Lesson Plan: The COVID-19 Pandemic: Climate Change, Demography, and Pandemics in a Warming World

As an **Undergraduate Social Sciences** or **Biological Sciences** teacher, you can use this lesson plan to teach your students about **demography**, **population trends**, **urbanization**, and the role of **demographics** in the **spread of infectious diseases such as COVID-19** and the **increased risk of pandemics** due to climate change.

In this lesson plan, students will be taught about population patterns, urbanization, and the **relation of demography** and the **environment**. This lesson plan will allow you to teach your students how demographic changes due to factors such as **climate change**, can make human populations more vulnerable to pandemics like COVID-19. Through an interactive online activity, this lesson plan will enable students to apply understanding of demographics such as **population density** and **mortality rates** on the **risk of transmission** of an infectious disease like COVID-19 and on the **efficacy of vaccination programs** against it.

Thus, the use of this lesson plan allows you to integrate the teaching of a climate science topic with a core topic in **Social Sciences** and **Biological Sciences**.

Use this lesson plan to help your students find answers to:

1. What is demography and what are the demographic measurements for a population?
2. What is urbanization and how does it affect human ecology?
3. What is the relation of demography with the environment?
4. How does the study of demography help explain the rate of transmission and mortality rates of an infectious disease such as COVID-19?
5. How do demographic changes due to climate change increase the risk of pandemics?

About the Lesson Plan

Grade Level: Undergraduate

Discipline: Social Sciences, Biological Sciences

Topic(s) in Discipline: Demography, Population Trends and Patterns, Population Density, Urbanization, Fertility and Mortality Rates, Human Ecology

Climate Topic: Climate and the Anthroposphere, Climate and the Biosphere

Location: Global

Access: Online

Language(s): English

Approximate Time Required: 70-90 min

1 Contents

4. Classroom/Laboratory Activity (20-40 min)

An interactive simulation to extend student understanding of the role of demographics in the rate of transmission of various diseases and on the efficacy of vaccines against them.

This can be accessed at:

https://www.learner.org/wp-content/interactive/envsci/disease/index.html

5. Suggested questions/assignments for learning evaluation

- What is demography and what are the demographic measurements for a population?
- What is urbanization and how does it affect human ecology?
- What is the relation of demography with the environment?
- How does the study of demography help explain the rate of transmission and mortality rates of an infectious disease such as COVID-19?
- How do demographic changes due to climate change increase the risk of pandemics?

2 Step-by-step User Guide

Here is a step-by-step guide to using this lesson plan in the classroom/laboratory. We have suggested these steps as a possible plan of action. You may customize the lesson plan according to your preferences and requirements.

1. Introduce the topics of demography, population trends, and urbanization

Use the teaching module, 'Introduction to Population, Urbanization, and the Environment' by OpenStax™ to teach your students about demography, population trends and patterns, fertility and mortality rates, demographic theories, and urbanization. Describe the changing

demographics of a population from various sociological perspectives such as climate induced human migrations. Finally, explain how urbanization has led to environmental concerns that are exacerbated due to climate change.

This can be accessed at:

https://openstax.org/books/introduction-sociology-2e/pages/20-introduction-to-population-urbanization-and-the-environment

2. Explain how demography determines the vulnerability of populations to pandemics

Use the article, 'How Demographic Changes Make Us More Vulnerable to Pandemics Like the Coronavirus' by Toshiko Kaneda and Charlotte Greenbaum for Population Research Bureau (PRB) to describe how current population trends enable viral transmission and raise the possibility of a pandemic such as COVID-19. Discuss how population mobility has enabled viral transmission across the world and population density has determined the rate of transmission of the disease. Explain how urbanization has greatly influenced the viral transmission of COVID-19. Further, discuss the vulnerability of a population due to age related pattern of mortality. Finally, emphasize how these demographic changes make populations vulnerable to pandemics.

This can be accessed at:

https://www.prb.org/how-demographic-changes-make-us-more-vulnerable-to-pandemics-like-the-coronavirus/

3. Discuss the demographic patterns of transmission of COVID-19

Use the report, 'Demographic science aids in understanding the spread and fatality rates of COVID-19' by Jennifer B. Dowd et al. in PNAS to explain the demographic trends of COVID-19 transmission in a population. Emphasize on the relevance of demographic science in elucidating the population patterns observed in the rates of disease transmission and the associated mortality rates.

This can be accessed at:

https://www.pnas.org/content/117/18/9696

4. Conduct a classroom/laboratory activity to extend understanding about demographic parameters in the rate of transmission of an infectious disease

Use the interactive lab activity, 'Disease Lab' by Annenberg Learner, to enable students to understand the rate of transmission of various hypothetical diseases under changing demographic parameters. This activity can be conducted in conjunction with another lab activity- 'Demographics Lab' to better understand the demographic parameters under consideration. Direct the students to follow the instructions given in the activity sheets to analyze the results of the simulations and formulate answers to the given questions. Extend the activity to analyze the scenarios of disease progression with or without vaccination programs. Use the current population and mortality data rates in your region to run the simulations in the context of COVID-19 and summarize the findings.

This activity can be accessed at:

https://www.learner.org/wp-content/interactive/envsci/disease/index.html

5. Questions/Assignments

Use the tools and the concepts learned so far to discuss and determine answers to the following questions:

- What is demography and what are the demographic measurements for a population?
- What is urbanization and how does it affect human ecology?
- What is the relation of demography with the environment?
- How does the study of demography help explain the rate of transmission and mortality rates of an infectious disease such as COVID-19?
- How do demographic changes due to climate change increase the risk of pandemics?

3 Learning Outcomes

The tools in this lesson plan will enable students to:

- learn about demography, population patterns and trends, and their relationship with the environment
- explain what urbanization is and how it has affected human ecology
- describe how demographic changes can affect the vulnerability of a population to pandemics such as COVID-19
- discuss how climate change results in demographic changes and therefore raises the risk of pandemics in urban populations

4 Additional Resources

If you or your students would like to explore the topic further, these additional resources will be useful.

1. Teaching Module

An activity module, '2019 World Population Data Sheet' by Population Reference Bureau (PRB) to enable students to analyze population data of various countries and regions of the world.

This can be accessed at:

https://www.prb.org/lesson-plan-2019-world-population-data-sheet/

2. Reading

An article, 'Climate Change Impacts and Emerging Population Trends: A Recipe for Disaster?' by Population Reference Bureau (PRB).

This can be accessed at:

https://www.prb.org/climatechangeimpactsandemergingpopulationtrendsarecipefordisaster/

3. Reading

An article, 'Climate Change and Infectious Diseases' published by the World Health Organization (WHO) about the link between climate change and the occurrence and transmission of infectious diseases.

This can be accessed at:

https://www.who.int/globalchange/climate/en/chapter6.pdf

5 Credits/Copyrights

All the teaching tools in our collated list are owned by the corresponding creators/authors/organizations as listed on their websites. Please view the individual copyright and ownership details for each tool by following the individual links provided. We have selected and analyzed the tools that align with the overall objective of our project and have provided the corresponding links. We do not claim ownership of or responsibility/liability for any of the listed tools.

1. Teaching module; 'Introduction to Population, Urbanization, and the Environment'

By OpenStax™

2. Reading; 'How Demographic Changes Make Us More Vulnerable to Pandemics Like the Coronavirus'

By Toshiko Kaneda and Charlotte Greenbaum for Population Research Bureau (PRB)

3. Reading; 'Demographic science aids in understanding the spread and fatality rates of COVID-19'

By Jennifer Beam Dowd, Liliana Andriano, David M. Brazel, Valentina Rotondi, Per Block, Xuejie Ding, Yan Liu, Melinda C. Mills. Proceedings of the National Academy of Sciences. May 2020, 117 (18) 9696-9698.

4. Classroom/Laboratory Activity; 'Disease Lab'

By Annenberg Learner

5. Additional Resources

Population Research Bureau (PRB)

World Health Organization (WHO)