



**Dr. Tak Igusa, *Department of Civil Engineering***

With appointments in the departments of Civil Engineering, International Health, Earth and Planetary Sciences, and Applied Mathematics and Statistics, Dr. Tak Igusa works on applications of systems science and methodologies to a broad set of disciplines. Because of growing interest among colleagues in the Johns Hopkins Homewood, East Baltimore and Bayview campuses in systems approaches to complex problems, he has engaged in cross-disciplinary teamwork supported by the NIH, NSF, CDC, and private foundations such as RWJF.

**Obesity Interventions for Baltimore Students**

Funded primarily by the NIH/NICHD and OBSSR through the U54 mechanism, the Johns Hopkins Global Obesity Prevention Center (GOPC) applies systems-based methodologies to better understand childhood obesity and potential impacts of environmental and policy interventions. During the first years of growth of this NIH center of excellence, Dr. Igusa served as Program Lead for the Education & Training Core, working with Dr. Thomas Glass, a social epidemiologist who is also an HPC Associate. Through a variety of programs, including cross-disciplinary co-mentoring of pre- and post-docs and a series of courses and workshops, they were able to bring the latest systems science methodologies to obesity research. Another HPC Associate, Dr. Joshua Epstein, was also one of the founding leaders of the Center.

In one of the systems science projects in GOPC, Dr. Igusa worked with medical anthropologist Dr. Joel Gittelsohn and his team to develop an agent-based model of school-aged children interacting with the food environment in Baltimore City. Their study shows how formal and informal food outlets in low-income neighborhoods influence the purchasing habits of children, eventually contributing to excessive weight gain. This model consists of two levels: one to show children's interaction with each other in after-school activities that includes visits to food sources, and a biological level to represent metabolic processes. Designed with interventions in mind, this study sets out to inform changes in the food environment so that inner-city children are more likely to make healthier food choices.

**Community Resilience in the Context of Natural Disasters**

In an ongoing CDC-funded project, Dr. Igusa collaborates with public health scientists at Johns Hopkins and sociologists Drs. James Kendra and Ben Aguirre at the University of Delaware Disaster Research Center to study the processes associated with community resilience to natural disasters. With the goal of guiding long-term plans for emergency preparedness, this project studies all 3000+ counties in the US in order to create a comprehensive model that links community characteristics with the ability to withstand disasters and rebuild afterwards. One key finding is that social cohesion plays a pivotal role in recovery, regardless of disaster type. Furthermore, they found that low-SES communities with high degrees of social cohesion can effectively mount an informal response to disasters.

**Future Work**

Dr. Igusa is collaborating with sociologist Dr. Lingxin Hao on systems approaches for modeling child development. Building on existing economics-based theory, they are assessing the feedback loops associated with the interaction of educational processes with the child's family environment. They are also examining the systemic influences that tend to propagate and maintain educational disparities.



## **Dr. Nicholas Papageorge, *Department of Economics***

Focusing primarily on the intersections among health, labor and education, Dr. Nicholas Papageorge's research in economics uniquely contributes to our understanding of medical innovation. He focuses not only on the impact of medical innovation on health and survival, but also on decision-making in various other contexts, such as employment. For instance, one recent project examines how health decision-making interacts with labor choices of HIV positive men, demonstrating how new medicines can affect a variety of important life course decisions. In addition to conducting research in health, Dr. Papageorge's work also examines teacher expectations and educational outcomes.

### **The Importance of Teacher Expectations**

Using a sample of approximately 6,000 tenth grade students from the Educational Longitudinal Study of 2002 (ELS), Dr. Papageorge and his team investigate how teacher expectations matter for student educational attainment. Because the ELS data includes the subjective expectations of each 10<sup>th</sup> grade student's reading and math teachers, Dr. Papageorge uses this information to analyze each set of expectations for the effects of racial mismatch between student and teacher. The key finding denotes that these expectations explicitly place black students at a disadvantage as compared to their white peers. Specifically, while black teachers and white teachers have similar expectations for white students, white teachers have markedly lower expectations than black teachers for black students. Furthermore, they find that teacher expectations align closely with actual student outcomes. They demonstrate that these expectations are not only "accurate forecasts" of educational attainment, but also have a causal impact on student outcomes by becoming self-fulfilling prophecies.

This project proves relevant for policy-makers because teacher expectations have material consequences for students such as diverting academic resources away from the student or the student internalizing and thus, conforming to these low expectations. Because of the causal evidence, Dr. Papageorge notes that in order to reduce the black-white achievement gap, it is necessary to increase efforts to combat these biases such as diversifying the teaching workforce or improving efforts to address the bias of white teachers.

### **Relating Genetic Markers to Educational Attainment**

Cutting edge genetic research has been able to isolate specific genetic variants that predict educational attainment. From the Health and Retirement Study (HRS), a longitudinal panel study that follows over 20,000 Americans over the age of 50 and their spouses, Dr. Papageorge and his team compute a polygenetic score for a subsample of 8,554 European-Americans, using this score as a measure of one type of genetic ability. This comprehensive data allows the score to interact with other life course investments. In this case, they use the data to examine how childhood SES produces human capital. When these genetic markers are situated in the context of childhood poverty, the policy implications and real world applications become evident. This study finds that high ability poor individuals tend to have lower educational attainment than their wealthier counterparts with similar genes, a striking finding of wasted human capital.

### **Future Work**

Building on his work in behavioral genetics, Dr. Papageorge has turned toward how those with lower ability have less financial wealth at retirement as well as make poor financial decisions, examining the growing wealth gap and poverty among the elderly. In addition to this ongoing project, Dr. Papageorge also has ongoing and forthcoming work in the areas of clinical trials, non-cognitive skills and criminal behavior.