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EDITORIAL

The brave new world of pandemic resilience

1 | INTRODUCTION

While it is true that the Covid-19 pandemic has affected our mere existence in important ways, the extent of its impact and the consequences of our strategies to mitigate its effects on our health, wellbeing, economy, and so forth, is still unclear. Part of the reason for this lack of clarity is the seemingly narrow focus in our response, which prioritized Covid-19 case numbers, hospitalizations, and deaths as metrics of success (or failure) and privileged the expertise of public health officials, healthcare professionals, and epidemiologists in formulating policy or in public discourse.[1] While there may be good reasons to focus on such metrics and expertise, we should be mindful that they do not tell the whole story. As we will at some point (soon) look at transitioning out of the pandemic and likely into an endemic state, discussion will inevitably pivot to questions around how to build systems and a society more resilient to infectious diseases, such that we can avoid future pandemics or mitigate the effects of those that cannot be avoided. We believe that resilience must reflect a holistic view of society and not just healthcare systems and outcomes from a specified infectious disease. In this editorial, we highlight some issues that will need to be addressed if we are to learn from our experience and build a society that is resilient to future threats from infectious disease.

2 | WHAT DO WE MEAN BY 'RESILIENCE'?

If we are to talk of resilience, we must first define what we mean so we can have a clear goal(s) of what we want to achieve. The concept of resilience has been explored in several contexts, notably, in healthcare, business, and psychiatry. A recent policy brief on health systems resilience, issued by the European Observatory on Health Systems and Policies in partnership with the World Health Organization (WHO), defines resilience 'as the ability to prepare for, manage (absorb, adapt and transform) and learn from shocks;'[2] (p. 6). The target of resilience is important here—if, for example, we were to focus our attention on building resilient healthcare systems, to achieve that we will also need resilience in other aspects of our society; one lesson that we have learned is that without a functioning economy or education system, the healthcare system will likely fail over time (e.g., due to a shortage of resources or trained workers). In other words, we must be careful to avoid being too narrow in our focus when speaking of resilience. Sutcliffe and Vogus[3] define resilience as the ability to 'absorb strain and preserve (or improve)

functioning despite the presence of adversity' (p.96). The key here is the definition of the term 'functioning.' During the Covid-19 pandemic, discussion was narrowly focussed on functioning healthcare systems. The 'flatten the curve' campaigns were meant to spread out the severe infections over time with the goal of not overwhelming (and collapsing) healthcare systems. As part of this campaign, children were sent home from schools, businesses were closed or pivoted to curb side or online sales, and people were pushed to isolating lifestyles. Certainly, education, commerce, and social interaction are part of what many would consider a functioning society and so any talk of resilience should be sensitive to the impact that mandates and restrictions had on those who were affected.

There is also the question of who participates in how we determine or define resilience. Involving nongovernmental stakeholders, not only the healthcare workforce, but also civil society and local communities would strengthen the response to an emergency through the formulation of acceptable policies and interventions. In turn, that would help build public trust in recommended emergency measures and reach marginalized communities.[4] It is difficult to see how resilience can be achieved without buy-in for policies by a wide section of community stakeholders.

Resilience does not only refer to systems (organizations). Psychiatry speaks of resilience from the perspective of the individual. For example, in a review of the concept, Herrman et al.[5] suggest that 'fundamentally, resilience is understood as referring to positive adaptation, or the ability to maintain or regain mental health, despite experiencing adversity' (p. 258). Certainly, the pandemic has been challenging to the mental health of many, and while we hear talk of that in media and from public health officials and clinicians, it is not clear how mental health is weighed against Covid-19 cases, hospitalizations, and deaths, for example, when determining our response, or even what to do about it. If we are to speak of resilience, we cannot ignore the individual.

There are no doubt other ways to define resilience. We do not intend to review all of them here. What our examples illustrate is that resilience is not unidimensional—it should be considered in light of the whole experience of the person, institution, community, or society.

3 | WHAT WE (OUGHT TO) MEASURE AND WHY?

One concern that has been raised throughout the Covid-19 pandemic is the lack and quality of information. As such, a focus of building more resilient systems has been on improving our capacity to collect

and share information. While information can be useful in avoiding or mitigating the impact of a pandemic, developing policy in response to spreading infection, and building systems and interventions to treat the effects of being infected (and any collateral damage from our response on other aspects of life), information is not a panacea, nor is a lack of information necessarily an excuse for why our responses and interventions are insufficient. We must first ask ourselves what do we know? Did we know, as the WHO claimed on 29 March 2020[6], that Covid-19 was primarily spread by droplets (and was not airborne)? Was it correct to claim, as was done so in a 6 April 2020 report by the WHO that 'there is currently no evidence that wearing a mask (whether medical or other types) by healthy persons in the wider community setting, including universal community masking, can prevent them from infection'[7]? What kinds of information are we lacking, and what kinds of information do we in fact need that would have any material impact on our response? Is it important to know if someone has Covid-19, for example, if nothing can be done to treat their symptoms and the person is already isolating (and thus, not putting others at risk)? What if our public health policy response to spreading infection will be the same no matter how many people are in fact infected (e.g., wide-scale lockdowns)? Would it matter in either of these cases that we do not have a robust, valid, and reliable testing and contact tracing infrastructure? Perhaps it will, but that should not be assumed.

We have often heard appeals to the fact that Covid-19 is a novel virus and that there is much we do not know about it. A constant reminder from public health officials that 'the science is evolving,'[8] has been deployed to urge the public to forgive those in charge for their approach to dealing with the pandemic—if only they had more evidence, data, and so forth, then we would not be in this mess. It is true that we do not know much about this particular virus, but much is known about coronaviruses. Much is known about infectious disease. Much is known about how to mitigate transmission (e.g., quarantine, closing borders, and lockdowns were used in 14th century Italy to combat infectious disease outbreaks[9]; masks are not a new technology and have been used extensively in hospitals as a method of infection control). We also have extensive knowledge of the immune system, virology, and vaccination. In short, we were not completely ignorant on what the impact of Covid-19 might be and what could be done about it.

None of this is to say that we did not lack information that could otherwise have been helpful in optimizing outcomes. It is reasonable, for example, that knowledge of who is getting infected, when, how, and with whom they are in contact can be helpful in organizing a public health response. As such, there is interest in developing more robust tracking and monitoring systems. What is concerning is the focus on only those metrics directly related to the virus (e.g., Covid-19 infection, hospitalization, ICU admission, death), as we suggested earlier. In focusing on those metrics, we are only looking at one side of the ledger, so to speak. Closing schools has an impact on mental and physical health of children, not to mention their academic and social development, which may have long-term effects on their health and income (which may also affect their health).[10] Closing

businesses can have similar effects, as poverty is highly related to health outcomes, for example. Furthermore, closing schools and businesses to in person gatherings can have a differential impact among people in a community and likely widen already existing inequities. Studies have hinted at possible increases, likely due, in part, to stresses of lockdown and the existential threat of infection, in body mass[11] (which, for example, may increase the incidence of heart disease, vascular disease, and diabetes), alcohol intake (which may lead to increases in cancer and heart disease),[12,13] intimate partner violence,[14] mental health burden,[15,16] and drug overdose[17] over the course of the pandemic. We also saw the delay or cancellation of medical procedures[18]—what impact that may have on long-term outcomes for those patients is not yet clear. All of these (and more) need to be considered if we are to make a proper assessment of the net benefit (or harm) of our pandemic response. Knowledge of these issues does not entail that our systems/society will be more resilient, lending support to the idea that achieving resilience goes well beyond possessing better information. What is needed are programs or strategies to address these issues, which may be aided by knowledge of who can benefit from care and for what. Information does not guarantee access to these programs, and such programs can be built with incomplete information.

4 | COMMUNICATION

Strategies to avoid a pandemic and mitigate the effects of those that cannot be avoided require several levels of communication. We need mechanisms and systems to communicate between governments (and levels of government) information about the incidence and spread of infectious disease. Scientists need to communicate important findings about the disease, and information about risk of infection (and risks from infection). Public health interventions to combat its spread and ill effects (e.g., correct use of face coverings, vaccination, hygiene, lockdowns, etc.) needs to be shared with the public. We have seen government officials and scientists engage these issues through public channels, such as social media, conventional media, preprint publication, and press conferences. The public-facing discourse has created several problems, sometimes attributed to the need to communicate policy based on incomplete information. Given the importance of communication on activating the public to respond to a pandemic—many public health interventions require the public be aware of their responsibilities, such as acquiring a vaccine or wearing a face-covering in public or avoiding contact with others—a society that is resilient to stresses caused by pandemic needs reliable and valid systems of communication. By reliable and valid, we mean that the correct information is communicated and that it is done so in a way that can be understood by the receiver and is not misleading.[19]

Communication during this pandemic might be seen as subpar. The strong resistance to some evidence-based public health interventions by a not insignificant proportion of the population might even suggest that communication has been inadequate. Not only

were public health officials dealing with a pandemic of misinformation, but we also saw several people (often academic scientists or physicians) brought to the forefront of the discussion who are not experts in topics on which they were commenting (e.g., public health, epidemiology, respiratory infection, immunology, virology, etc.). There was also a bit of irony in the communication—the public were often told that Covid-19 was a novel infection and that there was so much we did not know about it but then were also asked to trust the speaker based on their expertise on the issue! Communication of confusing or incorrect information can be counterproductive to achieving resilience. Likewise, having stronger healthcare systems and ample supply of medical-grade face masks and effective vaccines (resources that might be considered essential to achieve resilience) does no good if government and public health officials cannot effectively communicate to people the benefits of using them (or worse, people get the impression that the speaker cannot be trusted on account of what is perceived as them constantly changing the message).

Even if the information that is being communicated is reliable and valid, there are still issues of its content and the impact that has on how the public responds. For example, many countries focused on a few specific metrics, such as case incidence and prevalence, test positivity rate, hospitalizations, and deaths. While these may be important metrics, they do not tell the whole story. Officials in many countries, including our own (Canada), consistently warned against the perils of a single case. With the onset of more infectious strains, such as Omicron, for many jurisdictions the strategies to deal with Covid-19 will inevitably shift towards treating it as if it were endemic. However, the public may still be primed to focus on metrics that were communicated for a different purpose (i.e., a zero-case strategy vs endemic strategy) or do not carry the same evidentiary weight for policy as they did in a different context (e.g., when caseloads are very high a hospitalization case categorized as Covid-19 might be incidental—i.e., hospitalized 'for' Covid-19 vs. 'with' Covid-19). Thus, it is important that when communicating a metric one also articulates the thinking behind the use of that metric and how it relates to context. What we are illustrating (we hope!) is that well-intended strategies of communication may have unintended detrimental effects. If we are to achieve resiliency, we need both to have ways to assess and reflect on what is being communicated and its impact and to change course without fear of undermining authority or expertise on a matter. If we are not sensitive to such issues, we risk causing additional strain on the public and our institutions, for example, through loss of trust.

5 | ACCOUNTABILITY

Achieving resilience may require that we have responsible government and that those entrusted with institutions that play an important role in our ability to sustain functioning during a pandemic (e.g., public health officials, healthcare professionals, researchers, etc.) are working in the best interest of the defined goals of the

community. Were such stakeholders to act out of some other interest or were failing in meeting their responsibilities, it is reasonable to have concern that our ability to 'absorb strain' may be compromised. The ability to hold people accountable may help to ensure that those the public relies on are acting in the public's interest.

Democratic societies have several mechanisms in place to hold government officials accountable (e.g., elections). What is needed are mechanisms to hold leaders accountable in the periods between election cycles. It can be argued that the media can play an important role in holding officials accountable by asking the correct questions and making available a public record of actions. The extent to which this ecosystem is successful is not our interest here, but it is important to note that its success may be challenged by the influence of the state on media or the desire of media to have access to public officials (or to satisfy advertisers). It may not be enough that the public relies solely on media or opposition parties (who both may have their own interests that are not necessarily aligned with public good) to hold our government and institutional leaders accountable. What may be needed is a mechanism for public input on decisions that have significant influence on health, wellbeing, and social life (including education and commerce), especially where the risks associated with a policy (or lack of policy) can have significant negative impacts on society in a way that cannot be reversed through elections (or may be time-sensitive such that one cannot wait for an election).

Scientists and healthcare professionals have played an important role in the pandemic response and discourse. Traditionally, practitioners of science were held accountable by peer review and the broader scientific community, while healthcare professionals were held accountable by their respective professional colleges. What happens when it is not the individual that is behaving poorly, but it is those institutions that are meant to hold their membership accountable that are promoting an agenda (either consciously or subconsciously) that is not in the best interest of the public? What if the community of scientists or professional colleges are not functioning in their role of holding their membership accountable? Should we simply rely on self governing of institutions or professions that have significant influence over our communities? What may be needed is a mechanism for public engagement, such that the public play a role in ensuring accountability.[20,21] However, simply providing opportunity for the public (or media) to make inquiries may not be sufficient, given the specialized knowledge that may be at issue—ensuring that only those with appropriate expertise are in a position to inform policy or communicate information to the public, and that they can serve in that role without political influence or conflict of interest may be equally (if not more) important. Thus, we must also build appropriate and trustworthy systems of leadership for key stakeholders that serve in roles that are not tied to election.

6 | RESOURCES AND INFRASTRUCTURE

It may go without saying that resilient systems need the resources and infrastructure to ensure that the goals of the community can continue to be met. In a pandemic, this need is not limited to

healthcare resources, such as intensive care beds, mechanical ventilators, vaccinations and antiviral therapies, and public health resources, such as contact tracers and availability of a monitoring/ data-sharing infrastructure. We also need resources to help those who are displaced because of interventions (e.g., jobs lost due to lockdowns), ensure eduction is not disrupted, bridge businesses to alternative or temporary ways of commerce, and so forth. Our notion of resilience should be more than having money available to put out fires—it should include putting in place systems to pivot smoothly to these alternative modes of living when called upon to do so. In other words, we need to have the plan and capacity to pivot in place before a pandemic is upon us.

This need to be proactive is not limited to keeping schools, hospitals, and businesses open. The current pandemic should alert people to issues caused by vaccine nationalism,[22] hoarding of resources (e.g., food, personal protective equipment), interruptions in supply chains[23] caused by sick workers, lack of consensus on border controls, and/or vaccine mandates (among other causes), and so forth. We also saw uneven and suboptimal distribution of available vaccines in many jurisdictions.[22] These issues cause additional, and perhaps unnecessary strain on institutions and the public, and systems to limit them will do much to achieve resiliency. For example, implementing an infrastructure to develop and manufacture vaccines and essential resources/technologies locally (as opposed to relying on a single or few sources, internationally) has the potential to mitigate some of the problems for communities realized during the Covid-19 pandemic. International collaborations to describe the makeup of the virus, and partnerships between public and private sectors, such as the Oxford/ AstraZeneca collaboration for a vaccine and Operation Warp Speed,[24] show what can be done when a well-coordinated, funded, and concerted effort to solve a clearly defined problem is in place. Plans (including contingency plans) for how to activate available resources, ensure capacity to develop and distribute essential resources/services, and coordinate efforts (locally and internationally) should be put in place before a pandemic threatens our way of life.

7 | LEARNING FROM OUR EXPERIENCE

What is vitally important to building resiliency to pandemics is that we learn from our past experience.[25,26] However, if our past experience in learning from a pandemic is a guide, then we might not have good reason for optimism. For much of the first year of the pandemic, it seemed that all policies were focused on eradication of the virus through lockdowns and eventual vaccination. A simple look at the historical record would show that we have successfully eradicated exactly one infectious disease (smallpox) and it took 200 years after a vaccine was developed to do so. Lockdowns and quarantines are temporary measures to buy time to build capacity in the healthcare system, activate resources, and/or develop a vaccine that will minimize some of the worse outcomes—the better prepared we are to do so, the less time we could expect to spend in lockdowns, which means less strain on our institutions/society (and as a result, more resilience is achieved).

Some countries have shown much more resilience than others during this pandemic. It is instructive that these countries had experience with the 2002 SARS pandemic. Indeed, the countries or regions that were most affected by SARS, in order from most cases/ deaths to fewest were China, Hong Kong, Taiwan, Canada, Singapore, and Vietnam. With the notable exception of Canada (which we will highlight in a moment), these countries fared better, on most any commonly used metric, with Covid-19 than did many around the world. A significant factor was the systems and strategies put in place in the wake of the SARS pandemic (e.g., rapidly implemented (and enforced) regional lockdowns and border controls, wide-spread testing and contact tracing, deployment of isolation centres and Covid-19 specific hospitals, cultural acceptance of face coverings in public to mitigate transmission of respiratory infections). These systems were formally adopted in other regions around the world, but in many cases the adoption was slow, incomplete, and change was met with significant public resistance. Canada is an anomaly on this list. After the SARS pandemic, both a report issued by Naylor et al.[27] and a judicial committee inquiry by Campbell et al.[28] highlighted several lessons from SARS and issued a blueprint to promote resilience to future pandemics. These reports also highlighted that many of the failures during SARS were the result of a lack of commitment to public health by successive governments leading up to 2002, lending support to the notion that the impact of a pandemic can be minimized with prudent planning. Little change was made after the reports were made available (in fact, one might argue that the country continued the same course of resource cuts and neglect that led to the failure during SARS in the first place). The experience of countries impacted by SARS was available to other countries and yet much of the world (including Canada) seemed to be caught off guard with Covid-19. It is difficult to see how resilience can be achieved without learning from experience. We need time (and the members of our institutions) to reflect on experiences from the past, and mechanisms and political will for the implementation of solutions. This learning from experience is not limited to past pandemics—much can be learned in the midst of a crisis.

8 | DEALING WITH CRISIS AND HAVING THE ABILITY TO CHANGE COURSE

Barton et al. claim that 'when situations are volatile, unpredictable and complex, we can get so engrossed in the action that we do not notice small indicators that new problems are emerging or that the situation has changed so that our assumptions no longer hold'[29] (p.1). Certainly, our response to the pandemic has brought with it several unintended consequences and has highlighted underlying concerns related to the structure of our societies. It does us no good to stick with a plan in light of new information or collateral damage that may point to the need for a new direction in our response. However, that requires we avoid groupthink and narrow focus. It may have been acceptable early in the pandemic to be preoccupied with case numbers, but over time it has become inexcusable to ignore the rest of

society (e.g., there are many ways to die or be harmed during a pandemic).

Resilience is not 'limited to recovery, picking up the pieces after a crisis has occurred' and recovering the old normal[29] (p.1). It is also about recognizing the cracks in our systems and working proactively to change these systems so that necessary systems/mechanisms/collaborations/infrastructure are in place for a new normal. Reducing strain and preserving function of our institutions and society, which will hopefully lead to better health and wellbeing for the community, may require the ability to change course on our metrics, plans, and so forth, amid dealing with the crisis. All of this starts with clearly articulated goals that are agreed upon by members of the community according to some commonly accepted framework by members of that community (e.g., democratically), and a process to change those goals if the current ones not longer suit the community. As mentioned earlier, this can be facilitated by systems of accountability.

Ultimately, resilience may be best achieved through a generally healthier population. As is the case with past pandemics, the severity and impact of Covid-19 was worse for those with significant co-morbidities, such as obesity, diabetes, and immunodeficiency brought on by other conditions (or therapies to treat those conditions). We also saw worse outcomes among those who suffer from inequities due to race, gender, income, geography, and so forth.[30] It can be said reasonably that some of the strategies to mitigate the pandemic intensified these inequities, resulting in further strain that is counterproductive to achieving resilience. Equity is an important concept in public health discourse. A fairer society may be the path to a more resilient one.

KEYWORDS
health policy, healthcare, public health

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REFERENCES

1. Mercuri M. Just follow the science: a government response to a pandemic. *J Eval Clin Pract.* 2020;26(6):1575-1578.
2. Thomas S, Sagan A, Larkin J, Cylus J, Figueras J, Karanikolos M. *Strengthening Health Systems Resilience: Key Concepts and Strategies. Policy Brief 36. European Observatory on Health Systems and Policies.* WHO Regional Office; 2020.
3. Sutcliffe KM, Vogus TJ. Organizing for resilience. In: Cameron KS, Dutton JE, Quinn RE, eds. *Positive Organizational Scholarship: Foundations of a New Discipline.* Berrett-Koehler; 2003:94-110.
4. World Health Organization. *Health systems resilience during COVID-19: Lessons for Building Back Better.* WHO World Systems for Europe; 2021.
5. Herrman H, Stewart DE, Diaz-Granados N, Berger EL, Jackson B, Yuen T. What is resilience? *Can J Psychiatry.* 2011;56(5):258-265.
6. World Health Organization. Modes of transmission of virus causing COVID-19: implications for the IPC precaution recommendations (Scientific brief); 2020. Accessed January 24, 2022. https://www.who.int/news-room/commentaries/detail/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations
7. World Health Organization. Advice on the use of masks in the context of covid-19: Interim guidance; 2020. Accessed January 24, 2022. https://apps.who.int/iris/bitstream/handle/10665/331693/WHO-2019-nCov-IPC_Masks-2020.3-eng.pdf?sequence=1&isAllowed=y
8. House of Commons Canada Standing Committee on Health. Tuesday; 2020. Accessed January 24, 2022. https://www.ourcommons.ca/DocumentViewer/en/43-1/HESA/meeting-21/evidence
9. Tognotti E. Lessons from the history of quarantine, from plague to influenza A. *Emerg Infect Dis.* 2013;19(2):254-259.
10. Gallagher-Mackay K, Srivastava P, Underwood K, et al. COVID-19 and education disruption in Ontario: emerging evidence on impacts. *Science Briefs of the Ontario COVID-19 Science Advisory Table.* 2021;2(34). doi:10.47326/ocsat.2021.02.34.1.0
11. Khubchandani J, Price J, Sharma S, Wiblishauser MJ, Webb FJ. COVID-19 pandemic and weight gain in American adults: a nationwide population-based study. *Diabetes Metab Syndr Clin Res Rev.* 2022;16(1):102392.
12. Shield K, Wells S, Rehm J, Ali S, Sherk A, Stockwell T. Alcohol consumption and the COVID-19 pandemic: synthesizing knowledge for policy action. Draft CIHR Knowledge Synthesis Report; 2020. Accessed January 24, 2022. https://cihr-irsc.gc.ca/e/documents/SHIELD_CMH-KS-Knowledge-Synthesis__2020-09-22.pdf
13. Pollard MS, Tucker JS, Green HD. Changes in adult alcohol use and consequences during the COVID-19 pandemic in the US. *JAMA Netw Open.* 2020;3(9):e2022942.
14. Brink J, Cullen P, Beek K, Peters SAE. Intimate partner violence during the COVID-19 pandemic in Western and Southern European countries. *Eur J Pub Health.* 2021;31(5):1058-1063.
15. Kwong ASF, Pearson RM, Adams MJ, et al. Mental health before and during the COVID-19 pandemic in two longitudinal UK population cohorts. *Br J Psychiatry.* 2021;218(6):334-343.
16. Wang Y, Shi L, Que J, et al. The impact of quarantine on mental health status among general population in China during the COVID-19 pandemic. *Mol Psychiatry.* 2021;26:4813-4822.
17. Friesen EL, Kurdyak PA, Gomes T, et al. The impact of the COVID-19 pandemic on opiod-related harm in Ontario. *Science Briefs of the Ontario COVID-19 Science Advisory Table.* 2021;2(42). doi:10.47326/ocsat.2021.02.42.1.0
18. Canadian Medical Association. A struggling system: Understanding the health care impacts of the pandemic; 2021. Accessed on January 24, 2022. https://www.cma.ca/sites/default/files/pdf/health-advocacy/Deloitte-report-nov2021-EN.pdf
19. Mercuri M, Gafni A. (Mis)Communication of COVID-19 vaccine benefits and harms. *J Eval Clin Pract.* 2022. doi:10.1111/jep.13655
20. Douglas HE. *Science, Policy, and the Value-Free Ideal.* University of Pittsburg Press; 2009.

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21. Douglas H. *The Rightful Place of Science: Science, Values, and Democracy: The 2016 Descartes Lectures*. Consortium for Science, Policy & Outcomes; 2021.

22. Bansai A. Vaccine equity: there is no time to waste. *Bull World Health Organ*. 2022;100(1):2-2A.

23. El Baz J, Ruel S. Can supply chain risk management practices mitigate the disruption impacts on supply chains' resilience and robustness? Evidence from an empirical survey in a COVID-19 outbreak era. *Int J Prod Econ*. 2021;233:107972.

24. U.S. Government Accountability Office. Operation Warp Speed: Accelerated COVID-19 Vaccine Development Status and Efforts to Address Manufacturing Challenges; 2021. Accessed on January 24, 2022. https://www.gao.gov/products/gao-21-319

25. Smith M, Upshur R. Ebola and learning lessons from moral failures: who cares about ethics? *Public Health Ethics*. 2015;8(3):305-318.

26. Singer PA, Benatar SR, Bernstein M, et al. Ethics and SARS: lessons from Toronto. *Br Med J*. 2003;327:1342-1344.

27. Naylor D, Basrur S, Bergeron MG, et al. *Learning from SARS: Renewal of Public Health in Canada*. Health Canada; 2003. https://www.phac-aspc.gc.ca/publicat/sars-sras/pdf/sars-e.pdf

28. Campbell A. 2006. The SARS Commission Final Report: Spring of Fear [Internet]. http://www.archives.gov.on.ca/en/e_records/sars/report/v2-pdf/Volume2.pdf

29. Barton M, Christianson M, Myers CG, Sutcliffe K. Resilience in action: leading for resilience in response to COVID-19. *BMJ Leader*. 2020;4(3):1-3. doi:10.1136/leader-2020-000260

30. Adhikari S, Pantaleo NP, Feldman JM, Ogedegbe O, Thorpe L, Troxel AB. Assessment of community-level disparities in coronavirus disease 2019 (COVID-19) infections and deaths in large US metropolitan areas. *JAMA Netw Open*. 2020;3(7):e2016938.