

## Community Health Workers for hypertension control:

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### Summary

Hypertension ranks among the main causes of mortality in sub-Saharan Africa (SSA). A principal contributor to cardiovascular disease, a costly and debilitating occurrence, in which many African households find themselves undertaking significant expenditures, in some cases considered catastrophic vis a vis their disposable income. The Pan-African Society of Cardiology (PASCAR) has identified the screening and treatment of hypertension as the first priority to reduce the burden of cardiovascular diseases in sub-Saharan Africa (SSA). Hypertension detection in Africa currently relies on opportunistic screening at health facilities. With the non-existence of health facilities in remote/rural areas and the shortage of staff willing to go to those areas, task-shifting or task-delegation has been positioned as a practical solution for improving hypertension control. Thus, the benefits and costs associated with the scaling-up of the screening and treatment of hypertension using community health workers as active case-finders have been analyzed. Screening everyone, that is potentially hypertensive, reveals itself to be an expensive proposition, as prevalence rates in SSA average 46%. The model analyzed is active case detection by professional community health workers, which results in modest benefit-cost ratios of 4.3, 2.1, 2.3 in South Africa, Nigeria, and Kenya.

### Scope and identification of the problem

Hypertension is a major contributor to cardiovascular diseases (CVDs) and related mortality in sub-Saharan Africa (SSA). With an estimated prevalence of 46% among adults in 2013 (WHO, 2015), and a projected 216.8 million cases by 2030 (Adeloye and Basquill, 2014), hypertension is a major health crisis in SSA (Dzudie et al., 2017).

Mozaffarian et al (2014) found that, globally, 1.65 million annual deaths from cardiovascular causes (95%; 1.10 million to 2.22 million) were

attributed to sodium intake above the reference level; that these deaths accounted for nearly 1 of every 10 deaths from cardiovascular causes, and that four of every 5 deaths (84.3%) occurred in low- and middle-income countries. One of the risk factors for hypertension and cardiovascular disease is salt consumption exceeding 2g of sodium/5g of salt) per day. Africans consume on average 7 to 10 grams of salt per day, of which 40% is considered discretionary (Wentzel-Viljoen et al. 2017). Sodium reduction significantly lowers blood pressure, which consequently reduces the probability of occurrence of heart disease and stroke.

This high prevalence of hypertension in SSA is against a background of huge detection, treatment and control gaps (Ataklte et al., 2015), a picture that reflects the ineffectiveness of the existing health systems across Africa, to capture and efficiently treat people with hypertension and its related risk factors like salt intake and tobacco use. Hypertension detection in Africa currently relies on opportunistic screening at health facilities. With the low contact of the population with the health systems across Africa, only a small proportion of the population get exposed to health systems. Of those who eventually have contact with the health system, a large number of those eligible for hypertension screening do not benefit from such screening. Reasons include the shortage of adequately trained health personnel to screen for hypertension and initiate appropriate management, the lack of functioning equipment, the lack of- or unaffordability of medications. With the lowest doctor-to-population ratios globally, SSA cannot afford to rely on the traditional doctor-delivered model of care to improve the detection and control of hypertension.

### Description of the proposed solution

The intervention modelled is a patient-focused hypertension screening activity and subsequent antihypertensive treatment, using community health workers (CHW) for active

case finding. The intervention consists of the following activities:

- Training of the requisite number of CHW for screening, detection, treatment and ongoing management of hypertension at health care facility
- The door-to-door screening for identification of patients unaware of their hypertensive status and subsequent referral to a health care facility
- Follow-up visit to assure medication adherence

The countries of South Africa, Nigeria, and Kenya were selected because of the availability of data and the existence of previous studies evaluating the training and deployment of community health workers. According to the Southern African Hypertension Society, only half of South Africans are aware of the blood pressure status. The intervention for South Africa was therefore defined as the use of CHW to increase the number of persons screened and treated for hypertension, currently at 50%, to 75%. In Nigeria, since it has been estimated that as much as 78% of people are unaware of their status, the intervention was specified as the use of CHW to increase the number of persons screened and treated for hypertension, currently at 22%, to 50% (Raji et al, 2017). In Kenya, as 56% are unaware of their status, the intervention was specified to use CHW to increase the number of persons screened and treated for hypertension, currently at 44%, to 75% (Achoki et al (2019).

The countries have comparable mortality rates due to cardiovascular disease (CVD), and death occurs at approximately 64 years of age.

	South Africa	Nigeria	Kenya
Population	57.7M	206.1M	49.7M
Prevalence rate, hypertension	0.4	0.37	0.24
Mortality rate, CVD	0.14	0.11	0.13
Expectation of life at age 50, years	23.4	21	26.3
Weighted average age of death from CVD, years	63.8	64.2	63.3

Calculations were therefore undertaken based on a hypothetical person, screened at age 50, in order to avert a potentially fatal (and costly) CVD event.

## Costs

The costs of the CHW intervention include (1) the training, screening and salary costs for CHW and (2) the costs of antihypertensive treatment. The combined costs associated with the deployment of CHW per person screened was US\$6.09 (Gaziano et al., 2015), \$5.82 (Rosendaal et al., 2016), and \$17.73 (Oji Oti et al. 2016) for South Africa, Nigeria, and Kenya, respectively. In all three countries, the screening costs constituted the principal cost component: 52% in South Africa; 85%, Nigeria, and 95% in Kenya. Training costs in all three countries were negligible, compared to screening costs. With reference to screening, CHW undertake door-to-door household visits to raise awareness about the burden of cardiovascular diseases in the community and provide information about opportunities for screening, to conduct the screening and to provide brief counselling among the eligible population. The costs of screening includes equipment and screening kits and transportation.

Though most CHW in sub-Saharan Africa are volunteers, remunerated with a stipend, the assumption was made here that they would be fully integrated into the medical architecture as front-line service providers and therefore offered a salary.

The costs of hypertension management include the cost of medication, biology test, and consultations. It is assumed that patients undertake quarterly screenings and monthly medication pick-up for the remaining years of expected life. It is also assumed that everyone diagnosed with hypertension attempts to control it with medication. Because of the intensity of care required to treat hypertension, this component makes up 99% of total costs of the intervention. The costs of antihypertensive treatment were standardized across the countries, using the median estimate of a systematic review of studies in low and middle-income countries, of

US\$22/month (Gheorghe et al, 2018). Its magnitude depends entirely on the life expectancy of the 50-year old patient. Consequently, Kenya had the highest present value (discount rate of 5%) of treatment costs, \$3933.11; the costs for South Africa and Nigeria were \$3721 and \$3560, respectively.

Cost components, USD	South Africa	Nigeria	Kenya
CHW costs (training, screening)/patient	\$6	\$6	\$18
Hypertension treatment costs/patient	\$3,721	\$3,591	\$3,933
Total costs/patient, discounted	\$3,727	\$3,567	\$3,951

The social costs are dependent on the size of the population, the prevalence of hypertension and the effectiveness of case detection. The annual social cost of antihypertensive treatment of approximately a quarter of the people, who have been diagnosed as hypertensive in South Africa, is potentially \$671.7 million. In Nigeria, the corresponding cost is \$1.65 billion; in Kenya, \$279 million.

These costs are incurred to society as a consequence of being screened and positively diagnosed as hypertensive.

## Benefits

The benefits include the averted death and disability (DALY) arising from uncontrolled hypertension. The DALYs for the CHW intervention are presented below, as well as the valuation proxy.

	South Africa	Nigeria	Kenya
DALYs/capita	0.637	0.374	0.886
GNI/capita	\$5,720	\$1,960	\$1,620
PV, DALYs averted	\$10,771	\$2,578	\$3,927

Evidently, the magnitude of the value of DALYs depends entirely on the income factor used, and the GNI/capita estimates vary widely among the three cases.

It is assumed that controlled hypertension significantly reduces CVD risk. Therefore, another benefit included is the averted acute

care costs of a CVD event. These costs reflect the median direct costs at a public institution across a selection of low- and middle-income countries. Indirect costs (i.e. transportation, food, and productivity losses) have not been included due to high variation in the literature both between countries and between public and private service providers. The median direct cost to society of a CVD event (stroke) is \$5000 (Gheorghe et al., 2018).

	South Africa	Nigeria	Kenya
Averted death/disability/patient	\$10,771	\$2,578	\$3,927
Averted medical expenses /patient, CVD	\$5,250	\$5,250	\$5,250
Total benefits/patient, discounted	\$16,021	\$7,828	\$9,177

## Conclusion

For the CHW intervention, the benefit-cost ratios (BCR), discounted at 5%, are as follows:

	Benefits	Costs	BCR
<b>South Africa</b>	\$16,021	\$3,727	4.3
<b>Nigeria</b>	\$7,828	\$3,567	2.2
<b>Kenya</b>	\$9,177	\$3,951	2.3

Even though hypertension management is a lifetime treatment, it is still by far cheaper than a CVD episode. In Nigeria, direct medical costs/patient, up to 12 months post-stroke, have been reported to be as high as \$62,217 (2012); in South Africa, the average in-patient treatment for a CVD episode has been reported at \$11,093.74 (2012) and the cost of in-patient visit for stroke care at \$16,992 (Brouwer et al, 2015). Stroke admissions in Kenya have been costed at \$16,711 (Subramaniam et al, 2018).

And even though using CHWs for active screening and treatment follow-up could be considered cost effective, compared to setting up clinics and the provision of incentives to retain medical personnel in remote/rural areas, the more beneficial intervention is prevention, which, given the level of absorption of mobile technology and radio

communications, should be the intervention of choice.

Though not modelled this way in the analysis, in practice, CHWs are polyvalent; that is, their time in the field is spread over other health objectives such as active TB case finding, the promotion of antenatal and postnatal care, including the promotion of good nutrition, HIV testing, among others. Therefore, the screening for hypertension would carry a slightly lower cost burden, increasing the BCR.

Gheorghe et al (2018) calculate the ratio of the total costs of CVD care to health expenditures per capita. The median ratios for coronary heart disease and stroke are 10.02 and 12.7 respectively. The incidence of catastrophic payments, which is defined as an expenditure of more than 10% of disposable income on health costs, due to hypertension in Kenya, has been estimated to be 43%, 59% when transport costs are factored in (Oyando et al, 2019). This implies that there is an element of poverty alleviation associated with the early detection of hypertension, as well as the need to both curtail medical costs and expand access.

According to the evidence available on the societal impact of the scale up of community health worker programmes and health-related communications in Africa, it is expected that the interventions will increase productivity from a healthier population: person with cardiovascular disease like stroke or heart failure is prematurely removed from the labour market due to disability/death. They will also increase access to the health system, particularly in remote areas. They will also raise awareness among poor communities of the dangers of high salt intake and uncontrolled hypertension. Lastly, the interventions will promote the generation of more (and needed) evidence regarding lifestyle and hypertension management, as well as lead to a substantial reduction of CVDs complications and deaths on the African continent.

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