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COMMENTARY

Panel stacking is a threat to consensus statement validity

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154 **Contributors and sources**

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

160
161 **Patient involvement**

162 No patients were involved in making this paper.

163
164 **Data**

165 All used data are in the paper.

166

167 Conflicts of Interest

168 We have the following interests to declare:

169 Kasper P. Kepp declares no conflicts of interest.

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

176 Marcel Ballin declares no conflicts of interest.

177 Francois Balloux is the leader of two work packages of the END-VOC project funded by the
178 European Union's Horizon Europe programme under the grant agreement No. 101046314.
179 He has published multiple academic and public outreach articles on COVID-19. He has
180 given unpaid scientific advice on pandemic mitigation and vaccination policy to the
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182 Stefan Baral has published on COVID-19, did COVID-19 related clinical work, and was a co-
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188 Eran Bendavid has written Covid-19 research and opinion pieces (e.g.
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190 Covid-19, some questioning consensus on disease control interventions.

191 Raj Bhopal has served on COVID-19 related committees of government and NGOs,
192 including the Expert Reference Group on COVID-19 and Ethnicity, the Scottish Government,
193 2020-2022, and was a signature on several letters, including one to the prime minister (29/5
194 2020): "Dominic Cumming's actions damage public trust"
195 ([https://www.theguardian.com/commentisfree/2020/may/30/dominic-cummings-actions-](https://www.theguardian.com/commentisfree/2020/may/30/dominic-cummings-actions-damage-public-health)
196 [damage-public-health](https://www.theguardian.com/commentisfree/2020/may/30/dominic-cummings-actions-damage-public-health)).

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214 Sally Cripps declares no conflicts of interest.

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- 217 Benjamin Djulbegovic declares no conflicts of interest.
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- 219 Maria Elena Flacco declares no conflicts of interest.
- 220 Gordon H. Guyatt declares no conflicts of interest.
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- 222 Lars G. Hemkens received funding for the Covid-evidence project (www.covid-evidence.org)
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227 by Foundation Clinical Neuroimmunology and Neuroscience Basel, unrelated to this work.
228 RC2NB has a contract with Roche for a steering committee participation of LGH, unrelated
229 to this work. These funders had no role in the conceptualisation, design, data collection,
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- 232 Tammy Hoffmann declares no conflicts of interest.
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- 242 Carlo La Vecchia was a member of the Vaxzevria advisory board.
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- 253 Clio Mavragani declares no conflicts of interest.
- 254 David Moher declares that he is on the editorial board of *Journal of Clinical Epidemiology*.
- 255 Ben Mol is supported by a NHMRC Investigator grant (GNT1176437), and he reports
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257 and Norgine, and holding stock from ObsEva.

- 258 Taulant Muka is co-founder and CEO at Epistudia GmbH and acts as advisor for the
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- 274 Stefania Papatheodorou declares no conflicts of interest.
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282 entitled "Machine learning augmentation reduces prediction error in collective forecasting:
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- 287 Manuel Schabus declares no conflicts of interest.
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- 295 Holger Schünemann is the lead of the steering committee for the International Guideline
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297 bringing professionalism to the development of health recommendations by educating and
298 certifying those participating in the development of health recommendations; the program
299 charges course fees, and time spent on teaching in INGUIDE may lead to reimbursement to
300 HS in the future (until now no payments have been made). He is also co-chair of the GRADE
301 Working Group and chair of the board of trustees of the Guidelines International Network,
302 both are having transparency and trustworthy guideline development methods as a core
303 value. He is PI on a research contract from the Public Health Agency of Canada that focuses
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306 19 guidelines. He has worked with numerous global and other organisations on methods and
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308 Marco Solmi has received honoraria/has been a consultant for AbbVie, Angelini, Lundbeck,
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310 Andreas Stang received COVID-19 research grants from the German Science Foundation
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331 Athanasios Tsakris was a member of the National Greek Committee for the Protection of
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334 Simon Wood signed the Great Barrington Declaration, published three media articles for the
335 'Spectator' discussing tradeoffs, the evidence for when the UK infection waves peaked and
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337 sampling based assessment of incidence and prevalence and discussing tradeoffs and the
338 evidence on when UK infection waves peaked, and has written evidence provided to the IJK
339 parliament Science and Technology Committee.

340 John P.A. Ioannidis has published in the scientific literature both before
341 (<https://onlinelibrary.wiley.com/doi/10.1111/eci.13162>) and during the pandemic
342 (<https://www.bmj.com/content/371/bmj.m4048>) articles that are skeptical about the value of
343 vote counting and signature collections for deciding scientific issues.

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349 **Abstract**

350 Consensus statements can be very influential in medicine and public health. Some of these
351 statements use systematic evidence synthesis but others fail on this front. Many consensus
352 statements use panels of experts to deduce perceived consensus through Delphi processes.
353 We argue that stacking of panel members towards one particular position or narrative is a
354 major threat, especially in absence of systematic evidence review. Stacking may involve
355 financial conflicts of interest, but non-financial conflicts of strong advocacy can also cause
356 major bias. Given their emerging importance, we describe here how such consensus
357 statements may be misleading, by analysing in depth a recent high-impact Delphi consensus
358 statement on COVID-19 recommendations as a case example. We demonstrate that many
359 of the selected panel members and at least 35% of the core panel members had advocated
360 towards COVID-19 elimination (zero-COVID) during the pandemic and were leading
361 members of aggressive advocacy groups. These advocacy conflicts were not declared in the
362 Delphi consensus publication, with rare exceptions. Therefore, we propose that consensus
363 statements should always require rigorous evidence synthesis and maximal transparency on
364 potential biases towards advocacy or lobbyist groups to be valid. While advocacy can have
365 many important functions, its biased impact on consensus panels should be carefully
366 avoided.

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

375 **Keywords:** Evidence based medicine; consensus statements; panel bias; transparency;
376 competing interests; guidelines.

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Panel stacking is a threat to consensus statement validity

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 evidence¹ and ensure that the eventual consensus is supported by the evidence; this is a critical distinction between evidence- and non-evidence-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 characterised 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 (e.g. 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 recognised 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 towards 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

417 advocacy consensus statements), the presence of cognitive “yes” bias was apparent:
418 panelists tended to more easily acquiesce with positive assertions that required less
419 cognitive effort than negative statements.^{10,11}

420

421 **A case study: Delphi consensus on COVID-19**

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

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

436 We found that panel selection favoured the inclusion of advocates of SARS-CoV-2
437 elimination (“Zero-COVID”) perspectives. Zero-COVID was a minority position in 2021 even
438 in the mild version of being feasible in “some” regions (e.g., New Zealand),¹⁶ but the groups
439 identified here advocated in Europe and North America, where the policy was less feasible.
440 Zero-COVID was widely abandoned by 2022¹⁷ and eventually broadly recognised as
441 unattainable.¹⁸

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

447 The 367 named panelists include 9/25 (36%) signatories of a highly publicised Zero-COVID
448 open letter,^[R1] 3/8 (38%) signatories of a *Lancet* letter supporting elimination,^[R2] 36/132
449 signatories (26%) of the World Health Network (WHN),^[R3] 41/108 (38%) signatories of the
450 Vaccines Plus advocacy letter,^[R4] 7/19 (37%) full members of Independent Scientific

451 Advisory Group for Emergencies (indieSAGE),^[R5] 14/47 (30%) WHN members or experts-
452 advisors,^[R6] 5/79 (6%) OzSAGE members,^[R7] 3/14 (21%) NOCOVID members,^[R8] 5/8 (63%)
453 End Coronavirus advisors^[R9], 9/13 (69%) authors of another elimination viewpoint^[R10] and
454 3/17 (18%) ZeroCOVID-US members^[R11]. Large overlap emerged in membership across
455 these efforts, typical of advocacy activities.

456 Only 2/73 advocates/activists we identified ("S.G.", "K.Y.") disclosed advocacy/activism in
457 the competing interests section (Independent SAGE membership). Consistent with general
458 guidance on disclosing conflicts of interest, *Nature* authorship requires disclosure of "unpaid
459 membership in an advocacy or lobbying organization" ([https://www.nature.com/nature-
460 portfolio/editorial-policies/competing-interests](https://www.nature.com/nature-portfolio/editorial-policies/competing-interests)), but all members of WHN, OzSAGE, End
461 Coronavirus, ZeroCOVID-US, NOCOVID Europe, and all but two of seven active members
462 of Independent SAGE declared no competing interests. Such lack of disclosures could
463 mislead readers.

464 The number of panelists engaged in related advocacy/activism is probably far larger than the
465 number we uncovered. We only assessed several well-known groups. Many similar,
466 associated groups exist, especially at national levels. Most lack publicly posted membership
467 lists. Illustratively, dozens of Zero-COVID organizations are listed in [R3]. Still, key members
468 of zero-COVID advocacy groups were probably <1% of the 720,801 scientists¹⁹ who
469 authored COVID-19-related papers in 2020-2021 alone. A 35% (or higher) prevalence of
470 declared Zero-COVID advocates among core panel members is extreme.

471

	ZeroCovid letter (R1)	Elimination letter, Lancet (R2)	World Health Network, Lancet (R3)	Vaccines Plus Letter (R4)	Indie SAGE members (R5)	WHN members (R6)	OzSAGE members (R7)	NOCOVID letter (R8)	EndCoronavirus (R9)	Elimination perspective, Lancet (R10)	ZeroCovid USA (R11)
Core members											
JVL											
MLB											
YBY											
STC											
GJD											
MH											
JLJ											
MM											
MOB											
BP											
SR											
SV											
AB											
AEM											
Non-core members											
AK											
AH											
AS											
ARJ											
AK											
AP											
ACM											
AE											
AW											
AJL											
AS											
AK											
AB											
AKM											
CDN											
CG											
CP											
CAY											
CP											
ER											
EB											
EFD											
FC											
GAN											
GBM											
IT											
JL											
JV											
JMC											
JMMM											
KKC											
KK											
LM											
LES											
MB											
MFS											
MTJH											
MR											
MMB											
MB											
ON											
OA											
PM											
RA											
RTS											
RW											
SB											
SG											
SAM											
RM											
SM											
TL											
TG											
WR											
WJK											
Non-author panelists											
NA											
SD											
KP											
VP											

472

473

Figure 1: Named membership in advocacy efforts by panelists of Lazarus et al.¹²

474

475

Columns represent efforts/initiatives/organisations presented in the respective references. Red color

476

means advocacy/activism not disclosed. Yellow color means advocacy/activism disclosed. For

477

detailed methods, see Supplementary Methods, for names of panelists see Supplementary Table 1

478

and for information on the 11 sources see Supplementary References R1-11.

479 The panelists include many highly respected experts
480 (<https://elsevier.digitalcommonsdata.com/datasets/btchxktzyw/6>). Among 367 named
481 panelists, 71 (19%) are in the top-2% of their scientific subfield based on a composite
482 citation indicator²⁰ for career-long impact (**Table 1**, Supplementary Table 2). The main
483 subfields of these 71 highly-cited authors include 24 of the 174 subfields of science
484 (Science-Metrix classification, <https://science-metrix.com/classification/>). Most (41/71) are
485 concentrated in four subfields (general/internal medicine, microbiology, public health,
486 virology). Conversely, no named panelists were top-cited scientists in 150 of the 174
487 subfields of science. These 150 subfields include most biomedical research (9/12) and
488 clinical medicine (24/32) subfields, half (4/8) of the public health and health services
489 subfields, notably all eight psychology and cognitive sciences subfields, all 15 social
490 sciences subfields, all 12 economics and business subfields, all four mathematics and
491 statistics subfields, and all eight information and communication technologies subfields.
492 These absences may have limited multidisciplinary pandemic insights, and with almost 400
493 panelists, expanding beyond 24 subfields seems feasible. Furthermore, there was no public
494 involvement and commenting, and no systematic evidence review. In short, experts with
495 strong, known preferences could select the topics, evidence, and final statements with
496 little/no restraint from the community or impartial, systematic evidence synthesis.

497

498 **Causes and implications of stacking**

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

509

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

MAIN SCIENTIFIC SUBFIELD	Core	Other author	Panel only	Total	RANK IN SUBFIELD**	TOTAL SCIENTISTS IN SUBFIELD***
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 & Carcinogenesis	0	1	0	1	683	311,930
Obstetrics & 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 & Atmospheric Sciences	1	0	1	2	526, 681	70,828
Health Policy & Services	0	0	1	1	270	20,709
Genetics & Heredity	0	1	0	1	482	38,076
General & 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 & Hepatology	1	1	0	2	373, 458	98,720
Fluids & Plasmas	1	0	0	1	436	50,409
Environmental Sciences	0	3	0	3	19, 763, 905	99,480
Environmental & Occupational Health	0	1	0	1	128	14,381
Energy	1	0	0	1	919	287,766
Endocrinology & Metabolism	0	1	0	1	348	87,900
Emergency & Critical Care Medicine	0	2	0	2	487, 650	36,979
Building & Construction	0	3	0	3	28, 68, 252	38,335
Applied Ethics	1	0	0	1	1	5,857
Analytical Chemistry	0	1	0	1	298	114,981
150 other subfields*	0	0	0	0	none	7,355,558

514

515

516

Notes to Table 1: *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 non-represented subfields include (among others): Education, Demography,

517 Family Studies, Gender Studies, Cultural Studies, Sociology, Social Work, International Relations, Law, Political Science &
 518 Public Administration, Science Studies, Social Science Methods, Food Science, Bioinformatics, Operations Research,
 519 Information Systems, Medical Informatics, Networking & Telecommunications, Communication & Media Studies, Anthropology,
 520 Philosophy, Agricultural Economics & Policy, Business & Management, Development Studies, Econometrics, Economic
 521 Theory, Economics, Finance, Industrial Relations, Logistics & Transportation, Marketing, Sport, Leisure & Tourism,
 522 Biochemistry & Molecular Biology, Biophysics, Developmental Biology, Nutrition & Dietetics, Physiology, Allergy,
 523 Anesthesiology, Arthritis & Rheumatology, Cardiovascular System & Hematology, Dentistry, Dermatology & Venereal Diseases,
 524 General Clinical Medicine, Geriatrics, Immunology, Legal & Forensic Medicine, Neurology & Neurosurgery, Pathology,
 525 Pediatrics, Pharmacology & Pharmacy, Sport Sciences, Surgery, Behavioral Science & Comparative Psychology, Clinical
 526 Psychology, Developmental & Child Psychology, Experimental Psychology, General Psychology & Cognitive Sciences, Human
 527 Factors, Social Psychology, Epidemiology, Gerontology, Nursing, Rehabilitation, Ecology, Evolutionary Biology, Zoology,
 528 Applied Mathematics, Statistics & Probability – and several others (the nomenclature of subfields is according to the Science
 529 Metrix classification). While most published guidelines and consensus papers typically focus on circumscribed topics where
 530 only one or a few scientific subfields are relevant, this COVID-19 consensus aims to cover so many society-wide and
 531 government-wide aspects that all of these subfields listed above (and more) have essential roles to inform the statements and
 532 recommendations. Furthermore, for subfields that are represented by top-cited scientists (e.g. Public Health), their
 533 representation does not mean that these experts represent appropriately the spectrum of different positions, given the selection
 534 process in favour of specific advocacy perspectives.
 535 **excluding self-citations
 536 ***with at least 5 full publications.
 537 For details on methods regarding this table and for another relevant bibliometric evaluation related to COVID-19-related impact,
 538 see Supplementary Methods.

539

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

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

559 The problem with stacked consensus statements and recommendations is not only the
560 increased risk of being wrong. Even when they are right, the recommendations are more
561 likely to be incomplete and partial, as they may prioritise narratives that preoccupy the
562 advocates. This diminishes or even eliminates other important perspectives. Choices of
563 language, phrasing, statements, and recommendations become lopsided. Illustratively, in the
564 COVID-19 consensus example dissected above, the lengthy 41 statements and 57
565 recommendations¹² never mention the words “randomised”, “lockdown”, “closures”,
566 “isolation”, “loneliness”, “learning loss”, “poverty”, “depression”, “hunger”, “cost-benefit”,
567 “tradeoff”, “censorship” or “mandate”. They mention the word “harm” once, in statement
568 STMT3.1, which does not discuss harms to individuals, groups, or communities themselves,
569 but highlights “risk of harm to others” to endorse government mandatory policies.¹²
570 “Education” or “schools” are never mentioned and “educational” and “schooling policies” are
571 only mentioned in recommendation REC4.6: “Prevention of SARS-CoV-2 transmission in the
572 workplace, educational institutions and centers of commerce should remain a high priority”...
573 “remote work/schooling policies”.¹² “Mental” (health) is mentioned only for children and
574 healthcare workers. “Evidence-based” is mentioned only twice: STMT2.1 admits lack of
575 evidence-based standards and STMT6.8 is dismissive of the evidence-based medicine
576 paradigm.¹²

577

578 **Moving forward**

579 Despite scientific evidence being imperfect, aligning judgment with the evidence after
580 weighing it transparently remains the most important guardrail protecting the consensus
581 process. Every effort should be made to allow evidence to serve as a “neutral arbiter among
582 competing views”.²⁴ Consensus expert panels without systematic review are easily
583 dominated by few individuals even when many experts participate.^{10,25,26} They should be
584 replaced by robust evidence-based approaches when evidence exists. In the case of the
585 COVID-19 example discussed above, the published literature exceeds 500,000 articles.
586 However, sometimes evidence is limited, and entirely opinion-based Delphi processes may
587 have some value, informing on opinion trends. They would then benefit from better
588 standardisation and improved reporting²⁷ and even pre-registration.²⁸ But given how
589 sensitive panels are to stacking, transparent efforts to ensure non-biased recruitment of
590 panelists is critical, as is full transparency on aspects that may indicate risks of stacking.
591 Advocacy and activism are only part of a spectrum of potential non-financial conflicts that
592 may create panel stacking. Other relevant non-financial competing interests may include, for
593 example, membership in a government or non-governmental organisation, advisory positions

594 in commercial organisations, writing or consulting for an educational company, and acting as
595 an expert witness. Advocacy is essential for improving our world, but scientific consensus
596 driven by advocacy agendas represents an oxymoron. While recent ACCORD guidelines on
597 reporting of consensus methodology²⁹ emphasise transparency on panel recruitment, it is
598 impossible to eliminate all panel biases and arguably impossible to estimate remaining bias
599 accurately, unless conflicts of interest are widely known and in the public domain, as in the
600 studied example. We thus propose that, besides the recent ACCORD guidelines on panel
601 recruitment,²⁹ consensus efforts should explicitly aim to avoid advocate stacking and
602 describe the methods to achieve this. This applies not only to panel selection, but also to
603 choosing the topics, phrasing the questions, and performing the background systematic
604 review of the evidence, which may also be sensitive to biases.

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

616

617 **Barriers**

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

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

627 Some authors have also been skeptical of whether non-financial conflicts are significant.³³

628 To understand whether they are significant, at a minimum, they should not be grouped

629 together as “non-financial conflicts”, but presented more accurately and specifically in
630 context.³³ Non-financial conflicts might also indirectly yield financial conflicts, by increasing
631 visibility, boosting reputation and accelerating career advancement.

632 Another difficulty is that in fields with substantial industry penetration, almost all major
633 experts may have many competing conflicts, both financial and non-financial. Yet it should
634 still be possible to reduce lobbyism/advocacy inclusion, avoid stacking via unconflicted
635 experts, and at the least exhibit full transparency on potential conflicts.^{34,35} Furthermore,
636 there is debate³⁶ about who should be the authors of the background systematic reviews to
637 ensure that such reviews are unbiased.

638

639 **Conclusions**

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

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- Consensus statements without systematic evidence carry risk of panel bias
- We document this problem by analysis of a high-impact consensus-statement
- Based on the analysis, we argue that consensus statements always need rigorous evidence synthesis to be valid
- We urge protocols to avoid stacking and undisclosed advocacy associations

Journal Pre-proof

Competing Interests Statement for

Selection bias with panel stacking: a threat to consensus statement validity

Kasper P. Kepp declares no conflicts of interest.

Preben Aavitsland 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.

Marcel Ballin declares no conflicts of interest.

Francois Balloux is the leader of two work packages of the END-VOC project funded by the European Union's Horizon Europe programme 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 UK.

Stefan Baral 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>)

Kevin Bardosh 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.

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Eran Bendavid has written Covid-19 research and opinion pieces (e.g. <https://www.wsj.com/articles/is-the-coronavirus-as-deadly-as-they-say-11585088464>) on Covid-19, some questioning consensus on disease control interventions.

Raj Bhopal 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>).

Daniel T. Blumstein 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.

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

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Adam Brufsky 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).

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member of the team advising the Federal health department in 2022 on the future potential use and volumes of anti-viral and vaccines use for Covid-19.

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Tammy Hoffmann declares no conflicts of interest.

Ari R. Joffe 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 November 2023). He signed the Great Barrington Declaration.

Terry P. Klassen declares no conflicts of interest.

Despina Koletsi declares no conflicts of interest.

Dimitrios P. Kontoyiannis declares no conflicts of interest.

Ellen Kuhl declares no conflicts of interest.

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John Lambris declares no conflicts of interest.

Michael Levitt has signed the Great Barrington Declaration.

Spyros Makridakis declares no conflicts of interest.

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David Moher declares that he is on the editorial board of *Journal of Clinical Epidemiology*.

Ben Mol is supported by a 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.

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Paul W. Noble declares no conflicts of interest.

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Irene Petersen declares no conflicts of interest.

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Nikolaus Plesnila declares no conflicts of interest.

Anne Louise Ponsonby 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".

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Holger Schünemann is the lead of the steering committee for the International Guideline Training and Certification Program INGUIDE which is a 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 mobilisation related to COVID-19 guidelines. He has worked with numerous global and other organisations on methods and development of guidelines.

Marco Solmi has received honoraria/has been a consultant for AbbVie, Angelini, Lundbeck, Otsuka, unrelated to this work.

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Hendrik Streeck has been on the COVID-19 expert group of the government of Northrhine-Westfalia, Germany 2020-21, the COVID-19 expert group of the government of Germany 2021-23, 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 Northrhine-Westfalia, and since 2019, head of the board of trustees of the German AIDS foundation.

Joachim P. Sturmberg declares no conflicts of interest.

Lehana Thabane 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 PCORI (Patient-Centered Outcomes Research Institute) Methodology Committee.

Brett D. Thombs 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.

Athanasios Tsakris 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.

Simon Wood signed the Great Barrington Declaration, published three 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.

John P.A. Ioannidis 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.