

PREVENTION OF  
HEART DISEASEBarriers and challenges for primary  
and secondary prevention of heart  
disease in sub-Saharan Africa*Simon Stewart\*#, Melinda J. Carrington\*# and Karen Sliwa\*+*

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**INTRODUCTION**

There is increasing recognition that the diverse people of sub-Saharan Africa face a number of paradoxical challenges arising from economic development and urbanisation. Whilst these promise a reduction in the diseases of poverty (predominantly malnutrition and infectious disease) they will undoubtedly come at a price with a parallel rise in non-communicable forms of cardiovascular disease (CVD). A recent report from the Heart of Soweto Study, suggested that the urban, predominantly African community of more than 1 million people, stands at the crossroads between traditional/communicable forms of heart disease (including rheumatic heart disease (RHD) and the dilated cardiomyopathies)<sup>(1)</sup> and non-communicable forms of heart disease linked to epidemiological transition.<sup>(2)</sup> The most profound finding of this study is that women predominate and that de novo cases of often-advanced forms of heart disease from both sexes are far younger than that seen in high-income countries. Although cases of coronary artery disease (CAD) are on the rise, it is hypertensive heart failure (HF) that represent the most common form of non-communicable heart

**ABSTRACT**

**The diverse people of sub-Saharan Africa face a number of paradoxical challenges arising from economic development and urbanisation, including an increasing prevalence of non-communicable forms of heart disease. Prevention programmes designed not only to detect those with established and often disabling forms of heart disease, but prevent disease progression and a premature death, are an obvious priority in this setting. This review article reflects on the barriers and challenges to effective primary and secondary prevention of heart disease in sub-Saharan Africa by (a) examining what residual issues challenge effective prevention in high-income countries? (b) what are the key ingredients to an integrated programme of primary and secondary prevention across the lifespan (from the population to individual)? and (c) considering the first two points, what are the barriers and challenges in sub-Saharan Africa to implementing cost-effective primary and secondary prevention using a systematic approach to “who, what and how”? SAHeart 2011; 8:96-102**

disease in Soweto,<sup>(1,3)</sup> reflecting high levels of hypertension in urban communities in sub-Saharan Africa as a whole.<sup>(4)</sup> Secondary prevention programmes designed to not only detect those with established and often disabling forms of heart disease and other forms of CVD (including ischaemic and non-ischaemic forms of stroke),<sup>(5)</sup> but prevent disease progression and a premature death, are an obvious priority.

Fortunately, additional data from primary care clinics in Soweto, suggest there is still time to limit the number of typically advanced presentations of CVD because many cases of hypertension (representing 1 in 3 primary care contacts) have yet to present with end organ damage.<sup>(6)</sup> Alternatively, the general lack of blood pressure (BP) control despite pharmacological treatment, overwhelming burden of communicable diseases and other health issues (compared to only 3 in 100 primary care cases with an advanced form of CVD) and poor resources, are a stark reminder of the challenging environment confronting anyone wishing to improve health outcomes in this setting.<sup>(7)</sup>

This review article reflects on the barriers and challenges to effective primary and secondary prevention of heart disease in sub-Saharan Africa by (a) examining what residual issues challenge effective prevention in high-income countries?; (b) what are the key ingredients to an integrated programme of primary and secondary prevention across the life-span (from the population to individual)? and; (c) considering the first two points, what are the barriers and challenges in sub-Saharan Africa to implementing cost-effective primary and secondary prevention using a systematic approach to “who, what and how”?

### **LESSONS FROM HIGH-INCOME COUNTRIES: FROM HYPERTENSION TO HEART FAILURE**

In establishing draft guidelines for the (updated) management of hypertension in the United Kingdom,<sup>(6)</sup> NICE has recently attempted to tackle a number of critical issues that have weakened past attempts to optimally control blood pressure as part of effective primary and secondary prevention of CVD. Given that these guidelines are directed towards one of the “core” risk factors for CVD prevention originally identified by the Framingham Study<sup>(9)</sup> and the subject of years of global research efforts and investment in developing accurate and reliable monitors,<sup>(10)</sup> pharmacological therapies,<sup>(11)</sup> identifying key indicators of organ damage,<sup>(12)</sup> delineating the pattern and contribution of hypertension from a regional<sup>(13)</sup> to tertiary care perspective,<sup>(3)</sup> determining key thresholds for long-term risk<sup>(14)</sup> and perhaps harm from anti-hypertension treatment<sup>(15)</sup> and, most recently, innovative ways to treat resistant forms of hypertension,<sup>(16)</sup> it is perhaps surprising that NICE has decided to revisit a number of key areas. Firstly, the very foundation for diagnosing hypertension is being challenged with measurements taken in the clinic/office setting regarded as unreliable due to the phenomenon of “white coat hypertension”. Instead, the draft guidelines propose the use of 24-hour ambulatory BP monitoring to definitively establish the presence of hypertension in affected individuals.<sup>(8)</sup> Secondly, consistent with recent Australian guidelines,<sup>(17)</sup> NICE propose to permanently abolish the traditional one dimensional approach to establishing BP targets and treatment thresholds (i.e. using the simple BP threshold of 140/90 mmHg to detect and potentially treat hypertension) to incorporate absolute risk profiling for those without established forms of CVD and lower thresholds for those with CVD (or evidence of end-organ damage). Lastly, instead of advocating first-line diuretic

therapy the use of calcium channel antagonists or angiotensin converting enzyme inhibitors (depending on the age of the affected individual) with preference given to cheaper, generic brands.<sup>(8)</sup> Whilst there are recommendations to simplify treatment (to maximise adherence) and apply combination therapies for those not responding to mono-therapy, surprisingly, there is little consideration of the difficulties in applying complex guidelines for even a seemingly simple condition such as hypertension.<sup>(18)</sup> Coordinating management of hypertension through primary healthcare initiatives represents an important, but often, under-estimated component of wider BP control.<sup>(19)</sup>

At the other end of the spectrum (i.e. from treating hypertension as a primary risk factor), in the past, there have been similar issues in determining optimal ways to detect and manage the syndrome of chronic HF (CHF) in the ageing populations of high-income countries. In contrast to attempts to raise the threshold for diagnosing hypertension (effectively reducing the number of treated cases), the evolving definition of CHF has effectively ensured more cases are diagnosed (with both preserved and impaired systolic function) and actively treated to prevent disease progression; despite the lack of specific treatments for non-ischaeamic forms of the syndrome.<sup>(20)</sup> A key role for CHF management programmes that coordinate the detection and management of CHF has emerged, underpinned by meta-analyses that have demonstrated their secondary prevention benefits in respect to reduced hospitalisation and prolong survival.<sup>(21)</sup> However, their application remains problematic with imperfect application of the evidence in real-life,<sup>(22)</sup> new studies questioning the modern-day impact of face-to-face programmes of care<sup>(23)</sup> (despite strong historical evidence) and conflicting evidence from studies of remote monitoring techniques that aim to automate CHF management via more sophisticated (and more costly) technology.<sup>(24)</sup>

There is a cautionary tale, therefore, from the detection and management of one of the simplest of risk factors (hypertension) to the most complex of syndromes (CHF) in high-income countries with much to be resolved in terms of even simple concepts of defining risk and when to treat for optimal primary and secondary prevention. Overall, there is much to be learned from the rest of the world, both positive and negative. If anything, a strong filter needs to be applied by local experts who understand the dynamics

of heart disease in sub-Saharan Africa and are determined to strip away much of the commercialism and complexity that characterises healthcare in the rest of the world on the “fundamentals” of prevention that yield the greatest impact at the lowest cost.

## INTEGRATED PRIMARY AND SECONDARY PREVENTION

Figure 1 represents an integrated and holistic model of primary and secondary prevention of heart disease. It recognises the different stages of heart health across the life span and the factors, from the individual to the whole population, that influence this and need to be positively influenced to promote wellness and longevity. Although it incorporates some of the unique challenges inherent to sub-Saharan African and other low- to middle-income regions of the world, it still reflects the same challenges for integrated prevention faced by any healthcare system around the globe. Prevention should be regarded as a series of battles. If we cannot prevent the development of heart disease at an early age (e.g. by

promoting maternal health), we can at least detect and pro-actively treat it to prevent its progression into a deadly and disabling form. If we cannot prevent the development of chronic heart disease (e.g. by controlling blood pressure in those with hypertension and/or pro-actively treating those with acute rheumatic fever), we can at least ensure the affected individuals lives as long as possible with optimal quality of life.

The components of effective prevention (as represented in the figure) whilst fairly incontrovertible, are only effective when they can be applied consistently and efficiently with the right tools (this includes pharmacological treatments) and resources (including key healthcare professionals). As explored in the next section, sub-Saharan Africa has unique barriers and challenges that need to be addressed in order to prevent its diverse peoples not only suffering from the diseases of poverty but prevent them entering a transitional phase where those fortunate enough to survive the former are at high risk from developing (and dying prematurely from) non-communicable forms of heart disease.<sup>(7)</sup>

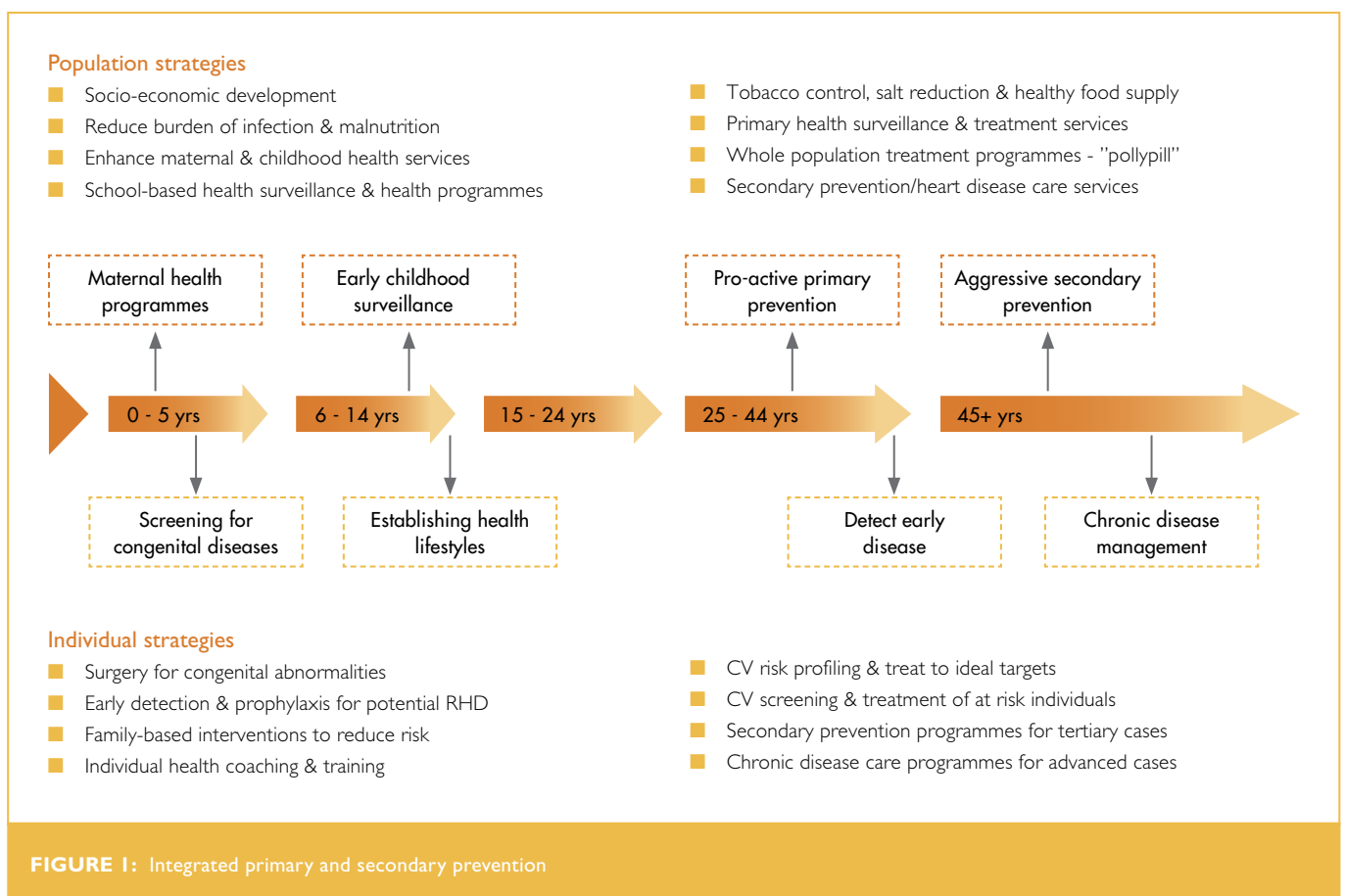


FIGURE 1: Integrated primary and secondary prevention

## BARRIERS AND CHALLENGES FOR SUB-SAHARAN AFRICA

It is beyond this broad review of primary and secondary prevention in sub-Saharan Africa to provide a detailed blueprint for effective prevention in the region. Whilst contemplating the challenges of applying any health intervention in a resource poor environment<sup>(7)</sup> it is vital that a systematic approach to articulate what is trying to be achieved (in this cost-effective case primary and secondary prevention) and how that might be achieved is applied. It is within this context that the American Heart Association Disease Management Taxonomy Writing Group's scientific statement designed to standardise the application of disease management are worth considering.<sup>(25)</sup> Adapting the eight key domains identified in this statement, it is possible to identify some of the barriers and challenges to effective prevention in the region.

### Target population

The enormous geo-political and socio-cultural diversity of sub-Saharan Africa mandates a region (or community) specific approach to identifying those most at risk of developing heart disease and therefore the target for primary prevention programmes. Much like a multi-national corporation developing a global strategy for developing an overall market for a particular product (e.g. a carbonated drink) and then varying its branding, supply and cost according to local factors to sustain interest and consumption, prevention does not represent a "one size fits all" strategy. At the very least it would appear that broad strategies for restricting the use of tobacco (through the combination of taxes and banning smoking in public places), lowering salt intake (through regulation of food manufacturing) and promoting healthier diets with less saturated fat and sugars (via food regulation and pricing policies), promoting exercising and educating the public (particularly through school programmes) are easy to articulate but often hard to apply.<sup>(26,27)</sup> However, when properly applied they have the potential to reach the maximal number of people from a primary prevention perspective. Clearly, other programmes to facilitate early detection and management of non-fatal congenital heart disease in newborns, long-term prophylaxis for children at risk of rheumatic heart disease and the proactive management of individuals being treated with anti-retroviral therapy for HIV/AIDS are high priorities for the region.<sup>(28)</sup>

Unfortunately, the political will and ability to fund pro-active programmes of this type are many and varied in the region. A consistent approach, perhaps funded by international agencies, across the region is undoubtedly required.

### Specific Recipients

From both a primary and secondary prevention perspective, there are aspects around the pattern of risk and, indeed, disease in the region that require further elucidation before a robust evidence base for individualised prevention (as opposed to the population-based strategies described above) can be reliably applied. Key issues include:

- Individual risk factors (including elevated BP and dyslipidaemia) as targets for prevention are largely derived from North American and European populations with completely different natural histories and consequences.
- There is no reliable absolute risk score for the African population to describe the impact of combined risk factors and their longer-term prognostic importance.
- The development of cheap and reliable tools (e.g. automated BP monitors and portable imaging devices)<sup>(29)</sup> is restricted by a lack of public funding and market forces to encourage private industry to develop and market such devices.
- National/international funding for surveillance programmes to detect non-communicable forms of disease are far inferior to those devoted to those with a communicable component.<sup>(30)</sup>
- The confounding impact of a high underlying burden of communicable disease states (i.e. tuberculosis, HIV/AIDS and RHD) are yet to be fully elucidated in respect to the "classical" risk factors.

The result of these and other key barriers is a fragmented picture of risk and established heart disease in the region with many unknowns as to specific priorities given the lack of data to determine who would benefit most from individualised prevention programmes.

### Intervention component

As indicated earlier, any “blind” application of therapeutic strategies applied in high-income countries in completely different ethnic groups with completely different disease trajectories (particularly considering the historical absence of communicable disease) is fraught with danger. For example, a polypill containing a statin to reduce cholesterol levels and/or aspirin to prevent thrombotic events secondary to atherosclerosis<sup>(31)</sup> may well prove to be extremely harmful in populations in whom cholesterol levels remain extremely low, coronary artery disease and other form of atherosclerosis remain rare, but rates of haemorrhagic stroke remain high.<sup>(5)</sup> Similarly, the needs of hypertensive individuals of African descent with a greater potential for salt sensitivity,<sup>(3)</sup> requires a markedly different approach to that applied in Europe.

As indicated earlier, the evidence-base for primary and secondary prevention strategies are largely non-African in origin. Major commercial investment to undertake the primary research to validate established treatments is unlikely to occur until a critical mass of consumer and government support for therapeutic products accompanies economic development. In the meantime, there is urgent need to promote access to and use of cheap generic drugs that have the most favourable benefit-to-risk profile in the sub-Saharan context. Similarly, the large disparity between non-commercial funding of strategies (predominantly international agencies such as the World Health Organisation) for communicable versus non-communicable disease states in sub-Saharan Africa (and other vulnerable regions) needs to be urgently addressed.<sup>(30)</sup>

### Delivery personnel

There is little doubt that sub-Saharan Africa, as a whole, suffers a critical shortage of health professionals (from nurses to cardiologists) with the requisite experience and training to apply rudimentary to advanced primary and secondary prevention programmes; from simple BP measurements to advanced investigations and management of the cardiomyopathies (often requiring careful delineation of underlying cause and impact on cardiac structure and function). In the longer-term, there is critical need to train and support a new generation of nurses, doctors and key allied health professionals (including dietitians, imaging technicians and rehabilitation experts) who can provide a network of expertise across integrated primary and secondary care services.

In the short-term, there is a clear need for the application of innovative technology (such as simple and reliable BP monitors)<sup>(10)</sup> that permits lay individuals to provide accurate risk assessments from a primary prevention perspective and with sufficient training to provide effective healthcare messages (see below) and/or treatments (e.g. a polypill).<sup>(31)</sup> At the same time, school teachers could be used to promote heart healthy messages – particularly if supported by surveillance programmes and dedicated education programmes. Community workers who are trained to undertake simple health assessments and deliver key health messages could well supplement the current network of primary and tertiary healthcare services throughout the region.

### Method of communication

Health literacy is a growing discipline in the context of primary and secondary prevention as awareness of the “knowledge gap” between the delivery of key messages by health professionals and the consequent understanding by targeted individuals/communities is appreciated. Certainly, any prevention programmes needs to employ a multi-modal approach to delivering key messages. In high-income countries, with high literacy levels and use of information technology, there is a natural (if not proven) progression towards more sophisticated prevention programmes. In sub-Saharan Africa, it is much more likely that a combination of oral (i.e. one-to-one counselling and or small group lectures), visual (i.e. pictorials) and written (simple brochures and posters) materials will prove to be most effective in promoting important preventative messages.

### Intensity and complexity

As indicated by Figure 1, an integrated prevention programme will encompass relatively simple health messages and programmes to adjust the overall risk and potential disease profile of a whole population (e.g. raising awareness of the consequences of tobacco use) to individualised secondary disease prevention/management. Clearly, the latter represents a more costly component with its requirements for increasingly sophisticated healthcare services and trained personnel. Cost-effective secondary prevention remains an elusive goal in high-income countries. Ultimately, it is likely to be achieved when the right combination of risk delineation (for disease progression) is coupled with a “titrated” approach to intervention; from routine follow-up to more aggressive forms of management (including pharmacotherapy and coaching to ideal targets on an individual basis).<sup>(32)</sup>

## Environment

Given the lack of integrated primary and tertiary healthcare services, it appears clear (at least until such an investment in dedicated services and personnel is made) that both primary and secondary prevention in the region should be focussed in the community and public institutions. The family unit and home, for example, may well prove to be the most powerful environment for triggering changes in the pattern of food intake, exercise and reducing exposure to extraneous risk factors. As indicated above, this could be facilitated by trained community workers who are able to work with the limited number of primary and tertiary healthcare services to reach a wider population.

## Clinical outcomes

Regardless of delivery, it is clear that any primary prevention programme will aim to reduce the overall risk profile of a particular individual/community/region and demonstrate reduced progression to preventable forms of CVD. Similarly, the secondary prevention programmes aim to prevent disability, hospital use and premature death. However, in order to properly assess any programme, it is essential that a number of parameters are documented and the potential of prevention truly understood. These include understanding:

- The major risk factors (i.e. those with the highest population attributable risk) that if addressed, will lead to the greatest reduction in primary and secondary events.
- The underlying incidence and prevalence of these risk factors.
- The underlying incidence and prevalence of the major forms of heart disease and other forms of CVD within the overall (target) population.
- Rates of hospitalisation attributable to the major forms of CVD.
- Case-fatality rates attributable to the major forms of CVD within the whole population and within high-risk groups.

Unfortunately, there is a paucity of such data in sub-Saharan Africa and systematically acquiring such data to map-out the maximum potential benefits of prevention, particularly within a fluid socio-economic environment, is of paramount importance.

## CONCLUSIONS

The challenges and barriers to effective primary and secondary prevention of heart disease in sub-Saharan Africa are enormous but not insurmountable. Unlike high-income countries that entered an epidemic of acute and chronic forms of heart disease with minimal warning and preparation and are still struggling to deliver cost-effective prevention, the diverse populations of sub-Saharan Africa still have time to change their current trajectory towards an epidemic of non-communicable forms of heart disease. Nevertheless, early signs are not encouraging. It appears a deadly mix of communicable forms of heart disease combining with non-communicable forms of disease affecting relatively young individuals (predominantly women) is becoming more evident in urban communities such as Soweto where socio-economic development continues to gather pace.<sup>(1)</sup> With limited resources at present, it is clear that wise investments in integrated primary and tertiary healthcare services and trained healthcare professionals with an understanding of the evolving threat of non-communicable disease, will result in healthier more productive communities in the future.

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## DISCLOSURES

None

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