



# Understanding why we do what we do during a global pandemic

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We are, at this writing, slowly beginning to see the light at the end of the COVID-19 tunnel. Eighteen percent of the population has now been vaccinated, and the national third wave of COVID-19 cases is on the wane. Both of these forces are conspiring to give us hope that the United States can soon start to move beyond the COVID-19 year, to start picking up the pieces from where the country left off when COVID-19 first hit. There is going to be much to do in the wake of COVID-19. The economy remains weak, and only about half of the jobs lost during COVID-19 have been recovered. There will have to be a rethinking of how the country works, a reckoning with the inequities laid bare by the pandemic, and a wholesale reimagining of how we can prevent future pandemics.

Science will have an important role to play in this post-COVID reconstruction. The COVID-19 year was marked by an incredible explosion of science around COVID-19 (1). Aided by the rise of preprints and the ubiquitous reach of social media, science made a real-time contribution to national and global decisions that needed to be made to contain the evolving pandemic. There has perhaps never been a more visible time for science in the decision-making landscape, and, commensurately, never has there been a time more fraught with potential peril for science. Fundamentally, the work of science is slow and painstaking, with different groups of scientists building on the work of others until we arrive at some consensus on what we know. That is, of course, challenged when science is being produced at a breakneck pace, made public mostly before peer review has taken place (2), and often looked to by decision makers hoping for solutions before the field has had time to discuss, rebut, refute, or replicate—all elements that lead us from individual published studies to accepted facts. It is, then, a welcome development, as we head into this post-COVID moment, to start seeing papers emerging that take a look back and start asking critical questions about what transpired over the past year, to the end of leading us to clearer answers that can educate what we do in future.

## The Emerging Science

Two papers in PNAS do just that. Both Berry et al. (3) and Yan et al. (4) aim to shed light on a critical question: What resulted in the massive change in behavior that followed the early recognition of COVID-19? And, more specifically, was this change in behavior driven by human voluntary action—perhaps informed by fear of the virus—or was it a result of stay-at-home or shelter-in-place policies that, in various ways, asked the population to stay at home? These are important questions indeed, and both papers make a compelling case for why this distinction may matter. If the evidence were to show that policies were primarily responsible for behavior change, it would point to the need for explicit policies to dictate terms of human engagement around future pandemics. The observation that most action is voluntary may question the need for such directive policy work.

The data emerging from the Berry et al. (3) and Yan et al. (4) papers—building on other papers (5–7) that are attempting to document the empirical link between policy change, mobility, and pandemic spread during COVID-19—are, as is to be expected from such a complex question, somewhat divided. Berry et al. (3), focusing on COVID cases and death as key outcomes of interest, find little evidence that shelter-in-place orders had a discernible effect, distinct from that due to voluntary change in behaviors. The authors are careful to note, correctly, that this does not suggest that social distancing and reduction of mobility during a pandemic is not a useful mitigation strategy, but rather that their observations suggest that shelter-in-place orders themselves did not contribute much to the wave of voluntary behavior change that drove populations, faced with a new pandemic, to limit mobility and reduce viral transmission during the early days of COVID-19. Somewhat in contrast, Yan et al. (4) find that both policies and voluntary behavior change mattered, with voluntary behavior change being responsible for a substantial share of the change in mobility observed during the

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Author contributions: S.G. wrote the paper.

The author declares no competing interest.

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See companion articles, "Measuring voluntary and policy-induced social distancing behavior during the COVID-19 pandemic," [10.1073/pnas.2008814118](https://doi.org/10.1073/pnas.2008814118), and "Evaluating the effects of shelter-in-place policies during the COVID-19 pandemic," [10.1073/pnas.2019706118](https://doi.org/10.1073/pnas.2019706118).

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Published April 13, 2021.

first COVID-19 wave. However, the authors also find that there was geographic heterogeneity in these effects, with the relative effects of stay-at-home orders being markedly greater in some counties than others. The authors also note that policy action may have accelerated the mobility response, even if it is possible that, absent the policy action, voluntary behavior itself also would have accelerated the decrease in mobility that contributed to decreased viral spread. This paper is also consistent with some of the emerging literature (7) showing that policy-based responses did indeed contribute to changes in population behavior, suggesting that it is likely that both voluntary behavior change and policy responses matter, and that such an understanding is important to guide our response to future pandemics.

### Looking Ahead, How This Work Moves Us Forward

What are we to make of this complex emerging picture? How can these papers offer guidance after future pandemics, and what do they teach us about why we do what we do? There are several contributions these papers make that, together with other emerging literature, can start to structure our thinking about how, in future, we can optimize response to pandemics that require large-scale population change.

First, the answer to the question posed at the outset of this comment is undoubtedly not straightforward. While it may still be too early to tell, from the available science, whether pandemic change in behavior was driven by human voluntary action or by stay-at-home orders, the analysis of Yan et al. (4) is compelling in its illustration that both likely matter, or at least intersect with one another. Conversely, Berry et al. (3) show that, when it comes to the outcomes that are most of interest—COVID cases and deaths—it is likely voluntary action that matters more, and that policy action was perhaps too little too late as behavior was already set, as populations reset their action voluntarily. The Berry et al. (3) analysis does not preclude the observed heterogeneity of effect observed by Yan et al. (4), nor does it preclude potential add-on effects of policies and voluntary actions over time, suggesting that we may indeed have multiple forces at play contributing to the outcome of interest, with the effect of policy action diluted by the time we get to COVID cases and deaths. It may seem trite to suggest that we need more science to better understand this question, but I suggest that we do. In particular, we need science that connects the causal dots to help understand how upstream forces such as policies or human voluntary action influence outcomes of interest (COVID cases and deaths), and the pathways that link these factors. In particular, while population mobility is a clear pathway between policies and outcomes, none of the published work, so far, addresses how factors such as economic necessities, job exigencies, and the realities of daily living intersect with decisions around voluntary actions or with the implementation or effectiveness of policy action.

Second, these papers, as all good science does, push us to better refine the questions we are asking. Both papers start by asking whether it was voluntary behavior change or policy-driven action that accounted for more of the behavior and COVID mitigation effect in the early days of the pandemic. But, learning from these findings, on reflection, perhaps a better question would be, How can we better understand the intersections of voluntary behavior change and policy efforts to shape, and maintain, particular behavior changes during an evolving pandemic? This, of course, would be a rather different question that would require different methodological approaches. This question may be best understood by thinking of a counterfactual, a useful approach to help

isolate causal questions. A counterfactual scenario would be one where there were no policy efforts to put in place stay-at-home orders or guidance. And the counterfactual question then would be, Would the observed behavior changes that mitigate the spread of the virus have been different had there been no policy directives? I pose this question to challenge the overly easy conclusion from these studies, that policy changes may not contribute to behavior change, and hence, by inference, that they are not necessary in a pandemic. I would hypothesize that, even if the bulk of the behavior change in the context of COVID-19 was due to voluntary behavior change, that behavior change would have been rather different in the medium term had it not been reinforced by policy change that reinforced the importance of mobility reduction for pandemic control, or that required mobility reduction by those who had not already done so voluntarily. Therefore, while it may well be that, in a linear view of the world, voluntary behavior change mattered more than the subsequent policy changes, would the voluntary behavior change have mattered as much as it did in post hoc analysis had there not been the policy changes that were put in place? This question is not answerable using the approaches adopted by the papers at hand, but it pushes us to ask next-order questions that may have implications for how we act in the context of future pandemics.

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Third, the papers at hand remind us of yet more unknowns. Assuming that it is likely correct that voluntary behavior change had much to do with the changes in mobility observed in the United States after the first COVID-19 wave, it remains unclear why that behavior change happened to begin with, and whether it was modifiable in any way toward promoting prosocial and public health ends. It is too easy to suggest that behavior changed because people were afraid of COVID-19. That is undoubtedly true. But why were we afraid? What is it about how the COVID-19 narrative unfolded that made us afraid to begin with? And how did this fear intersect with resources and relative privilege to create conditions where fear of an unknown virus trumped a set of other considerations about the consequences of reduced mobility? It is one of the central stories of COVID-19 that the economic slowdown that accompanied the pandemic affected substantially more those who were already low-wage earners, disproportionately people of color. Therefore, if reduced mobility, and consequent economic function, were driven primarily by voluntary behavior change, it should push us to ask the question, How do we control the fear response and other drivers of voluntary behavior change so as not to introduce, again, an undue penalty on those who were already marginalized in society to begin with? If fear on the part of those who were economically advantaged, and who could work from home without worry about their economic viability, drove response to the pandemic, we then have a

responsibility to understand these forces so that we can guide policies that can intersect with this fear productively, to channel the voluntary reactions in a way that maximizes viral mitigation but minimizes the economic and social impact that disproportionately affect the least powerful population subgroups.

Science has been ascendant during the past year, with COVID-19 bringing about an unprecedented acceleration of scientific output and, really, for the first time in human history, a wholesale global shift in focus on one topic, aiming to help guide us through

an unprecedented global pandemic. All of that is to the good. Importantly, while the science that has been done in the past year was urgent, we are now in a position to start asking the important scientific questions that can only be tackled with the calm dispatch of time. The Berry et al. (3) and Yan et al. (4) papers are exemplars of the kind of careful work that we need to engage in, that answer important open questions but, even more importantly, point us to other questions that we may not even have realized we should be asking. I am looking forward to this emerging learning in coming years.

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