

# Engaging the Entire Care Cascade in Western Kenya

## A Model to Achieve the Cardiovascular Disease Secondary Prevention Roadmap Goals

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Cardiovascular disease (CVD) is the leading cause of death in the world, with a substantial health and economic burden confronted by low- and middle-income countries. In low-income countries such as Kenya, there exists a double burden of communicable and noncommunicable diseases, and the CVD profile includes many nonatherosclerotic entities. Socio-politico-economic realities present challenges to CVD prevention in Kenya, including poverty, low national spending on health, significant out-of-pocket health expenditures, and limited outpatient health insurance. In addition, the health infrastructure is characterized by insufficient human resources for health, medication stock-outs, and lack of facilities and equipment. Within this socio-politico-economic reality, contextually appropriate programs for CVD prevention need to be developed. We describe our experience from western Kenya, where we have engaged the entire care cascade across all levels of the health system, in order to improve access to high-quality, comprehensive, coordinated, and sustainable care for CVD and CVD risk factors. We report on several initiatives: 1) population-wide screening for hypertension and diabetes; 2) engagement of community resources and governance structures; 3) geographic decentralization of care services; 4) task redistribution to more efficiently use of available human resources for health; 5) ensuring a consistent supply of essential medicines; 6) improving physical infrastructure of rural health facilities; 7) developing an integrated health record; and 8) mobile health (mHealth) initiatives to provide clinical decision support and record-keeping functions. Although several challenges remain, there currently exists a critical window of opportunity to establish systems of care and prevention that can alter the trajectory of CVD in low-resource settings.

Cardiovascular disease (CVD) is the leading cause of mortality in the world, with 80% of CVD deaths occurring in low- and middle-income countries [1,2]. In sub-Saharan Africa, CVD is the leading cause of death among individuals over age 30 years [3]. In addition to the epidemiologic burden, CVD threatens to impose a significant economic burden on low- and middle-income countries [4-6]. Whereas atherosclerotic CVD (particularly stroke) [7] and CVD risk factors (particularly hypertension) [8] are increasing in Kenya, nonatherosclerotic CVD remains significant in Kenya, including rheumatic heart disease, heart failure, and household air pollution-related CVD [9,10]. In addition, the country continues to confront a “double burden” of disease, including a significant burden of human immunodeficiency virus and other communicable diseases (Figure 1) [11], representing the evolution of the epidemiologic transition in this country.

### SOCIO-POLITICO-ECONOMIC REALITIES

Kenya is designated as a low-income country by the World Bank [12], and the average daily income for a substantial proportion of its population is <U.S. \$1 per day [13]. In addition, total expenditure on health is <5%

of gross domestic product, out-of-pocket expenditures are more than 75% of private spending on health, and government expenditure on health is <U.S. \$40 per capita [14]. Although there is a national health insurance program, it has traditionally covered only inpatient admissions and is only recently expanding to outpatient coverage [15].

In Kenya, a Division of Non-Communicable Diseases was formed in the Directorate of Preventive and Promotive Services within the Ministry of Health. This division is charged with the responsibility of driving policy response to noncommunicable diseases for the whole country. It is in the process of concluding the development of a strategic plan for noncommunicable diseases, as well as ensuring that the national health policy includes measures to prevent and control noncommunicable diseases. Clear targets have been designated, and evidence-based interventions have been recommended, including those for secondary CVD prevention. However, widespread implementation of programs for CVD prevention is still lacking.

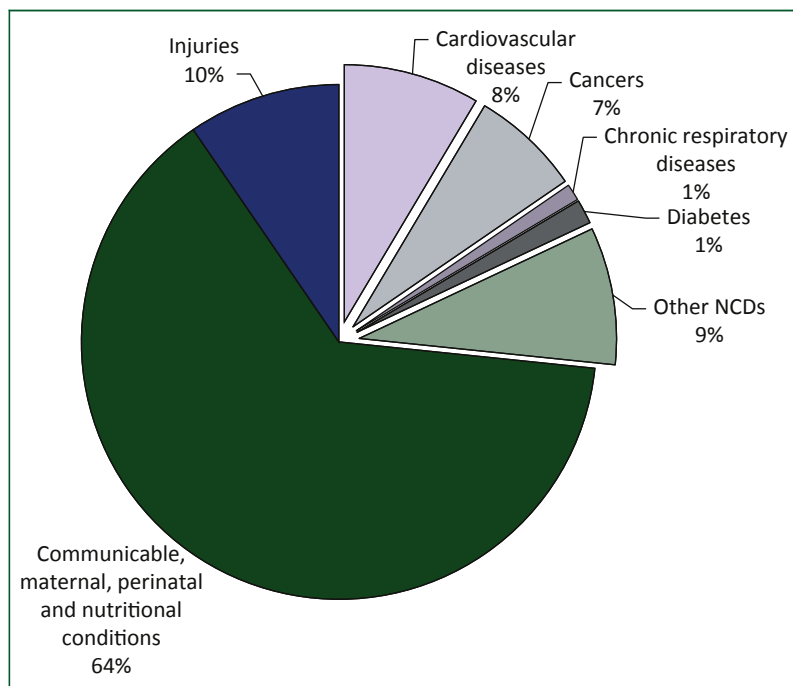
The infrastructure for CVD prevention is challenging. There are insufficient human resources for health overall [16], and the double burden of disease exacerbates this human resource shortfall. There are frequent and repeated

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**FIGURE 1. Percentage of total deaths by cause, all ages, both sexes.** NCD, noncommunicable disease(s). Reproduced, with permission, from World Health Organization [11].

medication stock-outs, of even the essential medicines contained on the national formulary [17]. Even when medicines are available, they often remain unaffordable, are subject to price gouging, and can sometimes be of uncertain quality [18]. CVD medicines are even less reliably available, especially for the rural population. In addition, there is a profound lack of facilities, supplies, and equipment—spanning laboratory facilities, radiology equipment, even sphygmomanometers. Finally, patients often engage the health care system at advanced and complicated stages of disease, at which point, prevention efforts are too late and curative efforts are expensive and sometimes futile.

It is within this socio-politico-economic reality that contextually appropriate programs for CVD prevention need to be developed. Here, we describe our experience from western Kenya, where we have engaged the entire care cascade across all levels of the health system, in order to improve access to high-quality, comprehensive, coordinated, and sustainable care for CVD and CVD risk factors.

### ENGAGING THE ENTIRE CARE CASCADE

Academic Model Providing Access to Healthcare (AMPATH) is a collaboration among the Moi University College of Health Sciences, the Moi Teaching and Referral Hospital, and a consortium of North American universities led by Indiana University. This partnership “leads with

care” while addressing the full academic mission that includes education and research. AMPATH has established a human immunodeficiency virus care system in western Kenya that has served over 160,000 patients [19,20]. Recently, AMPATH has leveraged this infrastructure to expand its clinical scope of work to develop a comprehensive chronic disease management program, focusing initially on CVD, hypertension, and diabetes [21]. In so doing, the program was guided by the following principles across the entire care cascade: find, link, treat, and retain. These four principles were embodied in several initiatives (Table 1): 1) population-wide screening for hypertension and diabetes; 2) engagement of community resources and governance structures; 3) decentralization of care services in order to improve geographic access; 4) task redistribution to allow for more efficient use of available human resources for health; 5) ensuring a consistent supply of essential medicines; 6) improving physical infrastructure of rural health facilities; 7) developing an integrated health record across all levels of the Kenyan health system; and 8) targeted, strategic use of mobile health (mHealth) initiatives to provide clinical decision support and record-keeping functions for rural clinicians.

By bringing together all of these components, AMPATH has been able to create an integrated system of chronic disease treatment and prevention services throughout its catchment area. Community health workers at the village level have received structured training to provide health education and assist with linkage and retention to chronic disease care. Nurses in rural dispensaries have been provided specialized training and support in order to independently manage hypertension and diabetes. Referral networks have been established that connect dispensaries, health centers, district hospitals, and the Moi Teaching and Referral Hospital. At the referral hospital, AMPATH has established outpatient cardiology and diabetes clinics that provide comprehensive, multidisciplinary, and longitudinal care for patients, many of whom have advanced or complex cardiovascular and metabolic diseases. Finally, by leveraging the academic partnership and philanthropic support, the program has built the first inpatient cardiac care unit in western Kenya, which allows for management, resuscitation, and rehabilitation of critically ill cardiovascular patients [22]. This integrated and comprehensive system of care provides the foundation for education, capacity building, and research, in line with the mission of AMPATH. The program has also launched a community-based outpatient health insurance program to facilitate greater access by resource-limited rural populations to the integrated care system.

AMPATH has also implemented creative and novel programs to increase access to CVD medicines. The program has partnered with key stakeholders in the Kenya Ministry of Health and local communities to establish a network of revolving fund pharmacies [17]. At the rural health center level, each revolving fund pharmacy is located within the government health center and serves as a

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