


interest in the future of our field and its professionals. Multifaceted efforts that incorporate students and the range of public health professionals are critical. Attentive monitoring of these employment trends and the efficacy of our actions is imperative—for the sake of public health and the public's health. **AJPH**

Laurie L. Meschke, PhD

Data With Passion and Purpose: A Public Health of Consequence, September 2018

 See also Alang, p. 1127; and Edwards et al., p. 1241.

We have argued frequently in this column for generating science that can help address questions of contemporary relevance, and we have written in previous work about the importance of conducting scholarship of consequence.¹⁻³ This approach moves us to generate data with clear passion and purpose, with the aim of contributing to efforts that improve the population's health. We continue to consider this the highest calling of public health research and were pleased to read articles in this issue of *AJPH* that do just that, including, for example, the article by Edwards et al. (p. 1241), who tackle what is indeed one of the most polarizing issues of our time—police homicides—and show substantial variability in police homicides rates by race, ethnicity, and place. This article has the potential to intersect with, and inform, vigorous ongoing public debates about police homicides.

But what of the other articles that are published in each issue of

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AJPH? How do we consider their contribution to science? Do articles that are not directly anchored in immediate consequence not warrant inclusion in a journal concerned with ultimately improving public health?

To grapple with these questions, we turn to the classic book *Pasteur's Quadrant: Basic Science and Technological Innovation* by Donald Stokes.⁴ Stokes suggested a framework presented as a two-by-two grid in which “relevance for the advancement of knowledge” is on the y-axis and “relevance for immediate applications” is on the x-axis; he used scientists he considered to be emblematic of each quadrant to illustrate his general point. Louis Pasteur, whose work was at the core of advancing our understanding of infectious disease and was directly applicable to the evolution of vaccinations, resides in “Pasteur's quadrant” at the intersection of advancing basic science knowledge and knowledge that is use inspired, or useful. Nils Bohr, the Danish physicist

whose work helped advance our understanding of quantum theory and atomic structure, resides in the top left corner, where work aspires to advance knowledge with little attention to its immediate application. Thomas Edison, the American inventor whose contributions include the practical electric light bulb, occupies the bottom right quadrant, where work with immediate relevance dwells, applying knowledge to practical use that aims to improve the world.

FINDING THE BALANCE

In many ways, the public health work that we advocate embodies the work in Pasteur's quadrant. We aim to advance knowledge that is applicable to the

production of population health. This type of work generates data with passion and purpose that can advance a science of consequence. But does this elide some subtleties in how we do our work? And do we, by focusing too much on Pasteur's quadrant, miss opportunities to advance both knowledge and its usefulness?

Although the charge of public health research may be, first and foremost, to produce useful knowledge, and as we have repeatedly stressed, to find causes of issues in population health,⁵ it is often not at all clear how straight the line is from the knowledge we are producing to its utility. At a simple level, this is straightforward; for example, many people die from heart disease, and research that aims to reduce heart disease fits this criterion. But in many other ways it is extraordinarily complicated; for example, should work that aims to improve individual behavioral approaches to dietary choices that are tailored to genetic risk be prioritized when the evidence suggests relatively limited effectiveness of such

ABOUT THE AUTHORS

Sandro Galea is with the School of Public Health, Boston University, Boston, MA. Roger D. Vaughan is an *AJPH* associate editor and is with the Department of Biostatistics, The Rockefeller University, New York, NY.

Correspondence should be sent to Roger D. Vaughan, DrPH, MS, The Rockefeller University, 1230 York Ave, New York, NY 10065 (e-mail: roger.vaughan@rockefeller.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the “Reprints” link.

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efforts.⁶ An engagement with Pasteur's quadrant must involve critical self-reflection about the work that we do and whether it is likely to have any utility. Underlying some of this are the values that animate our work. For example, if we prioritize health equity, we are much more likely to prioritize scholarship that aspires to improve health among disadvantaged populations, even if that comes at the expense of slowing down overall achievement in population health gains.

Elevating the centrality of Pasteur's quadrant as we do is, in some ways, a bold expression of confidence in the direct utility of what we do at the time we are doing it. We recognize Pasteur's work as useful because it laid the foundations of much of our understanding of vaccinology. Yet initially his work was far less clearly useful or linked to population health. The path of discovery is windy and not infrequently tortuous, and it is perhaps hubristic to say that we know what line of inquiry will definitely lead to utility and relevance to the work of population health improvement. Also, many of the causes of population health issues change over time, and embarking on work that one knows will be useful going forward is a tall order.

Importantly, identifying approaches to population health improvement arises, for example, from fields that are far removed from our typical public health scholarship—fields such as economics and sociology, which aim to understand how the world works with nary a thought to health. It is the synthesis of disciplinary work that is forged after the production of the original knowledge, then, that lends applicability to public health. The nature of public health as an

interdisciplinary field suggests that innovation in public health will inevitably come from discoveries in other disciplines adopted to public health questions.

This is a far messier, but perhaps far more realistic, picture of how knowledge that can lend itself to the production of public health is generated. This puts our work somewhere at the intersection of the Pasteur and Bohr sides of the Stokes schema, although the utility of engineering approaches to the work of public health is not lost either, suggesting that a dash of Edison is also useful in the mix. Additionally, anyone who has been involved in the process of generating knowledge recognizes the role that serendipity plays in discovery science and, commensurately, the role that serendipity plays in the production of health within complex human systems.⁷ This suggests that our capacity to anticipate the significance of what we might do is substantially more tenuous than a linear path would have us think.

BLURRING THE BOUNDARIES

Although work in Pasteur's quadrant, generating data with passion and purpose, may seem to align naturally with what we do, we suggest that the picture is more complicated when we delve deeper into the mechanics of the generation of knowledge in public health and the utility of that same knowledge toward improving public health. Perhaps rather than our work being in Pasteur's quadrant only, our work rightly crosses into Bohr and Edison territory, and we would do well to accept and nurture such cross-quadrant incursion. That may be less

clarifying than a simple focus on one quadrant, but it is perhaps a more rousing endorsement of the full breadth of work that constitutes the public health research that monthly populates the pages of *AJPH*. **AJPH**

Sandro Galea, MD, DrPH
Roger D. Vaughan, DrPH, MS

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