PMU199Y - Assignment 4 (Design an Experiment)

Instructions

Structure your assignment using these steps – i.e. include a subheading for each step, and describe what you did at that step.

1) **Initial Question.** Select a question that people might ask (related to climate change). Explain briefly why you picked it.

2) **Initial Analysis.** Do an initial analysis of the question, using the following to guide you:
   - a. What type of question is it (e.g. a value judgment for society to answer or a question about the physical world for scientists to answer)?
   - b. Who might ask this question?
   - c. Why might they ask it (what do they really need to know)?
   - d. What kind of answer would they need? (e.g. how accurate, how much detail?)
   - e. What kinds of expertise might be needed to answer the question?

3) **Critique of Initial Question.** Use the analysis you did in step 2 to identify any problems with the original question (e.g. vague wording, mixing too many issues, etc).

4) **Revised Question.** Using your critique, re-frame the question into one that can be answered using a quantitative, scientific analysis. Make sure you state clearly how your new question helps to answer at least some parts of the original question.

5) **Question Decomposition.** Do an initial breakdown of your revised question. What data will you need to have? (Note: at this stage, try not to look up any answers!) For each part of your breakdown, decide whether this is something you could simply look up (e.g. using a google search, or consulting government statistics, etc), or whether it would need to be assessed using an experiment with a model (e.g. for estimates that cannot be directly measured or assessed). How would you combine all the pieces to calculate an answer to your overall question?

6) **Initial estimate.** For each piece of data that you need, make an initial rough estimate, to give you a first approximation for the overall answer. What answer do you get? How reliable does it seem?

7) **Data sources.** Select the parts of your estimate that you think are least reliable, and try to find data to improve your estimate. (Note: You don’t need to find data for every part of your estimate – just concentrate on the parts you’re least confident about). When you find any appropriate data, try to trace it back to a primary source. How reliable do you think this data is? How well does it match your initial estimate?

8) **Model Experiments.** Select part of your estimate that you think could be answered by experimenting with a model (e.g. because there is no existing data, or because there seems to be some disagreement among different sources). What type of model would you use? How would you get an answer from the model? (Note: There’s no need to use a model – for this step you just need to sketch out how you would make use of a model).

9) **Summary.** Write up a short summary of your answer to the revised question (from step 4), including any notes about assumptions made in calculating it, possible inaccuracies of the source data, and an overall assessment of how reliable you think the answer it.