**2018 IMAG Futures Meeting – Moving Forward with the MSM Consortium (March 21-22, 2018)**

*Pre-Meeting Abstract Submission Form*

*\*Please submit to the NIBIB IMAG mailbox (*NIBIBimag@mail.nih.gov*) by* ***January 8th, 2018***

*\*Save your abstract as “MSM PI Last Name \_ 2018 IMAG Futures Pre-Meeting Abstract”*

**PI(s) of MSM U01: Bruce Y. Lee**

**Institution(s): Global Obesity Prevention Center at Johns Hopkins University**

**MSM U01 Grant Number:**  121364

**Title of Grant:** Virtual Baltimore Lab: A Computational, Multi-Scale Model for Obesity Solutions

**Abstract**

Which MSM challenges are you addressing from the IMAG 2009 Report and how?

<https://www.imagwiki.nibib.nih.gov/content/2009-imag-futures-report-challenges>

(indicate which challenge (#) you’re addressing)

*You may insert images by copying and pasting below*

14)  Models that provide innovative characterizations of interactions between individual-level behaviors, cognition, or affective processes and group-, market-, or population-level outcomes

15)  Models to explore underlying mechanisms of individual-, community-, or population-level preventive or therapeutic interventions

16)  Novel computational modeling approaches for big data that account for simultaneous sources of data on multiple scales; from biological and physiological measures, to social and psychological variables, and to environmental or contextual or societal level factors

17)  Multiscale models that characterize the implications of individual-level risks for collective outcomes, or the implications of systemic risks for individual behaviors and outcomes

Are you using machine learning and or causal inference methods and how?

*You may insert images by copying and pasting below*

 We develop agent based simulation models and follow the different types of outcomes and when particular outcomes occur, we perform systematic sensitivity analysis to determine cause and effect.

Please briefly describe significant MSM achievements made (or expected).

*You may insert images by copying and pasting below*

 Our GOPC Systems Science Core is working in concert with a wide variety of decision makers and has developed an agent based model (ABM), VPOP – Virtual Population for Obesity Prevention, to explore the impact of obesity and a variety of obesity-related policies and interventions. As detailed in a publication in *Health Affairs*, we developed and used an ABM, in conjunction with the Aspen Institute’s Project Play, of all youth in the US to evaluate the impact of increasing physical activity of different proportions of youth. Results showed that maintaining 2017 recommended levels of physical activity participation (31.9%) in youth would result each year in a net present value of $1.1 trillion in direct medical costs and $1.7 trillion in lost productivity over the course of their lifetimes. Improving physical activity participation by as much as 18.1% (e.g., raising the percentage of youth who exercise to 50%), would avert $8.1 billion in direct medical costs and $13.8 billion in lost productivity. Increasing the proportion of children who exercised to 75% would avert $16.6 billion and $23.6 billion, respectively. Our team also developed a VPOP model of Washington DC to explore the impact of crime on physical activity, as detailed in a publication in *Obesity*. We developed an ABM of wards 5, 7, and 8 in Washington, DC to quantify the impact of crime and crime reduction on physical activity location accessibility, leisure-time physical activity (LTPA) and obesity among African-American women. Our simulations show that crime may serve as a barrier to LTPA.  For example, reducing crime so more physical activity locations were accessible (increasing from 10% to 50%) decreased the annual rise in obesity prevalence by 2.69% among African-American women. Reducing crime and increasing the propensity to exercise through multi-level interventions (e.g., economic development initiatives to increase time available for physical activity and subsidized health care) may decrease obesity prevalence.Crime prevention strategies alone can help prevent obesity, but combining such efforts with other ways to encourage physical activity can yield even greater benefits. As described in a publication in the *American Journal of Preventive Medicine*, our GOPC has already developed ABMs of Baltimore City, Philadelphia, and San Francisco to evaluate the impact of point-of-purchase SSB warning labels, SSB consumption, and subsequently overweight and obesity prevalence among adolescents. San Francisco passed the Sugar Sweetened Beverage Warning label ordinance and Baltimore considered the mandate as well. For this study, SSBs were defined as a non-alcoholic beverage that contains added caloric sweetener. Experiments showed that implementing SSB warning labels at all SSB retailers lowered obesity prevalence among adolescents in all three cities. Point-of-purchase labels with 8% efficacy (e.g., labels reducing the probability of SSB consumption by 8%) resulted in the following percent changes in obesity prevalence (Fig. 2): Baltimore: -1.69% (95% range: -2.75, -0.97; p<0.001,); San Francisco: -4.08% (95% range: -5.96, -2.2; p<0.001); Philadelphia: -2.17% (95% range: -3.07, -1.42; p<0.001). Sensitivity analyses explored the impact of varying key parameters such as literacy rate, SSB warning label efficacy (e.g., the threshold at which the label no longer significantly reduces obesity and overweight prevalence), retailer compliance with implementing the label, and the types of establishments that utilize the label.

Please suggest any new MSM challenges that should be addressed by the MSM Consortium moving forward.

*You may insert images by copying and pasting below*

 The MSM consortium ought to focus efforts on making multiscale models understandable and accessible to decision makers.

What expertise are on your team (e.g. engineering, math, statistics, computer science, clinical, industry) and who?

*Please list as “Expertise – Name, email”*

Clinical – Bruce Y. Lee brucelee@jhu.edu ; Industry – Bruce Y. Lee; Computational modeling – Bruce Y. Lee, Atif Adam aadam1@jhu.edu , Marie Ferguson marie.ferguson@jhu.edu , Sindiso Nyathi snyathi@jhu.edu ; Behavior and Physiology – Tim Moran tmoran@jhmi.edu , Community Intervention and Medical Anthropology – Joel Gittelsohn jgittel1@jhu.edu ; Computer science – Daniel Hertenstein dherten1@jhu.edu , Mario Solano Gonzales msolano3@jhu.edu , Molly Domino mdomino3@jhu.edu

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