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Chapter 4

Baseline assessment of WHO's target for both availability and affordability of medicines to treat non-communicable diseases

ABSTRACT

Background: WHO has set a voluntary target of 80% availability of affordable medicines, including generics, to treat major non-communicable diseases (NCDs), in the public and private sectors of countries by 2025. We undertook a secondary analysis of data from 30 surveys in low- and middle-income countries, conducted from 2008–2013 using the World Health Organization (WHO)/Health Action International (HAI) medicine availability and price survey methodology, to establish a baseline for this target.

Methods: Data for 49 medicines (lowest-priced generics and originator brands) to treat cardiovascular diseases (CVD), diabetes, chronic obstructive pulmonary diseases (COPD) and central nervous system (CNS) conditions were analysed to determine their availability in healthcare facilities and pharmacies, their affordability for those on low incomes (based on median patient prices of each medicine), and the percentage of medicines that were both available and affordable.

Findings: In low-income countries, 15.9% and 16.7% of lowest-priced generics met WHO's target in the public and private sectors, respectively, and 2.2% and 4.3% of originator brands. In lower-middle income countries, 19.8% of lowest-priced generics met the target in both sectors, and 0.7% and 1.2% of originator brands in the public and private sectors, respectively. In upper-middle income countries, the situation was better for generics but still suboptimal as 32.3% and 37.4% met the target in public and private sectors,

respectively. For originator brands in upper-middle income countries, none reached the target in the public sector and 11.6% in the private sector. Across the therapeutic groups for lowest-priced generics, CVD medicines in low-income countries (9.8%) and upper-middle income countries (28.0%), and CNS medicines in lower-middle income countries (9.3%), were least available and affordable in the public sector. In the private sector for lowest-priced generics, CNS medicines were least available and affordable in all three country income groups (10.5%, 5.1% and 27.9% in low-, lower-middle and upper-middle income countries respectively).

Interpretation: This data, which can act as a baseline for the WHO target, shows low availability and/or poor affordability is resulting in few NCD medicines meeting the target in low- and middle-income countries. In the era of Sustainable Development Goals, and countries work to achieve Universal Health Coverage, increased commitments are needed by governments to improve the situation through the development of evidence-based, nationally-contextualised interventions, with regular monitoring of NCD medicine availability, prices and affordability.

INTRODUCTION

Attention is growing on preventing and treating non-communicable diseases (NCDs) which, according to the World Health Organization (WHO) are now the world's biggest killers (1). Over 36 million people die annually (63% of global deaths) from NCDs, mainly cardiovascular diseases, cancer, chronic respiratory diseases and diabetes. Of these, 80% occur in low- and middle-income countries (1). Complications from hypertension accounts for 9.4 million deaths worldwide annually (2). Diabetes is also of concern. By 2035, an estimated 592 million people will have diabetes, a 55 percent increase over the 2013 to 2035 period (3).

Following the Political Declaration on NCDs, adopted by the UN General Assembly in 2011, WHO published its Global Action Plan for the Prevention and Control of NCDs 2013–2020 (GAP), which was endorsed by the World Health Assembly in 2013 (1,4,5). Included are six objectives, one of which is to strengthen health systems to improve prevention, detection, treatment and management of people with or at high risk for cardiovascular diseases, diabetes, chronic respiratory diseases, cancer and other NCDs. This objective includes improving patient access to affordable medicines to treat NCDs.

NCDs are different to acute diseases in that most require uninterrupted, life-long treatment. To help achieve this, NCD medicines must be both available in facilities when needed and affordable, especially for those on low-incomes. Using savings, borrowing money or selling assets to pay for healthcare, a common occurrence in low-income countries (6), is not a sustainable option for people with NCDs. The WHO recognised this and included in the GAP a voluntary target of 80% availability of affordable basic technologies and essential medicines, including generics, required to treat major NCDs in both public and private facilities by 2025 (5).

In 2001, a resolution passed by WHO Member States called for the development of a standardised method for measuring medicine prices (7), which resulted in the launch of the WHO/Health Action International (HAI) Project on Medicine Prices and Availability. In 2003 WHO and HAI published a methodology to measure prices, availability and affordability of a selection of medicines to treat communicable and non-communicable diseases, plus measure price components in the pharmaceutical supply chain (8). Data is collected in the public sector (primary healthcare facilities and hospitals), private sector (retail pharmacies and licensed drug stores), and other relevant sectors (eg. mission sector). Availability is assessed as the percentage of outlets where the medicine was stocked on the day of data collection. Affordability is expressed as the number of days' wages needed by the lowest-paid unskilled government worker to purchase 30 days' supply for medicines to treat NCDs, and 7 days' supply for medicines to treat communicable diseases, using standard treatment regimens.

In the GAP, medicine availability is defined as per the WHO/HAI methodology. But affordability is not defined, which is not surprising as it is not straightforward. However, the WHO/HAI measure (number of days' wages needed by the lowest-paid unskilled government worker to purchase standard treatments) is widely accepted and used, and clearly shows the reality for those on low wages who must pay out-of-pocket for medicines (9-15). But while being easy to apply and understand, it may overestimate medicine affordability because in many countries a substantial proportion of the population earn less than this government worker (8,9). Niëns et al. proposed a different metric for expressing medicine affordability but it has not been widely used (16).

National and sub-national surveys using the WHO/HAI methodology have shown poor availability (particularly in the public sector) and poor affordability of medicines to treat a range of NCDs including cardiovascular diseases, diabetes, psychiatric disorders, asthma and epilepsy (9-13,17). In 2007 Mendis et al. assessed the availability and affordability of medicines to treat four NCDs in six low- and middle-income countries using an adaptation

of the WHO/HAI methodology (13). They found generic availability did not exceed 7.5% in the public sector in Bangladesh, Malawi, Nepal and Pakistan, and standard treatments often required 5 or more days' wages when purchased in the private sector. More recently, NCD surveys using the WHO/HAI methodology have been undertaken in several countries in the Middle East. In Lebanon (14), the availability of generics was low in primary healthcare centres (43.3%) where medicines are dispensed free-of-charge, but higher in private pharmacies (77.9%). Standard treatments with lowest-priced generics were generally affordable in the private sector, except for some medicines to treat neuroleptic disorders. Less affordable were originator brands and/or when a patient needs multiple medicines. Similar findings on treatment affordability were found in Egypt where treating a person with co-morbidities, such as diabetes, hypertension and hypercholesterolaemia would be largely unaffordable for those on low wages (23). Cameron et al. found the availability of medicines in developing countries was suboptimal in the public and private sectors, with generics to treat NCDs significantly less available than generics for acute conditions (18). Studies to date using WHO/HAI data have considered availability and affordability separately. But, as noted in the GAP, to improve access medicines must be both available in facilities and affordable for all who need them. Therefore, in this study, we looked at the combined availability and affordability of medicines to treat four major NCDs (cardiovascular disease (CVD), diabetes, chronic obstructive pulmonary diseases (COPD), and central nervous system conditions (CNS)) to ascertain the extent to which they met WHO's target.

METHODS

WHO/HAI price and availability surveys

The WHO/HAI methodology is a facility-based survey of the availability and price of 50 medicines to treat communicable and non-communicable diseases, in a minimum of six geographic or administrative areas in a sample of medicine outlets in the public sector, private sector, and other sectors. Data are also collected on government procurement prices and price components in the pharmaceutical supply chain (mark-ups, taxes etc.). Most surveys are undertaken at the national level, although subnational surveys are recommended in large countries.

Data is collected from five medicine outlets per sector per survey area. The selection of the outlets uses a multistage clustered approach, as described by Cameron et al. (9).

Survey medicines include global and regional lists of medicines (30), all strength- and dosage-form specific, commonly used to treat a range of conditions that cause substantial morbidity and mortality (eg. hypertension, diabetes, respiratory tract infection). At least 20 supplementary medicines of local importance are also surveyed. For each medicine, data are collected for the originator brand, and the lowest-priced generic equivalent found in each outlet.

Data is analysed by sector. Availability, reported as the percentage of outlets where the medicine was in stock on the day of data collection, takes into account the level of outlet in the public sector that is permitted to stock each medicine. Prices are expressed as medians in local currency, and as a ratio to median supplier prices listed in Management Sciences for Health's (MSH) International Drug Price Indicator Guide. A minimum of four patient prices per medicine per sector are needed for inclusion in the analysis. Affordability is based on median patient prices (originator brand and lowest-priced generics) of each medicine in local currency for a standard treatment regimen, and expressed as the number of days' wages needed by the lowest-paid unskilled government worker to purchase 30 days' supply of the medicine to treat NCDs, and 7 days' supply for medicines to treat communicable diseases. Where a medicine is not available or there are less than four price points, affordability is not assessed.

Methodology of the secondary analysis

Survey selection

Data for the secondary analysis were obtained from 30 surveys undertaken in low-income and middle-income countries from 2008 to 2013 using the WHO/HAI methodology, and published on the WHO/HAI price database (19). Based on 2014 World Bank income groups, 10 surveys were conducted in low-income countries, 12 in lower-middle income countries, and 8 in upper-middle-income countries. High-income countries were excluded as only 3 had been surveyed since 2008. Table 1 lists the surveys in the analysis, the number of outlets sampled per survey, plus the daily wage of the lowest-paid unskilled government worker per country.

Therapeutic group and medicine selection

Four groups of NCDs were included in the analysis i.e. CVD, diabetes, COPD, and CNS conditions i.e. psychoses, anxiety, depression, epilepsy and Parkinson's Disease. These had the greatest amount of data in the WHO/HAI database. A preliminary analysis identified the most surveyed medicines in each therapeutic group which, when combined, covered

at least 80% of data points within the group. From this, 18 medicines to treat CVD, 6 to treat diabetes, 8 inhalers for COPD, and 17 CNS medicines (all strength- and dosage-form specific) were selected for the secondary analysis (Table 2).

Table 1: Surveys in secondary analysis of NCD medicine availability and affordability

Country (survey year)	World Bank Income Group (2014)	Number of medicine outlets surveyed ^b	Daily wage lowest-paid unskilled government worker in local currency (in USD)
Afghanistan (2011)	Low	116	150 Afghani (\$3.03)
African country (2008) ^a	Low	48	\$1.32
African country (2013) ^a	Low	94	\$2.33
Bolivia (2008)	Lower-middle	60	19.25 Boliviano (\$2.72)
Burkina Faso (2009)	Low	65	1023 FCFA (\$2.17)
Burundi (2013)	Low	50	2692 Burundi Franc (\$1.78)
Brazil, Rio Grande de Sol (2008)	Upper-middle	52	12.73 Real (\$5.49)
China, Shaanxi Province (2014)	Upper-middle	140	37.3333 Chinese Yuan Renminbi (\$6.06)
Colombia (2008)	Upper-middle	89	15383 Colombian Peso (\$6.44)
Ecuador (2008)	Upper-middle	60	\$6.67
Ethiopia (2013)	Low	64	14 Birr (\$0.75)
Haiti (2011)	Low	89	200 Gourde (\$5.04)
India, NCT, Delhi (2011)	Lower-middle	113	247 Indian Rupee (\$5.53)
Indonesia (2010)	Lower-middle	144	36500 Rupiah (\$3.98)
Iran (2014)	Upper-middle	60	270000 Rial (\$10.78)
Kyrgyzstan (2010)	Lower-middle	25 ^c	26.6666 Som (\$0.57)
Lao PDR (2013)	Lower-middle	60	20867 Kip (\$2.62)
Latin American country (2009) ^a	Lower-middle	70	\$6.92
Lebanon (2013)	Upper-middle	60	22500 Lebanese Pound (\$14.93)
Mauritius (2008)	Upper-middle	60	215 Mauritius Rupee (\$8.27)
Mexico, Mexico City (2009)	Upper-middle	28	57.64 Mexican Peso (\$4.48)
Moldova (2011)	Lower-middle	100	20 Lei (\$1.69)

Table 1: Surveys in secondary analysis of NCD medicine availability and affordability (*Continued*)

Country (survey year)	World Bank Income Group (2014)	Number of medicine outlets surveyed ^b	Daily wage lowest-paid unskilled government worker in local currency (in USD)
Mongolia (2012)	Lower-middle	66	6686 Tugrik (\$4.79)
Nicaragua (2008)	Lower-middle	61	60.03 Cordoba (\$3.06)
Sao Tomé et Príncipe (2008)	Lower-middle	41	18150 Dobra (\$1.25)
Sudan (2013)	Lower-middle	71	12 Sudanese Pound (\$1.85)
Tanzania (2012)	Low	73	5667 Tanzanian Shilling (\$3.65)
Tajikistan (2013)	Low	60	6.67 Somoni (\$1.40)
Uganda (2013)	Low	66	5200 Ugandan Shilling (\$2.03)
Ukraine (2012)	Lower-middle	70	41.5915 Hryvnia (\$5.21)
Total: 30 countries		2155 outlets	Mean: \$4.23 Range: \$0.57-\$14.93

^aPermission not given to identify country; ^bPublic and private sector; ^cPrivate sector only; WHO World Health Organization; USD United States of America dollars

GAP lists medicines needed to provide basic, cost-effective primary healthcare i.e. 6 CVD medicines (aspirin, a statin, a thiazide diuretic, a beta-blocker, an ACE inhibitor, and a long-acting calcium channel blocker), two products to treat diabetes (metformin and insulin), and two inhalers (bronchodilator and steroid). We used an expanded list (including CNS medicines) in our analysis as they were selected nationally to be surveyed hence considered important.

Data analysis

Country data were stratified by World Bank income levels to low-income countries, lower-middle income countries and upper-middle income countries. Within each income group, the mean percentage availability across the basket of medicines in each therapeutic group, and across all the medicines, was calculated for originator brands and generics, separately and combined, in the public and private sectors. Similarly, the mean number of days' wages to purchase standard treatments was calculated across the basket of medicines in each therapeutic group, and across all medicines. The combined availability and affordability was then determined to identify the percentage of medicines within a

therapeutic group, and across all medicines, with 80% or greater availability and requiring 1 days' wages or less to purchase standard treatments or supplied free-of-charge in the public sector.

Table 2: NCD medicines in secondary analysis of availability and affordability

Medicine, strength and dosage form	Percentage of surveys with medicine (n= no. of surveys)	No. units for affordability analysis (30 days' supply)
<i>Medicines for cardiovascular diseases</i>		
Atenolol 50mg cap/tab*	90.0% (n=27)	30
Simvastatin 20mg cap/tab*	90.0% (n=27)	30
Furosemide 40mg cap/tab	86.7% (n=26)	30
Enalapril 5mg, 10mg and/or 20mg cap/tab*	83.3% (n=25)	30
Captopril 25mg cap/tab*	80.0% (n=24)	60
Atorvastatin 10mg and/or 20mg cap/tab*	63.3% (n=19)	30
Amlodipine 5mg cap/tab	60.0% (n=18)	30
Hydrochlorothiazide 25mg cap/tab*	53.3% (n=16)	30
Nifedipine Retard 20mg tab*	33.3% (n=10)	60
Digoxin 0.25mg cap/tab	30.0% (n=9)	30
Acetylsalicylic acid 100mg cap/tab*	26.7% (n=8)	30
Losartan 50mg cap/tab	23.3% (n=7)	30
Propranolol 40mg cap/tab*	23.3% (n=7)	120
Lisinopril 10mg cap/tab*	16.7% (n=5)	30
Isosorbide dinitrate 10mg cap/tab	16.7% (n=5)	180
<i>Medicines for diabetes</i>		
Glibenclamide 5mg cap/tab	100% (n=30)	60
Metformin 500mg and/or 850mg cap/tab*	86.7% (n=26)	500mg 90; 850mg 60
Insulin human, soluble, isophane and/or 30/70, 100IU/ml*	36.7% (n=11)	10ml
Gliclazide 80mg cap/tab	33.3% (n=10)	30
<i>Medicines for chronic obstructive pulmonary diseases (COPD)</i>		
Salbutamol 100mcg/dose inhaler*	96.7% (n=29)	200 doses
Beclometasone 50mcg/dose, 100mcg/dose and/or 250mcg/dose inhaler*	76.7% (n=23)	200 doses
Budesonide 100mcg/dose and/or 200mcg/dose inhaler*	10.0% (n=3)	200 doses

Table 2: NCD medicines in secondary analysis of availability and affordability (*Continued*)

Medicine, strength and dosage form	Percentage of surveys with medicine (n= no. of surveys)	No. units for affordability analysis (30 days' supply)
Ipratropium 20mcg/dose inhaler*	6.7% (n=2)	200 doses
Budesonide+formeterol 100mcg+6mg/dose inhaler	3.3% (n=1)	200 doses
Medicines for central nervous system (CNS) conditions: antipsychotics, medicines for anxiety, depression, epilepsy and Parkinson's Disease		
Diazepam 5mg and/or 10mg cap/tab	96.7% (n=29)	7
Amitriptyline 25mg cap/tab	93.3% (n=28)	90
Carbamazepine 200mg cap/tab	83.3% (n=25)	150
Fluoxetine 20mg cap/tab	66.7% (n=20)	30
Phenytoin 50mg and/or 100mg cap/tab	53.3% (n=16)	100mg 90; 50mg 180
Clonazepam 2mg cap/tab	33.3% (n=10)	120
Sodium valproate 200mg and/or valproic acid 150mg cap/tab	20.0% (n=6)	200mg 150; 150mg 200
Phenobarbital 100mg and/or 30mg cap/tab	16.7% (n=5)	100mg 30; 30mg 90
Risperidone 2mg cap/tab	13.3% (n=4)	60
Clozapine 100mg cap/tab	13.3% (n=4)	90
Imipramine 25mg cap/tab	6.7% (n=2)	120
Levodopa+carbidopa 25+250mg cap/tab	6.7% (n=2)	120

* Belong to the classes of NCD medicines in the GAP report considered necessary to provide basic cost-effective primary healthcare

All the primary data for each medicine in the analysis is available in the WHO/HAI price database (percentage availability, median patient price in local currency, and the number of days' wages needed by the lowest-paid unskilled government worker to purchase 30 days' supply) (19).

FINDINGS

Availability

In all three country income groups, the mean availability of generics for the treatment of NCDs did not exceed 80% for any therapeutic group in both public and private sectors

(Table 3). They ranged from a minimum of 34.2% for COPD medicines in the public sector of low-income countries, to a maximum of 69.6% for CVD medicines in the private sector of upper-middle income countries.

In low-income countries, overall generic availability was 40.7% and 51.0% in the public and private sectors, respectively. Similar results were seen in the lower-middle income countries where overall generic availability was 46.1% and 53.5% in the public and private sectors, respectively. In upper-middle income countries, generic availability was similar in the public sector (46.2%) but higher in the private sector (63.4%).

In the public sector, overall availability of originator brands did not exceed 7% in any of the country income groups. In the private sector, availability of originator brands was approximately 19% in low- and lower-middle income countries and 48.1% in upper-middle income countries.

In low-income countries, the mean availability of any product type (originator brands and generics), was 42.0% and 54.4% in the public and private sectors, respectively. In lower-middle income countries, overall availability for any product type was 48.6% and 58.9% in the public and private sectors respectively. In upper-middle income countries, overall availability for any product type was similar to the less wealthy countries in the public sector (48.7%) but much higher in the private sector (75.2%). Medicines for CVD and diabetes were very close to the WHO target at approximately 79% availability for any product type in the private sector.

Affordability

To purchase lowest-priced generics, on average more than 1 days' wages was needed to buy treatment in all four therapeutic groups, in the public and private sectors of low-income and lower-middle-income countries (Table 4). In both sectors of the upper-middle income countries, an average of less than 1 days' wages was needed to buy lowest-priced generics for CVD, diabetes and COPD but not CNS.

In all three country groups, originator brands were less affordable than lowest-priced generics in both sectors across all medicines. CNS medicines were the least affordable requiring 18.8 and 11.5 days' wages to purchase 30 days' supply in the public and private sectors respectively of lower-middle income countries.

Table 3: Mean percentage availability by World Bank Income Group

World Bank Income Group	Therapeutic group	Mean % availability					
		Public sector			Private sector		
		Originator brand	Lowest priced generic	Any product	Originator brand	Lowest priced generic	Any product
Low-income countries (n=10)	Cardiovascular	6.4%	39.3%	40.3%	16.8%	59.5%	61.3%
	Diabetes	7.1%	45.1%	47.0%	27.5%	54.6%	60.2%
	COPD	11.2%	34.2%	35.2%	28.9%	45.3%	49.6%
	CNS	5.1%	43.2%	44.6%	12.7%	40.3%	44.1%
Lower-middle income countries (n=12)	<i>All medicines</i>	6.8%	40.7%	42.0%	19.4%	51.0%	54.4%
	Cardiovascular	5.7%	53.5%	54.9%	19.6%	65.3%	69.6%
	Diabetes	7.9%	47.7%	51.3%	23.8%	56.3%	63.5%
	COPD	12.1%	38.2%	40.8%	25.7%	43.2%	53.7%
Upper-middle income countries (n=8)	CNS	6.0%	35.4%	39.0%	12.9%	35.1%	39.4%
	<i>All medicines</i>	6.8%	46.1%	48.6%	19.2%	53.5%	58.9%
	Cardiovascular	5.0%	42.7%	45.5%	49.1%	69.6%	79.0%
	Diabetes	10.7%	53.3%	59.7%	59.5%	64.0%	79.4%
COPD		3.0%	54.1%*	53.1%*	40.6%	59.6%	68.8%
	CNS	2.2%	45.8%	46.6%	43.2%	53.9%	68.2%
	<i>All medicines</i>	4.8%	46.2%	48.7%	48.1%	63.4%	75.2%

*Analysis for LPG only was based on 14 data points whereas the analysis for LPG & OB was based on 15 data points. This resulted in the mean availability of LPG & OB being less than the mean availability of LPG only.

Table 4: Mean number of days' wages needed to purchase standard treatments, by World Bank Income Group

World Bank Income Group	Therapeutic group	Mean days' wages*			
		Public sector		Private sector	
		Originator brand	Lowest priced generic	Originator brand	Lowest priced generic
Low-income countries (n=10)	Cardiovascular	3.3 (n=4)	1.2 (n=30)	6.4 (n=14)	1.7 (n=46)
	Diabetes	2.9 (n=2)	1.7 (n=11)	5.2 (n=7)	1.7 (n=17)
	COPD	0.9 (n=2)	3.1 (n=7)	3.1 (n=8)	3.3 (n=12)
	CNS	1.1 (n=2)	1.6 (n=15)	5.4 (n=6)	2.4 (n=30)
	<i>All medicines</i>	2.3 (n=10)	1.6 (n=63)	5.2 (n=35)	2.1 (n=105)
Lower-middle income countries (n=12)	Cardiovascular	3.7 (n=8)	1.3 (n=63)	6.9 (n=39)	2.8 (n=96)
	Diabetes	3.0 (n=4)	1.3 (n=18)	4.7 (n=15)	2.3 (n=27)
	COPD	2.0 (n=6)	1.6 (n=9)	4.1 (n=11)	3.1 (n=19)
	CNS	18.8 (n=4)	4.0 (n=31)	11.5 (n=16)	4.5 (n=40)
	<i>All medicines</i>	5.8 (n=22)	2.0 (n=121)	7.0 (n=81)	3.1 (n=182)
Upper-middle income countries (n=8)	Cardiovascular	4.4 (n=8)	0.7 (n=19)	4.3 (n=52)	0.9 (n=69)
	Diabetes	1.7 (n=3)	0.3 (n=7)	2.0 (n=17)	0.9 (n=24)
	COPD	0.6 (n=1)	0.4 (n=3)	2.0 (n=9)	0.8 (n=12)
	CNS	-	1.1 (n=9)	7.1 (n=30)	1.7 (n=34)
	<i>All medicines</i>	3.4 (n=12)	0.7 (n=38)	4.5 (n=108)	1.1 (n=139)

*Based on the median treatment prices and the daily wage of the lowest-paid unskilled government worker. Excludes medicines supplied free-of-charge in the public sector. n=number of price points in analysis

Meeting WHO's target for availability and affordability

The percentage of medicines with 80% or greater availability and requiring no more than 1 days' wages to purchase treatments (or supplied free-of-charge in the public sector) was low in all three country groupings as shown in Table 5. Overall in low-income countries, 15.9% and 16.7% of lowest-priced generics met this availability and affordability target in the public and private sectors, respectively. They ranged from 9.8% (CVD) to 23.5% (COPD) in the public sector, and 10.5% (CNS) to 30.0% (diabetes) in the private sector. The percentage of lowest-priced generics meeting the target increased as the wealth of the countries increased, although they remained sub-optimal. In lower-middle income countries, 19.8% met the target in both sectors. Lowest levels were seen for CNS medicines, and highest for CVD, in both sectors. In upper-middle income countries, 32.3% and 37.4% lowest-priced generics met the target in the public and private sectors, respectively. In

the public sector, they ranged from 28.0% (CVD) to 44.0% (diabetes). In the private sector, they ranged from 27.9% (CNS) to 45.2% (CVD).

Table 5: Medicines both available and affordable, by World Bank Income Group

World Bank Income Group	Therapeutic group	Medicines available and affordable*			
		Public sector		Private sector	
		Originator brand	Lowest priced generic	Originator brand	Lowest priced generic
Low-income countries (n=10)	Cardiovascular	2.6% (1/39)	9.8% (5/51)	2.6% (1/39)	17.6% (9/51)
	Diabetes	0.0% (0/16)	15.0% (3/20)	6.3% (1/16)	30.0% (6/20)
	COPD	0.0% (0/14)	23.5% (4/17)	7.1% (1/14)	11.8% (2/17)
	CNS	4.3% (1/23)	21.1% (8/38)	4.3% (1/23)	10.5% (4/38)
	<i>All medicines for all therapeutic groups</i>	2.2% (2/92)	15.9% (20/126)	4.3% (4/92)	16.7% (21/126)
Lower-middle income countries (n=12)	Cardiovascular	0.0% (0/68)	27.8% (27/97)	1.3% (1/77)	30.2% (32/106)
	Diabetes	0.0% (0/23)	16.7% (5/30)	0.0% (0/25)	21.9% (7/32)
	COPD	0.0% (0/19)	14.3% (3/21)	4.5% (1/22)	8.0% (2/25)
	CNS	2.4% (1/41)	9.3% (5/54)	0.0% (0/46)	5.1% (3/59)
	<i>All medicines for all therapeutic groups</i>	0.7% (1/151)	19.8% (40/202)	1.2% (2/170)	19.8% (44/222)
Upper-middle income countries (n=8)	Cardiovascular	0.0% (0/65)	28.0% (21/75)	15.4% (10/65)	45.2% (33/73)
	Diabetes	0.0% (0/20)	44.0% (11/25)	10.0% (2/20)	32.0% (8/25)
	COPD	0.0% (0/14)	35.7% (5/14)	14.3% (2/14)	35.7% (5/14)
	CNS	0.0% (0/39)	31.8% (14/44)	5.1% (2/39)	27.9% (12/43)
	<i>All medicines for all therapeutic groups</i>	0.0% (0/138)	32.3% (51/158)	11.6% (16/138)	37.4% (58/155)

*80% or greater availability and requiring 1 days' wages or less to purchase 30 days' supply or supplied free-of-charge in the public sector

Overall, very few originator brands met the target in low-income countries (2.2% and 4.3% in the public and private sectors, respectively) and lower-middle income countries (0.7% and 1.2%). In upper-middle income countries, no originator brands met the target in the public sector, and 11.6% in the private sector.

Figure 1 shows the availability and affordability of 30 days' supply of lowest-priced generics of metformin 500mg (90 tablets) and 850mg (60 tablets) to treat diabetes. The right hand lower quadrant represents 80% or greater availability and 1 days' wages or

DISCUSSION

Our analysis shows that low availability and/or poor affordability is resulting in few NCD medicines meeting WHO's target in low- and middle-income countries. Lowest-priced generics achieving the target in the public sector ranged from 15.9% in low-income countries to 32.3% in upper-middle income countries. In the private sector, the range was similar at 16.7% in low-income countries to 37.4% in upper-middle income countries. These unacceptably low levels are likely to be contributing to the high morbidity and premature mortality from NCDs seen in developing countries.

Low availability was the main reason why lowest-priced generics were not meeting the target in the public sector (77% of cases across all medicines and surveys) compared to poor affordability (5%), and low availability combined with poor affordability (18%). This was unsurprising as many of the countries provide medicines free-of-charge to patients in the public sector hence affordability is not an issue. In the private sector, the causes for generics not reaching the WHO target were 46% low availability, 14% poor affordability, and 40% both low availability and poor affordability. For originator brands in the public sector, low availability was the main reason why the target not being reached (92% of cases), with 8% due to low availability combined with poor affordability. Off-patent originator products are generally less available in the public sector as government purchase lower priced generic equivalents. In the private sector, originator brands did not meet the target due to low availability (52% of cases), poor affordability (6%), and low availability combined with poor affordability (42%).

Despite its strengths, the WHO/HAI methodology has some limitations as outlined by Cameron et al. (1) Medicine selection is limited to those with an MSH price and focuses on primary care, which may be reasons for the inclusion of few cancer medicines in surveys; (2) Alternate strengths, dosage forms or therapeutic alternatives are not taken into account; (3) Availability only refers to the day of data collection which may not reflect average availability over time, although it does reflect the situation people experience when going to facilities; (4) The affordability metric does not include other healthcare costs (consultations, diagnostic tests etc.).

This is the first analysis of combined NCD medicine availability and affordability, and establishes a baseline for assessing future performance against the WHO target. In the era of Sustainable Development Goals, and countries working to achieve Universal Health Coverage, this baseline data shows that increased commitments are needed by governments and others to improve access to essential NCD medicines. Firstly, countries

need to survey the availability, price and affordability of NCD medicines to identify target-gaps, then ascertain the determinants of low availability and/or poor affordability. From this, evidence-based policies and interventions are needed that are fully implemented and enforced, and their impact monitored on a regular basis.

The GAP and other documents (5,20-22) outline a range of policy options to address low medicine availability, high prices and poor affordability. The most appropriate action depends on the national context but may include promoting competition through accelerated and lower-cost registration procedures for generics, efficient government procurement (national pooled procurement, buying lower-priced quality-assured generics, negotiating prices with suppliers), passing on low procurement prices where free medicines is not possible in the public sector, eliminating stock-outs through adequate forecasting, adequate and sustainable financing, efficient distribution, eliminating taxes and tariffs on essential medicines, regulating mark-ups in the supply chain (including importers, wholesalers, pharmacists), mandating prescribing by the medicine's International Nonproprietary Name (INN), promoting generic substitution and incentivising the dispensing of lower-priced generics through regressive mark-ups or regressive dispensing fees (rather than the common practice of fixed percentage mark-ups that incentivises the dispensing of high priced products). Promoting the use of lower-priced generics to health professionals and the public is needed. Prerequisites to the acceptance and use of lower-priced generics include ensuring that products on the market are quality-assured, and the results of product quality testing are publicly available. Countries could also consider schemes to make high priced NCD medicines (such as inhalers and insulin) available in the private sector at low government procurement prices.

Whatever policies and interventions are used nationally, price transparency is vital as it empowers governments when procuring medicines, healthcare providers when prescribing, and, most importantly, patients when buying medicines. Governments should publish their tender prices, and ensure their citizens are easily able to compare patient prices. Likewise, governments should publicly report stock-outs.

As part of the plan to monitor the NCD indicators and targets, WHO and partner organisations should include availability, price and affordability of essential NCD medicines in all national surveys and monitoring work to be able to report on these critical indicators. Momentum to improve access to medicines should build in response to the Sustainable Development Goals, Universal Health Coverage goals and other initiatives. Priority must be given to medicines to treat NCDs. It is hoped that these opportunities, along with the implementation of the WHO Global Plan of Action, will result in much needed improvement in access to NCD medicines in low- and middle-income countries.

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