

Cancer Control in Africa 1

Challenges and opportunities in cancer control in Africa: a perspective from the African Organisation for Research and Training in Cancer

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Sub-Saharan Africa has a disproportionate burden of disease and faces a major public-health challenge from non-communicable diseases. Although infectious diseases continue to afflict Africa, the proportion of the overall disease burden in sub-Saharan Africa attributable to cancer is rising. The region is predicted to have a greater than 85% increase in cancer burden by 2030. Approaches to minimise the burden of cancer in sub-Saharan Africa in the past few years have had little success because of low awareness of the cancer burden and a poor understanding of the potential for cancer prevention. Success will not be easy, and will need partnerships and bridges to be built across countries, economies, and professions. A strategic approach to cancer control in sub-Saharan Africa is needed to build on what works there and what is unique to the region. It should ideally be situated within strong, robust, and sustainable health-care systems that offer quality health care to all people, irrespective of their social or economic standing. However, to achieve this will need new leadership, critical thinking, investment, and understanding. We discuss the present situation in sub-Saharan Africa and propose ideas to advance cancer control in the region, including the areas of cancer awareness, advocacy, research, workforce, care, training, and funding.

Introduction

Sub-Saharan Africa accounts for a disproportionate amount of the global burden of disease (approximately 24%) that substantially exceeds its fraction of the world's population (about 13%).¹ Moreover, the health-care systems of countries in this region are generally poorly equipped to cope with this large disease burden (figure 1). Only about 3% of the world's health-care workers live and work in sub-Saharan Africa.² Consequently, sub-Saharan Africa is a major focus of international donor efforts aimed at assistance for global health. Of the US\$5.7 billion spent on global health by the US Government in 2011, almost 85% was directed towards Africa.²

Although cancers kill more people globally than AIDS, tuberculosis, and malaria combined, this is not the case in sub-Saharan Africa, where AIDS, tuberculosis, and malaria account for about seven times more deaths than does cancer (table 1).^{3,4} Cancer in the African Region of WHO accounts for only about 5% of deaths in that region, compared with roughly 20% of deaths in each of the WHO Western Pacific, European, and Americas Regions.

Sub-Saharan Africa has a very young population—more than 40% of the entire population are younger than 15 years old.¹ People in sub-Saharan Africa also die at a younger age on average compared with those in Europe and the USA. Roughly 80% of all deaths in the African Region of WHO occur in those younger than 60 years, whereas in high-income countries the opposite is true—ie, about 80% of deaths are in those older than 60 years,⁵ which has several implications for cancer statistics in sub-Saharan Africa. First, incidence and mortality are lower in populations skewed toward younger ages than in

those with higher average ages, because age is a highly significant risk factor for most cancers. Second, the average age at which cancer is diagnosed in Africa is lower than in high-income countries, because the average age of the whole population is lower. Third, paediatric cancers constitute a larger fraction of the cancer burden in populations with high proportions of children than in those with fewer children. In some regions of Africa, 6% of all cancers are paediatric cases, whereas in developed countries, this figure is lower than 1%.⁶

The cancer burden reported for sub-Saharan Africa might be underestimated^{7,8} due to lack of appropriate

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Figure 1: Chemotherapy treatment in Accra, Ghana

	Worldwide (population size: 6 437 000 000)		Africa (population size: 738 000 000)	
	Deaths, n	% total deaths	Deaths, n	% total deaths
Total deaths	58 772	100.0%	11 248	100.0%
Deaths from communicable, maternal, perinatal, and nutritional diseases	17 971	30.6%	7682	68.3%
Infectious or parasitic diseases	9579	16.3%	4849	43.1%
Deaths from non-communicable disorders	35 017	59.6%	2797	24.9%
Cancers	7424	12.6%	480	4.3%
Deaths from other causes	5784	9.8%	769	6.8%

Data from WHO.³

Table 1: Deaths by cause worldwide and in Africa in 2004

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diagnosis,⁹⁻¹² poor access to care,¹⁰ limitations in technical workforce and infrastructure,¹⁰ and the low quality of cancer data systems in Africa compared with those in developed countries.^{10,13-15} The lower cancer incidence and mortality in sub-Saharan Africa than in other regions could also be partly explained by cancer not being prioritised by international donors or the health ministries in sub-Saharan Africa. Cancer cases are poorly catalogued by cancer registries in sub-Saharan Africa, and even common cancers might be under-reported in many regions.¹⁶ Subsequently, the nine programme areas identified by the US Global Health Initiative, which includes the President's Emergency Plan for AIDS Relief, do not mention non-communicable diseases, and this initiative's spending focuses on assistance aimed at AIDS, tuberculosis, and malaria. Two-thirds of people with HIV worldwide live in Africa, and 75% of global deaths from AIDS occur in African people. About 70% of the roughly 2 million new HIV infections every year occur in Africa. Similarly, sub-Saharan Africa has the world's highest tuberculosis incidence and the highest tuberculosis mortality per head. Malaria is the leading cause of death in African children younger than 5 years, and represents about 10% of Africa's total disease burden. Roughly 90% of all malaria deaths worldwide occur in Africa. In 2008, an estimated 421 000 deaths from cancer occurred in Africa, compared with 1.4 million deaths from HIV. At least 50% of deaths due to HIV and 80% of those due to cancer need pain treatment for an average of 3 months.^{17,18} However, fewer than 11 countries in sub-Saharan Africa offer access to oral morphine, and functional palliative care or home-based care for terminally ill patients is rare.^{18,19} Thus, competing health needs—particularly for tuberculosis, malaria, maternal mortality, and, more recently, the HIV epidemic—are a continuing challenge for cancer control in sub-Saharan Africa.

In view of the present range of diseases in sub-Saharan Africa, the suggestion that the main focus should move from AIDS, tuberculosis, and malaria towards cancer (or non-communicable diseases in general) is inappropriate. However, although the reported cancer incidence and

mortality in sub-Saharan Africa are low, and infectious diseases still plague the continent, Africa is in transition. The proportion of the disease burden in sub-Saharan Africa attributable to cancer is rising, and the region is projected to have more than an 85% increase in cancer incidence by 2030, solely based on demographic changes (ie, a larger and older population than exists presently).²⁰ The actual increase in cancer burden in sub-Saharan Africa is likely to be even larger than predicted because of westernisation of lifestyles that result in more cancers.²⁰ Progress achieved in control of infectious diseases in the region might also result in an increased proportion of the disease burden being linked to non-communicable diseases. During the transition from infectious to non-communicable diseases (which will probably be lengthy), sub-Saharan Africa is experiencing a so-called double burden of disease: infectious diseases remain, and non-communicable diseases are increasing. Presently, about 80% of the low amount of health spending by countries in sub-Saharan Africa is allocated to acute communicable diseases. These diseases have similarly been the overwhelming focus of donors. Although attention was drawn to non-communicable diseases at the UN high-level meeting about non-communicable diseases in September, 2011, the realignment of health budgets and donor interest in these diseases in sub-Saharan Africa will take time, partly because the rise of non-communicable diseases is not seen as an emergency in the same way as are pandemic infectious diseases, such as HIV/AIDS.

Several challenges exist in the movement to address cancer in Africa. State-of-the-art cancer care is expensive: the USA spends more than US\$120 billion every year on cancer care.^{21,22} Although some costs (eg, labour) are lower in sub-Saharan Africa than in the USA, many countries in sub-Saharan Africa spend less than US\$100 per head on all health costs combined (compared with about \$8000 in the USA; figure 2). Thus, treatment of an increasing number of patients with cancer will be challenging for most health-care systems in sub-Saharan Africa. Engagement in cancer care needs a substantial infrastructure, which does not exist in many, if not most, sub-Saharan Africa countries. For example, many countries in sub-Saharan Africa have no radiotherapy facilities,²⁴ which is particularly troubling since as many as 50% of all patients with cancer would be expected to benefit from radiotherapy as part of their treatment. Inequities in health-care treatment and access have important socioeconomic consequences. Investment in health should be seen as an essential tool for development, rather than a luxury.^{25,26}

Another challenge in Africa is the shortage of health-care workers. WHO has identified countries with a severe shortage of health-care workers, most of which are in sub-Saharan Africa. No reliable data exist for numbers of oncology specialists in sub-Saharan Africa, but we can reasonably assume that the numbers of doctors, nurses, pharmacists, and other health-care providers with

specialised training in cancer are far lower than the present and future demands for these workers. In view of the insufficient attention paid historically to cancer in Africa, the number of cancer specialists as a proportion of all health-care workers is probably low. Many developed countries (eg, the USA, the UK, and France) are addressing their own shortages of cancer specialists by recruiting appropriately trained workers from less-developed countries, including those in sub-Saharan Africa. In addition to training more health-care personnel, the push-and-pull issues that contribute to movement of African doctors and nurses from sub-Saharan Africa should be addressed to improve the African workforce situation.

Africa's contribution to the global cancer burden

The cancer burden in sub-Saharan Africa is poorly documented for several reasons, including the scarcity of updated, comprehensive, and reliable data. Nevertheless, on the basis of the available data, the cancer burden is rising, particularly in sub-Saharan Africa, where the increasing cancer burden is associated with factors that persistently affect the region, such as infectious diseases, unhealthy lifestyles, poor food supply, conflict, and poverty.²⁷

WHO has estimated that about 551 200 new cancer cases (243 500 in men and 307 700 in women) occurred in sub-Saharan Africa in 2008, with about 421 000 deaths.²⁸ The four most common cancers by site in men were prostate cancer, liver cancer, Kaposi's sarcoma, and oesophageal cancer, whereas in women they were cervical cancer, breast cancer, liver cancer, and Kaposi's sarcoma. The mortality caused by these cancers generally followed their incidence patterns, indicating the poor availability of cancer care in sub-Saharan Africa. Table 2 lists the most common cancers in sub-Saharan Africa.

Cervical cancer accounts for 12% of all newly diagnosed cancers, in both sexes combined, every year in Africa.²⁹ Most patients are diagnosed at advanced stages of the disease, which results in poor prognosis. For other common cancers, some peculiarities exist regarding their distribution between and within countries. The incidence of breast cancer shows regional variation between north Africa, where it is the leading cancer in women (27% of cases per year), and sub-Saharan Africa, where it is second to cervical cancer (15.7% of cases per year). The incidence of breast cancer is higher in urban settings than in rural areas.²⁸ In African men, prostate cancer is the leading cancer in terms of incidence and in cause of cancer death. Prostate cancer death rates are higher in west (age-standardised rate 6.6–11.6 per 100 000 population per year), east (age-standardised rate 11.7 per 100 000 population per year), and south Africa (age-standardised rate 6.3–45.7 per 100 000 population per year) than in north Africa (age-standardised rate 3.3 per 100 000 population per year).²⁸ Kaposi's sarcoma is more frequent in Africa than in other regions of the world, and

notable variations in incidence between different countries have been reported. In 2008, the incidence (per 100 000 population per year) of the epidemic type of Kaposi's sarcoma in men was 27.7 in Uganda, 40.5 in Zimbabwe, and 52.1 in Malawi.²⁹

Africa is very heterogeneous in terms of genetic, geographic, climatic, environmental, economic, and socio-cultural factors, which affects the incidence, prevalence, and mortality of cancer.²⁷ The risk of cancer development by the age of 75 years for both sexes in Africa is 12.5%, compared with 24% in Europe. Infection is a main cause of cancer in Africa—about a quarter of cases of cancer are infection related.³⁰ The main implicated infections with strong causal linkage with specific cancers include human papillomavirus, hepatitis B and C, human T-lymphotropic virus type 1, herpes simplex virus, *Schistosoma haematobium*, *Helicobacter pylori*, Epstein–

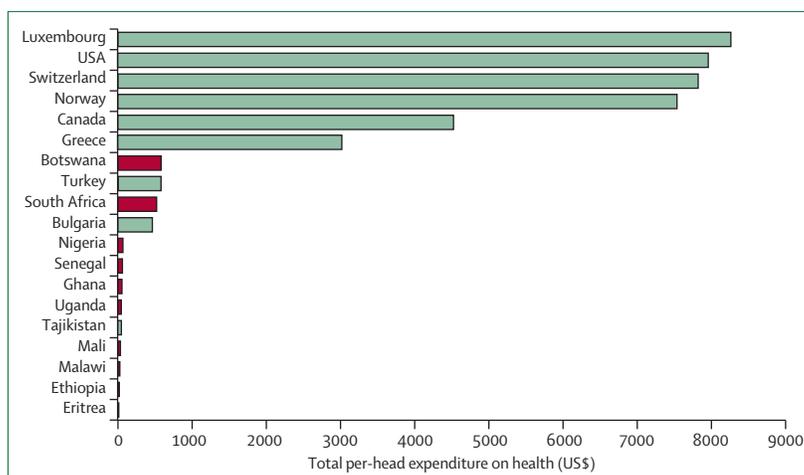


Figure 2: Total per-head expenditure (US\$) on health in different countries of the world in 2009. The red bars represent data for countries in sub-Saharan Africa. Data from WHO.²³

	Incidence in Africa (sub-Saharan Africa), ASR			Mortality in Africa (sub-Saharan Africa), ASR		
	Men	Women	Both sexes	Men	Women	Both sexes
Bladder	6.7 (3.7)	1.7 (1.5)	4.0 (2.5)	4.8 (2.8)	1.2 (1.1)	2.9 (1.8)
Breast	..	28.9 (26.3)	..	..	16.0 (15.3)	..
Cervix uteri	..	25.2 (31.7)	..	..	17.6 (22.5)	..
Colorectum	6.9 (6.8)	5.0 (4.7)	5.9 (5.7)	5.5 (5.5)	4.0 (3.8)	4.7 (4.6)
Kaposi's sarcoma	6.0 (8.1)	2.8 (3.6)	4.3 (5.7)	5.1 (6.9)	2.3 (3.1)	3.6 (4.8)
Liver	11.7 (13.1)	5.3 (6.3)	5.0 (9.5)	11.7 (13.2)	5.5 (6.6)	8.4 (9.7)
Lung	8.4 (5.9)	1.4 (2.0)	5.0 (3.7)	7.9 (5.6)	1.9 (1.9)	4.7 (3.6)
Non-Hodgkin lymphoma	6.3 (5.5)	4.1 (3.8)	5.2 (4.6)	5.3 (4.6)	3.5 (3.2)	4.3 (3.8)
Oesophagus	6.7 (8.5)	3.5 (4.2)	5.0 (6.2)	6.5 (8.2)	3.4 (4.0)	4.8 (6.0)
Ovary	..	4.2 (1.5)	..	..	3.4 (3.2)	..
Prostate	17.5 (21.2)	..	..	12.5 (15.0)	..	..

ASR=age-standardised rate. Data from GLOBOCAN 2008.²⁸

Table 2: Age-standardised incidence and mortality rates per 100 000 population per year in Africa as a whole and in sub-Saharan Africa for the most common cancers by site

Barr virus, and HIV.^{31,32} Smoking is a risk factor that is mainly specific for lung, throat, and mouth cancers, and is associated with about 6% of cancer-related deaths.³³ The STEPwise survey, undertaken by WHO in adults 24–65 years old in 32 countries, reported wide variation in the prevalence of tobacco use in Africa.³⁴ The rate of tobacco use in African men was between 9% and 35%.³⁴ Tobacco use in Africa also varies by age and sex. The rate of smoking is rising in youths, with an increasing preponderance in adolescent women, especially in Nigeria (17%).³⁴

Similarly, investigators reported overweight and obesity to be increasing in several African countries, in epidemic proportions in some cases.³⁴ The higher proportion of obesity in women is particularly notable, with about a third of women being overweight or obese.³⁴ The increasingly westernised lifestyle of women in terms of diet and habits has affected reproductive health development and outcomes, such as reduction in menarcheal age, aversion for exclusive breastfeeding, and smaller family size,³⁴ all of which make women vulnerable to breast and endometrial cancers.

The physical environment of many African cities is not conducive to healthy living because of rapid urbanisation, absence of urban planning, and the consequent scarcity of adequate open spaces for recreational physical activity. Absence of proper housing plans and regulation is a common problem in sub-Saharan Africa. Houses do not have appropriate ventilation, and no active regulatory agency exists to monitor emissions; thus, inhabitants are vulnerable to passive smoking and other environmental pollutants that are risk factors for cancer. Most recreational facilities that promote healthy living, such as exercise and swimming, are absent from many cities in sub-Saharan Africa. All these factors contribute to the increasing cancer risk in the region.

Panel 1: The eight key cancer prevention and control challenges in sub-Saharan Africa²⁹

- Absence of cancer prevention and control policy, strategies, and programmes
- Insufficient recent and comprehensive data for cancer and death registration
- Heavy economic and psychosocial burden of cancer
- Inadequate or no information about cancer, insufficient numbers of skilled health-care personnel, and scarce local, effective, and sustainable research
- High cost of immunisation against human papillomavirus and other infections that cause cancer
- Unavailability of secondary prevention for cancer amenable to this intervention
- Unaffordability of treatment resources and neglect of palliative care
- Absence of collaboration or coordination of interventions in stakeholders and donors to combat cancer

Present cancer control strategies in sub-Saharan Africa

Cancer control strategies are inadequate in sub-Saharan Africa. First, cancer surveillance in sub-Saharan Africa is insufficient, with only three population-based registries (the Gambia, Kampala, and Harare) cited in volume IX of *Cancer Incidence in Five Continents*.³⁵ A high priority for cancer control in Africa is to have more and better cancer registries. Unlike the USA, where more than 80% of the population is covered by cancer registries, only about 1% of African populations are presently covered. In a recent report of the the Kampala and Gambia registries, age-standardised relative survival did not exceed 22% for any cancer in the Gambia, and did not exceed 13% in Uganda for any site, except breast cancer (46%).³⁶ These values confirm the low quality and quantity of data, and the likely under-reporting of cancer in sub-Saharan Africa.¹⁶

The African Cancer Registry Network (AFCRN) was launched in March, 2012, to provide a more central role for cancer surveillance, identify priority areas, and offer technical support to participating countries.³⁷ Presently, AFCRN has about 46 member countries in Africa, including almost all sub-Saharan Africa countries. This regional hub provides technical and scientific support to countries, delivers training in population-based cancer registration and use of data, supports advocacy for cancer registration in the region, facilitates the creation of associations and networks of cancer registries, and coordinates international cancer research projects and publishes their findings.

Second, few effective cancer control programmes exist in sub-Saharan Africa. WHO has developed guidelines for evidence-based regional and national cancer control programmes, according to national economic development.³⁸ WHO recommends that countries in Africa start programmes incrementally, but recognise that such programmes will only be sustainable when countries in sub-Saharan Africa commit to investment in cancer control with dedicated budgets and appropriate staff training.³⁹ Similarly, access to prevention, early diagnosis, treatment, and palliative care for cancer-related disease is insufficient. The availability of cancer treatments in Africa is especially poor. In 2010, the International Atomic Energy Agency noted that only 24 of the 53 countries in Africa at the time reported availability of radiation treatment centres. Even in those countries with radiation machines, the number of centres is inadequate—eg, there are two radiation machine in Ethiopia for a population of more than 60 million people.²⁴ In 2002, the actual supply of radiation treatment in Africa was estimated to be only 18% of that needed.⁴⁰ Early diagnosis is essential to reduce cancer morbidity and mortality, and in Africa most people diagnosed with cancer have advanced disease, which is only suitable for palliative care. The first essential step in cancer management is to make a histopathological diagnosis and, even at this level, facilities are inadequate in most African settings.⁴¹

Third, poor management of occupational and other exposures to carcinogens is a major concern in sub-Saharan Africa. McCormack and Schuz⁴² reviewed environmental issues that contribute to Africa's cancer burden, and found that suboptimal implementation and monitoring of environmental protection and occupational health standards, use of outdated technologies in industry, and poor awareness of potential hazards in the specific employment structure lead to high levels of exposure to potential carcinogens. These include indoor air pollution, exposure in the mining and agricultural sectors, and agents arising from the mismanagement of hazardous waste.

Challenges of cancer control in sub-Saharan Africa

Sambo and colleagues²⁹ identified eight key cancer prevention and control challenges that are responsible for the effect of the cancer burden in sub-Saharan Africa (panel 1). We propose a prioritised list of important cancer challenges in sub-Saharan Africa. To address the challenges of cancer control in sub-Saharan Africa, a careful, well-coordinated response is necessary to promote and ensure a sustainable strategy with clear benchmark indicators to measure success. A strong coalition between governments, experts, communities, and donor agencies will be needed to achieve these goals.

Cancer awareness

One of the main reasons for the high cancer mortality in sub-Saharan Africa is poor public knowledge and awareness about cancer. Cancer awareness is especially important to improve risk reduction behaviours, promote timely cancer screening for early detection, and ultimately reduce the cancer burden in sub-Saharan Africa.

A review of the scientific literature about cancer awareness and knowledge in sub-Saharan Africa within the past 3 years indicates low levels of both (table 3).⁴³⁻⁵³ In general, cancer awareness is less than 40%, and awareness of cancer screening tests less than 20% in at-risk populations. Sex disparities in awareness also exist: the level of awareness for female cancers tends to be higher than that for male cancers, probably because of greater publicity for female cancers.⁵⁴ Female cancer awareness programmes have benefited substantially from collaborations between developed and developing countries, which have enhanced public-health campaigns and education outreach programmes for women. Although the sex disparities in cancer awareness are not unique to sub-Saharan Africa, this situation should be monitored in Africa so that it does not lead to a disproportionate cancer burden in men.

Poor cancer awareness and knowledge among primary health-care providers in sub-Saharan Africa has also been documented,⁵⁵⁻⁶³ which negatively affects accurate diagnosis at the primary care level and causes delays in referrals to specialists, and late diagnosis. Since one of the key sources for public awareness is health-care

workers, appropriate training and education of primary health-care providers is crucial to raise public awareness of cancer in sub-Saharan Africa.

Cancer advocacy

Cancer advocacy is inadequate and weak in sub-Saharan Africa. Active cancer advocacy is necessary to reverse the cancer crisis and make cancer issues a high priority in Africa. This aim can be achieved by the mobilisation of resources within sub-Saharan African countries for health promotion, prevention, and survivorship strategies; the formation of partnerships with key stakeholders (eg, political officials and researchers) to respond appropriately to cancer epidemics in the region; raising of funds to support advocacy activities; and the development and implementation of tailored, community-centred programmes. The cancer advocacy framework for sub-Saharan Africa should be comprehensive and focus on all aspects of advocacy, including

	Study country	Study year	Study population	Cancer awareness/knowledge
Cervical cancer				
Obiechina and Mbamara ⁴³	Nigeria	2009	400 sexually active women	26.85% aware of cervical cancer screening
Aniebue and Aniebue ⁴⁴	Nigeria	2010	394 undergraduate students	58.5% aware of cervical cancer; 23.1% aware of Pap smear test
Mbamara et al ⁴⁵	Nigeria	2011	198 women attending gynaecology clinics	12.6% aware of cervical screening test; 8.0% knowledgeable about cervical cancer prevention; 0% aware of HPV vaccine
Hoque ⁴⁶	South Africa	2010	205 female students	33.0% aware of cervical cancer; 31.0% had heard of Pap smear test
Wright et al ⁴⁷	Nigeria	2010	350 market women	15.0% aware of cervical cancer in study intervention group; 6.9% aware of cervical cancer in study control group
Nnodu et al ⁴⁸	Nigeria	2010	Female students and adults of reproductive age	28.8% aware of cervical cancer; 14.0% aware of HPV
Breast cancer				
Gwarzo et al ⁴⁹	Nigeria	2009	221 undergraduate students	85.1% aware of breast self-examination; 37.3% knowledgeable about breast self-examination; 11.8% aware of the ideal age to start breast self-examination
Olugbenga-Bello et al ⁵⁰	Nigeria	2011	393 women of reproductive age	67.9% knew about breast cancer screening methods; 32.8% knew about mammography
Prostate cancer				
Oladimeji et al ⁵¹	Nigeria	2009	561 men	80.0% aware of prostate cancer; 36.25% prostate cancer knowledge score (mean); 19.4% perceived themselves at risk for prostate cancer
Ajape et al ⁵²	Nigeria	2010	156 men	21.2% aware of prostate cancer; 5.8% had heard about prostate-specific antigen test
Testicular cancer				
Ugboma and Aburoma ⁵³	Nigeria	2011	750 students and adults	11.4% aware of testicular cancer; 9.2% aware of testicular lumps as a sign of cancer; 1.0% aware of testicular self-examination

HPV=human papillomavirus.

Table 3: Current state of cancer awareness in Africa

politics, education, community outreach, research, fund-raising, and support.⁶⁴

In 2011, an analysis of cancer advocacy was undertaken in preparation for the first African Organisation for Research and Training in Cancer (AORTIC) Cancer Advocacy Workshop to identify the strengths, weaknesses, opportunities, and threats in cancer advocacy in Africa. Some of the internal conditions identified as harmful to the establishment of cancer advocacy in Africa were: competing public health priorities; financial barriers; insufficient health-care resources; low awareness and knowledge of cancer advocacy; no cancer registry to provide accurate and complete cancer data for advocacy; absence of national cancer plans to guide and direct cancer control schemes; no collaboration between cancer advocates and non-governmental organisations, leading to fragmentation and duplication of cancer advocacy; and poor health systems.

The main factors causing low cancer awareness in sub-Saharan Africa are the political environment, the economic situation (including funding support), societal norms, cultural beliefs, and values. Unfortunately, most of these factors are not at optimum levels to raise cancer awareness in sub-Saharan Africa. Additionally, most countries in sub-Saharan Africa focus only on infectious diseases and ignore non-communicable diseases. With this restricted vision, cancer control and care will continue to be of low priority unless cancer advocacy improves in the region.

The main cancer advocacy group in Africa is the Africa Tobacco Control Consortium.⁶⁵ Coordinated by the American Cancer Society, this consortium is a coalition of public health organisations, including the Africa Tobacco Control Regional Initiative, Africa Tobacco Control Alliance, Framework Convention Alliance, Campaign for Tobacco-Free Kids, and the International Union Against Tuberculosis and Lung Disease. The primary goal of the consortium is the prevention of a tobacco epidemic in Africa. However, this consortium is an anomaly in Africa, since most of the advocacy organisations in Africa are on a small scale, have a restricted geographical effect, and face many challenges that hinder effective advocacy.

In 2011, the African Cancer Advocates Consortium (ACAC) was established during the AORTIC Inter-

national Workshop on Cancer Advocacy for African Countries. The mission of the ACAC is to make cancer a top priority in Africa. The ACAC comprises 51 members from many countries in Africa and is led by African cancer advocates. The consortium focuses on six advocacy areas (panel 2).⁶⁴ A key advocacy scheme that AORTIC is presently embarking on is collaboration with Afrox (Oxford, UK) to develop a cancer advocacy toolkit for Africa, which will use case studies to help advocates to run low-cost cancer awareness campaigns in Africa.⁶⁶

Strengthening of health systems

The absence of an adequately trained health-care workforce and the so-called brain drain of substantial numbers of trained professionals out of Africa is a major problem for cancer control in sub-Saharan Africa. An estimated 118 621 physicians work in Africa, which represents 2·2 physicians per 10 000 people, and only 1·4% of all physicians worldwide presently work in sub-Saharan Africa. By contrast, 2 942 289 physicians work in Europe, with a ratio of 33·2 physicians per 10 000 people. Globally, there are 8 652 107 physicians, with a global density of 14·2 physicians per 10 000 population. An estimated 467 487 nursing and midwifery personnel work in Africa, with a density of 9·0 per 10 000 population, compared with 5 766 646 nursing and midwifery personnel in Europe, representing a density of 65 per 10 000 population.⁶⁷ In a study of medical schools in sub-Saharan Africa, investigators noted 168 medical schools in the region, of which 146 were surveyed and 105 responded.⁶⁸ Every year, approximately 10 000 medical graduates qualify in Africa, but more than half of the responding institutions reported losing 6–18% of their staff in the past 5 years, for reasons including low salaries, restricted career options, and large teaching and clinical loads.

Development of the labour force for cancer care in sub-Saharan Africa needs proactive efforts in each country through provision of career counselling in medical schools and other allied professional institutions, and provision of mentorship opportunities, as incentives to generate interest and commitment. This concept might also reduce the problem of brain drain in this area of health care. Funding for research and higher pay with better incentives, coupled with the development of regional centres of excellence that offer better job satisfaction, might help to reduce the pull from the developed world.

The non-existent or poor infrastructure of health systems in sub-Saharan Africa is a fundamental reason for weakened output, and has contributed adversely to outcomes of care in several medical conditions, including cancers.^{69–71} First, several countries' health systems have a weak organisational structure, which leads to uncoordinated activities at all levels of care.^{70,72} Second, the collapse of primary and secondary health facilities has put serious pressure on tertiary health facilities that are not optimally prepared. Deteriorating

Panel 2: The six advocacy areas of the African Cancer Advocates Consortium⁶⁴

- Political advocacy—lobbying to affect public policy at local, state, and federal levels
- Education advocacy to enhance cancer information and education
- Research advocacy to promote high-quality cancer research that meets the needs of patients and the community
- Fund-raising advocacy to raise funds to support cancer research, services, education, and community outreach
- Support advocacy to support cancer patients, families, and caregivers
- Community outreach advocacy to engage and reach out to the community to advance cancer control

health systems have led to the proliferation of alternative health-care facilities (ie, traditional medicine) where patients with cancer go first, before their eventual referral when their condition has advanced and treatment is no longer feasible.⁷³ Third, basic support staff (oncology nurses, laboratory scientists, cancer counsellors, and those trained in palliative care), and modern laboratory facilities for tumour markers, gene sequencing, and equipment are not available to provide modern oncology services in sub-Saharan Africa.^{74,75}

A priority for all countries in sub-Saharan Africa should be to strengthen their health-care systems, especially in terms of infrastructural development, health financing, and service delivery. Governments should ensure fair access to health services through provision of health insurance for all people. The design and implementation of such provisions should encompass both the preventive and curative aspects of cancer care. Governments in sub-Saharan Africa could include vaccine and cancer screening programmes in health insurance schemes to assist health-care access, by contrast with the out-of-pocket service presently offered in most countries in the region.

Multidisciplinary cancer research

Multidisciplinary and translational research is essential to improve our understanding of the modifiable risk factors for cancer in African populations, and for the development of evidence-based prevention and treatment interventions to reduce cancer-associated morbidity and mortality. Sub-Saharan African countries have collaborated with the developed world to implement first-class research projects. Examples of success include Burkitt's lymphoma,⁷⁶ the relation between aflatoxin and hepatocellular carcinoma,²⁹ and HIV and AIDS.²⁹

Several deficiencies in the available data should be addressed before knowledge of global differences in cancer distribution or aetiology can be translated into improved approaches for cancer prevention and control in populations of African descent. Research studies that address cancer in African populations on a global scale, based on the principles listed in panel 3, are urgently needed.

Several examples of capacity-building research programmes on cancer in Africa exist. The Men of African Descent and Carcinoma of the Prostate (MADCaP) consortium¹⁶ presently includes multiple centres representing populations in Senegal, Ghana, Nigeria, Sudan, Uganda, Botswana, and South Africa. The consortium aims to improve prevention, screening, and treatment of cancer in affected communities, and the quality of life of men who have been diagnosed with cancer. Further, it serves to provide a forum for investigators with common research interests but diverse expertise to discuss research ideas and to share data collection instruments and protocols designed to optimise studies of African, African-American, and African-Caribbean men. The consortium also provides links with community groups,

survivors, and advocates to direct research and provide dissemination opportunities; and aims to identify research hypotheses and studies that are best undertaken by a large consortium (eg, studies that need large sample sizes, specialised accrual protocols, or population-specific outreach or dissemination activities).

The Women of African Ancestry Breast Cancer Consortium spans several African countries, including Nigeria, Ghana, Cameroon, Uganda, and Senegal. A landmark study by this consortium, which focused on breast cancer in women from Nigeria, Senegal, and the USA, documented for the first time that women of African ancestry are more likely to be diagnosed with a more aggressive form of breast cancer, with a different gene expression pattern, than are women of European ancestry.⁷⁷

The Prostate Cancer Transatlantic Consortium formed in 2005 to address the global disproportionate burden of prostate cancer in black men. This organisation is an open consortium of prostate cancer scientists, clinicians, survivors, and advocates from the USA, Europe, the Caribbean islands, and west Africa. Studies by the Prostate Cancer Transatlantic Consortium documented for the first time the within-group differences in African, Caribbean, and US black men relative to prostate cancer-related lifestyles, cultural beliefs, and values.^{48,49}

Operation Stop Cervical Cancer Nigeria—a multilateral collaboration of the MD Anderson Cancer Center,

Panel 3: Principles for cancer studies in African populations

- Research undertaken in African populations should be rigorous, so that the results will inform science and clinical practice worldwide. An understanding of global patterns and differences in cancer distribution and aetiology in Africa could improve cancer prevention and control worldwide. Studies in African settings are likely to inform cancer aetiology, risk, prevention, and treatment, but only if the work achieves a level of rigor that is recognised as valid by the global scientific community.
- The studies should tackle problems to specifically address local clinical and public health needs in Africa. Studies could be built on data obtained in non-African populations, but these studies should not completely copy research being done elsewhere.
- The research should be able to affect policy and practice related to cancer in African populations. Research should be developed so that it can be translated by researchers into clinical and public health practice to ministries of health, governments, the medical community, or other organisations and change clinical or public health practice in the affected communities.
- The research should be transferable, so that it can be translated to health systems across Africa.
- The research should be sustainable, and should be led by African researchers. Infrastructure should be developed to allow local investigators to achieve ongoing research and translational studies. Therefore, capacity-building activities should be a hallmark of all research development undertaken in Africa.
- The research should be disseminated scientifically in peer-reviewed journals and through presentations at national and international conferences. Additionally, attempts should be made to disseminate research results publicly, especially in study communities, to promote the adoption of evidence-based cancer prevention and control practices.

the British Columbia Cancer Agency, Rice University Department of Bioengineering, and the University of Ibadan School of Medicine—was established in 2006 with the objective to improve the national screening and treatment programmes for cervical cancer in Nigeria. The aims are improvement of capacity building of cervical cancer management teams using the newest biotechnological innovations adaptable to resource-poor settings, promotion of multidisciplinary team culture, generation of momentum for advocacy and translational research model for Africa using experience in Nigeria as the hub, and creation of a population-level database for cervical cancer care.^{78–80}

The African Caribbean Cancer Consortium (AC3) was created in May, 2006, to undertake multicentre research studies within an international network through collaboration, capacity building, and training to further the study of viral, genetic, environmental, and lifestyle risk factors for cancer in populations of African descent.

These consortia work collaboratively with AORTIC to advance cancer research in Africa, and are supported by the US National Cancer Institute Epidemiology and Genetics Research Program. Additionally, AORTIC works closely with the US National Cancer Institute to implement the Beginning Investigator Grant for Catalytic Research (Big Cat) grant programme for African researchers.

Cancer training and education

The dearth of resources in Africa means creative approaches to cancer training and education are needed. One strategy is the establishment of regional centres with sufficient expertise to address the problems of cancer in sub-Saharan Africa. These centres can share resources and create opportunities for good-quality training and research, and are located in French-speaking and English-speaking countries in east Africa (Kenya and Uganda, specialising in HIV-related malignancies), South Africa (specialising in cervical cancer), west Africa (Nigeria and Uganda [with a focus on breast and cervical cancer], Senegal [urological cancers]), and central Africa (Cameroon, focusing on breast cancer).

One of the primary goals of AORTIC is to improve the quality of cancer education and training in Africa, by identification of training sites in Africa for on-site research training; development of train-the-trainer activities through collaborations for short-term and long-term training abroad; development of minimum competencies and a curriculum in oncology specialties; generation of methods to raise funds for training; and development of policies for endorsement and support of non-AORTIC educational programmes. AORTIC has leveraged the scattered human resource of African scientists, and those who work in established institutions overseas, to develop a leadership academy and several online and on-site training programmes.

Specifically, AORTIC hopes that an increased number of oncology specialists in Africa will encompass all types

of health-care professionals—ie, surgeons, physicians, radiotherapists, pathologists, nurses, palliative care providers, and other support staff. The competing demands for manpower in sub-Saharan Africa might mean that only short-term training in oncology is realistic to begin with, while long-term development of formal training, such as a board certification fellowship programme, is being planned. Furthermore, regional training centres should be encouraged to initiate subspecialty training with support from sister professional groups in developed countries to enable better coordination. Governments should also consider provision of “bonded scholarships” for trainees or young staff members in oncology abroad to avoid the problem of subsequent brain drain.

Funding

Funding is a major challenge for cancer care and research in Africa, which has negatively affected the quality of services, multidisciplinary cancer research opportunities, and various other provisions, such as equipment and drugs. Investment into cancer care and research is mainly donor driven at present, with little or no support from native governments. Competing health priorities and the absence of national cancer control plans might have also contributed to the low amount of funding support. For Africa to make any substantial progress in cancer prevention and control, each country and the continent itself should take proactive steps to ensure suitable cancer control programmes are adopted. Second, corporate funding support from private companies (eg, endowments), and multinational companies (eg, telecommunications, oil and gas, and aviation industries) should be encouraged to complement the budget in every country. Governments could introduce incentives for any private or individual investment in cancer care services or research in the form of a compensatory tax deduction or other mutually agreed benefits to encourage this communal programme.

Another approach to improve funding is promotion of public–private partnership investment in oncology services, especially in laboratory equipment, research, and pharmaceuticals. Interested organisations could partner with health institutions to set up cutting-edge diagnostic laboratories, provide and supply chemotherapeutic agents, and establish hospices for care. Positive changes like these will lead to more external investments in the sub-Saharan Africa cancer control strategy.

Conclusions

We have drawn attention to several key concepts essential to address the growing cancer burden in Africa. Innovative approaches are needed to place cancer control and care in Africa within existing health systems, while resources should be amalgamated to minimise waste and optimise cost-effective use. This strategy will hopefully obtain legitimacy from the health strategy for Africa, which was

Search strategy and selection criteria

We did an extensive search of PubMed and Medline, African Journal Online, African Organisation for Research and Training in Cancer policy documents, and WHO, from 2000 to July, 2012, to identify relevant articles, abstracts, policy documents, and reports published in English. The search terms used included: "cancer", "cancer control", "cancer prevention", "cancer training", and "sub-Saharan Africa". We also did a manual search of additional references and cross-references to identify other articles. The selection of articles or reports was limited to those specifically on sub-Saharan Africa within the specified search period.

approved at the African Union Conference of Ministers of Health.⁸¹ Since many challenges exist, a strategic approach is essential for cancer control in Africa. Although cancer is not presently the leading killer in sub-Saharan Africa, statistics suggest that the cancer burden is rising and will become a major problem in the first quarter of the 21st century. Development of the capacity to address it now will enable the continent to offer universal access to those who need it now and in the future.

Contributors

All authors participated in the concept development and the writing of the report.

Conflicts of interest

IFA has received honoraria from GlaxoSmithKline for participation in various speaker forums, and for serving on the independent data safety monitoring committee for a multinational study. LD has received honoraria for appearing at various speaker forums for GlaxoSmithKline and Merck/MSA, and has worked on clinical trials supported by both companies. IOM-B, FO, TRR, JH, and J-MD declare that they have no conflicts of interest.

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