TITLE How can a population health approach be both useful and credible?

ABSTRACT

As researchers consider tackling factors affecting public health only in indirect or distant ways, great care must be taken to retain both the benefits of field expertise and the public credibility of the field. It is not enough to demonstrate that a factor has a first-order causal relationship with some health outcome. Rather, researchers wishing to investigate the distal and indirect relationships must be mindful of retaining the same rigor about causal claims, and the same objectivity, as is demanded in more traditional public health policy advice.

AUTHOR Kevin A. Bryan, Associate Professor of Strategic Management, University of Toronto Rotman School of Management, PhD, Managerial Economics, Northwestern University, 2014; Address: 105 St George, Toronto, ON, M5S2E8, Canada; kevin.bryan@rotman.utoronto.ca

KEYWORDS: Public health, methodology, indirect claims, causal claims, credibility

A fair question for any field of scientific inquiry to ask in 2021 is, have we been able to provide useful policy guidance during this incredibly disruptive pandemic? More broadly, are the methods and research foci of our field well-suited to tackle the pandemic and similar first-order social problems?

For this reason, Frank et al [2021] give a critical evaluation of where public health, especially in the Canadian context, went wrong in dealing with Covid-19, and offer guidance for how the field should shift to better respond to other major 21st century challenges. The primary diagnoses

are fourfold. Public health is often too palliative rather than preventative, monocausal rather than systemic, immediate rather than distal, and individualistic rather than global.

Changing public health's research focus and methodology in line with their suggestions, however, would be harmful. To understand why, it is worth asking what the purpose of scientific research is. Scientific research aims at increasing human knowledge or understanding of the external world (Mizrahi 2020). Policy-relevant science must also be seen as credible by practitioners. What makes science credible is objectivity, the idea that a reader can trust the result independently of the particular preferences, status, or position of the researcher: "[O]bjectivity is tied to a relentless search to replace individual volition and discretion in depiction by the invariable routines of mechanical reproduction" (Daston and Gallison 1992).

As all researchers have values and biases, attaining objectivity in the hunt for knowledge and understanding requires restrictions on how science operates in a way that may feel limiting for the individual. It is necessary to both have a form of *epistemic humility* - that any one researcher or group has only limited knowledge of auxiliary facts about the world to make a contribution to human understanding, and a firm *methodological constraint* - restrictions on the types of theoretical or statistical claims we accept as "valid" so as to prevent the non-scientific beliefs and values of the researcher from overwhelming the scientific inquiry (e.g., Wolpin 2013). That is, our research questions ought to lie in areas where we truly have special expertise, and on those questions we should use only methods which can give a direct and objective answer.

With these principles in mind, let us ask not whether there are important public health questions which can be prevented by investigating systemic, distal, non-individualistic causes. There is, one imagines, little debate on that point. The question instead is whether *public health research* is better able to offer credible results which advance knowledge and understanding in that

framework compared to more traditional research. To be precise, consider each of the four methodological complaints in turn.

On the question of whether public health is too palliative, there is surely room to critique, if only on bang-for-the-buck grounds, whether preventative strategies to problems like childhood obesity are more promising. But this critique cannot be so broad as to include "anything that affects individual welfare, especially as it differs across groups, is population health". For instance, consequences of climate change such as the effect of rising temperatures on malaria prevalence are ones researchers in the field are well-suited to evaluate. But the broader effect of climate change on society, including upstream solutions? In what way is a public health researcher credibly able to perform research about how zoning reform affects health via climate change? They are not historians of urban planning policy, nor are they economists who have studied equilibrium location choice as a function of shifts in housing quantity, nor are they experts on the geophysics of housing density and emissions. Indeed, if the population health role in climate change is the "pursuit of transformational system change" that "[wrests] public health infrastructure..from powerful interests" (Frank et al 2021), we are in the world of a political project and not a field of scientific inquiry.

Indeed, prevention at the population health level often involves looking at factors far removed from the outcome in question, and multiple in number - “causes of causes” in Frank et al’s (2021) terminology, though in many cases we are talking about “causes of causes of causes of causes”. The philosophical definition of “cause” being used here is some sort of manipulation account, where X causes Y if in a world where X was changed to X’, and all else was held constant except the direct and indirect consequences of the change to X’, then Y would change to Y’ (Cartwright 2006). Since the distance between X and Y is far, and Y is perhaps only affected indirectly by the change in X, a concern is that there are many potential ways to shift Y

to Y'. For instance, if we accept that changing the nature of global food production can reduce obesity, surely the intervention "tax all food highly so that parents cannot afford to buy as much" could do the same. In both cases, the causal factor being claimed is that cheap, calorie-dense food availability drives childhood obesity. The question, then, is which of the many causes X we ought focus on? And what particular expertise are public health researchers drawing on when they make that choice?

In that vein, another serious problem with distal claims is the scope for non-credible politicized statements to appear. To wit: "[T]here is growing agreement that [childhood obesity is] almost certainly related to the development of large-scale multinational agribusiness' production of crops and animal products able to provide manufacturable foods at lower prices, and higher profits, than ever before" (Frank et al 2021). No citation is given. Are we to believe that a highly competitive, no-imports foodstuffs industry, with decreasing profits over time, would not also have been able to produce more calorie-rich foods at lower prices? Are we to believe that the fundamental difference between France and Japan, with less childhood obesity, and Canada and the United States, with more, is due to the former countries not having modern supermarkets with imported, branded food? This isn't to say that the production of cheap, calorie-dense food at the population level is unrelated to childhood obesity - it surely is related! The problem is the much more distal, and much less well-supported claims about the link to "multinational" business and the supposed shifts in their profitability over time. If a distal causal claim is made, the causal relations at each step of the chain from population covariates to individual outcomes must be investigated and proven with as much rigor as the shorter causal chains in more traditional public health work. Just as the choice of research question allows research to veer dangerously into political rhetoric, long causal chains where the researcher is choosing which distal causal factor to emphasize can do so as well.

We seem to be at a curious impasse. On the one hand, many researchers believe, with good reason, that we can most effectively improve public health by putting more emphasis on “earlier” interventions, both in the sense of prevention and of earlier steps in a causal chain. Many of these interventions will necessarily be focused on populations rather than individuals. Reducing childhood obesity or the health effects of climate change by waiting for patients to show up in a doctor’s office is indeed an odd strategy, and perhaps a very expensive one. What we need, then, is a *methodology* for public health researchers who focus their attention on upstream interventions, which are often at a societal rather than individual level. This methodology must still extend human knowledge or understanding in a credible way for policymakers.

This is perhaps possible, if we are careful to constrain what researchers may do or claim. A preventative, systemic public health must do three things. First, it must take individual preferences, including revealed preferences, seriously. Second, the evidentiary standard in long causal chains must be equally rigorous at each step. Third, experts from other fields should be engaged whenever the research draws on technical questions outside the scope of public health training.

Taking individual preferences seriously when proposing societal interventions is important for precisely the reason Frank et al (2021) suggest: people are heterogeneous in their tastes, incomes, constraints, and so on. Consider, for example, a pandemic intervention that causes five percent of Canadians to lose their job for a year, but which reduces annual deaths by 10,000. Is this tradeoff worthwhile? At the individual level of public health, the question is simple: a patient can be informed of the risk they face from continuing some action, and of what they must do to prevent that risk. If they nonetheless refuse the health advice, we can infer that the benefits they perceive from the treatment exceed the costs (financial and otherwise) they perceive from deviating from the status quo. A societal intervention, however, is almost

necessarily all or nothing. The statistical value of life approach (Viscusi 2018) notes that people all the time choose between options with different costs and different life risks. For instance, more dangerous jobs, all else equal, are better-paid. We can therefore "back out" preferences from these choices. There are, it goes without saying, controversies about this approach, but it has the benefit of constraining social interventions to at least somewhat respect individual preferences, a concept that is completely uncontroversial when it comes to traditional consensual health interventions.

On "causes of causes", we have already seen the issue with not requiring the same rigor with causal claims in these distal effects as we do with more immediate effects. If I claim that intervening by changing X to X' will create a beneficial change in Y via an indirect effect on Z, we must both show that the shift to X' affects Z, and that Z affects Y in the claimed way. Sometimes we can show that change directly. For instance, Graff-Zivin and Neidell (2012) argue that air pollution restrictions (X) improve farm worker productivity (Y), presumably by making it easier to breathe. They are able to measure exogenous changes in ozone pollution by region by day, as well as changes in productivity by farmworkers on piece-rate contracts. In this case, the aspects of the causal change that matter for the policy question "how does air pollution harm worker productivity" are fully established. A much weaker result would be to show that exogenous shifts in air pollution make it harder to breathe, or less pleasant to be outside among surveyed workers, and then a loose claim that "therefore, air pollution harms worker productivity". We would not have established precisely how the public health result in question affects the economic one. Demanding rigorous evidence from the beginning of the causal chain to the end makes research harder, it is true. That said, this rigor makes it more useful (the full result is better established) and more credible (the scope for researcher bias on the "missing" parts of the causal chain is reduced).

Finally, in line with the idea of epistemic humility, researchers who want to extend the remit of public health to broad social problems with public health consequences must develop collaborators in outside fields. Sociologists are well-informed on the question of how job loss affects identity, relevant to the question of climate change policies which require industrial transition. Economists can speak to how tax and subsidy policy affects labor supply and consumption. Geophysicists and climate scientists and epidemiologists have complex models in each of their domains which are critical to calibrating the effect of health measures in response to climate change and pandemics. Again, these types of collaborations not only make research more useful, but also more credible.

There may well be important public health questions for which “health outcomes in a population and to the social and structural relations that produce those outcomes” must be known in order to efficiently design remedies (Frank et al 2021). The existence of those questions, however, does not imply that public health research can usefully and credibly answer those questions. As long as the field is to head in a broader direction, it must beware the risks both to the trustworthiness of the field as a provider of useful knowledge.

Cartwright, Nancy. "Where is the theory in our" theories" of causality?." The Journal of philosophy 103.2 (2006): 55-66.

Daston, Lorraine, and Peter Galison. "The image of objectivity." Representations 40 (1992): 81-128.

Frank, John W., Geoffrey M. Anderson, Fiona A. Miller, Iffath Syed. “Applying Population Health Principles to Pandemics: A Guide to Effective Public Health Practice to Address 21st Century Pandemics.” Healthcare Papers (forthcoming).

Graff Zivin, Joshua, and Matthew Neidell. 2012. "The Impact of Pollution on Worker Productivity." American Economic Review, 102 (7): 3652-73.

Mizrahi, Moti. "Conceptions of scientific progress in scientific practice: an empirical study." Synthese (2020): 1-20.

Viscusi, Kip. Pricing Lives: Guideposts for a Safer Society. Princeton University Press, 2018.

Wolpin, Kenneth I. The limits of inference without theory. MIT Press, 2013.