Journal of Clinical Epidemiology 173 (2024) 111428

Journal of Clinical Epidemiology

COMMENTARY

# Panel stacking is a threat to consensus statement validity

Kasper P. Kepp[a], Preben Aavitsland[b,c], Marcel Ballin[d,e], Francois Balloux[f], Stefan Baral[g,h,i], Kevin Bardosh[j,k], Howard Bauchner[l], Eran Bendavid[m,n,o], Raj Bhopal[p], Daniel T. Blumstein[q], Paolo Boffetta[r,s], Florence Bourgeois[t], Adam Brufsky[u], Peter J. Collignon[v,w], Sally Cripps[x], Ioana A. Cristea[y], Nigel Curtis[z,aa,ab], Benjamin Djulbegovic[ac], Oliver Faude[ad], Maria Elena Flacco[ae], Gordon H. Guyatt[af,ag], George Hajishengallis[ah], Lars G. Hemkens[ai], Tammy Hoffmann[aj], Ari R. Joffe[ak], Terry P. Klassen[al], Despina Koletsi[am], Dimitrios P. Kontoyiannis[an], Ellen Kuhl[ao], Carlo La Vecchia[ap], Tea Lallukka[aq], John Lambris[ar], Michael Levitt[as], Spyros Makridakis[at], Helena C. Maltezou[au], Lamberto Manzoli[r], Ana Marusic[av], Clio Mavragani[aw], David Moher[ax,ay], Ben W. Mol[az], Taulant Muka[ba], Florian Naudet[bb,bc,bd], Paul W. Noble[be], Anna Nordström[bf,bg,bh], Peter Nordström[e], Nikolaos Pandis[bi], Stefania Papatheodorou[bj,bk], Chirag J. Patel[bl], Irene Petersen[bm], Stefan Pilz[bn], Nikolaus Plesnila[bo,bp], Anne-Louise Ponsonby[bq,br,bs], Manuel A. Rivas[bt], Andrea Saltelli[bu,bv], Manuel Schabus[bw], Michaéla C. Schippers[bx], Holger Schünemann[af], Marco Solmi[by,bz], Andreas Stang[ca], Hendrik Streeck[cb], Joachim P. Sturmberg[cc,cd], Lehana Thabane[af], Brett D. Thombs[ce,cf,cg,ch,ci,cj], Athanasios Tsakris[ck], Simon N. Wood[cl], John P.A. Ioannidis[a,bt,cm,cn,co,*]

[a]*Meta-Research Innovation Center at Stanford, Stanford University, Stanford, CA, USA*
[b]*Pandemic Centre, University of Bergen, Bergen, Norway*
[c]*Norwegian Institute of Public Health, Oslo, Norway*
[d]*Centre for Epidemiology and Community Medicine, Region Stockholm, Stockholm, Sweden*
[e]*Department of Public Health and Caring Sciences, Clinical Geriatrics, Uppsala University, Uppsala, Sweden*
[f]*UCL Genetics Institute, University College London, London, UK*
[g]*Department of Epidemiology, Johns Hopkins School of Public Health, Baltimore, MD, USA*
[h]*Department of International Health, Johns Hopkins School of Public Health, Baltimore, MD, USA*
[i]*Department of Health, Policy, and Management, Johns Hopkins School of Public Health, Baltimore, MD, USA*
[j]*School of Public Health, University of Washington, Seattle, WA, USA*
[k]*Edinburgh Medical School, University of Edinburgh, Edinburgh, UK*
[l]*Department of Pediatrics, Boston University School of Medicine, Boston, MA, USA*
[m]*Department of Medicine (Primary Care and Population Health), Stanford University School of Medicine, Stanford, CA, USA*
[n]*Department of Health Policy, Stanford University School of Medicine, Stanford, CA, USA*
[o]*Freeman Spogli Institute for International Studies, Stanford University, Stanford, CA, USA*
[p]*Usher Institute, University of Edinburgh, Edinburgh, UK*
[q]*Department of Ecology & Evolutionary Biology, Institute of the Environment & Sustainability, University of California Los Angeles, Los Angeles, CA, USA*
[r]*Department of Medical and Surgical Sciences, University of Bologna, Bologna, Italy*
[s]*Stony Brook Cancer Center, Stony Brook University, Stony Brook, NY, USA*
[t]*Department of Pediatrics, Harvard Medical School, Boston, MA, USA*
[u]*Division of Hematology-Oncology, Department of Medicine, University of Pittsburgh, Pittsburgh, PA, USA*
[v]*Department of Infectious Diseases and Microbiology, Canberra Hospital, Garran, Australian Capital Territory, Australia*
[w]*Department of Infectious Disease, Medical School, Australian National University, Acton, Australian Capital Territory, Australia*
[x]*Human Technology Institute, University of Technology Sydney, Sydney, Australia*
[y]*Department of General Psychology, University of Padova, Padova, Italy*
[z]*Department of Paediatrics, The University of Melbourne, Parkville, Australia*

* Corresponding author. Department of Medicine (Stanford Prevention Research Center), Stanford University School of Medicine, 1265 Welch Rd, Medical School Office Building, Room X306, Stanford, CA 94305, USA.
*E-mail address:* jioannid@stanford.edu (J.P.A. Ioannidis).

https://doi.org/10.1016/j.jclinepi.2024.111428
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[aa]*Infectious Diseases Research Group, Murdoch Children's Research Institute, Parkville, Australia*
[ab]*Infectious Diseases Unit, The Royal Children's Hospital Melbourne, Parkville, Australia*
[ac]*Division of Hematology/Oncology, Department of Medicine, Medical University of South Carolina, Charleston, SC, USA*
[ad]*Department of Sport, Exercise and Health, University of Basel, Basel, Switzerland*
[ae]*Department of Environmental and Prevention Sciences, University of Ferrara, Ferrara, Italy*
[af]*Faculty of Health Sciences, Department of Health Research Methods, Evidence and Impact, McMaster University, Hamilton, Ontario, Canada*
[ag]*Faculty of Health Sciences, Department of Medicine, McMaster University, Hamilton, Ontario, Canada*
[ah]*Department of Basic and Translational Sciences, Penn Dental Medicine, University of Pennsylvania, Philadelphia, PA, USA*
[ai]*Department of Clinical Research, University Hospital Basel, University of Basel, Basel, Switzerland*
[aj]*Faculty of Health Sciences and Medicine, Institute for Evidence-Based Healthcare, Bond University, Robina, Queensland, Australia*
[ak]*Department of Pediatrics and John Dossetor Health Ethics Center, University of Alberta, Edmonton, Alberta, Canada*
[al]*Children's Hospital Research Institute of Manitoba, Department of Pediatrics and Child Health, Rady Faculty of Health Sciences, University of Manitoba, Winnipeg, Manitoba, Canada*
[am]*Clinic of Orthodontics and Pediatric Dentistry, Center of Dental Medicine, University of Zurich, Zurich, Switzerland*
[an]*Division of Internal Medicine, Department of Infectious Diseases, Infection Control, and Employee Health, University of Texas MD Anderson Cancer Center, Houston, TX, USA*
[ao]*Departments of Mechanical Engineering and of Bioengineering, Stanford University, Stanford, CA, USA*
[ap]*Department of Clinical Sciences and Community Health, Università degli Studi di Milano, Milano, Italy*
[aq]*Department of Public Health, University of Helsinki, Helsinki, Finland*
[ar]*Department of Pathology and Laboratory Medicine, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA, USA*
[as]*Department of Structural Biology, Stanford University School of Medicine, Stanford, CA, USA*
[at]*Institute For the Future (IFF), University of Nicosia, Nicosia, Cyprus*
[au]*Directorate of Research, Studies and Documentation, National Public Health Organization, Athens, Greece*
[av]*Department of Research in Biomedicine and Health and Center for Evidence-based Medicine, University of Split School of Medicine, Split, Croatia*
[aw]*Department of Physiology, Medical School, National and Kapodistrian University of Athens, Athens, Greece*
[ax]*Centre for Journalology, Clinical Epidemiology Program, Ottawa Hospital Research Institute, Ottawa, Ontario, Canada*
[ay]*School of Epidemiology and Public Health, Faculty of Medicine, University of Ottawa, Ottawa, Ontario, Canada*
[az]*Department of Obstetrics and Gynaecology, Monash University, Clayton, Australia*
[ba]*Epistudia, Bern, Switzerland*
[bb]*Research Institute for Environmental and Occupational Health (IRSET, UMR_S INSERM 1085), University of Rennes, Rennes, France*
[bc]*Institut Universitaire de France, Paris, France*
[bd]*Clinical Investigation Center (INSERM CIC 1414) and Adult Psychiatry Department, Rennes University Hospital, Rennes, France*
[be]*Department of Medicine, Women's Guild Lung Institute, Cedars-Sinai Medical Center, Los Angeles, CA, USA*
[bf]*Department of Public Health and Clinical Medicine, Umeå University, Umeå, Sweden*
[bg]*School of Sport Sciences, UiT the Arctic University of Norway, Tromsø, Norway*
[bh]*Department of Health Sciences, The Swedish Winter Sport Research Centre, Mid Sweden University, Östersund, Sweden*
[bi]*Department of Orthodontics and Dentofacial Orthopedics, Dental School/Medical Faculty, University of Bern, Bern, Switzerland*
[bj]*Department of Biostatistics and Epidemiology, Rutgers School of Public Health, Piscataway, NJ, USA*
[bk]*Department of Epidemiology, Harvard T.H. Chan School of Public Health, Boston, MA, USA*
[bl]*Department of Biomedical Informatics, Harvard Medical School, Boston, MA, USA*
[bm]*Department of Primary Care and Population Health, University College London, London, UK*
[bn]*Division Endocrinology and Diabetology, Department of Internal Medicine, Medical University of Graz, Graz, Austria*
[bo]*Institute for Stroke and Dementia Research (ISD), Ludwig-Maximilians-University Munich, Munich, Germany*
[bp]*Munich Cluster for Systems Neurology (Synergy), Munich, Germany*
[bq]*The Florey Institute of Neuroscience and Mental Health, Melbourne, Australia*
[br]*Murdoch Children's Research Institute, Royal Children's Hospital, Melbourne, Australia*
[bs]*Centre of Epidemiology and Biostatistics, School of Population and Global Health, University of Melbourne, Melbourne, Australia*
[bt]*Department of Biomedical Data Science, Stanford University School of Medicine, Stanford, CA, USA*
[bu]*UPF Barcelona School of Management, Barcelona, Spain*
[bv]*Centre for the Study of the Sciences and the Humanities, University of Bergen, Bergen, Norway*
[bw]*Department of Psychology, University of Salzburg, Salzburg, Austria*
[bx]*Department of Organisation and Personnel Management, Erasmus University Rotterdam, Rotterdam, Netherlands*
[by]*Department of Psychiatry, University of Ottawa, Ottawa, Ontario, Canada*
[bz]*Department of Child and Adolescent Psychiatry, Charité Universitätsmedizin, Berlin, Germany*
[ca]*Institute of Medical Informatics, Biometry and Epidemiology, University Hospital Essen, Essen, Germany*
[cb]*Faculty of Medicine, Institute of Virology, University of Bonn, Bonn, Germany*
[cc]*College of Health, Medicine and Wellbeing, University of Newcastle, Holgate, New South Wales, Australia*
[cd]*International Society for Systems and Complexity Sciences for Health, Waitsfield, Vermont, USA*
[ce]*Lady Davis Institute for Medical Research, Jewish General Hospital, Montreal, Quebec, Canada*
[cf]*Department of Psychiatry, McGill University, Montreal, Quebec, Canada*

[cg]Department of Epidemiology, Biostatistics, and Occupational Health, McGill University, Montreal, Quebec, Canada
[ch]Department of Medicine, McGill University, Montreal, Quebec, Canada
[ci]Biomedical Ethics Unit, McGill University, Montreal, Quebec, Canada
[cj]Department of Psychology, McGill University, Montreal, Quebec, Canada
[ck]Department of Microbiology, Medical School, University of Athens, Athens, Greece
[cl]Chair of Computational Statistics, School of Mathematics, University of Edinburgh, Edinburgh, UK
[cm]Department of Medicine (Stanford Prevention Research Center), Stanford University School of Medicine, Stanford, CA, USA
[cn]Department of Epidemiology and Population Health, Stanford University School of Medicine, Stanford, CA, USA
[co]Department of Statistics, Stanford University School of Humanities and Sciences, Stanford, CA, USA

Accepted 10 June 2024; Published online 17 June 2024

**Abstract**

Consensus statements can be very influential in medicine and public health. Some of these statements use systematic evidence synthesis but others fail on this front. Many consensus statements use panels of experts to deduce perceived consensus through Delphi processes. We argue that stacking of panel members toward one particular position or narrative is a major threat, especially in absence of systematic evidence review. Stacking may involve financial conflicts of interest, but nonfinancial conflicts of strong advocacy can also cause major bias. Given their emerging importance, we describe here how such consensus statements may be misleading, by analyzing in depth a recent high-impact Delphi consensus statement on COVID-19 recommendations as a case example. We demonstrate that many of the selected panel members and at least 35% of the core panel members had advocated toward COVID-19 elimination (Zero-COVID) during the pandemic and were leading members of aggressive advocacy groups. These advocacy conflicts were not declared in the Delphi consensus publication, with rare exceptions. Therefore, we propose that consensus statements should always require rigorous evidence synthesis and maximal transparency on potential biases toward advocacy or lobbyist groups to be valid. While advocacy can have many important functions, its biased impact on consensus panels should be carefully avoided. © 2024 Elsevier Inc. All rights are reserved, including those for text and data mining, AI training, and similar technologies.

*Keywords:* Evidence based medicine; Consensus statements; Panel bias; Transparency; Competing interests; Guidelines

**Plain language summary**

Consensus statements without systematic evidence may be biased toward specific views. We describe this problem both generically and in detail, by a case study of a recent high-impact consensus statement about COVID-19. We identify substantial undeclared advocacy interests that might have affected the panel views. To solve this issue, we propose that consensus statements always need to conduct a valid, rigorous evidence synthesis, and urge the development of protocols to ensure transparency and reduce biases in panels. This can be very important as such statements become increasingly common.

Thousands of consensus, guideline, and position statements are published annually and many of them exert significant influence on clinical decision-making, research priorities, public health policy, and other key matters informed by science. Scientific consensus-building should distinguish opinion from evidence [1] and ensure that the eventual consensus is supported by the evidence; this is a critical distinction between evidence-based and nonevidence-based consensus statements [2,3]. An early and indispensable step is to systematically review and appraise the available relevant evidence in an impartial way. Then, committees of panelists can use this systematic review, deliberate, and reach conclusions ensuring that judgment reflects the strength of the underlying evidence [4]. Delphi methods aim to improve decision-making by diminishing groupthink [5]. However, the methods are characterized by variable implementation and lack of consistency [6], and validity depends on which panelists are included and their preferences and allegiances, especially when the evidence is limited, contentious, uncertain, or not systematically reviewed. Empirical data suggest that consensus-based approaches without evidence synthesis are 3−5−fold more likely than evidence-based approaches to yield misleading advice [5,7].

Two requirements are essential when constructing consensus panels. First, the core group and the panel should comprehensively reflect the diversity of the expert landscape. Second, there should be transparency regarding specific preferences and allegiances [8]. Guided recruitment of similar views (‘‘stacking’’) can occur when key members

**Key findings**

- An influential consensus statement without systematic evidence review, extensive panel stacking with advocates and undeclared related conflicts can be highly misleading.

**What this adds to what was known?**

- Panel stacking for non-financial advocacy-related conflicts of interest can be a major problem for consensus statements.

**What is the implication and what should change now?**

- Panel stacking should be avoided in consensus statements and systematic review plus thorough conflict declarations are essential to promote.

(eg, chairs or core groups) nominate panelists with strong views, preferences, or allegiances independent of evidence. Recruitment specifically because of expressed viewpoints and allegiance is a recognized major problem for guideline development [9]. The issue can be exacerbated when stacked core group and panel members also choose the topics and phrasing of questions to be answered, weigh the review or method toward their own knowledge rather than adhering to accepted evidence review standards, and/or do not disclose conflicts of interest.

A systematic review of how guideline panels make recommendations showed that social dynamics significantly influence the development of recommendations: chairs and co-chairs dominate the process, while less influential stakeholders (such as patient partners) contribute to less than 5% of the total debate [10]. Strong opinions particularly dominate the process when panels are faced with insufficient or low-quality evidence [10]. Furthermore, when information was framed in terms of "positive" statements (as typically done in advocacy consensus statements), the presence of cognitive "yes" bias was apparent: panelists tended to more easily acquiesce with positive assertions that required less cognitive effort than negative statements [10,11].

## 1. A case study: Delphi consensus on COVID-19

As an example of potential panel stacking, we analyzed what was described as a "multinational Delphi consensus to end the COVID-19 public health threat" [12] published in *Nature*. The consensus included the views of 386 panel experts who developed 41 statements and 57 recommendations for mitigating COVID-19, making it a potentially very impactful position paper on this important topic that is already highly cited. The authors of the consensus state that: *"The four co-chairs … identified a core group of 40 …experts ... Selection by the co-chairs was primarily based on publication record and engagement on COVID-19 issues as well as online biographies. Twenty-nine of these experts were well known to the chairs while seven were suggested through snowball sampling … The core group proposed additional experts to create a global panel of approximately 400 experts*." [12].

There is no universally accepted method of selecting panelists [13], but snowball-sampling is highly sensitive to personal network biases and may sometimes reflect limited merit [14,15]. In this analysis, we therefore used conflict of interests by association with a particular advocacy view as a proxy of potential consensus panel stacking.

We found that panel selection favored the inclusion of advocates of SARS-CoV-2 elimination ("Zero-COVID") perspectives. Zero-COVID was a minority position in 2021 even in the mild version of being feasible in "some" regions (eg, New Zealand) [16], but the groups identified here advocated in Europe and North America, where the policy was less feasible. Zero-COVID was widely abandoned by 2022 [17] and eventually broadly recognized as unattainable [18].

At least 14 of 40 (35%) core members of the *Nature* consensus and at least another 59 panelists are explicitly named in influential and highly visible Zero-COVID advocacy/activism efforts in North America and Europe (Box 1: References R1-R11, Fig, Supplementary Table 1). Thus, at least 20% of named panelists (73/367; 19 panelists did not wish their names revealed) engaged in such strong advocacy/activism.

The 367 named panelists include 9 of 25 (36%) signatories of a highly publicized Zero-COVID open letter,[R1] 3 of 8 (38%) signatories of a *Lancet* letter supporting elimination,[R2] 36 of 132 signatories (26%) of the World Health Network (WHN),[R3] 41 of 108 (38%) signatories of the Vaccines Plus advocacy letter,[R4] 7 of 19 (37%) full members of Independent Scientific Advisory Group for Emergencies,[R5] 14 of 47 (30%) WHN members or experts-advisors,[R6] 5 of 79 (6%) Australian Strategic Advisory Group of Experts members,[R7] 3 of 14 (21%) NO-COVID members,[R8] 5 of 8 (63%) End Coronavirus advisors,[R9] 9 of 13 (69%) authors of another elimination viewpoint,[R10] and 3 of 17 (18%) Zero-COVID-US members.[R11] Large overlap emerged in membership across these efforts, typical of advocacy activities.

Only 2 of 73 advocates/activists we identified ("S.G." and "K.Y.") disclosed advocacy/activism in the competing interests section (Independent SAGE membership). Consistent with general guidance on disclosing conflicts of interest, *Nature* authorship requires disclosure of "unpaid membership in an advocacy or lobbying organization" (https://www.nature.com/nature-portfolio/editorial-policies/competing-interests), but all members of WHN, Australian Strategic Advisory Group of Experts, End Coronavirus, Zero-

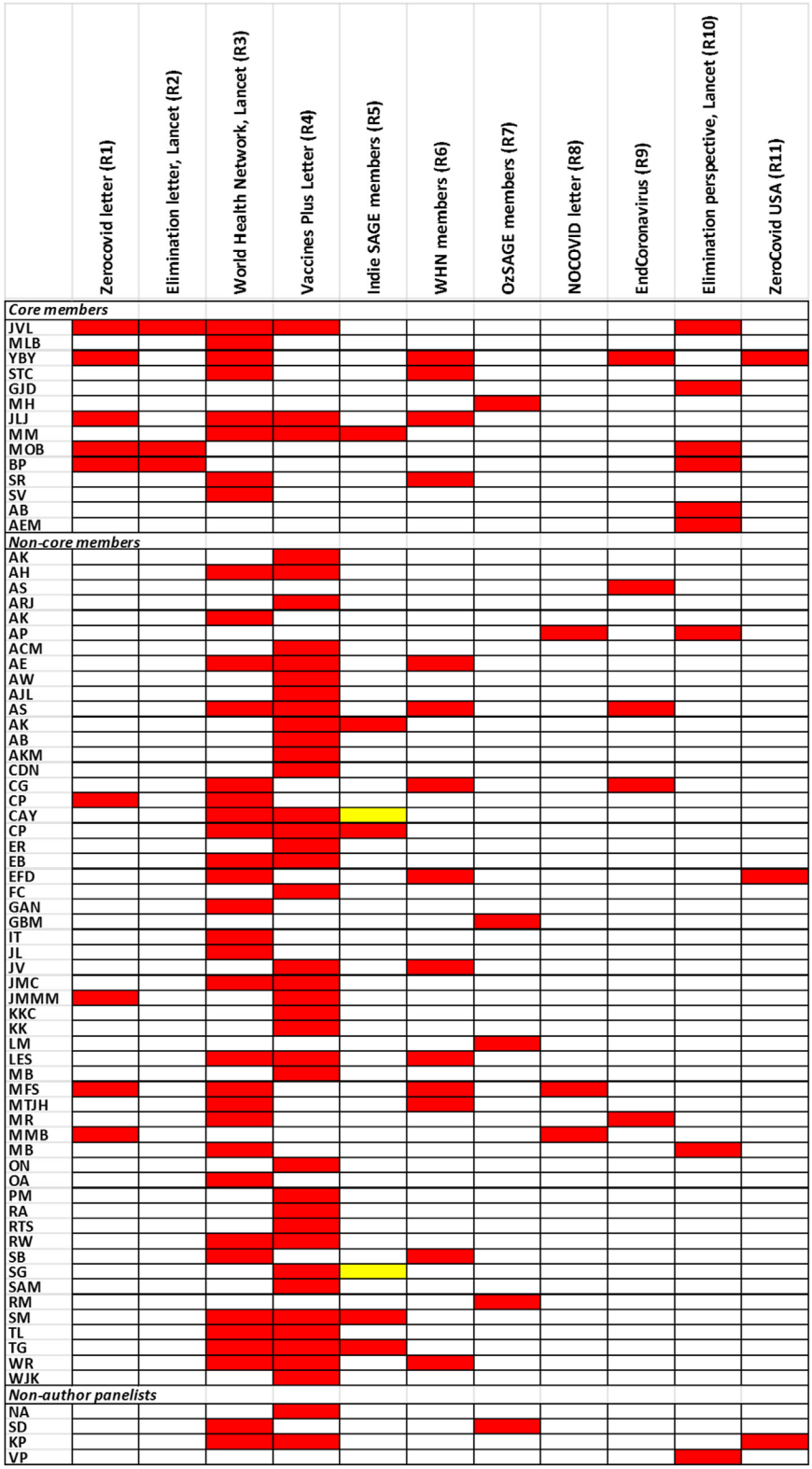


**Figure.** Named membership in advocacy efforts by panelists of Lazarus et al [12]. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

**Table 1.** Panelists of the ''multinational Delphi consensus to end the COVID-19 public health threat'' [12] who are in the top-2% of their scientific subfield (career-long impact) among scientists who published at least 5 full papers in their career (original articles, reviews, or conference papers)

| Main scientific subfield | Core | Other author | Panel only | Total | Rank in subfield[b] | Total scientists in subfield[c] |
|---|---|---|---|---|---|---|
| TOTAL | 15 | 49 | 7 | 71 | | |
| Virology | 4 | 2 | 1 | 7 | 11, 74, 131, 284,353, 696, 1264 | 68,279 |
| Tropical Medicine | 1 | 2 | 0 | 3 | 4, 36, 308 | 35,237 |
| Toxicology | 0 | 1 | 1 | 2 | 892, 1133 | 61,427 |
| Substance Abuse | 0 | 1 | 0 | 1 | 11 | 15,621 |
| Respiratory System | 0 | 1 | 0 | 1 | 204 | 62,483 |
| Public Health | 2 | 6 | 0 | 8 | 11, 12, 15, 165, 204, 309, 323, 756 | 64,147 |
| Psychiatry | 0 | 0 | 1 | 1 | 318 | 75,274 |
| Oncology and Carcinogenesis | 0 | 1 | 0 | 1 | 683 | 311,930 |
| Obstetrics and Reproductive Medicine | 0 | 1 | 0 | 1 | 277 | 91,850 |
| Microbiology | 1 | 7 | 1 | 9 | 110, 191, 824, 965, 1186, 1934, 1947, 3741, 3790 | 190,257 |
| Meteorology and Atmospheric Sciences | 1 | 0 | 1 | 2 | 526, 681 | 70,828 |
| Health Policy and Services | 0 | 0 | 1 | 1 | 270 | 20,709 |
| Genetics and Heredity | 0 | 1 | 0 | 1 | 482 | 38,076 |
| General and Internal Medicine | 2 | 14 | 1 | 17 | 18, 42, 138, 189, 416, 621, 698, 829, 986, 1194, 1505, 1531, 1929, 2449, 2715, 2876, 6205 | 321,279 |
| Gastroenterology and Hepatology | 1 | 1 | 0 | 2 | 373, 458 | 98,720 |
| Fluids and Plasmas | 1 | 0 | 0 | 1 | 436 | 50,409 |
| Environmental Sciences | 0 | 3 | 0 | 3 | 19, 763, 905 | 99,480 |
| Environmental and Occupational Health | 0 | 1 | 0 | 1 | 128 | 14,381 |
| Energy | 1 | 0 | 0 | 1 | 919 | 287,766 |
| Endocrinology and Metabolism | 0 | 1 | 0 | 1 | 348 | 87,900 |
| Emergency and Critical Care Medicine | 0 | 2 | 0 | 2 | 487, 650 | 36,979 |
| Building and Construction | 0 | 3 | 0 | 3 | 28, 68, 252 | 38,335 |
| Applied Ethics | 1 | 0 | 0 | 1 | 1 | 5857 |
| Analytical Chemistry | 0 | 1 | 0 | 1 | 298 | 114,981 |
| 150 other subfields[a] | 0 | 0 | 0 | 0 | None | 7,355,558 |

For details on methods regarding this table and for another relevant bibliometric evaluation related to COVID-19–related impact, see Supplementary Methods.

[a] 150 of the 174 subfields of science are not represented by any top-2% cited scientists among the 367 panelists of the consensus; illustratively, these nonrepresented subfields include (among others) Education, Demography, Family Studies, Gender Studies, Cultural Studies, Sociology, Social Work, International Relations, Law, Political Science and Public Administration, Science Studies, Social Science Methods, Food Science, Bioinformatics, Operations Research, Information Systems, Medical Informatics, Networking and Telecommunications, Communication and Media Studies, Anthropology, Philosophy, Agricultural Economics and Policy, Business and Management, Development Studies, Econometrics, Economic Theory, Economics, Finance, Industrial Relations, Logistics and Transportation, Marketing, Sport, Leisure and Tourism, Biochemistry and Molecular Biology, Biophysics, Developmental Biology, Nutrition and Dietetics, Physiology, Allergy, Anesthesiology, Arthritis and Rheumatology, Cardiovascular System and Hematology, Dentistry, Dermatology and Venereal Diseases, General Clinical Medicine, Geriatrics, Immunology, Legal and Forensic Medicine, Neurology and Neurosurgery, Pathology, Pediatrics, Pharmacology and Pharmacy, Sport Sciences, Surgery, Behavioral Science and Comparative Psychology, Clinical Psychology, Developmental and Child Psychology, Experimental Psychology, General Psychology and Cognitive Sciences, Human Factors, Social Psychology, Epidemiology, Gerontology, Nursing, Rehabilitation, Ecology, Evolutionary Biology, Zoology, Applied Mathematics, Statistics and Probability, and several others (the nomenclature of subfields is according to the Science Metrix classification). While most published guidelines and consensus papers typically focus on circumscribed topics where only 1 or a few scientific subfields are relevant, this COVID-19 consensus aims to cover so many society-wide and government-wide aspects that all of these subfields listed above (and more) have essential roles to inform the statements and recommendations. Furthermore, for subfields that are represented by top-cited scientists (eg, Public Health), their representation does not mean that these experts represent appropriately the spectrum of different positions given the selection process in favor of specific advocacy perspectives.

[b] Excluding self-citations.

[c] With at least 5 full publications.

COVID-US, NO-COVID Europe, and all but 2 of 7 active members of Independent SAGE declared no competing interests. Such lack of disclosures could mislead readers.

The number of panelists engaged in related advocacy/activism is probably far larger than the number we uncovered. We only assessed several well-known groups. Many similar, associated groups exist, especially at national levels. Most lack publicly posted membership lists. Illustratively, dozens of Zero-COVID organizations are listed in [R3]. Still, key members of Zero-COVID advocacy groups were probably $<1\%$ of the 720,801 scientists [19] who authored COVID-19−related papers in 2020−2021 alone. A 35% (or more) prevalence of declared Zero-COVID advocates among core panel members is extreme.

Columns represent efforts/initiatives/organizations presented in the respective references. Red color means advocacy/activism not disclosed. Yellow color means advocacy/activism disclosed. For detailed methods, see Supplementary Methods; for names of panelists, see Supplementary Table 1; and for information on the 11 sources, see Supplementary References R1-11.

The panelists include many highly respected experts (https://elsevier.digitalcommonsdata.com/datasets/btchxktzyw/6). Among 367 named panelists, 71 (19%) are in the top-2% of their scientific subfield based on a composite citation indicator [20] for career-long impact (Table 1, Supplementary Table 2). The main subfields of these 71 highly cited authors include 24 of the 174 subfields of science (Science-Metrix classification, https://science-metrix.com/classification/). Most (41 of 71) are concentrated in 4 subfields (general/internal medicine, microbiology, public health, and virology). Conversely, no named panelists were top-cited scientists in 150 of the 174 subfields of science. These 150 subfields include most biomedical research (9 of 12) and clinical medicine (24 of 32) subfields, half (4 of 8) of the public health and health services subfields, notably all 8 psychology and cognitive sciences subfields, all 15 social sciences subfields, all 12 economics and business subfields, all 4 mathematics and statistics subfields, and all 8 information and communication technologies subfields. These absences may have limited multidisciplinary pandemic insights, and with almost 400 panelists, expanding beyond 24 subfields seems feasible. Furthermore, there was no public involvement and commenting, and no systematic evidence review. In short, experts with strong, known preferences could select the topics, evidence, and final statements with little/no restraint from the community or impartial, systematic evidence synthesis.

## 2. Causes and implications of stacking

The roots of stacking are often financial interests, especially statements about drugs, devices, or other healthcare interventions. Industry lobbyism may seek to change narratives on evidence [8], and stacked panels help achieve this. There is currently no systematic or quantitative way to assess the risk of bias from conflicted interests; we only require them to be declared. Committee members may have financial ties to manufacturers and sponsors of drugs and technologies under evaluation [21]. Therefore, some guideline organizations increasingly make efforts to ensure that committee members have not had any relevant financial conflicts, especially in the recent past. Committee members may also be asked to declare that they will avoid relevant financial conflicts for some years after the guidelines are released.

However, these efforts may not reduce the risk of stacking with respect to nonfinancial interests [22]. Nonfinancial conflicts are very diverse and may be specific to topic and circumstances. Some nonfinancial conflicts such as group allegiances are difficult to document. Even without direct financial gain, stacking of specific narratives may inadvertently occur due to the biased nature of human networks: snowballing *inherently* selects for similar viewpoints. Advocates may perceive that they simply work for the broader common good by promoting what they believe is true, while also promoting or facilitating potential government, organization, or ordinance policies either consciously or unconsciously. Advocates may also intrinsically be more likely to accept an offer to a panel on policy recommendations. For exactly these reasons, Guideline International Network principles discourage the inclusion of people with strongly held preguidance views in development of recommendations [23].

The implications of stacking and simultaneous failure to disclose substantial advocacy association can be far-reaching: If activism-biased or lobbyism-biased consensus papers become common, and published by high-impact journals, organized interest networks with nontransparent membership could create through biased recruitment a false impression of consensus on virtually any topic, especially misleading when disclosures are incomplete. This could distort consensus and even stifle efforts to obtain scientific evidence on otherwise unsettled matters, with broad harms to science and society.

The problem with stacked consensus statements and recommendations is not only the increased risk of being wrong. Even when they are right, the recommendations are more likely to be incomplete and partial, as they may prioritize narratives that preoccupy the advocates. This diminishes or even eliminates other important perspectives. Choices of language, phrasing, statements, and recommendations become lopsided. Illustratively, in the COVID-19 consensus example dissected above, the lengthy 41 statements and 57 recommendations [12] never mention the words "randomized," "lockdown," "closures," "isolation," "loneliness," "learning loss," "poverty," "depression," "hunger," "cost-benefit," "tradeoff," "censorship," or "mandate." They mention the word "harm" once, in statement STMT3.1, which does not discuss harms to individuals, groups, or communities themselves, but highlights "risk of harm to others" to endorse

government mandatory policies [12]. ‘‘Education’’ or ‘‘schools’’ are never mentioned and ‘‘educational’’ and ‘‘schooling policies’’ are only mentioned in recommendation REC4.6: ‘‘Prevention of SARS-CoV-2 transmission in the workplace, educational institutions, and centers of commerce should remain a high priority’’… ‘‘remote work/schooling policies’’ [12]. ‘‘Mental’’ (health) is mentioned only for children and healthcare workers. ‘‘Evidence-based’’ is mentioned only twice: STMT2.1 admits lack of evidence-based standards and STMT6.8 is dismissive of the evidence-based medicine paradigm [12].

## 3. Moving forward

Despite scientific evidence being imperfect, aligning judgment with the evidence after weighing it transparently remains the most important guardrail protecting the consensus process. Every effort should be made to allow evidence to serve as a ‘‘neutral arbiter among competing views’’ [24]. Consensus expert panels without systematic review are easily dominated by few individuals even when many experts participate [10,25,26]. They should be replaced by robust evidence-based approaches when evidence exists. In the case of the COVID-19 example discussed above, the published literature exceeds 500,000 articles. However, sometimes evidence is limited, and entirely opinion-based Delphi processes may have some value, informing on opinion trends. They would then benefit from better standardization and improved reporting [27] and even preregistration [28]. But given how sensitive panels are to stacking, transparent efforts to ensure nonbiased recruitment of panelists is critical, as is full transparency on aspects that may indicate risks of stacking.

Advocacy and activism are only part of a spectrum of potential nonfinancial conflicts that may create panel stacking. Other relevant nonfinancial competing interests may include, for example, membership in a governmental or nongovernmental organization, advisory positions in commercial organizations, writing or consulting for an educational company, and acting as an expert witness. Advocacy is essential for improving our world, but scientific consensus driven by advocacy agendas represents an oxymoron. While recent ACcurate COnsensus Reporting Document guidelines on reporting of consensus methodology [29] emphasize transparency on panel recruitment, it is impossible to eliminate all panel biases and arguably impossible to estimate remaining bias accurately, unless conflicts of interest are widely known and in the public domain, as in the studied example. We thus propose that, besides the recent ACcurate COnsensus Reporting Document guidelines on panel recruitment [29], consensus efforts should explicitly aim to avoid advocate stacking and describe the methods to achieve this. This applies not only to panel selection but also to choosing the topics, phrasing the questions, and performing the background systematic review of the evidence, which may also be sensitive to biases.

Significant undeclared advocacy in consensus statements is unacceptable. Nontransparent conflicts of interest still pervade many guideline committees, including those on pandemics and health systems [30]. Journal editors should ensure transparency. Even then, consensus statements with substantial stacking cannot be trusted. Journal editors should avoid publishing consensus statements that appear to involve substantial stacking, for example, due to a clear bias in the panel. For complex situations like COVID-19, panels may need to include experts with different views and also other important stakeholders, for example, families and teachers to ensure a balanced view. Similarly, public and other not-for-profit funders of consensus statements could require full transparency and documentation and guarantee that stacking did not affect the process. It is important to buttress consensus processes and to maintain a bright line between advocacy and science.

## 4. Barriers

Panels may always have some bias due to the many convoluted features that define humans as experts. Therefore, one should prioritize obtaining reliable evidence and performing rigorous evidence synthesis that would be less amenable to subjective expert interpretation and distortion, and variations in interpretation should be described.

Ensuring transparency can be very difficult. Some types of potential conflicts are captured in inclusive databases, such as the databases of industry payments to clinicians [31,32]. However, there is a lack of publicly available, comprehensive information on many other types of biases. Iterative searches for undeclared conflicts can require detective work and there is no guarantee that all major conflicts can be revealed through some footprint they have left.

Some authors have also been skeptical of whether nonfinancial conflicts are significant [33]. To understand whether they are significant, at a minimum, they should not be grouped together as ‘‘nonfinancial conflicts,’’ but presented more accurately and specifically in context [33]. Nonfinancial conflicts might also indirectly yield financial conflicts, by increasing visibility, boosting reputation, and accelerating career advancement.

Another difficulty is that in fields with substantial industry penetration, almost all major experts may have many competing conflicts, both financial and nonfinancial. Yet, it should still be possible to reduce lobbyism/advocacy inclusion, avoid stacking via unconflicted experts, and at the least exhibit full transparency on potential conflicts [34,35]. Furthermore, there is debate [36] about who should be the

authors of the background systematic reviews to ensure that such reviews are unbiased.

## 5. Conclusion

Consensus methods are characterized by unacceptably wide variation in their implementation [6]. Consensus statements with poor methodology can even lead to polarized and misguided viewpoints deepening both conscious and unconscious confirmation and refutation biases, suboptimal decision-making, and exacerbated skepticism about medical science and public health. Panel stacking can introduce bias that substantially reduces the trustworthiness and credibility of recommendations, even when carefully building on meticulous systematic review of available evidence. This is exacerbated when there is no systematic evidence review informing the process. Rigorous guideline and recommendation development efforts should ensure that diverse legitimate views are represented, while at the same time avoid disproportionately over-representing specific views, advocacy efforts, or interests, and should use systematic evidence synthesis and justification of recommendations wherever possible.

## Contributors and sources

The idea and first draft of the analysis paper was developed by K.P.K. and J.P.A.I. All authors are top-2% cited scientists in 2022 according to the Elsevier-Stanford metric, published on COVID-19, and contributed to writing the paper over multiple iterations and revisions. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted. J.P.A.I. is a guarantor.

## Patient involvement

No patients were involved in making this paper.

## CRediT authorship contribution statement

**Kasper P. Kepp:** Writing − original draft, Validation, Formal analysis, Data. **Preben Aavitsland:** Writing − review & editing, Validation, Data. **Marcel Ballin:** Writing − review & editing, Validation, Data. **Francois Balloux:** Writing − review & editing, Validation, Data. **Stefan Baral:** Writing − review & editing, Validation, Data. **Kevin Bardosh:** Writing − review & editing, Validation, Data. **Howard Bauchner:** Writing − review & editing, Validation, Data. **Eran Bendavid:** Writing − review & editing, Validation, Data. **Raj Bhopal:** Writing − review & editing, Validation, Data. **Daniel T. Blumstein:** Writing − review & editing, Validation, Data. **Paolo Boffetta:** Writing − review & editing, Validation, Data. **Florence Bourgeois:** Writing − review & editing, Validation, Data. **Adam Brufsky:** Writing − review & editing, Validation, Data. **Peter J. Collignon:** Writing − review & editing, Validation, Data. **Sally Cripps:** Writing − review & editing, Validation, Data. **Ioana A. Cristea:** Writing − review & editing, Validation, Data. **Nigel Curtis:** Writing − review & editing, Validation, Data. **Benjamin Djulbegovic:** Writing − review & editing, Validation, Data. **Oliver Faude:** Writing − review & editing, Validation, Data. **Maria Elena Flacco:** Writing − review & editing, Validation, Data. **Gordon H. Guyatt:** Writing − review & editing, Validation, Data. **George Hajishengallis:** Writing − review & editing, Validation, Data. **Lars G. Hemkens:** Writing − review & editing, Validation, Data. **Tammy Hoffmann:** Writing − review & editing, Validation, Data. **Ari R. Joffe:** Writing − review & editing, Validation, Data. **Terry P. Klassen:** Writing − review & editing, Validation, Data. **Despina Koletsi:** Writing − review & editing, Validation, Data. **Dimitrios P. Kontoyiannis:** Writing − review & editing, Validation, Data. **Ellen Kuhl:** Writing − review & editing, Validation, Data. **Carlo La Vecchia:** Writing − review & editing, Validation, Data. **Tea Lallukka:** Writing − review & editing, Validation, Data. **John Lambris:** Writing − review & editing, Validation, Data. **Michael Levitt:** Writing − review & editing, Validation, Data. **Spyros Makridakis:** Writing − review & editing, Validation, Data. **Helena C. Maltezou:** Writing − review & editing, Validation, Data. **Lamberto Manzoli:** Writing − review & editing, Validation, Data. **Ana Marusic:** Writing − review & editing, Validation, Data. **Clio Mavragani:** Writing − review & editing, Validation, Data. **David Moher:** Writing − review & editing, Validation, Data. **Ben W. Mol:** Writing − review & editing, Validation, Data. **Taulant Muka:** Writing − review & editing, Validation, Data. **Florian Naudet:** Writing − review & editing, Validation, Data. **Paul W. Noble:** Writing − review & editing, Validation, Data. **Anna Nordström:** Writing − review & editing, Validation, Data. **Peter Nordström:** Writing − review & editing, Validation, Data. **Nikolaos Pandis:** Writing − review & editing, Validation, Data. **Stefania Papatheodorou:** Writing − review & editing, Validation, Data. **Chirag J. Patel:** Writing − review & editing, Validation, Data. **Irene Petersen:** Writing − review & editing, Validation, Data. **Stefan Pilz:** Writing − review & editing, Validation, Data. **Nikolaus Plesnila:** Writing − review & editing, Validation, Data. **Anne-Louise Ponsonby:** Writing − review & editing, Validation, Data. **Manuel A. Rivas:** Writing − review & editing, Validation, Data. **Andrea Saltelli:** Writing − review & editing, Validation, Data. **Manuel Schabus:** Writing − review & editing, Validation, Data. **Michaéla C. Schippers:** Writing − review & editing, Validation, Data. **Holger Schünemann:** Writing − review & editing, Validation, Data. **Marco Solmi:** Writing − review & editing, Validation, Data. **Andreas Stang:** Writing − review & editing, Validation, Data. **Hendrik Streeck:** Writing − review & editing,

Validation, Data. **Joachim P. Sturmberg:** Writing − review & editing, Validation, Data. **Lehana Thabane:** Writing − review & editing, Validation, Data. **Brett D. Thombs:** Writing − review & editing, Validation, Data. **Athanasios Tsakris:** Writing − review & editing, Validation, Data. **Simon N. Wood:** Writing − review & editing, Validation, Data. **John P.A. Ioannidis:** Writing − original draft, Supervision, Methodology, Formal analysis, Data.

## Data availability

All used data are in the paper. Data will be made available on request.

## Declaration of competing interest

K.P.K. declares no conflicts of interest.

P.A. has as part of his work at the Norwegian Institute of Public Health (a governmental agency) provided advice to the Governments of Norway and Denmark on handling the COVID-19 pandemic. He was a member of the WHO Review Committee on the Functioning of the International Health Regulations (2005) during the COVID-19 Response, and he chaired the WHO Review Committee regarding Standing Recommendations for COVID.

M.B. declares no conflicts of interest.

F.B. is the leader of 2 work packages of the END-VOC project funded by the European Union's Horizon Europe program under the grant agreement No. 101046314. He has published multiple academic and public outreach articles on COVID-19. He has given unpaid scientific advice on pandemic mitigation and vaccination policy to the Governments of Austria, France, and the United Kingdom.

S.B. has published on COVID-19, did COVID-19−related clinical work, and was a co-author on a Royal Society report on homelessness during COVID-19 which included systematic reviews which were later published (https://rsc-src.ca/en/themes/homelessness).

K.B. is Director of Collateral Global, a UK-based research and education charity that is focused on understanding the impact of COVID policies around the world.

H.B. declares no conflicts of interest.

E.B. has written COVID-19 research and opinion pieces (eg, https://www.wsj.com/articles/is-the-coronavirus-as-deadly-as-they-say-11585088464) on COVID-19, some questioning consensus on disease control interventions.

R.B. has served on COVID-19−related committees of government and NGOs, including the Expert Reference Group on COVID-19 and Ethnicity, the Scottish Government, 2020-2022, and was a signature on several letters, including one to the Prime Minister (29/5 2020): "Dominic Cumming's actions damage public trust" (https://www.theguardian.com/commentisfree/2020/may/30/dominic-cummings-actions-damage-public-health).

D.T.B. is a member of the board of the International Panel on Behavior Change, an international group that seeks to integrate behavioral knowledge to improve global sustainability.

P.B. is a co-PI of a grant on COVID-19 epidemic awarded by the European Commission to the University of Bologna.

F.B. declares no conflicts of interest.

A.B. receives consulting fees from AstraZeneca, Pfizer, Novartis, Lilly, Genentech/Roche, SeaGen, Daiichi Sankyo, Merck, Agendia, Sanofi, Puma, Myriad, and Gilead (unrelated to the current work).

P.J.C. was member of Infection control expert group (ICEG) that provided advice on Infection control and prevention issues to Australian Government bodies, Federal Health department and Chief Health Officers during the COVID-19 pandemic from 2020 to 2022, expert witness for the Australian Government in dispute with Western Australia on closure of State borders, member of the review team assessing hotel quarantine procedures by states and territories for the Australian government, and member of the team advising the Federal health department in 2022 on the future potential use and volumes of antiviral and vaccines use for COVID-19.

S.C. declares no conflicts of interest.

I.A.C. declares no conflicts of interest.

N.C. declares no conflicts of interest.

B.D. declares no conflicts of interest.

O.F. declares no conflicts of interest.

M.E.F. declares no conflicts of interest.

G.H.G. declares that he is on the editorial board of Journal of Clinical Epidemiology.

G.H. declares no conflicts of interest.

L.G.H. received funding for the COVID-evidence project (www.covid-evidence.org) by the Swiss National Science Foundation (project 31CA30_196190), unrelated to this work, and travel support from the WHO, unrelated to this work. L.G.H.'s institution (RC2NB) was contracted by WHO for the development of study protocol templates to evaluate Public Health and Social Measures, unrelated to this work. L.G.H.'s institution (RC2NB) is supported by Foundation Clinical Neuroimmunology and Neuroscience Basel, unrelated to this work. RC2NB has a contract with Roche for a steering committee participation of L.G.H., unrelated to this work. These funders had no role in the conceptualization, design, data collection, analysis, decision to publish, or preparation of the manuscript. He is also a member of the Network for Evidence-based Medicine (EbM-Netzwerk).

T.H. declares no conflicts of interest.

A.R.J. served as an unpaid advisor to the Public Health Emergencies Governance Review Panel in the province of Alberta, Canada, whose "report reviews legislation that guided Alberta's response to COVID-19 and recommends

changes to improve the handling of future public health emergencies for Albertans'' (the final report was published in November 2023). He signed the Great Barrington Declaration.

T.P.K. declares no conflicts of interest.

D.K. declares no conflicts of interest.

D.P.K. declares no conflicts of interest.

E.K. declares no conflicts of interest.

C.L.V. was a member of the Vaxzevria advisory board.

T.L. has provided an invited report for the Committee for the Future (an established, standing committee in the Parliament of Finland) in late 2022, where she was asked to describe the future of public health. Her report covered, for example, inequalities in health, population aging, oral health, and mental health.

J.L. declares no conflicts of interest.

M.L. has signed the Great Barrington Declaration.

S.M. declares no conflicts of interest.

H.C.M. declares no conflicts of interest.

L.M. declares no conflicts of interest.

A.M. declares no conflicts of interest.

C.M. declares no conflicts of interest.

D.M. declares that he is on the editorial board of *Journal of Clinical Epidemiology.*

B.M. is supported by an NHMRC Investigator grant (GNT1176437), and he reports consultancy, travel support, and research funding from Merck and consultancy for Organon and Norgine, and holding stock from ObsEva.

T.M. is co-founder and CEO at Epistudia GmbH and acts as advisor for the Academic Parity Movement, a nonprofit organization uprooting academic bullying, discrimination, and violence.

F.N. received funding from the French National Research Agency (ANR-17-CE36-0010), the French ministry of health, and the French ministry of research. He is a work package leader in the OSIRIS project (Open Science to Increase Reproducibility in Science). The OSIRIS project has received funding from the European Union's Horizon Europe research and innovation program under the grant agreement No. 101094725. He is a work package leader for the doctoral network MSCA-DN SHARE-CTD (HORIZON-MSCA-2022-DN-01 101120360), funded by the EU, unpaid member of the French Society of clinical pharmacology and therapeutics, and unpaid member of the European society of clinical pharmacology and therapeutics.

P.W.N. declares no conflicts of interest.

A.N. declares no conflicts of interest.

P.N. declares no conflicts of interest.

N.P. declares no conflicts of interest.

S.P. declares no conflicts of interest.

C.J.P. declares no conflicts of interest.

I.P. declares no conflicts of interest.

S.P. has signed the Great Barrington Declaration.

N.P. declares no conflicts of interest.

A.L.P. owns stock in Dysrupt Labs, a subsidiary of slowVoice Pty Ltd. Dysrupt Labs supplied the Almanis prediction market database for an article recently published in eBioMedicine in which Professor Ponsonby was the corresponding author, entitled ''Machine learning augmentation reduces prediction error in collective forecasting: development and validation across prediction markets with application to COVID events.''

M.A.R. is a Co-Founder of Broadwing Bio and consults for insitro, Mubadala Ventures, and Curie.Bio.

A.S. declares no conflicts of interest.

M.S. declares no conflicts of interest.

M.S. is founder of Ikigaitv.nl: positive psychology interventions for the general public, to enhance mental wellbeing, and co-founder of Great Citizens Movement (greatcitizensmovement.org). She has signed the Great Barrington Declaration. She also served as expert witness of extraparliamentary inquiry regarding the COVID-19 crisis handling in the Netherlands (2020); she owns the podcast followthescience.nl and does contract research on improving study success: https://www.erim.eur.nl/erasmus-centre-for-study-and-career-success/.

H.S. is the lead of the steering committee for the International Guideline Training and Certification Program INGUIDE which is an ISO-certified program focusing on bringing professionalism to the development of health recommendations by educating and certifying those participating in the development of health recommendations; the program charges course fees, and time spent on teaching in INGUIDE may lead to reimbursement to HS in the future (until now no payments have been made). He is also co-chair of the GRADE Working Group and chair of the board of trustees of the Guidelines International Network, both are having transparency and trustworthy guideline development methods as a core value. He is PI on a research contract from the Public Health Agency of Canada that focuses on developing and implementing post−COVID-19 condition guidelines. He has been a PI on several grants focusing on guideline methods and knowledge mobilization related to COVID-19 guidelines. He has worked with numerous global and other organizations on methods and development of guidelines.

M.S. has received honoraria/has been a consultant for AbbVie, Angelini, Lundbeck, and Otsuka, unrelated to this work.

A.S. received COVID-19 research grants from the German Science Foundation (DFC) without any conflict of interest. The granting agency DFG is not affected at all by this manuscript.

H.S. has been on the COVID-19 expert group pf the government of North Rhine-Westfalia, Germany 2020-2021, the COVID-19 expert group of the government of Germany 2021-2023, the expert group for evaluating infectious disease laws in Germany, since 2023 on the Enquete committee for the evaluation of crisis management of the government of North Rhine-Westfalia, and since 2019, head of the board of trustees of the German AIDS foundation.

J.P.S. declares no conflicts of interest.

L.T. has worked as a paid consultant by the companies Bausch Health, GSK, Teva Pharmaceuticals, and Theralase Inc and also works as Vice-President Research for St Joseph's Healthcare Hamilton and he serves on several committees or boards of health-related organizations that include Ontario Hospital Association, HealthcareCan, the SPOR (Strategy for Patient-Oriented Research) Refresh Steering Committee of the Canadian Institutes of Health Research, the Canadian Medical Hall of Fame, Canadian Academy of Health Sciences, Society for Clinical Trials, Baycrest Academy, and the Patient-Centered Outcomes Research Institute Methodology Committee.

B.D.T. is supported by a Canada Research Chair and was PI on several grants from the Canadian Institutes of Health Research to study mental health in COVID-19, and consulted with the Public Health Agency of Canada on this topic.

A.T. was a member of the National Greek Committee for the Protection of Public Health against COVID-19 from the beginning of the pandemic (February 2020) until March 2021, when he decided to resign.

S.N.W. signed the Great Barrington Declaration, published 3 media articles for the 'Spectator' discussing tradeoffs, the evidence for when the UK infection waves peaked and the evidence for mask efficacy, a small number of media appearances advocating for sampling based assessment of incidence and prevalence and discussing tradeoffs, and the evidence on when UK infection waves peaked, and has written evidence provided to the IJK parliament Science and Technology Committee.

J.P.A.I. declares that he is on the editorial board of Journal of Clinical Epidemiology and that he has published in the scientific literature both before (https://onlinelibrary.wiley.com/doi/10.1111/eci.13162) and during the pandemic (https://www.bmj.com/content/371/bmj.m4048) articles that are skeptical about the value of vote counting and signature collections for deciding scientific issues.

## Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jclinepi.2024.111428.

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