EPI 945: Practicum & Culminating Experience for the MPH in Epidemiology

> **Fall 2020 Progress Report/Analysis Plan (due December 14, 2020)**

> **Instructions:** Please use this template to complete the Fall Progress Report/Analysis Plan for your practicum and submit it through Canvas by December 14. This is required to receive credit for EPI 945 for the Fall semester. It is strongly recommended that you send a draft to your Harvard practicum mentor for review and feedback prior to submitting it via Canvas. Please note that some sections are the same as those that were on the Learning Agreement, but more detail is required. Please be sure to read the instructions in each section carefully. The total length should not exceed 8 pages, including any tables or figures. Citations do not count toward the page limit.

1. **Student name and email address:** David Hachuel (dhachuel@hsph.harvard.edu)
2. **Harvard practicum mentor name and email address:** Professor Meredith Rosenthal, Harvard School of Public Health, mrosenth@hsph.harvard.edu
3. **Proposed practicum title:** A Framework for Macro Stress Testing Hospital Resource Utilization
4. **Background and public health relevance: (~1-2 paragraphs)**

> Brief description of why this topic is important, including summary of relevant literature and any citations.

The COVID-19 global pandemic has exposed many weaknesses in health systems when it comes to shortages in medical supplies and other critical hospital resources. To help health administrators avoid the severity of this problem in the future, health systems should adopt stress testing or simulation practices analogous to those the U.S. Federal Reserve or the European Central Bank imposed to large financial institutions after the 2008 economic recession. These exercises help health administrators identify vulnerabilities and address them early on in supervisory dialogues

5. **Specific aims/hypotheses: (~1 paragraph; can be bulleted or list format)**

> Example

> Specific aim: To evaluate the association between [exposure] and [outcome] in a [country] nation-wide cohort.

> Hypothesis: There is an increased risk of [outcome] among participants who had [exposure].

The overall goal of this work is to demostrate that hospital resource utilization is reasonably predictable based on macro and local indicators and . Specifically, we aim to propose a stress testing framework that can be used as a decision-support tool by regulators and health administrators to calibrate between lean and protective resource management in the event of severe events such as COVID-19.

6. **Study design and population: (~1 paragraph)**

> Brief description of the study design (e.g., cross-sectional study, prospective cohort study, etc.) and the study population (e.g., who, when, where, size).

It is important to note that given the predictive nature of this study, we are generally not interested in removing bias from estimates of causal relationships. Instead, we are interested in selecting the best possible set of predictors that make the model predictions as accurate as possible. With that said, the population of our study are England's National Health Service (NHS) health centers or organizations as uniquely identified by their Organization Data Service (ODS) code. The study uses retrospective cohort data which combines NHS bed occupancy data (our primary outcome) with alternative data sources for predictors including the NHS and the Office for National Statistics (ONS).

7. **Primary and other exposure(s): (~1-2 paragraphs)**

> Brief description of the primary exposure (how and when it was collected, and how it was or will be defined in your study). If there are any other exposures of interest, describe them briefly here as well.

We will examine the predictive power of the following:

- Demand factors:
    - Population changes (age, sex and income distribution)
    - Seasonal effects (weather, calendar, natural disasters)
    - Epidemiological changes such as disease prevalence
    - Region characteristics (urban vs. rural)
- Supply factors:
    - Medical and technological advances
    - Hospital efficiency
    - Alternatives to hospital care
- External factors:
    - Political pressures
    - Policy changes
    - Macro-economic context (unemployment rate, GDP)

8. **Primary outcome(s): (~1 paragraph)**

> Brief description of the primary outcome (how and when it was collected, and how it was or will be defined in your study).

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9. **Secondary outcome(s), if applicable: (~1 paragraph)**

> Brief description of any secondary outcomes (how and when it was collected, and how it was or will be defined in your study).

10. **Other variables: (~1 paragraph)**

> Brief description of any other variables, in addition to the exposure(s) and outcome(s), that will be included (how and when they were or will be collected, and how they were or will be defined in your study).

11. **Statistical analysis plan: (~3-4 paragraphs, plus list or shells of possible tables/figures)**

> Please be sure to address all four of the points noted below.

- Describe all analyses that you plan to conduct to examine your specific aims(s). These should include descriptive, crude, and adjusted analyses.
- Be sure to identify potential confounders, covariates, effect modifiers, and any sensitivity analyses (if applicable).
- Identify any analytical challenges (technical, structural, etc.)
- Include a list or shells of possible tables and/or figures that will be included.

12. **Summary of work completed to date: (~1-2 paragraphs)**

> Brief description of what you have accomplished so far on the project.

13. **Summary of results to date: (~1-2 paragraphs)**

> If you do not have any results yet, you can leave this section blank. If you have results, describe them briefly here. You may include tables/figures as appropriate, but you should also include text that summarizes your results. Please do not include Stata output.

14. **Next steps: (~1-2 paragraphs)**
15. **Any challenges/problems encountered so far: (~1 paragraph)**
16. **Any other comments, if applicable: (~1 paragraph)**

References

[1]:Rees, E.M., Nightingale, E.S., Jafari, Y. et al. COVID-19 length of hospital stay: a systematic review and data synthesis. BMC Med 18, 270 (2020). https://doi.org/10.1186/s12916-020-01726-3

[2]:England, NHS. "Bed Availability and Occupancy Data – Overnight." NHS Statistics, NHS, https://www.england.nhs.uk/statistics/statistical-work-areas/bed-availability-and-occupancy/bed-data-overnight/.

[3]:"Open Postcode Geo." *Open Postcode Geo*, Calderdale Metropolitan Borough Council, 17 Oct. 2016, https://data.gov.uk/dataset/091feb1c-aea6-45c9-82bf-768a15c65307/open-postcode-geo.