

Innovation and Entrepreneurship: Harnessing the Public Health Skill Set in a New Era of Health Reforms and Investment

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The Context for Innovation and Entrepreneurship

The implementation of the Affordable Care Act and major reforms of the health system have resulted in rapid proliferation of innovation-driven start-up companies in the health sector.¹ These start-ups typically focus on the application of new technologies to improve a narrow selection of health services, or some aspect of patient self-efficacy, attempting to reduce the cost of services, increase patient competence, or improve health care delivery writ large. It is time for the field of public health to engage with this industry and work to direct its energies to tackling major health challenges.

The rapid growth of these companies suggests a strong potential market for these services. The investment in digital health care, such as telehealth, mHealth, or wearable technologies, is one of the fastest-growing health sector markets; in 2015, start-up funding for digital health care reached a new investment high of \$5.8 billion, a slight increase from \$5.2 billion in 2014 and more than double the funding of \$2.4 billion in 2013.¹ Some of the major private health systems in the country are also investing in this growing market. Kaiser Permanente Venture,² the Kaiser network's corporate venture capital arm with a dedicated focus on health care investing for more than 15 years, has approximately \$400 million of committed capital in these emergent fields.

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Are these companies pursuing important needs of patients and populations? The ever-growing market of wearable technologies illustrates the potential and limitations of many innovations. Although some earlier wearables, such as hearing aids, made a significant change to the quality of life of their users, there is little evidence that suggests that the stand-alone use of technologies such as activity trackers, unlinked from clinical feedback loops, is able to consistently demonstrate improvements in health. The evidence on effectiveness of wearable technology on a population level and on the user's experience with the technology varies; a randomized trial published recently in *JAMA* assessed the effect of wearable technology combined with a lifestyle intervention on long-term weight loss. It concluded that devices that monitor and provide feedback on physical activity may not offer an advantage over standard behavioral weight loss approaches.³ In contrast, the systematic review by Bravata et al⁴ on the usage of pedometers to increase physical activity and improve health showed short-term increases in physical activity and decreases in body mass index and blood pressure.

The Missing Link in the Current Health Innovation Ecosystem

An interdisciplinary approach to health innovation, with ongoing collaborations between technologists and public health and clinical professionals, may be missing. Driving innovation toward the greatest challenges in global or public health could help improve the alignment between profit-driven commercial success and impact on individual and collective quality of life.

There are examples of success as a result of interdisciplinary collaborations between technology and public health teams; Eموcha⁵ is a start-up providing a versatile mobile health platform. It offers solutions for several public health problems such as video-based Directly Observed Therapy (DOT) for

tuberculosis, where patients self-record their daily medication adherence through a HIPAA-compliant app on their smartphone for their providers to verify every dose and support them through the Web-based platform. Another example is the surveillance of infectious diseases such as Ebola virus disease and measles where with the use of a smartphone or desktop the at-risk populations report their temperature, symptoms, and/or travel plans according to customizable schedules. Eموcha’s Web portal provides the possibility for the health care organizations to visualize critical data from individuals or risk-stratified populations.⁵

Companies that apply innovative solutions to connect patients’ Bluetooth-enabled phones to blood pressure or blood glucose monitoring devices have demonstrated efficacy in improving outcomes, often linked to powerful cloud-based analytics.⁶

An example would be the application of a glucometer with a sensor that transmits the readings to a mobile phone via a Bluetooth wireless link. A Web-based application enables the clinicians to examine and respond to the readings.⁷ The interventions and care models developed by collaborative public health and technology teams that harness the capabilities of phones have been able to motivate improved adherence to prescriptions and can help navigate health systems and reduce losses to follow-up.^{5,6}

Collaborations between the private sector and public health agencies are beginning to emerge. The collaborations range from public health experts formulating a public health problem that affects communities to applying public health techniques in measuring the problems or defining cost-effective

solutions that address the key determinants of the public health issues. For instance, the Chicago Department of Public Health and the Smart Chicago Organization launched the Food Borne Chicago application to track food safety in real time.⁸ The Baltimore City Health Department collaborates with local programmers to develop technical solutions to problems identified by frontline staff.⁹

Reintroducing the Public Health Skill Set to Address the New Challenge

The history of medicine and public health has often illustrated how public health problem solvers have had an important influence on the design, implementation, and evaluation of health system innovations. For example, the invention of the bifurcated needle was a turning point innovation to help eradicate smallpox by making the vaccine easier and faster to deliver in low-resource settings.¹⁰

Core elements of public health training provide a required set of skills that facilitate impactful and sustainable innovation. The problem-solving paradigm in public health is designed to evaluate problems on a population level rather than on a patient level and to make diagnoses in terms of the problems in the community rather than an individual patient (Figure). This approach has had a significant impact on the health of populations. Public health innovation approach can be conceptualized as an extension to the problem-solving paradigm, modified to include the entrepreneurial ecosystem (Figure).

The public health innovation approach as a modified problem-solving paradigm includes defining the

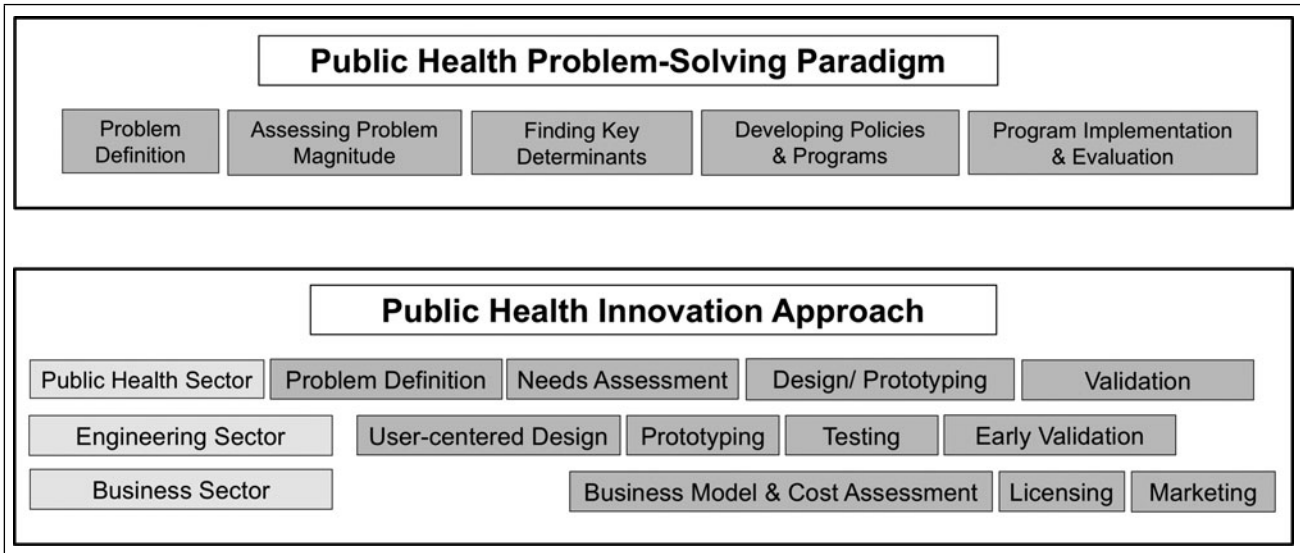


FIGURE Contrasting the Typical Public Health Problem-Solving Paradigm and the Interdisciplinary Public Health Innovation Approach

public health problem; assessing the magnitude and finding the key determinants of the problem in the public health paradigm; designing and prototyping of a product or intervention; defining priorities to choose the program or policy of greatest impact; and building a business model, implementing the program, and evaluating the results. This process is intrinsically multidisciplinary, as public health encourages collaborations across diverse specializations to achieve a common goal.

Adopting a public health innovation approach could help direct health sector innovation to address major global and domestic public health problems and promote greater alignment between innovations and interventions with the largest potential impact. An increased bridging of these 2 cultures would also push public health professionals to diversify their traditional sources of financial support beyond federal agencies and private philanthropic foundations, toward private sector funders such as the major provider networks, managed care organizations, and other payers in the health sector.

Such a transition will not be easy, as health care professionals still need to address some challenges to blending innovation and entrepreneurship with traditional public health research and practice. As opposed to medical innovation, many public health solutions focus on low-cost solutions, aiming for scale and reach—a common feature true for both national and international programs.

The size of the targeted markets might justify investment in low-cost solutions, but this requires a different marketing strategy in comparison with typical medical innovations with higher single-unit price points and wider profit margins. Inventors might need to engage with multilateral agencies such as the World Health Organization or UNICEF, while also courting private sector investors. Investors familiar with medical device innovations understand the high-risk/high-reward stakes of investing in the clinical or surgical space—the formula for a successful investment in public health innovation may need to encompass strategies such as impact or social investments.

In recent years, the financial services industry has dramatically expanded offerings that allow investors to fund projects generating social or environmental impact, alongside financial returns. The Global Impact Investing Network¹¹ is one of the many examples of the financial service that builds critical market infrastructure and supports different types of activities such as research and education. Such services help accelerate the investments made into companies and organizations and funds to provide financial return while generating social and environmental impact.

The Future Challenges of the Public Health Innovation Approach

The arrival of a new Administration could influence private investment in health sector. If the Administration and Congress continue to support state innovation in health policy, states may have greater opportunities over time to expand their investments in innovation and public health technologies.

Globally, as policy shifts toward greater accountability in the setting of unprecedented enthusiasm for the use of technologies to overcome intractable challenges in clinical and public health, a unique window of opportunity is opening. Appropriate, impactful, and entrepreneurially interesting solutions may provide a degree of sustainability to public health programs that today rely heavily on government or donor funding.

There is a need for greater dialogue and interdisciplinary approach between technology innovators and public health professionals—recognizing the inherent differences in the way public health problems are defined, solutions are developed and tested, and programs sustained and scaled. There has never been a better time for public health professionals to stretch their comfort zones to explore how entrepreneurial approaches to public health innovation could have an outsized impact on health.

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