



## **Data, Dollars, and DALYs: How Sensors and Data Can Improve Technology's Impacts for International Development**



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**Date: Thursday, February 15, 2018**

**Time: Noon to 1:00pm**

**Location: ATLAS Hackery (ATLAS building, room 208)**

### **Abstract:**

For decades, technological innovations like "clean cookstoves" and water pumps have promised to address basic energy and water needs for the global poor. However, today, three billion people still rely on basic traditional fires to cook, and two billion people lack access to safe reliable water at home. The failure of technological innovations to impact global poverty is due, in part, to poor application and maintenance of subsidized technological interventions. In this talk, I will discuss four case studies of how sensors and big data analytics can be used to derive insights and drive higher impacts and economic sustainability from technological interventions in the developing world.

The first case studies we will explore concern measuring adoption of cookstoves at various scales. Recent estimates attribute some 3-4 million annual premature deaths to emissions exposure from cooking, making cooking-derived air pollution one of today's greatest environmental health risk factors. We will explore adoption of improved cookstoves in Darfur, Sudan and Odisha, India and discuss how sensors and machine learning revealed meaningful insights about how to drive increased adoption. Additionally, we will discuss how this research empowered implementation agencies to perform their own sensor-based monitoring and verification programs with easy-to-use machine learning tools that we have developed. Then, to consider macro-level measurements of cooking's impacts, I will discuss a balloon-borne platform for measuring black carbon, and how atmospheric profiles of black carbon could be used to better estimate black carbon's radiative forcing contribution while serving as a proxy for biomass combustion at global scales. The second category of case studies will concern water pumping infrastructure. Our team has demonstrated the capability of Super Learner ensemble machine learning to forecast and detect failures of water pumps very quickly. The capability of machine learning to improve pump maintenance could unlock the potential of the ~50% of rural water pumps that are broken at any given point in time. Finally, this talk will conclude with a vision for how rigorous and ubiquitous sensor- and data-based monitoring and verification programs could enable a global marketplace for the sale of averted disability-adjusted life years (ADALYs), potentially leading to increased credibility, investment, and impacts for the international development sector.

### **Biography:**

Dr. Danny Wilson specializes in the application of sensors and machine learning to address tough problems in the international development sector. Dr. Wilson holds a Ph.D. in Mechanical Engineering with emphasis in Development Engineering from U.C. Berkeley where he was both a Fulbright Fellow and NSF Fellow. Danny has founded two companies, both focused on sensing and data, and is passionate about the role of entrepreneurship in solving international development challenges.