

# SPATIAL ANALYSIS OF HIV/AIDS IN SUB-SAHARA AFRICA USING GIS

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To address the spatial scope of HIV/AIDS in Sub-Sahara Africa, a world HIV/AIDS data set was obtained. GIS technology was used to create a series of map visualizations, which clearly demonstrates the existence of a number of HIV/AIDS patterns for adult women with HIV/AIDS 15-49 years old and for children with HIV/AIDS 0-14 years old. Acquired Immunodeficiency Syndrome emerged as a world health problem approximately twenty years ago. Since the 1980s, AIDS, including stage one of the disease known as Human Immunodeficiency Virus-HIV-has affected 42 million people worldwide. In 2002 the HIV/AIDS epidemic claimed the lives of three million people, and that same year, another five million acquired the HIV virus worldwide. Eastern Europe, and the Russian Federation, is experiencing the fastest increase in HIV/AIDS; during the past four years, the former rose from 100,000 to 1 million cases; Western Europe, North America, and Australia have more than 1.5 million cases; in the Caribbean and Latin America an estimated 1.9 million adults and children are affected. Unlike these regions, Sub-Sahara Africa is the worst affected region in the world. Of the 42 million people who were living with HIV/AIDS by the end of 2001, 70 percent of them live in Sub-Sahara Africa, an area which makes-up only 10 percent of the world's population.

## INTRODUCTION

According to the Southern African Humanitarian Information Network, "*no war, no terrorist attack, has ever threatened the lives of more than 40 million people worldwide. AIDS does. Southern Africa, currently bear the heaviest burden of the AIDS epidemic, its effects permeate societies and include children, women, men, rich and poor alike.*"<sup>1</sup> Worldwide, 47,142,865<sup>2</sup> people are infected with the HIV/AIDS virus. Given this large number of infected people, the purpose of this research paper is to determine which region of the world accounts for the largest proportion of HIV/AIDS cases and related deaths. Specifically, a link will be established between the total population of sub-Saharan nations and the proportion of people in each who are affected with the HIV/AIDS virus. Emphasis is placed on the number of people 15-49 years olds who are affected with HIV/AIDS; and, the proportion of women and children who are infected with the disease will be highlighted to demonstrate that the basic unit of Sub-Saharan societies-the family-is in rapid decline.

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<sup>1</sup> \_\_\_\_\_ "Treating HIV and AIDS," The Southern African Humanitarian Information Network for a coordinated Disaster Response, [www.sahims.net/regional/exec-review/2004/05\\_May\\_review\\_14\\_05\\_28.htm](http://www.sahims.net/regional/exec-review/2004/05_May_review_14_05_28.htm), May 22, 2005, p. 1.

<sup>2</sup> \_\_\_\_\_ "AIDS Clock," [www.unfpa.org](http://www.unfpa.org), p.1.

In view of the fact that 47.1 million people worldwide are currently infected with the HIV/AIDS virus, it is hypothesized that a disproportionate percent of the infected world population consists of men, women, and children who live in Sub-Sahara Africa. To proceed, let us briefly examine the number of people who have died from AIDS worldwide.

## **AIDS DEATHS WORLDWIDE**

The World Health Report 2004-Changing History 2004 stated "...tackling HIV/AIDS is the world's most urgent public health challenge."<sup>3</sup> Moreover, this report added AIDS "has killed more than 20 million people and is now the leading cause of death and lost years of productive life for adults worldwide. ...as of December 2003, ...2.5 million adults and 500,000 children died of AIDS..."<sup>4</sup> It is interesting to note AIDS kill 20 million people annually. These numbers are not showing signs of declining.

Based on the AIDS Epidemic Update 2004 report, which is published jointly by the World Health Organization ( WHO ) and the United nations Program on HIV/AIDS ( UNAIDS ), "the steepest increases in HIV infections occurred in East Asia, Eastern Europe, and Central Asia over the past two years."<sup>5</sup> Half of the new HIV infections from 2002 to 2004 were due to the growing epidemics in China, Indonesia, and Viet Nam. In North America and Europe the HIV/AIDS epidemic is worsening as well.

In fact, in these countries "...an increasing number of people are becoming infected through unprotected heterosexual sex. In the united States, AIDS disproportionately affects African American and Hispanic women, with AIDS ranked among the top three causes of death for African American women 35-44 years."<sup>6</sup> Between 1997 and 2002, HIV infections among heterosexuals in Western Europe doubled. In addition, the mentioned report stated "the Caribbean continues to be the second worst-affected region in the world. ...AIDS has become the leading cause of death among adults aged 15-44 in the region."<sup>7</sup> As we see, loss of life and productivity due to HIV/AIDS are advancing; few signs suggest that the worldwide epidemic will retreat anytime soon. Nowhere else in the world is this more true than Sub-Sahara Africa.

## **METHODOLOGY**

Before we address the HIV/AIDS situation in Sub-Sahara Africa, a few words about the above is provided.

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<sup>3</sup> \_\_\_\_\_ "treating HIV and AIDS," [www.sahims.net](http://www.sahims.net), p. 1.

<sup>4</sup> *Ibid.*, p. 1.

<sup>5</sup> \_\_\_\_\_ "HIV/AIDS Attack Women in Growing Numbers," [www.usinfo.state.gov](http://www.usinfo.state.gov), p. 3.

<sup>6</sup> *Ibid.*, p. 4.

<sup>7</sup> *Ibid.*, p. 4.

This data used to examine the HIV/AIDS epidemic in Sub-Saharan Africa was obtained from a 2002 United Nations report. Data were collected for 34 countries, including total population, HIV/AIDS infection for men and women, women 15-49, orphans 0-14 years old, and deaths. This data were placed in a Microsoft excel spreadsheet. Once it was collected for each Sub-Saharan country, the data were imported into ArcView 3.2. At this point, a number of map visualizations showing the spatial distribution of HIV/AIDS in Sub-Saharan countries was created using GIS Technology. A number of the map visualizations created is provided in the following section of this research to demonstrate the plight of people with HIV/AIDS in the Sub-Saharan region.

## **SUB-SAHARA AFRICA: WORLD LEADER IN HIV/AIDS INFECTIONS AND DEATH**

Nowhere else in the world are men, women, and children more affected by HIV/AIDS than in Sub-Saharan Africa. As we shall see, the 15-49 year old populations of a vast majority of countries in this region have unusually high concentrations of people with HIV/AIDS, particularly women. Also, a growing number of children 0-14 year olds have become orphans. Tragically, both parents, in most cases, have perished due to AIDS, leaving the future generations' survival highly uncertain throughout Sub-Saharan Africa. Map 1.0 and 1.1 shows the total African population and the total for Sub-Saharan Africa by 2001.

As indicated, the largest concentrations of people live in West Africa and along the east coast of Africa, extending from the Horn of Africa to the Cape located in South Africa. Interestingly, the distribution of the Sub-Saharan population parallels the general location of the largest concentration of HIV/AIDS cases. Map 1.2 shows the study area, or countries included in this research. As we proceed, pay close attention to the countries located in West and East Africa because they are the ones that account for the largest concentration of HIV/AIDS cases.

When we examined the data to see if this is true, we discovered a close geographical correlation between the countries located in West and East Africa and the total HIV/AIDS population in Sub-Saharan Africa by 2001. Map 1.3 shows the largest concentrations of HIV/AIDS cases are located in West Africa and along the East Coast, extending southward to South Africa. There is no change in this geographic pattern when the infected population 15-49 years old was considered by 2001.

Regarding the infected population with HIV/AIDS, of the 47.1 million people infected with HIV worldwide, "...30 million of them live in Africa."<sup>8</sup> According to Cichocki, "a significant number of this total are unaware they are infected with HIV."<sup>9</sup> Moreover, "the United Nations has said nearly 13 percent of South Africa's adult population is infected

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<sup>8</sup> "Treating HIV and AIDS," [www.sahims.net](http://www.sahims.net), p. 1.

<sup>9</sup> Cichocki, Mark, "The AIDS Epidemic in Africa," [www.aids.about.com](http://www.aids.about.com), p. 1.

# African Population, 2001

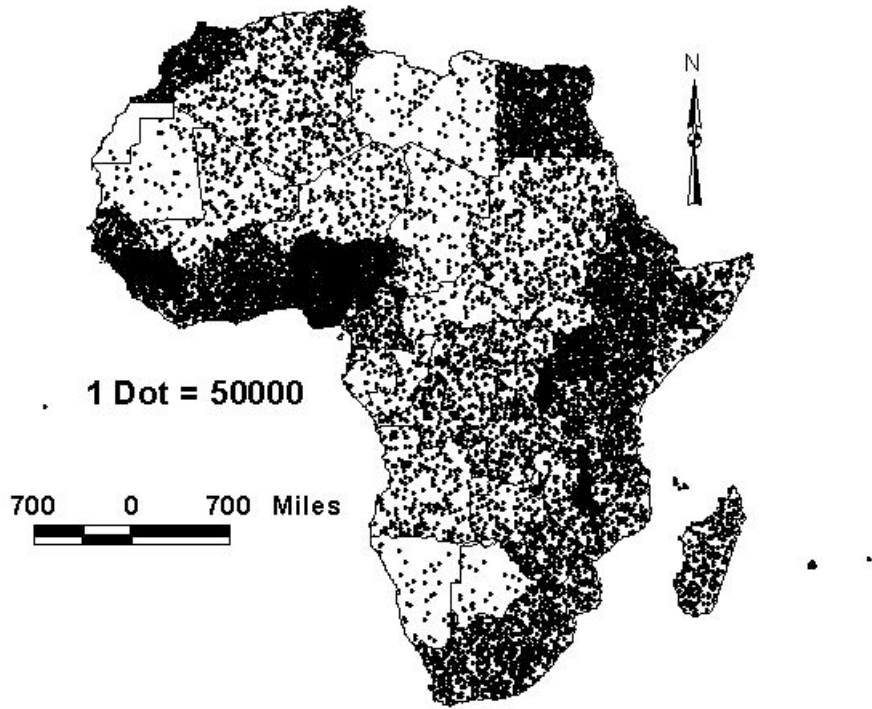


Figure 1.0

### Total Population Of Sub-Sahara Africa, 2001

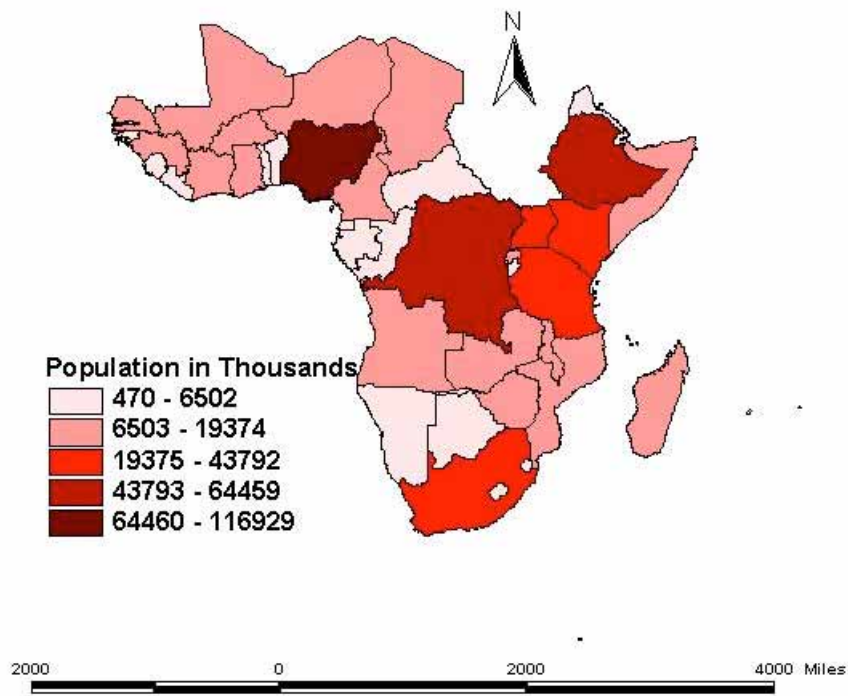


Figure 1.1

## Study Area: Sub-Sahara Africa, 2001

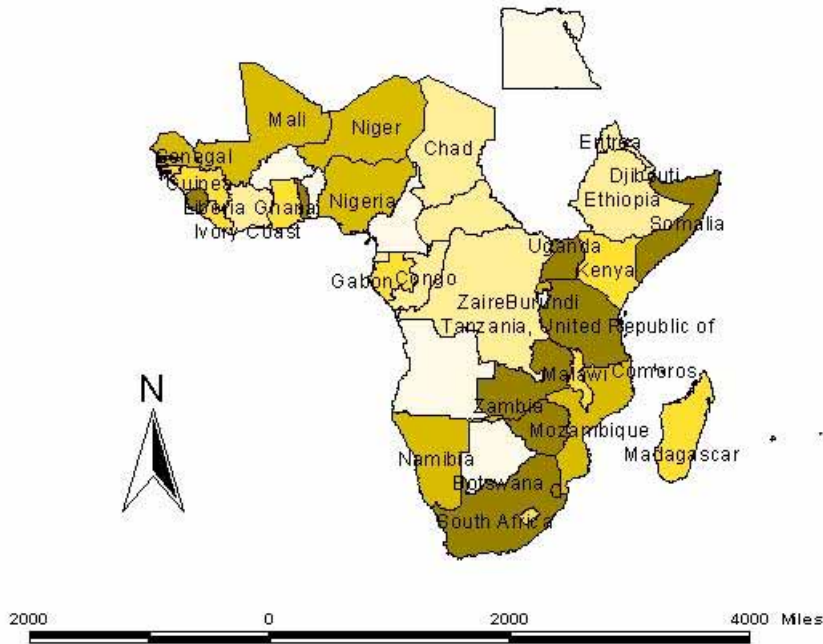


Figure 1.2

with HIV, and that an estimated one out of 10 infected people don't realize they have the virus."<sup>10</sup> That being so, women 15-49 years old constitute the largest segment of the populations of Sub-Sahara countries with HIV/AIDS, and since large numbers are unaware they are infected with HIV, this contributes significantly to its spread. According to the AIDS Epidemic Update 2004 report, "women are increasingly affected, now making up nearly half...the...adults (aged 15-49) living with HIV worldwide. In Sub-Sahara Africa, the worst affected region, close to 60% of adults living with HIV are women-13.3 million."<sup>11</sup> Moreover, "in sub-Sahara Africa, three quarters of all 15-24 year olds living with HIV are female."<sup>12</sup> Map 1.4 shows the total adult women population 15-49 years old who had HIV/AIDS by 2001. The geographic pattern is consistent with the location of the largest concentration of people throughout Sub-Sahara Africa. Children 0-14 years old make up a sizable portion of the infected population.

Map 1.6 shows the total children 0-14 years old with HIV/AIDS by 2001. According to The Southern African Humanitarian Information Network, "in sub-Sahara Africa, three

<sup>10</sup> \_\_\_\_\_ "U.N.: Life expectancy in Sub-Sahara Africa hit hard by AIDS," [www.cnn.com](http://www.cnn.com), p. 2.

<sup>11</sup> \_\_\_\_\_ "HIV/AIDS Attacks Women in Growing Numbers," [www.usinfo.state.gov](http://www.usinfo.state.gov), p. 2.

<sup>12</sup> *Ibid.*, p. 4.

## Infected Population, 15-49 yrs, 2001

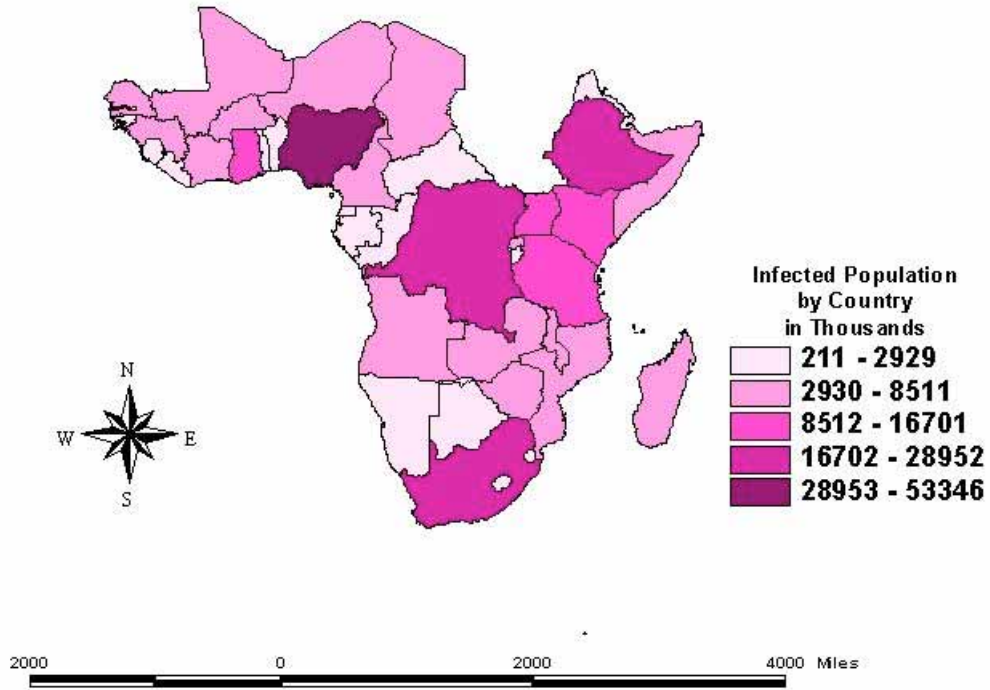


Figure 1.3

Total Adult Women Population With HIV/AIDS, 15-49 Yrs old, 2001

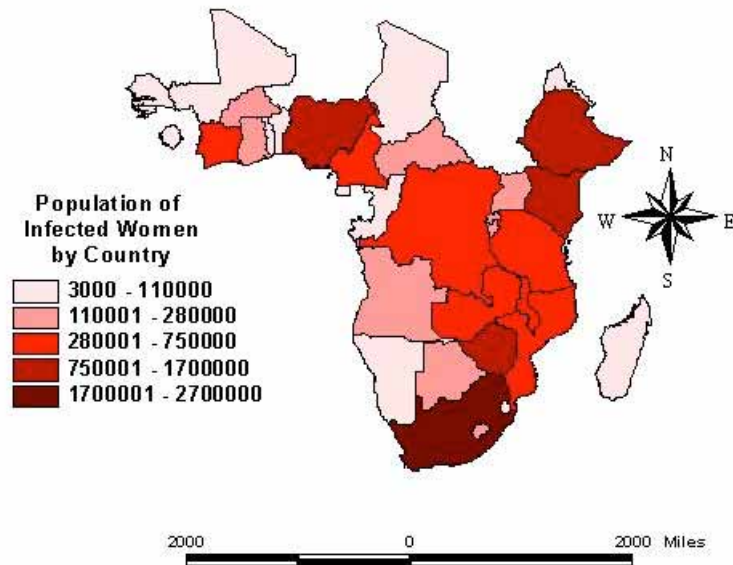


Figure 1.4

million children under 15 are living with HIV/AIDS.”<sup>13</sup> Map 1.5 supports this claim. In Sub-Sahara Africa there were 11 million children orphaned by AIDS by 2003. Map 1.6 shows the proportion of children 0-14 years old who were orphaned by AIDS in two years earlier. The data suggest a continuing increase; by 2010 the number of orphans is expected to triple. According to The World Health Report, “the number of orphan children could rise to 25 million under the age of eighteen by the year 2010.”<sup>14</sup>

In view of the affect the HIV/AIDS epidemic is having on the total population of the Sub-Sahara countries, where the number of infected women and children are steadily increasing, life expectancy is inversely decreasing. According to the AIDS EpidemicUpdate 2004 report, Southern Africa continues to be the worst-hit region with HIV prevalence rates surpassing 25%.In Botswana, Lesotho, and Swaziland, prevalence rates still exceed 30% among pregnant women. Life expectancy has dropped below 40 years in nine countries in the region.”<sup>15</sup> During 2004, AIDS killed 2.3 million adults and children. In the United Nations latest population report, it is stated “children born today

<sup>13</sup> \_\_\_\_\_ “Treating HIV and Aids,” [www.sahims.net](http://www.sahims.net), p. 1.

<sup>14</sup> \_\_\_\_\_ “AIDS orphan: ‘when you die,how should I do this?’, [www.findarticles.com](http://www.findarticles.com), p. 2.

<sup>15</sup> \_\_\_\_\_ “HIV/AIDS Attacks Women in Growing Numbers,” [www.usinfo.state.gov](http://www.usinfo.state.gov), p. 4.



Total Children 0-14 Yrs Old With HIV/AIDS, 2001

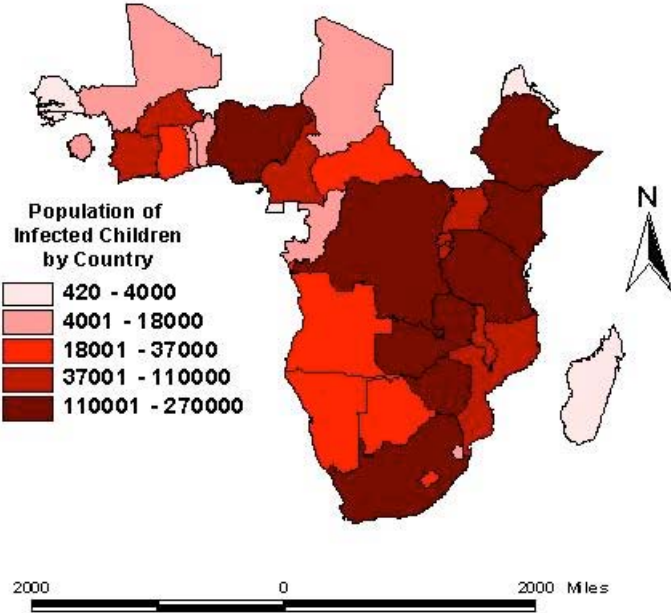


Figure 1.5

### Proportion Children Orphaned, 0-14 Yrs Old, 2001

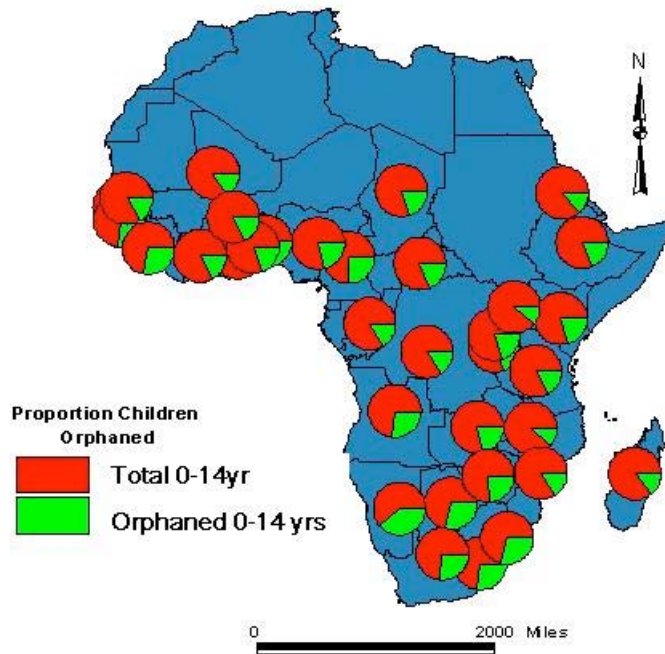


Figure 1.6

in 29 sub-Sahara Africa nations face a life expectancy of just 47 years because of the toll the AIDS pandemic is taking on the region...91 percent of the deaths occurred in 34 countries-29 in sub-Sahara Africa."<sup>16</sup> Erastus Mwencha, who is the secretary-general of the Common Market for Eastern and Southern Africa ( COMESA ), told The Zambezi Times, "...at the end of 2003, statistics showed that 6,600 people died due to AIDS in Sub-Saharan Africa. This indicates that 3.8 million people died during the year as a result of the disease."<sup>17</sup>

Thus far, we have seen of all the regions in the world today, Sub-Sahara Africa holds the distinction of being the one with the greatest incidence of HIV/AIDS and death. Accordingly, Sub-Sahara Africa accounted for 10 percent of the world population in 2004, and, at the same time, it accounted for 70 percent of the worldwide HIV/AIDS cases. "Sub-Sahara Africa accounts nearly for 70%of HIV and AIDS cases world wide. At present, women are 58% of adult HIV infections in Sub-Sahara Africa."<sup>18</sup> Erastus Mwencha added "it is astonishing to learn that 80 per cent of all the cases of HIV-AIDS are found in Africa."<sup>19</sup> This information substantiates the hypothesis that we set out at the

<sup>16</sup> \_\_\_\_\_ "U.N.: Life expectancy in sub-Sahara Africa hit hard by AIDS," [www.cnn.com](http://www.cnn.com), p. 1.

<sup>17</sup> \_\_\_\_\_ "Sub-Sahara Africa Losing 6,600 People To HIV/AIDS Every Day," Zambezi Times, June 15, 2004, p. 1 ( [www.sahims.net](http://www.sahims.net) )

<sup>18</sup> \_\_\_\_\_ "Women And HIV/AIDS, [www.africa-union.org](http://www.africa-union.org), p. 1.

<sup>19</sup> \_\_\_\_\_ "Sub-Sahara Africa Losing 6,600 People To HIV/AIDS Every Day, [www.sahims.net](http://www.sahims.net), p. 1.

beginning of this research. No other region comes close to Sub-Sahara Africa regarding the prevalence or severity of the HIV/AIDS problem. This point is further elaborated on in the conclusion that follows.

## CONCLUSION

The impact HIV/AIDS is currently having on the Sub-Sahara region is rapidly reaching a point where the affected nation's primary resource-people-are being threatened with extinction. Cichocki stated "aids will kill half of all 15 year olds in Zimbabwe, Botswana, and South Africa..."<sup>20</sup> Moreover, "as entire generations of children are unable to grow into productive adults, countries in Sub-Sahara Africa face economic collapse."<sup>21</sup> According to The Southern African Humanitarian Information Network, "projections now suggest that some countries in sub-Sahara Africa will face collapse unless they bring their epidemic under control, mainly because HIV/AIDS weakens and kills adults in their prime-depriving communities of doctors, teachers, and lawyers, as well as farmers, miners and police officers, and depriving children of their parents."<sup>22</sup> Unless HIV/AIDS treatment is provided by the government officials of Sub-Sahara countries, along with a commitment to support this effort by wealthy industrialized nations, it is likely that in the very near future we may hear or read that the social, economic, and political infrastructure of one or more Sub-Sahara countries has collapsed.

This would indicate the remaining population is too ill to carry on any kind of productive enterprise. Therefore, we, as a world community must take the responsibility to intervene while there is still an opportunity to insure this outcome never materialize.

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<sup>20</sup> Cichocki, Mark, "The AIDS Epidemic in Africa," [www.aids.about.com](http://www.aids.about.com), p.1.

<sup>21</sup> \_\_\_\_\_ "AIDS orphans: 'when you die, how should I do this?,' [www.findarticles.com](http://www.findarticles.com), p. 2.

<sup>22</sup> \_\_\_\_\_ "Treating HIV and AIDS," [www.sahims.net](http://www.sahims.net), p. 1.