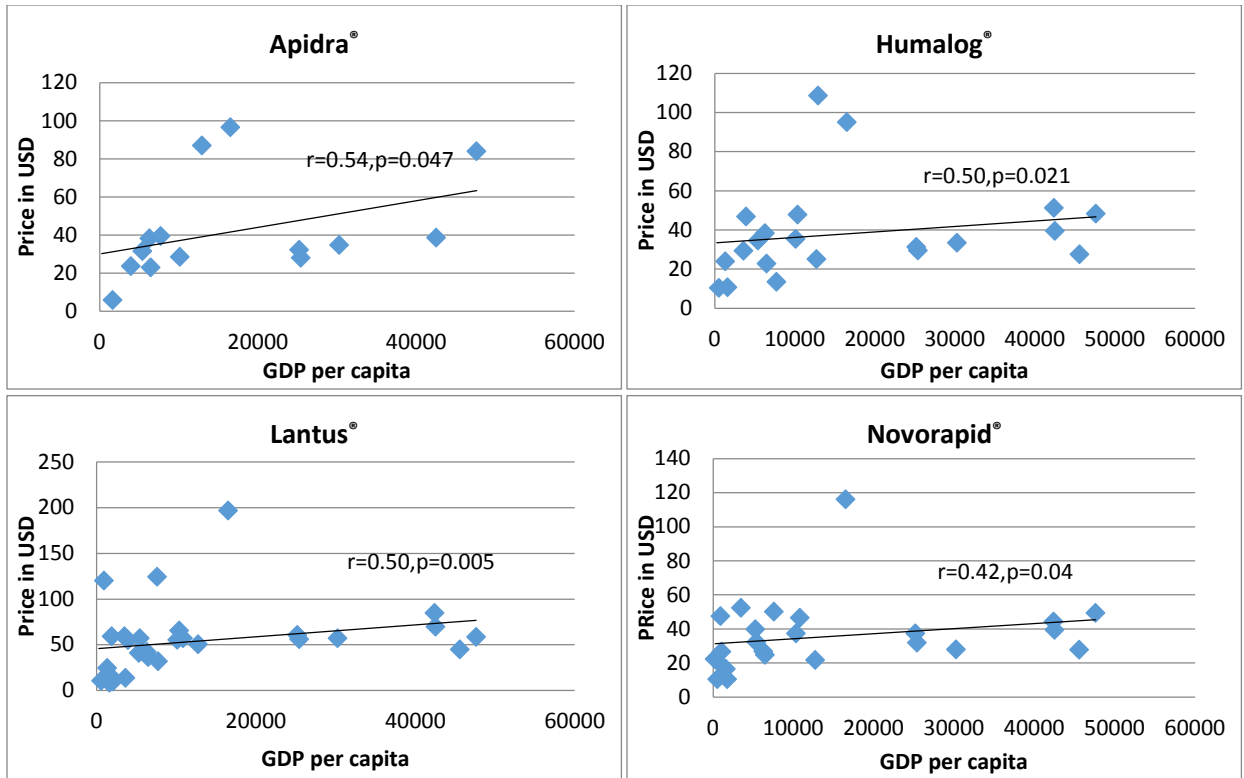




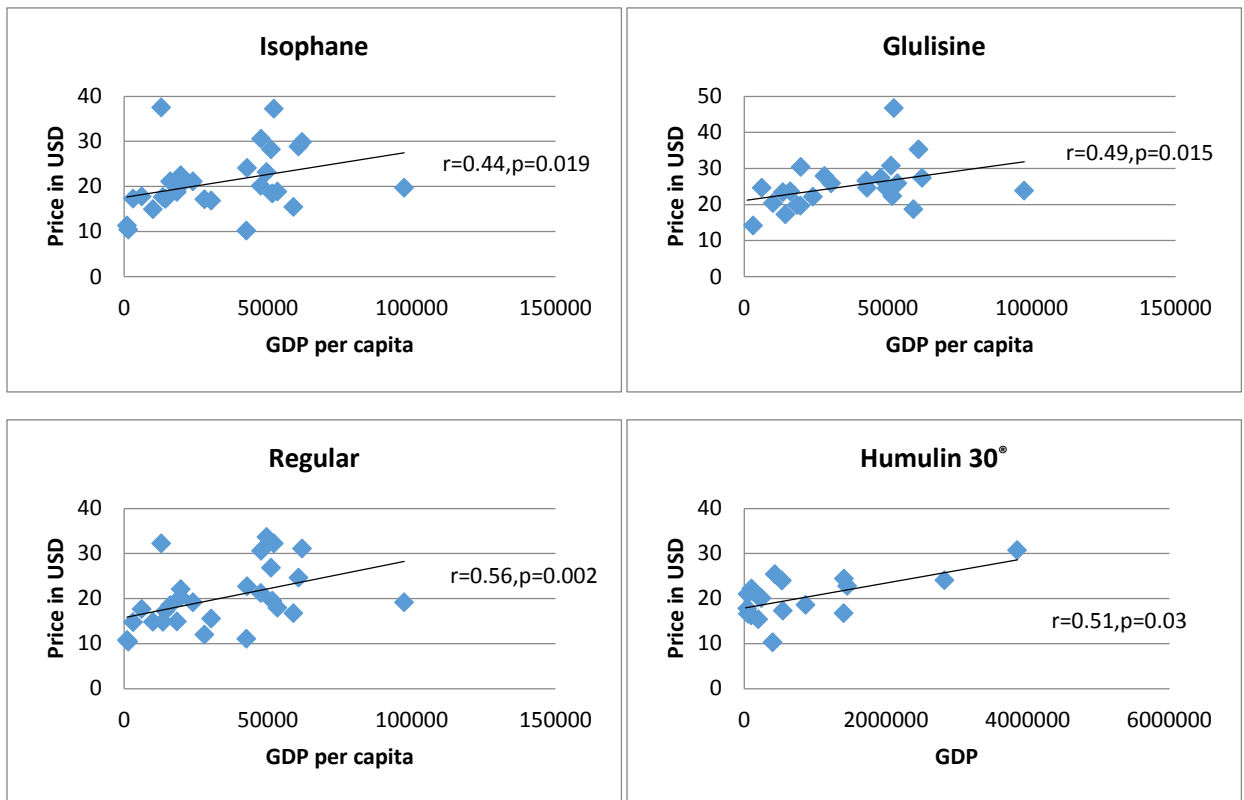
Private sector patient prices for insulin types and brands against GDP and GDP per capita

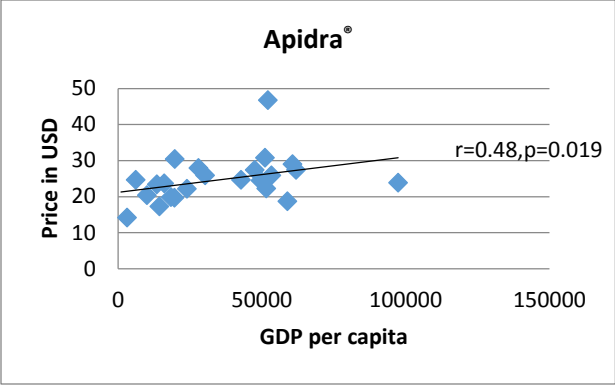






Reimbursement prices for types and brands against GDP and GDP per capita





Annex 8. Mean patient prices (USD) and affordability (days' wages) for 10 ml 100IU by brand and country, in the public sector

Note: (1) some countries did not provide the daily wage of the lowest paid unskilled government worker so affordability could not be calculated (2) some countries provide insulin free-of-charge in the public sector

Brand	Manufacturer	Country	PUBLIC SECTOR		N
			Mean patient price USD	Mean affordability days' wages	
Human insulins					
Actraphane 30®	Novo Nordisk	Germany	37.37		4
		South Africa	FREE	FREE	2
Actraphane 50®	Novo Nordisk	Germany	37.37		4
Actrapid®	Novo Nordisk	Burundi	10.64	6.2	2
		England	FREE	FREE	1
		Germany	35.79		4
		Kenya	5.39	2.1	3
		Malaysia	FREE	FREE	2
		Mali	6.51	1.7	1
		Philippines	6.14	0.6	1
		Guinea	5.06	2.6	1
		Russia	11.49	3.1	1
		South Africa	FREE	FREE	2
		Sri Lanka	2.36	2.1	1
Sudan	9.01	3.8	2		
Berlinsulin 30®	Berlin-Chemie	Germany	36.02		4
Berlinsulin Basal®	Berlin-Chemie	Germany	35.99		4
Berlinsulin Normal®	Berlin-Chemie	Germany	35.29		5
Biosulin N®	Kharazmi	Iran	4.20		1
	Pharmstandard	Russia	12.29	3.3	2
Biosulin R®	Adcock Ingram	South Africa	FREE	FREE	1
	Kharazmi	Iran	4.20		1
	Pharmstandard	Russia	12.14	3.3	2
Densulin N®	Denver Farma	Argentina	FREE	FREE	1
Densulin R®	Denver Farma	Argentina	FREE	FREE	1
Gansulin 30®	Tonghua Dongbao	China	30.59	4.2	1
Gansulin R®	Tonghua Dongbao	China	30.59	4.2	1
Gensulin N®	Bioton	Russia	13.84	3.8	1
Gensulin R®	Bioton	Russia	13.76	3.7	1
Humulin 30®	Eli Lilly	China	34.29	4.8	1
		England	FREE	FREE	2
		Germany	36.02		4

Brand	Manufacturer	Country	PUBLIC SECTOR		N
			Mean patient price USD	Mean affordability days' wages	
		Sudan	6.34	2.7	1
Humulin L®	Eli Lilly	Sudan	8.34	3.5	1
Humulin N®	Eli Lilly	El Salvador	FREE	FREE	1
		England	FREE	FREE	2
		Germany	34.95		5
		Indonesia	13.01	3.4	1
		Sudan	8.34	3.5	1
Humulin R®	Eli Lilly	China	34.45	4.8	1
		El Salvador	FREE	FREE	1
		England	FREE	FREE	1
		Germany	34.84		5
		Indonesia	13.01	3.4	1
		Kenya	3.39	1.4	3
		Sudan	8.34	3.5	1
Insugen 30®	Biocon	Lao PDR	6.23	2.5	1
Insugen L®	Biocon	Malawi	FREE	FREE	1
Insugen N®	Biocon	Lao PDR	6.23	2.5	1
Insugen R®	Biocon	Lao PDR	6.23	2.5	1
		Malawi	FREE	FREE	1
Insuget 30®	Getz	Philippines	5.70		1
Insuget N®	Getz	Philippines	5.70		1
Insuget R®	Getz	Philippines	5.70		1
Insulatard®	Novo Nordisk	Burundi	10.64	6.2	2
		England	FREE	FREE	3
		Malaysia	FREE	FREE	1
		Mali	6.51	1.7	1
		Philippines	11.79		1
		Guinea	5.06	2.6	1
		Senegal	2.35	1.2	1
Sudan	9.01	3.8	2		
Insulet R®	Sothema	Senegal	2.35	1.2	1
Insulex R®	PiSA	Ecuador			
Insuman Basal®	Sanofi	Argentina	FREE	FREE	1
		Germany	35.34		5
		Malaysia	FREE	FREE	1
Insuman Comb 15®	Sanofi	Germany	36.02		4
Insuman Comb 25®	Sanofi	Germany	36.02		4
Insuman Comb 30®	Sanofi	Malaysia	FREE	FREE	1
		South Africa	FREE	FREE	1
Insuman Comb 50®	Sanofi	Germany	36.02		4

Brand	Manufacturer	Country	PUBLIC SECTOR		N
			Mean patient price USD	Mean affordability days' wages	
Insuman Rapid®	Sanofi	Germany	35.27		5
		Malaysia	FREE	FREE	1
Insunova 30®	Biocon	Vietnam	6.83	1.1	1
Insunova N®	Biocon	Vietnam	6.83	1.1	1
Insunova R®	Biocon	Vietnam	6.83	1.1	1
Lansulin 30®	Exir	Iran	4.20		1
Lansulin N®	Exir	Iran	4.20		1
Lansulin R®	Exir	Iran	4.20		1
Mixtard 30®	Novo Nordisk	Burundi	10.64	6.2	2
		Cambodia	10.86	2.6	1
		Kenya	4.28	1.7	5
		Malaysia	FREE	FREE	1
		Philippines	11.79		1
		Guinea	5.06	2.6	1
		Senegal	2.35	1.2	1
		Sri Lanka	2.16	1.9	1
		Sudan	9.01	3.8	2
Novolin 30®	Novo Nordisk	China	30.14	4.2	2
		Grenada	6.24	0.7	1
Novolin 50®	Novo Nordisk	China	34.29	4.8	1
Novolin N®	Novo Nordisk	Colombia	FREE	FREE	1
		China	34.45	4.8	1
		Ecuador			
		El Salvador	FREE	FREE	1
		Grenada	6.24	0.7	1
Novolin R®	Novo Nordisk	China	30.14	4.2	2
		Grenada	6.11	0.7	1
		Colombia	FREE	FREE	1
Protaphane®	Novo Nordisk	Germany	35.99		4
		Russia	11.85	3.2	1
		South Africa	FREE		2
Ransulin 30®	Endure	Philippines	4.75	0.5	1
Ransulin N®	Endure	Philippines	4.75	0.5	1
Recomulin N®	Pharmatech	Dominican Republic	2.66	0.5	1
Recomulin R®	Pharmatech	Dominican Republic	2.66	0.5	1
Rosinsulin N®	GEROPHARM	Russia	13.46	3.7	1
Rosinsulin R®	GEROPHARM	Russia	13.19	3.6	1
Scilin M30®	Sci Gen	Philippines	9.25	0.9	1
Scilin N®	Not stated	Vietnam	11.80	1.8	1
	Sci Gen	Philippines	9.25	0.9	1

Brand	Manufacturer	Country	PUBLIC SECTOR		N
			Mean patient price USD	Mean affordability days' wages	
Scilin R®	Not stated	Vietnam	11.80	1.8	1
	Sci Gen	Philippines	9.25	0.9	1
Vitasulin N®	Vitane	Iran	4.20		1
Vitasulin R®	Vitane	Iran	4.20		1
Wosulin 30	Ambica	Philippines	6.70	0.7	1
	Wockhardt	Uganda	FREE	FREE	1
Wosulin N®	Ambica	Philippines	6.70	0.7	1
	Wockhardt	Philippines	11.79		1
Wosulin R®	Ambica	Philippines	6.70	0.7	1
	Wockhardt	Uganda	FREE	FREE	1
Analogue insulins					
Apidra®	Sanofi	China	53.28	7.4	1
		Colombia	FREE	FREE	2
		Germany	83.91		5
		Indonesia	24.87	6.5	1
		Russia	28.44	7.7	1
		Vietnam	6.41	1.0	1
Basalin®	Gan & Lee	China	96.88	13.4	1
Humalog®	Eli Lilly	China	46.37	6.4	1
		Colombia	FREE	FREE	1
		England	FREE	FREE	1
		Germany	48.28		4
		Indonesia	24.87	6.5	1
		Russia	24.65	6.7	1
Humalog Mix 25®	Eli Lilly	China	46.37	6.4	1
		England	FREE	FREE	1
		Germany	49.33		4
		Indonesia	30.63	8.0	1
Humalog Mix 50®	Eli Lilly	China	46.37	6.4	1
		Colombia	FREE	FREE	1
		England	FREE	FREE	2
		Germany	49.33		4
Lantus®	Sanofi	China	112.93	17.9	1
		Dominican Republic	25.83	4.6	1
		England	FREE	FREE	2
		Germany	58.33		5
		Indonesia	26.70	7.0	1
		Iran	40.87		1
		Malaysia	FREE	FREE	1
		Russia	48.20	13.1	1
Sudan	45.03	19.1	1		

Brand	Manufacturer	Country	PUBLIC SECTOR		N
			Mean patient price USD	Mean affordability days' wages	
		Vietnam	16.60	2.6	2
Levemir®	Novo Nordisk	China	124.90	17.3	2
		England	FREE	FREE	2
		Germany	56.64		4
		Indonesia	26.50	6.9	1
		Vietnam	10.42	1.6	1
Liprolog®	Berlin-Chemie	Germany	48.28		4
Liprolog Mix 25®	Berlin-Chemie	Germany	49.33		4
Liprolog Mix 50®	Berlin-Chemie	Germany	49.33		4
NovoMix 30®	Novo Nordisk	China	54.42	7.6	1
		England	FREE	FREE	2
		Germany	49.31		4
		Iran	39.70		1
		Malaysia	FREE	FREE	1
		Vietnam	7.33	1.1	1
		Indonesia	33.30	8.7	1
NovoMix 50®	Novo Nordisk	China	46.36	6.4	1
NovoRapid®	Novo Nordisk	China	50.40	7.0	2
		England	FREE	FREE	1
		Germany	49.31		4
		Iran	39.70		1
		Malaysia	FREE	FREE	1
		Russia	18.24	5.0	1
		Indonesia	26.81	7.0	1
Animal insulin					
Actrapid®	Novo Nordisk	England	FREE	FREE	1

Annex 9. Mean patient prices (USD) and affordability (days' wages) by brand and country, in the private sector

Note: some countries did not provide the daily wage of the lowest paid unskilled government worker so affordability could not be calculated

Brand	Manufacturer	Country	PRIVATE SECTOR		N
			Mean Patient Price USD	Mean Affordability Days' wages	
Human insulins					
Actraphane 30®	Novo Nordisk	Germany	37.37		4
		Malawi	11.14	10.0	1
		South Africa	27.49		3
		Zambia	8.64	3.0	1
		Zimbabwe	20.67	2.1	2
Actraphane 50®	Novo Nordisk	Germany	37.37		4
Actrapid®	Novo Nordisk	Bahrain	17.01		2
		Burundi	11.59	6.8	2
		Germany	35.79		4
		Ghana	17.70	8.6	1
		India	3.75	0.7	1
		Jordan	17.81		2
		Kenya	11.60	4.6	1
		Lebanon	14.66		2
		Mali	6.59	1.7	1
		Pakistan	5.92	1.4	1
		Republic of Guinea	6.52	3.3	1
		Saudi Arabia	17.84	0.7	2
		South Africa	23.82		2
		Spain	22.68	0.9	2
		Sudan	15.87	6.7	2
		UAE	19.19		3
		Uganda	6.14	3.3	1
		Zimbabwe	8.00	0.8	1
		Torrent	India	5.96	1.1
Berlinsulin 30®	Berlin-Chemie	Germany	36.02		4
Berlinsulin Basal®	Berlin-Chemie	Germany	35.99		4
Berlinsulin Normal®	Berlin-Chemie	Germany	35.29		5
Biosulin 30®	Cipla Medpro	South Africa	16.41		1
Biosulin L®	Cipla Medpro	South Africa	16.76		1
Biosulin N®	Cipla Medpro	South Africa	16.76		1
	Kharazmi	Iran	4.20		1

Brand	Manufacturer	Country	PRIVATE SECTOR		N
			Mean Patient Price USD	Mean Affordability Days' wages	
Biosulin R®	Cipla Medpro	South Africa	16.76		1
	Kharazmi	Iran	4.20		1
Clonsulin R®	Soperquimia	El Salvador	27.23	2.7	1
Densulin N®	Denver Farma	Argentina	47.74	2.8	2
Densulin R®	Denver Farma	Argentina	46.44	2.7	2
Gansulin 30®	Tonghua Dongbao	China	27.27	3.8	1
Gansulin R®	Tonghua Dongbao	China	24.93	3.5	1
Gensulin M30®	Bioton	Jordan	14.30		2
Gensulin N®	Bioton	Jordan	14.30		2
		Lao PDR	8.38	3.4	1
Gensulin R®	Bioton	Jordan	14.30		2
Gi Insulina Intermediate®	AMSA Laboratorios	Mexico	9.66	2.2	1
Gi Insulina Rapid®	AMSA Laboratorios	Mexico	4.77	1.1	1
Glinux 30®	Probiomed	Mexico	13.85	3.2	1
Glinux N®	Probiomed	Mexico	14.68	3.4	1
Glinux R®	Probiomed	Mexico	13.95	3.2	1
Humaninsulin 30®	Not stated	India	5.27	1.0	2
Humaninsulin N®	Not stated	India	5.27	1.0	2
Humaninsulin R®	Not stated	India	4.22	0.8	1
Humulin 10®	Eli Lilly	UAE	14.43		1
Humulin 20®	Eli Lilly	UAE	14.43		1
Humulin 30®	Eli Lilly	Bahrain	13.88		1
		El Salvador	26.67	2.7	1
		England	21.12	0.2	2
		Germany	36.02		4
		Ghana	21.47		1
		Jordan	19.00		2
		Malaysia	23.10	2.0	2
		Mexico	30.37	7.0	2
		New Zealand	39.08	0.5	1
		Pakistan	4.84	1.2	1
		Saudi Arabia	15.46	0.6	2
		South Africa	22.81		3
		Spain	22.50	0.9	2
		Sri Lanka	16.62	14.5	1
		Sudan	9.51	4.0	1
		UAE	13.66		3
Venezuela	3.64	1.1	1		

Brand	Manufacturer	Country	PRIVATE SECTOR		N
			Mean Patient Price USD	Mean Affordability Days' wages	
Humulin 40®	Eli Lilly	UAE	14.43		1
Humulin 50®	Eli Lilly	UAE	14.43		1
Humulin L®	Eli Lilly	Sudan	9.51	4.0	1
Humulin N®	Eli Lilly	Bahrain	13.88		1
		Dominican Republic	20.86	3.7	1
		Ecuador	20.00	1.7	2
		Egypt	4.06		1
		El Salvador	25.11	2.5	2
		England	19.76	0.2	1
		Germany	34.95		5
		Ghana	13.77	6.7	1
		Jordan	19.00		2
		Lebanon	16.70		1
		Malaysia	23.42	2.1	2
		Mexico	31.79	7.3	3
		New Zealand	27.84	0.4	1
		Pakistan	5.92	1.4	1
		Saudi Arabia	15.46	0.6	2
		South Africa	22.81		3
		Spain	22.68	0.9	2
		Sudan	9.51	4.0	1
		UAE	13.28		2
Venezuela	3.17	1.0	1		
Humulin R®	Eli Lilly	Dominican Republic	23.03	4.1	1
		Ecuador	19.50	1.7	2
		El Salvador	24.51	2.5	1
		Germany	34.84		5
		Jordan	19.00		2
		Kenya	7.13	2.8	1
		Malaysia	22.90	2.0	2
		Mexico	26.53	6.1	1
		Pakistan	5.92	1.4	1
		Philippines	49.89		1
		Saudi Arabia	15.46	0.6	2
		South Africa	19.77		3
		Spain	17.20	0.7	1
		Sudan	9.51	4.0	1
UAE	24.98		3		
Venezuela	3.17	1.1	1		
Insugen 30®	Biocon	Lao PDR	6.29	2.5	2
Insugen N®	Biocon	Lao PDR	6.89	2.8	2

Brand	Manufacturer	Country	PRIVATE SECTOR		N
			Mean Patient Price USD	Mean Affordability Days' wages	
Insugen R®	Biocon	Jordan	11.70		1
		Lao PDR	6.29	2.5	2
Insuget 30®	Getz	Pakistan	4.57	1.1	1
		Philippines	12.72		1
Insuget N®	Getz	Pakistan	4.67	1.1	1
Insuget R®	Getz	Pakistan	4.67	1.1	1
		Philippines	12.72		1
Insulatard®	Novo Nordisk	Bahrain	17.48		2
		Burundi	12.42	7.3	2
		England	23.72	0.2	1
		Ethiopia	50.57	48.9	1
		Ghana	17.70	8.6	1
		Jordan	17.39		2
		Lebanon	13.47		1
		Malaysia	20.97	1.8	1
		Mali	6.59	1.7	1
		Pakistan	5.92	1.4	1
		Republic of Guinea	6.52	3.3	1
		Saudi Arabia	17.84	0.7	2
		Senegal	1.68	0.8	1
		Spain	22.68	0.9	2
		Sudan	14.87	6.3	2
UAE	22.20		4		
Uganda	6.14	3.3	1		
Insulet R®	Sothema	Senegal	2.48	1.2	1
Insulex 30®	PiSA	Mexico	10.68	2.7	1
Insulex N®	PiSA	Mexico	10.68	2.7	1
Insulex R®	PiSA	Mexico	10.68	2.7	1
Insulin H Bio Mix 30®	Sedico	UAE	9.94		1
Insulin H Bio NPH®	Sedico	UAE	9.94		1
Insulin H Bio R®	Sedico	UAE	9.94		1
Insuman Basal®	Sanofi	Germany	35.34		5
		Jordan	18.45		2
		Lebanon	19.19		3
		Sudan	7.37	3.1	1
		Venezuela	2.79	0.9	1
Insuman Comb 15®	Sanofi	Germany	36.02		4
Insuman Comb 25®	Sanofi	Germany	36.02		4
		India	6.46	1.2	1
		Jordan	18.45		2
		Lebanon	19.61		2

Brand	Manufacturer	Country	PRIVATE SECTOR		N
			Mean Patient Price USD	Mean Affordability Days' wages	
		Sri Lanka	13.70	12.0	1
Insuman Comb 30®	Sanofi	Lebanon	15.52		1
		South Africa	21.77		1
Insuman Comb 50®	Sanofi	Germany	36.02		4
		India	6.46	1.2	1
Insuman Rapid®	Sanofi	Germany	35.27		5
		India	6.46	1.2	1
		Jordan	18.45		2
		Lebanon	18.31		3
		Sudan	6.91	2.9	1
		Venezuela	2.79	0.9	1
Jusline 30®	Julphar	UAE	12.25		1
Jusline N®	Julphar	Lebanon	10.83		1
		UAE	12.25		1
Jusline R®	Julphar	Lebanon	10.83		1
		UAE	12.25		1
Lansulin 30®	Exir	Iran	4.20		1
Lansulin N®	Exir	Iran	4.20		1
Lansulin R®	Exir	Iran	4.20		1
Lupinsulin R®	Not stated	India	1.71	0.3	1
Mixtard®	Novo Nordisk	Kenya	5.70	2.3	1
Mixtard 10®	Novo Nordisk	UAE	25.32		2
Mixtard 20®	Novo Nordisk	UAE	25.32		2
Mixtard 30®	Novo Nordisk	Bahrain	17.01		2
		Burundi	10.77	6.3	2
		Jordan	20.50		3
		Kenya	17.21	6.8	2
		Lebanon	13.47		1
		Malaysia	42.12	3.7	2
		Mali	16.48	4.3	1
		Pakistan	4.84	1.2	1
		Republic of Guinea	6.52	3.3	1
		Saudi Arabia	17.84	0.7	2
		Senegal	5.94	2.9	2
		Spain	29.87	1.2	2
		Sri Lanka	18.51	16.2	1
		Sudan	15.87	6.7	2
	UAE	22.20		4	
Uganda	6.14	3.3	1		
	Torrent	India	6.41	1.2	2
Mixtard 40®	Novo Nordisk	Saudi Arabia	23.20	0.9	2

Brand	Manufacturer	Country	PRIVATE SECTOR		N
			Mean Patient Price USD	Mean Affordability Days' wages	
		UAE	25.32		2
Mixtard 50®	Novo Nordisk	Saudi Arabia	23.20	0.9	2
		Sudan	11.06	4.7	1
		UAE	25.32		2
	Torrent	India	7.16	1.3	2
Monotard®	Novo Nordisk	Kenya	9.19	3.7	1
		UAE	16.74		1
	Torrent	India	7.11	1.3	2
Novolin 30®	Novo Nordisk	China	32.00	4.4	1
		Ecuador	18.00	1.5	1
		El Salvador	29.21	2.9	1
		Grenada	13.77	1.8	1
		Mexico	21.54	5.0	1
		Venezuela	3.80	1.2	1
Novolin N®	Novo Nordisk	Ecuador	22.67	1.9	1
		El Salvador	15.61	1.6	1
		Grenada	13.77	1.5	2
		Mexico	14.84	3.4	1
		Venezuela	3.78	1.2	1
Novolin R®	Novo Nordisk	Colombia	9.59	1.2	1
		Ecuador	18.00	1.5	1
		Venezuela	3.78	1.2	1
Penmix 30®	Novo Nordisk	New Zealand	39.08	0.5	1
Penmix 40®	Novo Nordisk	New Zealand	39.08	0.5	1
Protaphane®	Novo Nordisk	Germany	35.99		4
		New Zealand	26.78	0.4	2
		Russian Federation	12.70	3.5	1
		South Africa	29.64		2
		Zambia	8.64	3.0	1
		Zimbabwe	20.67	2.1	2
Scilin N®	Not stated	Vietnam	13.17	2.1	1
Scilin R®	Not stated	Vietnam	13.17	2.1	1
Ultratard®	Novo Nordisk	UAE	16.74		1
Vitasulin N®	Vitane	Iran	4.20		1
Vitasulin R®	Vitane	Iran	4.20		1
Wosulin 30®	Wockhardt	Lebanon	11.35		1
Wosulin N®	Wockhardt	Lebanon	11.35		1
Wosulin R®	Wockhardt	Vietnam	23.36	3.6	1
		Lebanon	11.35		1
Not stated	Vacsera-Bioton	Egypt	3.82		4

Brand	Manufacturer	Country	PRIVATE SECTOR		N
			Mean Patient Price USD	Mean Affordability Days' wages	
Analogue insulins					
Apidra®	Sanofi	India	5.89	1.1	1
		Argentina	86.93	5.0	2
		Bahrain	33.31		4
		Colombia	39.48	4.9	2
		Ecuador	38.33	3.3	2
		El Salvador	23.57	2.4	2
		Germany	83.91		5
		Jordan	31.57		3
		Lebanon	28.51		4
		Saudi Arabia	28.03	1.1	2
		South Africa	22.89		4
		Spain	34.78	1.5	3
		UAE	38.67		4
		Venezuela	96.60	30.0	2
Basalin®	Gan & Lee	China	96.06	13.3	2
Basalog®	Biocon	Kenya	28.99	11.5	1
Humalog®	Eli Lilly	Argentina	108.64	6.3	1
		Bahrain	31.18		2
		Colombia	13.38	1.7	2
		Ecuador	38.33	3.3	2
		El Salvador	46.72	4.7	3
		England	27.56	0.3	2
		Germany	48.28		4
		India	10.59	2.0	3
		Jordan	34.60		2
		Kenya	23.95	9.5	2
		Lebanon	35.37		3
		Mexico	47.70	11.0	3
		New Zealand	51.14	0.7	2
		Republic of Guinea	10.35	5.3	1
		Russian Federation	25.06	6.8	1
		Saudi Arabia	29.51	1.1	3
		South Africa	22.70		4
		Spain	33.40	1.4	5
		Sri Lanka	29.22	25.5	1
		UAE	39.37		3
Venezuela	95.01	29.5	2		
Humalog Mix 25®	Eli Lilly	Argentina	102.00	5.9	2
		Bahrain	34.19		3
		China	45.99	6.4	1

Brand	Manufacturer	Country	PRIVATE SECTOR		N
			Mean Patient Price USD	Mean Affordability Days' wages	
		Ecuador	43.33	3.7	1
		Germany	49.33		4
		Indonesia	46.80	12.2	1
		Jordan	38.31		1
		Kenya	19.79	7.9	2
		Lebanon	37.60		2
		Mexico	53.55	12.3	2
		New Zealand	39.08	0.5	1
		Saudi Arabia	31.77	1.2	2
		South Africa	25.62		4
		UAE	39.37		3
		Venezuela	106.62	33.1	2
Humalog Mix 50®	Eli Lilly	Argentina	97.45	5.7	2
		Bahrain	33.70		2
		China	45.99	6.4	1
		El Salvador	57.95	5.8	2
		Germany	49.33		4
		Jordan	38.23		1
		Kenya	22.62	9.0	1
		Lebanon	37.60		2
		Mexico	57.72	13.3	1
		New Zealand	39.08	0.5	1
		Saudi Arabia	31.77	1.2	2
		South Africa	26.90		1
		UAE	42.79		2
		Venezuela	116.13	36.1	1
Humalog NPL®	Eli Lilly	UAE	39.93		1
Lantus®	Sanofi	Bahrain	54.63		4
		China	124.09	17.2	2
		Colombia	31.62	4.0	4
		Ecuador	42.00	3.6	3
		El Salvador	54.92	5.5	1
		England	44.54	0.5	3
		Germany	58.33		5
		Ghana	16.72	8.1	1
		India	8.32	1.5	2
		Indonesia	58.97	15.4	1
		Iran	40.87		1
		Jordan	56.95		2
		Kenya	24.23	9.6	1
		Lebanon	55.29		2

Brand	Manufacturer	Country	PRIVATE SECTOR		N
			Mean Patient Price USD	Mean Affordability Days' wages	
		Malaysia	56.82	5.0	1
		Mexico	65.20	15.0	3
		New Zealand	84.52	1.1	2
		Republic of Guinea	10.35	5.3	1
		Russian Federation	50.17	13.7	1
		Saudi Arabia	55.81	2.1	3
		South Africa	36.27		4
		Spain	56.98	2.4	3
		Sri Lanka	13.45	11.7	1
		Sudan	59.04	25.0	1
		UAE	69.48		4
		Venezuela	196.46	61.0	3
		Vietnam	9.62	1.5	1
		Zambia	15.12	5.2	1
Zimbabwe	120.00	12.2	1		
Levemir®	Novo Nordisk	Bahrain	58.09		2
		China	120.82	16.8	1
		England	43.50	0.5	1
		Germany	56.64		4
		India	10.36	1.9	1
		Indonesia	53.58	14.0	1
		Jordan	67.12		2
		Lebanon	54.56		1
		Malaysia	65.19	5.7	1
		Mexico	56.39	13.0	2
		Russian Federation	29.89	8.1	1
		Saudi Arabia	58.28	2.2	2
		Senegal	32.32	15.9	1
		South Africa	35.39		2
		Spain	58.14	2.4	2
		UAE	66.79		2
		Venezuela	250.73	77.9	2
Zimbabwe	68.00	6.9	1		
Sri Lanka	73.49	64.2	1		
Liprolog®	Berlin-Chemie	Germany	48.28		4
Liprolog Mix 25®	Berlin-Chemie	Germany	49.33		4
Liprolog Mix 50®	Berlin-Chemie	Germany	49.33		4
NovoMix 30®	Novo Nordisk	Bahrain	33.70		2
		China	43.05	6.0	1

Brand	Manufacturer	Country	PRIVATE SECTOR		N
			Mean Patient Price USD	Mean Affordability Days' wages	
		England	30.38	0.3	2
		Germany	49.31		4
		Ghana	16.72	8.1	1
		India	16.35	4.8	4
		Indonesia	52.39	13.7	1
		Iran	39.70		1
		Jordan	33.28		2
		Lebanon	30.55		1
		Malaysia	46.37	4.1	1
		Mexico	44.87	10.3	2
		New Zealand	47.40	0.6	1
		Saudi Arabia	31.78	1.2	2
		Senegal	20.31	10.0	1
		South Africa	29.23		2
		Spain	36.13	1.5	1
		Sri Lanka	34.88	30.5	2
		UAE	46.78		2
		Venezuela	120.45	37.4	3
		Zimbabwe	54.00	5.5	1
NovoMix 50®	Novo Nordisk	Bahrain	33.70		2
		Saudi Arabia	31.78	1.2	2
		Spain	36.13	1.5	1
		UAE	46.78		2
NovoMix 70®	Novo Nordisk	Bahrain	33.70		2
		Saudi Arabia	31.78	1.2	2
		Spain	36.13	1.5	1
		UAE	46.78		2
NovoRapid®	Novo Nordisk	Bahrain	37.23		2
		China	49.96	6.9	2
		Ecuador	26.67	2.3	1
		England	27.63	0.3	3
		Germany	49.31		4
		Ghana	16.72	8.1	1
		India	16.36	4.8	4
		Iran	39.70		1
		Jordan	32.21		3
		Malawi	22.28	14.0	1
		Malaysia	46.37	2.8	1
		Mexico	37.33	8.6	3
		New Zealand	44.28	0.6	2
		Republic of Guinea	10.35	5.3	1

Brand	Manufacturer	Country	PRIVATE SECTOR		N
			Mean Patient Price USD	Mean Affordability Days' wages	
		Russian Federation	21.68	5.9	2
		Saudi Arabia	31.78	1.2	2
		Senegal	26.57	13.1	1
		South Africa	24.59		3
		Spain	27.79	1.2	2
		UAE	39.33		3
		Venezuela	116.06	36.0	3
		Zambia	10.36	3.5	1
		Zimbabwe	47.33	4.8	1
		Indonesia	52.36	13.7	1
Ryzodeg®	Novo Nordisk	Lebanon	78.13		2
Shorant®	Sanofi	Mexico	34.78	8.0	2
Tresiba®	Novo Nordisk	Lebanon	94.24		2
		Mexico	85.42	19.7	2
		UAE	110.62		3
Animal (bovine) insulins					
Betasint NPH®	Beta	Argentina	23.00	1.3	1
Betasint R®	Beta	Argentina	19.24	1.1	2

Annex 10. National insulin reimbursement information and patient contributions

Country	Insulin reimbursement information
Argentina	The Ministry of Health fully reimburses some insulins. They are listed on http://www.sssalud.gov.ar/normativas/consulta/000595.pdf . Suggested retail prices are on the Ministry of Health website http://servicios.pami.org.ar/vademecum/views/consultaPublica/listado.zul
Australia	The Pharmaceutical Benefits Scheme lists the reimbursement price i.e. the dispensed price for the maximum quantity given. http://www.pbs.gov.au/pbs/home
Austria	Reimburses 100% of the retail price listed on the website of the Alliance of Regional Insurance Funds (<i>Krankenkassen</i>) http://www.hauptverband.at/portal27/portal/hvbportal/emed/
Belgium	The government sets retail prices and reimbursement prices which are published on the website of the National Institute for Health Insurance. Payments are through mutualities (private non-for profit institutions). http://www.riziv.fgov.be/nl/Paginas/default.aspx
Croatia	The Croatian Health Insurance Fund has a basic drug list (fully reimbursed) and a supplementary drug list (partially reimbursed). Prices on the basic list are retail prices, whereas on the supplementary list they are reimbursement prices. Some insulins are on the supplementary list. http://www.hzzo.hr/zdravstveni-sustav-rh/trazilica-za-lijekove-s-vazecih-lista/
Czech Republic	The government publishes the maximum reimbursement price on the website of the State Institute of Drug Control (SUKL). http://www.sukl.eu/
Denmark	The Danish Medicines Agency publishes retail and reimbursement prices on a specific website http://www.medicinpriser.dk
Estonia	Reimbursement prices are published on the website of the Ministry of Social Affairs. They are reference prices and medicines are reimbursed for 50%, 75% or 100% of this reference price. Insulins are fully (100%) reimbursed by the national health insurance scheme. http://www.sm.ee/et/ravimid
Finland	Retail prices are published by the Social Security Institution (KELA) and reimbursement rates for certain medicines. Insulin falls under 'special reimbursement' and the price is 100% reimbursed. http://easiointi.kela.fi/laakekys_app/LaakekysApplication?kieli=en
France	Retail prices are listed on the website of L'Assurance Maladie. Insulin and other diabetes medicines are 100% covered under the long-term illness plan. http://www.codage.ext.cnamts.fr/codif/bdm_it/index.php?p_site
Germany	The Institute for Medical Documentation and Information publishes the maximum reimbursement price. Only human insulins are covered http://www.dimdi.de/static/de/amg/festbetrage-zuzahlung/festbetrage/index.htm
Ghana	The National Health Insurance Scheme publishes reimbursement prices on their website http://www.nhis.gov.gh
Iceland	National health insurance is regulated by the Ministry of Welfare which publishes the reimbursement price and the maximum retail price. Insulin prices are 100% reimbursed. http://www.lgn.is/index.php?pageid=62
Ireland	Diabetes is under the Long-term Illness Scheme so insulin is supplied free-of-charge. The Health Service Executive has a search portal for reimbursable items. They publish the reimbursement price. https://www.sspcrs.ie/druglist/pub
Latvia	The National Health Service publishes the retail price and reimbursement percentages. Insulins are 100% reimbursed. http://www.vmnvd.gov.lv/lv/kompensejamie-medikamenti/kompensejamo-zalu-saraksts
Morocco	The Moroccan insurance agency (ANAN) publishes reimbursement prices on their website. The agency supervises two insurance schemes: general and mandatory for employees, and a scheme for the poorest people. http://www.assurancemaladie.ma/

Netherlands	The Dutch government decides which medicines will be reimbursed in the basic package and publishes the reimbursement price on the website of the Healthcare Institute. The system operates through private insurers. www.medicijnkosten.nl
Norway	Maximum reimbursement prices are published by the Norwegian Medicines Agency on its website. Norwegian patients pay a co-payment for all healthcare that is provided to them up to a certain threshold. http://www.legemiddelverket.no/Legemiddelsoek
Poland	The Ministry of Health publishes the maximum reimbursement price. For insulins, patients have to pay an additional fee of 3.20 per 30 DDD. http://www.bil.aptek.pl
Romania	The National Health Insurance Fund publishes reimbursement prices. http://www.cnas.ro/category/lista-medicamentelor.html
Serbia	The National Health Insurance Fund publishes several medicines lists. For the A list, which includes insulin, patients have to pay a 50 Dinar co-payment and the balance is paid for by the insurance fund. http://www.rfzo.rs/index.php/osiguranalica/lekovi-info/pretraga-liste-lekova
Slovakia	Reimbursement and retail prices are published on the website of the State Institute for Drug Control (SUKL). Slovakian patients pay the retail price minus the reimbursement price. http://www.sukl.sk/sk/databazy-a-servis/databazy/vyhľadavanie-v-databaze-registrovaných-liekov?page_id=267
Slovenia	The National Insurance Fund publishes a 'positive' and 'intermediate' list of medicines that are reimbursed. Positive list medicines are 100% reimbursed which included all insulins. There is a national database of medicines (<i>Centralna baza zdravil</i>) which shows the regulated retail price without VAT. www.cbz.si
South Korea	The national health insurance sets the maximum allowable price and the reimbursement price and publishes this on the Health Insurance Review & Assessment Service website. http://www.hira.or.kr/rf/medicine/getSummaryList.do?pgmid=HIRAA030035010000
Spain	For chronic diseases, 90% of the retail price is reimbursed by the National Health Insurance. Retail prices are set in Spain.
Sweden	The Dental and Pharmaceutical Benefits Agency publishes reimbursement prices on their website. The amount that is reimbursed is on a sliding scale based on the patient contribution. http://www.tlv.se/beslut/sok/lakemedel
Tanzania	Reimbursement prices are set by the National Health Insurance Fund.
UAE	Reimbursement prices are listed on the website of Daman Health, the National Health Insurance Company. The prices are for the Abu Dhabi Basic Plan, an insurance plan for the poor. http://www.damanhealth.ae/opencms/opencms/Daman/en/home/medical-provider/pharmaceutical-benefits/damandrugformulary/index.html

Country	Patient contribution
Argentina	No co-payment but an annual contribution is paid to social security providers
Australia	Co-payment of \$37.7AUS for each dispensing. This includes patient charges, contribution and allowable fees that are applied.
Austria	Co-payment of €5.55 (2014). Depending on the krankenkasse, there is a maximum amount of co-payment to be paid.
Belgium	Patients get reimbursed for the cost price of the insulin, but have to pay the dispensing fee
Croatia	Patients pay the difference between the retail price and the reimbursement price if the medicine is not on the basic list but is on the supplementary list
Czech Republic	Patients pay the difference between the retail price and reimbursement price.
Denmark	Reimbursement has several thresholds, based on expenditure during a calendar year and age (<18 or >18). The more expenses you have for reimbursable medicine,

	the more reimbursement you will receive within a period of one year (the reimbursement period). For chronically ill the co-payment ceiling is DKK 3,830 (US\$ 585)
Estonia	Patients pay a € 1.27 co-payment for insulin, which is 100% reimbursed.
Finland	Patients pay a € 3.00 payment for special reimbursement, which is 100% for Diabetes Mellitus patients
France	People pay for compulsory health insurance. Patients with diabetes fall under the long-term illness plan and receive diabetes treatment for free
Germany	Patients pay the difference between the maximum reimbursement price and the actual retail price
Iceland	A scaling reimbursement scheme operates where the patient pays the first 22,000 krona, the next 65,000 krona the patient pays 15% (9,750 krona) and then to 490,333 krona the patient pays 7.5% (30,250 krona). Above this threshold the patient will receive the treatment for free.
Ireland	Diabetes falls under the Long Term Illness Scheme (LTI): the patient receives medicines for specific conditions (e.g. diabetes, epilepsy) free-of-charge.
Latvia	Patients pay a fee of €0.71 fee if the product is 100% reimbursed, which is the case for medicines for diabetes
Morocco	Two different insurance schemes: one compulsory which is for employees of public or private organizations (AMO). It is financed by employer and employee contributions. RAMED covers healthcare services for the poor. The website lists reimbursement and retail prices. Where there is a difference, the patient must pay.
Netherlands	Patients pay a premium for coverage. If the medicine is not fully reimbursed, they also have to pay the difference (depending on the policy of their insurer)
Norway	Patient pays co-payment up to a certain level. This co-payment included all healthcare costs (doctor, laboratories, pharmacy).
Poland	Poland has a National Health Fund that has fixed prices and margins for reimbursed medicines. Certain levels of payment are defined. There is free of charge, lump sum (most insulins), 50% payment, and 30% payment. For lump sum - if the price of the medicine is equal to the reimbursement limit or lower, patients pay 3.20 PLN per pack (30 DDD of treatment).
Romania	Patients pay the difference between the maximum reimbursement price and the retail price.
Serbia	For insulin, patients pay a 50 Dinar co-payment.
Slovakia	Patients pay the difference between the retail price and reimbursement price.
Slovenia	Slovenia has a positive or intermediate medicine list, for which medicines are reimbursed. Patients pay for medicines on the negative list.
South Korea	Patients have to pay additional fees such as dispensing fee.
Spain	People with severe and chronic diseases will have a reduced contribution of 10% of the retail price
Sweden	Per 12 month period, the first 1100 kronar are without reimbursement, the next 1000 kronar have 50% reimbursement, the next 1800 kronar patients pay 25% reimbursement, the next 1500 kronar the patient pays 10%. After that patients receive medicines free-of-charge
Tanzania	The fund only covers basic medicine requirement. Excess costs have to be paid by the patient
United Arab Emirates	Basic Plan covers those on low incomes and reimburses 70% of pharmaceuticals up to a limit of 1500 AED

Annex 11. Reimbursement prices by insulin type and presentation

Insulin Type	Presentation	Reimbursement price USD 10 ml 100IU				N
		Mean	Median	Min	Max	
Human insulins						
Isophane	Cartridge	21.79	20.19	13.60	44.59	23
	Pen	24.12	22.25	15.78	47.62	24
	Vial	17.32	15.61	9.39	31.38	20
Lente	Vial	21.18	21.18	11.72	30.64	2
Regular	Cartridge	21.35	19.81	14.30	41.30	23
	Pen	21.81	20.58	15.00	30.80	13
	Vial	16.92	14.81	9.39	32.17	21
Regular/ Isophane 10/90	Cartridge	19.54	19.54			1
	Pen	21.45	21.45			1
Regular/ Isophane 15/85	Cartridge	24.54	23.98	21.07	28.56	3
	Pen	27.08	27.08			1
	Vial	17.75	17.75			1
Regular/ Isophane 20/80	Cartridge	18.27	18.27	17.21	19.33	2
Regular/ Isophane 25/75	Cartridge	21.20	20.39	15.78	30.88	10
	Pen	19.63	19.63	15.78	30.88	10
	Vial	16.42	16.42	8.26	28.45	6
Regular/ Isophane 30/70	Cartridge	21.41	21.51	14.30	30.53	18
	Pen	24.51	24.19	16.74	33.04	12
	Vial	16.08	15.65	9.39	24.21	15
Regular/ Isophane 40/60	Cartridge	18.70	18.70	17.26	20.14	2
Regular/ Isophane 50/50	Cartridge	22.66	22.97	15.78	30.48	8
	Pen	27.82	27.82	27.08	28.56	2
	Vial	17.75	17.75			1
Analogue insulins						
Aspart	Cartridge	27.99	25.86	17.29	79.25	21
	Pen	31.82	28.50	21.10	90.35	22
	Vial	24.70	23.22	18.80	36.97	15
Aspart/Protamine 30/70	Cartridge	26.41	26.11	17.29	43.12	18
	Pen	29.66	28.25	21.19	41.37	21
Aspart/Protamine 50/50	Cartridge	22.43	22.43	17.29	27.57	2
	Pen	28.30	26.88	22.41	40.61	7
Aspart/Protamine 70/30	Cartridge	27.81	27.81	27.57	28.05	2
	Pen	29.81	28.80	22.41	40.61	5
Degludec	Cartridge	43.07	43.07	36.07	50.06	2

Insulin Type	Presentation	Reimbursement price USD 10 ml 100 IU				N
		Mean	Median	Min	Max	
	Pen	52.57	49.79	38.20	69.46	5
Detemir	Cartridge	44.19	43.39	31.35	69.49	18
	Pen	43.43	43.12	28.02	59.16	21
Glargine	Cartridge	41.30	41.33	25.61	63.42	23
	Pen	40.78	41.96	25.61	51.57	24
	Vial	41.91	41.85	36.26	48.13	10
Glulisine	Cartridge	24.36	24.62	16.46	35.50	22
	Pen	25.45	25.47	16.46	38.14	23
	Vial	24.42	22.74	5.04	66.44	19
Lispro	Cartridge	25.09	25.50	15.60	36.53	22
	Pen	29.10	28.97	18.56	40.89	20
	Vial	24.87	22.78	17.72	43.53	17
Lispro/Protamine 25/75	Cartridge	24.75	25.49	17.29	31.53	18
	Pen	29.32	28.47	21.66	42.49	20
	Vial	21.65	21.65	20.52	22.78	2
Lispro/Protamine 50/50	Cartridge	25.25	25.47	17.29	36.56	17
	Pen	27.64	28.08	22.67	36.56	14
Animal (bovine) insulins						
Isophane	Vial	64.24	64.24			1
Lente	Vial	69.04	69.04			1
Regular	Cartridge	67.10	67.10			1
	Vial	64.24	64.24			1

Annex 12. Reimbursement prices by brand

Insulin type	Brand	Manufacturer	Reimbursement price, 10 ml 100 IU, in USD				N
			Median	Mean	Maximum	Minimum	
Human insulins							
Isophane	Berlinsulin Basal®	Berlin-Chemie	30.86	30.86			1
	Betalin NPH®	Beta	43.81	43.81			1
	Biosulin N®	Not stated	12.10	12.10			1
	Gensulin N®	Bioton	17.22	17.22			1
	Humulin N®	Eli Lilly	20.67	21.67	39.20	10.29	25
	Insulatard®	Novo Nordisk	20.25	22.63	36.70	12.66	20
	Insulet N®	AristoPharma	7.91	7.91			1
	Insulin Bio NPH®	Sedico	6.96	6.96			1
	Insuman Basal®	Sanofi	18.68	19.81	30.47	14.48	17
	Jusline N®	Julphar	8.58	8.58			1
	Novolin N®	Novo Nordisk	17.18	17.18			1
	Polhumin N®	Polfa Tarchomin	17.21	17.21			1
	Protaphane®	Novo Nordisk	24.44	25.49	31.00	22.08	4
Lente	Betalin Lente®	Beta	30.64	30.64			1
	Monotard®	Novo Nordisk	11.72	11.72			1
Regular	Actrapid®	Novo Nordisk	18.61	19.75	32.17	13.14	21
	Berlinsulin Normal®	Berlin-Chemie	30.69	30.69			1
	Betalin R®	Beta	37.12	37.12			1
	Biosulin R®	Not recorded	12.10	12.10			1
	Gensulin R®	Bioton	17.22	17.22			1
	Humulin R®	Eli Lilly	18.48	18.97	32.41	10.29	23
	Insulet Rapid®	AristoPharma	7.91	7.91			1
	Insulin Bio R®	Sedico	6.96	6.96			1
	Insuman Rapid®	Sanofi	21.02	21.48	30.59	14.48	15
	Jusline R®	Julphar	8.58	8.58			1
	Novolin R®	Novo Nordisk	17.18	17.18			1
Polhumin R®	Polfa Tarchomin	17.21	17.21			1	
Regular/ Isophane	Mixtard 10®	Novo	20.50	20.5			1

Insulin type	Brand	Manufacturer	Reimbursement price, 10 ml 100 IU, in USD				N
			Median	Mean	Maximum	Minimum	
10/90		Nordisk		0			
Regular/Isophane 15/85	Insuman Comb 15®	Sanofi	22.94	24.19	28.56	21.07	3
Regular/Isophane 20/80	Mixtard 20®	Novo Nordisk	19.33	19.33			1
	Polhumins Mix-2®	Polfa Tarchomin	17.21	17.21			1
Regular/Isophane 25/75	Insuman Comb 25®	Sanofi	17.75	20.47	30.83	15.34	12
Regular/Isophane 30/70	Actraphane 30®	Novo Nordisk	23.12	23.12	30.88	15.35	2
	Berlinsulin 30®	Berlin-Chemie	30.88	30.88			1
	Biosulin 30®	Not recorded	12.10	12.10			1
	Gensulin 30®	Bioton	17.22	17.22			1
	Humulin 30®	Eli Lilly	20.19	20.20	30.71	10.29	18
	Insulet Mix 30®	AristoPharma	7.91	7.91			1
	Insulin Bio Mix 30/70®	Sedico	6.96	6.96			1
	Jusline 30®	Julphar	8.58	8.58			1
	Mixtard 30®	Novo Nordisk	18.83	20.46	30.59	12.41	17
	Polhumins Mix-3®	Polfa Tarchomin	17.21	17.21			1
Regular/Isophane 40/60	Actraphane 40®	Novo Nordisk	19.20	19.20			1
	Gensulin M40®	Bioton	17.29	17.29			1
	Mixtard 40®	Novo Nordisk	19.19	19.19	21.08	17.29	2
	Polhumins Mix-4®	Polfa Tarchomin	17.21	17.21			1
Regular/Isophane 50/50	Actraphane 50®	Novo Nordisk	30.88	30.88			1
	Gensulin M50®	Bioton	17.29	17.29			1
	Insuman Comb 50®	Sanofi	22.44	23.10	30.11	15.78	6
	Mixtard 50®	Novo Nordisk	26.73	25.41	30.88	17.29	4
	Polhumins Mix-5®	Polfa	17.21	17.21			1
Analogue insulins							
Aspart	NovoRapid®	Novo Nordisk	26.43	29.20	84.80	17.29	25
Aspart/Protamine 30/70	NovoMix 30®	Novo Nordisk	27.76	28.23	42.25	17.29	23

Insulin type	Brand	Manufacturer	Reimbursement price, 10 ml 100 IU, in USD				N
			Median	Mean	Maximum	Minimum	
Aspart/Protamine 50/50	NovoMix 50®	Novo Nordisk	26.24	26.85	40.61	17.29	8
Aspart/Protamine 70/30	NovoMx 70®	Novo Nordisk	28.19	29.38	40.61	22.41	5
Degludec	Tresiba®	Novo Nordisk	49.88	52.45	69.46	37.49	5
Detemir	Levemir®	Novo Nordisk	43.12	43.12	64.32	28.02	23
Glargine	Lantus®	Sanofi	41.48	41.03	57.49	25.61	24
Glulisine	Apidra®	Sanofi	24.52	24.86	46.70	14.18	24
Lispro	Humalog®	Eli Lilly	25.53	27.20	43.53	17.29	25
Lispro/Protamine 25/75	Humalog Mix 25®	Eli Lilly	27.43	27.50	42.49	17.29	23
Lispro/Protamine 50/50	Humalog Mix 50®	Eli Lilly	26.71	26.08	36.56	17.29	19
Animal (bovine) insulin							
Isophane	Hypurin Bovine NPH®	Wockhardt	64.24	64.24			1
Lente	Hypurin Bovine L®	Wockhardt	69.04	69.04			1
Regular	Hypurin Bovine R®	Wockhardt	65.67	65.67	67.10	64.24	2

N=number of countries

Annex 13. Reimbursement prices by brand and presentation

Insulin Brand	Presentation	Reimbursement price USD 10 ml 100 IU				N
		Media	Mean	Max	Min	
Human insulins						
Actraphane 30®	Cartridge	24.50	24.50	30.88	18.12	2
	Pen	21.73	21.73	30.88	12.58	2
Actraphane 40®	Cartridge	19.20	19.20			1
Actraphane 50®	Cartridge	30.88	30.88			1
Actrapid®	Vial	14.94	16.59	32.17	11.72	12
	Cartridge	19.81	20.90	30.54	14.30	17
	Pen	21.40	24.16	31.05	20.05	3
Berlinsulin 30®	Cartridge	30.88	30.88			1
Berlinsulin Basal®	Cartridge	30.86	30.86			1
Berlinsulin Normal®	Cartridge	30.69	30.69			1
Betalin Lente®	Vial	30.64	30.64			1
Betalin NPH®	Vial	39.60	39.60			1
	Cartridge	48.01	48.01			1
Betalin R®	Vial	28.78	28.78			1
	Cartridge	41.30	41.30			1
Biosulin 30®	Vial	12.10	12.10			1
Biosulin N®	Vial	12.10	12.10			1
Biosulin R®	Vial	12.10	12.10			1
Gensulin M30®	Vial	17.14	17.14			1
	Cartridge	17.29	17.29			1
Gensulin M40®	Cartridge	17.29	17.29			1
Gensulin M50®	Cartridge	17.29	17.29			1
Gensulin N®	Vial	17.14	17.14			1
	Cartridge	17.29	17.29			1

Insulin Brand	Presentation	Reimbursement price USD 10 ml 100 IU				N
		Media	Mean	Max	Min	
Gensulin R®	Vial	17.14	17.14			1
	Cartridge	17.29	17.29			1
Humulin 30®	Vial	14.59	17.05	24.21	10.29	9
	Cartridge	20.64	21.99	32.27	16.22	14
	Pen	24.40	23.95	30.88	17.76	7
Humulin N®	Vial	17.09	18.05	27.94	10.29	14
	Cartridge	20.62	22.64	44.78	14.05	18
	Pen	24.35	24.78	39.20	15.89	15
Humulin R®	Vial	17.82	18.49	32.41	10.29	14
	Cartridge	19.67	20.49	30.34	14.05	16
	Pen	29.53	29.53	30.69	28.36	2
Insulatard®	Vial	15.92	17.19	31.38	11.72	12
	Cartridge	20.24	22.83	37.54	13.60	17
	Pen	26.64	27.93	47.62	16.55	12
Insulet Mix 30®	Vial	7.91	7.91			1
Insulet N®	Vial	7.91	7.91			1
Insulet Rapid®	Vial	7.91	7.91			1
Insulin Bio NPH®	Vial	6.96	6.96			1
Insulin Bio R®	Vial	6.96	6.96			1
Insulin Bio Mix 30/70®	Vial	6.96	6.96			1
Insuman Basal®	Vial	14.72	16.00	28.05	8.26	6
	Cartridge	18.43	20.19	30.61	14.05	13
	Pen	19.55	21.00	30.46	14.91	15
Insuman Comb 15®	Vial	17.75	17.75			1
	Cartridge	23.98	24.54	28.56	21.07	3
	Pen	27.08	27.08			1
Insuman Comb 25®	Vial	16.42	17.01	28.45	8.26	6
	Cartridge	20.39	21.20	30.88	15.78	10
	Pen	19.63	21.87	30.88	15.78	10
Insuman Comb 50®	Vial	17.75	17.75			1
	Cartridge	22.97	23.30	30.25	15.78	6
	Pen	27.82	27.82	28.56	27.08	2
Insuman Rapid®	Vial	16.12	18.41	28.45	11.86	7

Insulin Brand	Presentation	Reimbursement price USD 10 ml 100 IU				N
		Media	Mean	Max	Min	
	Cartridge	20.06	21.09	30.57	15.10	11
	Pen	20.33	21.78	30.69	15.00	12
Jusline 30®	Vial	8.58	8.58			1
Jusline N®	Vial	8.58	8.58			1
Jusline R®	Vial	8.58	8.58			1
Mixtard 10®	Cartridge	19.54	19.54			1
	Pen	21.45	21.45			1
Mixtard 20®	Cartridge	19.33	19.33			1
Mixtard 30®	Vial	14.03	14.66	20.41	11.72	8
	Cartridge	22.06	21.73	30.25	14.30	11
	Pen	23.99	26.14	33.04	20.90	7
Mixtard 40®	Cartridge	19.19	19.19	21.08	17.29	2
Mixtard 50®	Cartridge	26.73	25.41	30.88	17.29	4
Monotard®	Vial	11.72	11.72			1
Novolin N®	Vial	17.18	17.18			1
Novolin R®	Vial	17.18	17.18			1
Polhumix Mix-2®	Cartridge	17.21	17.21			1
Polhumix Mix-3®	Cartridge	17.21	17.21			1
Polhumix Mix-4®	Cartridge	17.21	17.21			1
Polhumix Mix-5®	Cartridge	17.21	17.21			1
Polhumix N®	Cartridge	17.21	17.21			1
Polhumix R®	Cartridge	17.21	17.21			1
Protaphane®	Vial	21.49	21.49			1
	Cartridge	23.99	24.96	31.07	19.81	3
	Pen	25.03	26.23	30.86	23.99	4
Analogue insulins						

Insulin Brand	Presentation	Reimbursement price USD 10 ml 100 IU				N
		Media	Mean	Max	Min	
Apidra®	Vial	22.74	24.42	66.44	5.04	19
	Cartridge	24.62	24.36	35.50	16.46	22
	Pen	25.47	25.45	38.14	16.46	23
Humalog®	Vial	22.78	24.87	43.53	17.72	17
	Cartridge	25.50	25.09	36.53	15.60	22
	Pen	28.97	29.10	40.89	18.56	20
Humalog Mix 25®	Vial	21.65	21.65	22.78	20.52	2
	Cartridge	25.49	24.75	31.53	17.29	18
	Pen	28.47	29.32	42.49	21.66	20
Humalog Mix 50®	Cartridge	25.47	25.25	36.56	17.29	17
	Pen	28.08	27.64	36.56	22.67	14
Lantus®	Vial	41.85	41.91	48.13	36.26	10
	Cartridge	41.33	41.30	63.42	25.61	23
	Pen	41.96	40.78	51.57	25.61	24
Levemir®	Cartridge	43.39	44.19	69.49	31.35	18
	Pen	43.12	43.43	59.16	28.02	21
Novomix 30®	Cartridge	26.11	26.41	43.12	17.29	18
	Pen	28.25	29.66	41.37	21.19	21
Novomix 50®	Cartridge	22.43	22.43	27.57	17.29	2
	Pen	26.88	28.30	40.61	22.41	7
Novomix 70®	Cartridge	27.81	27.81	28.05	27.57	2
	Pen	28.80	29.81	40.61	22.41	5
Novorapid®	Vial	23.22	24.70	36.97	18.80	15
	Cartridge	25.86	27.99	79.25	17.29	21
	Pen	28.50	31.82	90.35	21.10	22
Tresiba®	Cartridge	43.07	43.07	50.06	36.07	2
	Pen	49.79	52.57	69.46	38.20	5
Animal (bovine) insulins						
Hypurin Bovine L®	Vial	69.04	69.04			1
Hypurin Bovine NPH®	Vial	64.24	64.24			1
Hypurin Bovine Regular®	Vial	64.24	64.24			1
	Cartridge	67.10	67.10			1

Annex 14. Reimbursement prices by brand and country

Insulin Type	Brand	Country	Mean Reimbursement Price USD	N
Human insulins				
Isophane	Berlinsulin Basal®	Germany	30.86	2
	Betalin NPH®	Argentina	43.81	4
	Biosulin N®	Morocco	12.10	1
	Gensulin N®	Poland	17.22	2
	Humulin N®	Argentina	36.36	2
		Australia	22.74	2
		Austria	26.21	3
		Belgium	23.95	2
		Croatia	16.55	1
		Czech Republic	20.32	2
		Denmark	25.45	2
		Estonia	22.49	2
		Finland	24.35	1
		France	24.03	3
		Germany	30.33	17
		Iceland	39.20	1
		Ireland	20.06	3
		Latvia	20.67	2
		Morocco	22.19	2
		Netherlands	18.84	2
		Poland	17.29	1
		Romania	15.38	2
		Serbia	17.76	2
		Slovak Republic	16.22	2
		Slovenia	20.98	3
		South Korea	18.83	2
		Spain	16.87	2
	Sweden	14.34	3	
	UAE	10.29	1	
	Insulatard®	Argentina	36.70	3
		Austria	29.95	2
		Belgium	18.61	2
Czech Republic		20.06	1	
Denmark		29.84	7	
France		24.91	5	
Germany		30.40	20	
Iceland		36.60	3	
Ireland		20.51	3	

Insulin Type	Brand	Country	Mean Reimbursement Price USD	N
		Morocco	18.83	3
		Netherlands	17.85	3
		Norway	20.44	2
		Poland	17.29	1
		Serbia	17.76	1
		Slovak Republic	32.50	1
		Slovenia	20.76	2
		South Korea	13.75	1
		Spain	16.87	2
		Sweden	16.35	6
		UAE	12.66	2
	Insulet N®	Morocco	7.91	1
	Insulin Bio NPH®	UAE	6.96	1
	Insuman Basal®	Austria	29.55	2
		Belgium	18.55	3
		Croatia	18.68	1
		Czech Republic	20.32	2
		Finland	24.35	1
		France	22.94	3
		Germany	30.47	36
		Ireland	14.58	2
		Latvia	17.35	1
		Netherlands	18.84	2
		Norway	18.99	2
		Poland	17.26	3
		Romania	14.69	3
		Serbia	17.76	1
		Slovak Republic	15.88	3
		Slovenia	22.10	1
		Sweden	14.48	2
	Jusline N®	UAE	8.58	1
	Novolin N®	Argentina	17.18	1
	Polhumina N®	Poland	17.21	1
Protaphane®	Australia	23.16	3	
	Finland	22.08	2	
	Germany	31.00	17	
	Latvia	25.71	1	
Lente	Betalin Lente®	Argentina	30.64	2
	Monotard®	UAE	11.72	1
Regular	Actrapid®	Australia	22.74	2

Insulin Type	Brand	Country	Mean Reimbursement Price USD	N
		Austria	29.47	1
		Belgium	18.61	2
		Croatia	13.14	1
		Czech Republic	20.06	1
		Denmark	24.44	3
		Finland	19.81	1
		France	17.26	3
		Germany	30.69	40
		Iceland	32.17	1
		Ireland	13.58	1
		Morocco	18.83	3
		Netherlands	18.15	3
		Norway	19.81	1
		Poland	17.29	1
		Serbia	18.17	1
		Slovak Republic	15.10	1
		Slovenia	19.21	1
		Spain	16.87	2
		Sweden	15.94	2
		UAE	13.44	3
	Berlinsulin Normal®	Germany	30.69	2
	Betalin R®	Argentina	37.12	3
	Biosulin R®	Morocco	12.10	1
	Gensulin R®	Poland	17.22	2
	Humulin R®	Argentina	32.41	1
		Australia	22.74	2
		Austria	25.41	2
		Belgium	23.95	2
		Croatia	16.55	1
		Czech Republic	20.32	2
		Denmark	19.60	1
		Estonia	22.06	1
France		24.46	3	
Germany		30.14	15	
Ireland		18.50	2	
Latvia		18.48	1	
Morocco		12.10	1	
Netherlands		17.62	1	
Poland		17.29	1	
Romania	15.36	2		

Insulin Type	Brand	Country	Mean Reimbursement Price USD	N
		Serbia	16.51	1
		Slovak Republic	15.10	2
		Slovenia	19.03	1
		South Korea	11.99	1
		Spain	12.80	1
		Sweden	13.56	2
		UAE	10.29	1
	Insulet Rapid®	Morocco	7.91	1
	Insulin Bio R®	UAE	6.96	1
	Insuman Rapid®	Austria	26.92	2
		Belgium	21.09	3
		Czech Republic	20.32	2
		Denmark	30.18	1
		Finland	23.78	2
		France	25.45	4
		Germany	30.59	42
		Ireland	21.24	1
		Netherlands	21.02	4
		Norway	18.50	1
		Poland	17.21	1
		Romania	14.48	3
		Serbia	18.17	1
		Slovak Republic	14.62	3
	Sweden	18.71	4	
	Jusline R®	UAE	8.58	1
	Novolin R®	Argentina	17.18	1
	Polhumin R®	Poland	17.21	1
Regular/ Isophane 10/90	Mixtard 10®	Netherlands	20.50	2
Regular/ Isophane 15/85	Insuman Comb 15®	France	22.94	3
		Germany	28.56	1
		Netherlands	21.07	1
Regular/ Isophane 20/80	Mixtard 20®	Netherlands	19.33	1
	Polhumin Mix-2®	Poland	17.21	1
Regular/ Isophane 25/75	Insuman Comb 25®	Austria	29.55	2
		Czech Republic	20.32	2
		Finland	24.35	1
		France	22.94	3
		Germany	30.83	45
		Ireland	15.34	2

Insulin Type	Brand	Country	Mean Reimbursement Price USD	N
		Netherlands	17.74	2
		Poland	17.25	2
		Romania	15.68	3
		Serbia	17.76	1
		Slovak Republic	16.55	3
		Sweden	17.27	2
Regular/Isophane 30/70	Actraphane 30®	Germany	30.88	6
		Netherlands	15.35	2
	Berlinsulin 30®	Germany	30.88	2
	Biosulin 30®	Morocco	12.10	1
	Gensulin M30®	Poland	17.22	2
	Humulin 30®	Australia	22.74	2
		Austria	25.41	2
		Belgium	23.95	2
		Croatia	16.55	1
		Czech Republic	20.32	2
		France	24.03	3
		Germany	30.71	13
		Ireland	20.06	3
		Morocco	22.19	2
		Netherlands	18.59	1
		Poland	17.29	1
		Romania	15.36	2
		Serbia	17.76	2
		Slovak Republic	16.22	2
		Slovenia	20.98	3
		South Korea	24.40	1
		Spain	16.74	2
	UAE	10.29	1	
	Insulet Mix 30®	Morocco	7.91	1
	Insulin Mix 30/70®	UAE	6.96	1
	Jusline 30®	UAE	8.58	1
	Mixtard 30®	Australia	23.99	2
		Austria	30.44	1
		Czech Republic	20.06	1
		Denmark	26.72	3
		France	16.71	1
		Germany	30.59	16
Morocco		18.83	3	
Netherlands		18.27	2	

Insulin Type	Brand	Country	Mean Reimbursement Price USD	N
		Poland	17.29	1
		Romania	18.94	1
		Serbia	17.76	1
		Slovenia	25.41	1
		South Korea	12.41	1
		Spain	16.87	2
		Sweden	15.97	1
		Tanzania	22.06	1
		UAE	15.54	4
	Polhumix Mix-3®	Poland	17.21	1
Regular/Isophane 40/60	Actraphane 40®	Netherlands	19.20	1
	Gensulin M40®	Poland	17.29	1
	Mixtard 40®	Netherlands	21.08	1
		Poland	17.29	1
Polhumix Mix-4®	Poland	17.21	1	
Regular/Isophane 50/50	Actraphane 50®	Germany	30.88	2
	Gensulin M50®	Poland	17.29	1
	Insuman Comb 50®	Austria	28.95	1
		France	22.94	3
		Germany	30.11	12
		Ireland	21.95	1
		Netherlands	18.86	1
		Romania	15.78	1
	Mixtard 50®	Australia	23.99	1
		Austria	29.47	1
		Germany	30.88	4
		Poland	17.29	1
	Polhumix Mix-5®	Poland	17.21	1
Analogue insulins				
Aspart	NovoRapid®	Argentina	84.80	2
		Australia	27.36	3
		Austria	31.74	3
		Belgium	25.92	3
		Croatia	23.77	2
		Czech Republic	20.02	3
		Denmark	35.42	9
		Estonia	32.12	2
		Finland	25.53	3
		France	27.92	5
		Iceland	38.63	2

Insulin Type	Brand	Country	Mean Reimbursement Price USD	N
		Ireland	27.06	5
		Latvia	28.67	2
		Morocco	36.12	2
		Netherlands	22.41	4
		Norway	25.09	3
		Poland	17.29	1
		Romania	24.49	1
		Serbia	27.62	2
		Slovak Republic	21.81	2
		Slovenia	22.43	2
		South Korea	26.43	2
		Spain	24.55	2
		Sweden	21.08	9
		UAE	31.64	2
Aspart/Protamine 30/70	NovoMix 30®	Australia	28.25	2
		Belgium	29.18	2
		Croatia	23.77	2
		Czech Republic	20.63	2
		Denmark	37.15	5
		Estonia	34.45	1
		Finland	27.76	2
		France	28.19	2
		Iceland	42.25	2
		Ireland	27.77	3
		Latvia	29.11	1
		Morocco	34.48	2
		Netherlands	24.58	2
		Norway	26.23	2
		Poland	17.29	1
		Romania	26.36	1
		Serbia	27.62	1
		Slovak Republic	24.23	2
		Slovenia	22.93	2
		South Korea	35.20	1
		Spain	26.88	1
Sweden	22.19	4		
UAE	32.75	2		
Aspart/Protamine 50/50	NovoMix 50®	Belgium	30.32	1
		Croatia	25.61	1
		Denmark	40.61	1

Insulin Type	Brand	Country	Mean Reimbursement Price USD	N
		France	28.19	2
		Netherlands	22.41	1
		Poland	17.29	1
		Slovenia	23.48	1
		Spain	26.88	1
Aspart/Protamine 70/30	NovoMix 70®	Belgium	28.81	3
		Denmark	40.61	1
		France	28.19	2
		Netherlands	22.41	1
		Spain	26.88	1
Degludec	Tresiba®	Netherlands	37.49	3
		Slovak Republic	43.47	1
		Slovenia	69.46	2
		South Korea	61.96	2
		Sweden	49.88	3
Detemir	Levemir®	Australia	46.25	2
		Austria	55.26	2
		Belgium	46.36	2
		Croatia	28.02	1
		Czech Republic	38.51	2
		Denmark	41.95	3
		Estonia	43.50	1
		Finland	44.50	3
		France	45.43	3
		Iceland	64.32	2
		Ireland	42.07	5
		Latvia	43.12	1
		Morocco	56.26	2
		Netherlands	37.65	2
		Norway	40.20	2
		Poland	31.35	1
		Romania	46.05	1
		Serbia	41.33	1
		Slovak Republic	37.08	2
		Slovenia	38.22	2
Spain	43.25	2		
Sweden	34.43	11		
UAE	46.76	2		
Glargine	Lantus®	Australia	46.25	2
		Austria	50.53	2

Insulin Type	Brand	Country	Mean Reimbursement Price USD	N
		Belgium	42.37	2
		Croatia	25.61	2
		Czech Republic	34.68	3
		Denmark	41.48	3
		Estonia	44.66	2
		Finland	43.89	3
		France	45.77	4
		Iceland	57.49	2
		Ireland	42.42	6
		Latvia	39.03	2
		Morocco	47.35	7
		Netherlands	37.56	3
		Norway	39.05	2
		Poland	31.35	2
		Romania	38.97	3
		Serbia	38.64	2
		Slovak Republic	36.25	5
		Slovenia	36.81	2
		South Korea	41.48	2
		Spain	42.39	3
Sweden	32.15	19		
UAE	48.65	4		
Glulisine	Apidra®	Australia	27.36	3
		Austria	30.72	3
		Belgium	27.36	3
		Croatia	23.40	1
		Czech Republic	19.64	3
		Denmark	29.00	3
		Estonia	30.44	2
		Finland	24.44	3
		France	24.63	3
		Iceland	46.70	3
		Ireland	25.89	4
		Latvia	23.66	2
		Morocco	14.18	5
		Netherlands	22.28	3
		Norway	23.82	3
		Poland	17.24	3
		Romania	20.40	2
Serbia	24.59	3		

Insulin Type	Brand	Country	Mean Reimbursement Price USD	N
		Slovak Republic	19.82	3
		Slovenia	22.14	2
		South Korea	27.88	2
		Spain	25.88	3
		Sweden	18.65	4
		UAE	26.57	3
Lispro	Humalog®	Argentina	43.53	1
		Australia	27.36	3
		Austria	31.27	3
		Belgium	28.51	3
		Croatia	23.77	2
		Czech Republic	20.02	3
		Denmark	33.20	6
		Estonia	29.25	2
		Finland	25.53	3
		France	23.73	2
		Iceland	38.74	2
		Ireland	27.65	4
		Latvia	25.18	2
		Morocco	32.71	2
		Netherlands	22.94	5
		Norway	21.68	3
		Poland	17.29	1
		Romania	27.52	3
		Serbia	25.15	1
		Slovak Republic	21.19	3
		Slovenia	22.43	2
		South Korea	41.63	4
Spain	23.86	3		
Sweden	18.38	11		
UAE	27.57	3		
Lispro/Protamine 25/75	Humalog Mix 25®	Australia	28.25	2
		Belgium	29.18	2
		Croatia	23.77	2
		Czech Republic	20.63	2
		Denmark	36.85	1
		Estonia	29.25	2
		Finland	29.67	1
		France	27.57	1
		Iceland	42.49	1

Insulin Type	Brand	Country	Mean Reimbursement Price USD	N
		Ireland	27.82	2
		Latvia	27.15	2
		Morocco	32.99	2
		Netherlands	23.29	2
		Norway	26.40	2
		Poland	17.28	1
		Romania	27.44	2
		Serbia	25.47	2
		Slovak Republic	22.69	2
		Slovenia	22.93	2
		South Korea	36.53	1
		Spain	26.88	1
		Sweden	20.49	3
		UAE	27.57	3
Lispro/Protamine 50/50	Humalog Mix 50®	Australia	28.25	2
		Belgium	29.18	2
		Croatia	23.77	2
		Czech Republic	20.63	2
		Estonia	29.25	2
		Finland	29.67	1
		France	27.57	1
		Ireland	27.52	2
		Latvia	26.71	2
		Netherlands	25.08	1
		Poland	17.29	1
		Romania	27.31	2
		Serbia	25.47	2
		Slovak Republic	22.69	2
		Slovenia	22.93	2
		South Korea	36.56	2
		Spain	25.76	1
		Sweden	21.86	3
		UAE	27.96	1
Animal insulins				
Isophane	Hypurin Bovine NPH®	Australia	64.24	1
Lente	Hypurin Bovine L®	Finland	69.04	1
Regular	Hypurin Bovine Regular®	Australia	64.24	1
		Finland	67.10	1

Annex 15. Contribution of base prices (CIF/MSP) and add-ons to the final patient prices by WHO Region

CIF – Cost, insurance and freight; MSP – Manufacturer's selling price

WHO Region for Africa

	Chad (2004)			Congo (2007)			Ethiopia (2004)	Kenya (2004)	Nigeria (2004)	Uganda (2004)	
	Private generic	Private originator	Public generic	Private generic	Private originator	Public generic	Public generic	Private	Private	Private (low)	Private (high)
Base price	59.3%	59.3%	52.0%	40.8%	47.6%	81.6%	54.8%	40.3%	44.8%	65.3%	5.6%
Add-ons	40.7%	40.7%	48.0%	59.2%	52.4%	18.4%	45.2%	59.7%	55.2%	34.7%	94.4%

WHO Region for the Americas

	Caribbean high-income country (2010)	Peru (2005)	
	Public	Private (high)	Public generic
Base price	62.0%	29.6%	48.1%
Add-ons	38.0%	70.4%	51.9%

WHO Region for Eastern Mediterranean

	Iran (2007)				Jordan (2004)	Kuwait (2004)	Lebanon (2013)		Oman (2007)	Syria (2003)	Tunisia (2004)	UAE (2006)	Yemen (2006)	
	Locally produced						Private originator	Private					Private (low)	Private (high)
	Private (low)	Private (high)	Public (low)	Public (high)	Private originator	Private	Private (low)	Private (high)	Private	Private	Public	Private	Public	Private
Base price	70.0%	51.0%	78.0%	56.0%	61.8%	58.8%	67.0%	64.0%	65.0%	82.7%	90.9%	69.4%	90.9%	63.5%

Add-ons	30.0%	49.0%	22.0%	44.0%	38.2%	41.2%	33.0%	36.0%	35.0%	17.3%	9.1%	30.6%	9.1%	36.5%
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WHO Region for Europe

	Kazakhstan (2004)	Kyrgyzstan (2005)	Moldova (2011)			
	Private	Private	Public (low)	Public (high)	Private (low)	Private (high)
Base price	67.0%	60.7%	62.0%	65.0%	70.0%	66.0%
Add-ons	33.0%	39.3%	38.0%	35.0%	30.0%	34.0%

WHO Region for South East Asia

	India											Sri Lanka (2001)		Thailand (2006)	
	Delhi (2011)		Maharashtra (2004)		West Bengal (2004)		Karnataka (2004)		Haryana (2004)						
	Private (low)	Private (high)	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private	Hospital (low; high)	Private (low; high)	
Base price	83.0%	7.0%	96.2%	75.4%	82.9%	71.4%	95.2%	66.3%	96.2%	72.6%	61.5%	60.8%	78.1%; 24.0%	82.8%; 40.7%	
Add-ons	17.0%	93.0%	3.8%	24.6%	17.1%	28.6%	4.8%	33.7%	3.8%	27.4%	38.5%	39.2%	21.9%; 76.0%	17.2%; 59.3%	

WHO Region for Western Pacific

	China – Shandong Province (2004)				Mongolia (2012)			Philippines (2005)	
	Public (low)	Public (high)	Private (low)	Private (high)	Public	Private originator	Private generic	Imports Minimum	Imports Maximum
Base price	88.0%	69.0%	81.0%	75.0%	75.6%	59.6%	50.5%	52.8%	26.8%
Add-ons	12.0%	31.0%	19.0%	25.0%	24.4%	40.4%	49.5%	47.2%	73.2%