

A World of Darkness: What If Thomas Edison Had to Write Grant Proposals to Invent the Light Bulb?

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As Thomas Edison began to write his grant report he cringed. Despite trying over 2,000 different materials to create a light bulb that could bring light to every American, he felt no closer to a solution. The bulbs he had built required too much power and would only stay lit for a few hours. His inputs, outputs, timeline, and logic model all made sense on paper—but still no light.

Cobbling together over 12 grants to build his team was stressful. He was building the world's first industrial laboratory, had discovered a way to record and playback sound, and was on the verge of building a motion picture machine, but he worried perpetually that he might lose his grant funding. Would he have to lay off his staff? He marveled that his team was willing to work in his workshop, when he could not guarantee their jobs. He needed to report progress on the light bulb and there was none, at least not yet.

Since 1945 the National Institutes of Health (NIH), a federal government agency that funds medical research, has spent \$547 billion dollars to cure disease and push the frontiers of medical knowledge. This spending has been supplemented by funding from private foundations. Sadly, despite all of this spending we have little understanding of how to deliver better care at lower cost to every American. At best, in the field of population health, we have a few light bulbs that stay lit for an hour or two, but we lack even basic knowledge to drive this field forward.

With 85 million baby boomers in the midst of retiring and a health care system that consumes 18 percent of our economy, it is not a small problem. We do not understand the fundamental drivers of health care utilization; the basic rules for designing and implementing effective interventions; the best ways to use data to plan, implement, manage, and evaluate interventions; nor how to train staff to run and lead these interventions. Why the lack of progress?

As executive director and founder of the Camden Coalition of Healthcare Providers, a nonprofit organization committed to delivering better care at lower cost in Camden, New Jersey, one of America's poorest cities, I have spent a lot of time thinking about these questions. Finding a path forward will require new leadership from private foundations and a different way of funding population health initiatives.

The last 60 years of research funding has driven the develop-

ment of truly stunning academic health care institutions that have applied the scientific method on a massive scale, but these same institutions have grown dependent on delivering unnecessary care through the misapplication of the technology they have created. They have grown their inpatient hospital bed and specialty care capacity, while leaving the fundamental questions of equity, justice, and beneficence for these technologies broad application unresolved.

How do we ensure that every American benefits from these health care advances? Or, more precisely, how do we industrialize our health care system, spreading these advances while simultaneously driving down the costs, expanding access, and ensuring quality for every patient, every day?

The innovations in productivity that have occurred in almost every other segment of the economy have left health care behind. While we are dazzled by the drugs, devices, and procedures of health care, the structure of our health care delivery system, the way we organize work, the way we analyze data, and the way we train our professionals have become obsolete. Our health care delivery system has been very slow to change and embrace industrial methods pioneered in the 19th and 20th centuries by other sectors of the economy. Techniques like standardization, protocolization, segmentation, workflow redesign, task shifting, change management, and modern lean principles are only beginning to be adopted in health care.

The scientific revolution of better care at lower cost will not be led by academic health centers alone because they have too much to lose. The underpinnings of their financial model would collapse if their unneeded bed capacity went unoccupied. Instead, the cutting edge of population health is being built at the periphery of the system, sometimes far from our traditional academic health care institutions, in places like south central Alaska; Albuquerque, New Mexico; Danville, Pennsylvania; Doylestown, Pennsylvania; Grand Rapids, Michigan; and Camden, New Jersey. In all of these communities, urban poor or rural underserved, doing more with less is a core social value.

The barbarians at the gate for population health will be nurses, social workers, project managers, and health coaches armed with new analytic models, real-time data from Health Information Exchanges, and tools borrowed from behavioral health like motivational interviewing and trauma-informed care.

Rightsizing our nation's biomedical infrastructure and shifting 18 percent of our economy will be no easy task, but it is a task that philanthropy was intended to solve, to be a counterbalance to systems that have become obsolete and need to change.

At the heart of the problem is the importance of identifying the field of population health as a unique and distinct discipline, which combines skills, knowledge, and perspective from public health, medicine, sociology, psychology, anthropology, business, engineering, biology, and computer science. To borrow a word from the famous scientist, E.O. Wilson, population health is a discipline that requires consilience—a synthesis and recombination of many existing fields of knowledge into a new and distinct set of knowledge.

Population health works to ensure that every patient receives high-quality, effective, and timely health care at the lowest cost every day. To accomplish this goal means understanding the quarks, protein folding, and $e=mc^2$ of human behavior as it relates to delivering and utilizing health care services with the goal of creating an industrial revolution in health care delivery.

Current public and foundation funding streams are inadequate to solve this problem. An NIH research grant will fund the research team but is not enough to fund the clinical teams. A foundation grant will fund the clinical team, but not the data or legal infrastructure. Population health requires significant infrastructure: data management, data analysis, legal, public policy, project management, quality improvement, finance, social work, behavioral health, nursing, pharmacy, medical, and more.

There are two historical examples that can illustrate a pathway forward—the creation of industrial laboratories by Thomas Edison and Xerox at Xerox Parc in California. Thomas Edison gathered a team of machinists, chemists, and engineers to solve the most challenging technological problems of his age. With over a thousand patents his team developed the phonograph, motion picture camera, long-lasting light bulb, fluoroscope, and carbon microphone, and deployed a system for distribution of electricity in parts of New York City. Entire industries were created or changed by his work. Under one roof he assembled an enormous array of human talent and resources.

Xerox Parc brought together engineers, scientists, psychologists, and anthropologists to change how humans interact with computers. In a short period of time they created the mouse, GUI computer interface with icons, laser printer, optical data storage, word processing, and the Ethernet. Their work paved the way for the modern desktop computer.

I am proposing the creation and support of industrial population health research laboratories in several locations in America supported by private foundations. Small community health grants disseminated to under-resourced community programs across the country will never solve the bigger health care problems of our time. The articulated purpose of these smaller grants should be to find population health innovators capable of building and leading population health projects, to find communities with broad alignment around population health goals, and to find health care systems ready to change.

Industrial population health research laboratories should be

led by communitywide, nonprofit organizations with broad stakeholder and community support. Local hospitals, providers, and insurers must be committed to delivering better care at lower cost regardless of the potential impact on their business model.

A population health laboratory would need to have full access to real-time, patient-level data; legal infrastructure to enable easy data sharing; a stable communitywide governance model; the ability to conduct mixed method and randomized control studies; the capacity to analyze, visualize, and learn from data; business skills in project management, workflow redesign, performance improvement, and strategic planning; and a deep bench of clinical outreach staff and project managers.

These laboratories would act as hubs for highly qualified researchers in diverse fields to access data and participate in designing and implementing population health research studies. A strong commitment to testing interventions with randomized control trials would be essential; there have not been enough quality ones done in this field.

Edison's work and Xerox Parc were funded through the commercialization of new technologies. I do not believe the field of population health and the proposed laboratories should be funded by commercialization of their discoveries. Delivering better care at lower cost is too important to our society, and commercialization will slow down the pace of discovery and dissemination. Their sustainability plan should be planned obsolescence—when they cease to provide important knowledge for mankind they close down, instead of patenting, copyright protecting, and selling things like patient screening tools. Open source tools can drive innovation more quickly.

I fervently hope the Camden Coalition gets smaller as the work we do becomes a mainstream part of the health care system and the knowledge we have discovered becomes a part of everyday health care services for Camden residents and patients all over the country. Our vision will be realized when we become obsolete. For this reason, we have put our contracts, training manuals, workflows, screening tools, and other materials on-line and made them freely available. I hope someone takes them and creates even better innovations.

Fortunately, Edison did not need to cobble together multiple grants and file grant reports to support his work. I am not sure we would have the light bulb; it took Edison another 1,000 tries before he stumbled upon a carbonized bamboo filament as the best filament to create a low-cost, long-lasting, commercially viable bulb.

The Camden Coalition has had the support of foundation partners willing to fund the core infrastructure necessary to grow our work in an entrepreneurial and flexible way. Our funders include: The Nicholson Foundation, Robert Wood Johnson Foundation, Merck Foundation, Bristol-Myers Squibb Foundation, The Commonwealth Fund, Campbell Soup Foundation, The Atlantic Philanthropies, Pincus Foundation, and the Aetna Foundation.

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