This is a sample of one of the "Team Based Learning" (TBL) exercises that I developed for the Public Health Impacts of Climate Change course at the Mailman School of Public Health. Each week, students work in groups to complete a TBL that is based on the corresponding lecture from the week. They complete readings on the topic, and this guided, ungraded activity prepares them for the material that will be delivered during the lecture.

By design, TBLs are typically practical case studies that are hands-on, open ended, and provide students with an insider look on how research is typically conducted in this field. As the first TBL exercise in the course, this activity walks students through how a typical health impact assessment is conducted – one of the most important tools used in climate change and health research. This artifact reinforces my dedication to group-based activities to enhance learning, and it is typically very well received by students. At the end of the exercise, they all gain an understanding of this foundational tool that will be reinforced throughout the rest of the course.

Public Health Impacts of Climate Change – P8304, Spring 2018
Team Based Learning Exercise 1 – Health Impact Assessment

Health impact assessment involves combining information from several sources in order to estimate climate-attributed health impacts. As inputs, we need information on:

Population; Baseline rate of health outcome; Exposures; Exposure/response;

Problem statement:

You have been awarded a multi-million dollar grant by the Chinese government to estimate the number of air pollution-related deaths that may be expected in 2050 in Beijing under a changing climate as compared with historical conditions. You do some research and come up with the following information:

Exposures:

The average level of fine particulate matter ($PM_{2.5}$, an air pollutant) in Beijing in 2015 was 85 $\mu g/m^3$.

A global climate model produced three potential scenarios for $PM_{2.5}$ in 2050:

- Climate only (CLIM): this scenario holds global emissions constant at 2015 levels and finds that in 2050, the average $PM_{2.5}$ in Beijing will be 90 $\mu g/m^3$.
- Current legislation (CLE): this scenario assumes "business as usual" and finds that in 2050, the average $PM_{2.5}$ in Beijing will be 105 $\mu g/m^3$.
- Maximum feasible reduction (MFR): this scenario assumes that global emissions will be reduced by as much as current technology allows, and finds that in 2050, the average $PM_{2.5}$ in Beijing will be 75 $\mu g/m^3$.

Exposure/response:

You do a literature search and find the following findings from various epidemiology studies.

Study 1. A study in Boston, MA reported that death rates in the overall population increased by 1% for each $\mu g/m^3$ increase in $PM_{2.5}$.

Study 2. A study in Shanghai, China reported that death rates for persons over age 65 increased by 4% for each $\mu g/m^3$ increase in $PM_{2.5}$.

Study 3. A study looking at 12 cities in Europe reported that death rates in the overall population increased on average by 2% for each $\mu g/m^3$ increase in $PM_{2.5}$.

Question 1: How will you use this information? For example, which of these studies do you think would be best to use for estimating health impacts in Beijing? What's your reasoning? Be prepared to report back to class.

Other information:

Population:
Assume that the population of Beijing is:

21,500,000

Baseline rate:
Assume the baseline mortality rate (all-cause mortality) in Beijing is:

50 deaths/100,000 persons

Based on the above, carry out a health impact assessment that addresses the government's question. That is:

How many $PM_{2.5}$-related deaths in Beijing are anticipated in 2050 under each scenario (CLIM, CLE, MFR)?

What caveats, if any, should the government be aware of in using these estimates?

Assume you are a high-ranking government official who just received this information. How should this information be used in the context of new policy development?