

## Editorial

# Quality, integrity and utility of COVID-19 science: opportunities for public health researchers

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The COVID-19 pandemic has presented many challenges for researchers, including the need to rapidly obtain and disseminate information while still maintaining sufficiently rigorous standards of study design and conduct. The processes of scientific evidence generation, synthesis, use and dissemination underwent a crash test since 2020. It is useful to be self-reflective and capture both the successful and the unsuccessful changes, disruptions and resets in research practices induced by the pandemic response.

Traditional hierarchies of evidence for decision-making in medicine and public health tended to have experimental evidence along with the synthesis of that evidence at the top and expert opinion at the bottom. The pandemic reinforced the importance of rigorous experimental evidence but also showed the large gap induced by the lack of large-scale, reliable and conclusive experimental evidence. Large adaptive randomized controlled trials using rapid recruitment of participants from real-world clinical practice<sup>1,2</sup> were instrumental in documenting treatment benefits with large-scale evidence for some treatments and lack of treatment benefits for many others. Concurrently, many thousands of small, useless trials were launched, many of which were futile or wasted.

Observational data have been essential to demonstrate the effectiveness of interventions at the population level, but the choice of the models and the amount of unmeasured confounding might affect their findings. This became highly manifest for the claims surrounding the effectiveness of non-pharmaceutical interventions, where randomized evidence was a small minority<sup>3</sup> in a literature driven largely by observational data—or even no observational empirical data at all, but modeling, speculation and a high dose of expert opinion.

Expert opinion became prominent during the pandemic with distinct and opposed narratives leading to potentially exaggerated and misleading claims. Expert opinion no longer required scientific journal venues to cast a strong shadow in medical and public health decision-making. Political machinery, advisory committees and task forces, science journalism (both good and bad), media and social media (both brilliant and horrible) formed an explosive mix along with plenty of misinformation and disinformation. Caution in the use of evidence from observational data and expert opinion has not been always practiced in the past, even before the pandemic. However, the advent, use and misuse of weak data and of expert opinion without data reached new heights during COVID-19.

As COVID-19 science output grew enormously with major disruptions in the production and dissemination of evidence, public health researchers were confronted with the need to synthesize and filter this massive literature, making it available to local, national and international policymakers in a way that would be reliably actionable. However, even if well-intentioned, most public health stakeholders were not equipped with the capacity to assess the quality, transparency, reproducibility of all this research and the buzz surrounding it. If an encyclopedia of wrong public health decisions and poor evidence could be written for COVID-19, it must include a large share of the tens of thousands of measures taken to try to deal with the pandemic based on no evidence, weak evidence or wrong evidence. A critical, dispassionate examination of the process is clearly needed to learn from this epic experience and to guide future research with the best research practices and the highest integrity with protection from biases. During the pandemic, the tendency to bypass the usual research standards, rely on opinions over data, and on descriptive/modeling over hypothesis-testing studies have been widely documented. Also, pre-prints were increasingly posted on dedicated servers receiving much public attention; the characteristics of the usage, dissemination (and often trivialization) of their findings in media and social media suggests that the scientific community were unprepared for monitoring and assessing the quality of this overflow of not peer-reviewed papers.

Earlier during the pandemic, Allebeck (Editor-in-Chief of this journal) and Sörberg Wallin asked if the increased number of articles received till then were addressing the most pressing issues regarding the COVID-19 pandemic,<sup>4</sup> listing some examples of the research questions they would have liked to see covered instead, including long-term consequences of the pandemic, effectiveness of control measures, side-effects of lockdowns, and validity of case and mortality national registries.<sup>4</sup> Two years later, some of these questions remain largely unanswered or confusing due to the emergence of contradictory answers. However, there is a widespread perception that the waste in COVID-19-related research has been massive.

The legacy of COVID-19 will likely have repercussions not only for the future handling of SARS-CoV-2, but more generally for the way science is conceived, conducted, appreciated and acted upon. Issues of research quality, integrity and utility have always lurked in the underbelly of science. However, now they have become highly visible, debated and influential not only for research specialists but

also for public health decisions that have affected in major ways the world at large. We should not waste this opportunity to learn—and do better in the future.

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## Data availability

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## References

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