

This publication would not have been possible without the contributions of the International Agency for Research on Cancer and its work in producing GLOBOCAN 2008 (http://globocan.iarc.fr) alongside the work of cancer registrars worldwide.

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Surveillance Research

Foreword

Cancer is increasingly recognized as a critical public health problem in Africa. While communicable diseases continue to burden African populations, it is becoming clear that noncommunicable diseases also require the attention of those whose goal it is to ensure the health of Africans. Increases in life expectancy, changes in diet and lifestyle, and lower burden of communicable diseases promise to increase the cancer burden in Africa over the coming years. To address this growing cancer burden, the African Organization for Research and Training in Cancer (AORTIC) is committed to fostering research, education, and advocacy on a variety of levels to increase awareness of cancer in Africa. This awareness must be evidence-based and built on data that accurately and completely capture the occurrence, causes, prevention, and treatment of cancer in all African populations. It is important that the collection and application of data represent all parts of Africa. These data are critical for researchers, clinicians, nongovernmental organizations, ministries of health, and other policy makers to prioritize efforts that address Africa's cancer burden.

Against this background, the information presented in this brochure represents a critical resource needed to promote cancer prevention and control in Africa. These data highlight not only the importance of cancer as a major cause of disease morbidity and mortality in Africa, but that cancers diagnosed in Africa are associated with a higher mortality compared with other regions of the world. This pattern is largely due to more limited availability of screening and early detection, as well as poorer access to treatment. It is also possible that cancers are not as well-ascertained in Africa as in other parts of the world. High-quality, population-based cancer registries are not as commonly available in Africa as elsewhere, and this report highlights the need for expansion of cancer registry programs in Africa for better understanding of the cancer burden and cancer control planning.

We have reached an important junction with regard to cancer activities in Africa: with the historic 2011 United Nations High Level Meeting on Noncommunicable Diseases and the momentum building to elevate cancer on the global agenda, efforts to address cancer in Africa are more critical than ever. AORTIC is committed to partnering with the American Cancer Society and other groups to advance a shared agenda of cancer advocacy, care, research, and education in Africa.

Timothy R. Rebbeck, PhD
AORTIC Executive Council
Introduction

Cancer is an emerging public health problem in Africa. According to the International Agency for Research on Cancer (IARC), about 715,000 new cancer cases and 542,000 cancer deaths occurred in 2008 in Africa.1 These numbers are projected to nearly double (1.28 million new cancer cases and 970,000 cancer deaths) by 2030 simply due to the aging and growth of the population,1 with the potential to be even higher because of the adoption of behaviors and lifestyles associated with economic development, such as smoking, unhealthy diet, and physical inactivity.2

Despite this growing burden, cancer continues to receive low public health priority in Africa, largely because of limited resources and other pressing public health problems, including communicable diseases such as acquired immune deficiency syndrome (AIDS)/human immunodeficiency virus (HIV) infection, malaria, and tuberculosis (Table 1). It may also be in part due to a lack of awareness about the magnitude of the current and future cancer burden among policy makers, the general public, and international private or public health agencies. This report summarizes available information on cancer occurrence, risk factors, screening, and treatment in Africa in order to raise cancer awareness and promote cancer prevention and control in the region. It is intended for use by community leaders, private and public health agencies, cancer control advocates, and donors who are interested in cancer prevention and control in Africa.

**African Regions**

**Northern Africa:** Algeria, Egypt, Libya, Morocco, Sudan, Tunisia, and Western Sahara

**Eastern Africa:** Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, La Reunion (France), Madagascar, Malawi, Mauritius, Mozambique, Rwanda, Somalia, Tanzania, Uganda, Zambia, and Zimbabwe

**Middle Africa:** Angola, Cameroon, Central African Republic, Chad, Democratic Republic of Congo, Republic of Congo, Equatorial Guinea, and Gabon

**Southern Africa:** Botswana, Lesotho, Namibia, South African Republic, and Swaziland

**Western Africa:** Benin, Burkina Faso, Cape Verde, Cote d’Ivoire, Gambia, Ghana, Guinea-Bissau, Guinea, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, and Togo

**Sub-Saharan Africa** refers to the combined Eastern, Middle, Southern, and Western regions.

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**Figure 1. Life Expectancy at Birth, Both Sexes Combined, 2008**

Sociodemographics

Africa has an extraordinarily diverse population with respect to country of origin, religion, language, culture, economic status and other sociodemographic characteristics that affect the occurrence of cancer and its outcomes. While the sub-Saharan region is dominated by indigenous black populations, the Northern Africa region (especially Egypt, Sudan, Libya, Algeria, Tunisia, and Morocco) is dominated by Arabs. In some sub-Saharan African countries, however, whites of European origin account for a substantial proportion of the population, as much as 9% in South Africa. In addition to Islam, which is commonly practiced in Northern Africa, and Christianity, practiced in sub-Saharan Africa, there are several traditional religions in Africa. About 2,000 languages/dialects are spoken in Africa, although Arabic is the official language in most Northern Africa. Although Arabic is the official language in most Northern Africa countries and English or French in most sub-Saharan African countries. The percentage of the population living on <1$^\text{st}$ US dollar a day in 2005 ranged from <2% in Egypt to 80% in Burundi. Similarly, life expectancy ranged from 45 years in Zambia and Zimbabwe to more than 70 years in Algeria, Tunisia, and Libya (Figure 1), approaching that of Europe and the Americas.

How Does the Occurrence of Cancer in Africa Differ from That in North America?

The occurrence of cancer in Africa varies remarkably from that in economically developed regions, such as North America, by type of major cancer, stage at diagnosis, survival, and incidence and mortality rates. This is largely due to differences in exposure to major risk factors, detection practices (availability of diagnostic and screening services), awareness of early signs and symptoms, and availability of treatment.

Types of major cancers: Cancers related to infectious agents (cervix, liver, Kaposi sarcoma, urinary bladder) are among the dominant types of the disease in Africa (Figure 2). In 2008, cervical cancer accounted for 21% of the total newly diagnosed cancers in females and liver cancer for 11% of the total cancer cases in males. In contrast, cancers related to tobacco use (e.g., lung), reproductive behaviors (female breast), dietary patterns and obesity (e.g., colorectal), and screening or diagnostic services (prostate) are the most common cancers in North America. However, such cancers are also becoming more common in developing countries due to the adoption of unhealthy behaviors and lifestyles associated with economic development, such as smoking, physical inactivity, and consumption of calorie-dense food. For example, prostate cancer in men and
Cancer in Africa

### Stage at Diagnosis

A majority of cancers in Africa are diagnosed at an advanced stage of disease because of lack of screening and early detection services, as well as limited awareness of early signs and symptoms of cancer among the public and health care providers. Stigma associated with a diagnosis of cancer also plays a role in late-stage presentation in most parts of Africa.

### Survival

Survival after a diagnosis of cancer is much poorer in Africa than in the developed world for most cancer types (Table 2), especially those affected by screening and improved treatment. For example, the five-year survival rate for breast cancer is less than 50% in Gambia, Uganda, and Algeria, compared to nearly 90% in the United States. In addition to being diagnosed at an advanced stage of the disease, which limits treatment options, cancer patients in most parts of Africa have limited access to timely standard treatment, further diminishing their chances of survival.

### Table 2: Five-year Relative Survival for Select Sites and Countries for the Most Recent Year for Which Data Are Available

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</thead>
<tbody>
<tr>
<td>Gambia 1993-1997</td>
<td>4.0</td>
<td>–</td>
<td>–</td>
<td>20.0</td>
<td>3.0</td>
<td>12.0</td>
<td>22.0</td>
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<tr>
<td>Uganda (Kyadondo)</td>
<td>1993-1997</td>
<td>8.0</td>
<td>–</td>
<td>0.0</td>
<td>0.0</td>
<td>46.0</td>
<td>13.0</td>
<td>9.0</td>
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<tr>
<td>Algeria (Setif)</td>
<td>1990-1994</td>
<td>–</td>
<td>11.4</td>
<td>30.6</td>
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<td>38.8</td>
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<tr>
<td>United States</td>
<td>1990-1992</td>
<td>62.2</td>
<td>62.1</td>
<td>62.4</td>
<td>14.0</td>
<td>21.6</td>
<td>85.4</td>
<td>70.6</td>
<td>42.6</td>
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</tr>
<tr>
<td>United States</td>
<td>1999-2006</td>
<td>66.6</td>
<td>66.9</td>
<td>66.3</td>
<td>16.4</td>
<td>26.7</td>
<td>89.9</td>
<td>71.1</td>
<td>45.3</td>
<td>–</td>
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</tbody>
</table>

Survival data for African countries are based on cases followed through 1999. US cases were followed through 2007.

Sources: Gambia and Uganda—Sankaranarayanan et al.84; Algeria—Coleman et al.85; United States—Altekruse et al.86
chance of survival. According to a World Health Organization (WHO) government survey of national capacity for cancer control programs in 2001, anti-cancer drugs were only available in 22% and affordable in 11% of the 39 African countries that participated in the survey.\(^7\)

### Incidence and mortality:

Although age-specific incidence rates (per 100,000 persons) for all cancers combined generally increase with age in both Africa and the economically developed world, rates are generally lower in Africa.\(^8\) For example, the incidence rates are higher in the United States than in Uganda except in the 5- to 9-year and 30- to 40-year age groups in which rates are slightly higher in Uganda (Figure 3). The high incidence rates for ages 5-9 in the Uganda registry may reflect the high burden of non-Hodgkin lymphoma (especially Burkitt’s lymphoma), which accounts for about half of all cancers in this age group.\(^8\) The elevated rates for ages 30-40 may reflect the early onset of cervical cancer in women and liver cancer and Kaposi sarcoma in men.\(^8\)

Compared to North America, the age-standardized incidence rate (per 100,000) for all cancers combined in Africa is about one-third as high for males (334.0 vs. 108.1) and less than half as high for females (274.4 vs. 115.3).\(^3\) This contrasts sharply with the relatively small differences in the overall age-standardized cancer death rates between the two regions for both males (122.4 in North America, 90.6 in Africa) and females (91.5 vs. 84.1).\(^1\) High mortality rates relative to incidence rates in Africa (Figure 4) reflect poor survival of cancer patients due to late stage at diagnosis and lack of timely and standard treatment, as well as a higher proportion of more fatal cancers such as esophagus and liver.

### Regional Differences in Cancer Rates in Africa

Similar to the differences between Africa and the developed world, cancer incidence and mortality patterns vary remarkably across regions within Africa because of the substantial regional differences in economic development and social, cultural, and other environmental factors, including major known risk factors.

**Women:** Cervical cancer was the most frequently diagnosed cancer (31,500) and the leading cause of cancer death (21,600) in women in Eastern Africa in 2008, accounting for about 25% of the total new cancer cases and deaths (Tables 3 and 4). Notably, some countries in this region, such as Zambia, Malawi, Mozambique, and Tanzania, show the highest cervical cancer rates (50 cases per 100,000) worldwide.\(^1\) This is due to a high prevalence of human papillomavirus (HPV) infection, which causes cervical cancer, coupled with a lack of screening services (Pap test) for prevention and early detection of the disease. It is noteworthy...
that in 1947-48, before the wide dissemination of Pap testing in the 1960s in the United States, cervical cancer incidence rates (per 100,000 females) in 10 select metropolitan areas were 40.1 in whites and 73.1 in non-whites, higher than the highest rates found today in Eastern Africa.

In contrast to Eastern Africa, breast cancer was the most commonly diagnosed cancer and the leading cause of cancer death among women in Southern Africa (9,000 cases, 4,500 deaths) and Northern Africa (28,000 cases, 14,600 deaths) in 2008 (Tables 3 and 4). In fact, Southern African women have the highest breast cancer incidence rates of all African regions, in part because of the high proportion of whites in the population who are more affluent and have a higher prevalence of reproductive risk factors for breast cancer, such as early menarche and late child bearing. For example, the female breast cancer incidence rate in Harare (Zimbabwe) in 1990-1992 was six times higher in whites (127.7) than in blacks (20.4).

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Table 3. Age-adjusted Incidence Rates* for the Most Common Cancers in Males and Females in Africa, 2008

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Africa</th>
<th>Sub-Saharan Africa</th>
<th>Southern Africa</th>
<th>Eastern Africa</th>
<th>Middle Africa</th>
<th>Northern Africa</th>
<th>Western Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Males</strong></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>All sites†</td>
<td>108.1</td>
<td>115.9</td>
<td>235.9</td>
<td>121.3</td>
<td>88.1</td>
<td>109.2</td>
<td>92.0</td>
</tr>
<tr>
<td>Prostate</td>
<td>17.5</td>
<td>21.2</td>
<td>53.9</td>
<td>14.5</td>
<td>16.4</td>
<td>8.1</td>
<td>22.2</td>
</tr>
<tr>
<td>Liver</td>
<td>11.6</td>
<td>13.1</td>
<td>13.9</td>
<td>7.2</td>
<td>18.9</td>
<td>7.5</td>
<td>16.5</td>
</tr>
<tr>
<td>Lung</td>
<td>8.4</td>
<td>5.9</td>
<td>29.0</td>
<td>4.1</td>
<td>2.8</td>
<td>1.4</td>
<td>3.1</td>
</tr>
<tr>
<td>Esophagus</td>
<td>6.7</td>
<td>8.5</td>
<td>22.3</td>
<td>14.9</td>
<td>1.5</td>
<td>2.0</td>
<td>1.4</td>
</tr>
<tr>
<td>Colorectal</td>
<td>6.9</td>
<td>6.8</td>
<td>20.4</td>
<td>5.8</td>
<td>4.3</td>
<td>7.0</td>
<td>5.6</td>
</tr>
<tr>
<td>Non-Hodgkin lymphoma</td>
<td>6.3</td>
<td>5.5</td>
<td>9.7</td>
<td>6.2</td>
<td>5.4</td>
<td>8.4</td>
<td>4.8</td>
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<tr>
<td>Urinary bladder</td>
<td>6.7</td>
<td>3.7</td>
<td>7.3</td>
<td>3.4</td>
<td>1.5</td>
<td>14.5</td>
<td>6.3</td>
</tr>
<tr>
<td>Stomach</td>
<td>4.7</td>
<td>5.0</td>
<td>4.1</td>
<td>5.6</td>
<td>4.3</td>
<td>9.3</td>
<td>5.9</td>
</tr>
<tr>
<td>Leukemia</td>
<td>3.2</td>
<td>2.8</td>
<td>3.9</td>
<td>3.0</td>
<td>8.2</td>
<td>7.4</td>
<td>9.2</td>
</tr>
<tr>
<td>Larynx</td>
<td>10.0</td>
<td>2.6</td>
<td>10.5</td>
<td>2.6</td>
<td>10.8</td>
<td>8.0</td>
<td>10.1</td>
</tr>
<tr>
<td>Kaposi sarcoma</td>
<td>–</td>
<td>8.1</td>
<td>6.1</td>
<td>1.4</td>
<td>6.1</td>
<td>4.1</td>
<td>–</td>
</tr>
</tbody>
</table>

| **Females**          |        |                   |                |               |              |                |               |
| All sites†           | 115.3  | 124.7             | 161.1          | 125.3         | 96.7         | 98.9           | 123.5         |
| Breast               | 28.0   | 26.3              | 38.1           | 19.3          | 21.3         | 32.7           | 31.8          |
| Cervix uteri         | 25.2   | 31.7              | 26.8           | 34.5          | 23.0         | 6.6            | 33.7          |
| Liver                | 5.3    | 6.3               | 7.1            | 3.6           | 9.6          | 8.2            | 8.1           |
| Colorectal           | 5.0    | 4.7               | 8.2            | 4.7           | 3.3          | 5.8            | 4.3           |
| Ovary                | 4.2    | 4.0               | 3.8            | 4.0           | 6.4          | 1.6            | 1.0           |
| Non-Hodgkin lymphoma | 4.1    | 3.8               | 4.3            | 3.7           | 4.8          | 5.0            | 7.3           |
| Esophagus            | 3.5    | 4.2               | 11.7           | 6.4           | 0.8          | 1.6            | 0.6           |
| Stomach              | 3.3    | 3.7               | 2.2            | 4.0           | 5.7          | 2.4            | 6.3           |
| Uterus               | 2.5    | 2.6               | 6.9            | 2.4           | 1.9          | 2.2            | 10.1          |
| Thyroid              | 2.1    | 1.7               | 2.3            | 1.7           | 1.2          | 3.4            | 1.7           |
| Kaposi sarcoma       | –      | 3.6               | 8.5            | 6.8           | 0.6          | –              | 1.2           |

* Rates are per 100,000 and age standardized to the world population.
† Rate for all cancers combined for all of Africa excludes Kaposi sarcoma and non-melanoma skin cancer. The rank order of cancers for all of Africa also does not include cases of Kaposi sarcoma. For all other regions, the rates for all sites excludes only non-melanoma skin cancers.

Source: GLOBOCAN 2008.
While cervical cancer in East Africa and breast cancer in Southern and Northern Africa were the most commonly diagnosed cancer among women in 2008, these two cancers occurred with similar frequency in Middle and Western Africa (Table 3). In several sub-Saharan African countries, however, breast cancer has now become the most commonly diagnosed cancer in women (Figure 5), a shift from previous decades in which cervical cancer was the most commonly diagnosed cancer in many of these countries.14 This may be due to increases in the prevalence of risk factors for breast cancer such as early menarche, late child bearing, having fewer children, and obesity, which are associated with economic development. Based on data from the Uganda (Kampala) and Algeria (Setif) cancer registries, breast cancer incidence rates have nearly doubled over the past 20 years, though the rates still remain about one-fifth those in the US and several other Western countries.15,16 However, cervical cancer still remains the leading cause of cancer death among women in sub-Saharan Africa, except Southern Africa where breast cancer ranks first.

**Men:** The regional patterns of cancer occurrence in Africa among men are much more variable than among women. Kaposi sarcoma was the most commonly diagnosed cancer and the leading cause of cancer death among men in Eastern Africa in 2008 (16,000 cases, 13,700 deaths).1 The incidence and mortality rates in Eastern Africa were more than 20 times as high as in Northern Africa, consistent with the geographic variations of the HIV/AIDS epidemic; Kaposi sarcoma is an HIV-associated cancer caused by human herpes virus-8.17,18

Esophageal cancer was the second most commonly diagnosed cancer and the second leading cause of cancer death in Eastern African men, with an estimated 10,500 newly diagnosed cases and 10,000 deaths in 2008. Incidence and mortality rates for esophageal cancer in Eastern Africa are more than seven times as high as in Western, Middle, or Northern Africa, but about 30% lower than in Southern Africa (Tables 3 and 4). Reasons for the high burden of esophageal cancer in several parts of Eastern and Southern Africa are not fully understood, but are thought to reflect smoking,

<table>
<thead>
<tr>
<th>Table 4. Age-adjusted Death Rates* for the Most Common Cancers in Males and Females in Africa, 2008</th>
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<tbody>
<tr>
<td><strong>All Africa</strong></td>
</tr>
<tr>
<td>Rank</td>
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</tr>
<tr>
<td><strong>Males</strong></td>
</tr>
<tr>
<td>All sites†</td>
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<tr>
<td>Prostate</td>
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<tr>
<td>Liver</td>
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<tr>
<td>Lung</td>
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<tr>
<td>Esophagus</td>
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<tr>
<td>Colorectal</td>
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<tr>
<td>Non-Hodgkin lymphoma</td>
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<tr>
<td>Urinary bladder</td>
</tr>
<tr>
<td>Stomach</td>
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<tr>
<td>Leukemia</td>
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<tr>
<td>Larynx</td>
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<tr>
<td>Kaposi sarcoma</td>
</tr>
<tr>
<td><strong>Females</strong></td>
</tr>
<tr>
<td>All sites†</td>
</tr>
<tr>
<td>Uterine cervix</td>
</tr>
<tr>
<td>Breast</td>
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<td>Liver</td>
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<tr>
<td>Colorectal</td>
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<td>Non-Hodgkin lymphoma</td>
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<td>Ovary</td>
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<td>Leukemia</td>
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<tr>
<td>Lung</td>
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<tr>
<td>Kaposi sarcoma</td>
</tr>
</tbody>
</table>

* Rates are per 100,000 and age standardized to the world population.  
† Rate for all cancers combined for all of Africa excludes Kaposi sarcoma and non-melanoma skin cancer. The rank order of cancers for all of Africa also does not include cases of Kaposi sarcoma. For all other regions, the rates for all sites excludes only non-melanoma skin cancers.  
Source: GLOBOCAN 2008.
alcohol intake, and poor dietary patterns, such as the consumption of a maize-based diet that is low in fruits and vegetables. In Middle and Western Africa, liver cancer was the most commonly diagnosed cancer and the leading cause of cancer death in men. About 7,000 new cases and 6,800 deaths in Middle Africa and 13,900 new cases and 13,600 deaths in Western Africa occurred in 2008. Chronic infections with hepatitis B virus (HBV) in sub-Saharan Africa regions and hepatitis C virus (HCV) in Northern Africa are the major causes of liver cancer, accounting for 65%-80% of the total cases. The high burden of HCV-associated liver cancer in Egypt is largely the result of contamination of staple foods, such as maize and ground nuts, with aflatoxin B1, a known cancer-causing agent produced by molds during inadequate storage of crops, is another contributing factor to the liver cancer burden in many sub-Saharan African countries.

In Northern Africa, lung cancer was the most commonly diagnosed cancer (10,400) and the leading cause of cancer death (9,600) among men in 2008. However, lung cancer incidence rates in Northern Africa were only half as high as the rates in Southern Africa (Table 3) because of the more advanced stage of the tobacco epidemic in Southern Africa. Smoking accounts for 65% of lung cancer cases in South Africa, similar to the tobacco epidemic in Western countries.

In contrast to lung cancer, bladder cancer incidence and mortality rates among men in Northern Africa are twice as high as those in Southern Africa, which has the second highest regional rates (Tables 3 and 4). In fact, Egyptian men have the highest bladder cancer incidence rates worldwide. About 40% of the disease in most parts of Africa is caused by a parasite known as Schistosoma hematobium. The infection occurs when people come into contact with free-swimming larvae (early developmental stage) of the parasite, which are released by snails. In Schistosoma-free regions such as Europe and North America, bladder cancer is caused mainly by smoking and occupational exposures to certain industrial chemicals.

Prostate cancer was the most commonly diagnosed cancer among men in Southern Africa in 2008. The incidence rate in Southern Africa is twice as high as the second highest regional rate in Western Africa and nearly seven times higher than the lowest regional rate in Northern Africa. The high incidence rate in Southern Africa may reflect increased diagnosis, rather than disease occurrence. However, high prostate cancer incidence rates have been reported among Western and Southern African descendants in Jamaica and Trinidad and Tobago, where prostate-specific antigen testing is not commonly practiced, suggesting a role for genetic susceptibility.
Opportunities for Cancer Control in Africa

Opportunities for reducing suffering and death from cancer in Africa exist across all stages of the cancer control spectrum, from prevention, to early detection, treatment, and palliative care.41–44

Prevention: Prevention of exposure to cancer-causing agents or risk factors, including infections, tobacco use, and obesity, is by far the most feasible and cost-effective approach to cancer control in Africa.

Tobacco use: Tobacco use is the most preventable cause of cancer death, accounting for 20% of cancer deaths worldwide and for about 6% of cancer deaths in Africa.45 The smaller contribution of tobacco use to cancer deaths in Africa reflects the early stage of the tobacco epidemic and low smoking prevalence, especially in women. Adult smoking prevalence is less than 10% in men and 2% in women in many African countries,32 including Nigeria and Ethiopia, the two most populous nations on the continent. However, cigarette consumption is increasing in this region due to the adoption of new behaviors associated with economic growth and increased marketing by tobacco companies.46 The smoking pattern among teens is even more disturbing. According to the Global Youth Tobacco Survey, in some African countries, the smoking prevalence among boys is higher than among adults.32

In response to the globalization of the tobacco epidemic, the WHO established the Framework Convention on Tobacco Control (FCTC), which features internationally coordinated provisions to control tobacco that include raising the price of tobacco products, banning smoking in public places, restricting tobacco advertising and promotion, counter-advertising, and providing treatment and counseling for tobacco dependence.47 Of the 53 African countries that are members of the WHO, 46 have ratified the FCTC (Figure 6). See the Framework Convention Alliance Web site at fctc.org for continually updated statistics. However, few African countries have implemented the tobacco control measures or policies according to the framework. In 2009, only seven countries had comprehensive advertising bans in place (Botswana, Djibouti, Eritrea, Madagascar, Niger, South Africa, and Sudan);32 only four countries had instituted complete public smoking bans (Botswana, Guinea, Niger, and Uganda); and 12 countries had implemented moderate public smoking bans (Djibouti, Egypt, Eritrea, Libya, Madagascar, Mali, Mauritius, Morocco, Mozambique, Nigeria, South Africa, and Zimbabwe).32 These policies cover only 12.0%, 5.1%, and 40.3% of the African population, respectively, and they are not well-enforced in many countries.

Tobacco use shortens life expectancy by 10–20 years.48 The failure of Western countries to contain the tobacco epidemic in the beginning of the 20th century resulted in approximately 100 million premature deaths.32 African countries have a unique opportunity to avoid this tragedy by curbing the tobacco epidemic at an early stage through the implementation and enforcement of proven and effective comprehensive tobacco control strategies.

Obesity: Unhealthy diet, physical inactivity, and obesity have been associated with increased risk of several cancers, including breast, colorectal, stomach, liver, kidney, and uterine corpus.49–50 The prevalence of obesity and physical inactivity is increasing in several African countries, especially in urban areas, as a result of increased consumption of calorie-dense food and declines in energy expenditures at work and in daily life.51–55 For example, according to a 2003 survey in four urban districts of Cameroon, more than 25% of men and almost 50% of women were overweight or obese, and 6.5% of men and 19.5% of women were obese.51 Notably, according to the Global School-Based Student Health Survey, more than 40% of 13–15-year-old teens in urban areas of Kenya and Zimbabwe spent three or more hours per day watching television and doing other sedentary activities.56

The WHO developed a global strategy to improve dietary patterns and physical activity through the development of national-, regional-, and/or community-level policies and programs that are comprehensive and sustainable.57 Some countries in the WHO African Region, including Algeria, Mauritius, and South Africa, have implemented this strategy, with a focus on promoting physical activity.56 In school-based HIV/AIDS prevention projects in Benin and Burundi, there are efforts to incorporate prevention measures for noncommunicable diseases (noninfectious diseases), such as increasing physical activity, eating a healthy diet, and not smoking.56
Infection: Infectious agents are the causes of some of the most commonly diagnosed cancers in Africa, including cervix, liver, and bladder cancers, as well as Kaposi sarcoma. A substantial proportion of these cancers are potentially preventable by vaccination, improved hygiene, sanitation, and/or treatment. A vaccine against HBV, which causes a majority of the liver cancers in sub-Saharan Africa, has been available since 1982. The WHO has recommended the vaccine as part of routine national infant immunization programs since 1992.28 Because of high cost however, the vaccine was introduced in only a few African countries until the establishment of the Global Alliance for Vaccines and Immunization (GAVI) in 2000, which made the vaccine more affordable in developing countries. As of 2008, 48 out of the 53 African countries included the vaccine as part of their national infant immunization schedules (Figure 7). However, the vaccination coverage was less than optimal (<80%) in many countries in sub-Saharan Africa, where HBV infection is more prevalent.

The human papillomavirus (HPV) is another cancer-causing infectious agent that is preventable through vaccination. The vaccines are administered to adolescent girls and offer protection against major strains of HPV infections that cause 70% of cervical cancer. Undoubtedly, these vaccines provide the best opportunity for substantially reducing the future burden of cervical cancer in sub-Saharan Africa, where it is a leading cause of cancer death among women.

In 2008, the GAVI prioritized the introduction and wide dissemination of HPV vaccines in developing countries as part of its new vaccine investment strategy.59 The companies that manufacture these vaccines recently agreed to a reduced sales price in developing countries. However, barriers to wide dissemination of the vaccines remain, especially in rural parts of Africa, including access to adolescent girls, few of whom attend school or receive regular preventive care.60,61

Transmission of some cancer-causing infectious agents can be prevented by improving hygiene in the health care delivery system and by educating people to modify high-risk behaviors. Infections that cause liver cancer and Kaposi sarcoma can be prevented by screening blood products, sterilizing injection needles and equipment, and/or by stopping injection drug use. Exposure to liver cancer-causing aflatoxins (AFBI) can be decreased by improving post-harvest food storage practices,82 although efforts to reduce AFBI exposure in sub-Saharan Africa have been limited due to economic and logistic constraints. HIV infection can be prevented by practicing safer sex (condom use, commitment to one partner) abstinence, and circumcision.63

A certain type of parasite (Schistosoma hematobium) causes a substantial proportion of bladder cancer in Africa. Infection from this parasite can be prevented by avoiding swimming, bathing, or wading in fresh-water areas known to contain the free-swimming stage (larvae) of the parasite. People who are already infected with the parasite can be successfully treated with the drug praziquantel. The use of this drug, as well as lower infection rates due to urbanization, is thought to have contributed to the substantial decrease in incidence of Schistosoma-associated bladder cancer in Egypt over the past few decades.64,65

Early detection: Cancer prevention and control using standard screening methods, such as mammography for breast cancer, fecal occult blood testing and sigmoidoscopy/colonoscopy for colorectal cancer, and Pap testing for cervical cancer, are not only cost prohibitive in most parts of Africa, but they are also not supported by the existing health care infrastructure. However, early detection for cervical cancer or precancerous lesions by visual inspection using Lugol’s iodine or acetic acid and low-cost DNA tests to detect HPV infections have been shown to be feasible and effective in many parts of Africa, including Kenya and South Africa.66-68 Previous studies based on simulation modeling have reported that screening once or twice in a lifetime between ages 35-55 using these low-cost/low-tech screening methods can reduce cervical cancer by about 30%.66,67 Early detection is the only viable option for reducing the currently high cervical cancer burden in sub-Saharan Africa because the available vaccines are only recommended for adolescent girls. Screening would be appropriate even for vaccinated girls once they reach the recommended screening age since the vaccines do not provide protection for 30% of chronic HPV infections that cause cervical cancer.
Increasing public awareness of early signs and symptoms of cancers of the breast, cervix, colorectum, oral cavity, urinary bladder, and prostate may increase detection of these diseases at earlier stages when there are more options for treatment and survival rates are higher. Every effort must be made to expand the capacity of health care delivery systems to provide timely and effective treatment to patients diagnosed with early stage disease in order for increased awareness initiatives to result in improved patient outcomes.

**Curative treatment:** Surgery and/or radiation are the most important methods of treating early stage (local) cancers, including cancers of the breast, colorectum, cervix, head and neck, esophagus, stomach, and prostate. However, the availability of such treatments in Africa is limited because of lack of skilled manpower, surgical equipment, and radiation facilities. Based on radiotherapy data from the International Atomic Energy Agency (IAEA) that have been updated through 2010, 16 out of 53 countries in Africa have no radiation treatment centers, and an additional 13 have no data reported (Figure 8). When countries have facilities, many are inadequate in number. For example, more than 80 million people in Ethiopia are served by a single radiotherapy center. The actual supply of radiation treatment in Africa in 2002 was only 18% of the total needed.

The IAEA, through its Programme of Action for Cancer Therapy, has been working with the WHO and other interested international and national organizations to establish safe and effective radiotherapy facilities to deliver high-quality treatment to cancer patients in Africa and other developing countries. The IAEA, through its Programme of Action for Cancer Therapy, has been working with the WHO and other interested international and national organizations to establish safe and effective radiotherapy facilities to deliver high-quality treatment to cancer patients in Africa and other developing countries.

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**Table 5. Priority Actions for National Cancer Control Programs in Countries with Low Resources**

<table>
<thead>
<tr>
<th>National Cancer Control Program</th>
<th>Prevention</th>
<th>Early Diagnosis</th>
<th>Screening</th>
<th>Curative Therapy</th>
<th>Pain Relief and Palliative Care</th>
</tr>
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<tbody>
<tr>
<td>• Consider the implementation of one or two key priorities in a demonstration area with a stepwise approach.</td>
<td>• Focus on areas where there are great needs and potential for success.</td>
<td>• Use low-cost and effective community approaches to promote, in a first phase, early diagnosis of one or two priority detectable tumors in a pilot area with relatively good access to diagnosis and treatment.</td>
<td>• If there is already infrastructure for cervical cytology screening for women aged 35 to 40 years once in their lifetime or, if more resources are available, provide screening every 10 years for women aged 30 to 60 years.</td>
<td>• Organize diagnosis and treatment services, giving priority to early detectable tumors.</td>
<td>• Ensure that minimum standards for pain relief are progressively adopted by all levels of care in targeted areas and that there is high coverage of patients through services provided mainly by home-based care.</td>
</tr>
<tr>
<td>• Consider palliative care as an entry point to a more comprehensive approach.</td>
<td>• Ensure that priority prevention strategies are targeted to those groups that are influential and can spearhead the process (e.g., policy makers, and teachers).</td>
<td>• Integrate HBV with other vaccination programs in areas endemic for liver cancer.</td>
<td>• Ensure that minimum standards for pain relief are progressively adopted by all levels of care in targeted areas and that there is high coverage of patients through services provided mainly by home-based care.</td>
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<tr>
<td>• Use appropriate technologies that are effective and sustainable in this type of setting.</td>
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IAEA is also launching a Virtual University for Cancer Control and Regional Training Network to fill the gap in skilled human resources in Africa (iaea.org). African countries must also do more to halt the exodus of their home-grown health care providers to the West in search of lucrative compensation and better opportunities for career development by providing financial incentives and other benefits.74

**Palliative care:** Lack of access to basic pain relief continues to make living and dying with cancer in Africa a very different experience from that in developed countries. About 80% of cancer patients in Africa are diagnosed at advanced stages of the disease, when pain relief is often the only choice of treatment. In sub-Saharan Africa, in particular, weak health systems, legal and regulatory restrictions, inadequate training of health care providers, concern about diversion, addiction, and abuse, and cultural misperceptions about pain create a web of barriers that keep safe, effective, and inexpensive opioid analgesics out of the reach of more than a million people with treatable pain.

In 2008, there were approximately 421,0001 deaths due to cancer and 1.4 million deaths due to HIV75 in sub-Saharan Africa. It has been estimated that 50% of HIV deaths and 80% of cancer deaths require pain treatment lasting an average of three months; the amount of morphine needed for these deaths alone is approximately 6,413 kg.76 However, in 2008, the actual procurement of morphine and equivalent opioids (pethidine, oxycodone, and hydromorphone) reported by sub-Saharan African governments to the International Narcotics Control Board was just 639 kg.77 about 10% of the quantity needed just for the terminal months of cancer and HIV patients, and not considering the need for pain treatment among those living with cancer, HIV, traumatic injury, or chronic pain. These data clearly indicate that for the vast majority of those in severe pain in sub-Saharan Africa, treatment is simply not available. While it is the responsibility of each African government to take the lead in making pain relief accessible to its citizens who need it, the activities of palliative care organizations and other civil society groups are critical to supporting government efforts. In several countries, these groups have been instrumental in getting pain relief on the agenda of governments, articulating technical solutions, and leading efforts to work across disease areas, particularly cancer and HIV, to address this issue jointly. International and national nongovernmental health organizations have generally been slow to integrate pain relief into their programs, often believing it is outside of their disease-specific treatment or prevention mandate. A re-classification of pain treatment from a separate entity to a part of comprehensive treatment of cancer and HIV – and a full recognition of pain-relieving medications as a cornerstone of the global essential medicines agenda – would assist governments with a more rational programming of attention and resources to address untreated pain.

**Establishing and Maintaining Cancer Control Programs in Africa**

The WHO has developed guidelines for regional and national cancer control programs according to national economic development.7 In its 58th World Health Assembly in 2005, the WHO urged member states to develop and reinforce comprehensive and evidence-based cancer control programs in order to curb the growing global burden of cancer.78 The WHO recommends cancer control programs in Africa begin in a stepwise approach by implementing one or two key priorities in a demonstration project (Table 5). Such projects could be sustainable only when African countries take the initiative and make the political commitment to invest in the programs with a dedicated budget and required staff. Of course, international public health agencies and donors can and should play major roles in strengthening and broadening such government-based initiatives.

When possible, cancer control programs should be integrated with other established disease control programs because some diseases share the same risk factors or routes of transmission. For example, unsafe sexual practice is a risk factor for both HIV and HPV infections. Therefore, some aspects of cervical cancer prevention programs in sub-Saharan African countries could be integrated with ongoing HIV prevention programs. The successful integration of HBV vaccination into infant immunization programs in Africa and other parts of the world should serve as a model for the integration of preventive measures for many diseases.

The availability of a high-quality, population-based cancer registration system is an important component of any evidence-based cancer control program because cancer registration is essential for assessing the burden of cancer, setting priorities, and implementing and evaluating cancer control programs.79,80 However, only 11% of the African population is covered by population-based cancer registries.81 Further, many cancer registries in Africa do not meet IARC’s criteria for high-quality incidence data (completeness, validity, timeliness);8,82 only five cancer registries (covering 1% of Africa’s population) met the criteria for inclusion in Cancer Incidence in Five Continents Volume IX.8 Therefore, there is a greater need for establishing or strengthening population-based cancer registration systems in Africa in order to implement effective and evidence-based cancer control programs.

In addition to guiding and evaluating cancer-control programs, cancer registries are also useful for studying the causes (risk factors) of cancer.83 There are opportunities to identify novel risk factors for cancer in Africa that could advance cancer-prevention measures worldwide in view of the diverse African population with respect to culture, dietary patterns, and other environmental factors and the very limited prior efforts to study the causes of cancer in this population.
What Is the American Cancer Society Doing to Curb the Growing Burden of Cancer in Africa?

The American Cancer Society and its partners in Africa are working to prioritize cancer and other noncommunicable diseases on the region’s health and development agenda, and to promote tobacco control throughout Africa. Together with regional stakeholders, the Society raises awareness about the growing burden of cancer in Africa and promotes evidence-based policies and programs for cancer prevention.

The Society works with a number of partners in the public and private sectors, including the African Organization for Research and Training in Cancer, Cervical Cancer Action, the International Union Against Cancer, the International Union for Health Promotion and Education, The Corporate Council on Africa, the World Economic Forum, the World Health Organization, and a host of community-based civil society organizations, as well as media networks, to achieve its regional cancer advocacy objectives. The Society is also working with several leading tobacco-control organizations, including the African-based African Tobacco Control Regional Initiative, the African Tobacco Control Alliance, and the Framework Convention Alliance, to prevent further increases and realize eventual reductions in the prevalence of smoking in Africa. These efforts are supported by a multi-year grant from the Bill & Melinda Gates Foundation.

The American Cancer Society also supports the Global Access to Pain Relief Initiative (GAPRI), which was established in 2009 by the International Union Against Cancer to make pain relief accessible to all cancer patients by 2020. The GAPRI program supports partner governments in sub-Saharan Africa and other regions to improve safe access to opioid analgesics for all patients in treatable pain.

Tobacco control in sub-Saharan Africa

In 2010, the American Cancer Society received a $7 million (US) grant from the Bill & Melinda Gates Foundation to spearhead the African Tobacco Control Consortium (ATCC), a collaborative effort to prevent and reduce tobacco use in sub-Saharan Africa by implementing proven tobacco control strategies at the national and local level. Partners in this effort include the Africa Tobacco Control Regional Initiative based in Lagos, Nigeria; the Africa Tobacco Control Alliance based in Lome, Togo; the Framework Convention Alliance; the Campaign for Tobacco-Free Kids; and the International Union Against Tuberculosis and Lung Disease.

The American Cancer Society and its partners will assist national governments and civil society to implement policies such as advertising bans, tobacco tax increases, graphic warning labels, and the promotion of smoke-free environments recommended by the WHO Framework Convention on Tobacco Control (FCTC), the world’s first public health treaty. In addition, the partners will advocate for further tobacco control resources in the region and will protect existing laws from tobacco industry efforts to overturn them and halt crucial progress.

Despite being the most significant investment ever in tobacco control in sub-Saharan Africa, the ATCC does not support research activities. In order to fill this gap, the Society has partnered with the University of Cape Town and the University of Pretoria to build tobacco control research and training capacity in sub-Saharan Africa. The Society not only provides financial resources to these pilot projects, but staff expertise as well. The partnership formalizes and expands the current tobacco control-related research and training activities at both institutions, and intends to grow the number of tobacco control researchers and produce original, policy-relevant and country/regional-specific research. This collaborative trans-disciplinary and translational regional research initiative supports human and institutional capacity building, while bridging the divide between knowledge generation (i.e., research) and knowledge translation (i.e., policy making). The project supports graduate student training and research and organizes training workshops for advocates, policy makers, and researchers.

The Society will continue to work with its global partners to increase awareness for the growing global cancer and tobacco burden and its impact on low-and middle-income countries. As advocates for more focused attention on cancer and other noncommunicable diseases, the Society produces and shares information on cancer and tobacco control issues for domestic and global audiences.

Data Sources and Methods

Cancer incidence data are available from the International Agency for Research on Cancer (IARC) in the Cancer Incidence in Five Continents (CI5) database for select registries worldwide with high-quality data. Cancer incidence data in the most recent volume (IX) of CI5 cover about 11% of the world population (http://ci5.iarc.fr/C15i-ix/ci5i-ix.htm). Cancer incidence estimates for all countries worldwide are prepared by IARC and made available in the GLOBOCAN 2008 database (globocan.iarc.fr/). The methods used to estimate the sex- and age-specific incidence rates for specific countries are described elsewhere and are dependent on the availability and accuracy of cancer incidence and mortality data for each country. For countries without any cancer incidence or mortality data, as is the case in many developing countries, estimates were created using frequency data or the rates of neighboring countries.

Mortality data are collected in all industrialized countries and some developing countries. These data, covering approximately one-third of the world population, are abstracted from death certificates and compiled by IARC in the WHO cancer mortality database (dep.iarc.fr/WHOdb/WHOdb.htm). The quality of mortality data varies by country, with high accuracy of underlying cause of death in developed countries and low accuracy in developing countries.
Incidence and mortality rates

Incidence and mortality rates are the two most frequently used measures of cancer occurrence. These statistics quantify the number of newly diagnosed cancer cases or deaths, respectively, in a specified population over a defined time period. Incidence and death rates are usually expressed per 100,000 people per year.

Age standardization

Age standardization simplifies comparisons of incidence and mortality rates among populations that have different age compositions. The usual approach to age standardization in surveillance data is to apply the age-specific rates in the populations of interest to a standard set of weights based on a common age distribution. This eliminates the effect of the differences in age structure among the populations being compared and provides a hypothetical rate that would be observed in each population had its age composition been the same as that of the standard population. An age-standardized rate (ASR) is a summary measure of a rate that a population would have if it had a standard age structure. Age-standardized rates are only comparable when the same age standard is applied to each of the populations being compared. This is not the case currently in surveillance data from different sources. The international data presented in this publication are all standardized to the 1960 world standard population used by IARC. In contrast, cancer incidence and mortality data in the United States and several European countries published elsewhere are standardized to the 2000 US and European standard populations, respectively.

Therefore, data presented in this publication cannot be compared with those published elsewhere using a different standard population for age adjustment.

New cancer cases and deaths

Another measure of the cancer burden in a population is the total number of new cases and deaths that occur in a given year. These counts reflect the absolute number of affected individuals and patients who require medical care and social services. Estimates of the number of new cancer cases and deaths for the year 2008 were obtained from GLOBOCAN 2008.1

Survival rates

The survival rate reflects the proportion of people alive at a specified period after a diagnosis, usually five years. The two basic measures of survival are observed and relative. The observed survival rate quantifies the proportion of cancer patients alive after five years of follow up since diagnosis, irrespective of deaths from conditions other than cancer. In contrast, relative rate reflects the proportion of people alive five years after diagnosis compared to that in a population of equivalent age and sex without cancer. This accounts for deaths from other causes. Survival data are available for countries in North America and Europe and for some developing countries.85-89 The large variation in survival rates across countries/regions reflects a combination of differences in the mix of cancer types, the prevalence of screening and diagnostic services, and/or the availability of effective and timely treatment. Methodological problems relating to incompleteness of registration and follow up also contribute to apparent differences.
References


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