

3. National Conference of State Legislatures. Prescribing policies: states confront opioid overdose epidemic. Prescribing legislation (summary). 2018. Available at: <http://www.ncsl.org/research/health/prescribing-policies-states-confront-opioid-overdose-epidemic.aspx>. Accessed July 1, 2018.

4. Meghani SH, Vapiwala N. Bridging the critical divide in pain management guidelines from the CDC, NCCN, and ASCO for cancer survivors. *JAMA Oncol*. 2018;Epub ahead of print.


5. Stone DM, Simon TR, Fowler KA, et al. Vital signs: trends in state suicide rates—United States, 1999–2016 and

circumstances contributing to suicide—27 states, 2015. *MMWR Morb Mortal Wkly Rep*. 2018;67(22):617–624.

6. Krueger AB. Where have all the workers gone? An inquiry into the decline of the US labor force participation rate. *Brookings Pap Econ Act*. 2017; 2017(2):1–87.

7. Volkow ND, Frieden TR, Hyde PS, Cha SS. Medication-assisted therapies—tackling the opioid-overdose epidemic. *N Engl J Med*. 2014;370(22):2063–2066.

Population Health Science as the Basic Science of Public Health: A Public Health of Consequence, October 2018

 See also Rabarison et al., p. 1370; Broniatowski et al., p. 1378; Shover et al., p. 1408; and McDonald et al., p. 1401.

There has been a substantial increase in the use of the term “population health” in the academic literature over the past few years.¹ Although academic publications have aspired to define population health and its implications for more than a decade,² there remains lack of clarity in the field about what population health may be and how it is distinct from public health.³ While we consider academic argument and debate about definitional issues generally as a positive, continued fuzziness about the relationship of population health to public health creates confusion that ill-serves the goals of public health. We propose here a simple approach to bridging population health and public health, using illustrations from this issue of *AJPH*.

To our mind, population health is the basic science of public health, much as biomedical research is the basic science of clinical medicine. There have now been several definitions proposed for population health science, although broadly all center on some variant of population health science as the study of the conditions that shape distributions of health within and across populations and

of the mechanisms through which these conditions manifest as the health of individuals.¹ The American Public Health Association then notes that “Public health promotes and protects the health of people and the communities where they live, learn, work and play.”⁴ This, therefore, suggests well that the two terms are complements—that population health science provides the basic understanding of how health is produced while public health aims to apply that understanding toward producing and promoting health in populations. The parallels to clinical medicine are strikingly clear.

Research articles in *AJPH* then can be most constructively considered to be predominantly in the realm of population health science, even as some articles are closer conceptually to basic science inquiries while others are closer to informing the practice of public health.

BOOKENDS OF THE SPECTRUM

Starting with the more basic science end of the spectrum, Broniatowski et al. (p. 1378) are

concerned with understanding how Twitter bots and Russian trolls amplify the vaccine debate. Their work shows how bots spread antivaccine messages and that, perhaps counterintuitively, directly confronting vaccine skeptics can serve to legitimize false vaccine debates, creating seeming false equivalence in the world of digital argument, elevating ideas that have no scientific standing. This article, therefore, is addressing some of the fundamental drivers of the cultural discussion, helping us understand how segments of the population come to consume information that then informs how they think and act. The understanding generated by this article has implications for the practice of public health, even if the realization of public health effort informed by this work requires a fair bit more work. Vaccine skepticism is a real and growing concern, but approaches to tackling it remain, at best, untested. A public health follow-up to this article would perhaps test different approaches

to deflecting the spread of vaccine skepticism, encouraging the proliferation of science-based notions in the cultural discussion on the issue.

Rabarison et al. (p. 1370) tackle a different topic and use a different approach. This article is concerned with the economic value of informal caregiving for dementia and calculates that, for 38 states, an estimated 3.2 million dementia caregivers provided more than 4.1 billion hours of care, with an average of 1278 hours, or more than \$13 000 per caregiver. This is an enormous societal value that will likely grow in coming decades as the population ages. It is data like these that can inform the broader political discussion about the allocation of resources to grapple with the rising tide of dementia in the population. We would expect more pragmatic public health approaches to dementia to emerge in coming decades that couple supports for informal caregiving with more structured efforts that can both alleviate the burdens of, and complement, this informal caregiving.

Some articles in this month's *AJPH* show how population health science can come closer to the practice of public health by evaluating public health action to

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 Rockefeller University, New York, NY.

Correspondence should be sent to Roger D. Vaughan, The Rockefeller University, 1230 York Ave, Box 327, 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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monitor improvement. For example, Shover et al. (p. 1408) characterize uptake of HIV pre-exposure prophylaxis (PrEP) in a community setting and identify disparities in PrEP use by demographic and behavioral factors associated with increased HIV risk. They found that Asians and Latinos were less likely to be using PrEP, despite eligibility, suggesting clear areas for potential improvement in the work of public health that aims to reduce the burden of HIV.

By way of another example, on a very different topic, McDonald et al. (p. 1401) assessed drinking water violations by counties and found that minorities face significant challenges with exposure to poor water quality, most notably among community water systems that serve large populations, suggesting a strong need to ensure that counties with a higher proportion of minorities, uninsured, and low-income households have access to safe drinking water. Both of these articles ultimately are about our understanding of population health—hence, generating population health science—but both are closer to the practice of public health, generating knowledge that directly informs public health.

FUNDING FOR A LEGITIMATE SCIENCE

We can well imagine that an epistemological discussion about the distinction between population health science and public health may elicit sighs of exasperation from the reader. We would contend, however, that there are real merits to clarity in this arena. One of the challenges that public health has long faced is

that we do not have clearly demarcated federal funding for questions of import to the health of the public; there is no avenue for public health funding through the National Institutes of Health (NIH), for example. Insofar as the mission of NIH is “to seek fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to enhance health, lengthen life, and reduce illness and disability,”⁵ we would argue that population health science should be well in the remit of the NIH, as the fundamental discipline that generates insights about the health of populations, to inform public health, and should be on budgetary par with biomedical research. Perhaps clarity on our end about the role of population health science can be a useful nudge forward in this direction. **AJPH**

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

REFERENCES

1. Keyes KM, Galea S. Setting the agenda for a new discipline: population health science. *Am J Public Health.* 2016;106(4):633–634.
2. Kindig DA. Understanding population health terminology. *Milbank Q.* 2007;85(1):139–161.
3. Diez Roux AV. On the distinction—or lack of distinction—between population health and public health. *Am J Public Health.* 2016;106(4):619–620.
4. Benjamin G. What is public health? American Public Health Association. Available at: <https://www.apha.org/what-is-public-health>. Accessed July 9, 2018.
5. The National Institutes of Health. Mission and goals. Available at: <https://www.nih.gov/about-nih/what-we-do/mission-goals>. Accessed July 9, 2018.