



Perspective

“Precision” Public Health — Between Novelty and Hype

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In May 2018, the National Institutes of Health (NIH) began enrollment for a vast medical research cohort. Named “All of Us,” it’s meant to include 1 million U.S. volunteers, who will be studied

over 10 years at a cost of \$1.45 billion. The project promises to “lay the scientific foundation for a new era of personalized, highly effective health care,” a counterpoint to previous “one-size-fits-all” medicine.”

All of Us derives from a decade’s worth of developments in the research world. In 2011, the National Academies of Sciences, Engineering, and Medicine called for a “new taxonomy of human disease,” stating that “opportunities to define diseases more precisely and to inform health-care decisions” were “being missed.”¹ Five years later, President Barack Obama launched the Precision Medicine Initiative. The concept was promoted by NIH Director Francis Collins, who defined it

as “prevention and treatment strategies that take individual variability into account.”² A bandwagon effect followed, with marked shifts in resources and attention toward precision medicine.

The trend has now been extended to “precision public health” (PPH), which promises to reconfigure the mission of the public health field. Such a shift is not merely semantic. Substantial funding streams and institutional rewards are attached to all matters “precision,” with significant implications for approaches to population health. The Bill and Melinda Gates Foundation hosted a 2016 conference entitled “Precision Public Health: The First 1,000 Days,” which considered, among other things, infant mortality. Muin

Khoury, head of the Office of Genomics and Public Health at the Centers for Disease Control and Prevention (CDC), declared 2016 the “year of precision public health.” Western Australia’s Office of Population Health Genomics, which first introduced the term, is cosponsoring an international conference on PPH in the coming months, as is the Rockefeller Foundation. PPH proponents argue that the public health field ignores at its peril emerging technologies that can fundamentally alter our understanding of who is vulnerable and who falls ill.

But there are key issues to consider before public health throws its lot in with the precision agenda. What are the implications of this scientific and institutional turn for the future of public health? Does it offer the opportunity for a reconceptualized, empowered public health enterprise — or might it represent an abandonment of our mission of enhancing popu-

lation well-being? And how novel is PPH, anyway?

Beginning this conversation requires clarifying the divide between precision medicine and traditional public health analysis, policy, and practice. Precision medicine starts with the individual. Insofar as it considers groups that may be at increased risk for disease, vulnerability is conceptualized biologically, and particularly genomically. Improved population health follows from improved health of multiple individuals. In contrast, public health begins with populations. Increased vulnerability is framed as the consequence of structural factors, including social class, ethnic background, gender and sexual identity, and physical environment, among others. Many factors shaping the health of populations have no individual-level analogue but are properties of our shared surroundings. Without discounting the importance of clinical intervention, public health personnel view enhanced population well-being as the primary goal. The protection or restoration of individual health results from structural transformations affecting the population as a whole.

The field has certainly faced perennial controversies over whether interventions should be macro-level or targeted. For instance, the 1882 discovery of the tubercle bacillus, along with the belief that it alone caused consumption, now known as tuberculosis, led to hope for "magic bullets" for diseases. Yet such cures were slow to materialize, and social critics noted that workplace and housing conditions were critical contributors to the development of symptomatic tuberculosis in people carrying the bacil-

lus. The dual social and biologic basis of tuberculosis infection catalyzed generations of inquiry into the relative efficacy of intervening at the individual versus the community level.

Nearly a century later, British epidemiologist Geoffrey Rose extended that debate, questioning the assumption that focusing on the highest-risk people would yield the greatest population health benefit. In what he termed the "paradox of prevention," Rose asserted that more lives would be saved by attending to people with average or low risk — and ignited a series of arguments that are ongoing.³ Other, more recent, discussions consider whether a focus on a disease's root causes is compatible with interventions tailored to specific groups and individuals.

This struggle to navigate the tension between the macro and the granular has reached a fever pitch in the precision era. And beyond the premise that recent technological innovations should be leveraged for public health purposes, there are important relevant differences between the two primary versions of PPH.

One view centers on the theoretical ability to sort populations into subgroups defined by genetic traits; these subgroups, carrying varying levels of risk, would then receive appropriately targeted interventions. It owes much to the reconceptualization promised by precision medicine. Hewing closely to the contributions of genomics, the director of the CDC Office of Population Health Genomics has argued in various forums that PPH would make possible "the right intervention to the right population at the right time."

But an alternative conception is broader and emphasizes using

vast amounts of data to serve "precision" ends, incorporating genomics as only one of multiple methods. In endorsing PPH, Gates Foundation officials emphasized the reinvigoration of the core public health function of surveillance, explaining that "the use of data to guide interventions that benefit populations more efficiently is a strategy we call precision public health. It requires robust primary surveillance data, rapid application of sophisticated analytics to track the geographical distribution of disease, and the capacity to act on such information."⁴ In this conception, a precision-invigorated public health enterprise deploys big data of all types for the benefit of all.

This more elastic vision may merely be a rebranding of public health's traditional enterprise of bringing broad structural understanding to bear on population health through targeted efforts and technologies, one that incorporates genomics as one tool in an expanding arsenal. If the PPH concept aids integration of technological developments into work that responds to social concerns and helps produce demonstrable results, it may be a welcome development. It may, to answer one of our key questions, help to reinvigorate public health research and practice — without, to answer another, being nearly as revolutionary as its promoters claim.

However, when PPH centers specifically on genomics, it threatens to take sides categorically in a productive tension in public health. To the extent that PPH, seeking a radical reconfiguring of the field, tips the scale heavily toward the narrow and mechanistic, there is reason for concern, especially if it's too anchored in as-

yet-unrealized genomic promises. Such a conceptualization of PPH could become a quixotic search for magic bullets that undermines belief in broader social determinants as foundational — an abandonment of public health’s long-standing mission. Given how rapidly precision medicine has been embraced, the genomic-heavy variant of PPH may prematurely prevail.

To date, discussion of PPH has rarely addressed larger social structures shaping population health outcomes. This omission is conspicuous, given renewed attention to economic and racial inequality in American society, as indicated by movements such as Black Lives Matter and Occupy Wall Street and by major studies such as *Shorter Lives, Poorer Health*, in which the National Research Council and the National Academy of Medicine revealed stark associations between income inequality and negative health outcomes. That work also confirmed that the United States lags behind other countries on myriad population health indicators.

Of course, we do not deny the

usefulness of relevant technological innovations. Advances in data storage, computational power, and yes, genomic data will help improve understanding of mechanisms connecting the macro and the micro, and the social and the biologic, as research on epigenetics and gene–environment interactions is beginning to show. There are signs, too, that even ardent proponents of a genomics-inflected PPH understand the potential pitfalls; for example, Khoury et al. affirm that “genomics is only one approach to improving health, and for the most part cannot be used in isolation from other factors or determinants of health and disparities including socioeconomic factors such as housing, education, and access to care.”⁵ Insofar as this reality is recognized, we believe there’s no need to add the word “precision” to “public health.” Public health scholars and practitioners have always debated the proper place of precision approaches.

Unfortunately, this direction is not where PPH appears to be heading: the more tightly defined

and individually focused conception, anchored in genomics, has gained greater momentum — and poses a greater threat. This strain of PPH deserves much more scrutiny than it has heretofore received.

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