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Project Us: The Intersection of VGA, Crowd Funding, and Citizen Science

Genetic Geographic Information Science (Genetic GISc, Figure 1) is a new construct founded on the exposome, genome+, and behavome. It poses several critical challenges in geographic thought, including theory development, model development, and measurement. (Jacquez G.M., C. Sabel, C. Shi 2015). Its benefits are several, including estimation of space-time disease latency; modeling at multiple scales, from the genome, to the cell, individual, and population; and the creation of novel mapping products, including the burden of yet to be diagnosed disease.

This presentation will have 3 objectives. (1) Present an overview of Genetic GISc, and the research problems and directions it poses. (2) Demonstrate how it may be used in an analysis of pancreatic cancer in southeastern Michigan. (3) Introduce Project Us (www.behavome.com), which seeks to quantify the
exposome, with the ultimate objective of establishing global baseline environmental health assessments.

Project Us is developing wearable environmental sensors that will provide space-time data streams on personal exposures to air pollutants. It poses several applied research problems, as follows.

(1) **What is an individual exposure profile (IEP)?**
This may include measures of central tendency, dispersion, distribution, exceedences, and how these change through space over time, sufficient to provide information required to better understand past and present illness and wellness within their behavioral and genetic contexts.

(2) **What are neighborhood, community, regional, national, international and global aggregate exposure profiles?**
These are the foundation for advancing our understanding of group- and population-level geographic and temporal variation in exposure profiles. On larger scales, GMJ refers to these as Baseline Environmental Health Assessments (BEHA). Are these simply groupings of IEP's (likely not), or are there emergent properties and information critical to the measurement and understanding of aggregate exposures, and to quantifying interactions/joint effects with the behavome and genome+?

(3) **What are “normal” exposure profiles?**
Both IEP and BEHA are new constructs in the spatial health sciences and have yet to be quantified. This likely will lead to a new understanding of “normal” human environmental exposures.

(4) **Do (and if so how do) exposure profiles vary geographically, temporally, across social and economic classes, by sex, by race, by age, and by occupation?**
Knowledge of exposure variability promises a deeper understanding of illness and wellness in relation to the exposome, genome+ and behavome. We expect this to be a significant contribution in spatial information sciences in general, and to spatial epidemiology in particular.

(5) **What are the future potential high-yield benefits?**
The measurement of IEP and BEHA is expected to transform our ability to predict disease, understand epigenetic changes, gene expression, and the impacts of individual-level exposures and behaviors on disease risks. We need to scope these out to assure our implementations of IEP and BEHA are sufficient to support potential high-yield benefits.

These question, and others like them, will be presented and discussed over the course of the meeting.

**References**