Rethinking the epidemiogenic power of modern societies

Annabelle Lever[†] & Lou Safrat[†]

Sciences Po, CEVIPOF, CNRS UMR 7048, Paris, France

[†] equal contribution

Correspondence to: lou.safra@sciencespo.fr , annabelle.lever@sciencespo.fr

Introduction

In less than a year, COVID-19 has imposed itself as one of the major health crises in the history of Western democracies although, as zoonotic diseases go, it is not especially deadly, nor are its symptoms especially terrifying (Harvard Health 2020; Ioannidis 2020). Faced with the spread of COVID-19, one of the most noticeable reactions of governments have been to impose lock-downs and important restrictions on liberty of movement and of association. These radical decisions caused so many severe negative externalities (unemployment, poverty, inequality, loneliness, anxiety, depression, violence and the loss of schooling for millions of children) that they can only be temporary (Altman 2020; Arpino et al. 2020; Banks, Karjalainen, and Propper 2020; Benke et al. 2020; Bonaccorsi et al. 2020; Czymara 2020; Fountoulakis et al. 2021; Green 2020; Grover et al. 2020; Martin et al. 2020; Usher et al. 2020). Such unparalleled restraints in peace-time were explicitly conceived as temporary measures to control, or mitigate, the spread of the epidemic while waiting for an effective and safe vaccine to be developed (See for instance Stella Kyriakides, EU commissioner for health and food safety, declaration on April 2020 Day 2020). Even softer measures, such as social distancing and mask-wearing, were seen as ancillary to the main weapon - vaccination - and the assumption was that they had no relevance to healthcare in 'normal' times.

Thanks to an unprecedented pharmacological effort, the development and roll-out of a variety of safe, effective vaccines against COVID 19 is now on the horizon, offering concrete means to end this crisis (Zimmer, Corum, and Wee 2020). Nonetheless, these pharmacological solutions should not prevent the consideration of those factors, endogenous to our societies, which helped to catalize this pandemic. Indeed, this paper argues, epidemics reflect a combination of exogenous and endogenous factors. Attention only to the former risks underestimating what we call 'the epidemicogenic' dimensions of our society, at the risk of leaving us yet more vulnerable to destructive epidemics in future.

Issues with pharmacological solutions

The European Commission and the World Health Organization have both emphasized the importance of ensuring that pharmacological tools against Covid-19 are developed collaboratively and made accessible to all equally, in order to counter the medical, political and social risks of the pandemic (Riordan 2020; World Health Organization 2020). They fear, rightly, that otherwise scientific developments on which everyone depends will be instrumentalised by those who are able to monopolise them, and used to advance sectarian political, economic or ideological agendas. Within countries, not merely internationally, differential access to healthcare can be used to favour one social group over others, and to discriminate on racial, religious and ethnic grounds (as it has already been the case for food distribution (The New Humanitarian 2002)) and the international context makes such problems possible, if not probable. In July, already, Putin announced the development of a safe vaccine against COVID-19 by Russia (Official website vaccine against coronavirus Sputnik V. 2020). This announcement places Russia as a leader in technological development with all its potential consequences, including the military ones. The name of the vaccine itself, Sputnik V, reveals the reputational, diplomatic and political intentions behind the announcement.

Besides these political and ethical considerations, the long-term consequences of relying on pharmacological solutions for epidemics are not promising; scientists have indicated that pandemics may be more and more frequent in the future, due to the erosion of natural habitats exacerbated by global warming, agricultural intensification and urban areas extension (Dasgupta and Andersen 2020; Epstein 2000; International 2020; Madhav et al. 2017). However, vaccines, in their nature, are disease-specific, and thus an inefficient way of protecting global public health. Successful vaccines for global health threats of any severity and scale require the dedication of colossal disease-specific resources, as we have seen, with the real possibility of extensive restrictions on civil liberty in the meantime. Considerable emphasis has been put on the economic and mental health consequences of the COVID-19 pandemic, but little attention until now has been paid to the consequences of mass deaths for families and the generational balance amongst populations, although as know from the HIV epidemic in Africa, these can be severe. Moreover, the psychological effects of acute exposure to the risk of infectious disease have significant political and social consequences in themselves. Epidemics tend to produce xenophobic scapegoating and hostility to 'outsiders' (Clissold et al. 2020; White 2020) – in this case, Asian communities in the West have borne the brunt of that hostility since Spring 2020. Such empirically observable tendencies appear also in experimental research, which shows that real or perceived exposure to a threatening pathogen increases racist and xenophobic attitudes in test participants. So instead of looking for made to measure, post-hoc, solutions to each large-scale epidemic, it is crucial to find ways to prevent them, as far as possible (Aarøe, Petersen, and Arceneaux 2017; Faulkner et al. 2004).

Diseases as external enemies: the exogenous dialectic

Mainstream political discourse presents epidemics as an external enemy and epidemic prevention as a process of repelling this external threat. Emmanuel Macron's reference to wartime, in his speech announcing the France's lockdown in March 2020 exemplified the phenomenon (Macron 2020). The representation of epidemics as something external fits naturally with intuitive Western images of disease as an alien threat to the body. Pathogens

worm their way into the population and cause an epidemic in just the same way that they insinuate themselves into individual bodies and cause disease (Napier 2020). However, this representation faces two problems. First, it ignores the fact that acute infections often give rise to chronic illness and, even when cured, can damage one's ability to fight further infections in future some illnesses, can leave one vulnerable to new infections over the long term, as well as to the chronic illness over a life time which acute infections often entail (e.g., Bonaccorsi et al. 2020; Musher, Abers, and Corrales-Medina 2019; Sejvar 2007; Xiong et al. 2020). In the case of COVID-19, specifically, an increasing number of incapacitating long-term pathologies have been noted by the medical community, and it is quite possible that the full range of long-term damage from COVID 19 has not yet been appreciated (Carfi, Bernabei, and Bermpohl 2020; CDC 2020; Fraser 2020). However, the second main problem with the idea that disease, and particularly epidemics, can be adequately conceptualized as an external threat to an otherwise healthy body/society is that this ignores the social conditions that make epidemics possible, and which help to determine who will suffer most from them.

The exponential spread of COVID-19 in Western countries, therefore, forces us to consider the causal role of our structuring institutions, habits and norms in turning what might have been a relatively contained disease into an epidemic that had hit us full force by March, 2020. Indeed, in Autumn as in Spring 2020, most Western countries experienced exponential rises in the number of COVID-19 cases (Roser et al. 2020). Thus even if this particular epidemic emerged from China, Western societies have clearly played a role in its propagation and development – in part, through their reluctance to accept that the epidemic could be controlled without access to a vaccine, as seems largely to have happened in South East Asia (An and Tang 2020).

The structure of modern societies as epidemic accelerators

Significant outbreaks of Covid-19 in slaughterhouses throughout Europe (Académie nationale de médecine 2020) have reminded us of the importance of healthy working and living conditions in containing lethal epidemics, such as tuberculosis, diphtheria, and measles long before there was a vaccine for them, or, as in the case of cholera, in controlling diseases for which there is no vaccine (Porter 2005). Slaughterhouses are poorly ventilated and crowded workplaces and their employees often share cramped, unsanitary housing conditions as well. Whereas the importance of adequate ventilation has only recently been stressed as an essential tool in controlling the spread of COVID-19 (Connolly 2020), its importance to the control of tuberculosis was known since the late 19th century (Dubos and Dubos 1987). More recently, the importance of fresh air and sanitary conditions to the health of non-human animals was highlighted by the role of intensive livestock farming in the spread of zoonotic diseases. Intensive poultry farms suffer more from the development of coccidiosis, a potential fatal disease for chickens, due to the over-crowding of animals (Tewari and Maharana 2011), and 'mad cow disease' – less colloquially known as Bovine Spongiform Encephalopathy - is thought to have arisen as a result of feeding intensively farmed cattle with meat-and-bone-meal (Colchester and Colchester 2005). Its human form, Creutzfeldt-Jakob disease is thought to have been transmitted by eating contaminated cattle. In short, the importance of fresh air, low density housing, safe drinking water, food safety and effective waste collection were all key to the control of epidemics before the advent of modern treatments for them. However,

140 it seems that repeated zoonotic epidemics are necessary to remind us of their continuing
relevance nowadays.

145 A critical look at the organization of many industrialized societies highlights the contrast
between classic public health measures, and current ways of living in our societies, with their
high population density, constant population movements and life, work and travel in low
ventilation indoor areas. Even in hospitals and doctors' offices fresh air can be hard to come
by, and in the United States, notoriously, one is not supposed to open windows because
centralized heating and air conditioning mean that this otherwise innocent gesture risks over-
heating or freezing hapless co-workers elsewhere in the building.

150 Moreover, the social organization of contemporary industrialized societies appears at odds
with the primary principles of public health. While 'case isolation' has been one of the central
elements of the strategy of the World Health Organization for managing COVID-19 epidemic,
this principle cannot be implemented given the current constraints on workplace
155 organization. In addition to the statutory and economic constraints on sick leave, such as the
existence of unpaid days during paid sick leave, Western societies, create a moral and
reputational incentive to work, even when feeling unwell, because of the importance that
they attach to being 'productive'. Moreover, health insurance for cattle and crops, as well as
for people, are generally available only at significant personal cost, although if widely used
160 they would promote an important public good: the rapid sharing of reliable information about
infections before they become epidemics. As such, industrialized societies unite the material
and psychological characteristics that spread disease. This social organization is at odds with
the natural behavior individuals adopt when threatened with disease. Psychological studies
in experimental settings show that individuals tend to avoid contact with potentially
165 infectious individuals (Blacker and LoBue 2016; Park, Van Leeuwen, and Chochorelou 2013).
) Such individually and collectively beneficial behaviour, unfortunately, is hard to adopt in
societies where people are forced to work in close contact with others, and to commute using
overcrowded public transport.

170 **Understanding the roots of the epidemiogenic power of Western societies**

However, if the factors that contribute to epidemics are well-known and, in a sense, part of
folk knowledge, we can wonder why industrialized societies are designed the way they are.
The rise of a productivity and growth-centered economy since the Second World War is an
175 important factor. Two other factors also strike us as essential to current vulnerabilities to
epidemics, though so far, they have not received attention. The first, is the
compartmentalization of society, such that problems of human health are largely separated
from the health of non-human animals, pollution and the design of our physical and social
environment. Not only does this make it difficult to recognize changes in public health which
180 are relevant to epidemics, as in the case of pollution (Fattorini and Regoli 2020; Frontera et
al. 2020; Travaglio et al. 2021), but it makes it harder to integrate knowledge across public
policy areas.

185 Second, with the successful development of vaccines and antibiotics since the Second World
War, diseases such as diphtheria, measles, tuberculosis, polio have become distant threats for
many of us, rather than omnipresent threats to families and, especially, to their most

vulnerable members. vulnerable members. Although the 21st century is not exempt from life-threatening transmissible diseases, in most industrialized countries these mainly concern specific 'at-risk' populations rather than everyone: older people for the seasonal flu, LGBT communities and drug addicts for AIDS, prisoners and deprived urban populations for tuberculosis. In other words, mass infectious diseases have become less and less of a concern for public policies in most countries, and outbreaks are publicly treated as isolated and exceptional events. In this context, public health principles are increasingly ignored in the development of contemporary societies, paving the path for the exponential spread of epidemics.

Conclusion

In this paper, we highlight the structural, epidemiogenic factors in industrialized societies that contribute to the development, intensification and spread of epidemics. While these factors are generally acknowledged when dealing with epidemics in non-human species, their significance for humans was slow to be recognized during the early stages of the COVID-19 pandemic. Reconsidering the structural factors that place our societies on a collision course with the most basic lessons of public health is the only way to design long-term solutions to current epidemics, and to prevent further ones in future. Recognising and changing those factors is, also, the only way to combat the socially inequalitarian patterns of risk and illness, which COVID-19 has laid bare (Wilkinson and Pickett 2009; Wolff and de-Shalit 2007). Crowded, unsanitary housing; poorly ventilated and dilapidated schools; poorly paid work, with no entitlement to sick leave or parental leave, means that the burdens of COVID-19 fall hardest on socially vulnerable groups who, too often, are the offspring of parents and grandparents who, themselves, suffered discrimination, exploitation and neglect (Patel et al. 2020). In short, recognising and correcting the endogenous determinants of epidemics is not simply a matter of prudence, or of wise public policy. It is also a matter of justice, and of our duty for future generations.

References

Aarøe, Lene, Michael Bang Petersen, and Kevin Arceneaux. 2017. 'The Behavioral Immune System Shapes Political Intuitions: Why and How Individual Differences in Disgust Sensitivity Underlie Opposition to Immigration'. *American Political Science Review* 111(2):277–94. doi: 10.1017/S0003055416000770.

Académie nationale de médecine. 2020. 'Slaughterhouses: A Major Target for Covid-19 Prevention'. Retrieved 2 December 2020 (<https://www.academie-medecine.fr/communiquede-lacademie-nationale-de-medecine-et-de-lacademie-veterinaire-de-france-les-abattoirs-une-cible-majeure-pour-la-prevention-de-la-covid-19/?lang=en>).

Altman, Morris. 2020. 'Smart Thinking, Lockdown and Covid-19: Implications for Public Policy'. *Journal of Behavioral Economics for Policy* 4(COVID-19 Special Issue):12.

An, Brian Y., and Shui-Yan Tang. 2020. 'Lessons From COVID-19 Responses in East Asia: Institutional Infrastructure and Enduring Policy Instruments'. *The American Review of*

Public Administration 50(6–7):790–800. doi: 10.1177/0275074020943707.

Arpino, Bruno, Marta Pasqualini, Valeria Bordone, and Aïda Solé-Auró. 2020. 'Older People's Nonphysical Contacts and Depression During the COVID-19 Lockdown'. *The Gerontologist*. doi: 10.1093/geront/gnaa144.

235 Banks, James, Heidi Karjalainen, and Carol Propper. 2020. 'Recessions and Health: The Long-Term Health Consequences of Responses to the Coronavirus*'. *Fiscal Studies* 41(2):337–44. doi: <https://doi.org/10.1111/1475-5890.12230>.

240 Benke, Christoph, Lara K. Autenrieth, Eva Asselmann, and Christiane A. Pané-Farré. 2020. 'Lockdown, Quarantine Measures, and Social Distancing: Associations with Depression, Anxiety and Distress at the Beginning of the COVID-19 Pandemic among Adults from Germany'. *Psychiatry Research* 293:113462. doi: 10.1016/j.psychres.2020.113462.

245 Blacker, Katy-Ann, and Vanessa LoBue. 2016. 'Behavioral Avoidance of Contagion in Childhood'. *Journal of Experimental Child Psychology* 143:162–70. doi: 10.1016/j.jecp.2015.09.033.

250 Bonaccorsi, Giovanni, Francesco Pierri, Matteo Cinelli, Andrea Flori, Alessandro Galeazzi, Francesco Porcelli, Ana Lucia Schmidt, Carlo Michele Valensise, Antonio Scala, Walter Quattrocioni, and Fabio Pammolli. 2020. 'Economic and Social Consequences of Human Mobility Restrictions under COVID-19'. *Proceedings of the National Academy of Sciences* 117(27):15530–35. doi: 10.1073/pnas.2007658117.

Carfi, A., R. Bernabei, and F. Bermpohl. 2020. 'Persistent Symptoms in Patients After Acute COVID-19.' *JAMA* 324(6):603–5. doi: 10.1001/jama.2020.12603.

255 CDC. 2020. 'Coronavirus Disease 2019 (COVID-19)'. Centers for Disease Control and Prevention. Retrieved 2 December 2020 (<https://www.cdc.gov/coronavirus/2019-ncov/long-term-effects.html>).

Clissold, Elliot, Davina Nylander, Cameron Watson, and Antonio Ventriglio. 2020. 'Pandemics and Prejudice'. *International Journal of Social Psychiatry* 66(5):421–23. doi: 10.1177/0020764020937873.

260 Colchester, Alan CF, and Nancy TH Colchester. 2005. 'The Origin of Bovine Spongiform Encephalopathy: The Human Prion Disease Hypothesis'. *The Lancet* 366(9488):856–61. doi: 10.1016/S0140-6736(05)67218-2.

265 Connolly, Kate. 2020. 'Germans Embrace Fresh Air to Ward off Coronavirus'. *The Guardian*. Retrieved 2 December 2020 (<https://www.theguardian.com/world/2020/sep/30/germans-embrace-fresh-air-to-ward-off-coronavirus>).

Czymara, Christian S. 2020. 'Cause for Concerns: Gender Inequality in Experiencing the COVID-19 Lockdown in Germany'. *European Societies* 15.

- 270 Dasgupta, Partha, and Inger Andersen. 2020. 'Coronavirus Shows We Must Change Our Economy to Recognise That Human Wealth Depends on Nature's Health'. The Independent. Retrieved 2 December 2020 (<https://www.independent.co.uk/news/business/analysis-and-features/biodiversity-economy-coronavirus-covid-19-dasgupta-review-a9550156.html#gsc.tab=0>).
- Day, Michael. 2020. 'Covid-19: Lockdown Exit Will Be "Very Long," European Officials Warn'. BMJ 369. doi: 10.1136/bmj.m1549.
- 275 Dubos, René Jules, and Jean Dubos. 1987. *The White Plague: Tuberculosis, Man, and Society*. Rutgers University Press.
- Epstein, Paul R. 2000. 'Is Global Warming Harmful to Health?' *Scientific American* 283(2):50–57. doi: 10.1038/scientificamerican0800-50.
- 280 Fattorini, Daniele, and Francesco Regoli. 2020. 'Role of the Chronic Air Pollution Levels in the Covid-19 Outbreak Risk in Italy'. *Environmental Pollution* (Barking, Essex : 1987) 264:114732. doi: 10.1016/j.envpol.2020.114732.
- Faulkner, Jason, Mark Schaller, Justin H. Park, and Lesley A. Duncan. 2004. 'Evolved Disease-Avoidance Mechanisms and Contemporary Xenophobic Attitudes'. *Group Processes & Intergroup Relations* 7(4):333–53. doi: 10.1177/1368430204046142.
- 285 Fountoulakis, Konstantinos N., Maria K. Apostolidou, Marina B. Atsiova, Anna K. Filippidou, Angeliki K. Florou, Dimitra S. Gousiou, Aikaterini R. Katsara, Sofia N. Mantzari, Marina Padouva-Markoulaki, Evangelia I. Papatriantafyllou, Panagiota I. Sacharidi, Aikaterini I. Tonia, Eleni G. Tsagalidou, Vasiliki P. Zymara, Panagiotis E. Prezerakos, Sotirios A. Koupidis, Nikolaos K. Fountoulakis, and George P. Chrousos. 2021. 'Self-Reported Changes in Anxiety, Depression and Suicidality during the COVID-19 Lockdown in Greece'. *Journal of Affective Disorders* 279:624–29. doi: 10.1016/j.jad.2020.10.061.
- 290 Fraser, Emily. 2020. 'Long Term Respiratory Complications of Covid-19'. BMJ 370. doi: 10.1136/bmj.m3001.
- 295 Frontera, Antonio, Lorenzo Cianfanelli, Konstantinos Vlachos, Giovanni Landoni, and George Cremona. 2020. 'Severe Air Pollution Links to Higher Mortality in COVID-19 Patients: The "Double-Hit" Hypothesis.' *The Journal of Infection* 81(2):255. doi: 10.1016/j.jinf.2020.05.031.
- Green, Francis. 2020. 'Schoolwork in Lockdown: New Evidence on the Epidemic of Educational Poverty.' LLAKES Research Paper 24.
- 300 Grover, Sandeep, Swapnajeet Sahoo, Aseem Mehra, Ajit Avasthi, Adarsh Tripathi, Alka Subramanyan, Amrit Pattojoshi, G. Prasad Rao, Gautam Saha, K. K. Mishra, Kaustav Chakraborty, Naren P. Rao, Mrugesh Vaishnav, Om Prakash Singh, P. K. Dalal, Rakesh K. Chadda, Ravi Gupta, Shiv Gautam, Siddharth Sarkar, T. S. Sathyanarayana Rao, Vinay Kumar, and Y. C. Janardran Reddy. 2020. 'Psychological Impact of COVID-19 Lockdown: An Online Survey from India'. *Indian Journal of Psychiatry* 62(4):354. doi: 10.4103/psychiatry.IndianJPsychiatry_427_20.
- 305

Harvard Health. 2020. 'COVID-19 Basics'. Harvard Health. Retrieved 3 December 2020 (<https://www.health.harvard.edu/diseases-and-conditions/covid-19-basics>).

310 International, W. W. F. 2020. 'Protect Nature: Prevent Pandemics'. WWF. Retrieved 2 December 2020 (<https://explore.panda.org/for-nature-for-us>).

Ioannidis, John. 2020. The Infection Fatality Rate of COVID-19 Inferred from Seroprevalence Data. preprint. Infectious Diseases (except HIV/AIDS).

315 Macron, Emmanuel. 2020. 'Adresse aux Français, 16 mars 2020'. elysee.fr. Retrieved 3 December 2020 (<https://www.elysee.fr/emmanuel-macron/2020/03/16/adresse-aux-francais-covid19>).

Madhav, Nita, Ben Oppenheim, Mark Gallivan, Prime Mulembakani, Edward Rubin, and Nathan Wolfe. 2017. Pandemics: Risks, Impacts, and Mitigation. The International Bank for Reconstruction and Development / The World Bank.

320 Martin, Amory, Maryia Markhvida, Stéphane Hallegatte, and Brian Walsh. 2020. 'Socio-Economic Impacts of COVID-19 on Household Consumption and Poverty'. Economics of Disasters and Climate Change 4(3):453–79. doi: 10.1007/s41885-020-00070-3.

Musher, Daniel M., Michael S. Abers, and Vicente F. Corrales-Medina. 2019. 'Acute Infection and Myocardial Infarction' edited by D. L. Longo. New England Journal of Medicine 380(2):171–76. doi: 10.1056/NEJMra1808137.

325 Napier, David. 2020. 'Nos conceptions des maladies sont culturellement construites'. AOC media - Analyse Opinion Critique. Retrieved 2 December 2020 (<https://aoc.media/entretien/2020/06/05/david-napier-nos-conceptions-des-maladies-sont-culturellement-construites/>).

330 Official website vaccine against coronavirus Sputnik V. 2020. 'Sputnik V - the First Registered Vaccine against COVID-19.' Retrieved 2 December 2020 (<https://sputnikvaccine.com/>).

335 Park, Justin H., Florian Van Leeuwen, and Ypapanti Chochorelou. 2013. 'Disease-Avoidance Processes and Stigmatization: Cues of Substandard Health Arouse Heightened Discomfort With Physical Contact'. The Journal of Social Psychology 153(2):212–28. doi: 10.1080/00224545.2012.721812.

Patel, J. A., F. B. H. Nielsen, A. A. Badiani, S. Assi, V. A. Unadkat, B. Patel, R. Ravindrane, and H. Wardle. 2020. 'Poverty, Inequality and COVID-19: The Forgotten Vulnerable'. Public Health 183:110. doi: 10.1016/j.puhe.2020.05.006.

340 Porter, Dorothy. 2005. Health, Civilization and the State: A History of Public Health from Ancient to Modern Times. 1st ed. Routledge.

Riordan, Liane. 2020. 'EU Global Response to COVID-19'. International Cooperation and Development - European Commission. Retrieved 2 December 2020 (<https://ec.europa.eu/international-partnerships/topics/eu-global-response-covid->

19_fr).

- 345 Roser, Max, Hannah Ritchie, Esteban Ortiz-Ospina, and Joe Hasell. 2020. 'Coronavirus
Pandemic (COVID-19)'. Our World in Data.
- Sejvar, James J. 2007. 'The Long-Term Outcomes of Human West Nile Virus Infection'. *Clinical
Infectious Diseases* 44(12):8.
- Tewari, A. K., and B. R. Maharana. 2011. 'Control of Poultry Coccidiosis: Changing Trends'.
350 *Journal of Parasitic Diseases* 35(1):10–17. doi: 10.1007/s12639-011-0034-7.
- The New Humanitarian. 2002. 'Violence and politicisation of food aid continue'. *The New
Humanitarian*. Retrieved 3 December 2020
(<https://www.thenewhumanitarian.org/fr/node/208471>).
- Travaglio, Marco, Yizhou Yu, Rebeka Popovic, Liza Selley, Nuno Santo Leal, and Luis Miguel
355 Martins. 2021. 'Links between air pollution and COVID-19 in England - ScienceDirect'.
Environmental Pollution 268. doi: <https://doi.org/10.1016/j.envpol.2020.115859>.
- Usher, Kim, Navjot Bhullar, Joanne Durkin, Naomi Gyamfi, and Debra Jackson. 2020. 'Family
Violence and COVID-19: Increased Vulnerability and Reduced Options for Support'.
360 *International Journal of Mental Health Nursing* 29(4):549–52. doi:
<https://doi.org/10.1111/inm.12735>.
- White, Alexandre I. R. 2020. 'Historical Linkages: Epidemic Threat, Economic Risk, and
Xenophobia'. *The Lancet* 395(10232):1250–51. doi: 10.1016/S0140-6736(20)30737-6.
- Wilkinson, Richard D., and Kate Pickett. 2009. *The Spirit Level: Why More Equal Societies
Almost Always Do Better*. New York, NY, US: Bloomsbury Publishing.
- 365 Wolff, Jonathan, and Avner de-Shalit. 2007. *Disadvantage*. OUP Oxford.
- World Health Organization. 2020. 'Fair Allocation Mechanism for COVID-19 Vaccines through
the COVAX Facility'. Retrieved 2 December 2020
([https://www.who.int/publications/m/item/fair-allocation-mechanism-for-covid-19-
vaccines-through-the-covax-facility](https://www.who.int/publications/m/item/fair-allocation-mechanism-for-covid-19-vaccines-through-the-covax-facility)).
- 370 Xiong, Tian-Yuan, Simon Redwood, Bernard Prendergast, and Mao Chen. 2020.
'Coronaviruses and the Cardiovascular System: Acute and Long-Term Implications'.
European Heart Journal 41(19):1798–1800. doi: 10.1093/eurheartj/ehaa231.
- Zimmer, Carl, Jonathan Corum, and Sui-Lee Wee. 2020. 'Coronavirus Vaccine Tracker'. *The
New York Times*, June 10.

375