



Access to medicines for asthma, diabetes and hypertension in eight counties of Kenya

Veronika J. Wirtz, Kristen Turpin, Richard O. Laing, Carol K. Mukiira and Peter C. Rockers

Abstract

Objectives: To assess access to noncommunicable diseases (NCD) medicines in Kenya for patients diagnosed and prescribed treatment for asthma, diabetes and hypertension.

Methods: Households in eight purposively chosen counties were randomly selected. To be eligible, a household needed to have at least one member aged 18 years or older who had been previously diagnosed and prescribed medicines for one of the following NCDs: asthma, diabetes or hypertension. Using a logistic regression model, we explored the relationship between patient characteristics and the probability that patients had the medicines available at the time of the survey visit.

Results: A total of 627 individuals were included in the analysis. The highest percentage of medicines availability was in households with diabetes patients (83.1%), followed by hypertension (77.1%) patients. The lowest availability of medicines was found in households with asthma patients (53.1%). The median household expenditure on medicines per month was US\$7.00 for households with diabetes patients; it was US\$4.00 for asthma. In general, strong predictors of having medicines at home was being older, having some education compared to no education, few household members, wealth, being diagnosed at private nonprofit facilities and having only one patient with NCDs in the household.

Conclusions: Our study found that nearly three-quarters of patients diagnosed and prescribed a medicine for hypertension, asthma or diabetes had the medicine available at home. Access challenges remain, in particular for patients from low-income households and for those diagnosed with asthma.

Introduction

Morbidity and mortality from noncommunicable diseases (NCDs) have increased globally. In 2012, almost three-quarters of all deaths due to NCDs occurred in low- and middle-income countries (LMICs) [1, 2]. The most prevalent NCDs are cardiovascular diseases, cancer, diabetes and chronic respiratory diseases [1, 2]. Apart from the impact on morbidity and mortality, NCDs have significant economic and social implications that affect households and communities [3].

In 2014, 27% of total deaths in Kenya were due to NCDs and the probability of dying from one of the four main types of NCDs for individuals between the ages of 30 and 70 years was 18% [1, 2, 4]. Rapid unplanned urbanisation, limited access to healthcare and affordability of treatment [4–7] among other factors have led to an increase in prevalence of NCDs [8].

Healthcare delivery in Kenya is provided by three large sectors: public, private and faith based. The decentralisation gave the main responsibility of healthcare provision to the county governments [9]. Whereas the private and the faith-based sector charge fees for service, a basic package of services is free of charge in the public sector with variations between levels of care and counties. Even though remarkable progress in health service delivery efficiency has been made in Kenya over a short period of time, major gaps remain in terms of availability and access to NCD care. For example, 82% of women and 79% of men in Kenya do not have health insurance [10]. Availability and affordability of medications due to high rates of out-of-pocket spending have been cited as a major barrier to NCD management. In Kenya, out-of-pocket spending on outpatient services accounts for about 78% of the total household health expenditure [11]. In general, medicines can account for 20–60% of healthcare spending and in many situations, up to 90% of the population purchase them through out-of-pocket payments [12]. By law, prescription-only medicines can only be dispensed with a valid prescription and sales need to be registered in a prescription recording book; however, in practice, retail pharmacies may not implement these requirements [13]. The 2009 Access to Essential Medicines in Kenya report indicates that while medicines are generally affordable to the lowest wage government worker, the majority of Kenyans make less than this wage, indicating that medicines may not be affordable to many [14]. Therefore, with individuals having to spend more and more of their income on healthcare, affordability has become a major concern in Kenya [12]. Even though the majority (76%) of Kenyans live in rural areas [1, 2], the rapid growth of urban areas has resulted in large informal settlements or slums where 58% of those in urban areas live [15]. Large gaps in the access to NCD medicines in slums have been found in Kenya [15].

This article aimed to assess access to NCD medicines for Kenyan patients diagnosed and prescribed treatment for asthma, diabetes and hypertension.

Methods

This study was part of a baseline assessment of the evaluation of Novartis Access, a social business programme, that offers a basket of 15 NCD medicines to public and private nonprofit health organisations for a price of about US\$1.0 per monthly treatment [16]. As the detailed protocol of the cluster-randomised evaluation (ClinicalTrials.gov registration number NCT02773095) including study design and data collection can be found elsewhere [17], this section provides a summary: in a two-stage sampling procedure, households in eight purposively chosen counties were randomly selected. To be eligible, a household needed to have at least one member aged 18 years or older who had been previously diagnosed and prescribed medicines for at least one of the four following NCDs: asthma, diabetes, hypertension or breast cancer. Breast cancer is excluded in the analysis presented here. The overall target sample for the study was 800 participants.

Data collection

Field data collectors and supervisors were trained by experienced researchers in all relevant aspect of data collection including the use of the instrument which was tested and revised in two pilot rounds. The instrument was based on validated WHO household survey instruments [18] and adapted to the Kenyan setting. The instrument collected information on household demographic and socio-economic data, location of diagnosis of the NCDs studied, location of medicines purchase, price of each medicines, total household expenditure and total household expenditure on medicines.

Data analysis

Descriptive statistics were calculated for the following set of demographic variables: age, education, location of residence, number of household members with NCDs, location of diagnosis and treatment. The classification of urban and rural was obtained from the Statistics Bureau in Kenya [10]. A measure of household wealth was constructed using principle component analysis of household assets and standardising within the study population. The total monthly household expenditure was calculated as the sum of all expenditures reported for each household. The household expenditure on medicines was calculated as the sum of all expenditures on medicines within the last month. For our study sample, both were expressed as the median in US dollars at the exchange rate from August 2016. A set of logistic regression models were fitted to the full sample and to disease subgroups to explore the relationship between patient characteristics and the probability that patients had medicines available at the time of the survey visit. The following characteristic variables were included in the models: gender, age, level of education (none; some primary; primary completed; at least some secondary); household residents; household wealth z-score; urban/rural location of residence; location of diagnosis (public facility; private nonprofit facility; private-for-profit facility/outlet; multiple diagnoses at different locations); a dichotomous indicator of having more than one NCD diagnosed; and a dichotomous indicator of having more than one NCD patient in the household. These variables were selected because they capture different aspects of each patient's medicine-seeking experience and potential barriers to access. All standard errors were adjusted to account for clustering at the county-level. SAS/STAT[®] 9.4 software¹ was used for the analysis.

Results

Of a total of 627 individuals included in the analysis, 68.7% were women, 81.7% lived in locations classified as rural, 51.0% were over 60 years old, and 26.8% had 1 year or less of formal education (Table 1). The mean number of household members was 5.2. The median household expenditure on medicines per month was US \$5.00.

There were important differences between the subpopulations by diagnosis: asthma patients were younger and had lower education and income levels than patients with diabetes and hypertension. The highest percentage of medicines availability was in households with diabetes patients and the lowest in households with asthma patients. The median household expenditure on medicines per month was US\$7.00 for

households with diabetes patients vs. US\$4.00 for asthma. The median monthly household expenditure was US\$100.00 for households with diabetes; it was US\$50.00 for asthma.

Compared to the general population, the study population was slightly wealthier, in particular with regards to patients diagnosed and treated for diabetes (Figure 1). By contrast, households with patients diagnosed and treated for asthma were the least wealthy. On average, households with patients diagnosed and treated for diabetes were wealthier than the other two subgroups.

About half of patients with hypertension, diabetes and asthma were diagnosed at public hospitals (Figure 2). Patients with asthma were most frequently diagnosed at public hospitals (60%), followed by patients with diabetes (55%) and hypertension (49%). Roughly one in five patients with diabetes were diagnosed at private-for-profit hospitals or clinics. Public clinics or health centres were the only locations where there was a large difference between the diseases in the percentage of patients diagnosed. 15% of patients with hypertension were diagnosed in public clinics or health centres, but only 5% of patients with diabetes.

Contrary to diagnosis, most patients purchased treatment in the private sector. More than 50% of patients with asthma and about 40% of patients with hypertension and diabetes purchased treatment in the private sector. About 30% of patients with hypertension and diabetes purchased treatment in public hospitals. Only 17% of patients purchased their asthma medicines in public clinics or health centres (Figure 3).

In general, we found a relationship between having medicines at home and several household characteristics: being older, having some education compared to no education, few household members, wealth and having only one patient with NCDs in the household (Table 2). For instance, the odds of having medicines at home decreased by one-third when more than one person had an NCD in the home. Similarly, a primary education increased the odds twofold of having medicines at home compared to no education.

Discussion

This study contributes to our knowledge about diagnosis and treatment to medicines for three common NCDs in Kenya: hypertension, diabetes and asthma. Our analysis yielded three key findings. First, nearly three-quarters of respondents had their prescribed medicines at home, though the probability was lower for asthma patients than for hypertension and diabetes patients. Second, while most respondents reported being diagnosed in the public sector, the majority who had medicines had purchased them in the private sector. Third, older age, more education, fewer members per household, diagnosis at private nonprofit facilities and greater wealth were associated with a higher probability of having the necessary medicine.

The availability of asthma medicines was much lower than for hypertension or diabetes. This may be due to the lower wealth of households with asthma patients, who are not able to afford paying for medicines. The median household expenditure was the lowest of the three disease groups (US\$50.00); the proportion of total household expenditures for medicine the highest (8%). Our study does not allow determining whether lower household wealth is a consequence of the higher expenditure on medicines or whether members of poorer households are at higher risk of developing asthma. We know that exposure to indoor pollution, which is more prevalent in poorer households, increases the risk of asthma [19]. Although asthma is considered an NCD, it is different from hypertension and diabetes in so far that it has an acute component. As a result, patients perceive asthma treatment as only necessary in the acute phase; we found some evidence for this perception in our qualitative data published elsewhere [20]. Asthma patients were also much more likely to be younger than hypertension and diabetes patients, which may have contributed to their lower likelihood of having medicines. The risks of not having medicines may be less dire in the young, or they perceive this to be the case.

In general, for all three diseases diagnosis was more common in the public than in the private sector. About half of the patients were diagnosed in public hospitals. Unsurprisingly, only a very small number of patients with diabetes were diagnosed at public clinics or health centres, instead of at the hospital level, as the diagnosis of diabetes requires diagnostic tests that are more resource-intensive and likely not available in public clinics or health centres [21]. In contrast, measuring blood pressure to diagnose hypertension is likely available in public clinics and health centres. Therefore, diabetes diagnosis was more common in private-for-profit hospitals and clinics; this may be one reason diabetes patients are from households that are more wealthy than hypertension and asthma.

Table 1 Individual data on study participants enrolled in the full study

	Overall† (N = 627)	Asthma (N = 129)	Diabetes (N = 142)	Hypertension (N = 445)	P-value‡
Gender					
Female	431 (68.7)	81 (62.8)	83 (58.5)	318 (71.5)	
Male	196 (31.3)	48 (37.2)	59 (41.6)	127 (28.5)	0.253
Urban/Rural					
Urban	115 (18.3)	32 (24.8)	31 (21.8)	70 (15.7)	
Rural	512 (81.7)	97 (75.2)	111 (78.2)	375 (84.3)	0.114
Age group					
18–29	32 (5.1)	20 (15.5)	4 (2.8)	9 (2.0)	
30–39	57 (9.1)	29 (22.5)	9 (6.3)	22 (4.9)	
40–49	88 (14.0)	24 (18.6)	26 (18.3)	47 (10.6)	
50–59	130 (20.7)	25 (19.4)	31 (21.8)	96 (21.6)	
≥60	320 (51.0)	31 (24.0)	72 (50.7)	271 (60.9)	<0.001
Highest level of education					
None	168 (26.8)	34 (26.4)	22 (15.5)	128 (28.8)	
Some primary school (not completed)	158 (25.2)	27 (20.9)	35 (24.7)	114 (25.6)	
Primary school completed	138 (22.0)	37 (28.7)	36 (25.4)	86 (19.3)	
Secondary school completed	114 (18.2)	21 (16.3)	30 (21.1)	85 (19.1)	
Vocational school/higher than secondary school completed	49 (7.8)	10 (7.8)	19 (13.4)	28 (7.2)	0.817
Wealth quintiles					
1st	121 (19.3)	35 (27.1)	17 (12.0)	75 (16.9)	
2nd	128 (20.4)	31 (24.0)	28 (19.7)	84 (18.9)	
3rd	126 (20.1)	23 (17.8)	27 (19.0)	96 (21.6)	
4rd	126 (20.1)	25 (19.4)	34 (23.9)	88 (19.8)	
5th	126 (20.1)	15 (11.6)	36 (25.4)	102 (22.9)	0.003
Household members, mean (SD)	5.2 (3.5)	6.0 (3.5)	5.2 (3.0)	5.0 (3.6)	0.002
Household members with an NCD, mean (SD)	1.1 (0.4)	1.2 (0.4)	1.2 (0.4)	1.1 (0.3)	0.363
Individuals having at least one medicine at home (%)	462 (73.7)	75 (58.1)	118 (83.1)	343 (77.1)	<0.001
Household monthly expenditure on medicines (US\$), median (IQR)	\$5.00 (\$1.23–\$17.55)	\$4.00 (\$1.00–\$10.00)	\$7.00 (\$2.00–\$20.00)	\$5.00 (\$1.40–\$17.60)	0.289
Household monthly expenditure total (US\$), median (IQR)	\$66.50 (\$30.00, \$150.00)	\$50.00 (\$20.00, \$135.00)	\$100.00 (\$40.00, \$200.00)	\$70.00 (\$38.00, \$140.00)	0.746

†Overall is not the sum of the disease subgroups as some patients have more than one disease.

‡Based on test of hypothesis that asthma patients are different from patients without asthma.

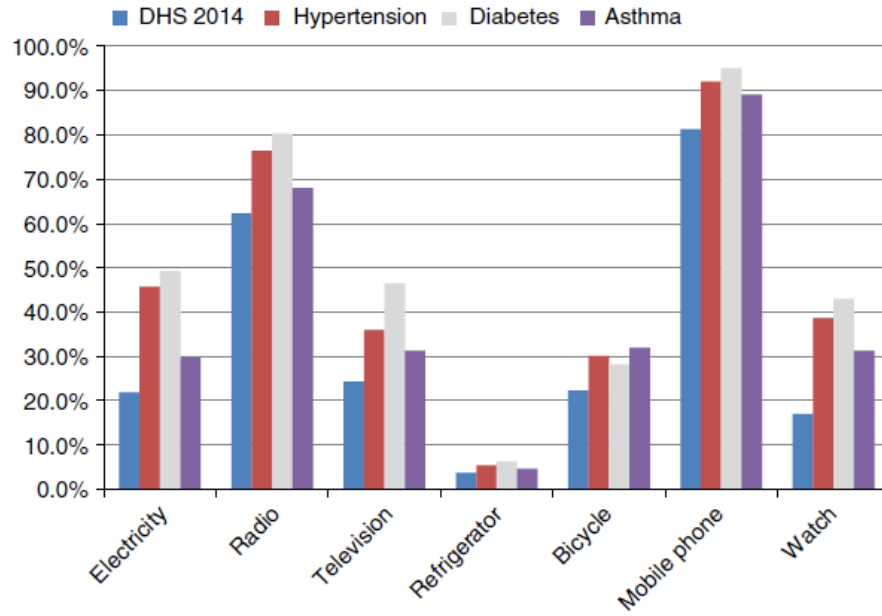


Figure 1 Household possessions by type of diagnosis compared to Demographic Health Survey (DHS).

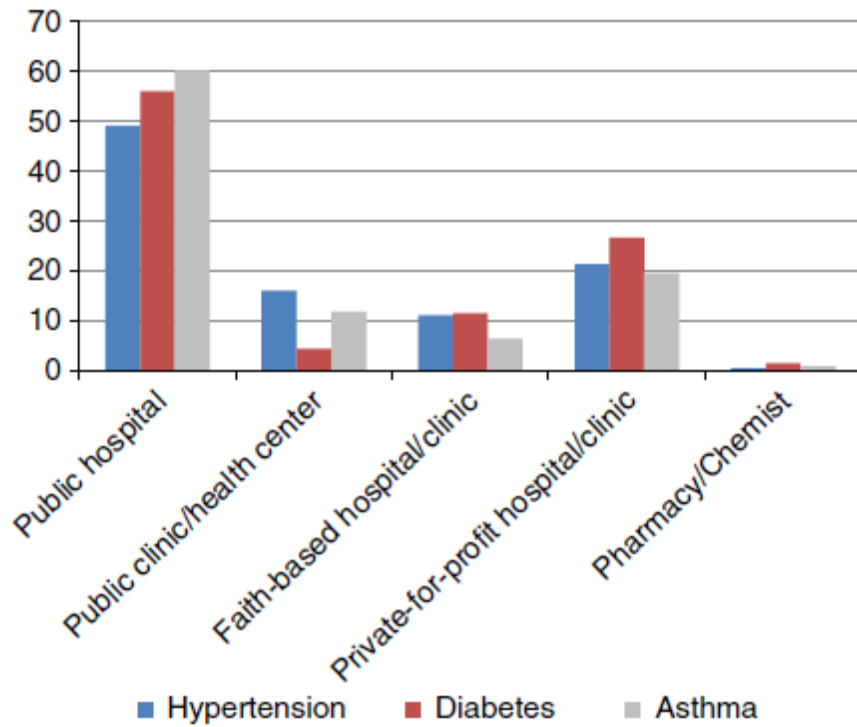


Figure 2 Percentage distribution of location of diagnosis by noncommunicable disease.

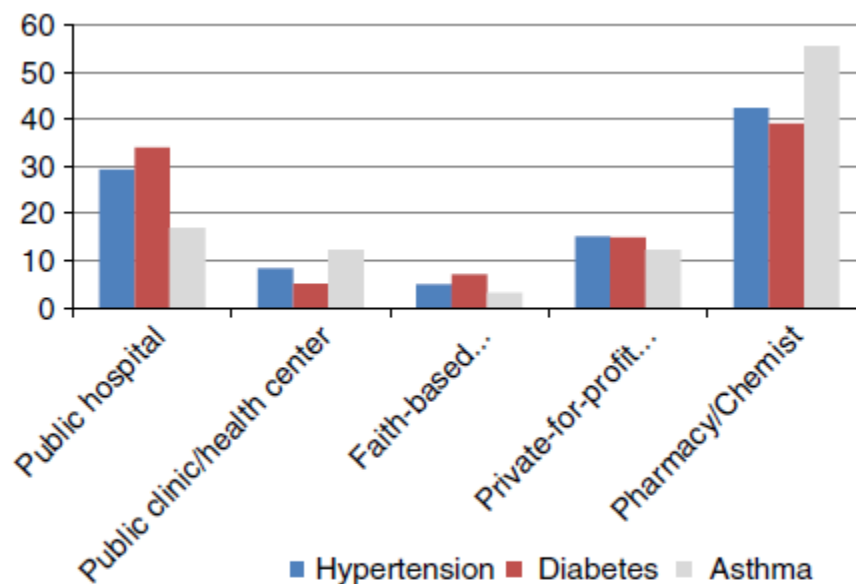


Figure 3 Percentage distribution of location of treatment by noncommunicable disease.

The majority of patients purchased medicines in the private sector, in particular patients with asthma, perhaps because asthma medicines are less likely to be available in public facilities than antihypertensive and diabetes medicines. According to the national Essential Medicines List, NCD medicines are not readily available below the district hospital level (level 4) [22]. Public clinics and health centres (levels 2 and 3, respectively) are not obliged to stock them which explains the fact that a large proportion of patients use public hospitals to access medicines. This is an important access barrier to NCD medicines in Kenya. There is a large body of literature showing that availability of medicines in general and NCD medicines in particular is better in private facilities and retail pharmacies than in the public sector [12]. The lower availability in the public sector where medicines may be dispensed for free means that patients are required to purchase medicines largely out of pocket.

Table 2 Relationship between patient characteristics and having medicines at the home. Dependent variable: probability that patient has medicines for disease at the home

	Hypertension OR (95% CI)	Diabetes OR (95% CI)	Asthma OR (95% CI)	All diseases OR (95% CI)
Patient demographics				
Female	1.12 (0.65–1.92)	1.13 (0.37–3.44)	1.51 (0.67–3.43)	1.14 (0.71–1.81)
Age (years)	1.01 (0.99–1.03)	1.02 (0.99–1.06)	1.04*** (1.02–1.07)	1.03*** (1.01–1.04)
Highest level of education				
None	Ref	Ref	Ref	Ref
Some primary	2.25*** (1.21–4.19)	0.67 (0.15–3.02)	1.10 (0.20–6.06)	2.06** (1.14–3.72)
Primary completed	2.63*** (1.24–5.59)	0.75 (0.19–3.06)	1.02 (0.24–4.38)	2.05** (1.04–4.07)
At least some secondary	1.68 (0.79–3.58)	0.40 (0.09–1.76)	1.01 (0.16–6.27)	1.64 (0.85–3.18)
Household demographics				
Number of residents	0.94** (0.88–1.00)	0.88* (0.76–1.02)	0.91 (0.80–1.04)	0.94** (0.88–1.00)
Wealth (z-scores)	1.39*** (1.02–1.90)	1.59 (0.69–3.63)	2.06** (1.13–3.75)	1.50*** (1.15–1.97)
Urban	0.69 (0.37–1.28)	1.10 (0.28–4.29)	0.75 (0.26–2.19)	0.76 (0.46–1.27)
Disease				
Location of diagnosis				
Public facility	Ref	Ref	Ref	Ref
Private nonprofit facility	1.29 (0.61–2.74)	3.23 (0.27–38.69)	1.79 (0.14–23.08)	1.50 (1.72–3.13)
Private-for-profit facility/outlet	0.91 (0.46–1.78)	1.21 (0.31–4.72)	0.99 (0.34–2.83)	0.94 (0.56–1.57)
Multiple diagnoses at different locations	–	–	–	1.30 (0.23–7.37)
Patient diagnosed with more than one NCD	1.20 (0.70–2.08)	2.78 (0.75–10.30)	0.29* (0.07–1.16)	1.23 (0.68–2.20)
More than one NCD patient in household	0.67 (0.38–1.16)	0.68 (0.15–2.95)	0.44 (0.14–1.42)	0.65* (0.41–1.02)
Observations	445	142	129	639
Counties	8	8	8	8

Estimates are from logistic regression models. 95% confidence intervals are presented in parentheses. All standard errors were adjusted at the county-level to account for clustering.

***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

Unsurprisingly, we found that better-educated and wealthier patients were more likely to have the medicines they needed. This finding is consistent with similar findings from previous studies [23], and highlights the fact that affordability barriers are a key impediment to medicine access in this setting. The sample differed from the general population in being wealthier, which suggests that affordability of medicines in the general population is likely lower.

We found that spending on medicines in households with diabetes patients was higher than in households with other diseases. Patients with diabetes frequently take multiple medicines which contribute to higher expenditure [24]. Patients who require insulin probably incur higher overall medicines expenditure than patients who require asthma or antihypertensive medicines due to the higher cost of insulin.

This study has some important limitations. First, our study sample is limited to individuals who had been diagnosed and prescribed treatment. We are therefore not able to comment on access to diagnostic services. Second, we did not verify medical diagnosis nor did we assess the appropriateness of the medical prescription. We relied on self-reports by individuals which may have been biased by recall. Third, for the assessment of household expenditure we relied on the recall of individuals rather than

a diary or receipts. Finally, this study was a baseline assessment and therefore did not collect information over time.

Conclusions

Kenya has taken important steps to increase access to NCD care. Nearly three-quarters of patients diagnosed and prescribed a medicine for hypertension, asthma or diabetes had the medicine available at home. However, access challenges remain, in particular for patients from low-income households and for those diagnosed with asthma. Making NCD medicines more affordable and available to patients of all income groups remains an important task to promote universal health coverage in Kenya.

References

1. World Health Organization. *Global Status Report on Non-Communicable Diseases 2014*. World Health Organization: Geneva.
2. World Health Organization. *Non Communicable Diseases Country Profiles – Kenya 2014*. World Health Organization: Geneva.
3. Mwai D, Muriithi M. Economic effects of non-communicable diseases on household income in Kenya: a comparative analysis perspective. *Public Health Res* 2016; 6: 83–90.
4. Haregu TN, Oti S, Egondi T, Kyobutungi C. Co-occurrence of behavioral risk factors of common non-communicable diseases among urban slum dwellers in Nairobi, Kenya. *Glob Health Action* 2015; 8: 28697.
5. Ministry of Health, Kenyan National Bureau of Statistics WHO. *Kenya STEPwise Survey for Non Communicable Diseases Risk Factors Report*. 2015. (Available from: <http://aphrc.org/wp-content/uploads/2016/04/Steps-Report-NCD-2015.pdf>) [15 Jun 2017].
6. Ayah R, Joshi MD, Wanjiru R *et al*. A population-based survey of prevalence of diabetes and correlates in an urban slum community in Nairobi, Kenya. *BMC Public Health* 2013; 13: 371.
7. Oti SO, van de Vijver S, Kyobutungi C. Trends in non-communicable disease mortality among adult residents in Nairobi's slums, 2003–2011: applying InterVA-4 to verbal autopsy data. *Glob Health Action* 2014; 7: 25533.
8. Joshi MD, Ayah R, Njau EK *et al*. Prevalence of hypertension and associated cardiovascular risk factors in an urban slum in Nairobi, Kenya: a population-based survey. *BMC Public Health* 2014; 14, 1177.
9. Williamson T, Mulaki A. *Devolution of Kenya's Health system*. Health Policy Project. Waltham, MA: RTI International, 2015.
10. Kenya National Bureau of Statistics, Ministry of Health, National AIDS Control Council, Kenya Medical Research Institute, National Council for Population and Development The DHS Program, ICF International. *Kenya Demographic and Health Survey 2014*. Nairobi: Kenya National Bureau of Statistics, 2015.
11. Ministry of Health, Government of Kenya. *2013 Kenya Household Health Expenditure and Utilisation Survey*. Nairobi: Government of Kenya, 2014.
12. Cameron A, Ewen M, Ross-Degnan D, Ball D, Laing R. Medicine prices, availability, and affordability in 36 developing and middle-income countries: a secondary analysis. *Lancet* 2009; 373: 240–249.
13. Wafula F, Abuya T, Amin A, Goodman C. The policy-practice gap: describing discordances between regulation on paper and real-life practices among specialized drug shops in Kenya. *BMC Health Serv Res* 2014; 14: 394.
14. Ministry of Health, Ministry of Public Health and Sanitation. Access to Essential Medicines in Kenya - A Health Facility Survey. Available from: <http://apps.who.int/medicinedocs/documents/s18695en/s18695en.pdf>
15. van de Vijver SJM, Oti SO, Agyemang C, Gomez GB, Kyobutungi C. Prevalence, awareness, treatment and control of hypertension among slum dwellers in Nairobi, Kenya. *J Hypertens* 2013; 31: 1018–1024.
16. Novartis. *Novartis Launches 'Novartis Access', a Portfolio of Affordable Medicines to Treat Chronic Diseases in Lower-Income Countries*. 2015. (Available from: <https://>

www.novartis.com/news/media-releases/novartis-launches-novartis-access-portfolio-affordable-medicines-treat-chronic) [3 Feb 2018].

17. Rockers PC, Wirtz VJ, Vian T, Onyango MA, Ashigbie PG, Laing R. Study protocol for a cluster-randomised controlled trial of an NCD access to medicines initiative: evaluation of Novartis Access in Kenya. *BMJ Open* 2016; 6: e013386.

18. World Health Organization. *WHO Operational Package for Assessing, Monitoring and Evaluating Country Pharmaceutical Situations*. World Health Organization: Geneva, 2007.

19. Zhang J, Smith KR. Indoor air pollution: a global health problem. *Br Med Bull* 2003; 68: 209–225.

20. Barakat D, Rockers PC, Vian T, Onyango M, Laing R, Wirtz VJ (2018) Diagnosis and treatment of asthma in eight counties in Kenya. *Int J Tuberc Lung Dis* 22, 585–590.

21. Government of Kenya. *Kenya Service Availability and Readiness Assessment Mapping (SARAM) Report*. Nairobi: Ministry of Health, 2014. (Available from: <http://apps.who.int/healthinfo/systems/datacatalog/index.php/ddibrowser/42/download/145>) [15 Jun 2017].

22. Kenya Ministry of Health. Kenya Essential Medicines List 2016 Edition. Ministry of Health, Republic of Kenya; 2016.

23. Vialle-Valentin CE, Serumaga B, Wagner AK, Ross-Degnan D. Evidence on access to medicines for chronic diseases from household surveys in five low- and middle-income countries. *Health Policy Plan* 2015; 30: 1044–1052.

24. Garda-Pérez LE, Álvarez M, Dilla T, Gil-Guillén V, Garcia-Perez D. Adherence to therapies in patients with type 2 diabetes. *Diabetes Ther* 2013; 4: 175 .