Thesis Project Portfolio

Causal Impacts of Climate Change on Human Health

(Technical Report)

Impacts of EHRs on Patient Health Outcomes

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

Big data technology in healthcare allows clinicians to translate large volumes of medical information into actionable health insight. Given that public health issues such as medical errors and climate change continue to impact our daily lives, it is of the utmost importance to utilize technology to mitigate these issues. Big data technologies, such as electronic health records (EHRs) and climate computational models, are starting to revolutionize healthcare by offering solutions that enhance care and improve the quality of life for all.

The STS thesis focuses on how the EHR system impacts patient health outcomes, the doctor-patient relationship, and the overall patient experience in the US. Actor-Network Theory (ANT) is being applied in order to understand how patient health outcomes are generated as a result of the dynamic relationships between human and non-human actors within the healthcare network. Initially, EHR system adoption met significant resistance from clinicians. However, through federal incentives and promising research in 2009, EHR systems began to show strong connections to improved patient health outcomes through a reduction in medical errors and mortality rates. Furthermore, the purpose of this paper is to demonstrate the transformation of the healthcare system from relying on clinicians as obligatory passage points to now focusing more on patient-centered care. Through supplementary tools, the EHR system has also shown to combine clinical support, efficiency, and interoperability to foster a new stable healthcare system that prioritizes patients. Overall, the analysis demonstrates that the EHR system is not a solver of all problems, but that it can maximize the social good for patients and create the foundations for social progress.

In relation to big data, the capstone project utilizes computational models to investigate the causal impacts of climate change on human health outcomes. In particular, the models

demonstrate the effects of climate change variables, such as air pollutants and temperature, on respiratory-related mortalities in the Washington DC metropolitan area. The purpose of this project is to elucidate the impacts of climate change and highlight which climate change variables have a direct causal impact on particular health outcomes. The specific aims of the project include collecting climate and health time-series data, developing Granger causality and Bayesian network models, and then cross-validating the models. Model results showed direct causal links present between temperature and respiratory-related mortalities. Stratified demographic data and its associated models demonstrated that racial minorities, the elderly, and individuals with respiratory diseases are disproportionately affected by climate change variables. Overall, these models quantify the health dangers of climate change and hope to foster the development of adaptation and mitigation efforts.

Altogether, the two projects in this portfolio successfully demonstrate the potential in using big data technology to generate actionable insight and improve health outcomes. The benefits of big data technology in healthcare are only starting to be realized paving the way to an integrated healthcare system that prioritizes patients.

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