# Introduction: biomedical knowledge in a time of COVID-19

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When the editorial team of HPLS started to plan for two topical collections on the philosophy and history of COVID-19 research, back in March 2020, we were acting on the awareness that this pandemic would be an event of profound consequence for the planet as a whole. Nevertheless we did hope that by the time the collections would be completed, two years later, it would be possible to look back on the emergence of this deadly strand of coronavirus as a past emergency, eventually scaled down through a combination of vaccination, public health measures and global solidarity. Fast-forward to July 2022 and here I am writing this introduction from isolation, having caught omicron variant BA.5 just a few days ago while visiting family in Italy, and tackling demanding caring arrangements for multiple sick relatives as well as the by now "usual" confusion around current guidelines—while remaining grateful for the three doses of vaccine that protect me and loved ones against the most serious consequences of infection. One of the paradoxes of a twenty-first century pandemic is its being predictable and unpredictable at the same time. On the one hand, the coronavirus crisis provided an opportunity to deploy the latest biomedical insights and technologies in a spectacular and prominent fashion. Alongside such technical achievements, most obviously in the form of effective vaccines, there were triumphs for the human and social sciences too, though of a much more discouraging sort. The warnings that many scholars in those fields issued in the early months of 2020—including some of the earliest contributors to this topical collection—turned out to be eerily accurate. The history and contemporary findings of public health experts concerning the potential social impact of the pandemic were vastly ignored. Narrowly construed epidemiological models focused on tracking the spread of infections ruled the first stage of the pandemic response, with many

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politicians arguing that they "followed the science" while at the same time giving widely diverse interpretations of the implications of such findings for government. Ethnic minorities, underprivileged communities, children and elderly everywhere suffered disproportionately from lock-downs, lack of access to social and medical services, and failed communication strategies. Low-resourced countries in the Global South were largely left to fend for themselves, despite lots of noise being made about "sharing the vaccines" through charity efforts; no serious challenge was issued to the intellectual property regimes surrounding the drugs whose production was supported through a colossal show of transnational solidarity among researchers and patients. The virus kept spreading and mutating ever more efficiently; and governments around the globe turned to quick-fix digital technologies to retain some control of the situation, leading to an enormous expansion of existing digital divides and the creation of novel surveillance tools required to certify one's COVID status, often on a national basis. International travel was significantly affected, with families, friends and scientific collaborators separated by newly strengthened borders and insurance requirements. Money became the crucial resource around which access to medical care, transport and everyday necessities—including COVID testing in most countries—revolves. None of this surprised philosophers, historians, and social scientists who had studied previous pandemics, the predictability of the unfolding disaster weighing heavily on debates over the relationship between research and policy.

On the other hand, the pandemic continues to be highly unpredictable on an everyday, situated basis. The appearance of new variants continues to wreak havoc on plans made by individuals and institutions alike, with governmental strategies, no matter how diverse, consistently failing to contain or curb the virus, and wave after wave of new variants overwhelming societies everywhere. The successes in curbing the rate of deaths from COVID, and arguably the decrease in severity of the disease over time, may well be counter-balanced by the emergence of long COVID as a disabling condition for untold numbers of people around the globe - a phenomenon itself vastly underplayed and underestimated by governments eager to proclaim 'victory' against the virus and move on. The initial ranking of "which country is faring best", which was often to be found especially on the newspapers of the nations less affected at the time, became meaningless as soon as places such as Australia, with its initial "zero tolerance" approach, were also overrun with the virus. There is of course no underestimating the significance of the prompt discovery of vaccines, and the millions of lives saved through their swift administration accompanied by severe measures to contain transmission, such as social distancing and the wearing of masks. And yet, vaccine hesitancy combined with low availability in many of the poorer communities and the greed of pharmaceutical companies in charge of production have limited the effectiveness of vaccines.

It is at such a time of uncertainty that interdisciplinary research encompassing the humanities and natural/social sciences is at its most useful, and this is where the contributions in this topical collection truly shine. History, philosophy and social studies of the life sciences—including biomedicine and epidemiology—are a precious resource for understanding the present and preparing for the future, by helping to place scientific findings and technical fixes into a broader societal perspective, intervene into science-in-the-making with insights around what could be improved

and/or taken into account, and working through what the lessons learnt from the past may signify in our new and evolving context. This collection aimed to harness the research done by many HPLS contributors in this domain, thus providing a first HPLS perspective on the pandemic that was specifically tailored to the historical moment—the first eighteen months of the pandemic. The hope is that this collection will demonstrate the capacity of HPLS not only to think on their feet (as demonstrated by our other collection of short papers, URL: https://link.springer.com/journal/40656/topicalCollection/AC_af37b22a2bd2a600bb6606bfe53dd415/page/1), but also to bring the considerable body of HPLS research already in existence to the study of the pandemic, with the explicit aim to improve future COVID science and related social interventions.

To this aim, we started the collection with an open call to anybody in our field who may have had the opportunity and resources to carry out research on the unfolding pandemic. The call resulted in many expressions of interest and nine papers finally accepted, which cover three key aspects of COVID research and its history. A large cluster of contributions are of course focused on the role of models and the practice and technologies of modelling, including: an examination of the roots of epidemic theories that shaped twentieth century epidemiology (Lukas Engelmann, https://link.springer.com/article/10.1007/s40656-021-00445-z); a comparative study of the most popular epidemiological models used for the pandemic (Valeriano Iranzo & Saúl Pérez-González https://link.springer.com/article/10.1007/s40656-021-00457-9); an analysis of how predictive epidemiological models provide both descriptive and explanatory understanding of the pandemic (Johannes Findl & Javier Suárez https://link.springer.com/article/10.1007/s40656-021-00461-z); and an investigation of the highly consequential, yet much underrated, entanglement between software engineering tools and pandemic modelling efforts (Jack K. Horner & John F. Symons https://link.springer.com/article/10.1007/s40656-020-00347-6). A second cluster concerns the use of metaphors within scientific research as well as public debate around its findings. Marcel Boumans https://link.springer.com/article/10.1007/s40656-021-00374-x explores in detail the merits and pitfalls of the idea of "flattening the curve" of transmission that dominated the press especially in the first year of the pandemic; Btihaj Ajana https://link.springer.com/article/10.1007/s40656-021-00384-9 critically considers the notions of defence and sacrifice intrinsic to immunological discourse in and out of biology; and Margherita Benzi & Marco Novarese https://link.springer.com/article/10.1007/s40656-022-00501-2 tackle the 'elephant in the room' by analysing the influence of war metaphors within public communication concerning COVID-19. Finally, Brian Rappert's https://link.springer.com/article/10.1007/s40656-021-00415-5 and Azita Chellappoo's https://link.springer.com/article/10.1007/s40656-021-00477-5 papers further expand our gaze to reflect on the broader social and biomedical context for the management of evidence (such as death counts, in Rappert's case) and narratives (such as the link between mortality and obesity in Chellappoo's) within public discourse around the pandemic.

One of the key challenges in putting this important body of work together was to identify referees willing to provide constructive and rigorous feedback to papers written in response to a new phenomenon, which required an enormous effort from

our referees at a time of great distress for most. We are immensely grateful to the dozens of colleagues who took time and energy to help us and the authors to improve the papers, and of course to the authors themselves for their excellent work and their patience with the revision process. Last but not least, I want to extent my thanks and gratitude for their brilliant, dedicated work to: David Teira, who edited this topical collection with me; the HPLS editorial team as a whole, including of course my co-editor-in-chief Giovanni Boniolo, our book review editor Daniel Nicholson, and our associate editors Lisa Onaga, Katie Kendig and Pierre-Olivier Methot; and the Springer production team, particularly Saranya Karunakaran and Marielle Klijn.