



## MEDICAL GEOGRAPHY: THE HIV/AIDS CRISIS IN SUB-SAHARAN AFRICA

### LESSON INFORMATION



Subject Area: Geography



Grade Level: High School



Time Frame/Duration: 2-3 hours

### OVERVIEW OF LESSON

Students will utilize web resources to explore data on the HIV/AIDS crises in Sub-Saharan Africa and globally. They will analyze how the extent of the AIDS epidemic differs across regions and address factors that explain the diffusion and impact of the virus.

### LEARNING OUTCOMES

By the end of this lesson, students will be able to

1. Find up-to-date and credible data about the HIV/AIDS epidemic.
2. Analyze that data to shed light on the extent and severity of the HIV/AIDS crisis in Sub-Saharan Africa.
3. Identify roles medical geography plays in addressing health crisis.

### ESSENTIAL / GUIDING QUESTIONS

*What are the questions being asked and potentially answered for this lesson?*

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### CONNECTION TO CURRICULUM / UNIT

During study of Sub-Saharan Africa.

### BASIC TERMS AND VOCABULARY

*diffusion \* endemic \* epidemic \* medical geography \* pandemic \* vector*

### POWERFUL GEOGRAPHY FOCUS

Careers and Jobs: epidemiologist | medical scientists | microbiologists | study of diffusion

Career Categories: Medical, Life Sciences, Social Sciences

### KEYWORDS

2-day lesson, diffusion, epidemic, health geography, health path, high school, lesson plan, life sciences, medical geography, pandemic, powerful geography, Sub-Saharan Africa

### GEOGRAPHIC SKILLS

- Asking Geographic Questions
- Acquiring Geographic Information
- Organizing Geographic Information
- Analyzing Geographic Information
- Answering Geographic Questions

### ADDITIONAL INFORMATION

Date Created February 2021

Developed by Michael Makowsky

### STANDARDS (STATE AND/OR NATIONAL)

AP Human Geography

- *Unit 3 Cultural Patterns and Processes*
  - 3.4 Types of Diffusion
  - 3.8 Effects of Diffusion

World Geography Studies (Texas Essential Knowledge and Skills Standards)

- (7) *Geography. The student understands the growth, distribution, movement, and characteristics of world population. The student is expected to:*
  - (D) analyze how globalization affects connectivity, standard of living, pandemics, and loss of local culture.
- (21) *Social studies skills. The student applies critical-thinking skills to organize and use information acquired through established research methodologies from a variety of valid sources, including technology. The student is expected to:*
  - (A) analyze and evaluate the validity and utility of multiple sources of geographic information such as primary and secondary sources, aerial photographs, and maps;
  - (D) analyze information by sequencing, categorizing, identifying cause-and-effect relationships, comparing, contrasting, finding the main idea, summarizing, making generalizations and predictions, drawing inferences and conclusions, and developing connections over time.
- (23) *Social studies skills. The student uses problem-solving and decision-making skills, working independently and with others. The student is expected to:*
  - (B) use case studies and GIS to identify contemporary challenges and to answer real-world questions.

**U.S. History Studies since 1877 (Texas Essential Knowledge and Skills Standards)**

- (10) *History. The student understands the impact of political, economic, and social factors in the U.S. from the 1970s through 1990. The student is expected to:*
  - (E) describe significant societal issues of this time period such as the War on Drugs and the AIDS epidemic.

**RESOURCE / MATERIALS NEEDED**

*For Students:*

- Copy of student version of this activity for each student
- A computer with internet access and a video capability to display websites
- *Avert: Global Information and education on HIV and AIDS:* <https://www.avert.org/global-hiv-and-aids-statistics>
- *World Bank Open Data:* <https://data.worldbank.org/>
- *Radiolab Podcast:* <http://www.radiolab.org/story/169879-patient-zero/>

*For Teachers:*

- Instructor computer with internet access and a video capability to display websites
- Powerpoint slide show 'Patient Zero' for Part 3 of the activity
- *Avert: Global Information and education on HIV and AIDS:* <https://www.avert.org/global-hiv-and-aids-statistics>
- *World Bank Open Data:* <https://data.worldbank.org/>
- *Radiolab Podcast:* <http://www.radiolab.org/story/169879-patient-zero/>

**PEDAGOGICAL STRATEGIES**

[Think-Pair-Share Strategy](#)

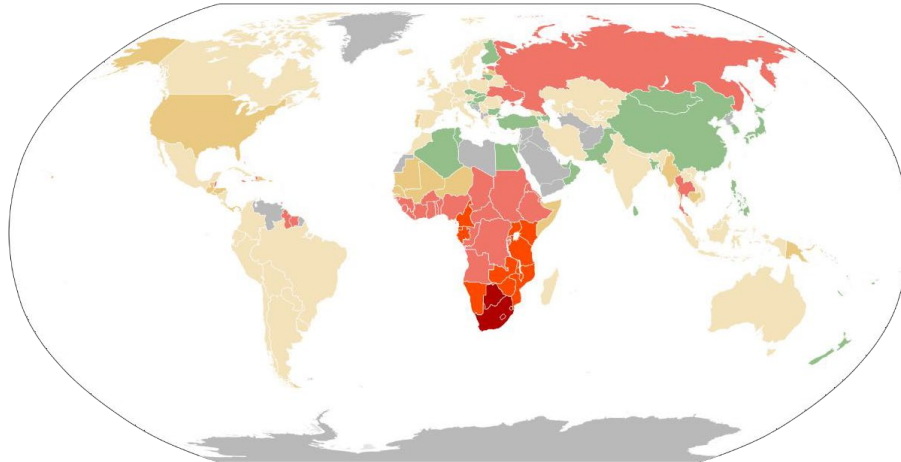
**PRE-REQUISITE KNOWLEDGE**

**Recommended:** Prior to activity, have students go to the Avert website and review the Regional Overview pages for East & Southern Africa, West & Central Africa, and the United States.

**Required:** Students must understand the following key terms:

- Diffusion - the spread of a phenomenon, such as an idea, a technological innovation, or a disease, over space.
  
- Endemic - a disease native to a particular people or region. The disease may exist in equilibrium with the population. Many develop an immunity of sorts, but the disease saps energy, lowers resistance, and shorten lives. For example, malaria is endemic in some areas of Africa. And traffic in illicit drugs is endemic in some neighborhoods.
  
- Epidemic - a sudden outbreak at a local or regional scale, as with AIDS in Africa or AIDS in intravenous drug users.
  
- Pandemic - a worldwide spread of a disease. Example: the Influenza Pandemic of 1918. The influenza pandemic of 1918-1919 killed more people than WWI, at somewhere between 20 and 40 million people. It has been cited as the most devastating epidemic in recorded world history. More people died of influenza in a single year than in four-years of the Black Death Bubonic Plague from 1347 to 1351. Known as "Spanish Flu" or "La Grippe" the influenza of 1918-1919 was a global disaster.
  
- Vector - an agent (person, animal, or microorganism) that carries and transmits a disease.
  
- Medical Geography – the study of health and disease within a geographic context and from a spatial perspective. Among other things, this geographic field examines the sources, diffusion routes, and distributions of diseases.

## LESSON DEVELOPMENT



AIDS and HIV prevalence | < 0.1% | 0.1–0.5% | 0.5–1% | 1–5% | 5–15% | 15–50%

### **STARTING THE LESSON**

Prerequisite Knowledge:

Introduce these terms as part of a group discussion. Suggestion: prompt students to share their impressions and experiences with COVID-19 within the context of its origin, spread, and impact on their lives and society. Follow up with other examples (some listed above) for each of the terms. When appropriate, move focus of discussion to HIV/AIDS and introduce the activity. Consider the following verbiage when doing so:

*“The most publicized health crisis in Sub-Saharan Africa is the spread of the HIV virus, which can lead to AIDS (Acquired Immune Deficiency Syndrome). In many parts of Sub-Saharan Africa, HIV/AIDS has become the leading cause of death, claiming more lives than malaria and warfare.*

*In drawing conclusions about AIDS and other diseases based on quantitative data, organizations such as the [Centers for Disease Control and Prevention \(CDC\)](#), and the [World Health Organization \(WHO\)](#), had to “start from scratch.” When HIV/AIDS was first identified in the early 1980s, little was known about the virus. Public fear and ignorance led to wild speculation on what it was, how it was transmitted, and where it came from. Intense scientific study has since revealed much about the virus, but a cure remains elusive. Much has been learned, too, about the origins and diffusion (i.e. spread) of HIV through the application of [Medical Geography](#).*

*In this activity, you will:*

*A) Work with statistics that shed light on the extent and severity of the HIV/AIDS crisis in Sub-Saharan Africa, and B) listen to a 29-minute audio program that discusses the origins and spread of the HIV virus. Each section includes several questions you will need to answer.”*

### **Part 1**

Working individually or in pairs, have students go to the Avert website and find the answers to the following questions to discuss afterwards. Remind them that they will have to do some ‘digging’

within the site to find some answers (answers are included and are derived from the most recent data available at the time this lesson was created – some answers will need to be updated as new data becomes available).

1) How many people are living with HIV worldwide?

A: 37.9m as of 2018

2) What percentage of those living with HIV live in Sub-Saharan Africa?

A: 68% as of 2018

3) It is estimated that 777,000 people died in 2018 from AIDS related causes worldwide. How many of these people lived in Sub-Saharan Africa? (West & Central + East & Southern Africa)

A: 440,000

4) Which Sub-Saharan African country, with over a quarter of its adult population infected, has the highest HIV prevalence in the world.

A: Eswatini (formerly Swaziland)

5) Based on the figure in question #3, how many people died on average each day from AIDS related causes in Sub-Saharan Africa?

A: 1205

6) How many days would it take to equal the population of your hometown? (please include the name and population of your hometown).

A: Answers will vary

7) Using your answers from questions #s 2 & 3, what percentage (%) of HIV/AIDS sufferers in Sub-Saharan Africa died from AIDS related causes last year?

A: approx. 1.7%

8) How many people are living with HIV in the United States?

A: 1.1m

9) How many people died in the most recent year data is available from AIDS related causes in the United States?

A: 6000

10) Using your answers from questions #s 8 & 9, what percentage (%) of HIV/AIDS sufferers in the United States died from AIDS related causes in the most recent year data was available?

A: approx. 0.54%

11) How many times greater is the HIV/AIDS death rate in Sub-Saharan Africa than in North America? (i.e. #7/#10)

A: approx. 3.14x

Afterwards, go over the answers as a class and facilitate a discussion over the following questions:

12) Do think the HIV/AIDS crisis is an epidemic or pandemic? Explain your thinking.

**A: Answers will vary**

13) Why is the HIV/AIDS epidemic in Sub-Saharan Africa so much more severe than it is in North America?

**A: The death rate from AIDS in Sub-Saharan Africa is higher than in other parts of the world... (explanations should include...medical facilities in Africa are inferior; access to medicines is limited because of expense and geographic proximity to facilities; poverty is prevalent-Africa lacks the economic resources to combat the crisis; the realm is where the virus arose, so infections are more prevalent; some do not acknowledge the virus as a threat (social stigma, ignorance)).**

**Also, some Africans engage in riskier sexual activity; rape is prevalent; women do not have the same right to self-determination as they do in the US; US health care system is superior-greater access to care and more treatment options; US educational system is also superior; African men typically travel for work and are away from families-multiple sexual partners is more common; political corruption is prevalent-African leaders are less willing to admit scope of crisis and have funneled monies designated for treatment programs to other projects.**

## Part 2

Have students go to the World Bank Demographic Data site to answer the following questions:

14) What Sub-Saharan Africa nation(s) has the lowest life expectancy for males? What is its life expectancy? <http://data.worldbank.org/indicator/SP.DYN.LE00.MA.IN>

**A: Central African Republic & Lesotho – 51 yrs**

15) What Sub-Saharan Africa nation(s) has the lowest life expectancy for females? What is its life expectancy? <http://data.worldbank.org/indicator/SP.DYN.LE00.FE.IN>

**A: Central African Republic, Chad, Nigeria, Chad – 55 yrs**

16) What has happened to life expectancies in the Sub-Saharan Africa realm in the last 20 years? What does this say about efforts to combat AIDS, other diseases, and other factors that influence human development levels in the realm?

<http://data.worldbank.org/indicator/SP.DYN.LE00.IN?locations=ZG>

**A: After leveling off due to the AIDS epidemic, they are increasing due to successes in improving accessibility to AIDS treatments and prevention education. Despite harsh conditions, levels of human development are improving.**

Share with students: *“Despite recent increases in life expectancy, to date approximately 20 million children have been orphaned by HIV/AIDS, the vast majority living in Sub-Saharan Africa. Death rates in this realm are the highest in the world (dr. 9), but so are birth rates (br. 35). Sub-Saharan Africa is the planet’s fastest growing human realm.”*

17) What implications does a fast-growing population with a large number of youth, many of whom are orphaned, have for the Sub-Saharan Africa realm?

**A: Explanations should include... creates greater pressures on already strained health care, social services, educational, vocational, infrastructure systems. Younger generation, which is 50%+ of total population, does not benefit from wisdom and guidance of parents and**

**grandparents (older generations) that is lost due to low life expectancies. As large numbers of youth enter reproductive years, they have children and population growth could continue to grow at accelerating levels.**

Go over the answers and facilitate a class discussion comparing growth rates in Sub-Saharan Africa with the rest of the world and the challenges of dealing with a young, fast-growing population.

## THE LESSON

### Part 3

Have students listen to the following audio segment from the Radiolab program “Patient Zero” on the origins and spread of the HIV virus and direct them to answer the following questions as they listen:

- <https://www.wnycstudios.org/podcasts/radiolab/episodes/patient-zero-updated>  
(start at time index 16:15 and listen through to time index 44:35.)
- **Recommendation:** Show the attached companion slide show for Part 3 while students listen to the segment.
- The rest of the program is optional and deals with other examples of ‘Patient Zero’. The beginning of the program focuses on the story of Typhoid Mary, followed by the HIV/AIDS segment, then a segment on a recent Ebola outbreak, and concludes with a segment on the origins of the ‘high five’. While this lesson focuses on HIV/AIDS, the other stories are equally interesting and worthwhile resources themselves.

18) **When was HIV/AIDS first reported in the US?**

**A: 1981**

19) **How did the CDC determine that the spread of the HIV virus was largely due to sexual contact?**

**A: They surveyed infected people around the country and determined where they and their sexual partners lived. They mapped/diagrammed the data, which showed the point of origin for the spread of the virus. This led them to the alleged ‘patient zero’.**

20) **Who was Gaetan Dugas and what role did he play with respect to the initial outbreak of HIV/AIDS?**

**A: He was a French-Canadian flight attendant who was alleged Patient Zero in North America. Played a significant role in contributing to the AIDS epidemic in North America, as he knowingly infected hundreds of partners across North America in 1970s and 1980s. Research determined, however, that he was not the true Patient Zero.**

21) **Research has determined that the HIV virus entered the US many years prior to it first being reported. In what year did it enter the US and from where did it originate?**

**A: 1966 from Africa via Haiti (entered Haiti from Africa)**

22) **What does the term “Spillover” mean?**

**A: The initial event(s) where and disease/infection spreads from one species to another.**

23) **About what time did the HIV spillover to humans occur?**

**A: 1908 - give or take a few years.**

24) What animal species did humans get HIV from?

**A: Chimpanzees**

25) Describe the 'Cut-Hunter' hypothesis.

**A: Driven by demand for 'Bush' meat, human hunter came in contact with infected chimpanzee blood as a result of a violent encounter (both human and chimp are bloodied during 'fight' and chimp blood comes into contact with open wound on human) or via the butchering process where hunter with open wound is processing chimp meat and infected chimp blood comes into contact with wound.**

26) Where in Sub-Saharan Africa did HIV likely first spillover to humans?

**A: Cameroon/Central Africa**

27) What is a likely scenario that illustrates how the HIV virus spread from its initial human 'victim' to other humans? (i.e. how did the epidemic begin?)

**A: Patient Zero (the 'Hunter') returns home and infects sexual partners. These partners travel down river to larger population centers and infect more. Due to greater fluidity of social and sexual interactions, virus spreads from there (Central Africa, Cameroon) via Expansion Diffusion.**

28) What is the likely scenario that illustrates how the SIV virus spilled over to 'Chimp Zero'?

**A: Likely from 'Chimp' Zero' ingesting two species of monkeys (Red-Capped Mangabey and Spot-Nosed monkey) which were infected.**

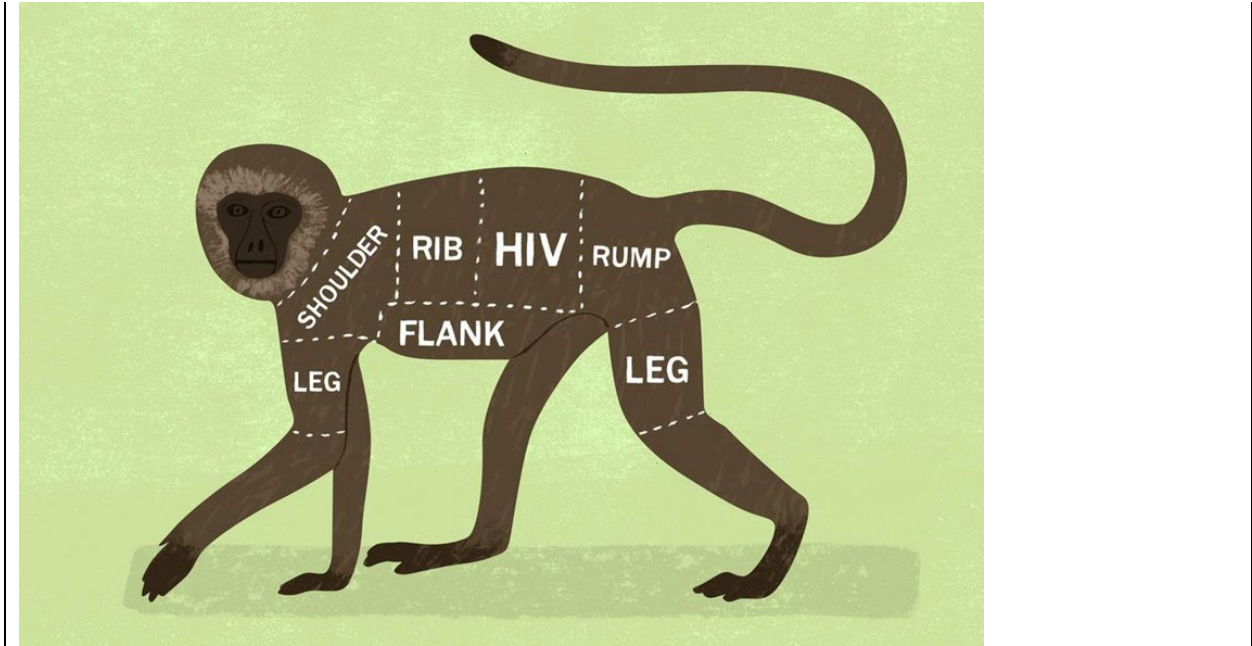
29) Lastly... the story of the diffusion of HIV/AIDS is a long and seemingly complicated one, but as we have seen and heard, science has learned much about the origins and spread of the virus. What role has Medical Geography played in helping us understand the origins and spread of the HIV virus?

**A: Through its application, Medical Geography has allowed scientists to track the spread of infections both forward and back in time. It has made it possible to identify source region and likely Patient Zero scenario and shown that spillover to humans came from chimps and that chimps got it from eating other infected primate species. It also reveals a great deal about the behavior and spread of virus and allows health care workers and scientists working on treatments and a cure to focus their efforts where they are likely to be most successful.**

#### **ENDING THE LESSON AND CLOSING PRODUCT**

At the conclusion of the segment, go over the 'patient zero' answers with the class and conclude the lesson with a discussion of the role medical geography has played in addressing the HIV/AIDS crisis and other disease outbreaks.





#### **DIFFERENTIATION STRATEGIES**

- Provide a [transcript](#) of the audio story for students to read along with.
- Reduce the number of questions a student must answer.
- Pause the audio story intermittently and allow students to check in with a partner about questions they have answered thus far.
- Provide a cue for students when the next question is about to be answered.
- Use the [Think-Pair-Share Strategy](#) to allow for individual thinking time and discussion during whole class discussions.

#### **EVALUATION AND ASSESSMENT**

Students will turn in their worksheet for completion.

#### **EXTENSION AND ENRICHMENT**

Have students do a critical comparison of the HIV/AIDS epidemic and Covid-19. Students should discuss similarities and differences of the viruses and include a discussion about the diffusion worldwide.