Cardiovascular Disease in Sub-Saharan Africa

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“The wind of change is blowing through this continent.”
—Harold McMillan, former Prime Minister of the United Kingdom

O pen your eyes to Africa. It is big, complex and con-
 founding,” says the British Medical Journal of October
1, 2005.1 It has some of world’s richest natural resources in
minerals and oil. Yet 34 of the world’s 41 indebted poor
countries are in Africa, and only 37% of Africa’s children
attend secondary school. Africa, with one sixth of the world’s
population, accounts for one fiftieth of the global trade. We
also read of wars, civil disturbances, and devastating chronic
diseases such as malnutrition, HIV/AIDS, tuberculosis, and
malaria. The problems seem insuperable. “Who takes responsi-
bility for Zimbabwe?” asked The Lancet in despair in a
recent editorial.2

Sub-Saharan Africa, the Cradle of Humankind

Why is the focus of the present series of articles on Africa in
this issue of Circulation on sub-Saharan Africa? Linguistic
maps of Africa show that the Sahara divides northern peri-
Mediterranean Africa and some adjoining areas from sub-
Saharan Africa. The language of the north is Hamito-Semitic
and Arab, whereas the sub-Saharan is covered almost entirely
by the Niger-Congo Bantu languages, with 2 exceptions: the
Khoisan language in the Kalahari desert, lying in what is now
Namibia and Botswana, and parts of South Africa in which
the Indo-European languages are prominent. Thus, Sub-
Saharan Africa differs linguistically and culturally from
Northern Africa. Sub-Saharan Africa is also the putative
cradle of humankind (Figure).

In 1871, Charles Darwin predicted that human ancestors
would be found in Africa.3 “Both the genetic antiquity and
impact of the African contribution to the modern Homo
sapiens are so great as to view Africa as a central place of
human evolution.”4 Many researchers now support the “out-
of-Africa” model,5 whence came “Eve,” the postulated com-
mon ancestor to all modern humans. But, from where in
Africa? The “out-of-Ethiopia” hypothesis gives an estimated
age of ancestors more human than ape (Homo sapiens) in
Ethiopia about 160 000 years ago,6 on the basis of mitochon-
drial footprints.6 There are also some ancient Homo sapiens
remains in South Africa, although not quite as old. “But all
that refers only to the recent stages in human evolution” (P.V.
Tobias, DSc, FRS, e-mail communication, on human evolu-
tion, October 25, 2005). With regard to the origin of the
hominids, which occurred at an even earlier stage of evolu-
tion, the oldest South African sites at Sterkfontein, west of
Johannesburg, contain fossils that go back about 3.3 million
years (ibid). There are even older remains of these early
hominids from Kenya, Ethiopia, and especially the Chad
Republic (ibid). Flat-faced fossils between 3.2 and 3.5 million
years old were found in the Olduvai Gorge in Kenya.7
Overall, we can safely say that “out of Africa” is the cradle of
humankind without being able to pinpoint the exact area.
Multiple sites of origin cannot be excluded.

What about subsequent expansion? How did the population
escape from the cradle(s) to become “Pan-African” and
sub-Saharan, which is the scope of this focused issue of
Circulation? Within Africa, the oldest detectable major mi-
ginations occurred about 60 000 to 77 000 years ago,8 expand-
ing to Southern Africa, becoming the Khoisan people (and
more about them later), and into Eastern, Central, and
Western Africa.9 There might even have been earlier “up-
stream” flows into central Africa from the Khoisan about
150 000 years ago.9 Similar techniques, with DNA patterns,
have been used to trace the expansion from Africa to all parts
of the globe, presumably spreading upward along the great
lakes and Nile River to Egypt, and thence into Asia about
60 000 years ago (Figure). Spread from Africa to Europe
occurred about 45 000 years ago. Further emigration from
Asia to America occurred via Alaska about 7000 to 35 000
years ago.

The First Drawing of a Human Heart?

Now we take a big jump in time and briefly deviate via Egypt.
The origins of the ancient Egyptians are not too well defined
but could have occurred from those emigrants en route from
Africa to Asia who saw their future in the rich waters of the
Nile delta, or from Eurasians who had returned to Mediter-
ranean Africa or from a separate origin in the near Middle
East. In time, Egypt became the source of a thriving civiliz-
ation where, among other things, they were obsessed with
death and the afterlife. The Egyptian Book of the Dead was a
collection of papyrus rolls placed in Egyptian tombs. The
heart, the organ of conscience and understanding, had to be
weighed against the feather, which symbolized order, truth,
and justice. A heavy heart was a bad heart, and the heart had
to be lighter than the feather for its previous bearer to pass

The opinions expressed in this editorial are not necessarily those of the editors or of the American Heart Association.

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Kenya by Donnison in 1929, and confirmed in Uganda by Williams in 1941. These tribesmen did not suffer from the steady rise in BP as in “the people of Europe and North America.” Is it a coincidence that another “self-contained socioeconomic group,” this time white and female, showed no BP increase over 30 years? What could be the common factor to these 3 very diverse groups? Clearly not external genetic similarities, nor diet, nor the level of physical exercise, nor lack of stress (imagine the daily lives of early tribesmen), but rather the socioeconomic independence from “Western civilization.” These observations show how lifestyle can affect BP and, hence, cardiovascular outcome. If we could pinpoint the secret of the flat BP in these 3 rather disparate groups, this could contribute to solving a major public health problem in Western societies in which even those who are normotensive at 55 years of age have a 90% lifetime risk of developing hypertension.

**Epidemiological Factors and Cardiovascular Risk**

Currently, there are strong economic forces propelling previously isolated rural groups into the periurban and urban areas. Much of Africa is undergoing an epidemiological transition. Cardiovascular disease (CVD) is the leading worldwide cause of death in all developing regions with the exception of sub-Saharan Africa. There, the first phase of this transition, that is, the phase of pestilence and famine, is still dominant. However, in the next phase, that of receding pandemics, CVD becomes more prominent, and in the third phase of degenerative and man-made disease, CVD is the leading cause of death. As “civilization” spreads, so does CVD become an increasing health burden that requires skillful, cost-effective management. As shown in the INTERHEART study, hypertension is a strong contributor to the hazards of CVD in black Africans, with an OR of 7.0 versus 2.3 to 3.9 in other ethnic groups, with \( P < 0.0002. \) Hypertension is eminently treatable and to some extent preventable.

Poverty and affluence may both bring disease. According to the “fetal” origins of adult disease, as put forward by Barker, environmental factors and particularly poor maternal nutrition during pregnancy may program risks for adverse health that appear only later in adult life. Specifically, there is an inverse relation between birth weight and CVD in later life, as shown in a longitudinal study from Scotland. Affluence, too, has its problems. Higher-income black Africans are more susceptible to myocardial infarction than high-income white or other nonblack Africans, hypothetically because different stages of the epidemiological transition are at work. Besides hypertension, another major cardiovascular disease susceptible to the changing environment in Africa is diabetes mellitus, also a prominent risk factor for myocardial infarction in black Africans. Other major cardiovascular diseases in Africa include the consequences of HIV/AIDS (often manifesting as tuberculous pericarditis), rheumatic valvular disease, and cardiomyopathy, each of which has at least some environmental component and each of which is discussed in different articles in this issue of *Circulation.*

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*Linguistic map of Africa, showing the marked division between the northern and sub-Saharan areas. Upward arrows indicate possible evolution of humankind, from the sites in South Africa and elsewhere as hominids about 3 million years ago, then from the East African site as *Homo sapiens* about 160 000 years ago. The latter is often referred to as the “Out of Africa” hypothesis for the origin of modern humans. First spread from Africa was to western Asia, thence to Europe, and much more recently to North America and then to South America via Alaska. Map courtesy of Creative Commons, created by Mark Dingemanse. Accessed on October 26, 2005, at: http://commons.wikimedia.org/wiki/Image:African_language_families.png*
Toward Practical Solutions

In a continent where poverty is rife, despite the burgeoning wealth of upper-income groups in countries such as Nigeria and South Africa, how can effective cardiovascular therapy be sustained financially? This question is tackled by Gaziano et al in an important article selected for the Editor’s pick of this week. The answer is that major improvements could be achieved with not much expenditure but much application of policy. Furthermore, by judicious selection of high-risk hypertensive patients, those who need more urgent treatment can be selected by risk factor calculation. Such scientific knowledge must be matched by the political will to apply these policies. This is where the nongovernmental organizations come in, a large number of which are active in sub-Saharan Africa (Table).

The ingredients for success in the struggle against cardiovascular diseases include governmental will-power, vigorous nongovernmental organizations, dedicated physicians, and fully trained nurses with technical support. An important issue is keeping trained personnel in Africa, as brought to the fore in ProCOR by Nobel Prize winner Bernard Lown, a renowned cardiologist. The “brain drain” deprives Africa of doctors, nurses, technicians, and others who, together, could help to fight the growing CVD epidemic. Dr Lown empha-

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### Cardiovascular Health Organizations of Sub-Saharan Africa

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Organization</th>
<th>Mission</th>
<th>Web or E-Mail Address (Where Available)</th>
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sizes that wealthy Western countries should only with reluctance permanently take on those from Africa. An exception would be refugees from those African regimes that make it impossible for such qualified people to continue to practice in their home country. Promoting a strong research base indirectly helps to keep “good brains” in their home countries, in addition to enhancing patient care. “Inequalities in health research contribute to inequalities in health.”24

On the positive side, a web of medical and cardiovascular societies is spreading across Africa, including active nongovernmental organizations such as the Heart Foundations (Table). For example, there is a very active Heart Foundation in Nigeria that strongly supports a World Health Organization report on preventing chronic diseases, released on October 5, 2005. Dr K. Akinroye, Vice President of the Nigerian Heart Foundation, reports that Nigerian President Olusegun Obasanjo has lent his support to the goal of reducing death from chronic disease as follows: “Governments have a responsibility to support their citizens in their pursuit of a healthy, long life. It is not enough to say, we have told them not to smoke, we have told them to eat fruit and vegetables, we have told them to take regular exercise. We must create communities, schools and workplaces and markets that make these healthy choices possible. We must tackle this problem step by step and we must start now.”25

Conclusions

In Africa, the dominant factors driving (or limiting) success are the will to deliver first-class cardiovascular care within the limits of cost-effectiveness and the need to build a suitable infrastructure, including those doctors, nurses, and others who should be kept in Africa. Many major cardiovascular drugs are no longer prohibitively expensive. The real challenge is how best to deliver the drugs to those who need them. We are deeply appreciative of the opportunity of presenting this group of articles in Circulation, a shining example of the application of first-world concepts and rigor of scientific method, including thorough review processes, to help heal the cardiovascular problems of sub-Saharan Africa.

Disclosures

None.

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