ACCESSIBILITY TO MEDICINES FOR MAJOR NON-COMMUNICABLE DISEASES IN JORDAN – 2018

MEDECINS SANS FRONTIERES
DOCTORS WITHOUT BORDERS

MSF INTERNAL BRIEFING DOCUMENT

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Analyses based on data from 2016 to 2018

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Contents

1. EXECUTIVE SUMMARY

This is a summary of work undertaken between March 2018 and May 2018 in order to increase understanding of accessibility to medicines for major non-communicable diseases (NCDs) among Jordanians and urban Syrian refugees. It includes multiple facets of accessibility - affordability, availability, price determinants, government and out-of-pocket expenditures, the pharmaceutical and health sectors, and prescriber and consumer behaviors.

Overall accessibility to medicines in Jordan for the NCDs studied here is relatively high. However, a minority of the population does not access treatment, mainly due to affordability (predominantly provider costs, but also medicines and transportation costs); these factors are most likely linked to capacity to pay given that expenditures exceed income among Jordanians and urban refugees, the majority of whom report debt. It is imperative to understand that price of medicines cannot be examined in isolation but needs to be considered in relation to capacity to pay, as even very low-priced generic medicines remain out of reach for lower-income households.

All World Health Organization (WHO) essential drugs (oral plus insulin) for the NCDs studied here were registered by the Jordan Food and Drug Administration, and procured by the government for the public sector. Based on the literature, public sector availability of medicines for NCDs is generally limited among lower income countries investigated. However, only a minority of urban Syrian refugees reported unavailability of medicines in the Jordanian public sector. From the literature, private sector NCD medication availability is higher and close to 80% among higher income countries and in urban settings; it is also higher in lower income countries, for medicines to treat cardiovascular disease. These findings should hold true for Jordan.

Jordan has sufficient healthcare resources. Government expenditure on health exceeds that of many Middle East North Africa (MENA) countries of the same income group, while the population has lower out-of-pocket expenditure compared to the same group of countries. Government purchases of medicines (availability) are likely sufficient for cardiovascular disease, hypertension and non-insulin-dependent diabetes if 65% or fewer of the affected population access the public sector.

Most medicines used to treat major NCDs are procured at competitive prices (comparable to the international reference price) by the Jordanian government. Public tendering as well as pricing of medicines is transparent in Jordan. In the private sector, prices are essentially fixed by law, but despite this pricing is heavily influenced by the pharmaceutical sector, whose priorities lie with profitability and in general, the predominant export market.

The majority of medicines for major NCDs were determined to be affordable (less than one day's wage to purchase a 30-day supply) in the public sector, even when multiple drugs were prescribed for hypertension, cardiovascular disease and/or diabetes. Affordability in the private sector is predominantly the case for medicines for hypertension, cardiovascular disease and oral medicines for diabetes; notable exceptions include insulin, fixed-dose combination (FDC) inhalers and statins. Across both sectors, higher costs can be attributable to prescriber practices, consumer preferences and predominance of brand drugs, especially for insulin and FDC inhalers.

Risk factors for NCDs among Jordanians and Syrians surpass global averages, driving disability and death. While affordability comes through as the main obstacle in accessing health care, annually Jordanians are spending more on tobacco than medical expenses.

Considerations for humanitarian and other implementing organizations:

- Prior to engaging in NCD interventions, evaluation of the existing health system is key to determining how to plan (if at all), where along the continuum of NCD care the focus of the response should be and whom to target.
- Programming details and operational costs need to factor procurement options, as there may be governmental requirements for local and/or international sourcing.
- Prevention possibilities should be reviewed in relation to NCDs given known impact on reducing death and disability.

2. INTRODUCTION

Médecins sans Frontières (MSF) has increased operations in the Middle East and North Africa (MENA) region in recent years; this has required renewed focus on non-communicable diseases (NCDs) that are the predominant causes of morbidity and mortality. As MSF will continue to operate or contemplate interventions in this context, gaining institutional understanding *on the how, when or not at all* to do so as well as the implications of those operational decisions becomes imperative. Current information gaps are in part due to the lack of:

- data on access to NCD medication in public and private sectors in countries where MSF has NCD focused activities;
- transparency of cost of essential NCD medications through public and private systems;
- knowledge of pharma access initiatives and influencing of tendering and procurement processes for NCD medication within the public sector.

This is a summary of work undertaken between March 2018 and May 2018, in collaboration with the MSF Access Campaign (AC; created to support MSF Operations in improving access to essential medicines and diagnostics) and with support from the Operational Centre Amsterdam (OCA) NCD advisor. The aim of this report is to describe accessibility to treatment of NCDs amongst Jordanians and urban Syrian refugees and to explore the factors that influence accessibility to include price determinants, government and out-of-pocket expenditures, the pharmaceutical and health sectors as well as prescriber and consumer behaviors.

3. METHODOLOGY

Existing publicly available data sources from 2016 and 2017 for registered medicines, including pricing information, in Jordan for the private and public sectors were obtained, and used to conduct quantitative analyses for availability and affordability. Qualitative work included semi-structured interviews with local suppliers and manufacturers; meetings and/or conversations with governmental officials, non-governmental organizations (NGOs), other local organizations or consultants as well as regional and international MSF staff; and literature review and use of online sources for gathering information pertaining to government and out-of-pocket expenditures, population and country statistics, disease prevalence, etc.

To organize the work, a widely used definition (developed by Penchansky and Thomas in 1981) of access to medicines, encompassing several dimensions including affordability, availability and accessibility, was adopted.[1] NCDs for this analysis were defined as including: cardiovascular disease (CVD), hypertension, asthma, chronic obstructive pulmonary disease (COPD), diabetes, epilepsy, psychiatric illnesses (depression, psychosis) and hypothyroidism or hyperthyroidism.

4. BACKGROUND

Jordan, which has shifted between upper and lower middle-income country classifications in recent years (lower 2015-17; upper before 2015, and currently), has a total population of about 9.8 million.[2,3] Syrian refugees contribute an additional 660,000 to the population, with the majority living in urban areas.[4] Deaths attributable to NCDs in 2016 ranked among the top three, including ischemic heart disease, CVD and diabetes; with hypertensive heart disease ranking ninth and essentially all unchanged in ranking since 2005.[5] Data from Syria is similar except conflict and terror ranked number one in 2016 followed by ischemic heart disease, CVD (two and three), chronic kidney disease, leukemia, COPD, and diabetes ranking fifth, seventh, ninth, and tenth; respectively.[6] Apart from deaths attributable to conflict and terror, which was ranked 145th in 2005, essentially all other rankings for Syria have remained the same.

In 2016 MSF OCA conducted a survey among 17,584 urban southern Syrian refugees in Irbid governorate, Jordan to understand access to crucial health care services.[7] Main findings revealed a population largely under 18 years of age and, among the 2575 interviewed adults and guardians for 1570 children under 5 years of age, the majority had required health care in the previous six months. Among all groups, the primary reason for seeking health care was for communicable diseases, followed by joint pain and NCDs in adult men and NCDs and gynaecological care for adult women. Unaffordability of provider costs was cited as the main reason for not seeking care among guardians of 274 children and 530 adults, of which 61.7% and 66.7%, respectively did not seek it. Specifically, among 1243 interviewed adults with a NCD, 160 or 14.1% did not seek care citing provider costs; but the vast majority (831 of 873 individuals or 95.2%) who sought care, received it. Among those needing medication for a chronic condition, 23.1% (265 of 1146 individuals) reported an interruption of medication for greater than two weeks in the previous six months; 63.4% (168 individuals) due to costs of the medications.

Over the past three years, the number of registered Syrian refugees has stayed relatively unchanged (660,315 as of 1 June 2017). Key findings from the CARE 2017 urban household survey among Syrian (the majority) and other minority refugees as well as Jordanian citizens, identified cash, and cash for rent, as individuals' primary need.[8] Half or more of individuals' monthly expenditures were reported to be going towards rent. On average, Syrian refugees spent 25% more than their income, while Jordanians almost tripled their expenditure gap from 56 Jordanian Dinars (JD) in 2016 to 123.7 JD in 2017.

4.1 Health sector

Established in 2003, the Jordan Food and Drug Administration (JFDA), is charged with drug safety and efficacy as well as food safety and quality. Governed by a board of directors and chaired by the Minister of Health, it is financially and administratively independent. Since 2001, pricing of pharmaceuticals has been entrusted to the JFDA by law.[9] In brief, innovator or brand drugs are priced by the lowest of four benchmarks *(Appendix A, Box 1)* while generics are essentially priced at a ceiling of 80% of the brand product. Pricing is subject to reconsideration after 2 years for innovator drugs and otherwise every 5 years upon renewal of registration if renewal is desired. However, a reduction in price in the originator country (if used as the basis for the public price), must be communicated within 6 months or penalties will ensue.[9,10] For branded generics the first and second products are approved relatively quickly (months); however for 3rd or 4th ones, there is little incentive for the JFDA to expedite approval given product availability on the market; these later products will join the normal queue (1 to 2 years).[11] Prices as determined by the JFDA are publicly available and must be affixed to individual products in pharmacies.

Effective since 2004, the Joint Procurement Department (JPD) purchases drugs via yearly tenders for the public sector, encompassing Ministry of Health (MoH), Royal Medical Services (RMS), University hospitals (King Abdullah, Jordan University Hospital), and King Hussein Cancer Center (KHCC).[12,13] The JPD selects the best price (timely delivery for quantities requested, for example) and not necessarily the lowest price; data on items purchased with mean price including the 4% tax on drugs are publicly available.[12,14] For each product, the award is given to one supplier or manufacturer; so either a brand or generic drug may be procured. The JPD leverages huge purchasing power for competitive pricing given the large quantities requested; manufacturers and suppliers still profit due to the volume and savings exhibited by: no promotions, no product loss attributable to expiry, payment guarantee.[15] The private sector (hospitals, pharmacies, etc.) relies on its networks of wholesalers and suppliers importing drugs from international manufacturers or buying from local manufacturers.[16]

Access to universal health insurance for all citizens has been a strategic government goal for over the past three decades.[17] The MoH (established in late 1950) with its civil insurance program (established in 1965) provides coverage for civil servants and their families, the poor, the disabled, persons < 6 years old and those over 60 years old.[18,19] Sources for insurance coverage are conflicting, but perhaps best reflected by the population and housing

census of 2015 which determined 68.7% of Jordanians were insured with the following type of coverage - MoH/civil health insurance at 41.7%, RMS at 38%, private insurance at 12.4%, university hospitals covering 2.5% of the population, UNWRA (United Nations Relief and Works Agency for Palestine Refugees in the Near East) at 2.5%, and the remaining by others at 2.5%. Approximately 25% of the 2.9 million non-Jordanians have some form of coverage reflecting an overall insurance rate among the entire population of approximately 55%.[20] Pursuant to another health policy change in Jordan in end January 2018, Syrian refugees are no longer able to access the non-insured Jordanian rate for health care but instead pay 80% of the foreigner rate.[21]

4.2 Pharmaceutical Sector

Pharmaceutical manufacturing is a significant industry in Jordan, comprising approximately 9% of exports.[22] The majority (70-80%) of manufactured products are exported to over 60 countries; Saudi Arabia and Iraq comprise one-third of the market share.[16,22] The Jordanian pharmaceutical market is an open market – local manufacturers, or suppliers for international manufacturers, can apply to register a drug; the process is the same for both except that preference is given to the 1st and 2nd generics or other added value drugs.[11] However in other markets such as United Arab Emirates, local manufacturers are given preference making it much more challenging for Jordanian manufacturers to compete. Given Jordan's positive trade balance in pharmaceuticals, local manufacturers need to cater to export markets in terms of labeling, product packaging and language – all additive costs.[23] The main driver for local manufacturers and suppliers is profitability; data gathered by Intercontinental Marketing Services (IMS) Health are used to forecast sales, determine renewal (or not) as well as perform other market analyses - "to be the first generic on the market".[11,24] Suppliers also have agreements with larger private clients to ensure competitiveness in a regulated and fixed margin market via bonuses but this practice puts lower priced generics at a disadvantage.[16]

5. KEY FINDINGS AND ANALYSES

5.1 Availability

Availability has historically been defined in terms of a prescribed medicine being in stock when required; part of this component would therefore require that essential medicines for NCDs be registered with the JFDA. Using publicly available data from the JFDA,[25] the potential availability of defined NCD drugs in terms of pharmacological class, dosage, innovator (brand) or generic was characterized. Additionally, a further examination of sub-classes of drug categories to better understand product availability, particularly those with major market shares as well as quantify availability of fixed-dose combinations (FDCs), was undertaken. Similarly, for the publicly available JPD data,[14] purchased drugs for NCDs for the public sector were described in terms of pharmacological class, dosage and quantity. Additionally, total monthly regimens for classes and/or individual drugs were quantified for availability of drugs in the public sector *(Appendix A, Box 2).*

5.1.1 Quantitative findings and analysis

Of the 12,960 entries in the JFDA dataset, 5758 or 44.4% were registered as drugs; 56 did not have an *INGREDIENT/generic* name listed and therefore were excluded. A total of 5702 registered entities were included as part of the analysis. Nineteen local manufacturers produced 2465 or 42.8% of all registered drug items. There were a total of 1155 or 20.2% registered drugs for defined NCDs. Of these 1155 drugs, 845 were generics and 624 or 73.8% were locally manufactured. The import market for NCD drugs included 310 brand and 221 generic drugs totaling 531 of the 1155 NCD drugs or 46% demonstrating the dominance in local manufacturing in this segment.

Regarding NCD drugs, almost half (606 products or 52.5%) were indicated for hypertension or CVD while 187 drugs (16.2%) were indicated for diabetes; remaining drugs were distributed as follows: asthma or COPD, 105 or 9.1%; epilepsy, 99 or 8.6%; psychiatric illnesses (including treatment for extra-pyramidal symptoms (EPS)), 148 items or 12.8%; and thyroid disease (hypo- or hyper-), 10 or 0.87%. In terms of FDCs, 163 or 14.1% were registered; the majority (74.8% or 122) were indicated for hypertension or CVD, 25 products for diabetes and 16 for either asthma or COPD *(Appendix B, Table 1*).

For publicly procured drugs, (*extracted directly from JPD data summary*)[14] generics comprised 61% of all products purchased (544 items) compared to 352 brands. Foreign manufacturers comprised the majority of products procured compared to local manufacturers, 64.6% versus 36%, respectively. In terms of reason for the award, for 58.4% it was the *only* offer and for 38.1% due to the lowest offer.

A total of 160 drugs, including varying dosages, were procured by the JPD for NCDs as defined here. The majority, 41.9% or sixty-seven drugs, were for hypertension or CVD, 28 products or 17.5% for treatment of diabetes including 11 insulin products but no FDCs. Twenty-seven products (16.9%) were procured for asthma or COPD; twenty-three for epilepsy as well as the essential medicines for treatment for thyroid disease. Finally, for psychiatric illnesses, a total of 12 products were procured; four antipsychotics and for treatment of depression, tricyclic antidepressants (TCAs) and selective serotonin reuptake inhibitors (SSRIs) *(Appendix B, Table 2*).

Overall, all World Health Organization (WHO) essential drugs (oral plus insulin)[26] for the specified NCDs were registered by the JFDA and procured by the JPD. However, availability of individual products on the market is likely dictated by market demand. Manufacturers or suppliers with either low product sales or profitability are under no obligation to re-register their product or keep it on the market. In the private sector, sales and marketing forces have huge influences at the prescriber and retail level and may explain why certain products dominated individual classes, e.g. valsartan comprised 48.2% of all angiotensin II receptor blockers (ARBs), atorvastatin constituted 42.6% of its class versus the other five statins. Specifically, among statins branded generics predominated with only 11 innovator drugs registered and with 67 (80.7%) of 83 generics locally manufactured. Multiple manufacturers and suppliers have registered similar products to compete for market share, thus various packaging sizes by varying suppliers are available. The dominance of drugs for hypertension and CVD reflects the burden of disease in the population.

5.1.2 Evidence from the literature

Several survey instruments have been used to assess medicine availability and while limitations do exist, these studies provide valuable insight. A 2004 study conducted in Jordan using the WHO/Health Action International (HAI) methodology[27] to assess availability and affordability of medicines found that public sector drugs were competitively priced (comparable to international reference prices), but often unavailable (median availability of 28%) forcing individuals to private markets where affordability may be problematic (generic medicines were priced 10 times higher in private pharmacies but were available 80% of the time).[28] More recently, a secondary analysis of surveys conducted over 2008 to 2015 using the same methodology to assess availability and affordability of NCD medicines for four disease categories demonstrated that in all income countries, median availability for generics in the public sector was low and marginally better in the private sector *(Table 1*).[29] Median availability for brand drugs in the public sector across all three income groups was 0%. However, the availability of either the lowest generic or brand for CVD medicines in the private sector was greater than 80% across all income groups and in general, median product availability in the private sector was higher than in the public sector.

***Table 1**. Median percentage availability of medicines for four NCDs diseases (CVD, diabetes, COPD, & central nervous system (CNS) conditions) by World Bank Income group* and sector*

		Public Sector median availability (%)		*Private Sector median availability (%)*	
		Lowest price generic	*Any* product	*Lowest* price generic	*Any* product
LIC (n=10)	*All* medicines	**40.2%** (n=112)	**43.3%** (n=89)	**59.1%** (n=111)	**66.7%** (n=88)
	CVD		**45.0%** (n=34)		**82.9%** (n=33)
LMIC (n=12)	*All* medicines	**54.6%** (n=172)	**57.6%** (n=172)	**65.7%** (n=190)	**68.6%** (n=190)
	CVD		**74.2%** (n=80)		**88.6%** (n=90)
UMIC (n=8)	*All* medicines	**56.7%** (n=136)	**60.2%** (n=136)	**76.7%** (n=132)	**90.0%** (n=133)
	CVD		**60.3%** (n=58)		**93.3%** (n=56)

**LIC – Low-income country; LMIC – lower-middle income country; UMIC – upper-middle income country*

An analysis of the Prospective Urban Rural Epidemiological (PURE) study data, covering blood pressure-lowering medicines, statins, and metformin availability from 626 communities in 20 countries between 2009 and 2016, demonstrated that 90% of communities had at least one blood pressure-lowering medicine at the local pharmacy surveyed.[30] Among the seven upper-middle income countries (UMICs), availability of at least two blood pressure-lowering medicine was 87% and among high-income countries (HICs) to include United Arab Emirates, availability was 98% but among lower-middle income countries (LMICs) and low-income countries (LICs) (excluding India) availability was 72%. Availability of four blood pressure-lowering medicines was high only among HICs at 94%; among UMICs, LMICs and LICs (excluding India) it was 71%, 47% and 13%, respectively. Another post-hoc analysis of the PURE study data for cardiovascular medicine availability (angiotensin-converting enzyme inhibitors (ACEIs), beta(β)-blockers, statins and aspirin) showed similar findings, with poor availability of all four medicines among communities in LICs (except India), at 3% in rural communities and 25% in urban settings. Availability increased with country income level, with LMICs at 37% in rural areas, and 62% in urban areas; UMICs at 73% in rural settings and 80% in urban settings; and HICs at 90% in rural settings and 95% in urban settings.[31]

Data from a 2014 survey among 1550 urban Syrian refugee households in Jordan found 86.1% of households seeking and receiving adult medical care the last time it was needed.[32] Additionally, 87.4% of adult care seekers (n=1043) were prescribed medicines during the most recent health visit, of which 89.8% were able to obtain all needed medications. In the public sector 396 (or 86.7%) of the 457 individuals obtained all medicines prescribed compared to 346 (or 93.8%) of the 369 individuals who obtained from the private sector and 77 (or 89.5%) of the 86 individuals from the NGO sector. (For almost half of those individuals (n=48) not obtaining prescribed medicines, this was due to unavailability in the public facility. Similarly, as previously mentioned, the 2016 MSF survey showed that among individuals with a NCD seeking care, the vast majority or 95.2% received it. Slightly over half sought care in the NGO sector, followed by 27% and 18% in the public and private sectors, respectively. Only twenty-five individuals, or 9.6%, did not seek care due to availability of NCD services, defined by inadequate service quality, unavailability of staff or service or long waiting lists.[7]

While the above studies used validated instruments to assess availability, single measurements are not very robust and current thinking calls for more innovative approaches over costlier surveys.[33] The PURE study used the Environmental Profile of a Community's Health (EPOCH) instrument, which collected data from one private pharmacy per community. Household surveys can be subject to recall bias; participants in these surveys were asked

for information specific to the past 6 months or beyond. Regardless, availability of medicines for NCDs and especially for CVD and hypertension, was relatively high among UMICs (Jordan was a UMIC during the PURE study's time period) in both the private sector and in urban settings. Among LICs and LMICs, close to 80% availability of essential medicines for CVD in the private sector has been reported. Among urban Syrian refugees in Jordan, availability of medicines for major NCDs was approximately 90% among those seeking care.

5.1.3 Government expenditure, fiscal space & out-of-pocket expenditure

Health financing is instrumental to a government's ability to provide basic health care. In general, governments provide the major source of financing for health (Jordan's government contributed 50.6% in 2013)[20] and can furthermore influence policy to steer priorities. Fiscal space, or the ability of a government to provide additional budgetary capacity for health, without compromising its financial sustainability[34] is a key factor.

Jordan exhibited relatively higher general government expenditure on health (GGHE) as a proportion of overall government expenditure in 2014, compared to the average 10% among MENA countries of the same income group (*Table 2*). However, government expenditure on health as a proportion of total health expenditure (THE) was comparable to the average expenditure of 63.7% *(only select MENA countries are shown in Table 2)*. A threshold of below 70 to 80% for government spending on health, increases the risk of households falling into fiscal straits, and is exhibited by LMICs and UMICs in the MENA region.[35] In terms of out-of-pocket spending (OOPS) as a share of total health expenditure, Jordan is well below the MENA average of 31% but just at the threshold of 20%, reflecting a low likelihood of catastrophic spending. Except for HICs, most other populations in MENA countries rely on OOPS to finance healthcare.

Table 2. Indicators of government and out-of-pocket health spending for selected MENA countries – 2014 data[35,36,37]

World Bank income group	GGHE % GGE	GGHE % THE	GGHE % GDP	OOPS % THE
Iraq (UMIC)	6.5	37.2	3.4	39.7
Jordan (UMIC)	**13.7**	**64.5**	**7.4**	**20.9**
Lebanon (UMIC)	10.7	51.7	7.4	36.4
Saudi Arabia (HIC)	8.2	73.4	5.1	14.3
Syria (LMIC)	4.8	-	-	53.7
Yemen (LMIC)	3.9	16.2	5.6	76.4

*** GGHE – General Government Expenditure on Health; GGE – General Government Expenditure; THE- Total Expenditure on Health; GDP – Gross Domestic Product; OOPS– Out-Of-Pocket Spending*

The JPD procured medicines totaling 113.2 million JD in 2016, an increase from 95.3 million JD in 2012. Some of the increased demand can be attributable to Syrian refugees, however as a percentage of GDP, spending remained relatively constant (0.43% in 2012 and 0.42% in 2016).[14,38,39]

Data on availability of medicines in the public sector for Jordan are limited, except from recent household surveys among Syrian refugees. Quantities purchased by the JPD (supply) should approximate availability in the public sector, and when paired with prevalence for targeted diseases (demand), can give an indication of the supply-demand dynamics. Data on disease specific prevalence is sparse and not current, and comparability among sources is difficult as age cut-offs or populations vary; best estimates for Jordanians were used applying the 2015 age distributions to the 2016 population figures *(Table 3)*.[3,40,41,42,43]

Since data on utilization of public sector facilities for medicines was not available, several scenarios were used to understand availability. For any anti-hypertensive medicine, 77.2% or 527,072 annual treatments would be available if 65% of the estimated hypertensive population accessed a public facility; that said it is more likely that this population takes multiple medications, in which case availability would be lower. Except for aspirin, availability of medicines for CVD was high and for diabetes, overall availability low. However, prevalence for diabetes was estimated for those aged 20 or older and it is more likely that the burden (at least for use of oral agents) is closer to the CVD prevalence in which case, availability would be 43.6% or 65,492 annual treatments for sulfonylureas and 67.8% or 101,667 annual treatments for metformin, if the public sector was accessed 65% of the time.

***Table 3**. Availability of medicines for one-year period in the public sector according to disease prevalence and public sector use**

		HYPERTENSION		**CVD**		**DIABETES**	
	Prevalence	36.5% *[age >35]*		8% *[age >35*]		11.7% *[age ≥20]*	
	Total population (2016) 9,798,000	1,050,110		230,650		638,603	
	Total monthly doses purchased	Availability based on population accessing public sector (one-year treatment)					
		85% use	*65%* use	*85%* use	*65%* use	*85%* use	*65%* use
ACEIs & ARBs	2,162,270	20.2%	26.4%	91.9%	120.2%		
***β*-Blockers**	1,832,156	17.1%	22.4%	77.9%	101.8%		
Diuretics	1,244,400	11.6%	15.2%				
CCBs *(includes amlodipine)*	1,086,037	10.1%	13.3%				
***Any* Antihypertensive**	6,324,863	59.0%	77.2%				
Aspirin	1,023,333			43.5%	56.9%		
Statins	1,794,533			76.3%	99.7%		
Sulfonylureas	785,900					12.1%	15.8%
Metformin	1,220,000					18.7%	24.5%
Insulin – *Mixed Combinations*	930,400					14.3%	18.7%

** Complete list of availability in terms of monthly regimens by class or individual drug detailed in Appendix B, Table 3*

5.1.4 Summary

- In Jordan, all essential medicines for NCDs are registered and procured by the government; particularly for hypertension and CVD, the greatest burden of disease found in the population
- Generics comprised the vast majority of registered NCD medicines with local manufacturers dominating in this segment
- Public tendering as well as pricing of medicines is transparent in Jordan
- Several studies documented availability of medicines for NCDs in the public sector was limited among LICs and LMICs
- More recently and among urban Syrian refugees, only a minority reported unavailability of medicines in the public sector
- Availability in the private sector is higher, reflected by recent surveys among urban Syrian refugees, evidence from the PURE study and other literature; and is close to 80% among higher income countries and in urban settings, but also in lower income countries for CVD medicines
- Compared to MENA countries of the same income group, the Jordanian government spends relatively more on health than neighboring countries while the population has less out-of-pocket expenditure

- Fiscal space or the ability of a government to provide additional budgetary capacity for health without compromising its financial sustainability is a key consideration
- Government purchases of medicines (availability) seems sufficient for CVD and most likely hypertension as well as diabetes for oral glycemic-lowering medicines if 65% or fewer of the affected population accessed the public sector

5.2 Affordability

Affordability can be loosely defined as the ability to purchase a needed quantity of medicine without causing undue financial hardship.[1] The price of a medicine is only one aspect of affordability; even very low-priced generic medicines remain out of reach for many LIC and LMIC households.[30]

5.2.1 Quantitative findings and analysis

5.2.1.1 Private sector pricing

Given prices for all registered drugs are publicly available, the data was further analyzed to understand pricing variation among classes of drugs (if present or not) especially those with major market shares as well as to assess affordability.

As a class, statins comprised a sizeable market share of CVD drugs (*Appendix B, Table 4*) and exhibited a range of prices across products. Among 20mg statins, atorvastatin, pravastatin and rosuvastatin were priced at a higher level as compared to simvastatin, which was on average one third of the cost. Furthermore, 30 tablets of atorvastatin has a relatively wide pricing range among local manufacturers and across exported generic manufacturers – among local manufacturers, unit pharmacy prices ranged from 0.52 JD to a high of 0.69 JD; but the lowest unit price, 0.43 JD was from a foreign manufacturer. Thus, for a 30-day prescription, the difference between the lowest and highest price generic would be 10.2 JD. Prices were lower for bulkier quantities - atorvastatin 20mg supplied by Dar Al Dawa, sold and packaged as 10 tablets, was priced at 0.73 JD per tablet versus 0.67 JD and 0.60 JD for 30 and 500 tablets, respectively.

Among ACEIs and ARBs, which comprised 12.3% of the registered products for NCDs, enalapril and lisinopril had the majority of the share with median prices somewhat similar between the drugs (*Appendix B, Table 5*). The median unit price for ARBs was 0.25 JD from a low of 0.11 JD to a high of 0.58 JD. However, within drugs of the same dosage, little variation existed as exhibited by the narrow price range. Innovator drugs comprised 16.1% of all ARBs (*Appendix B, Table 6)*.

Apart from statins and FDC inhalers, insulin products were priced at a higher level as compared to other NCD drugs – particularly the "newer" rapid acting and long acting insulins (*Appendix B, Table 7*). All are branded medications, with the vials priced at a lower level; however, with only one product for each type, leaving few options. Among the eight NPH or isophane products registered, the biosimilar vial was priced at a slightly lower level but this was not the case for the pen-fills as compared to the brand drug (*Appendix B, Table 8*). Similarly, for the sixteen bronchodilator + steroid FDCs, pricing was relatively steep given that brands dominated, with a median patient price of 26.73 JD [range 4.22, 47.53 JD] (*Appendix B, Table 9*). Among the seven different selective serotonin reuptake inhibitors (SSRIs), median pharmacy prices ranged from a low of 0.13 JD for generic paroxetine 20mg to 0.85 JD for generic duloxetine 60mg. A one month's prescription would generate a difference between the drugs of 28.31 JD. Even within the same drug, e.g. escitalopram, wide variations in price among doses and between doses existed (*Appendix B, Table 10*).

5.2.1.2 Public sector pricing

Prices for publicly procured drugs can be compared to an international reference price (IRP)[44] as a measure of efficient purchasing power. The medicine price ratio (MPR) was calculated by taking the median unit price of publicly procured medicines and dividing by the international median unit buyer price for available medicines and adjusting for the 2016 currency rate.[39,45] Publicly procured drugs should ideally have an MPR ≤ 1.

Among drugs for hypertension or CVD, the median MPR ranged from 0.59 to 1.88 across statins, β-blockers, calcium channel blockers (CCBs), ACEIs and blood thinning medications *(Appendix B, Table 11*). Of note statins, had a MPR of 0.59 and amlodipine a MPR of 0.93. Although the median MPR was above one for the remaining classes, several classes had drugs that were below the MPR as noted by the 25% inter-quartile range for β-blockers and CCBs (0.78 and 0.71, respectively). It is noteworthy to mention that the absolute price differences for certain drugs are minimal; for example, bisoprolol 5mg tablets had a median JPD price of 0.0127 USD with the IRP actually higher at 0.0462 USD, but the absolute difference per unit is only 0.0335 USD. For diabetes, MPRs for insulin and metformin were competitively priced as were some sulfonylureas. However, most inhalers for asthma or COPD treatment as well as drugs for epilepsy were almost twice the IRP although some exceptions existed.

Previous studies have demonstrated the JPD is purchasing competitively, including a study conducted on behalf of UNWRA that used it as a benchmark to assess its purchasing power.[46] Given that JPD uses tenders and only one is awarded per product, brand drugs can be procured at most likely a greater cost and likely explains some of the results. Regardless, pooled purchasing does allow the government to exert increased buying power to acquire competitive pricing. However, there are some unintended consequences in pooling purchases; in the case of Jordan, the private sector is essentially subsidizing the public sector.[16,23] Manufacturers and suppliers can bid for tenders but to offset some of the "loss" from selling at lower prices; prices in the private sector are higher or target the maximum ceiling of 80% of the innovator drug. Others have suggested that pooling purchases disrupt normal competition by increasing market concentration of the same suppliers, for example.[47]

5.2.1.3 Price determinants – competition, generics, packaging

Increasing competition in the market can drive prices, as mentioned previously: among eight generic atorvastatin 20mg - 30 tablet products, a range of pricing exists both within local manufacturers and across manufacturers (includes products produced by foreign manufacturers), however smaller market shares like lisinopril 20mg with four different generics were all priced exactly the same (among 28 tablets packaging).

Jordan is mostly an export market[16] although local generic manufacturers dominate the NCD drug market share. This dominance is likely attributable to the Jordanian market being relatively small and therefore not attracting other larger generic manufacturers, as yet.[23,48] Increasing the share of generics in the market may not always result in more competitive or lower pricing; in Jordan, generics can take up to 80% of the innovator drug price and with the largely export market and benchmarking at country of origin, local manufacturers are not necessarily inclined to lower prices. As well with few foreign larger generic manufacturers present in Jordan, there is no guarantee that prices would decrease as the market can bear current prices. Lack of price transparency for patients and prescribers - so-called information asymmetry - is also a factor in maintaining high prices for medicines;[47] pricing data for medicines in Jordan is publicly available, but perhaps not readily.

There are some cost savings associated with larger packaged products; patient cost savings for a month's supply of atorvastatin 20mg, would be about 2.22 JD (3 packages of 10 tablets totals 28.62 JD, versus 26.4 JD for the 30-tablet package). The majority of registered drugs were available predominantly in weekly, bi-weekly or monthly quantities. For private pharmacies, likely these package sizes are easier for stock management, including reducing losses from expiry. For patients, monthly prescriptions may be convenient and more economical, as those with chronic

conditions can bring their (nearly) empty box and receive next month's prescription, foregoing any consultation fees[49], and the same product with the same packaging will be dispensed each time.

5.2.1.4 Affordability per lowest wage metric

Looking at prices in isolation fails to capture the fact that even low prices can still be cost prohibitive for certain households. Taking income or household expenditure into consideration is a much more reliable and a better indicator of affordability. The WHO/Health Action International (HAI) metric[50] for affordability was thus used, in which the lowest priced generic and brand price are divided by the wage of the lowest-paid unskilled worker. A ratio of greater than one days' wage for a 30-day supply of medicine defined unaffordability. For JFDA data, monthly costs for the lowest price generic price were determined by taking the patient price and dividing by the package size and then multiplying by the monthly regimen quantity (daily or twice daily, etc.). Monthly costs for brands were determined similarly. For the JPD data, the single product price was used. The lowest skilled daily wage (minimum wage) was determined by taking the monthly wage (220 JD)[51] and dividing by 30 days. Additionally, the JFDA database was filtered by the lowest daily wage affordability cut-off and then reviewed for monthly regimens to quantify number of affordable products.

Overall, almost one-third of registered individual drugs for NCDs were considered affordable in the private sector. Examining across specific classes, most were for hypertension or CVD including β-blockers, diuretics and some ACEIs and ARBs as well as oral medicines for diabetes including sulfonylureas and metformin *(Appendix B, Table 12)*. Insulin and inhalers for asthma or COPD were essentially unaffordable for private consumers as the majority were only available as brands; however, generics were also unaffordable at just over one days' wage for insulin and closer to almost two days' wage for inhalers.

In the public sector, the majority of drugs (123 or 76.9%) were affordable even if multiple drugs were prescribed. For example, two anti-hypertensive medicines + metformin + statin combined would be affordable at approximately 0.3 days' wage. Thirty-seven drugs were determined to be unaffordable (*Appendix B, Table 13*). Newer anticoagulation treatment such as rivaroxaban (Xarelto) both 15 and 30mg were the least affordable, at almost 8 days' wage. Essentially 50% (12 of 23) of inhaled products were unaffordable – including single agents as steroids, long-acting beta-2-(β2) agonists (LABAs) and bronchodilators as well as FDCs - with a median number days' wage of 2.9 [range 1.4, 4.9]. For treatment of diabetes, newer oral agents including repaglimide and dipeptidyl peptidase-4 (DPP-4) inhibitors were unaffordable at median number days' wage 1.5 [range 1.3, 2.8]; however only a few insulin products (pen-fills/cartridges) were unaffordable ranging from 2.0 to 2.5 days' wage. Some anti-epileptic drugs (e.g. topiramate, valproic acid) were unaffordable at number days' wage ranging from 1.1 to 2.7. Regardless, the basic essential medicines for NCDs are affordable in the public sector with few excluded from cost-effective treatment.

Public - private sector comparison

Fifteen products among various disease categories that were also known to be purchased by the JPD in 2016 were otherwise randomly selected for the public-private sector comparison (*Appendix B, Table 14*). Overall, the median days' wage for the lowest generic was 0.7 days' wage and 1.5 days' wage for brand in the private sector and in the public sector, the median days' wage was 0.1 days' wage (no distinction between generic or brand). Most striking are the vast absolute differences in sector affordability specifically for atorvastatin 40mg at 3.2 days' wage for the generic and 4.6 days' wage for the innovator. Similarly with levetiracetam 500mg, an absolute difference of 2.5 days' wage and 3.7 days' wage for generic and brand, respectively; lesser but significant was the insulin mixed 70/30 vial with an absolute difference of 1 and 1.3 days' wage.

Insulin and inhalers for asthma and COPD reflect relatively higher costs for consumers in both the public and private sectors as the majority are only available as innovator brands. Worldwide insulin affordability remains problematic ranging from 3.5 days' wages for human insulin to 9.5 days' wages for analogue insulin in the private sector;[52] affordability was better in Jordan, ranging from to 1.6 days' wages for human insulin to 3.8 days' wages for analogue insulin in the private sector. Among FDCs, close to 25% were determined to be affordable in the private sector. For treatment of diabetes, all thirteen sulfonylurea + metformin combinations were affordable based upon once daily dosing and for hypertension or CVD treatment, mostly combinations of ACEI/ARB/β-blocker/diuretic + diuretic were less than a days' wage (median 0.9 days' wage). Fewer FDCs were procured for the public sector with similar findings to those of the private sector.

5.2.1.5 Evidence from the literature

These findings are largely consistent with the previously mentioned study of availability and affordability of essential medicines to treat four NCDs. Based on median number of days' wage, buying the lowest-price generic in the public sector required no more than one days' wage except for some COPD and CNS medications in LMICs.[29] In the private sector, unaffordability of the lowest priced generic was only demonstrated among LMICs at 1.4 days' wage, but for brand medicines, the median number of days' wage was higher at 3.1, 3.8 and 2.4 among LICs, LMICs and UMICs, respectively.

Similarly the PURE study data analyses showed affordability (total monthly cost of medicines < 20% of households' monthly capacity to pay) among households of one to two blood-pressure lowering medications in LMICs and in UMICs.[30] The addition of metformin increased household-level unaffordability from 6% to 11%; and this rose to 22% if the lowest cost statin was added to two blood-pressure lowering medications in LMICs. Similarly in UMICs, the proportion of households that could not afford the addition of metformin to two blood pressure-lowering medications increased to 19%; with the addition of a statin, unaffordability among households rose to 26%. In the private sector in Jordan, the lowest priced β-blocker + diuretic would be affordable at 0.7 days' wage, adding metformin increases the cost to 0.9 days' wage, but adding a statin would increase the total cost to almost 3 days' wage.

Among 1550 urban Syrian refugee households surveyed in 2014, unaffordability of provider costs was the main reason 64.5% or 109 of 169 individuals did not seek health care the last time it was needed and the second ranked reason (39.8%) medicines were not obtained for 93 cases in those who sought care.[32] Specifically in Irbid governorate, among 2575 urban Syrian refugees interviewed, 68.1% needed health care, however 30.2% or 529 individuals did not seek it.[7] Unaffordability of provider costs was cited as the main reason in 66.6% or 352 individuals. Risk factors associated with not seeking care included: age (< 60 years less likely), gender (males less likely) and household economic status with the lowest two quintiles essentially 1.6 times less likely to seek care compared to the highest quintile. Having household debt was not a significant risk factor.

For Jordan specifically, annual out-of-pocket expenditure (OOPE) on health, adjusting for inflation, increased from 136 JD in 2008 to 215 JD in 2013.[53] Higher OOPE (461 JD) occurred among the richest quintile as compared to the poorest quintile (66 JD), and Amman, housing 42% of the population, had an OOPE of 327 JD. Medicines accounted for 62.5% of OOPE, with the poorest quintile spending a higher percentage compared to the richest quintile (69.4% versus 58.5%). Among refugees and vulnerable Jordanians, data collected from the 2017 CARE urban household survey showed that the largest expenditure was on rent and utilities. Average monthly OOPE on health ranged from about 20% in non-Syrian refugees, to 25% in Jordanians and 34% in Syrian refugees of income earned from work and that the large majority reported being in debt (*Table 4*).[8]

Table 4. Reported income and expenditure among urban refugees and vulnerable Jordanians in 2017

		Urban Syrian refugees	Other refugees	Jordanians
Main income source(s)	Work (%)	36.1	22	
	Assistance from (i)NGOs (%)	39.6	47	
Average income from work (JD)		176	169	195.2
Average rent support (JD)		178	167	
Expenditure (JD)		222	204	318.9
	Rent/utilities	*> 2/3 of work income*	164	125
Average monthly health expenditure (JD)		60	31	48
% Reporting debt		88.9	79.6	80.9
Amount of debt (JD)		694	1329	
% Unemployed		77.8		65

The capacity to pay without causing financial difficulty has huge implications for whether a household can afford medicines or other commodities, even in instances where medicines appear to be inexpensive. In India, for example where medicines are widely available, unaffordability of 23% was reported even with one blood pressure lowering medication, as compared to other LICs in which unaffordability was 17%. This finding was explained by not only the relatively higher price of medicines in India compared to other LICs, but also the lower capacity to pay.[30]

5.2.2 Prescriber and consumer (patient) behavior

In Jordan, prescribing behavior is heavily influenced by suppliers as well as local manufacturers who employ *(deploy)* sales representatives targeting doctors and pharmacists.[10,15,16,24] Pharmaceutical promotion is highly unregulated and most continuing education in the private sector is sponsored and organized by the pharmaceutical industry.[20] While NCD guidelines exist for hypertension and diabetes, they date back to 2010 and adherence is questionable. A rational drug list has been in existence since 2006 and is used for procurement of drugs in the public sector; however, concerns include conflict of interests and limited accountability of members, with these issues not managed by the committee deciding on the selection of drugs.[54] Additionally, the 2016 NHA report[20] identified provider prescribing behavior as one of the major reasons behind pharmaceutical spending in Jordan. In addition to citing diverse medical background in terms of level of training for physicians and pharmacists, the lack of effective regulatory pharmaceutical policies are to blame.

Pharmacists in private pharmacies can influence the market and pricing downstream, with a 26% fixed markup and presumably profit; they potentially can earn more selling higher priced or brand drugs and may have little incentive to recommend generics.[16,28] Relationships between suppliers and pharmacies also presumably change price determinants; in some cases manufacturers opt to deal directly with pharmacies to cut out the middleman and keep costs down.[16,24] As demonstrated among certain categories of drugs, there were wide price variations and choices, as is in the number and types of SSRIs, statins and ARBs. Although discouraged via routine visits by the JFDA,[49] pharmacies do give concessions to regular customers; pharmacies often receive bonuses (additional quantities of products free of charge) from suppliers and/or manufacturers; ultimately private pharmacies, suppliers and local manufacturers need to turn a profit in order to remain in business.

Health seeking behavior of consumers is also potentially responsible for high pharmaceutical expenditures in Jordan.[20] Specifically the practice of self-medication is one concern, where patients refer themselves to pharmacies for care and pharmacists in turn prescribe higher priced drugs; thus, behavior and expectations need to be managed. The availability of innovator drugs is likely linked to prescriber as well as individual behavior, including low

acceptance of generics; and preference for brand over generic or for newer items in place of other more affordable or cost-effective medicines. Psychological factors can result in individuals equating price with quality, creating a barrier to using generic medicines and potentially more affordable treatment.[47] Current laws in Jordan do not allow for automatic generic substitution. The same is true in the United Kingdom, yet there, generic prescribing is common, given both financial incentives and the provision of information for physicians on the impact of cost-savings.[47] Rather, arguments can be made for encouraging generic prescribing even where competent staffing disfavors automatic substitution. Several small studies conducted in Jordan indicate support for generic substitution by patients and prescribers, but with caveats – prescribers wanted to be informed prior to substitution and patients preferred to be informed of cheaper alternatives but retain the option to choose.[55,56]

Among urban Syrian refugees in Irbid governorate, affordability was cited as a barrier to accessing health care, yet individuals still sought care in private facilities - 42.2% of 1223 individuals received care in a private clinic or hospital, 28.4% in the public sector and 25.3% in the NGO sector.[7] In a separate survey among urban Syrian refugees, although 51.5% sought care in public facilities, 38.7% used private facilities, with lower socioeconomic quintiles defined by expenditure more likely to seek public sector care. Compared to the care seekers in the North, residents of southern Jordan were 7.8 times (CI: 1.83, 33.23) more likely to use public sector facilities versus in central Jordan (Amman) who were twice as likely to use the private sector.[32] Among Syrian refugees and vulnerable Jordanians respondents, perceived better quality of treatment, personal preference as well as the only health facility in the area were cited as reasons they sought private sector care.[7,8]

5.2.3 Summary

- In the private sector, prices are relatively fixed but pricing variability among and between classes is present
- The pharma sector is intricately linked to available prices in Jordan given competition for market share, profitability (generics can take up to 80% of the innovator drug price) and managing its predominantly export market
- The Jordanian pharma market is relatively small and does not attract larger foreign manufacturers, possibly limiting competition
- Competitive pricing (comparable to international reference prices (IRPs)) exists for the majority of NCD drugs procured by the government
- The majority of NCD medicines were affordable (less than one days' wage) in the public sector, including if multiple drugs were prescribed for hypertension, CVD and/or diabetes
- Overall almost one-third of individual drugs for NCDs are affordable in the private sector - mainly among medicines for hypertension or CVD and oral medicines for diabetes and largely consistent with findings in the literature
- Insulin and FDC inhalers for asthma or COPD were largely unaffordable across both sectors reflected by the predominance in branded drugs
- Capacity to pay without causing financial hardship has huge implications on whether a household can afford medicines or other commodities even in instances where medicines appear to be relatively inexpensive
- Affordability of provider costs is the main barrier for seeking and receiving health care in a minority of the population and is most likely linked to capacity to pay (the majority of the population reported debt)
- Prescriber and consumer (patient) behavior plays an integral role in affordability with prescribers recommending less cost-effective options given little incentive to do otherwise and consumers preferring to self-medicate and/or seek private care or brand drugs

5.3 ACCESSIBILITY

Accessibility is essentially the ability to access medicines when needed.[1] Jordan has 110 hospitals and a range of facilities in the public and private sector, where staffing levels are close to regional standards *(Table 5).*[3,19,37] Prior to 2016, Jordan exceeded the global average for UMICs for physician density, with 16.1 per 10,000 population.[57] The decline to 14.1 per 10,000 population since 2016 is most likely two-fold; physician attrition given its labor market is inclusive of Saudi Arabia and Gulf states, and the Syrian refugee influx.[17,19]

Table 5. Health service delivery and workforce for selected MENA countries by World Bank income group – 2016 data

		Personnel per 10,000 population	
World Bank income group	**Hospital beds per 10,000 population**	Physicians	Nurses and midwifery
Iraq (UMIC)	13	8.4	19.4
Jordan (UMIC)	**14**	**14.1**	**18.9**
Lebanon (UMIC)	27.3	31	34.2
Saudi Arabia (HIC)	22.3	23.9	57.0
Syria (LMIC)	14.6	12.2	14.6
Yemen (LMIC)	7.1*	3**	7.3**

** 2013 data; ** 2014 data*

Geographically, Jordan is a small country with a functioning infrastructure; thus transportation and physical access to healthcare are unlikely to be substantial impediments.[16] In fact, Jordan's MoH states that every citizen is within a 30-minute driving distance to one of its hospitals.[19] Physical accessibility is an issue for a minority of refugee populations, in which it is reported some seek private sector care due to no public health facility in the area (and thus compounding the affordability issue), but also due to affordability of provider fees and medicine or transportation costs.[7,8,32]

An analysis of survey data collected from 2008 to 2010 assessed factors associated with accessibility of chronic disease medicines among five LICs and LMIC.[58] It documented that about half of individuals surveyed in Jordan during 2010 (n=583) had access to medications to treat chronic disease compared to the Philippines (38%), Ghana (35%) and Kenya (33%). Predictors of having access to medicines included having some insurance coverage or obtaining medicines free-of-charge and for three of the surveyed countries (Ghana, Kenya and Jordan) living in the capital city. Yet, living within 15 minutes of a public healthcare facility increased the likelihood in Uganda and the Philippines, but not for individuals in Jordan who were 20% less likely to access medicines for chronic disease.

It is noteworthy to mention that accessibility does not mean that the most appropriate medicines are at hand. In fact, accessibility has "largely trumped" appropriate use according to one report largely because there is no ownership and stakeholders often have vying objectives or incentives.[59]

5.3.1 Summary

- Jordan nears regional standards in health service delivery and workforce metrics, yet considerably lower than Lebanon
- With regard to geography and infrastructure – limited if any barriers exist to accessing health care
- Accessibility is a barrier for a minority of refugee populations seeking care due to lack of public facility or costs associated with provider fees, medicines or transportation

- Survey data from 2008 to 2010 among five lower income countries documented low accessibility to medicines for treating chronic disease; Jordan was the highest at about 50% of individuals accessing medicines
- Accessibility does not imply that medicines are appropriate or being used correctly

6. PREVENTION

Four of the nine global voluntary targets comprising WHO's global action plan for the prevention and control of non-communicable diseases are modifiable behavioral risk factors.[60] For Jordan in particular, the importance of prioritizing prevention should be emphasized on two levels - in the health sector, to improve resource utilization and costs incurred; and for individuals, to potentially reduce morbidity and mortality and decrease out-of-pocket expenditure on health.

In terms of risk factors, Jordan has very high levels of modifiable behavioural risk factors as compared to global averages as well as levels in other MENA countries.[35] Jordanian men smoke at a rate of almost twice the global average, with a prevalence of 63.6%. Prevalence of obesity among Jordanians and Syrians is also above the global average, especially for women, where obesity prevalence is close to 40% for Jordanians and 30% for Syrians, as compared to the global average of 15.2%. Additionally, 2016 global burden of disease (GBD) data for Jordan indicates the risk factors driving the most death and disability included high-body mass index (ranked number one), dietary risks (ranked four) and tobacco (ranked six); for Syrians, the number one ranked factor was dietary risks, followed by high-body mass index ranked third and tobacco ranked fifth.[5,6]

In terms of healthcare resource utilization, among urban Syrian refugees surveyed in the 2016 MSF study, joint pain was the second main reason that males (124 among 673 adult men), and fourth main reason that females (145 among 1080 adult women), sought care.[7] Additionally, the GBD data profile on Syria and Jordan, ranked low back and neck pain as the number one health problem causing disability, with other musculoskeletal problems ranked tenth for Syrians and eighth for Jordanians.[5,6] There most likely exists a link between these health problems and the prevalence of obesity.

The MoH has a separate budget for smoking cessation and health awareness campaigns and it has been recommended that it broaden use of primary care to harness behavior change communication as well as take greater ownership for prevention.[19] Fiscally, spending more money on preventing chronic disease is the best way to reduce curative care costs. Evidence for increasing or establishing excise or so-called "sin" taxes on unhealthy consumer products such as tobacco and high-sugar drinks have demonstrated value, additionally increasing fiscal space towards attaining universal health coverage.[19,35]

Finally, coming back to affordability, the latest population and housing census data from 2015, indicates that annually, Jordanians across all governorates are spending more on tobacco than medical expenses - almost double or more (except in Amman) (*Table 6*).[40] Additionally, with increasing household size, the average annual expenditure on tobacco increased (from 215.1 JD in households of 1 to 2 up to 871.8 JD in households of > 15) with no correlation in medical expenses (increase or decrease).

Table 6. Average annual household income and expenditure by region (2013 data)

	Income (JD)			Expenditures (JD)				
	Total	***From* employment**		**Total**	**Tobacco & cigarettes**		**Medical care**	
			% of total		Total	% of work income	Total	% of work income
Kingdom	9258.0	4326.2	46.7	10251.6	480.7	11.1	214.6	4.9
Urban	9447.2	4367.5	46.2					
Rural	8331.3	4123.9	49.5					
Amman	10716.1	4613.9	43.1	12078.6	466.8	10.1	327.2	7.1
Irbid	9009.0	4064.4	45.1	9616.4	492.1	12.1	137.4	3.4
Mafraq	7749.8	3982.5	51.4	8516.0	427	10.7	118.8	2.9

7. LIMITATIONS

As previously alluded to, while household surveys provide a wealth of information, they can be limited in terms of methodology. The health access and utilization surveys may be subject to recall bias influencing responses. The validated instruments used in several studies to assess availability and affordability visited only one pharmacy for product availability and may not be representative of actual availability. We did not use the "gold-standard" approach to assess availability and affordability, but rather a more pragmatic one by using existing in-country health system data. We included most major NCDs but not cancer. Some of the literature referenced for comparisons were dated. Additionally, calculations for affordability using data from the JFDA and JPD relied on standard dosing regimens that may not necessarily reflect reality. For example, individuals could be prescribed treatment more frequently or in higher dosages. WHO's global action plan for prevention and treatment of NCDs, sets a voluntary global target of achieving availability of affordable essential medicines to treat major NCDs in both public and private facilities at 80%[60] – unfortunately our investigation did not simultaneously examine availability and affordability, yet it still provides a current snapshot of progress towards this goal.

8. CONCLUSIONS

Overall accessibility to medicines for major NCDs in Jordan is relatively high with a minority of the population not accessing treatment mainly due to affordability (predominantly provider costs, but also medicines and transportation costs). This is most likely linked to capacity to pay given expenditures exceed income among urban refugees and Jordanians and while, debt was not a factor in not seeking care in one study, the majority of the population report debt. It is imperative to understand that prices of medicines cannot be examined in a vacuum.

Jordan has sufficient healthcare resources and government expenditure on health exceeds that of many MENA countries of the same income group. Overall, all WHO essential drugs (oral plus insulin) for the specified NCDs are registered with the JFDA and the majority are being procured at competitive prices (comparable to the international reference price (IRP)) by the government. Public tendering as well as pricing of medicines is transparent in Jordan. In the private sector, prices are essentially fixed by law, but heavily influenced by the pharma sector whose priorities lie with profitability and in general, the predominant export market. There is essentially limited to no space for external influence.

According to the literature, in general among lower income countries investigated, public sector availability of medicines for NCDs was limited. However, only a minority of urban Syrian refugees reported unavailability of medicines in the public sector. According to the same literature, availability in the private sector is higher and close

to 80% among higher income countries and in urban settings, but also in lower income countries for CVD medicines. These findings should hold true for Jordan.

The majority of NCD medicines were determined to be affordable (less than one days' wage) in the public sector including if multiple drugs were prescribed for hypertension, CVD and/or diabetes. Affordability in the private sector is predominantly among medicines for hypertension or CVD and oral medicines for diabetes; notable exceptions include insulin, FDCs for inhalers as well as statins. Higher costs can be attributable in part to personal prescriber practices and consumer preferences.

Risk factors for NCDs among Jordanians and Syrians surpass global averages, driving disability and death. While affordability comes through as the main obstacle in accessing health care, annually Jordanians are spending more on tobacco than medical expenses.

9. CONSIDERATIONS for humanitarian and other implementing organizations

- Prior to engaging in NCD interventions, evaluation of the existing health system is key to determining how to plan (if at all), where along the continuum of NCD care the focus of the response should be and whom to target.
- Programming details and operational costs need to factor procurement options, as there may be governmental requirements for local and/or international sourcing.
- Prevention possibilities should be reviewed in relation to NCDs given known impact on reducing death and disability.

10. REFERENCES

1. *Wirtz VJ, Kaplan WA, Kwan GF, et al. Access to medications for cardiovascular diseases in low- and middle-income countries. Circulation.2016;133:2076-85*

2. *https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups [accessed 29 May 2018]*

3. *http://apps.moh.gov.jo/reports/headermain.jsp?print_parameter=yes&lang_parameter=english [accessed 3 May 2018]*

4. UNHCR. https://data2.unhcr.org/en/situations/syria/location/36. Accessed 3 May 2018.

5. *Institute for Health Metrics and Evaluation (IHME); http://www.healthdata.org/jordan [accessed 17 April 2018]*

6. *Institute for Health Metrics and Evaluation (IHME); http://www.healthdata.org/syria [accessed 30 May 2018]*

7. *Médecins sans Frontières (MSF). Health service access survey among non-camp Syrian refugees in Irbid governorate, Jordan. Jan 2017 (unpublished)*

8. *CARE. "Seven years into exile – How urban Syrian refugees, vulnerable Jordanians and other refugees in Jordan are being impacted by the Syria crisis". June 2017. [Online]. Available: https://www.care-international.org/files/files/publications/7_years_into_exile_CARE_Jordan_Syrian_refugees_Summary.pdf [accessed 20 March 2018]*

9. *Jordan Food and Drug Administration (JFDA). Drug pricing guidelines for the year 2016. The Official Gazette. Issued in session No. 39; 29 Dec 2015*

10. *Sabbagh Drug Store, Quality Assurance Manager, Regulatory Department – Co-leader. Personal communication. 26 March 2018*

11. *Dar Al Dawa (DAD) Development & Investment, Tender supervisor. Personal communication. 21 Mar 2018*

12. *Joint Procurement Department, General Director. Personal communication. 27 March 2018*

13. *Joint Procurement Department. https://jordan.gov.jo/wps/portal/Home/GovernmentEntities/Ministries/Ministry/Ministry%20of%20Health/Joint%20Procurement%20Department?nameEntity=Joint%20Procurement%20Department&entityType=sub. [accessed 5 March 2018]*

14. *Joint Procurement Department. http://www.jpd.gov.jo/Pages/viewpage.aspx?pageID=63. [accessed 28 March 2018]*

15. *Hikma, Sales and marketing director, Lebanon and Jordan markets. Personal communication. 26 March 2018*

16. *Conesa S, Yadav P, Bader R. Analysis of the pharmaceutical supply chain in Jordan. 2009. https://pdfs.semanticscholar.org/d7cc/3b3fd906dfac2347deb764b5a6526a7c7805.pdf. [accessed 5 Mar 2018]*

17. *The national strategy for health sector in Jordan 2015-2019. http://www.hhc.gov.jo/uploadedimages/The%20National%20Strategy%20for%20Health%20Sector%20in%20Jordan%202015-2019.pdf. [accessed 7 March 2018]*

18. *The Jordanian Health Sector report. 2012. http://inform.gov.jo/Portals/0/Report%20PDFs/3.%20Strategic%20Sector%20Development/ii.%20Healthcare&Pharmaceuticals/2012%20Sep%20Jordinvest-Jordanian%20Health%20Sector.pdf. [accessed 4 March 2018]*

19. *United States Agency for International Development (USAID) (prepared by DAI). Jordan public expenditure perspectives. 2015*

20. *Jordan National Health Accounts 2013, Technical Report No. 6. April 2016*

21. *http://reporting.unhcr.org/sites/default/files/UNHCR%20Jordan%20Factsheet%20-%20February%202018.pdf [accessed 5 March 2018]*

22. *Jordan Food and Drug Administration. http://www.jfda.jo/Default.aspx. [accessed 2 March 2018]*

23. *Jordanian Association of Pharmaceutical Manufacturers (JAPM), Secretary General. Personal communication. 25 April 2018*

24. *United Pharmaceuticals Manufacturing (UPM), Sales Director. Personal communication. 26 March 2018*

25. *http://services.jfda.jo/JFDA/DBLogin/DBLogin.aspx [accessed by MENA pharmacist, 2017]*

26. *http://www.who.int/medicines/publications/essentialmedicines/20th_EML2017_FINAL_amendedAug2017.pdf [accessed 16 Apr 2018]*

27. *WHO/HAI. Measuring medicine prices, availability, affordability and price components, 2nd edition. 2008*

28. *Medicine prices, availability and affordability in Jordan. Report of a survey conducted in 2004 in Amman, Irbid, Zarqa and Karak using the WHO/HAI price measurement methodology. 2007; http://apps.who.int/medicinedocs/documents/s17749en/s17749en.pdf [accessed 5 March 2018]*

29. *Ewen M, Zweekhorst M, Regeer B, Laing R. Baseline assessment of WHO's target for both availability and affordability of essential medicines to treat non-communicable diseases. PLoS ONE. 2017;12(2):e0171284*

30. *Attaei MW, Khatib R, McKee M, et al., Availability and affordability of blood pressure-lowering medicines and the effect on blood pressure control in high-income, middle-income, and low-income countries: an analysis of the PURE study data. Lancet Public Health 2017;2:e411-19*

31. *Khatib R, McKee M, Shannon H, et al., Availability and affordability of cardiovascular disease medicines and their effect on use in high-income, middle-income, and low-income countries: an analysis of the PURE study data. Lancet Public Health 2016;387:61-69*

32. *Doocy S, Lyles E, Akhu-Zaheya L, et al. Health service access and utilization among Syrian refugees in Jordan. Intl J Equity in Health. 2016;15:108*

33. *Wirtz VJ, Moucheraud C. Beyond availability and affordability: how access to medicines affects non-communicable disease outcomes. Lancet. 2017;2:e390-91*

34. *Powell-Jackson T, Hanson K, McIntyre D. Fiscal space for health: a review of the literature. Resilient and responsive health systems (RESYST) working paper 1; 2012*

35. *Asbu EZ, Masri MD, Kaissi A. Health status and health systems financing in the MENA region: roadmap to universal health coverage. Global Health Research and Policy. 2017; 2:25*

36. *http://apps.who.int/nha/database/ViewData/Indicators/en; [accessed 29 May 2018]*

37. *World Health Organization. Eastern Mediterranean Region: Framework for health information systems and core indicators for monitoring health situation and health system performance. 2017*

38. *https://data.worldbank.org/indicator/NY.GDP.MKTP.CD [accessed 29 May 2018]*

39. *https://www.xe.com/ [accessed 4 June 2018]*

40. *http://localhost/dos2017/censuses/population-and-housing/population-and-housing-2015/ [accessed 3 May 2018]*

41. *International Diabetes Federation. IDF Diabetes Atlas, 7th edn. Brussels, Belgium: International Diabetes Federation, 2015. http://www.diabetesatlas.org*

42. *Ikeda N, Sapienza D, Guerrero R, et al. Control of hypertension with medication: a comparative analysis of national surveys in 20 countries. Bull World Health Organ 2014;92:10–19C*

43. *Roth GA, Johnson C, Abajobir A, et al. Global, Regional, and National Burden of Cardiovascular Diseases for 10 causes, 1990 to 2015. JACC 2017;70(1):1-25*

44. *http://mshpriceguide.org/en/drug-search-page-2/ [accessed 30 April 2018]*

45. *WHO EMRO/HAI. Medicine prices, availability, affordability, and price components: a synthesis report of medicine price surveys undertaken in selected countries of the WHO Eastern Mediterranean Region. Egypt: WHO Eastern Mediterranean Regional Office; 2008*

46. *Ewen M, Sakit MA, Saadeh R, et al. Comparative assessment of medicine procurement prices in the United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNWRA). J of Pharmaceutical Policy and Practice 2014;7:13*

47. *Kaplan W, Wirtz V, Nguyen A, et al. Policy options for promoting the use of generic medicines in low-and middle-income countries. HAI 2016*

48. *MSF/OCA- APU, Tactical procurement officer. Personal communication. 19 April 2018.*

49. *Local private pharmacy, Pharmacist. Personal communication. 17 April 2018*

50. *http://www.who.int/medicines/areas/access/OMS_Medicine_prices.pdf [accessed, 9 April 2018]*

51. *http://www.jordantimes.com/news/local/gov%E2%80%99t-raises-minimum-wage-hikes-taxes-tobacco-telecom-services [accessed 18 Apr 2018]*

52. *Beran D, Ewen M, Lepeska M, et al. Access to insulin: current challenges and constraints. Mar 2017. http://haiweb.org/wp-content/uploads/2017/03/Issues_Paper_2017.pdf*

53. *High Health Council. Policy Brief – Health spending in Jordan. UNICEF 2016*

54. *WHO. Measuring transparency to improve good governance in the public pharmaceutical sector in Jordan. WHO Eastern Mediterranean Regional Office; 2009.*

55. *El-Dahiyat F, Kayyali R, Bidgood P. Physicians' perception of generic and electronic prescribing: a descriptive study from Jordan. J of Pharmaceutical Policy and Practice 2014;7:7*

56. *El-Dahiyat F, Kayyali. Evaluating patients' perceptions regarding generic medicines in Jordan. J of Pharmaceutical Policy and Practice 2013;6:3*

57. *http://apps.who.int/gho/data/view.main.92100 [accessed 6 June 2018]*

58. *Vialle-Valentin CE, Serumaga B, Wagner AK, et al. Evidence on access to medicines for chronic diseases from household surveys in five low- and middle-income countries. Health and Policy Planning 2015;30:1044-52.*

59. *Wirtz VJ, Hogerzeil HV, Gray AL, et al. Essential medicines for universal health coverage. Lancet 2017;389:403-76.*

60. *World Health Organization. Global action plan for the prevention and control of non-communicable diseases 2013-2020. Geneva: World Health Organization, 2013*

11. APPENDICES

Appendix A

Box 1

JFDA pricing laws[a]

- Price of *originator* (innovator) drug is the lower of 4 benchmarks:
  a. Export price (manufacturer listed invoice price)
  b. Public price in country of origin – VAT & wholesaler/pharmacy profits + shipping, bank charges, insurance, clearing & inland transportation costs
  c. Median public price from the following 17 countries: Britain, France, Spain, Italy, Belgium, Greece, The Netherlands, Australia, Cyprus, Hungary, Ireland, New Zealand, Portugal, Czech, Croatia and Austria
  d. Public price in Saudi Arabia
- Price of *generic* (branded generic) drug; essentially as above AND requested price cannot exceed 80% of the price of originator drug

a. *Jordan Food and Drug Administration (JFDA). Drug pricing guidelines for the year 2016. The Official Gazette. Issued in session No. 39; 29 Dec 2015*

Box 2

Jordan Food & Drug Administration (JFDA) data

The 2017 dataset listed all drugs and other items such as herbals, cosmetics, drugs, vaccines, infant formula, etc. per product with details on name brand, dosage, supplier and manufacturer information as well as price; price reflected: (1) pharmacy obtained price; (2) patient price – a fixed 26% markup; and (3) patient price including tax– fixed 4% tax(with the exception of insulin, all drugs are taxed).

Data was first filtered on "List Class Specification" for drugs to obtain the working dataset. Local manufacturers were identified and coded accordingly. Drugs were classified as a NCD drug largely based on the 2018 MSF NCD programmatic and clinical guidelines[b] for asthma, chronic obstructive pulmonary disease (COPD, diabetes, hypothyroidism or hyperthyroidism, epilepsy, cardiovascular disease (CVD), hypertension and psychiatric illnesses (depression, psychosis). Drugs for treatment of cancer, pain (e.g. non-steroidal anti-inflammatory drugs (NSAIDs) or gastrointestinal illnesses including proton pump inhibitors (e.g. omeprazole) H2 blockers (e.g. ranitidine), atypical antipsychotics (except risperidone) or benzodiazepines were not included); insulin was the sole injectable drug included in the analysis. Newer drugs for example, Dipeptidyl peptidase-4 (DPP-4) inhibitors (gliptins) for treatment of diabetes were included as were fixed-dose combinations (FDCs); other drugs used for chronic conditions specified were also included, e.g. amiodarone, aminophylline.

Each product was coded either as brand or generic drug. FDCs were identified and coded accordingly. Each product was also coded by disease category (CVD and hypertension were grouped as one as were asthma and COPD) and within categories by drug type, e.g. beta (β)-blocker, statin, insulin, etc. Detailed analyses were executed on categories of drugs to demonstrate and understand larger market share categories, supplier and manufacturer competition and pricing. Median unit price was calculated by dividing the pharmacy price by package size over the same drug and strength; taking the low and high values to determine the range. Innovator drugs were excluded from the median unit price calculations.

Joint Procurement Department (JPD) data

The 2016 JPD dataset acquired had single entries for individual drugs categorized by disease category with total quantities purchased, mean unit price of purchase and total value of purchase. For example, atenolol 50mg tablets were listed under *"Cardiovascular System Drugs"* with a *total quantity of 12,555,000 tablets* purchased for an *average price of 0.007 Jordanian Dinar (JD)* per tablet. Only JFDA registered drugs were purchased and only either innovator brand or generic per item. Affordability was determined using the number of days' wage metric as per the JFDA analyses.

b. Médecins sans Frontières (MSF). Non-communicable diseases – Programmatic and clinical guidelines; 2018 (version3)

Appendix B.

Table 1. *Essential medicines for major NCDs registered by disease category and pharmacologic class (only major class shares listed for individual drugs)*

Disease category with pharmacologic class	n=1155 (%)
Hypertension or CVD	**n=606 (52.5)**
• Diuretics - furosemide; spironolactone; hydrochlorothiazide (HCTZ)	31 (5.2)
• Beta (β)-blockers - bisoprolol (21); atenolol (19); carvedilol (9); 5 others (10)	59 (9.7)
• Angiotensin-converting enzyme inhibitors (ACEIs) - enalapril (24); lisinopril (24); 7 others (38)	86 (14.2)
• Angiotensin II receptor blockers (ARBs) - valsartan (27); 6 others (29)	56 (9.2)
• Statins - atorvastatin (40); rosuvastatin (27); 4 others (27)	94 (15.5)
• Calcium channel blockers (CCBs) – amlodipine (28); nifedipine; diltiazem; verapamil; 2 others	51 (8.4)
• Other – Fibrates/lipid lowering (10); vasodilators/anti-anginal agents (23); anti-coagulants (11); anti-platelet aggregates (24); amiodarone, digoxin, other anti-hypertensives including methyldopa (19)	107 (17.7)
• FDCs - 10 varying combinations; diuretic + ACEI, ARB, β-blocker or other diuretic (65); CCB +ACEI, ARB or statin (37); triple combination – ARB + CCB + diuretic (15)	122 (20.1)
Diabetes	**n=187 (16.2)**
• Sulfonylureas - glimepiride (44); glibenclamide (13); 3 others (10)	67 (35.8)
• Metformin *500 to 1000mg*	40 (21.4)
• Other - pioglitazone; empagliflozin (competitive inhibitor of sodium-glucose co-transporter 2 (SGLT2)); repaglinide (meglitinide); Dipeptidyl peptidase-4 (DPP-4) inhibitors (gliptins) (5) - linagliptin, saxagliptin, sitagliptin, vildagliptin	18 (9.6)
• Insulin - (vials, cartridges or penfills) *Fast-acting* - lispro, regular, aspart; *long-acting* - isophane, detemir, glargine; *mixed combinations*	37 (19.8)
• FDCs - metformin + sulfonylureas (13), + DPP-4 inhibitors (10)	25 (13.4)
Asthma or COPD	**n=105 (9.1)**
• Steroids (oral & inhaled) - prednisolone (oral); beclomethasone, fluticasone, budesonide, mometasone	19 (18.1)
• beta-2-(β2) agonists short-acting (SABA) - salbutamol oral & inhaled (20) & long-acting (LABA) – (10) salmeterol, formoterol, indacaterol	30 (28.6)
• Other – bronchodilators (22) - theophylline, ipratropium, tiotropium & terbutaline; montelukast (18)	40 (38.1)
• FDCs – SABA + bronchodilator; LABA + bronchodilator or steroid	16 (15.2)
Epilepsy	**n=99; (8.6)**
• Carbamazepine (17); valproic acid or sodium valproate (17); levetiracetam (25); phenytoin or phenobarbital (5)	64 (64.6)
• Other - lamotrigine (23); topiramate (6); oxcarbazepine (4); lacosamide (2)	35 (35.4)
Psychiatric illnesses (includes treatment for extra-pyramidal symptoms (EPS))	**n=148; (12.8)**
• Tricyclic antidepressants (TCAs) – amitriptyline, imipramine	10 (6.8)
• Selective serotonin reuptake inhibitors (SSRIs) - citalopram (14); escitalopram (13); fluoxetine (19); sertraline (10); 3 others (9)	65 (43.9)
• Antipsychotics - risperidone (55), 2 others (6)	73 (49.3)
• Trihexyphenidyl (treatment of EPS) (12)	
Thyroid disease (hypo- or hyper)	**10 (0.87)**
• Carbimazole (2)	10 (100)
• Levothyroxine *25, 50, 100, or 150 micrograms (mcg)* (8)	

Table 2. *Essential medicines for major NCDs purchased by the JPD for the public sector by disease category and pharmacologic class*

Disease category with pharmacologic class	n=160 (%)
Hypertension or CVD	**n=67 (41.9)**
• Diuretics - furosemide; spironolactone; hydrochlorothiazide (HCTZ); indapamide	5
• Beta (β)-blockers – bisoprolol, atenolol, carvedilol, metoprolol, nebivolol, propranolol, betaxolol	11
• Angiotensin-converting enzyme inhibitors (ACEIs) – enalapril, captopril	9
• Angiotensin II receptor blockers (ARBs) - valsartan, candesartan	
• Statins – atorvastatin; simvastatin; rosuvastatin; fluvastatin	6
• Calcium channel blockers – amlodipine, nifedipine, diltiazem, verapamil	8
• Other - Fenofibrate, gemfibrozil; vasodilators/anti-anginal agent (ISDN, trimetazidine); anti-coagulants (warfarin, rivaroxaban, dabigatran); anti-platelet aggregates (acetylsalicylic acid, clopidogrel, dipyridamole, ticagrelor); anti-arrhythmics (amiodarone, flecainide); digoxin; other anti-hypertensives (methyldopa, moxonidine)	23
• FDCs - diuretic + ARBs, diuretic + diuretic	5
Diabetes	**n=28 (17.5)**
• Sulfonylureas – glimepiride (5), glibenclamide, gliclazide	9
• Metformin *500 to 1000mg*	3
• Other - repaglinide (meglitinide); DPP-4 inhibitors - saxagliptin, sitagliptin, vildagliptin	5
• Insulin - (vials, cartridges or penfills) *fast-acting* (4)– lispro, regular & aspart; *long-acting* (3) - isophane, detemir, glargine; *mixed combinations* (4) (70/30 isophane/human & 70/30 aspart, 50/50 lispro)	11
Asthma or COPD	**n=27 (16.9)**
• Steroids (oral & inhaled) - prednisolone (oral); beclomethasone, fluticasone, budesonide, mometasone	9
• beta-2-(β2) agonists short-acting (SABA) - salbutamol oral & inhaled (4) & long-acting (LABA) – formoterol (2), indacaterol (2)	8
• Other – bronchodilators- theophylline, ipratropium, tiotropium, glycopyronium	4
• FDCs – SABA (1), LABA (4) with steroid; bronchodilator + LABA	6
Epilepsy	**n=23 (14.4)**
• Carbamazepine (4), valproic acid or sodium valproate (7), levetiracetam (2), phenytoin or phenobarbital (4)	17
• Others - lamotrigine (3), topiramate (3)	6
Psychiatric illnesses (includes treatment for extra-pyramidal symptoms (EPS))	**n=12 (7.5)**
• Tricyclic antidepressants (TCAs) – amitriptyline, imipramine	3
• Selective serotonin reuptake inhibitors (SSRIs) – citalopram, fluoxetine, fluvoxamine, paroxetine	5
• Antipsychotics - risperidone, haloperidol	4
Thyroid disease (hypo- or hyper)	**n=3 (1.9)**
• carbimazole, levothyroxine *(50, 100 micrograms only)*	3

Table 3. *Total monthly doses purchased for the public sector by class or drug with standard dosing regimens*

Drug class or individual drug	Dosing regimen	Total monthly doses
Beta (β)-blockers - *all*	Once daily; *except carvedilol twice daily; propranolol three times daily*	1,832,156
- Bisoprolol *only*	5 & 10mg once daily	904,900
ACEIs *only (no FDCs)*	Once daily; *except captopril - twice daily*	1,721,937
ARBs *only (no FDCs)*	Once daily	440,333
Diuretics	Once daily; *including FDC - diuretic + diuretic*	1,244,400
- Furosemide *only*	40mg once daily	850,000
Calcium channel blockers	Once daily; *except - diltiazem & verapamil (non-SR) - three times daily; nifedipine retard - twice daily*	1,086,037
- Amlodipine *only*	5mg once daily	888,000
Statins - *all*	Once daily	1,794,533
- Atorvastatin *only*	20 & 40 mg once daily	886,667
- Simvastatin *only*	20mg once daily	894,667
Acetylsalicylic Acid *(aspirin)*	100 mg once daily	1,023,333
Sulfonylureas	Once daily	785,900
- Glimepiride	1, 2, 3, 4 or 6mg once daily	745,133
Metformin	Twice daily	1,220,000
Insulin - fast acting	Regular, aspart, lispro - twice to three times daily *(up to 9 -10 mL depending on vials, cartridges or penfills)*	42,517
Insulin - long acting	Detemir, glargine, isophane - once to twice daily *(up to 10 mL)*	120,900
Insulin - mixed combinations	70/30 - isophane + regular or aspart; lispro 50/50 - twice daily *(up to 9 -10 mL depending on vials, cartridges or penfills)*	930,400
- isophane + regular 70/30 *only*	Twice daily *(up to 9 -10 mL depending on vials, cartridges or penfills)*	914,500
Prednisolone	10mg once daily	116,667
Steroids - *inhaled*	1 puff or 1-2 puffs twice daily; *except budesonide solution - once daily*	59,640
SABA - *inhaled*	Salbutamol 0.5 % - 0.5-1ml four times daily or salbutamol 100 mcg 2-4 puffs twice daily	318,767
FDCs - asthma/COPD	SABA or LABA + bronchodilator; LABA + steroid	35,527
- LABA + steroid *only*	Budesonide + Formoterol - 2 puffs twice daily; salmeterol + fluticasone 1 puff twice daily	30,500
Carbamazepine	*Children* 400-600mg/day; *Adults* 800-1200mg/day divided twice daily	160,723
Sodium valproate or valproic acid	20-30mg/kg twice daily	83,580
SSRIs	Once daily	46,067
Levothyroxine	50 or 100mcg once daily	401,833

***Table 4**. Registered 20 mg statins in terms of packaging size, supplier, manufacturer and unit price*
Highlighted cells indicate local manufacturers **Innovator brands are denoted in **bold*

Name Brand	No. doses	Dosage	Supplier	Manufacturer	Unit price (JD)
ATORVASTATIN 20 MG					
Lipodar	10	Tablet	Dar Al Dawa Development & Investment Co. Ltd/DAD	Dar Al Dawa Development & Investment Co. Ltd/DAD	0.7280
Aditor	20	Tablet	The Arab Pharmaceutical Manufuring Company	The Arab Pharmaceutical Manufactruing Co.	0.6780
Aditor	30	Tablet	The Arab Pharmaceutical Manufuring Company	The Arab Pharmaceutical Manufactruing Co.	0.6780
Lipodar	30	Tablet	Dar Al Dawa Development & Investment Co. Ltd/DAD	Dar Al Dawa Development & Investment Co. Ltd/DAD	0.6713
Lipover	30	Tablet	Jordan River Pharmaceutical Industries	Jordan River Pharmaceutical Industries	0.5160
Torvacol	30	Tablet	Jordan Pharmaceutical Manufacturer (JPM)	Jordan Pharmacuticals Manufacture (JPM)	0.5233
Lipomax	30	Tablet	Ibn Rushd Drug Store	SAJA-Saudi Arabian Japanese Pharma. Co.	0.6570
Tulip	30	Tablet	Nabulsi Drug Store	LEK Pharm. and Chemical Work	0.6147
Vastor	30	Film-coated	Hikma Pharmaceuticals	Hikma Pharmaceuticals	0.6863
Tovast	30	Tablet	Regional Drug Store	Spimaco (Sudi Pharmacutical Industries & Medical Appliances Corp)	0.4260
Lipitor	**30**	**Tablet**	**Sabbagh Drug Store**	**Pfizer Pharmaceuticals Vega Baja /USA**	**0.8577**
Vastor	90	Film-coated	Hikma Pharmaceuticals	Hikma Pharmaceuticals	0.6450
Lipodar	500	Tablet	Dar Al Dawa Development & Investment Co. Ltd/DAD	Dar Al Dawa Development & Investment Co. Ltd/DAD	0.6042
Lipover	1000	Tablet	Jordan River Pharmaceutical Industries	Jordan River Pharmaceutical Industries	0.4385
Atorvast	1050	Tablet	Jordan Sweden Medical & Sterilization Co.	Jordan Sweden Medical & Sterilization Co.	0.4097
PRAVASTATIN 20 MG					
Lowchol	30	Tablet	United Pharmaceutical Manufacturing Co. Ltd.	United Pharmaceutical Manufacturing Co. Ltd.	0.3673
Lipostat	**30**	**Tablet**	**Suleiman Tannous & Sons Co. Ltd**	**Bristol Myers Squibb Company Evansville Indiana**	**0.4593**
ROSUVASTATIN 20 MG					
Eveness	28	Film-coated	Pharma International Company	Pharma International Company	0.7236
Scolta	30	Film-coated	United Pharmaceutical Manufacturing Co. Ltd.	United Pharmaceutical Manufacturing Co. Ltd.	0.6657
Supersta	30	Tablet	Hikma Pharmaceuticals	Hikma Pharmaceuticals	0.7233
Rosatin	30	Tablet	Al-Taqqadom Pharmaceutical Industries	Al-Taqqadom Pharmaceutical Industries	0.7233
Rosakit	30	Film-coated	Jordan Pharmaceutical Manufacturer (JPM)	Jordan Pharmacuticals Manufacture (JPM)	0.6207
Joswe Corteza	30	Tablet	Jordan Sweden Medical & Sterilization Co.	Jordan Sweden Medical & Sterilization Co.	0.5343
Zerova	30	Film-coated	Savvy Pharma	Savvy Pharma	0.7233
Excor	30	Tablet	Hayat Pharmaceutical Industries Co.PLC	Hayat Pharmaceutical Industries Co.PLC	0.7233
Rozitta	30	Film-coated	Dar Al Dawa Development & Investment Co. Ltd/DAD	Dar Al Dawa Development & Investment Co. Ltd/DAD	0.5000
Rozitta	500	Film-coated	Dar Al Dawa Development & Investment Co. Ltd/DAD	Dar Al Dawa Development & Investment Co. Ltd/DAD	0.6295
SIMVASTATIN 20 MG					
Sivacor	10	Tablet	The Arab Pharmaceutical Manufuring Company	The Arab Pharmaceutical Manufacturing Co.	0.1900
Sivacor	30	Tablet	The Arab Pharmaceutical Manufuring Company	The Arab Pharmaceutical Manufacturing Co.	0.1793
Syvast	28	Film-coated	Professional Drug Store	Julphar	0.1793
Vasta	30	Film-coated	Sukhtian Group	Tabuk pharmaceutical Manufacturing Co.	0.1793
Lipomid	30	Film-coated	Middle East Pharmaceutical And Chemical Industries	Middle Est Pharmaceutical & Chemical Industries	0.1793
ZOCOR	**30**	**Tablet**	**Adatco Drug Store**	**Merck Sharp & Dohme Ltd**	**0.2243**

Table 5. *Median unit prices among two major ACEIs by drug concentrate*
Innovator brands are denoted in **bold **Prices **without** a range reflect only one price or product registered*

Ingredient/Generic Name	Name Brand	Dosage	Drug Concentrate	Median unit price [range] (JD)
Enalapril Maleate		Tablet	5 mg	0.0865 [0.0741, 0.12]
Enalapril Maleate		Tablet	10 mg	0.1323 [0.1058, 0.1827]
Enalapril Maleate		Tablet	20 mg	0.2275 [0.1749, 0.312]
Lisinopril		Tablet	5 mg	0.1099 [0.0935, 0.11]
Lisinopril	**Zestril Tablet**	**Tablet**	**5 mg**	**0.1281**
Lisinopril		Tablet	10 mg	0.1846 [0.1653, 0.1945]
Lisinopril		Tablet	20 mg	0.1943 [0.1653, 0.2043]
Lisinopril	**Zestril Tablet**	**Film-coated tablet**	**20 mg**	**0.1949**

Table 6*. Registered ARBs by drug concentrate and median unit price*
**Innovator brands are denoted in bold **Prices without a range reflect only one price or product registered*

Ingredient/Generic Name	Name Brand	Dosage	Drug Concentrate	Median unit price [range] (JD)
Candesartan Cilexetil	**ATACAND**	**Tablet**	**4 mg**	**0.2454**
Candesartan Cilexetil	**ATACAND**	**Tablet**	**8 mg**	**0.2454**
Candesartan Cilexetil		Tablet	8 mg	0.1067
Candesartan Cilexetil		Tablet	16 mg	0.4482 [0.448, 0.4707]
Eprosartan		Tablet	600 mg	0.5607
Irbesartan		Tablet	150 mg	0.2028 [0.2027,0.2539]
Irbesartan		Tablet	300 mg	0.2027 [0.1763, 0.2033]
Losartan Potassium		Tablet	50 mg	0.1831
Losartan Potassium	**COZAAR**	**Tablet**	**100 mg**	**0.2370**
Olmesartan medoxomil		Film-coated tablet	10 mg	0.4046
Olmesartan medoxomil		Film-coated tablet	20 mg	0.5553
Olmesartan medoxomil		Film-coated tablet	40 mg	0.5775
Telmisartan	**MICARDIS**	**Tablet**	**40 mg**	**0.4207**
Telmisartan	**MICARDIS**	**Tablet**	**80 mg**	**0.5432**
Valsartan	**DIOVAN**	**Film-coated tablet**	**40 mg**	**0.1496**
Valsartan		Film-coated tablet	40 mg	0.1203 [0.1203, 0.1247]
Valsartan	**DIOVAN**	**Tablet**	**80 mg**	**0.2068**
Valsartan		Tablet	80 mg	0.1673 [0.1423, 0.1723]
Valsartan	**DIOVAN**	**Tablet**	**160 mg**	**0.2729**
Valsartan		Film-coated tablet	160 mg	0.2263 [0.1968, 0.2263]
Valsartan		Tablet	320 mg	0.3057
Valsartan	**DIOVAN**	**Film-coated tablet**	**320 mg**	**0.3768**

***Table 7**. Sample of registered insulin products with patient pricing*

Name Brand	Package size	Dosage	Ingredient/Generic Name	Manufacturer	Patient price (JD)
NovoRapid Flexpen	5 X 3ml **Pre-Filled Pens**	Solution for injection	Insulin **Aspart** 100 iu/ml	Novo Nordisk A/S (Bagsvaerd)	44.03
NovoRapid Penfills	5 X 3ml **Cart**	Solution for injection	Insulin **Aspart** 100 iu/ml	Novo Nordisk A/S (Bagsvaerd)	28.21
NovoRapid **Vial**	1 X 10ml	Solution for injection	Insulin **Aspart** 100 iu/ml	NovoNordisk Pharmaceutical Industries Inc	17.88
Novomix 50 flexpen	5 **Pen** X 3ml	Solution for injection	Insulin **Aspart** 100 iu/ml	Novo Nordisk A/S (Bagsvaerd)	40.6
Levemir Flexpen Pre Filled Pen	5 **Cart** X 3ml	Solution for injection	Insulin **Detemir** 100 iu/ml	Novo Nordisk Production SAS	56.88
Levemir **Penfill**	5 X 3ml	Penfills	Insulin **Detemi**r 100 IU/ml	Novo Nordisk A/S (Bagsvaerd)	68.05
Lantus **Vial**	10 ml	Vial	Insulin **Glargine** 100 iu/ml	Aventis Pharma	43.5
Humalog Mix 50	5 x 3ml **Cartridge**	Suspension	Insulin **Lispro** 100 iu/ml	Lilly France	39.2
HUMALOG **Vial**	1 x 10ml	Vial	Insulins & Analogues, Fast-Acting 100 IU/ml, Insulin **Lispro**	Eli-Lilly & Company	21.72

***Table 8**. Available isophane or NPH insulin products with patient pricing*
Innovator brands are denoted in **bold*

Name Brand	Package size	Dosage	Ingredient/Generic Name	Manufacturer	Patient price (JD)
Insuman basal vial	5ml *Vial*	Solution for injection	Recombinant Human Insulin 100 IU/ml	Aventis Pharma	5
Gensulin N	10ml *Vial*	Vial	Recombinant Human Insulin Isophane 100 iu/ml	Bioten S.A	8.6
Insulatard	**1 *Vial* X 10ml**	**Suspension**	**Human Insulin (rDNA Origin) 100 iu/ml**	**Novo Nordisk A/S (Bagsvaerd)**	**10.79**
HUMULIN N NPH Vial	**1 X 10ml**	***Vial***	**Human Insulin Isophane (rDNA Origin) 100 iu/ml**	**Eli-Lilly & Company**	**11.43**
Insuman Basal (100iu/ml)	1 *Vial* (10ml)	Suspension for injection	Insulin Human 100 iu	Sanofi-Aventis Deutschland GmbH	9.5
Humulin N	**5 X 3ml Cart**	**Suspension**	**Insulin Human 100 iu/ml**	**Lilly France**	**21.81**
Insulatard Penfills	**5 X 3ml**	**Penfills**	**Insulin Isophane 100 iu**	**Novo Nordisk A/S (Bagsvaerd)**	**19.47**
Insuman basal Cartridge	5 X 3ml	Suspension	Recombinant Human Insulin 100 IU/ml	Aventis Pharma	24.41

Table 9. *FDCs of inhalers for asthma or COPD with patient pricing – (median patient price of 26.73 JD [range 4.22, 47.53])*

Highlighted cells indicate SABAs to differentiate from LABAs **Innovator brands (majority) are denoted in* ***bold*

Name Brand	No. Doses	Dosage	Ingredient/Generic Name	Manufacturer	Patient Price (JD)
Foster	120	Solution	Beclomethasone Dipropionate *100* mcg, Formoterol Fumarate Dihydrate *6* mcg	Chiesi pharmaceutici SPA	22.65
Symbicort Turbuhaler	**60**	**Turbuhaler**	**Budesonide *160* mcg, Formoterol Fumarate Dihydrate *4.5* mcg**	**AstraZeneca**	**21.83**
Symbicort Turbuhaler	**120**	**Turbuhaler**	**Budesonide *160* mcg, Formoterol Fumarate Dihydrate *4.5* mcg**	**AstraZeneca**	**42.37**
Symbicort Turbuhaler	**60**	**Turbuhaler**	**Budesonide *320* mcg, Formoterol Fumarate Dihydrate *9* mcg**	**AstraZeneca**	**39.54**
Seretide Evohaler	**120**	**Inhaler**	**Fluticasone *250* mcg, Salmeterol *25* mcg**	**Glaxo Wellcome**	**42.42**
Relvar Ellipta	**30**	**Inhalation powder***	**Fluticasone Furoate *200* mcg, Vilanterol *25* mcg**	**Glaxo Wellcome Operations/Ware**	**38.37**
Seretide Diskus	**60**	**Diskus**	**Fluticasone Propionate *100* mcg, Salmeterol (as xinafoate) *50* mcg**	**Glaxo Operations UK Ltd**	**25.53**
Seretide Diskus	**60**	**Diskus**	**Fluticasone Propionate *250* mcg, Salmeterol (as xinafoate) *50* mcg**	**Glaxo Wellcome**	**34.85**
Seretide Diskus	**60**	**Diskus**	**Fluticasone Propionate *500* mcg, Salmeterol (as xinafoate) *50* mcg**	**Glaxo Operations UK Ltd**	**47.53**
Atrovent Comp HFA	**200**	**Solution for inhaler**	**Ipratropium Bromide *20* mcg, Fenoterol HBr *50* mcg**	**Boehringer Ingelheim Pharma Gmbh & Co. KG**	**8.1**
Clenil Comp. Spray	200	Inhaler	Salbutamol *100* mcg, Beclomethasone Dipropionate *50* mcg	Chiesi pharmaceutici SPA	4.22
Ventide Inhaler	**200**	**Inhaler**	**Salbutamol *100* mcg, Beclomethasone Dipropionate *50* mcg**	**Glaxo Wellcome**	**7.25**
Combivent Unit Dose Vial	**60 X 2.5ml**	**Solution for inhaler**	**Salbutamol Sulfate *3* mg, Ipratropium Bromide *500* mcg**	**Laboratoire Unither**	**27.93**
Combivent Unit Dose Vial	**20 X 2.5ml**	**Solution for inhaler**	**Salbutamol Sulfate *3.01* , Ipratropium Bromide anhydrous *500* mcg**	**Laboratoire Unither**	**9.9**
Seretide Evohaler	**120**	**Aerosol**	**Salmeterol *25* mcg, Fluticasone Propionate *125* mcg**	**Glaxo Wellcome**	**32.15**
Seretide Evohaler	**120**	**Aerosol**	**Salmeterol *25* mcg, Fluticasone Propionate *50* mcg**	**Glaxo Wellcome**	**22.77**

Table 10*. SSRIs by drug concentrate and median unit drug price*

Innovator brands are denoted in* ***bold* *** Prices without a range reflect only one product registered*

Ingredient/Generic Name	Name Brand	Dosage	Drug Concentrate	Median unit price [range] (JD)
Citalopram		Tablet	20 mg	0.3622 [0.3209, 0.4457]
Citalopram		Tablet	40 mg	0.5742 [0.5333, 0.85]
Duloxetine	**Cymbalta**	**Capsules**	**60 (as hydrochloride) mg**	**0.6914**
Duloxetine		Hard gelatin capsule	60 mg	0.8517
Escitalopram (Oxalate)		Film-coated tablet	5 mg	0.2490
Escitalopram		Tablet	10 mg	0.476 [0.2768, 0.51]
Escitalopram (Oxalate)		Tablet	15 mg	0.7139 [0.4833, 0.9446]
Escitalopram (Oxalate)		Tablet	20 mg	0.6613 [0.5583, 0.75]
Fluoxetine (Hcl)		Capsules	20 mg	0.271 [0.2303, 0.34]
Fluvoxamine Maleate		Film-coated tablet	50 mg	0.1611
Fluvoxamine Maleate		Film-coated tablet	100 mg	0.3143
Paroxetine	**Seroxat CR**	**Tablet**	**12.5 mg**	**0.4487**
Paroxetine	**Seroxat**	**Tablet**	**20 mg**	**0.4938**
Paroxetine		Tablet	20 mg	0.1315
Paroxetine		Film-coated tablet	40 mg	0.2465
Sertraline (Hcl)		Film-coated tablet	50 mg	0.1812 [0.1763, 0.258]
Sertraline	**ZOLOFT**	**Tablet**	**50 mg**	**0.2347**
Sertraline (Hcl)		Tablet	100 mg	0.414 [0.289,0.425]

Table 11. *Public sector median price ratio (MPR) by drug class (or specific drug given data availability)*
**Ratio is the median unit price procured by the JPD/ international standard buyer median unit price (International Medical Products Price Guide, 2015)*
***Single items denoted with median prices only*

		MPR (IQR)
Hypertension or CVD; n=25		
ACEIs (n=5)	*Enalapril, captopril*	1.38 (1.11, 1.49)
β-blockers (n=8)	*Atenolol, bisoprolol, carvedilol, metoprolol, propranolol*	1.45 (**0.78**, 2.34)
CCBs (n=6)	*Amlodipine, diltiazem, nifedipine, verapamil*	1.88 (**0.71**, 3.95)
	• *Amlodipine 5mg ONLY*	**0.93**
Anti-platelet aggregate	*Acetylsalicylic acid 100 mg (aspirin)*	1.41
Anticoagulant (n=2)	*Warfarin*	1.21 (1.19, 1.23)
Statins (n=3)	*Atorvastatin, simvastatin*	**0.59** (**0.52, 0.90**)
Diabetes; n=11		
Sulfonylureas (n=5)	*Glibenclamide, gliclazide, glimepiride*	1.33 (**0.96**, 2.05)
(n=2)	*Metformin*	**0.83** (**0.76, 0.89**)
Insulin (n=4)	• *Insulin Human 100 IU/mL R (n=2)*	**0.52** (**0.47, 0.57**)
	• *Insulin Isophane (rDNA Origin) 100 IU/mL*	**0.58**
	• *Insulin Human 30 IU/mL, Insulin Isophane 70 IU/mL -mixed*	**0.82**
Asthma or COPD; n=5		
Inhaled steroid (n=2)	*Beclomethasone dipropionate 250 mcg, Budesonide 200 mcg*	2.57 (2.29, 2.85)
SABA *(inhalation only)* (n=2)	*Salbutamol (as sulphate) 0.5 % solution & 100 mcg aerosol*	1.13 (**0.82**, 1.44)
Bronchodilator	*Ipratropium bromide anhydrous 20 mcg/puff*	1.51
Epilepsy; n=12		
(n=4)	*Carbamazepine*	**0.83** (**0.61**, 1.09)
	Valproic acid 200mg	**0.24**
(n=3)	*Lamotrigine*	1.91 (1.19, 2.35)
	Phenobarbital 30mg	2.14
	Phenytoin 100mg	1.70
(n=2)	*Topiramate*	2.91 (2.43, 3.39)
Psychiatric illnesses; n=3		
Tricyclic anti-depressants (TCAs) (n=3)	*Amitriptyline, imipramine*	1.11 (**0.96**, 1.40)

***Table 12**. Affordability of generic and brand (originator) medicines in the private sector for predominant diseases by drug class (% represent share of total drugs registered, n=1155)*
**Pricing data unavailable for one product*
*** Numbers in **bold** indicate affordability (≤1 days' wage)*

	Drug class	Number days' wage - generic (median; IQR)	Number days' wage - originator (median, IQR)
Hypertension or CVD; n=323 (28%)			
	ACEIs (n=85*)	1.04 (**0.71**, 1.23) (n=73)	**0.98** (**0.86**, 1.55) (n=12)
	ARBs (n=54*)	1.05 (**0.90**, 1.25) (n=44)	1.39 (1.28, 2.20) (n=10)
	(β)-blockers (n=59)	**0.58** (**0.40, 0.94**) (n=51)	**0.72** (**0.59, 0.79**) (n=8)
	Diuretics (n=31)	**0.38** (**0.32, 0.70**) (n=26)	**0.50** (**0.44, 0.74**) (n=5)
	Statins (n=94)	2.48 (2.00, 3.64) (n=84)	2.59 (1.65, 3.41) (n=10)
Diabetes; n=144 (12.5%)			
Based on up to 30 units/day	Sulfonylureas (n=67)	**0.39** (**0.24, 0.57**) (n=59)	**0.60** (**0.40, 0.74**) (n=8)
	Metformin (n=40)	**0.41** (**0.31, 0.54**) (n=37)	**0.62** (**0.50, 0.80**) (n=3)
	Insulin *fast-acting* (n=14)	1.17 (1.09, 1.30) (n=5)	2.44 (1.85, 2.96) (n=9)
	Insulin *long-acting* (n=11)	1.27 (1.14, 1.58) (n=4)	1.98 (1.67, 5.55) (n=7)
	Insulin *mixed* (n=12)	1.36 (1.30, 2.22) (n=5)	1.98 (1.67, 2.53) (n=7)
Asthma or COPD; n=45 (3.9%)			
	Steroid *(inhaled)* (n=16)	**0.32** (**0.32, 0.33**) (n=2)	1.81 (1.13, 2.65) (n=14)
	SABA or LABA (n=16)	1.59 (1.29, 2.02) (n=3)	2.48 (**0.74**, 3.55) (n=13)
	SABA or LABA + steroid (n=13)	1.98 (1.42, 2.53) (n=2)	5.23 (3.93, 5.78) (n=11)

Table 13. *Unaffordable medications in the public sector based on standard monthly dosing regimen*
**Unaffordability defined by > 1 days' wage for 30-day supply of medicine*

Drug class/indication	Drug name and dosage	Dosing regimen	No Days' Wage
Anticoagulant or Antiplatelet/CVD	Rivaroxaban 15 mg or 20 mg	Once daily	8.0
	Dabigatran Etexilate 75 mg	Twice daily	7.7
	Dabigatran Etexilate 150 mg	Twice daily	7.1
	Ticagrelor 90 mg	Twice daily	6.4
ARB/diuretic/Hypertension	Candesartan Cilexetil 16 mg, HCTZ 12.5 mg	Once daily	1.7
	Candesartan Cilexetil 8 mg, HCTZ 12.5 mg	Once daily	1.3
	Nifedipine 30 mg	Once daily	1.2
	Verapamil Hcl 80 mg	Three times daily	2.0
Antiarrhythmic/CVD	Flecainide 100 mg	Twice daily	1.4
SSRI/Depression	Fluvoxamine Maleate 100 mg	Once daily	1.3
	Paroxetine 12.5 mg	Once daily	1.5
Antiepileptic/seizures	Topiramate 25 mg	Twice daily *[75 tablets; 3.5mg/kg*10kg]*	1.4
	Topiramate 50 mg	Twice daily *[60 tablets; 3.5mg/kg*15kg]*	2.7
	Topiramate 100 mg	Once daily [i*f taken alone]*	2.3
	Valproic Acid 150 mg	Twice daily *[180 capsules; 20mg/kg*45kg]*	1.1
	Valproic Acid 300 mg	Twice daily *[180 capsules; 20-30mg/kg*60-90kg]*	1.5
Meglitinide/Diabetes	Repaglinide 2 mg	Twice daily	1.3
DPP-4 inhibitor/Diabetes	Saxagliptin 2.5 mg	Once daily	1.5
	Saxagliptin 5 mg	Once daily	1.8
	Sitagliptin 100 mg	Once daily	2.7
	Vildagliptin 50 mg	Twice daily	1.5
Insulin/Diabetes	Insulin Aspart 100 IU/mL	Three times daily *[5-10 IU/ 3*3mL Penfil/Flexpen]*	2.5
	Insulin Lispro 100 IU/mL *(Humalog Mix 50/50)*	Three times daily *[up to 10 IU/ 3*3mL Cart]*	2.0
	Insulins & Analogues, Intermediate-Fast Combin 70/30 IU/mL, Insulin Aspart	Twice daily *[up to 15 IU/3*3mL penfill cart]*	2.3
Steroid/Asthma	Budesonide 0.5 mg/ml (Pulmicort suspension)	Once daily *[30*2mL vial]*	4.9
	Mometasone Furoate 200 mcg	*inhaler]*	2.6
	Mometasone Furoate 400 mcg	*inhaler]*	3.4
LABA/COPD	Indacaterol 150 mcg or 300 mcg	Once daily	2.2
Bronchodilator/COPD	Tiotropium 18 mcg	Once daily	4.0
	Glycopyronium Bromide inhaler powder hard capsule 50 mcg	Once daily	4.1
SABA/bronchodilator/COPD	Salbutamol Sulfate 3 mg, Ipratropium Bromide 500 mcg/unit dose	Three times daily *[2.5mL vial]*	4.1
LABA/steroid/Asthma	Budesonide 160 mcg, Formoterol Fumarate Dihydrate 4.5 mcg/dose	Two puffs twice daily *[2*60-dose inhaler]*	3.1
Steroid/LABA/Asthma	Fluticasone Propionate 100 mcg, Salmeterol (as xinafoate) 50 mcg	One puff twice daily *[60 dose inhaler]*	1.4
	Fluticasone Propionate 250 mcg, Salmeterol (as xinafoate) 50 mcg	One puff twice daily *[60 dose inhaler]*	1.8
	Fluticasone Propionate 500 mcg, Salmeterol (as xinafoate) 50 mcg	One puff twice daily *[60 dose inhaler]*	2.5

***Table 14**. Affordability comparison of essential medicines between private and public sectors based on number of days' wage metric*

Numbers in **bold indicate unaffordability defined by > 1 days' wage*

Drug class/indication	Drug name and dosage	Dosing regimen	Private Sector		Public Sector
			No. days' wage - *Lowest price generic*	No. days' wage - *Originator*	No. days' wage
βblocker/hypertension	Bisoprolol Fumarate 5mg	Once daily	0.4	0.6	0.04
ACEI/hypertension	Enalapril Maleate 10mg	Once daily	0.6		0.04
ARB/hypertension	Valsartan 160mg	Once daily	**1.1**	**1.5**	0.09
Diuretic/hypertension	Hydrochlorothiazide 25mg	Once daily	0.3	0.4	0.05
CCB/hypertension	Amlodipine 5mg	Once daily	0.6	0.9	0.02
Statin/CVD	Atorvastatin 40mg	Once daily	**3.3**	**4.7**	0.12
Antiepileptic/seizures	Levetiracetam 500mg	Twice daily	**2.9**	**4.1**	0.40
Insulin/Diabetes	Insulin 70/30 10 mL vial	Up to 15 units twice daily	**1.2**	**1.5**	0.20
Sulfonylurea/Diabetes	Glimepiride 2mg	Once daily	0.3	0.4	0.03
Antihyperglycemic/Diabetes	Metformin 850mg	Twice daily	0.2	0.6	0.08
LABA/steroid/Asthma	Salmeterol 50mcg/Fluticasone 250mcg	One puff twice daily		**4.8**	**1.76**
Atypical antipsychotic/Psychosis	Risperidone 4mg	Once daily	**2.8**	**3.8**	0.08
SSRI/Depression	Citalopram 40mg	Once daily	**2.9**		0.11
ARB/diuretic/Hypertension	Candesartan 16mg/HCTZ 12.5mg	Once daily	0.6	**3.4**	**1.74**
ARB/diuretic/Hypertension	Valsartan 160mg/HCTZ 12.5mg	Once daily	0.8	**1.5**	0.11