

Place and Health:

New Assessment of Essential and Actionable Features of College Life

Vision paper for NSF Workshop on Future Technology to Preserve College Student Health and Foster Wellbeing

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According to the US Department of Education, there are more than 4,300 degree-granting colleges and universities in the United States, enrolling 17.8 million students in fall 2006. This means that millions of young people spend time on college and university campuses, whether as residences or simply for class and administrative purposes, every year. The built environment includes all of the physical parts of where we live and work (e.g., homes, buildings, streets, open spaces, and infrastructure). It is known that the built environment influences a person's level of physical activity. For example, inaccessible or nonexistent sidewalks and bicycle or walking paths contribute to sedentary habits. These habits lead to poor health outcomes such as obesity, cardiovascular disease, diabetes, and some types of cancer. Additionally, the built environment is also extremely important for understanding infectious disease transmission. Thus detailed understanding of the dynamics of pathogen transmission requires simultaneous information on the presence and nature of pathogens in hosts and on contact patterns that drive transmission events between hosts. The built environment of universities has been optimized typically for education and logistical purposes – **thus there is room to better understand how the environment is used and can be used to improve the health of college students.**

Existing work examining place and health

Past studies have aimed to understand how the environment relates to preventative behaviors such as exercise, but have been limited by cost and labor-intensive formats involving hours of phone calls, clinic or home visits and surveys used to measure those behaviors. Reviews of studies ascertaining the relationship between built environment parameters and health outcomes specifically call for more objective and consistent measures of data, for example, on use of the environment (for example via walking, recreation like running and particularly for separating these uses). Additionally, studies of environmental measures and health have underlined the importance of spatially- and temporally- resolved data compared to “nearest monitor” or county-specific data. Further, these methods only provide a static view of any relationships; unable to uncover how these vary over time. Temporal relationships are important in order to understand if there are specific periods at which environmental parameters may be better utilized (for example if walkability or food availability are most important on weekends). Recently, specific high-resolution studies have uncovered how movement in place specifically relates to infectious disease transmission (see: www.sociopatterns.com) and investigated the relationships between aspects of the environment and healthy exercise behaviors (see: <http://keeping-pace.chunaralab.com>)

Data

We increasingly use digital media and computational devices in our daily activities, and leave behind a sizable amount of digital traces while doing so. The proliferation of

mobile devices, and the incorporation of various sensing technologies in these devices, will further add to this growing trail of data. The possibility to mine and analyze these data, and the scale at which this can be done on contemporary computer systems, affords a novel, *data-driven* approach in the investigation of various aspects of human behavior. Specifically, Internet and mobile connectivity enable a new opportunity for behavior data collection with extremely fine spatio-temporal resolution that can also evade survey recall biases. New efforts from health startups to large corporations reveal the massive investment in tools that enable spatio-temporal position to be resolved.

Specific Metrics

Overall the factors that relate to positive health outcomes are well understood, from consumption to behavior. However understanding how our environment can affect those is what needs better understanding. Thus there are three overall aspects of where an understanding of places place are combined to give essential insight into health outcomes, and we propose should be measured:

1) Spaces that promote healthiness

2) Temporal patterns of behavior

3) Social environments

Background and Credentials of the Proposer

Rumi Chunara, PhD is an Assistant Professor at New York University, at the College of Global Public Health and Computer Science & Engineering Department. Through her unique joint appointment she identifies important issues in public health and builds computational methods to address them. Specifically her research interests are on using new personally generated data in public health surveillance. Through work to-date she has developed computational methods to use new data sets from mobile and Internet-connected devices for epidemiological analysis around the world.

For example, she has used search query data for malaria surveillance in Thailand, and influenza surveillance in China. Additionally she has pioneered the use of social media for measures of the social environment, specifically obesity in the United States. Further, much of her work has demonstrated and harnessed the high temporal resolution and intra-city spatially resolved surveillance efforts for non-communicable and infectious disease risk factors. Dr. Chunara's research is currently funded by the National Science Foundation, National Institutes of Health, Health Data Explorers (subcontract from Robert Wood Johnson Foundation) and the International Growth Corporation. She was one of MIT Technology Review's Top 35 Innovators under 35 in 2014.