

**Data Detective:**  
**Investigating the Human Health Effects of Air Pollution in Washington State**  
**STEM Global Teacher Workshop**  
**IHME | [healthdata.org](http://healthdata.org)**  
<https://www.wghalliance.org/initiative/stem-global/resources/>



**Time:** 3 50 minute class periods (assuming in-person instruction)

**Subject & Grade Level(s):** HS Earth and Space Sciences (Grades 9-12). This lesson incorporates mathematics and computational thinking concepts and practices.

**Brief Overview:** This lesson explores past, current, and future trends of air pollution in Washington State and provides opportunities for students to better understand the phenomena through intensive interaction and manipulation of data. Through this lesson, students will develop an understanding of foundational data science principles and recognize techniques for manipulating and analyzing data. In particular, students will develop skills in vetting data quality and generating basic descriptive statistics, including calculating mean, median, min, and max. Students will also gain skills in interpreting trends and patterns in data and making informed and evidence-based conclusions. In addition, students will gain an understanding of how air pollution effects human health and the global epidemiology of outcomes attributed to air pollution. ***Updated July 2020 with suggested adaptations for remote learning.***

## STUDENT UNDERSTANDINGS

**Anchoring Phenomenon:** Exposure to outdoor (ambient) air pollution is a major risk factor for disease for people around the world. There is a wide array of health effects which are believed to be associated with air pollution exposure. Among them are respiratory diseases (including asthma and changes in lung function), cardiovascular diseases, adverse pregnancy outcomes (such as preterm birth), and even death. While air pollution is a global phenomenon, it has very local impacts that can profoundly affect communities in unique and profound ways. In Washington State for instance, increasing temperatures, rapid urbanization, increased manufacturing, and natural disasters can affect the region's air quality which, in turn, can contribute to poorer health outcomes for residents. In order to alleviate/mitigate the consequences of air pollution in the State, we must assess and understand levels and trends of exposure to air pollution to better identify solutions and interventions.

### Driving Questions

- How can data be used to understand changing levels of air pollution exposure in the State of Washington?
- What are health effects from outdoor air pollution exposure to Washington residents?
- How can data be used to make predictions and recommendations about air pollution and human health?

## NEXT GENERATION SCIENCE STANDARDS

This lesson builds toward the following bundle of high school level Performance Expectations (PEs) from the Next Generation Science Standards.

High School PEs:

- **HS-ESS3-3:** Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
- **HS-ESS3-6:** Use a computational representation to illustrate the relationship among Earth systems and how those relationships are being modified due to human activity.

**Download this lesson plan and associated student handouts at the STEM Global Resources**

**page:** <https://www.wghalliance.org/initiative/stem-global/resources/>

**Credit:** *This activity was originally developed by the Institute for Health Metrics and Evaluation (IHME), a global health organization located in Seattle, WA and adapted for a STEM Global Teacher Workshop in April 2019. Authors include: Austin Carter, Doctoral Candidate and Researcher, IHME; Joseph Frostad, Doctoral Candidate and Researcher, IHME; Sean Lassiter, Senior Education Program Manager. Revisions in July 2020 by Sarah Wozniak and Justin Lo of the IHME. Lesson plan development, editing, and adaptations for remote instruction provided by Kristen Bergsman of Laughing Crow Curriculum LLC.*