

# Lockdowns and the Science of COVID

June 24, 2021

Jay Bhattacharya, MD, PhD

Stanford University

## Table of Contents

A. Does Covid-19 pose a real or imminent serious threat to the health of the population? .....	2
B. What Does the Scientific Evidence Indicate Regarding the Possibility that a Person with No COVID-19 symptoms, but Infected With SARS-CoV-2, Can Spread the Virus to Others? .....	7
C. What principles of good health policy and public health practice do lockdown policies violate? .....	10
D. Are lockdown measures necessary to maintain and enhance the health and well-being of the general population? .....	12
E. Are governmental actions aiming to slow down the propagation of the disease harmful to the health of the population? .....	18
F. Do the Emergence of Variant Strains of the SARS-CoV-2 Virus Justify Continuing Lockdowns? .....	21
G. Are the harms of the lockdowns equitably distributed? .....	26
H. Do Children Pose A High Risk of Disease Spread? .....	27
I. How Effective is contact tracing in controlling disease spread? .....	34
J. What Specific Harms Do Young Adults Face From Lockdowns? .....	35
K. How Beneficial Are Religious Services For Participants And Can They Be Held Safely? ....	36
L. Can Restaurants And Bars Be Opened Safely? .....	39
M. What Benefits Do Gyms, Martial Arts Studios, And Other Physical Fitness Venues Provide For Public Health And Can They Operate With Minimal Risk Of Disease Spread? .....	41
N. Do Alternate Policies Exist That Can Protect the Population, That Do Not Impair Human Rights, Civil Liberties, Constitutional Freedoms, And Basic Principles of Public Health? .....	43
O. Is There Lasting Natural Immunity After Recovering From COVID-19 Infection? .....	46
P. What Concrete Policies Would Provide Focused Protection of the Vulnerable? .....	48
Q. Does A Positive RT-PCR Test For the SARS-CoV-2 Virus Imply That A Patient Poses A Substantial Risk Of Infecting Others? .....	51
Surveillance Case Definition .....	55
Appendix A: Is The Case of Manaus, Brazil A Counter Example To The Possibility of Focused Protection? .....	57

### Reader Note:

This paper has been prepared from submissions to the Manitoba Court of Queen’s Bench by Dr. Jay Bhattacharya on behalf of several Applicants in a *Charter* challenge against the Government of Manitoba. Most of this material was prepared in December 2020, with some updates in March 2021 and June 2021. It thus reflects the scientific literature up to those dates. The Applicants allege that the provincial lockdown response to COVID-19 is unconstitutional and unjustifiably violates the *Charter* freedoms of Manitobans.

## **A. Does Covid-19 pose a real or imminent serious threat to the health of the population?**

The mortality danger from COVID-19 infection varies substantially by age and a few chronic disease indicators.<sup>1</sup> For much of the population, including the vast majority of children and young adults, COVID-19 infection poses less of a mortality risk than seasonal influenza. By contrast, for older populations – especially those with severe comorbid chronic conditions – COVID-19 infection poses a high risk of mortality, on the order of a 5% infection fatality rate.

The best evidence on the infection fatality rate from SARS-CoV-2 infection (that is, the fraction of infected people who die due to the infection) comes from seroprevalence studies. The definition of seroprevalence of COVID-19 is the fraction of people within a population who have specific antibodies against SARS-CoV-2 in their bloodstream. Seroprevalence studies provide better evidence on the total number of people who have been infected than do case reports or positive reverse transcriptase-polymerase chain reaction (RT-PCR) test counts; these both miss infected people who are not identified by the public health authorities or do not volunteer for RT-PCR testing. Because they ignore unreported cases in the denominator, fatality rate estimates based on case reports or positive test counts are substantially biased upwards.

According to a meta-analysis<sup>2</sup> by Dr. John Ioannidis of every seroprevalence study conducted to date of publication with a supporting scientific paper (74 estimates from 61 studies and 51 different localities around the world), the median infection survival rate from COVID-19 infection is 99.77%. For COVID-19 patients under 70, the meta-analysis finds an infection survival rate of 99.95%. A separate meta-analysis<sup>3</sup> by scientists independent of Dr. Ioannidis' group, reaches qualitatively similar conclusions.

A US CDC report<sup>4</sup> found that there were between six and 24 times more SARS-CoV-2 infections than cases reported between March and May 2020. This study is based on serological analysis of blood samples incidentally collected by commercial laboratories in 10 cities nationwide, although the CDC does not provide the infection fatality rate estimate implied by their seroprevalence studies reviewed by Dr. Ioannidis above.

In September 2020, the CDC updated its current best estimate of the infection fatality ratio - the

---

<sup>1</sup> Public Health England (2020) Disparities in the Risk and Outcomes of COVID-19. August 2020. [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/908434/Disparities\\_in\\_the\\_risk\\_and\\_outcomes\\_of\\_COVID\\_August\\_2020\\_update.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/908434/Disparities_in_the_risk_and_outcomes_of_COVID_August_2020_update.pdf)

<sup>2</sup> John P.A. Ioannidis, *The Infection Fatality Rate of COVID-19 Inferred from Seroprevalence Data*, Bulletin of the World Health Organization BLT 20.265892.

<sup>3</sup> Andrew T. Levin, et al., *Assessing the Age Specificity of Infection Fatality Rate for COVID-19: Meta-Analysis & Public Policy Implications* (Aug. 14, 2020) MEDRXIV, <http://bit.ly/3gp1o1V>.

<sup>4</sup> Fiona P. Havers, et al., *Seroprevalence of Antibodies to SARS-CoV-2 in 10 Sites in the United States, March 23-May 12, 2020* (Jul. 21, 2020) JAMA INTERN MED., <https://bit.ly/3goZUgy>.

ratio of deaths to the total number of people infected - for various age groups.<sup>5</sup> The CDC estimates that the infection fatality rate for people ages 0-19 years is 0.003%, meaning infected children have a 99.997% survivability rate. The CDC's best estimate of the infection fatality rate for people ages 20-49 years is 0.02%, meaning that young adults have a 99.98% survivability rate. The CDC's best estimate of the infection fatality rate for people aged 50-69 years is 0.5%, meaning this age group has a 99.5% survivability rate. The CDC's best estimate of infection fatality rate for people ages 70+ years is 5.4%, meaning seniors have a 94.6% survivability rate.

A study of the seroprevalence of COVID-19 in Geneva, Switzerland (published in the *Lancet*)<sup>6</sup> provides a detailed age breakdown of the infection survival rate in a preprint companion paper<sup>7</sup> 99.9984% for patients 5 to 9 years old; 99.99968% for patients 10 to 19 years old; 99.991% for patients 20 to 49 years old; 99.86% for patients 50 to 64 years old; and 94.6% for patients above 65.

I estimated the age-specific infection fatality rates from the Santa Clara County seroprevalence study<sup>8</sup> data (for which I am the senior investigator). The infection survival rate is 100% among people between 0 and 19 years (there were no deaths in Santa Clara in that age range up to that date); 99.987% for people between 20 and 39 years; 99.84% for people between 40 and 69 years; and 98.7% for people above 70 years. In fact, in all of California<sup>9</sup> through August 20, there have been only two deaths at all among COVID-19 patients below age 18. Also, 74.2% of all COVID-19 related deaths occurred in patients 65 and older.

Further, COVID-19 case fatality rates have been dropping steadily since the disease emerged. Peer-reviewed studies document these trends.<sup>10</sup> One study in England found that “30-day mortality peaked for people admitted to critical care in early April... There was subsequently a sustained decrease in mortality risk until the end of the study period” in late June. This trend was found for people of all age groups, and survived adjustment for patient characteristics, which strongly suggests an improvement in treatment and patient management as the cause.<sup>11</sup>

Ventilator protocols which were used during the early days of the epidemic were too aggressive,

---

<sup>5</sup> COVID- 19 Pandemic Planning Scenarios, Centers for Disease Control and Prevention, <https://www.cdc.gov/coronavirus/2019-ncov/hep/planning-scenarios.html>.

<sup>6</sup> Silvia Stringhini, et al., *Seroprevalence of Anti-SARS-CoV-2 IgG Antibodies in Geneva, Switzerland (SEROCoV-POP): A Population Based Study* (June 11,2020) THE LANCET, <https://bit.ly/3187S13>.

<sup>7</sup> Francisco Perez-Saez, et al. *Serology- Informed Estimates of SARS-COV-2 Infection Fatality Risk in Geneva, Switzerland* (June 15,2020) OSF PREPRINTS, <http://osf.io/wdbpe/>.

<sup>8</sup> Eran Bendavid, et al., *COVID- 19 Antibody Seroprevalence in Santa Clara County, California* (April 30,2020) MEDRXIV, <https://bit.ly/2EuLIFK>.

<sup>9</sup> COVID- 19, *Cases and Deaths Associated with COVID-19 by Age Group in California* (Aug. 20,2020) CAL. DEPT. OF PUB. HEALTH, <https://bit.ly/31inK9q> [accessed Aug. 22,2020].

<sup>10</sup> Brumfiel G. (2020) Studies Point To Big Drop In COVID-19 Death Rates. NPR. October 20, 2020. <https://www.npr.org/sections/health-shots/2020/10/20/925441975/studies-point-to-big-drop-in-covid-19-death-rates>

<sup>11</sup> Dennis JM, McGovern AP, Vollmer SJ, Mateen BA. Improving Survival of Critical Care Patients With Coronavirus Disease 2019 in England: A National Cohort Study, March to June 2020. *Crit Care Med.* 2020 Oct 26. doi: 10.1097/CCM.0000000000004747. Epub ahead of print. PMID: 33105150.

with physicians too quick to place patients on mechanical ventilation. In those early days, nearly 90% of all COVID-19 patients on mechanical ventilation died.<sup>12</sup> New discoveries about the use of histamine blockers in conjunction with ventilators contribute to improved survival of hospitalized COVID-19 patients.<sup>13, 14</sup>

Separately, there were particular problems in the care of elderly COVID-19 patients in state-run nursing homes in Quebec, as an example, during the early days of the epidemic, where some COVID-19 patients were neglected and died from thirst and hunger.<sup>15</sup> Quebec also did very poorly because the government failed to protect the vulnerable population by sending COVID infected patients to long-term care homes that were unable to isolate them from the rest of the population, greatly increasing patient mortality.<sup>16</sup> Addressing this neglect certainly contributed to improved outcomes in Quebec.

The discovery that a deadly immune over-reaction to SARS-CoV-2 infection in some patients could be modulated by dexamethasone has greatly improved patient outcomes.<sup>17, 18</sup> There has also been an improved understanding of the pathophysiological reasons why some patients progress to more severe outcomes from SARS-CoV-2 infection, while others do not.<sup>19</sup> So, the improvements in outcomes for COVID-19 patients derive from multiple sources. All these advances have made COVID-19 infection less deadly than it was in March 2020.

---

<sup>12</sup> Richardson S, Hirsch JS, Narasimhan M, et al. Presenting Characteristics, Comorbidities, and Outcomes Among 5700 Patients Hospitalized With COVID-19 in the New York City Area. *JAMA*. 2020;323(20):2052–2059. doi:10.1001/jama.2020.6775

<sup>13</sup> Hogan Ii RB, Hogan Iii RB, Cannon T, Rappai M, Studdard J, Paul D, Dooley TP. Dual-histamine receptor blockade with cetirizine - famotidine reduces pulmonary symptoms in COVID-19 patients. *Pulm Pharmacol Ther*. 2020 Aug;63:101942. doi: 10.1016/j.pupt.2020.101942. Epub 2020 Aug 29. PMID: 32871242; PMCID: PMC7455799.

<sup>14</sup> Janowitz T, Gablenz E, Pattinson D, Wang TC, Conigliaro J, Tracey K, Tuveson D. Famotidine use and quantitative symptom tracking for COVID-19 in non-hospitalized patients: a case series. *Gut*. 2020 Sep;69(9):1592-1597. doi: 10.1136/gutjnl-2020-321852. Epub 2020 Jun 4. PMID: 32499303; PMCID: PMC7299656.

<sup>15</sup> Richer J. (2020) Aînés affamés et déshydratés: «ils ont crevé de faim». *Journal de Montreal*. April 23, 2020. <https://www.journaldemontreal.com/2020/04/23/aines-affames-et-deshydrates>

<sup>16</sup> Quebec Ombudsman (2020) COVID-19 in CHSLDs during the first wave of the pandemic. Learning from the crisis and moving to uphold the rights and dignity of CHSLD residents. Dec. 10, 2020.

[https://protecteurducitoyen.qc.ca/sites/default/files/pdf/rapports\\_speciaux/progress-report-chslds-covid-19.pdf](https://protecteurducitoyen.qc.ca/sites/default/files/pdf/rapports_speciaux/progress-report-chslds-covid-19.pdf)

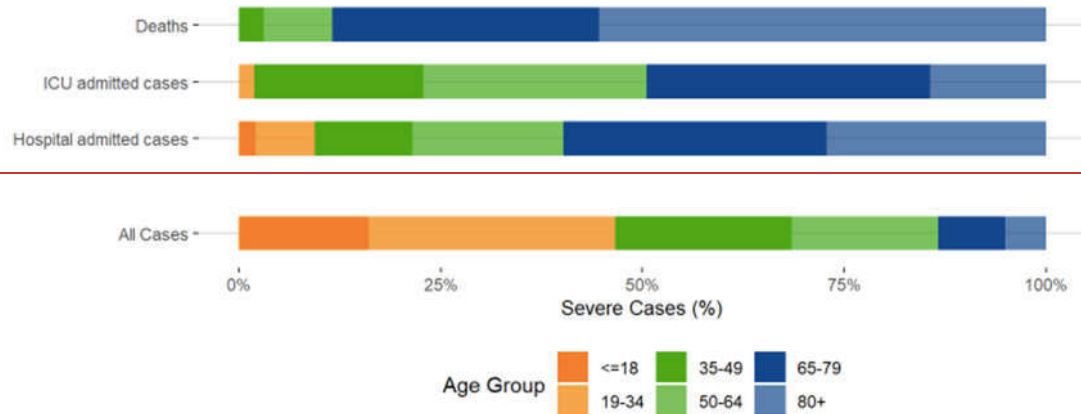
<sup>17</sup> RECOVERY Collaborative Group, Horby P, Lim WS, Emberson JR, Mafham M, Bell JL, Linsell L, Staplin N, Brightling C, Ustianowski A, Elmahi E, Prudon B, Green C, Felton T, Chadwick D, Rege K, Fegan C, Chappell LC, Faust SN, Jaki T, Jeffery K, Montgomery A, Rowan K, Juszczak E, Baillie JK, Haynes R, Landray MJ. Dexamethasone in Hospitalized Patients with Covid-19 - Preliminary Report. *N Engl J Med*. 2020 Jul 17;NEJMoa2021436. doi: 10.1056/NEJMoa2021436. Epub ahead of print. PMID: 32678530; PMCID: PMC7383595.

<sup>18</sup> Tomazini BM, Maia IS, Cavalcanti AB, Berwanger O, Rosa RG, Veiga VC, Avezum A, Lopes RD, Bueno FR, Silva MVAO, Baldassare FP, Costa ELV, Moura RAB, Honorato MO, Costa AN, Damiani LP, Lisboa T, Kawano-Dourado L, Zampieri FG, Olivato GB, Righy C, Amendola CP, Roepke RML, Freitas DHM, Forte DN, Freitas FGR, Fernandes CCF, Melro LMG, Junior GFS, Morais DC, Zung S, Machado FR, Azevedo LCP; COALITION COVID-19 Brazil III Investigators. Effect of Dexamethasone on Days Alive and Ventilator-Free in Patients With Moderate or Severe Acute Respiratory Distress Syndrome and COVID-19: The CoDEX Randomized Clinical Trial. *JAMA*. 2020 Oct 6;324(13):1307-1316. doi: 10.1001/jama.2020.17021. PMID: 32876695; PMCID: PMC7489411.

<sup>19</sup> McCullough, Peter A et al. "Pathophysiological Basis and Rationale for Early Outpatient Treatment of SARS-CoV-2 (COVID-19) Infection." *The American journal of medicine*, S0002-9343(20)30673-2. 7 Aug. 2020, doi:10.1016/j.amjmed.2020.07.003

While I am not aware of a serosurvey available for Manitoba, it is clear that the age gradient in COVID-19 mortality found everywhere else applies. The figure immediately below makes clear, based on data from Manitoba, that the overwhelming majority of deaths from COVID-19 in Manitoba have occurred in ages 65 and older.<sup>20</sup>

**Figure 6. Age Distribution of Severe COVID-19 Cases Compared to All Cases, Manitoba, 2020**



In addition to the risk posed by old age, COVID-19 infection poses an elevated mortality risk for people with certain chronic conditions like diabetes. We now have good evidence on the relative risk posed by the incidence of chronic conditions, so we know that among common conditions, age is the single most important risk factor. For instance, a 65-year-old obese individual has about the same COVID-19 mortality risk conditional upon infection as a 70-year-old non-obese individual.

According to data from Statistics Canada,<sup>21</sup> “Of the over 9,500 COVID-involved deaths between March and July, the majority (90%) had at least one other cause, condition or complication reported on the certificate.” From the first wave of the pandemic to the end of May 2020, 80% of the COVID-19 deaths in Canada occurred at long-term care facilities and retirement homes.<sup>22</sup> As illustrated on Chart 2, dementia or Alzheimer’s disease was most often listed as comorbidities among Canadians aged 65 years or older whose deaths involved COVID-19 – especially among those aged 85 or older.

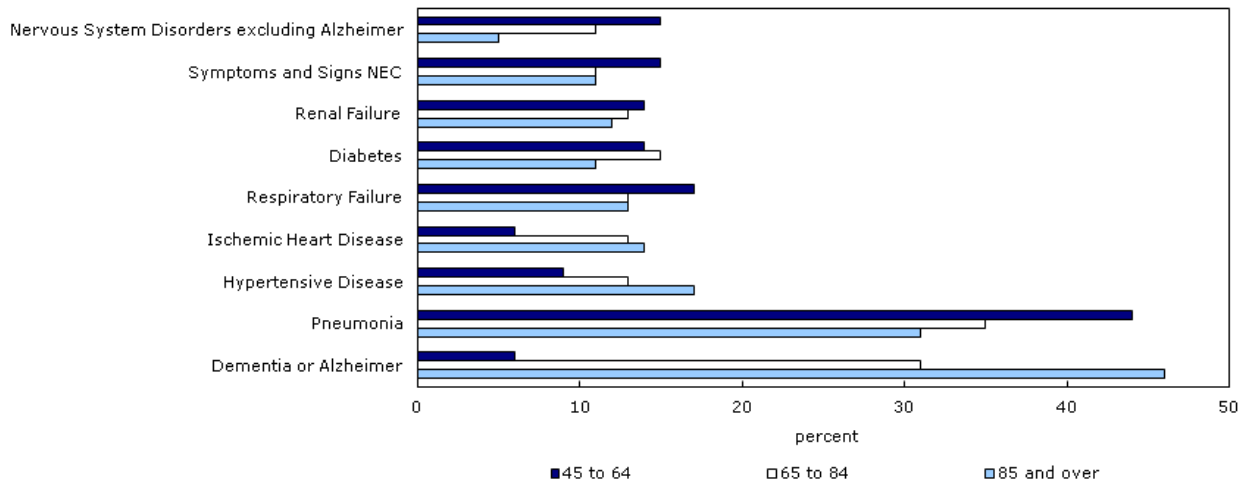
<sup>20</sup> Provincial Covid-19 Surveillance, Manitoba, Week 45, [https://www.gov.mb.ca/health/publichealth/surveillance/covid-19/week\\_45/index.html](https://www.gov.mb.ca/health/publichealth/surveillance/covid-19/week_45/index.html)

<sup>21</sup> Kathy O’Brien, et. al., “Covid-19 Death Co-Morbidities in Canada” Statistics Canada, November 16, 2020, <https://www150.statcan.gc.ca/n1/pub/45-28-0001/2020001/article/00087-eng.htm>

<sup>22</sup> *Ibid.*

**Chart 2**  
**Common medical conditions or complications (comorbidities) associated with a severe course of COVID-19 resulting in death, by select age groups**

Common COVID-19 comorbidities



**Note:** Comorbidities for deaths occurring between March 1, 2020 and July 31, 2020, where COVID-19 was involved.  
**Source:** Canadian Vital Statistics – Death Database (2020).

According to Statistics Canada, “When a pre-existing condition is suspected of putting a person at higher risk of a severe course of COVID-19 resulting in death, the death is counted as a death due to COVID-19 rather than a death due to the pre-existing condition...It is also possible that the death may have been influenced by COVID-19 but caused by another disease or an unintentional injury event. In these situations, COVID-19 should still be recorded on the medical certificates of cause of death...”<sup>23</sup>

Pre-existing conditions can also put people at a higher risk of severe courses of influenza resulting in death, but to my knowledge, such deaths are not routinely counted as influenza deaths. Such a discrepancy in counting COVID-19 deaths and influenza deaths makes comparisons between the two respiratory illnesses difficult and may result in artificially elevated death statistics due to COVID-19.

In summary, COVID-19 poses a real or imminent serious threat only to the health of a specific part of the population – the elderly and a limited number of people with certain chronic conditions. Age is the single most important risk factor, with a worldwide 99.95% infection survival rate for people under 70 and 95% infection survival rate for people 70 and over. When this vulnerable population is vaccinated against COVID-19 and protected against hospitalization and mortality from the infection, the disease poses little risk beyond the risk posed by other respiratory viruses.

<sup>23</sup> *Ibid.*

## **B. What Does the Scientific Evidence Indicate Regarding the Possibility that a Person with No COVID-19 symptoms, but Infected With SARS-CoV-2, Can Spread the Virus to Others?**

According to a comprehensive survey of the literature on reported cases through early June 2020, about 20% of COVID-19 cases are asymptomatic.<sup>24</sup> Seroprevalence studies tend to report a larger fraction of infections – often not identified as cases – as asymptomatic.<sup>25</sup> In any case, asymptomatic viral carriers clearly make up a large fraction of COVID-19 cases and infections. It is thus not surprising that much of the infrastructure of COVID-19 lockdown policy is premised on the idea that the SARS-CoV-2 virus can spread from infected people who display no symptoms typical of COVID-19 infection (e.g., respiratory symptoms or loss of sense of taste or smell) to uninfected individuals. If asymptomatic or pre-symptomatic disease spread is uncommon, lockdown policies could be replaced with less onerous policies, such as symptom-checking in public venues and public health advice for people with symptoms to stay home and avoid public places, with little effect on infection transmission rates.

The best evidence on this question comes from a large meta-analysis of 54 studies from around the world of within-household spread of the virus – that is, from an infected person to someone else living in the same home (Madewell et al. 2020). This study represents the most comprehensive survey of the vast empirical literature on asymptomatic spread. At home, *of course*, none of the safeguards often recommended in public spaces outside of home (such as masking, plexiglass barriers, and social distancing) are typically applied. Because the study focuses on a single setting (household transmission), it is not subject to the same problems that other studies on this topic might have. In particular, by focusing on a homogenous setting where few safeguards exist, the estimate represents an upper bound on the frequency that someone positive for the virus but with no symptoms (and hence either pre-symptomatic or asymptomatic) may spread the virus to close contacts. The primary result is that symptomatic patients passed on the disease to household members in 18% of instances. In comparison, those infected but without symptoms (asymptomatic and pre-symptomatic patients) passed on the infection to household members in only 0.7% of instances.<sup>26</sup>

There is some additional evidence. A large study of 10 million residents of Wuhan, China, all

---

<sup>24</sup> Buitrago-Garcia D, Egli-Gany D, Counotte MJ, Hossmann S, Imeri H, Ipekci AM, Salanti G, Low N. Occurrence and transmission potential of asymptomatic and presymptomatic SARS-CoV-2 infections: A living systematic review and meta-analysis. *PLoS Med.* 2020 Sep 22;17(9):e1003346. doi: 10.1371/journal.pmed.1003346. PMID: 32960881; PMCID: PMC7508369.

<sup>25</sup> Bendavid, E., Mulaney, B., Sood, N., Shah, S., Ling, E., Bromley-Dulfano, R., Lai, C., Weissberg, Z., Saavedra, R., Tedrow, J., Tversky, D., Bogan, A., Kupiec, T., Eichner, D., Gupta, R., Ioannidis, J., & Bhattacharya, J. (2020). COVID-19 Antibody Seroprevalence in Santa Clara County, California. *medRxiv*, 2020.04.14.20062463. <https://doi.org/10.1101/2020.04.14.20062463>

<sup>26</sup> Madewell ZJ, Yang Y, Longini IM, Halloran ME, Dean NE. Household Transmission of SARS-CoV-2: A Systematic Review and Meta-analysis. *JAMA Netw Open.* 2020;3(12):e2031756. doi:10.1001/jamanetworkopen.2020.31756



tested for the presence of the virus, found a total of 300 cases, all asymptomatic. A comprehensive contact tracing effort identified 1,174 close contacts of these patients, none of whom tested positive for the virus.<sup>27</sup> This is consistent with a vanishingly low level of asymptomatic spread of the disease. Given the late date of the study relative to the date of the large first wave of infections in Wuhan, it is likely that none of the 300 asymptomatic cases were likely ever to develop symptoms. A separate, smaller meta-analysis similarly found that asymptomatic patients are much less likely to infect others than symptomatic patients.<sup>28</sup>

By contrast with asymptomatic patients, symptomatic patients are very likely to infect others with the virus during extended interactions, especially in the initial period after they develop symptoms. A careful review of 79 studies on the infectivity of COVID-19 patients found that even symptomatic patients are infectious for only the first eight days after symptom onset, with no evidence of live virus detected beyond day nine of illness.<sup>29</sup>

Much of the support for the idea that asymptomatic disease spread is common comes from theoretical modeling work from earlier in the epidemic (including some of my own published research<sup>30</sup>), predicting some level of asymptomatic disease spread. However, this sort of modeling work does not represent actual evidence that asymptomatic spread is common in the real world. In particular, these models often (at least implicitly) assume that lockdowns work in reducing interactions between individuals in ways that reduce disease transmission risk. Therefore, it is inappropriate – a tautology, in fact – to conclude from such modeling studies that lockdowns work in a way predicted by the model.

There is at least one prominent real-world study that some have used to argue that asymptomatic disease spread is common. A recently published meta-analytic study by Qiu et al. (2021) distinguishes the likelihood of disease spread by a pre-symptomatic individual from the likelihood of spread by an asymptomatic individual who never develops symptoms.<sup>31</sup> A primary finding of this study is that, while an asymptomatic individual who never develops symptoms is exceedingly unlikely to spread the disease, individuals who are not symptomatic now but will eventually develop symptoms are efficient at infecting others during their pre-symptomatic state.

---

<sup>27</sup> (Cao, S., Gan, Y., Wang, C. et al. Post-lockdown SARS-CoV-2 nucleic acid screening in nearly ten million residents of Wuhan, China. *Nat Commun* 11, 5917 (2020). <https://doi.org/10.1038/s41467-020-19802-w>)

<sup>28</sup> Buitrago-Garcia D, Egli-Gany D, Counotte MJ, Hossmann S, Imeri H, Ipekci AM, Salanti G, Low N. Occurrence and transmission potential of asymptomatic and presymptomatic SARS-CoV-2 infections: A living systematic review and meta-analysis. *PLoS Med.* 2020 Sep 22;17(9):e1003346. doi: 10.1371/journal.pmed.1003346. PMID: 32960881; PMCID: PMC7508369.

<sup>29</sup> Cevik M, Tate M, Lloyd O et al. SARS-CoV-2, SARS-CoV, and MERS-CoV viral load dynamics, duration of viral shedding, and infectiousness: a systematic review and meta-analysis. *The Lancet Microbe.* Nov. 19, 2020. DOI:[https://doi.org/10.1016/S2666-5247\(20\)30172-5](https://doi.org/10.1016/S2666-5247(20)30172-5)

<sup>30</sup> Peirlinck M, Linka K, Costabal FS, Bhattacharya J, Bendavid E, Ioannidis J, Kuhl E (2020), “Visualizing the Invisible: The Effect of Asymptomatic Transmission on the Outbreak Dynamics of COVID-19” *Computer Methods in Applied Mechanics and Engineering.* 372: 1 Dec. 2020, 113410. <https://doi.org/10.1016/j.cma.2020.113410>.

<sup>31</sup> Qiu X, Nergiz AI, Maraolo AE, Bogoch II, Low N, Cevik M. The role of asymptomatic and pre-symptomatic infection in SARS-CoV-2 transmission-a living systematic review. *Clin Microbiol Infect.* 2021 Apr;27(4):511-519. doi: 10.1016/j.cmi.2021.01.011. Epub 2021 Jan 21. PMID: 33484843; PMCID: PMC7825872.

One problematic interpretation of this result is that the relative efficiency of disease spread by pre-symptomatic individuals militates in favor of lockdown policies and mass asymptomatic testing. This interpretation is incorrect.

Distinguishing between an infected individual who will eventually develop symptoms and an infected individual who will never develop symptoms is practically impossible without the passage of time. Infected individuals who will develop symptoms tend to do so within a very short interval (two to three days) after first becoming infected. Meanwhile, infected individuals who never develop symptoms may test positive with the PCR test for the virus for an extended period of time. These two groups of observationally identical individuals are mixed in the population in some unknown frequency that may change over time. Given this information constraint, from a policy point of view, the relevant question is how likely it is that an infected individual without symptoms (whether pre-symptomatic or purely asymptomatic) will spread the disease to close contacts. The Madewell et al. (2020) study provides an answer (less than 0.7% secondary attack rate in household settings), while the Qiu et al. (2021) study does not. Additionally, unlike the Madewell et al. (2020) study, the Qiu et al. (2021) study does not concentrate its focus on a homogenous environment (households), which makes the results it reports harder to interpret.

In summary, asymptomatic individuals are an order of magnitude less likely to infect others than symptomatic individuals, even in intimate settings such as people living in the same household where people are much less likely to follow social distancing and masking practices that they follow outside the household. Spread of the disease in less intimate settings by asymptomatic individuals – including religious services, in-person restaurant visits, gyms, and other public locations – are even less likely than in the household.

One clear implication of the small likelihood of asymptomatic and pre-symptomatic disease spread and a higher likelihood of symptomatic spread is that many intrusive lockdown policies (including church and business capacity limitations and closures) could be replaced with less intrusive symptom checking requirements, with little or no detriment to infection control outcomes.

In particular, the public health authorities could inform citizens of the higher risk of disease transmission posed by symptomatic individuals and advise people with symptoms consistent with COVID-19 infection to stay at home and avoid private gatherings with people outside of their households. If people without symptoms are gathering, even if they come from different households, the likelihood of disease spread occurring is an order of magnitude lower than if symptomatic people gather alongside uninfected people. Such insights about the spread of Covid indoors from this literature could also be used to replace draconian policy restricting in-home private gatherings with a less draconian policy.

### C. What principles of good health policy and public health practice do lockdown policies violate?

The principles of good public health<sup>32</sup> and health policy<sup>33</sup> practice predate the epidemic. While the topic is voluminous, there are a few principles that are particularly relevant to COVID-19 policy-making, including the following guidelines for decision-makers:

- Consider both the costs *and* benefits of alternative policies, choosing policies that appropriately balance the two.
- Appropriately account for uncertainty in the projected costs and benefits of policy options.
- Account for the strength of the scientific evidence.
- Be constrained in policy making by democratic norms and ethical principles.
- Choose policies that treat people in society equitably, and in particular, eschew policies that disproportionately favor more affluent members of society over poorer members.

Sound health policy decision-making requires a careful evaluation of both the costs and benefits over both the long and short term. It is striking that public health officials rarely discuss the collateral harms from forced closures, including in Manitoba. The costs considered should include physical costs (such as enhanced risk of mortality and morbidity from all sources), psychological harms (such as increased rates of depression and suicidality), and economic damage (such as increased joblessness, closed businesses, and reduced income).

The costs and benefits of every potential policy involve some degree of uncertainty, including lockdowns. In the face of uncertainty, public health decision-making should be based on the best available evidence regarding the most likely outcomes from the imposition of the policy. Public health decision-making should eschew decision-making based on worst-case or best-case assumptions about the outcomes that may happen if alternate policies are adopted. It is particularly bad practice to make decisions that assume worst-case scenarios regarding the costs of a policy and best-case assumptions regarding the benefits of a policy, or vice versa. So, for instance, it is poor public health practice to assume that lockdowns, if implemented, will have a dramatic effect on disease transmission and mortality with no consideration of the harms associated with lockdowns.<sup>34</sup>

---

<sup>32</sup> Public Health Leadership Society (2002) Principles of the Ethical Practice of Public Health. American Public Health Association. [https://www.apha.org/-/media/files/pdf/membergroups/ethics/ethics\\_brochure.ashx](https://www.apha.org/-/media/files/pdf/membergroups/ethics/ethics_brochure.ashx)

<sup>33</sup> Bhattacharya J, Hyde T, Tu P. Health Economics, London: Palgrave-MacMillan, (2013).

<sup>34</sup> In Manitoba, Chief Public Health Officer Dr. Brent Roussin adopted the position in November 2020 that lockdowns would stop the spread of Covid-19 and save lives: “We need to turn these numbers around and we need to turn them around now. . . . [T]hese new restrictions will help halt the spread of this virus, to protect Manitobans, and to ensure that our healthcare system can continue to function. . . . “These next few weeks will be difficult for many. And we know that. But this sacrifice over this time (sic) will save lives.” Dr. Brent Roussin, 2020-11-10 Press Conference, Video at 23:10 and 31:16 <https://news.gov.mb.ca/news/index.html?item=49737>.

In addition to the costs and benefits, public health policy must consider the strength of the scientific evidence regarding the measure in achieving the aims it proposes. Of course, without solid scientific evidence in favor of a policy – especially one with enormous costs – its imposition by a government on a population would be unethical. The greater the potential harms from the policy on some part of the population, the greater the evidentiary standard required to establish its necessity.

Finally, equity is a key principle of public health. Public health officials must consider whether the harms of a policy like lockdowns fall disproportionately on the poor, minority populations, or others of low socio-economic status. Similarly, policies that accrue benefits disproportionately to the rich, to majority populations, and people of high socio-economic status should be redesigned to comport with the requirement for equity in public-health decision-making.

In summary, sound public-health practice adheres to key principles aimed at grounding policy in sound science, respecting human rights and democratic norms, appropriately accounting for costs and benefits of policies and uncertainty in outcomes, treating people equitably, as well as other principles not discussed here.

## **D. Are lockdown measures necessary to maintain and enhance the health and well-being of the general population?**

In this section, I address both the theoretical and empirical literatures on lockdown effectiveness.

### **Theoretical Considerations**

From a theoretical perspective, lockdowns are any measure undertaken to limit the physical interaction between two individuals. In the epidemiological literature, lockdowns are sometimes referred to as “non-pharmaceutical interventions” (NPI). Example policies include shelter-in-place orders and forced quarantines, business, cultural, sports, and religious service restrictions and closures, restrictions on in-person schooling, restrictions on private gatherings, travel restrictions across provinces, restrictions on children playing together and scholastic sport, and the arbitrary designation of businesses into ‘essential’ and ‘non-essential.’

Though it is not commonly admitted, the primary theoretical tool to predict and justify lockdowns – compartment or SEIR models – do not predict a decrease in the total number of infected people but a shift in the timing of infections. Compartment models work by envisioning a population exposed to a new pathogen like the SARS-CoV-2 virus. In the simplest versions of these models, everyone in the population is initially susceptible to infection. The epidemic starts with one infected person infecting other people in the pool of susceptible (non-immune) people. Many infected people recover from the disease and are no longer susceptible because of immunity induced by infection. With a vaccine available, some people become immune without ever being infected (obviously preferable). Over time, the population of susceptible people diminishes to the point where a newly infected person infects one or fewer people, and the epidemic declines.

In models like this, which are in common use to forecast the COVID-19 epidemic, lockdowns play a role of dampening the number of interactions between susceptible people and infected people, which in theory should slow the growth of the epidemic. However, unless the number of infections is reduced to zero – a result clearly not in evidence in the COVID-19 epidemic – the disease continues to spread in the population.

The clear theoretical implication from these models is that lockdowns delay infections into the future rather than prevent them from occurring altogether.<sup>35</sup> But society-wide lockdowns are not a tool of disease eradication and have never in history eradicated a disease. This benefit – a theoretical delay in the incidence of cases – should be considered against the harms from lockdowns, some of which I describe below.

---

<sup>35</sup> Chikina M and Pegden W (2020) A Call to Honesty in Pandemic Modeling. *Medium*. <https://medium.com/@wpegden/a-call-to-honesty-in-pandemic-modeling-5c156686a64b>

What is the evidence that these theoretical models provide accurate forecasts of the future path of the pandemic? Unfortunately, their track record is poor. According to a comprehensive evaluation of the performance of these models by an international group of statisticians and mathematicians, their poor performance stems from a wide variety of problems, including:<sup>36</sup>

“Poor data input, wrong modeling assumptions, high sensitivity of estimates, lack of incorporation of epidemiological features, poor past evidence on effects of available interventions, lack of transparency, errors, lack of determinacy, looking at only one or a few dimensions of the problem at hand, lack of expertise in crucial disciplines, groupthink and bandwagon effects and selective reporting are some of the causes of these failures.”

In fact, there are many possible reasons why the number of cases might change over time outside of lockdowns that the theoretical literature ignores. There are many possible reasons why the number of cases might change over time outside of lockdowns, and these should be accounted for in any accurate estimation of lockdown effects. For instance, there is evidence that COVID-19 infection rates are increased during cold weather seasons.<sup>37, 38</sup> It is striking that the rise and subsequent fall in COVID-19 cases in the northern hemisphere corresponded to the colder weather of winter months, despite the continuing lockdowns. Even authors who favor lockdowns as a policy option in summarizing this evidence agree that seasonality plays an important role in case spread:<sup>39</sup>

“A convincing argument that weather influences COVID-19 can be formulated in three parts: (1) Experimental data suggest SARS-CoV-2 persistence on surfaces or in the air is sensitive to temperature, humidity, and ultraviolet light; (2) Other environmentally sensitive respiratory viruses are seasonal, and more common in winter; and therefore, (3) Climatic effects could be protective over space (hot, dry places might have less transmission) and time (summer might see reduced transmission compared to winter.)”

Seasonality should thus be accounted for in any analysis of case spread, but is often not included in theoretical modeling. Studies decomposing lockdown effects should also account for the fact that, even in the absence of policy interventions, people change their behavior to protect themselves from disease risk if they perceive the danger from infection to be high.<sup>40</sup>

---

<sup>36</sup> Ioannidis JPA, Cripps S, Tanner MA. Forecasting for COVID-19 has failed. *Int J Forecast.* 2020 Aug 25. doi: 10.1016/j.ijforecast.2020.08.004. Epub ahead of print. PMID: 32863495; PMCID: PMC7447267.

<sup>37</sup> Araujo MB and Naimi B (2020) Spread of SARS-CoV-2 Coronavirus Likely Constrained by Climate. medRxiv. <https://www.medrxiv.org/content/10.1101/2020.03.12.20034728v3.article-info>

<sup>38</sup> Sajadi, Mohammad M. and Habibzadeh, Parham and Vintzileos, Augustin and Shokouhi, Shervin and Miralles-Wilhelm, Fernando and Amoroso, Anthony, Temperature, Humidity and Latitude Analysis to Predict Potential Spread and Seasonality for COVID-19 (March 5, 2020). Available at SSRN: <https://ssrn.com/abstract=3550308> or <http://dx.doi.org/10.2139/ssrn.3550308>

<sup>39</sup> Carson CJ, Gomez ACR, Shweta B, and Ryan SJ (2020) “Misconceptions about Weather and Seasonality Must not Misguide COVID-19 Response” *Nature Communications* 11: 4312. <https://doi.org/10.1038/s41467-020-18150-z>

<sup>40</sup> Yoo BK, Kasajima M, Bhattacharya J. (2020) “Public Avoidance and the Epidemiology of novel H1N1 Influenza A.” National Bureau of Economic Research Working Paper #15752. DOI 10.3386/w15752. <https://www.nber.org/papers/w15752>

Given this poor track record in prediction, extreme caution should be exercised by public health decision-makers in using compartment models to forecast the future direction of the pandemic and in predicting the effects of policy interventions such as lockdowns on COVID-19 outcomes such as mortality and hospitalization.<sup>41</sup>

## Empirical Literature

The existing empirical literature that assesses the effectiveness of lockdown policies shows that they have a poor track record in reducing COVID infection.

In the case of lockdowns and social distancing interventions, there is no existing randomized study – the gold standard study type in clinical therapeutics and public health interventions – that has evaluated the efficacy or costs of these measures. Scientific experts have argued for the necessity and feasibility of such randomized evaluation of restricting schools, universities, workplaces, banning public gatherings, and the like.<sup>42</sup> If one were to view these lockdowns and activity restrictions as a medical intervention, it would be unethical to implement them in the absence of randomized evidence supporting their efficacy.

In the absence of such evidence, scientists and public health officials tend to rely on studies that are less rigorous than randomized trials in establishing causal links between the intervention and outcomes, including event studies and other observational studies. In the case of the lockdowns, the evidence from these sources is decidedly mixed. Evidence from the draconian lockdown order in China – including home and centralized quarantine, severe travel restrictions, cordon sanitaire, mandated centralized symptom reporting, and other interventions inconsistent with democratic norms – suggests that lockdowns can temporarily reduce the spread of the virus.<sup>43</sup> Evidence from the early days of the epidemic (March and early April 2020) in the U.S. found that states that imposed strict stay-at-home orders had slower growth in the epidemic than states that did not over that short period.<sup>44</sup>

The problem with these Chinese event studies is that they cannot be used to forecast the effect of imposing less strict lockdowns (such as restrictions on businesses and gatherings). Focused as they are on quarantine or stay-at-home orders and the draconian policies imposed during the

---

<sup>41</sup> Chin V, Ioannidis J, Tanner M, Cripps S. (2020) Effects of Non-Pharmaceutical Interventions on COVID-19: A Tale of Three Models. medRxiv. <https://www.medrxiv.org/content/10.1101/2020.07.22.20160341v2>

<sup>42</sup> Cristea, I. A., Naudet, F., & Ioannidis, J. P. A. (2020). Preserving equipoise and performing randomized trials for COVID-19 social distancing interventions. *Epidemiology and Psychiatric Sciences*. <https://doi.org/10.1017/S2045796020000992>

<sup>43</sup> Pan A, Liu L, Wang C, et al. Association of Public Health Interventions With the Epidemiology of the COVID-19 Outbreak in Wuhan, China. *JAMA*. 2020;323(19):1915–1923. doi:10.1001/jama.2020.6130

<sup>44</sup> Mark N Lurie, Joe Silva, Rachel R Yorlets, Jun Tao, Philip A Chan, Coronavirus Disease 2019 Epidemic Doubling Time in the United States Before and During Stay-at-Home Restrictions, *The Journal of Infectious Diseases*, Volume 222, Issue 10, 15 November 2020, Pages 1601–1606, <https://doi.org/10.1093/infdis/jiaa491>; The article also had a correction appended. Mark N Lurie, Joe Silva, Rachel R Yorlets, Jun Tao, Philip A Chan, Corrigendum to: COVID-19 Epidemic Doubling Time in the United States Before and During Stay-at-Home Restrictions, *The Journal of Infectious Diseases*, Volume 222, Issue 10, 15 November 2020, Page 1758, <https://doi.org/10.1093/infdis/jiaa506>

early epidemic in China, they represent a best case for the effectiveness of lockdowns (and, of course, ignore their harms). More importantly, they only measure the effect of lockdown on the speed of disease spread in the short run and should not be used to forecast the impact of lockdown on long-run epidemic outcomes since the theoretical literature strongly cautions against it. Recall that lockdowns push cases into the future; they do not prevent them altogether.

A growing peer-reviewed empirical literature has emerged that demonstrates the futility of lockdowns to control COVID case growth over a long period of time. The best studies, which account for environmental, epidemiological and economic factors alongside policy interventions conclude that the mortality from COVID-19 infection in different regions is not primarily driven by policy decisions like lockdowns, but rather by other factors specific to each region.<sup>45</sup> A comprehensive international cross-country study, analyzing data from the first eight months of the pandemic, concluded that:<sup>46</sup>

“Countries that already experienced a stagnation or regression of life expectancy, with high income and non-communicable disease rates, had the highest price to pay. This burden was not alleviated by more stringent public decisions. Inherent factors have predetermined the Covid-19 mortality: Understanding them may improve prevention strategies by increasing population resilience through better physical fitness and immunity... The death rate appears not to be linked with the responses of governments.”

In other words, countries that had a population predisposed to poor COVID-19 infection outcomes, especially countries that had an older population, tended to have worse outcomes irrespective of whatever lockdown policies they implemented.

A peer-reviewed study recently published in the *European Journal of Clinical Investigation*, of which I am a co-author, compares the effectiveness of mandatory lockdown orders (stay-at-home orders and forced business closures) versus less restrictive policies adopted by ten European and Asian countries on case growth in Spring 2020. This study re-analyzes and revises the results from an earlier study by using countries that did not introduce mandatory stay-at-home orders and business closures over this period (like Sweden and South Korea) compared to countries that did. The main conclusion arising from this analysis is that “While small benefits cannot be excluded, [my co-authors and I] do not find significant benefits on case growth of more restrictive NPIs. Similar reductions in case growth may be achievable with less restrictive interventions.”

Other peer-reviews papers, using different methodologies, and different comparison countries

---

<sup>45</sup> Atkeson A, Kopecky K, Zha T. (2020) “Four Stylized Facts about COVID-19” National Bureau of Economic Research Working Paper #27719. DOI 10.3386/w27719. <https://www.nber.org/papers/w27719>

<sup>46</sup> De Laroche Lambert Q, Marc A, Antero J, Le Bourg E, and Toussaint JF. (2020) Covid-19 Mortality: A Matter of Vulnerability Among Nations Facing Limited Margins of Adaptation. *Front. Public Health*, 19 November 2020 | <https://doi.org/10.3389/fpubh.2020.604339>



and regions, confirm this finding. An excellent analysis published in *Scientific Reports* considers the effects of non-pharmaceutical interventions such as those imposed in Canada on COVID-19 related mortality in 87 regions worldwide. The primary finding is that there is no detectable effect of lockdowns on COVID mortality in the vast majority of cases. The authors conclude that “With our results, we were not able to explain if COVID-19 mortality is reduced by staying at home in ~98% of the comparisons after epidemiological weeks 9 to 34.”

### **Case Study: Florida vs. California**

Further evidence that lockdowns are not required to reduce transmission, reduce cases and prevent death comes from an examination of a case study contrasting COVID results in California, (which has implemented extended lockdowns, including mandatory stay-at-home orders, curfews, school, church, and business closures, among other strategies at various points during the epidemic) and Florida which is demographically similar to California, but has not implemented harsh lockdown since May 2020 (and entirely lifted lockdowns in September 2020.)

Through March 28th, 2021, 8.9% of all Californians have been identified as COVID cases – 3.6 million cases.<sup>47</sup> Since most infections are not recognized as cases, a much larger fraction of the population has been infected with COVID.<sup>48</sup> Through March 31<sup>st</sup>, nearly 58,000 people have died in California with COVID.<sup>49</sup> In sharp contrast with California, Florida partially lifted its lockdown in May 2020<sup>50</sup> and then further relaxed restrictions in September 2020.<sup>51</sup> Most Florida schools and universities have been open for in-person instruction since the fall, normal human activities – sports, church-going, visits to the park – occur regularly, and businesses have been open for in-person activities.<sup>52</sup> Local ordinances can recommend masks and social distancing and impose indoor capacity limitations but cannot mandate closures, as is the case in California. Disneyworld in Orlando, Florida, has been open since July.<sup>53</sup> At the same time, Florida increased

---

<sup>47</sup> Financial Times COVID Tracker (2021) “Cumulative Confirmed Cases of COVID-19 in Florida and California” ? <https://ig.ft.com/coronavirus-chart/?areas=can&areas=swe&areasRegional=usfl&areasRegional=usca&cumulative=0&logScale=0&per100K=1&startDate=2020-03-01&values=cases> Accessed March 31, 2021.

<sup>48</sup> Sood N, Simon P, Ebner P, Eichner D, Reynolds J, Bendavid E, Bhattacharya J. Seroprevalence of SARS-CoV-2-Specific Antibodies Among Adults in Los Angeles County, California, on April 10-11, 2020. *JAMA*. 2020 Jun 16;323(23):2425-2427. doi: 10.1001/jama.2020.8279. PMID: 32421144; PMCID: PMC7235907.

<sup>49</sup> Financial Times COVID Tracker (2021) “Cumulative Deaths Attributed to COVID-19 in Florida and California” <https://ig.ft.com/coronavirus-chart/?areas=can&areasRegional=usfl&areasRegional=usca&cumulative=0&logScale=0&per100K=1&startDate=2020-03-01&values=deaths> Accessed March 31, 2021.

<sup>50</sup> Emily Crane (2020) “Florida is Back in Business!” *Daily Mail*. May 4, 2020. <https://www.dailymail.co.uk/news/article-8285211/Florida-reopens-economy-states-continue-lift-COVID-19-lockdowns.html>

<sup>51</sup> Greg Allen (2020) “Florida’s Governor Lifts All COVID-19 Restrictions on Businesses Statewide” National Public Radio KQED. September 25, 2020. <https://www.npr.org/sections/coronavirus-live-updates/2020/09/25/916969969/floridas-governor-lifts-all-covid-19-restrictions-on-businesses-statewide>

<sup>52</sup> USA Today (2020/1) “COVID-19 Restrictions. Map of COVID-19 Case Trends, Restrictions, and Mobility” <https://www.usatoday.com/storytelling/coronavirus-reopening-america-map/> Accessed February 18, 2021.

<sup>53</sup> Janine Puhak and Michael Bartiromo (2020) “Disney World Targets July 11 as Reopening Date for Theme Park” Fox News. <https://www.foxnews.com/travel/disney-world-present-reopening-plans-theme-park>.

testing and protection of its nursing homes to reduce the risk of COVID among its most vulnerable residents.

Florida has the fifth oldest population in the country, and California the seventh youngest.<sup>54</sup> Despite one of the sharpest lockdowns in the United States (including closed schools, shuttered businesses and churches, periodic shelter-in-place orders and curfews, and mask mandates), California has had higher age-adjusted COVID-19 mortality per capita through April 2021.

The death rates with COVID through April 2020 are, by my calculations, higher in California than in Florida. In fact, the COVID mortality rate for *both* the under-65 population and the over-65 population are lower to date in Florida than in California. The overall age-adjusted per-capita COVID mortality rate in Florida is 118 per 100,000 population, while it is 168 per 100,000 population in California. At best, one can say that the lockdowns delayed the spread of the disease in California by a few months, at enormous harm to the population.

In reality, the California lockdowns and elsewhere have served to protect only a portion of the population – the rich. Data from L.A. County, where a large fraction of COVID cases in California has occurred, put this fact in stark relief.<sup>55</sup> Through January 23<sup>rd</sup>, in the wealthiest parts of L.A. county (with less than 10% poverty), the age-adjusted death rate with COVID-19 was 76 people per 100,000 population. As we look in poorer and poorer areas, the death rate mounts; areas with more than 30% poverty have faced a death rate of 263 people per 100,000 population – more than three times as many deaths. Hispanics in L.A. have borne the worst of the pandemic, with a death rate of 219 per 100,000 people. By contrast, black, Asian, and white residents have experienced 131, 96, and 78 deaths per 100k residents, respectively. The California and Canadian<sup>56</sup> lockdowns are a form of trickle-down epidemiology. In Florida, by contrast, there is little difference between races in COVID-related death rates throughout the epidemic, with the Hispanic population dying at lower rates than the white population.<sup>57</sup>

## Summary

Neither the theoretical literature nor the empirical literature provides convincing support for the idea that lockdowns effectively contain the spread of COVID-19 disease over anything other than short periods.

---

<sup>54</sup> World Population Review (2021) Median Age by State 2021. <https://worldpopulationreview.com/state-rankings/median-age-by-state>. Accessed March 31, 2021.

<sup>55</sup> LA County Public Health (2021) “Age-Adjusted Death Rates due to COVID-19 per 100K.” <http://publichealth.lacounty.gov/media/Coronavirus/data/index.htm#graph-deathrate>. Accessed January 23, 2021.

<sup>56</sup> Kulldorff M and Gupta S (2020) Canada’s COVID-19 Strategy is an Assault on the Working Class. Toronto Sun, Nov. 28, 2020. <https://torontosun.com/opinion/columnists/opinion-canadas-covid-19-strategy-is-an-assault-on-the-working-class>

<sup>57</sup> COVID Tracking Project (2021) “The Data: Florida” <https://covidtracking.com/data/state/florida>. Accessed January 23, 2021.

## **E. Are governmental actions aiming to slow down the propagation of the disease harmful to the health of the population?**

While the evidence on the benefits of lockdowns is equivocal, the harms of the lockdowns are manifold and devastating. The effects on the health of populations, in particular, warrant careful attention since they can be compared directly against the harms from COVID-19 infection. The COVID-19 lockdowns have often featured the cessation of elective and other medical services to keep hospital and health care systems available for COVID-19 patients. Naturally, patients who skip medical services will suffer adverse health consequences as a result. The empirical evidence supporting these ideas includes documentation for plummeting childhood vaccination rates,<sup>58</sup> worse cardiovascular disease outcomes (in part because patients delayed necessary cardiac care),<sup>59</sup> less cancer screening<sup>60 61</sup>, and deteriorating mental health.<sup>62 63 64</sup>

For example, non-urgent procedures and tests were canceled in Manitoba on March 24, 2020<sup>65</sup>, and wait times for non-urgent MRIs and ultrasounds (such as bone-density tests) are nearly triple what they were at the end of 2019.<sup>66</sup> Specifically, regarding children’s surgeries, authors writing in the *Canadian Medical Association Journal* reported that “although nearly 9,000 emergency and urgent surgeries were completed in Canadian children’s hospitals between mid-March and June, there were an estimated 7,600 surgery postponements with an additional estimated 4,000 children not wait-listed owing to reduced access to consultation.”<sup>67</sup>

In addition to the physical health harms from lockdown, there has been immense psychological harm. The social isolation induced by lockdown has led to a sharp rise in opioid and drug-related

---

<sup>58</sup> CDC (2020) Effects of the COVID-19 Pandemic on Routine Pediatric Vaccine Ordering and Administration — United States, 2020. *MMWR*. 69(19): 591-3. <https://www.cdc.gov/mmwr/volumes/69/wr/mm6919e2.htm>

<sup>59</sup> Ball S, Banerjee A, Berry C, et al. Monitoring indirect impact of COVID-19 pandemic on services for cardiovascular diseases in the UKHeart Published Online First: 05 October 2020. doi: 10.1136/heartjnl-2020-317870

<sup>60</sup> Rutter MD, Brookes M, Lee TJ, et al. Impact of the COVID-19 pandemic on UK endoscopic activity and cancer detection: a National Endoscopy Database Analysis Gut Published Online First: 20 July 2020. doi: 10.1136/gutjnl-2020-322179

<sup>61</sup> <https://www.bbc.com/news/health-53300784>, UK scientists warned in July that delayed cancer diagnosis and treatment due to lockdown measures could cause at least 7,000 additional deaths in the UK alone, and as many as 35,000 deaths in a worst-case scenario. If the lockdowns had the same impact in Canada, a population just less than half of the UK, 3,500 to 17,500 deaths could have occurred.

<sup>62</sup> Vizard T, Davis J, White E, Beynon B (2020) Coronavirus and depression in adults, Great Britain: June 2020. Office for National Statistics, UK. <https://www.ons.gov.uk/peoplepopulationandcommunity/wellbeing/articles/coronavirusanddepressioninadultsgreatbritain/june2020>

<sup>63</sup> United Nations. Policy Brief: COVID-19 and the Need for Action on Mental Health, 13 May 2020. New York, New York: United Nations Sustainable Development Group, <https://unsdg.un.org/resources/policy-brief-covid-19-and-need-action-mental-health>

<sup>64</sup> Centre for Addiction and Mental Health, Mental Health in Canada, Covid-19 and Beyond: CAMH Policy Advice, July 2020, <http://www.camh.ca/-/media/files/pdfs--public-policy-submissions/covid-and-mh-policy-paper-pdf.pdf>

<sup>65</sup> Kristin Annabel, “Wait times for diagnostic tests climb in Manitoba after pandemic prompted spring shutdown”, July 30, 2020, <https://www.cbc.ca/news/canada/manitoba/wait-tests-manitoba-1.5667409>

<sup>66</sup> Diagnostic Services, Bone Density Test wait times (in weeks), updated November 24, 2011, <https://www.gov.mb.ca/health/waittime/historical/diagnostic.pdf>

<sup>67</sup> Erik D. Sarsgaard, Prioritizing specialized children’s surgery in Canada during the COVID-19 pandemic, *CMAJ*, October 13, 2020 192 (41) E1212-E1213; DOI: <https://doi.org/10.1503/cmaj.201577>

overdoses,<sup>68 69 70</sup> similar to the ‘deaths of despair’ that occurred in the wake of the 2008 Great Recession.<sup>71</sup> Social isolation of the elderly has contributed to a sharp rise in dementia-related deaths around the country.<sup>72</sup> For children, the cessation of in-person schooling since the spring has led to ‘catastrophic’ learning losses<sup>73</sup>, with severe projected adverse consequences for affected students’ life spans.<sup>74</sup> According to a U.S. CDC estimate, one in four young adults seriously considered suicide in June 2020.<sup>75</sup> Among 25 to 44-year-olds, the U.S. CDC reports a 26% increase in excess all-cause mortality for 2020 relative to past years, though fewer than 5% of 2020 deaths have been due to COVID-19.<sup>76, 77</sup>

A recent study<sup>78</sup> in *European Psychiatry* analyzed the psychological harms of the lockdowns in Switzerland and attempted to quantify citizens’ years of life lost as a result. The authors focused on deaths caused by “suicide, depression, alcohol use disorder, childhood trauma due to domestic violence, changes in marital status, and social isolation.” The authors found that the 2.1% of the population who suffered from one of these conditions would suffer nearly 9.8 years of life lost in expectation due to just a three-month lockdown. They emphasize that their estimate is likely to be underestimated because many of the outcomes they analyze will persist even after the lockdown ends. The authors conclude,

“The literature suggests that increased duration of confinement is associated with worse outcomes for psychological health of those confined. While some of the stress-related problems ensuing from confinement may remit, an important portion of this damage may prove to be hard or impossible to reverse and the

---

<sup>68</sup> Public Health Ontario, Preliminary Patterns in Circumstances Surrounding Opioid-Related Deaths in Ontario During the COVID-19 Pandemic, November 2020, <https://www.publichealthontario.ca/-/media/documents/o/2020/opioid-mortality-covid-surveillance-report.pdf?la=en>

<sup>69</sup> Vipal Monga, “Opioid Deaths in Canada Were Falling Then Came Coronavirus”, *Wall Street Journal*, November 14, 2020 <https://www.wsj.com/articles/opioid-deaths-in-canada-were-falling-then-came-coronavirus-11605368112>

<sup>70</sup> American Medical Association (2020) Issue Brief: Reports of Increases in Opioid- and Other Drug Related Overdose and Other Concerns During COVID Pandemic. AMA Advocacy Resource Center. Oct. 31, 2020. <https://www.ama-assn.org/system/files/2020-11/issue-brief-increases-in-opioid-related-overdose.pdf>

<sup>71</sup> Deaton A and Case A (2020) Deaths of Despair and the Future of Capitalism. Princeton University Press. March 17, 2020.

<sup>72</sup> Alzheimer’s Impact Movement (2020) The 2020 COVID-19 Pandemic and Dementia: Deaths Above Average. <https://www.scribd.com/document/483085777/Dementia-Deaths-Above-Average-State-by-State-Table>

<sup>73</sup> Center for Research on Education Outcomes (2020) Estimates of Learning Loss in the 2019-2020 School Year. CREO Stanford University. October 2020.

[https://credo.stanford.edu/sites/g/files/sbiybj6481/f/short\\_brief\\_on\\_learning\\_loss\\_final\\_v.3.pdf](https://credo.stanford.edu/sites/g/files/sbiybj6481/f/short_brief_on_learning_loss_final_v.3.pdf)

<sup>74</sup> Christakis DA, Van Cleve W, Zimmerman FJ. Estimation of US Children’s Educational Attainment and Years of Life Lost Associated With Primary School Closures During the Coronavirus Disease 2019 Pandemic. *JAMA Netw Open*. 2020;3(11):e2028786. doi:10.1001/jamanetworkopen.2020.28786

<sup>75</sup> Czeisler MÉ, Lane RI, Petrosky E, et al. Mental Health, Substance Use, and Suicidal Ideation During the COVID-19 Pandemic — United States, June 24–30, 2020. *MMWR Morb Mortal Wkly Rep* 2020;69:1049–1057. DOI: <http://dx.doi.org/10.15585/mmwr.mm6932a1>

<sup>76</sup> Rossen LM, Branum AM, Ahmad FB, Sutton P, Anderson RN. Excess Deaths Associated with COVID-19, by Age and Race and Ethnicity — United States, January 26–October 3, 2020. *MMWR Morb Mortal Wkly Rep* 2020;69:1522–1527. DOI: <http://dx.doi.org/10.15585/mmwr.mm6942e2>

<sup>77</sup> CDC (2020) Provisional COVID-19 Death Counts by Sex, Age, and State. <https://data.cdc.gov/NCHS/Provisional-COVID-19-Death-Counts-by-Sex-Age-and-S/9bhg-hcku>

<sup>78</sup> Dominik A. Moser, Jennifer Glaus, Sophia Frangou and Daniel S. Schechter, “Years of Life Lost Due to the Psychosocial Consequences of Covid-19 Mitigation Strategies Based on Swiss Data” 19 May 2020, *European Psychiatry*, 63(1), e58, 1–7, <https://doi.org/10.1192/j.eurpsy.2020.56>

affected individuals may experience ongoing suffering. Our projection suggests that the Swiss population will incur a substantial increase in mortality as a consequence of confinement-related psychosocial stress, which should be considered in forming public health responses to the pandemic.”

While the lockdowns directly harm the health of populations where they are implemented, they also have devastating indirect consequences resulting from a collapse in worldwide economic outcomes, with enormous adverse effects on poor countries.<sup>79</sup> This economic harm translates directly into health harm, as large populations are no longer able to feed themselves due to poverty. The UN estimates that an additional 130 million poor people will be at risk of starvation due to the economic collapse caused by the lockdowns – predicting a famine of “biblical” proportions.<sup>80</sup> Estimates suggest that an additional 400,000 people will die from inadequate tuberculosis treatment due to the diversion of resources away from TB identification and treatment.<sup>81</sup> Vaccination campaigns in rich and poor countries that address diseases like diphtheria and polio have been suspended due to the lockdowns.<sup>82</sup> According to a recent editorial in the journal *Nature*, COVID-19 is “fueling a resurgence of AIDS, malaria, and tuberculosis” worldwide.<sup>83</sup>

---

<sup>79</sup> Bhattacharya J and Packalen M (2020) Focused COVID-19 Restrictions will Save Lives in Poor Countries. Financial Post. July 3, 2020. <https://financialpost.com/opinion/focused-covid-19-restrictions-will-save-lives-in-poor-countries>

<sup>80</sup> Dowsett C (2020) As famines of ‘biblical proportion’ loom, Security Council urged to ‘act fast’. UN News. April 21, 2020. <https://news.un.org/en/story/2020/04/1062272>

<sup>81</sup> McKie R (2020) Covid set to cause 400,000 surge in TB deaths as medics diverted. The Guardian. Nov. 8, 2020. <https://www.theguardian.com/world/2020/nov/08/covid-set-to-cause-400000-surge-in-tb-deaths-as-medics-diverted>

<sup>82</sup> GAVI (2020) At least 80 million children at risk of disease as COVID-19 disrupts vaccination efforts, warn Gavi, WHO and UNICEF. May 22, 2020. <https://www.gavi.org/news/media-room/least-80-million-children-risk-disease-covid-19-disrupts-vaccination-efforts>

<sup>83</sup> Nature (2020) How to stop COVID-19 fueling a resurgence of AIDS, malaria and tuberculosis. *Nature* 584: 169. August 12, 2020. doi: <https://doi.org/10.1038/d41586-020-02334-0>

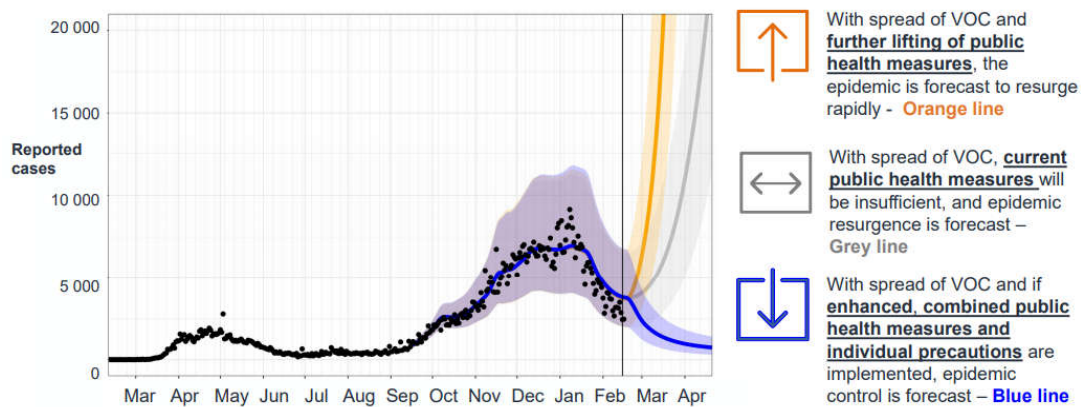
## F. Do the Emergence of Variant Strains of the SARS-CoV-2 Virus Justify Continuing Lockdowns?

The Canadian public health agencies have expressed concern about the development of Covid variants strains and have used the spread of these strains to justify the continuance of lockdown measures. It is instructive to assess the inadequate ability of Canadian public health authorities to predict the impact of new strains on disease spread. Consider, for instance, a forecast made by the Public Health Agency of Canada on February 19<sup>th</sup> 2021. The Agency’s model predicted that the spread of particular variants common in the U.S. and the U.K. throughout Canada would lead to a sharp increase in the number of COVID-19 cases throughout Canada in the coming months. It also predicted an imminent catastrophic new wave of cases of greater magnitude than the cases in the first and second wave combined, based on the assumptions that a mutated variant of the SARS-CoV-2 virus will spread throughout Canada in the next weeks.<sup>84</sup>

Figure 1, immediately below, shows this official Canadian forecast. In the figure, there are three lines, one corresponding to the lifting of all restrictions, one corresponding to the maintenance of the lockdowns as they were in mid-February, and a third corresponding to a tightening of restrictions. The first two predicted a sharp growth in Canadian cases, while the third predicted a decline in cases. The experience in Canada through March has contradicted those predictions.

**Figure 1: February 29<sup>th</sup> 2021 Canadian Forecast of COVID-19 Case Growth Assuming Spread of Variants**

**New longer-range forecast that includes Variants of Concern indicates a strong resurgence unless we have stringent measures and strict adherence**



Data as of February 16, 2021

Notes: Variants of concern introduced in mid-Dec (~1 week prior to first detected case in Canada) at very low prevalence. Variants of concern assumed to be 50% more transmissible compared to wildtype. The growth rates AND replacement rate are negatively correlated with the strength of public health measures in place.

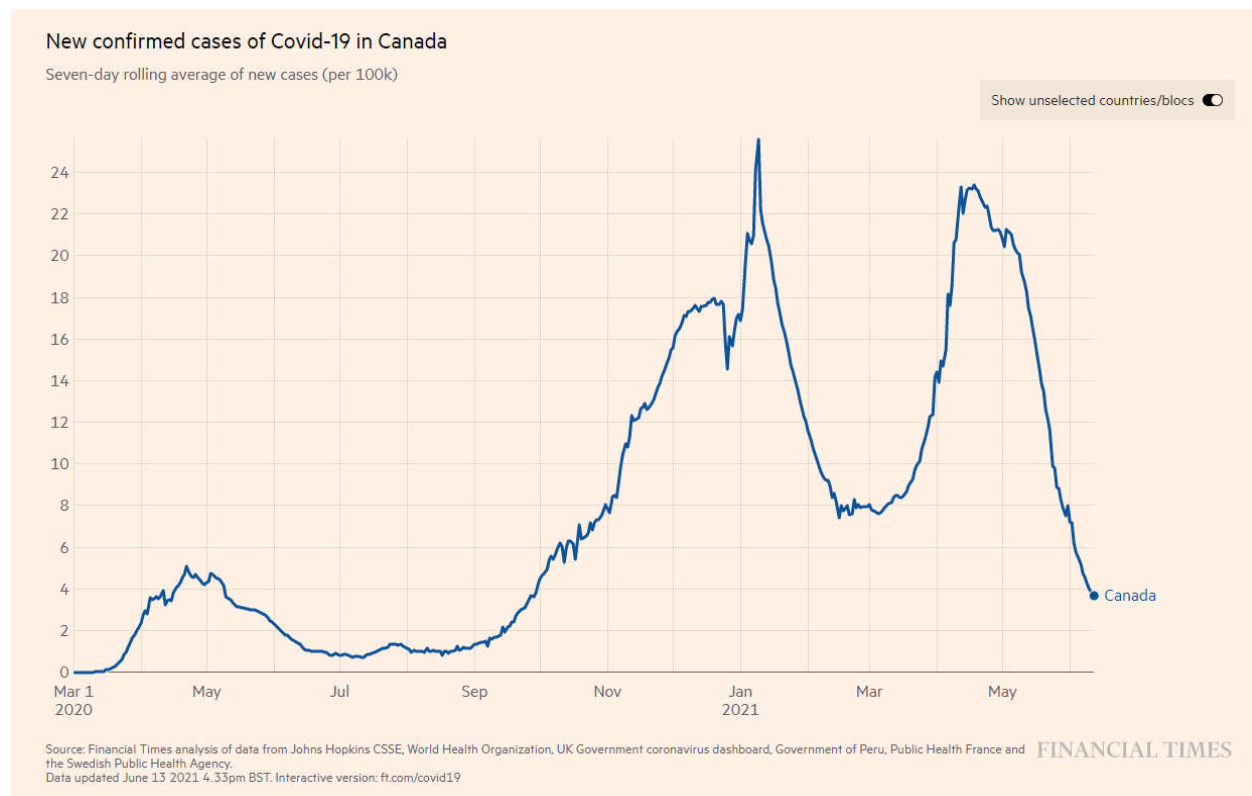


<sup>84</sup> Public Health Agency of Canada (2021) *Update on COVID-19 in Canada: Epidemiology and Modelling*. <https://www.canada.ca/content/dam/phac-aspc/documents/services/diseases-maladies/coronavirus-disease-covid-19/epidemiological-economic-research-data/update-covid-19-canada-epidemiology-modelling-20210219-en.pdf>

Figure 2, immediately below, plots the number of cases in Canada from March 2020 through the end of March 2021. Rather than the sharp increase in cases predicted by Canadian public health unless sharp new restrictions were implemented, Canada experienced a moderate increase in cases through April 2021 with a peak below the January 2021 peak. Contrary to the February forecasting model by Canadian public health and despite the acknowledged spread of disease variants, the increase in cases that Canada actually experienced remained below the peak of cases during the previous wave.

Notice also that the COVID-19 caseload increased well above the level predicted by the model despite the imposition of a draconian lockdown in much of Canada between February and June 2021. The model overestimated the spread of the disease without a lockdown, and it overestimated the efficacy of the lockdown in controlling what spread there was. That the actual case estimates have diverged from the modeling predictions should not be surprising, as epidemic forecasting has proved unreliable (typically in the direction of overestimating disease spread) throughout the epidemic.

**Figure 2: COVID-19 Confirmed Cases in Canada– March 2020 to June 2021**



The emergence of variants does not alter the facts about the inefficacy of lockdowns.



The forecasting models, which focus on disease spread, do not convey an accurate assessment of the degree of public health risk due to the emergence of disease variants, nor do they accurately describe the efficacy of lockdown policies in controlling disease spread.

First, the mutant variants do not escape the immunity provided by previous infection with the wild-type virus or vaccination.<sup>85,86,87</sup> Although reinfection can occur, people who have been previously infected by the wild-type (non-variant) virus are unlikely to have a severe outcome (hospitalization or death) after exposure to a variant virus. This means that a variant circulating in the population poses little additional risk of hospital overcrowding or excess mortality due to viral infection.

Second, theoretical work suggests that lockdowns place selective pressure that promotes the development and establishment of more deadly variants. This, in part, may explain why the most concerning variants have emerged in places like the UK, South Africa, and California, where severe lockdowns have been imposed for extended periods.<sup>88</sup> While this hypothesis awaits a definitive empirical test, it is consistent with the *prima facie* evidence on mutant variants' development. None of these facts is accounted for in the Canadian Public Health Agency's forecasts.<sup>89</sup>

Third, the variants have been widely spreading in many countries these past months, even as cases have dropped. This is true, for instance, in Florida, where the UK variant B.1.1.7 is widespread<sup>90</sup>, but cases have fallen sharply over the same period that the variant has been spreading. That variants with an infectivity advantage – but no more lethality – make up a larger fraction of a smaller number of cases is an interesting scientific observation but not important for public health policy.

Fourth, the dissemination of vaccines that protect against hospitalizations and deaths upon

---

<sup>85</sup> Alison Tarke, A., Sidney, J., Methot, N., Zhang, Y., Dan, J. M., Goodwin, B., Rubiro, P., Sutherland, A., da Silva Antunes, R., Frazier, A., Rawlings, S. A., Smith, D. M., Peters, B., Scheuermann, R. H., Weiskopf, D., Crotty, S., Grifoni, A., & Sette, A. (2021). Negligible impact of SARS-CoV-2 variants on CD4 + and CD8 + T cell reactivity in COVID-19 exposed donors and vaccinees. *BioRxiv*, 2021.02.27.433180. <https://doi.org/10.1101/2021.02.27.433180>

<sup>86</sup> Wu, K., Werner, A. P., Moliva, J. I., Koch, M., Choi, A., Stewart-Jones, G. B. E., Bennett, H., Boyoglu-Barnum, S., Shi, W., Graham, B. S., Carfi, A., Corbett, K. S., Seder, R. A., & Edwards, D. K. (2021). mRNA-1273 vaccine induces neutralizing antibodies against spike mutants from global SARS-CoV-2 variants. *BioRxiv : The Preprint Server for Biology*, 2021.01.25.427948. <https://doi.org/10.1101/2021.01.25.427948>

<sup>87</sup> Redd, A. D., Nardin, A., Kared, H., Bloch, E. M., Pekosz, A., Laeyendecker, O., Abel, B., Fehlings, M., Quinn, T. C., & Tobian, A. A. (2021). CD8+ T cell responses in COVID-19 convalescent individuals target conserved epitopes from multiple prominent SARS-CoV-2 circulating variants. *MedRxiv : The Preprint Server for Health Sciences*, 2021.02.11.21251585. <https://doi.org/10.1101/2021.02.11.21251585>

<sup>88</sup> Moran J. (2021) Mutant variations and the danger of lockdowns. *The Critic Magazine*. March 2, 2021. <https://thecritic.co.uk/mutant-variations-and-the-danger-of-lockdowns/>

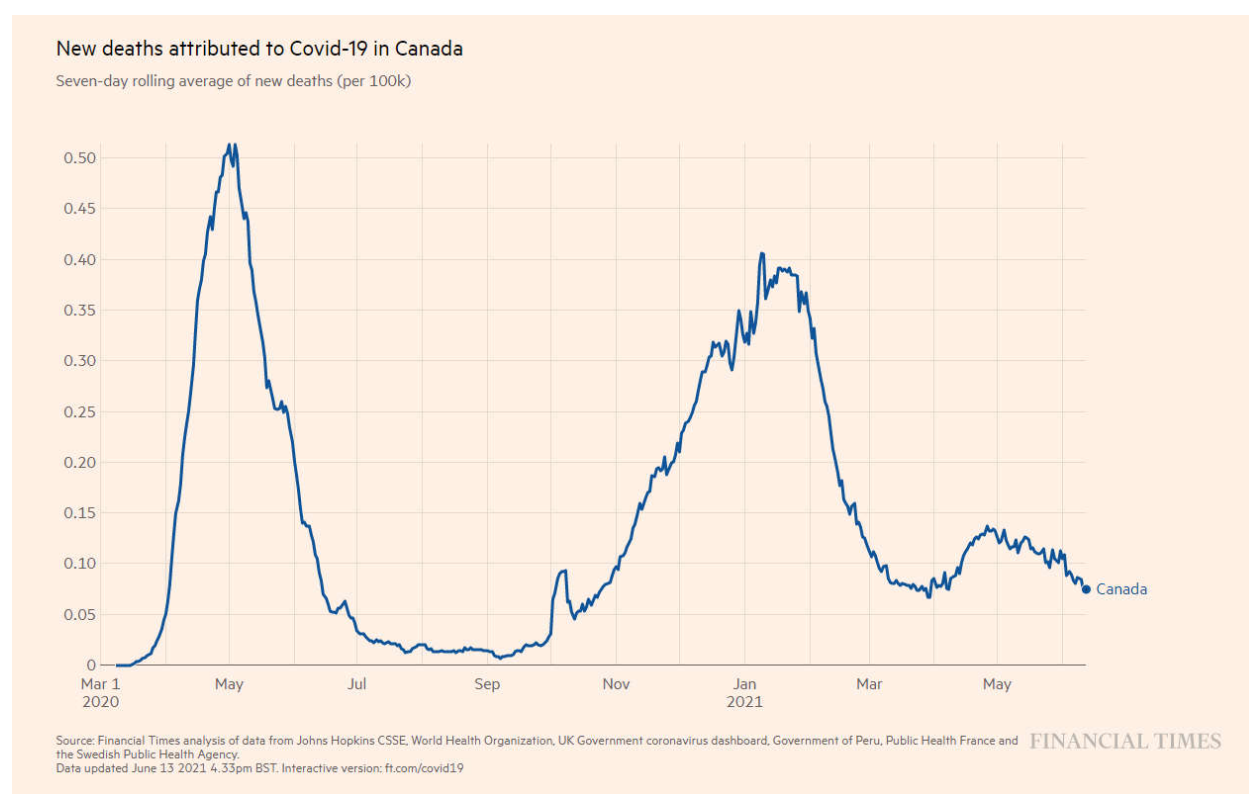
<sup>89</sup> Brisson M. et al. (2021) *Modélisation de l'impact potentiel d'un variant COVID-19 plus transmissible au Québec*. Institut National de Sante Publique Québec. <https://www.inspq.qc.ca/sites/default/files/covid/projections/inspq-projections-4mars2021.pdf>

<sup>90</sup> US Centers for Disease Control (2021) US COVID-19 Cases Caused by Variants. <https://www.cdc.gov/coronavirus/2019-ncov/transmission/variant-cases.html>



COVID-19 infection throughout the older population in Canada has decoupled the growth in COVID-19 cases from COVID-19 mortality. Vaccinated people can still perhaps be infected but rarely have severe symptoms in response to infection. Figure 3 plots the number of COVID-19 deaths in Canada over this same time period as cases were plotted in Figure 2. Strikingly, the number of COVID-19 deaths has declined in Canada in February and March 2021 despite the mildly increasing number of cases. Throughout last year, a rise in cases has inevitably been accompanied by an increase in deaths with a two-to-three-week lag. However, during this most recent wave, there has been little rise in deaths to accompany the increase in cases because of the deployment of the vaccine in the vulnerable older population in Canada. This is true despite the spread of new variant forms of the virus throughout Canada in February and March 2021.<sup>91</sup> Because of the success of the Canadian vaccination effort among the vulnerable elderly, COVID-19 cases and COVID-19 deaths are now effectively decoupled.

**Figure 3: COVID-19 Deaths in Canada – March 2020 to June 2021.**



Fifth, and perhaps most importantly, even if it is accepted the increased transmissibility of the new variants, the harsh lockdowns implemented across Canada over the past year as its primary infection control policy are unlikely to work to limit the number of COVID-19 infections.

<sup>91</sup> Bensadoun E (2021) Coronavirus variants are spreading throughout Canada. Is it still safe to reopen? Global News. Feb. 9, 2021. <https://globalnews.ca/news/7627391/coronavirus-variants-canada-provinces-reopen/>

Despite the harsh lockdowns and the circulation of the somewhat less infectious wild-type virus, nearly a million Canadians have been infected over the previous year, and tens of thousands of Canadians have died with COVID-19. If the lockdowns did not work to protect Canadians from the less infectious wild-type virus (and they did not – see the discussion in the previous section) – then there is little reason to expect that they would work to suppress a more infectious variant.

## **G. Are the harms of the lockdowns equitably distributed?**

The harms of lockdowns are unequally distributed. In the U.S., for instance, economists have found that only 37% of jobs in the U.S. can be performed wholly online, and high-paying jobs are over-represented among that set.<sup>92</sup> By declaring janitors, store clerks, meat packers, postal workers, and other blue-collar workers as ‘essential’ workers in most states, regardless of whether they qualify as high COVID mortality risk, the lockdowns have failed to shield the vulnerable in these occupations.

The same is true in Canada as well. Canada has the highest unemployment rate in the G7.<sup>93</sup> The impact of this unemployment has fallen most severely on younger and less well-educated workers.<sup>94</sup> The economic dislocation from the lockdowns has increased the number of households where young adults who have lost their jobs co-reside with vulnerable older parents,<sup>95</sup> which may increase the risk of COVID-related death.<sup>96</sup> Lockdowns thus fail the test of imposing costs and conferring benefits equitably.<sup>97</sup>

---

<sup>92</sup> Dingel JI and Neiman B (2020) How Many Jobs Can Be Done at Home? National Bureau of Economic Research Working Paper #26948. April 2020

<sup>93</sup> Goldsetein L (2020) We’re Number One! Highest Unemployment Rate in the G7. Toronto Sun. Sept. 30, 2020.

<https://torontosun.com/opinion/columnists/goldstein-were-number-one-highest-unemployment-rate-in-the-g7>

<sup>94</sup> Beland LP, Brodeur A, Mikola D, and Wright T. (2020) Here’s how the coronavirus is affecting Canada’s labour market. The Conversation. May 13, 2020. <https://theconversation.com/heres-how-the-coronavirus-is-affecting-canadas-labour-market-137749>

<sup>95</sup> Evandrou M, Falkingham J, Qin M, and Vlachantoni A (2020) Changing Living Arrangements, Family Dynamics and Stress During Lockdown: Evidence from Four Birth Cohorts in the UK. University of Southampton Eprint Soton.

[https://eprints.soton.ac.uk/443865/1/family\\_dynamics\\_during\\_covid\\_19\\_final.pdf](https://eprints.soton.ac.uk/443865/1/family_dynamics_during_covid_19_final.pdf)

<sup>96</sup> Fenoll AA & Grossbard S (2020) Intergenerational residence patterns and Covid-19 fatalities in the EU and the US, *Economics & Human Biology*, 39. <https://doi.org/10.1016/j.ehb.2020.100934>.

<sup>97</sup> Kulldorff M and Gupta S. (2020) Canada’s COVID-19 strategy is an assault on the working class. Toronto Sun. Nov. 29, 2020. <https://torontosun.com/opinion/columnists/opinion-canadas-covid-19-strategy-is-an-assault-on-the-working-class>

## H. Do Children Pose A High Risk of Disease Spread?

The overwhelming weight of scientific data suggests that the risk of transmission of the virus from children to older people is small relative to the risk of transmission posed by adults.

The most important evidence on childhood spread of the disease comes from a study conducted in Iceland and published in the *New England Journal of Medicine*.<sup>98</sup> The data for this study comes from Iceland's systematic screening of its population to check for the virus. This is the most important study on this topic because it is the only study that definitively establishes the direction of spread of the virus from contact to contact. The study reports on both a population-representative sample, and a sample of people who were tested because of the presence of symptoms consistent with COVID-19 infection. The study team isolated SARS-CoV-2 virus samples from every positive case, sequenced the genome of the virus for every case and tracked the mutation patterns in the virus. This analysis, along with contact tracing data, allowed the study team to identify definitively who passed the virus to whom. There have been hundreds of minor mutations of the virus identified, which typically do not alter the function of the virus but which provide a unique fingerprint, of sorts, that makes it possible to tell whether two patients could possibly have passed the virus to one another. From this analysis, the senior author of the study, Dr. Kari Stefansson, concluded<sup>99</sup> that “[E]ven if children do get infected, they are less likely to transmit the disease to others than adults. We have not found a single instance of a child infecting parents. There is amazing diversity in the way in which we react to the virus.”

Although the Iceland study is the only definitive study, there are a number of other studies that use contact tracing methods to investigate the role of children in disease spread. The bulk of such studies conclude that children play a small role, consistent with the Iceland data. A French study,<sup>100</sup> conducted by scientists at the L'Institut Pasteur, examined data from late April 2020 on schoolteachers, students, and their parents in Crepy-en-Valois in France. The schools in France were closed from the end of January on, at first because of a February holiday and then the late February lockdown. The authors found three cases among children in January using antibody tests but found no evidence of virus spread to other kids or teachers from those early cases. Any spread between the end of January and the end of April (when the authors collected samples) must have occurred during the lockdown. Because of the circumstances of the lockdown, the children who tested antibody-positive at the end of April must have become positive from a source other than their school. The main contacts of the young children were their parents, of whom 61% were positive, which is consistent with parent-to-child spread. Also consistent is the

---

<sup>98</sup> Daniel F. Gudbjartsson, Ph.D., Agnar Helgason, Ph.D., et al., *Spread of SARS-CoV-2 in the Icelandic Population*, *The New England Journal of Medicine*, <https://www.nejm.org/doi/full/10.1056/NEJMoa2006100> (June 11, 2020).

<sup>99</sup> Roger Highfield, *Coronavirus: Hunting Down COVID-10*, Science Museum Group, <https://www.sciencemuseumgroup.org.uk/blog/hunting-down-covid-19/> (April 27, 2020).

<sup>100</sup> Arnaud Fontanet, MD, DrPH, Rebecca Grant, et al., *SARS-CoV-2 Infection in Primary Schools in Northern France: A Retrospective Cohort Study in an Area of High Transmission*, Institut Pasteur, <https://www.pasteur.fr/fr/file/35404/download> (last visited July 9, 2020).

fact that only 6.9% of parents tested positive in April for the virus among the kids who were antibody-negative. The authors' main conclusion<sup>101</sup> from these facts is that parents were the source of infections in school children; children were not the source. This finding mirrors the conclusion from the Icelandic study that the disease spreads less easily from children to adults than it does from adults to adults.

Researchers in Ireland conducted a similar study<sup>102</sup> which analyzed 1,160 children and adults in Ireland who were at some time between March 1st and March 13th, physically present in a school where a COVID-19 case was identified. (Schools were closed in Ireland on March 12th). The authors found three children (all between 10 and 15 years old) and three adults who had COVID-19 infections. Their study followed students and families after the school closures to see if there was any evidence of disease spread from these identified cases. All six patients had confirmed cases of COVID-19 disease but were found to have contracted the virus from contacts outside of the school setting. Despite identifying a total of 722 contacts, the study authors reported finding no instance of an infected child infecting another child. The infected adults, by contrast, had many fewer contacts – 102 – but did pass on the infection to a few adult contacts.

A report<sup>103</sup> by the ministry of health in the Netherlands, based on contact tracing-data, finds almost no disease spread by infected patients 20 and under at all, and only limited spread by adults 20-25 to others outside their own age category. The authors of the study concluded: “Data from the Netherlands also confirms the current understanding: that children play a minor role in the spread of the novel coronavirus. The virus is mainly spread between adults and from adult family members to children. The spread of COVID-19 among children or from children to adults is less common.”

A German<sup>104</sup> study reports a strikingly similar finding on the likelihood of pediatric disease spread. The German Society for Pediatric Infectious Diseases collected data on all children and adolescents admitted to a hospital for COVID-19 treatment between mid-March and early May 2020 – 128 patients in all, admitted to 66 different hospitals. The authors were able to find the source of infection for 38% of these patients, which turned out to be a parent 85% of the time. Though the authors document a limitation of small sample size, they conclude that, “In contrast to other epidemic viral respiratory infections, the primary source of infection with SARS-CoV-2

---

<sup>101</sup> *COVID-19 In Primary Schools: No Significant Transmission among Children or From Students to Teachers*, Institut Pasteur, <https://www.pasteur.fr/en/press-area/press-documents/covid-19-primary-schools-no-significant-transmission-among-children-students-teachers> (June 23, 2020).

<sup>102</sup> Laura Heavey, Geraldine Casey, et al., *No Evidence of Secondary Transmission of COVID-19 from Children Attending School in Ireland, 2020*, Eurosurveillance, [https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2020.25.21.2000903#html\\_fulltext](https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2020.25.21.2000903#html_fulltext) (May 28, 2020).

<sup>103</sup> *Children and COVID-19*, National Institute for Public Health and the Environment, <https://www.rivm.nl/en/novel-coronavirus-covid-19/children-and-covid-19> (July 2, 2020).

<sup>104</sup> Armann, J. P., Diffloth, N., Simon, A., Doehardt, M., Hufnagel, M., Trotter, A., Schneider, D., Hübner, J., & Berner, R. (2020). Hospital Admission in Children and Adolescents With COVID-19. *Deutsches Arzteblatt international*, 117(21), 373–374. <https://doi.org/10.3238/arztebl.2020.0373>

appears not to be other children.” The authors reported a single death among these 128 pediatric patients.

One of the largest studies in the world on coronavirus in schools, carried out in 100 institutions in the UK, recently confirmed that “there is very little evidence that the virus is transmitted” in schools.<sup>105</sup> Indeed, the president of the Royal College of Pediatrics and Child Health and a member of the government advisory group Sage confirmed that “there is very little evidence that the virus is transmitted in schools” based on this extensive study.

A study of 23 family disease-clusters in Greece, published on Aug. 7<sup>th</sup> in the *Journal of Medical Virology*, found that in 91% of the clusters, an adult was the first person to be infected. Their contact tracing effort attempted to clarify the direction of disease spread by careful questioning about the relative timing of the development of symptoms. They found no evidence of either child-to-adult spread, or even of child-to-child spread. They concluded that “[w]hile children become infected by SARS-CoV-2, they do not appear to transmit infection to others. Furthermore, children more frequently have an asymptomatic or mild course compared to adults.”<sup>106</sup>

A study by the Federal Office of Public Health of Switzerland analyzed 793 cases reported by Swiss doctors in late July 2020.<sup>107</sup> The reports included the place where each patient most likely contracted the infection. The most common source of infection was at home, with 27.2% tracing their disease there. School, by contrast, consisted of only 0.3% of the infections; exactly two of the 793 cases could be tracked to a school. There are some limitations though of this study. First, it is a contact-tracing study without genetic sequencing verification, so the usual caveat applies; and second, the report provides no details about the age of the cases, so it is not possible to separately glean the disease acquisition frequencies for children and adults; and third, only summer schools were in session during this time period. Nevertheless, the results strongly suggest that schools are a minor source of community spread of the infection.

A recent South Korean contact-tracing study<sup>108</sup> was cited in the New York Times as providing evidence that, “Older Children Spread the Coronavirus Just as Much as Adults.” Contrary to the interpretation of the NYT headline, the pattern of evidence reported in the study does not imply

---

<sup>105</sup> Sian Griffiths, *Pupils pose little risk of spreading COVID*, The Sunday Times (Aug. 9, 2020), available at <https://www.thetimes.co.uk/article/pupils-pose-no-risk-of-spreading-covid-27q6zfd9l>.

<sup>106</sup> Helena C. Maltezou Rengina Vorou Kalliopi Papadima, et al. (2020) “Transmission dynamics of SARS-CoV-2 within families with children in Greece: a study of 23 clusters” *Journal of Medical Virology*, <https://doi.org/10.1002/jmv.26394> (accessed August 12, 2020).

<sup>107</sup> Office fédéral de la santé publique OFSP (2020) “Rectificatif : les lieux de contamination sont les contextes familiaux et non les boîtes de nuit” Aug. 2, 2020. Available at <https://www.bag.admin.ch/bag/fr/home/das-bag/aktuell/news/news-02-08-2020.html>

<sup>108</sup> Park YJ, Choe YJ, Park O, Park SY, Kim YM, Kim J, et al. “Contact tracing during coronavirus disease outbreak, South Korea, 2020,” *Emerg Infect Dis.* (Oct. 2020), available at <https://doi.org/10.3201/eid2610.201315> (accessed online July 27, 2020),

that older children spread the coronavirus as much as adults. A follow-up paper on a South Korean case study, reanalyzing the same data set, the same patients, and published in the *Archives of Disease in Childhood*, clarified the direction of transmission of disease by focusing only on cases without “shared exposure” to a positive case.<sup>109</sup> The idea in this re-analysis paper is to exclude from consideration situations where two people who are infected share a third contact who is also infected, since it is possible that third contact infected both the original two people. Using this method, the authors found a single case (out of 107 pediatric index cases and 248 household members who also tested positive) of a child passing on the disease to another household member – another child. They find no instances of a child passing the disease to an adult.

This re-analysis of the South Korean paper is instructive, and the lesson should be clear. Correlation studies and anecdotes that do not distinguish the direction of spread of disease provide no information whatsoever about the safety (or lack thereof) of school reopening. In every single instance, when a more careful analysis that identifies the direction of spread (such as this South Korean study) is conducted, the analysis finds that children pose a negligible risk of spreading the disease to adults, both at school and at home.

There are other contact tracing-based studies that have attempted to reach conclusions about the role of children in spreading the epidemic that suffer from the same problem as the original South Korean study referenced above. For instance, a pre-print study from the Italian province of Trento<sup>110</sup> reported on 2,812 cases who reported 6,690 contacts. Though there were only 14 children among these cases, the authors nevertheless conclude that they transmitted the disease at a high rate, infecting 11 of their 49 contacts, nearly all within the same household. This represents only a small fraction of cases and contacts the authors analyzed, so numerically it is incorrect to conclude that children played a key role in the spread of the epidemic. Furthermore, unlike the Icelandic study, the Italian study cannot distinguish a child infecting a contact from the contact infecting the child. To my knowledge, nearly every contact-tracing based study of the role of children in the epidemic – with the Icelandic study and reanalysis of the South Korean study cited above as notable exceptions – suffers from this same problem.

A recent report, published in the *Journal of Pediatrics* and entitled “Pediatric SARS-CoV-2: Clinical Presentation, Infectivity, and Immune Responses”, measured the concentration of the SARS-CoV-2 virus in the nasopharynx of children who showed symptoms consistent with COVID-19 infection.<sup>111</sup> The report found that the viral load in pediatric patients with symptoms

---

<sup>109</sup> Kim J, Choe YJ, Lee J, et al., *Role of children in household transmission of COVID-19*, ARCHIVES OF DISEASE IN CHILDHOOD (August 7, 2020), available at doi: 10.1136/archdischild-2020-319910

<sup>110</sup> Pirous Fateh-Moghadam, Laura Battisti, Silvia Molinaro, Steno Fontanari, Gabriele Dallago, Nancy Binkin, Mariagrazia Zuccali (2020) “Contact tracing during Phase I of the COVID-19 pandemic in the Province of Trento, Italy: key findings and recommendations” medRxiv preprint, DOI: <https://doi.org/10.1101/2020.07.16.20127357>. (accessed online Aug. 6, 2020)

<sup>111</sup> Lael Yonker et al. (2020) “Pediatric SARS-CoV-2: Clinical Presentation, Infectivity, and Immune Responses.” *The Journal of Pediatrics* DOI: 10.1016/j.jpeds.2020.08.037 [https://www.jpeds.com/article/S0022-3476\(20\)31023-4/fulltext](https://www.jpeds.com/article/S0022-3476(20)31023-4/fulltext)

(typically mild symptoms) was higher than adult hospitalized patients with severe COVID-19 disease. This is consistent with reports from earlier in the epidemic, which found similarly high viral loads in children.<sup>112</sup> Many news media reports of the *Journal of Pediatrics* study extrapolated beyond the results of the study, with alarming headlines saying that children are “silent spreaders” of SARS-CoV-2.<sup>113</sup>

These media reports are misleading because the presence of virus in the nasopharynx is not synonymous with the transmissibility of the virus. The PCR test which checks for the presence of the virus registers false positive results in the presence of non-viable, non-infectious, viral particles.<sup>114,115,116</sup> So, even a high viral load is not evidence of infectivity.<sup>117</sup> The *Journal of Pediatrics* study itself appropriately lists the fact that their study does not assess the transmissibility of the virus as a limitation of the study. The only way to check for infectivity is to conduct a careful study of actual transmission of the virus, of the sort reported in the Icelandic contact tracing/viral mutation analysis referenced earlier.<sup>118</sup>

Another approach to this topic involves analyzing the effect of actual school closures on the spread of the epidemic within a country. If children play a role as a key vector of the epidemic, then one would expect that countries that closed schools would see a significant effect of this policy on disease spread. In fact, the opposite is the case. Studies from around the world that have examined school closures (including Japan,<sup>119</sup> New South Wales,<sup>120</sup> and Sweden/Finland<sup>121</sup>) find little or no effect of school closure on disease spread. The studies

---

<sup>112</sup> Terry C Jones et al. (2020) “An Analysis of SARS-CoV-2 Viral Load by Patient Age” medRxiv. doi:<https://doi.org/10.1101/2020.06.08.20125484>. <https://www.medrxiv.org/content/10.1101/2020.06.08.20125484v1>

<sup>113</sup> Science Daily (2020) “Researchers show children are silent spreaders of virus that causes COVID-19” Press release, August 20, 2020. <https://www.sciencedaily.com/releases/2020/08/200820102442.htm>

<sup>114</sup> Kucirka LM, Lauer SA, Laeyendecker O, et al. (2020) Variation in False-Negative Rate of Reverse Transcriptase Polymerase Chain Reaction–Based SARS-CoV-2 Tests by Time Since Exposure. *Annals of Internal Medicine*. <https://doi.org/10.7326/M20-1495>

<sup>115</sup> Lan L, Xu D, Ye G, et al. (2020) Positive RT-PCR Test Results in Patients Recovered From COVID-19. *JAMA*. 2020;323(15):1502–1503. doi:10.1001/jama.2020.2783

<sup>116</sup> Cohen AN, Kessel B (2020) False positives in reverse transcription PCR testing for SARS-CoV-2. medRxiv 2020.04.26.20080911; doi: <https://doi.org/10.1101/2020.04.26.20080911>. Accessed 7/22/2020.

<sup>117</sup> Gavin Joynt and William Wu (2020) “Understanding COVID-19: what does viral RNA load really mean?” *Lancet Infectious Diseases* 20(6): P635-6. DOI:[https://doi.org/10.1016/S1473-3099\(20\)30237-1](https://doi.org/10.1016/S1473-3099(20)30237-1) [https://www.thelancet.com/journals/laninf/article/PIIS1473-3099\(20\)30237-1/fulltext](https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(20)30237-1/fulltext)

<sup>118</sup> Daniel F. Gudbjartsson, Ph.D., Agnar Helgason, Ph.D., et al., Spread of SARS-CoV-2 in the Icelandic Population, *The New England Journal of Medicine*, <https://www.nejm.org/doi/full/10.1056/NEJMoa2006100> (June 11, 2020).

<sup>119</sup> Kentaro Iwata, Asako Doi, and Chisato Miyakoshi (2020) “Was school closure effective in mitigating coronavirus disease 2019 (COVID-19)? Time series analysis using Bayesian inference” *International Journal of Infectious Diseases*. DOI: <https://doi.org/10.1016/j.ijid.2020.07.052> (accessed online Aug. 6, 2020).

<sup>120</sup> Kristine Macartney, Helen Quinn, Alexis Pillsbury, et al. (2020) “Transmission of SARS-CoV-2 in Australian Educational Settings: A Prospective Cohort Study” *The Lancet Child & Adolescent Health*. DOI: [https://doi.org/10.1016/S2352-4642\(20\)30251-0](https://doi.org/10.1016/S2352-4642(20)30251-0) (accessed online Aug. 6, 2020)

<sup>121</sup> Public Health Agency of Sweden (2020) “COVID-19 in Schoolchildren: A Comparison between Finland and Sweden” <https://www.folkhalsomyndigheten.se/contentassets/c1b78bffb4e4a7899eb0d8ffdb57b09/covid-19-school-aged-children.pdf> (accessed online Aug. 6, 2020)



encompass closures of both elementary schools and high schools. A study<sup>122</sup> analyzing the Swedish experience concluded that there was no additional risk to elderly people cohabiting with school age children up to age 16, despite the fact that Swedish schools were kept open throughout the epidemic. A systematic review of this evidence<sup>123</sup> concluded that even though it may be possible for children to be infected with the virus and even transmit it, “[o]pening up schools and kindergartens is unlikely to impact COVID-19 mortality rates in older people.”

One purported counter-example to this evidence that has received widespread attention involves the reopening of school in Israel in the early summer.<sup>124</sup> While the Israeli opening of schools is cited as a counter-example to the many other studies showing the negligible risk of transmitting COVID-19 by children, the Israeli reports suggest it was a unique circumstance, with children crowded into a small closed space and few precautions taken against disease spread. The New York Times story cited above provides an illustrative anecdote of symptomatic teachers passing the virus to their students. And the primary source of disease spread at the Gymnasia Rehavia high school was a single symptomatic teacher infecting colleagues and students. Additionally, an analysis of cell-phone mobility data, conducted by Dr. Scott Atlas, shows that by the end of May, Israel had returned to pre-pandemic norms.<sup>125</sup> Contemporary reports, which emphasize the success of Israel in controlling the epidemic, suggest that Israelis reduced adherence to other mitigation measures as well. The cases that arose in Israeli schools are more likely a reflection of pre-existing community spread of the virus than a cause.

Thus, with no careful study to back it, and several lines of evidence that complicate any causal inference, the role of school opening in the resurgence of COVID-19 cases in Israel is not established. If there is a lesson to be learned, it is that schools can be opened safely for in-person learning if reasonable precautions – specific to the circumstances of each school – are taken. In the Israeli case, as with much of the anecdotal evidence cited, no viral sequencing analysis was conducted to verify the direction of disease spread. A report in *Science* emphasizes that no causal connection should be inferred from the correlation between Israeli school openings and the rise in cases there: “In Israel, infections among children increased steadily after schools opened. That paralleled a rise in cases nationwide, but it’s not clear whether the country’s rising caseload contributed to the increase within schools or vice versa.”

A large study of 1,900 children attending urban summer schools in Barcelona, Spain over a five-

---

<sup>122</sup> Brandén, Maria; Aradhya, Siddhartha; Kolk, Martin; Härkönen, Juho; Drefahl, Sven; Malmberg, Bo; et al. (2020): Residential Context and COVID-19 Mortality among the Elderly in Stockholm: A population-based, observational study. Stockholm Research Reports in Demography. Preprint. <https://doi.org/10.17045/sthlmuni.12612947.v1> (accessed online Aug. 6, 2020)

<sup>123</sup> Jonas Ludvigsson (2020) “Children are Unlikely to be the Main Drivers of the COVID-19 Pandemic – A Systematic Review” *Acta Paediatrica*, DOI: 10.1111/apa.15371 (accessed online Aug. 6, 2020).

<sup>124</sup> Isabel Kershner and Pan Belluck (2020) “When COVID Subsided, Israel Reopened Its Schools. It Didn’t Go Well.” New York Times. Aug. 4, 2020. <https://www.nytimes.com/2020/08/04/world/middleeast/coronavirus-israel-schools-reopen.html> (Accessed online Aug. 6, 2020)

<sup>125</sup> Personal communication.

week period found only 39 new index cases (30 pediatric).<sup>126</sup> The setting was chosen because the investigators viewed it as a model for what to expect from school openings in the fall. These kids had 253 contacts in total, of whom only 12 developed an infection – a secondary attack rate of 4.7%. The low secondary attack rate was similar for children of all ages attending the programs, ranging up to 17 years-old. The investigators attributed the success in controlling the spread of the disease to frequent hand-washing by the children and to organizing the children into “bubbles” so that the kids interacted with the same group of children all day long.

A recent and comprehensive official report by Public Health England of the role of English schools, which were reopened on June 1, 2020 despite high community case numbers, appears to confirm the limited role of children at school in spreading the pandemic.<sup>127</sup> The author of this report found that cases and outbreaks were “uncommon across all educational settings” and that “[s]taff members had an increased risk of SARS-CoV-2 infections compared to students in any educational setting, and the majority of cases linked to outbreaks were in staff.” In response to this study, UK education minister Gavin Williamson said, “The latest research, which is expected to be published later this year – one of the largest studies on the coronavirus in schools in the world – makes it clear there is little evidence that the virus is transmitted at school.”<sup>128</sup>

The overwhelming bulk of scientific studies that have examined the topic – including the best studies, which take pains to distinguish correlation from causation – find that children play a limited role in spreading COVID-19 infection to adults and that children themselves face minimal risk of poor outcomes if they should become infected.

In summary, Canadian responses to the epidemic have included many limitations on the activities of children, including but not limited to closures of schools, limitations to in-person teaching, restrictions on Bible camps and Bible studies, suspension or limitations of sports and activities, and limitations on contacts with friends. Given the evidence cited here, these policies are inconsistent with the principle that public health decisions must be grounded in good scientific evidence.

---

<sup>126</sup> Oriol Guell (2020) *Major coronavirus study in Spanish summer camps shows low transmission among children*. El Pais. (Aug. 26, 2020) available at <https://english.elpais.com/society/2020-08-26/major-coronavirus-study-in-spanish-summer-camps-shows-low-transmission-among-children.html>

<sup>127</sup> Sharif Ismail et al. (2020) “SARS-CoV-2 infection and transmission in educational settings: cross-sectional analysis of clusters and outbreaks in England” Public Health England, Aug. 12, 2020 [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/911267/School\\_Outbreaks\\_Analysis.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/911267/School_Outbreaks_Analysis.pdf)

<sup>128</sup> Peter Walker (2020) “Little Evidence COVID Spreads in Schools, says Gavin Williamson” *The Guardian*, Aug. 10, 2020. <https://www.theguardian.com/world/2020/aug/10/little-evidence-covid-spreads-in-schools-says-gavin-williamson>

## **I. How Effective is contact tracing in controlling disease spread?**

While contact tracing is a useful public health technique for diseases where the location of disease spread is readily identifiable (e.g., sexually transmitted diseases), it is less efficacious for diseases like COVID-19, where the moment of disease transmission is harder to identify.

This is especially true since a significant fraction of COVID-19 cases involves no symptoms at all. Though asymptomatic disease spread is much less efficient than symptomatic disease spread, it does occur (0.7% of the time in intimate household settings). It renders contact tracing efforts less likely to succeed.

Errors in the PCR testing, which render it unable to distinguish a COVID-19 patient who is highly infectious from a patient who has recovered from the disease, still have non-infectious viral fragments detectable and is no longer a threat to spread the disease, also make contact tracing efforts less likely to succeed.

When contact tracers are overwhelmed, delays in identifying, contacting, and testing contacts makes it more likely that contacts will be found long after they pose any risk of disease spread.

Finally, from a privacy point of view, the reluctance of Canadians (and others) to cooperate with contact tracers is entirely understandable – there is little to no private benefit derived by the infected patient from reporting on their friends, family, churches, or favorite restaurants, and there is some possible social harm from the unwanted attention and privacy violations inherent in contact tracing. I discuss many of these issues in a paper entitled “On the Futility of Contact Tracing”, that I published in September of last year.<sup>129</sup>

---

<sup>129</sup> Bhattacharya J, Paackalen M. On the Futility of Contact Tracing. *Inference* 5(3) September (2020) <https://inference-review.com/article/on-the-futility-of-contact-tracing>

## J. What Specific Harms Do Young Adults Face From Lockdowns?

Unlike children, young adults who are infected – especially early in infection – spread disease as efficiently as older adults. However, they are harmed by infection much less than older adults. Young adults face a very low mortality risk from COVID-19 infection – an infection survival rate of 99.98% for people aged 20-49, according to the U.S. CDC.<sup>130</sup>

By contrast, young adults face enormous harm from lockdowns. Indicators of psychological harm have also increased sharply in prevalence in this group. According to a U.S. CDC survey, one in four young adults aged 18 to 24 seriously considered suicide.<sup>131</sup> Similarly, a Canadian Mental Health Association survey found that nearly 1 in 5 (19%) young adults in that age group had suicidal thoughts.<sup>132</sup> The survey also found that 60% of young adults aged 18 to 24 surveyed said their mental health had seriously deteriorated since March 2020. Other harms include lost educational opportunities with colleges and universities shutting down or providing only online classes and catastrophically high unemployment and economic dislocation.<sup>133</sup> Ironically, the lockdowns themselves have thus increased the risk of COVID-19 faced by older populations by increasing the number of households where young adults who have lost their jobs co-reside with vulnerable older parents<sup>134</sup>, which increases the risk of COVID-related death.<sup>135</sup>

For young adults, then, the harms from lockdowns are substantially greater than the harms from COVID. Viewed as a medical treatment, lockdowns imposed on younger populations violate the ethical principle that medical actions should do no harm to the patient. Unlike chemotherapy for cancer, which induces short-term harm to a patient in exchange for a potential longer-term benefit, lockdowns cause long-lasting harm to young adults with little-to-no long-lasting benefit.

---

<sup>130</sup> COVID-19 Pandemic Planning Scenarios, Centers for Disease Control and Prevention, <https://www.cdc.gov/coronavirus/2019-ncov/hep/planning-scenarios.html>.

<sup>131</sup> Czeisler ME, Lane RI, Petrosky E, et al. Mental Health, Substance Use, and Suicidal Ideation During the COVID-19 Pandemic — United States, June 24–30, 2020. *MMWR Morb Mortal Wkly Rep* 2020;69:1049–1057. DOI: <http://dx.doi.org/10.15585/mmwr.mm6932a1> external icon

<sup>132</sup> Mental Health Impacts of Covid-19, Wave 2: Canadian Mental Health Association & University of British Columbia Survey, December 3, 2020

<sup>133</sup> Sharp A. (2020) Youth unemployment rate spikes amid pandemic. *Canada's National Observer*. May 8, 2020. <https://www.nationalobserver.com/2020/05/08/news/youth-unemployment-rate-spikes-amid-pandemic>

<sup>134</sup> Evandrou M, Falkingham J, Qin M, and Vlachantoni A (2020) Changing Living Arrangements, Family Dynamics and Stress During Lockdown: Evidence from Four Birth Cohorts in the UK. University of Southampton Eprint Soton. [https://eprints.soton.ac.uk/443865/1/family\\_dynamics\\_during\\_covid\\_19\\_final.pdf](https://eprints.soton.ac.uk/443865/1/family_dynamics_during_covid_19_final.pdf)

<sup>135</sup> Fenoll AA & Grossbard S (2020) Intergenerational residence patterns and Covid-19 fatalities in the EU and the US, *Economics & Human Biology*, 39. <https://doi.org/10.1016/j.ehb.2020.100934>.

## **K. How Beneficial Are Religious Services For Participants And Can They Be Held Safely?**

Religious activity is essential to a meaningful life for many Canadians, and the Canadian Constitution guarantees the free exercise of religion. Because assembly for religious practice is so essential to so many, rather than recommending that religious assembly be canceled during the pandemic, the World Health Organization has provided guidance for religious assembly in the context of COVID-19.<sup>136</sup>

### **Safe Worship**

The U.S. CDC provides similar guidance and is instructive in the North American context. The CDC guidance for communities of faith starts by recognizing the particular importance that religious communities should be permitted to gather for worship.<sup>137</sup> The CDC document cites the U.S. First Amendment right to the free exercise of religion and reminds state and local authorities to account for this right in decision-making about permitting religious communities to meet. (Similar guarantees are present in the Canadian *Charter of Rights and Freedoms*, these involve fundamental human rights.) The recommendations in the CDC guidance include:

- (1) Communication with local public health authorities regarding in person service plans;
- (2) Protection for staff who are at higher risk for severe illness, including older staff members and those with underlying medical conditions;
- (3) Encouragement of the congregation and staff to engage in hygienic hand-washing practices;
- (4) Encourage the congregation and staff to wear masks when social distancing is difficult;
- (5) Promote six-foot social distancing during worship and reduce physical contact (shaking hands, hugging);
- (6) Disinfection and cleaning of the worship space before and after each service;
- (7) Minimize sharing of worship materials and shared food;
- (8) Encourage staff and congregants with symptoms consistent with COVID-19 infection or at high mortality risk given infection (e.g. elderly congregants and those with relevant comorbid conditions) to stay home;
- (9) Post signs and messages to communicate information about practices that can lead to disease spread.

A special consideration for church services involves the risk posed by singing in terms of disease spread. The evidence *most often* cited regarding the risk of “super spreader” events in churches comes from locations (e.g., South Korea, early in the epidemic) where no precautions were taken for social distancing or mask-wearing in service. However, there is evidence that churches that ask congregants to wear masks and ask congregants with symptoms to stay at home can safely worship indoors and permit singing without an undue risk of causing a super spread event. Until recently, the CDC guidance document on the safe gathering of religious communities was pointedly silent on singing during worship.

---

<sup>136</sup> World Health Organization (2020) Practical Considerations and Recommendations for Religious Leaders and Faith-Based Communities in the Context of COVID-19. <https://www.who.int/publications/i/item/practical-considerations-and-recommendations-for-religious-leaders-and-faith-based-communities-in-the-context-of-covid-19>

<sup>137</sup> US Centers for Disease Control (2020) Considerations for Communities of Faith. <https://www.cdc.gov/coronavirus/2019-nCoV/community/faith-based.html>

There is evidence in the medical literature regarding the particular psychological benefits provided by communal singing in the process of worship.<sup>138</sup> Communal singing<sup>139</sup> provides a sense of belonging and connectedness that is crucially important in the life of many believers, with measurable effects on mental health.<sup>140,141,142</sup>

These guidelines require social distancing, which can reduce the likelihood of disease spread, but do not require a limitation to a fixed number of people in a service regardless of the size of the church, which has no scientific justification. By following these guidelines, churches, mosques, synagogues, and other religious assemblies can safely hold indoor worship services with minimal effect on the spread of COVID-19 disease.

On the other hand, what is the effect of the forced closure of churches?

### **Economic**

The forced closure of churches by lockdown has substantially harmed the financial viability of churches and other houses of worship, including the ability to employ staff. The forced limitation of church activities has ripple impacts on the businesses from which churches purchase goods and services. Many churches, synagogues, and mosques are active in their communities in providing social services to disadvantaged populations and the organization of charitable giving to providers of such services. The forced closure or limitation of church activities is likely to impact churches and other religious organizations' ability to provide such services.

### **Psychological**

Worship provides psychological benefits. For instance, a comprehensive meta-analysis of the literature found evidence of improved mental health from religiosity (typically defined to encompass church attendance).<sup>143</sup> This is consistent with the broader literature on the psychological benefits of membership in voluntary associations as a way to alleviate psychological distress.<sup>144</sup> The evidence suggesting psychological benefits arising from church attendance (including reductions in rates of depression) are particularly strong for adolescents.<sup>145</sup> Church attendance reduces stress and allostatic load (a term indicating stress endured over a long

---

<sup>138</sup> Shakespeare T & Whieldon A (2017) Sing Your Heart Out: community singing as part of mental health recovery. *Medical Humanities*, 44(3) <http://dx.doi.org/10.1136/medhum-2017-011195>

<sup>139</sup> A special consideration for church services involves the risk posed by singing in terms of disease spread. The evidence sometimes cited regarding the risk of “super spreader” events in churches comes from locations (e.g. South Korea, early in the epidemic) where no precautions were taken for social distancing or mask wearing in service.

However, there is evidence that churches that ask congregants to wear masks, and asks congregants with symptoms to stay at home, can safely worship indoors, and permit singing, without an undue risk of causing a super spread event.

<sup>140</sup> Clift S, Hancox G, Morrison I, et al. Choral singing and psychological wellbeing: quantitative and qualitative findings from English choirs in a cross-national survey. *J Applied Arts & Health* 2010;1:19–34. doi:10.1386/jaah.1.1.19/1

<sup>141</sup> Clift S, Morrison I. Group singing fosters mental health and wellbeing: findings from the East Kent ‘singing for health’ network project. *Mental Health and Social Inclusion* 2011;15:88–97. doi:10.1108/20428301111140930

<sup>142</sup> Livesey L, Morrison I, Clift S, et al. Benefits of choral singing for social and mental wellbeing: qualitative findings from a cross-national survey of choir members. *J Public Ment Health* 2012;11:10–26. doi:10.1108/17465721211207275

<sup>143</sup> Hackney, C. H., & Sanders, G. S. (2003). Religiosity and Mental Health: A Meta-Analysis of Recent Studies. *Journal for the Scientific Study of Religion*, 42(1), 43–55. <https://doi.org/10.1111/1468-5906.t01-1-00160>

<sup>144</sup> Rietschlin, J. (1998). Voluntary Association Membership and Psychological Distress. *Journal of Health and Social Behavior*, 39(4), 348–355. <https://doi.org/10.2307/2676343>

<sup>145</sup> Demir, M., & Urberg, K. A. (2004). Church attendance and well-being among adolescents. *Journal of Beliefs and Values*, 25(1), 63–68. <https://doi.org/10.1080/1361767042000198951>

period of time,)<sup>146</sup> which can cause both psychological and physical harms, including higher incidence of chronic disease and higher mortality.<sup>147</sup>

### **Spiritual**

The spiritual benefits of in-person religious observance are personal to every member of the religious communities and should not be discounted, even if they are not discretely measurable in terms of health benefits. For many believers, faith provides purpose in life.

The particular importance of these spiritual benefits is that the harm induced by lockdowns on this dimension cannot be compensated wherever the fundamental right to worship freely has been violated. No pecuniary remuneration would be sufficient to offset this harm, which can only be addressed by once more permitting the free exercise of religion in Canada.

### **Summary**

The overwhelming evidence that church attendance provides psychological and other benefits for attendees, should be considered against the cost of a marginal increase in disease spread, (a harm that can be mitigated by following safety protocols.) Notably missing in governmental justifications for church closure, is any attempt to quantify or consider in any way the positive public health benefits foregone by shutting down churches and banning worship, both for congregants and the positive ripple effects in the community. Before closure orders are imposed on religious organizations, it is incumbent upon those imposing them to conduct an analysis of the direct or indirect economic impacts. Policies enacted without a careful consideration of *both* its costs and benefits cannot possibly be construed to have a rational basis.

---

<sup>146</sup> Bruce, M. A., Martins, D., Duru, K., Beech, B. M., Sims, M., Harawa, N., Vargas, R., Kermah, D., Nicholas, S. B., Brown, A., & Norris, K. C. (2017). Church attendance, allostatic load and mortality in middle aged adults. PLOS ONE, 12(5), e0177618. <https://doi.org/10.1371/journal.pone.0177618>

<sup>147</sup> Juster, R. P., McEwen, B. S., & Lupien, S. J. (2010). Allostatic load biomarkers of chronic stress and impact on health and cognition. In *Neuroscience and Biobehavioral Reviews* (Vol. 35, Issue 1, pp. 2–16). Pergamon. <https://doi.org/10.1016/j.neubiorev.2009.10.002>

## L. Can Restaurants And Bars Be Opened Safely?

The restaurant and food service industry, including countless eateries, bars, and cafés, is an important industry that provides entrepreneurial and employment opportunities that benefit Canadians in many ways, including providing psychologically important opportunities to eat together with friends and family. Unfortunately, in much of Canada, these facilities remain locked down. These closure orders are not scientifically justified.

If restaurants, bars, etc., adhere to basic safety protocols promulgated by public health agencies throughout Canada (the protocols in summer/fall 2020 in Alberta are a typical example,<sup>148</sup>) they can safely operate with in-person service.

The recommendations include the following (among other items not listed here):

- (1) Discourage patrons from congregating together while waiting for seating;
- (2) Limit party size at tables and require a 2-meter distance between each dining party;
- (3) Provide for physical barriers between tables when 2-meter distance is impossible;
- (4) Use contactless payments and avoid cash payments where possible;
- (5) Clean menus between uses or use paper menus;
- (6) Avoid singing or provide physical distancing between singers and patrons;
- (7) All employees must wear an acceptable face covering at all times;
- (8) Frequent sanitizing of surfaces;
- (9) Encourage symptom checking of potential patrons and do not serve patrons who have symptoms consistent with COVID-19 disease.

In New York City, a similar set of recommendations was in place for restaurants and bars. A detailed contact-tracing report found restaurants that were permitted to operate for in-person dining (until a new closure order was put in place effective Dec. 14, 2020)<sup>149</sup> accounted for only 1.4% of the COVID spread. In that study, private gatherings at home account for 74% of the COVID spread.<sup>150</sup>

This finding should not be surprising. The evidence on the sharply lower frequency of disease spread by asymptomatic individuals (see Section B above) means that the vast majority of people visiting a restaurant pose no risk whatsoever for spreading the disease to fellow restaurant patrons, even if they happen to carry the virus. The main set of people who pose a risk of disease spread are symptomatic patients during the first eight days of infection. Requiring a symptom check at the restaurant door is a much less onerous imposition than banning in-person dining altogether and will have roughly the same impact on disease spread.

Against these data regarding the negligible risks of COVID-19 transmission in indoor dining – in a restaurant following guidelines – should be considered the substantial evidence that social eating provides significant and tangible psychological and physiological benefits for diners.

---

<sup>148</sup> Alberta Public Health (2020) COVID-19 Information: Guidance for restaurants, cafes, pubs, and bars. September 2020.

<sup>149</sup> Klein C. (2020) New York City Indoor Dining Will Shut Down Again. *Intelligencer*. Dec. 11, 2020.

<https://nymag.com/intelligencer/2020/12/new-york-city-indoor-dining-to-shut-down-again-over-covid-19.html>

<sup>150</sup> Adams E and Warekar T (2020) Restaurants and Bars Account for 1.4 Percent of COVID-19 Spread in New York. Dec. 11, 2020. <https://ny.eater.com/2020/12/11/22169841/restaurants-and-bars-coronavirus-spread-data-new-york>



These benefits are lost through the imposition of such scientifically and epidemiologically unjustified blanket and untargeted bans.

Those who eat socially more often feel happier and are more satisfied with life, are more trusting of others, are more engaged with their local communities, and have more friends they can depend on for support; path analysis suggests that the causal connection runs from eating together to bondedness rather than the other way around.<sup>151</sup> A comprehensive survey of 17,612 men and 19,581 women over the age of 65 found that eating alone has been linked to a higher incidence of depression among adults, particularly those who live alone.<sup>152</sup> Eliminating the possibility of indoor dining, no matter the precautions taken, reduces or eliminates these important benefits.

---

<sup>151</sup> (Dunbar, *Breaking Bread: the Functions of Social Eating, Adaptive Human Behavior and Physiology* (available at <https://link.springer.com/article/10.1007/s40750-017-0061-4>)).

<sup>152</sup> Tani, et al, *Eating alone and depression in older men and women by cohabitation status: the JAGES longitudinal survey*, *Age Ageing* 44(6) 1019-1026 (2015) (available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4621239/>).

## **M. What Benefits Do Gyms, Martial Arts Studios, And Other Physical Fitness Venues Provide For Public Health And Can They Operate With Minimal Risk Of Disease Spread?**

Gyms, martial arts studios, dance studios, and other venues offering physical activities are important to many Canadians as a way of staying physically fit and healthy. However, despite the importance of these venues to public health, the lockdown orders have ordered them to remain closed for extended periods during the past months in much of Canada. These orders are unjustified.

To my knowledge, public health authorities have provided no studies – based on contact tracing or other data – to document that gyms and other such venues pose a risk of disease spread. There is a single report of a “super-spreader” event that occurred in a gym in Ontario in October.<sup>153</sup> In that case, there was a spinning class, with stationary bicycles with wheels that, in theory, could aerosolize the virus. If that is true, the correct remedy is to limit indoor spin classes or require physical barriers between bicycles, not to shutter gyms and fitness venues altogether. The CBC story reporting on this event cited one infectious disease expert who admitted that gyms are not high-risk environments:

“Dr. Ilan Schwartz, an infectious disease expert with the University of Alberta, said spin classes may pose more risk than other group settings because of the bikes themselves. In theory, the rapidly spinning wheels could aerosolize droplets by flinging them farther distances.”

“I haven’t seen any studies of this, but theoretically it makes sense,” he said.

“I think going to the gym isn’t necessarily high-risk, unless individuals are close together and there’s poor ventilation. But there might be specific circumstances that could make it higher-risk, where something with fast, moving parts [or] a rapidly moving fan can generate aerosols as well.”

Compared with this sort of anecdotal evidence, more systematic data from other localities suggest that physical fitness centers play a limited role in disease spread.<sup>154</sup>

In a study published in *Nature* analyzing the association between the mobility of populations, super-spreader events, and disease risk, the authors conclude that restricting occupancy in public venues is the best approach to limiting the risk of disease spread, while lockdowns aimed at

---

<sup>153</sup> Zuber MC. (2020) Heavier breathing, spewing droplets, poor ventilation add to gyms' superspreading risk. CBC. October 15, 2020. <https://www.cbc.ca/news/health/gyms-superspreading-events-covid-19-1.5763297>

<sup>154</sup> UK Office for National Statistics (2020) Which occupations have the highest potential exposure to the coronavirus (COVID-19)? May 11, 2020. <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/whichoccupationshavehighestpotentialtothe冠onaviruscovid19/2020-05-11>

general mobility restrictions work less well.<sup>155</sup> They find that fitness centers do not pose a very high risk of disease spread relative to other public venues.

Second, guidelines disseminated by public health agencies around Canada provide discrete steps that fitness centers can take to reduce the risk of spreading the disease at these centers.<sup>156</sup> These steps include physical distancing requirements, physical barriers, ventilation requirements, symptom checking, cleaning requirements, and face masks when physical distancing is impossible. Given the findings in the scientific literature, these requirements – if implemented appropriately – are sufficient to limit the probability of disease spread at fitness centers.

Third, closing fitness centers reduces the ability of the population to engage in activities that maintain physical fitness and thus increase the risk of poor outcomes if a COVID-19 infection were to occur. For example, obesity is a risk factor for mortality from COVID-19 infection. In addition, regular exercise is essential for patients with type 2 diabetes<sup>157</sup> or cardiovascular disease<sup>158</sup> to maintain their health. Exercise also provides people with anxiety, depression, and stress-related disorders with an important avenue to address these problems.<sup>159, 160</sup> The negligible benefits of closing fitness centers in terms of slowing disease spread should be balanced against the health benefits of these centers for people who frequent them.

In summary, if fitness centers take standard precautions as recommended by Canadian public health agencies (symptom checking, good ventilation, physical barriers, etc.), the risk of COVID-19 disease spread from their operation is small. Furthermore, the most comprehensive studies confirm that fitness centers play a small role in disease spread. And finally, there are considerable harms to health – both physical and psychological health – from reducing the availability of venues for physical fitness for the population.

---

<sup>155</sup> Chang S, Pierson E, Koh PW, Gerardin J, Redbird B, Grusky D, Leskovec J. Mobility network models of COVID-19 explain inequities and inform reopening. *Nature*. 2020 Nov 10. doi: 10.1038/s41586-020-2923-3. Epub ahead of print. PMID: 33171481.

<sup>156</sup> Government of Canada (2020) Community-based measures to mitigate the spread of coronavirus disease (COVID-19) in Canada. October 15, 2020. [https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/health-professionals/public-health-measures-mitigate-covid-19.html#\\_Community\\_gathering\\_spaces](https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/health-professionals/public-health-measures-mitigate-covid-19.html#_Community_gathering_spaces)

<sup>157</sup> Kirwan JP, Sacks J, Nieuwoudt S. The essential role of exercise in the management of type 2 diabetes. *Cleve Clin J Med*. 2017 Jul;84(7 Suppl 1):S15-S21. doi: 10.3949/ccjm.84.s1.03. PMID: 28708479; PMCID: PMC5846677.

<sup>158</sup> Nystoriak MA and Bhatnagar A (2020) Cardiovascular Effects and Benefits of Exercise. *Front. Cardiovasc. Med.*, 28 September 2018 | <https://doi.org/10.3389/fcvm.2018.00135>

<sup>159</sup> Craft, Lynette L., and Frank M. Perna. “The Benefits of Exercise for the Clinically Depressed.” Primary care companion to the *Journal of clinical psychiatry* vol. 6,3 (2004): 104-111. doi:10.4088/pcc.v06n0301

<sup>160</sup> Stubbs B, Vancampfort D, Rosenbaum S, Firth J, Cosco T, Veronese N, Salum GA, Schuch FB. An examination of the anxiolytic effects of exercise for people with anxiety and stress-related disorders: A meta-analysis. *Psychiatry Res*. 2017 Mar;249:102-108. doi: 10.1016/j.psychres.2016.12.020. Epub 2017 Jan 6. PMID: 28088704.

## **N. Do Alternate Policies Exist That Can Protect the Population, That Do Not Impair Human Rights, Civil Liberties, Constitutional Freedoms, And Basic Principles of Public Health?**

The Great Barrington Declaration, of which I am a primary co-author, describes an alternate policy of focused protection. This policy would lead to less COVID-related death and less non-COVID related deaths than the current government policy. The co-authors of the Declaration include Prof. Martin Kulldorff of Harvard University and Prof. Sunetra Gupta of Oxford University. Over 12,000 epidemiologists and public health professionals, and 35,000 medical professionals have co-signed the declaration. The text of the Great Barrington Declaration is copied immediately below.<sup>161</sup>

“As infectious disease epidemiologists and public health scientists we have grave concerns about the damaging physical and mental health impacts of the prevailing COVID-19 policies, and recommend an approach we call Focused Protection.

Coming from both the left and right, and around the world, we have devoted our careers to protecting people. Current lockdown policies are producing devastating effects on short and long-term public health. The results (to name a few) include lower childhood vaccination rates, worsening cardiovascular disease outcomes, fewer cancer screenings and deteriorating mental health – leading to greater excess mortality in years to come, with the working class and younger members of society carrying the heaviest burden. Keeping students out of school is a grave injustice.

Keeping these measures in place until a vaccine is available will cause irreparable damage, with the underprivileged disproportionately harmed. Fortunately, our understanding of the virus is growing. We know that vulnerability to death from COVID-19 is more than a thousand-fold higher in the old and infirm than the young. Indeed, for children, COVID-19 is less dangerous than many other harms, including influenza.

As immunity builds in the population, the risk of infection to all – including the vulnerable – falls. We know that all populations will eventually reach herd immunity – i.e. the point at which the rate of new infections is stable – and that this can be assisted by (but is not dependent upon) a vaccine. Our goal should therefore be to minimize mortality and social harm until we reach herd immunity. The most compassionate approach that balances the risks and benefits of reaching herd immunity, is to allow those who are at minimal risk of death to live their lives normally to build up immunity to the virus through natural infection, while better protecting those who are at highest risk. We call this Focused Protection.

---

<sup>161</sup> Bhattacharya J, Gupta S, Kulldorff M (2020) Great Barrington Declaration. <https://gbdeclaration.org>

Adopting measures to protect the vulnerable should be the central aim of public health responses to COVID-19. By way of example, nursing homes should use staff with acquired immunity and perform frequent testing of other staff and all visitors. Staff rotation should be minimized. Retired people living at home should have groceries and other essentials delivered to their home. When possible, they should meet family members outside rather than inside. A comprehensive and detailed list of measures, including approaches to multi-generational households, can be implemented, and is well within the scope and capability of public health professionals.

Those who are not vulnerable should immediately be allowed to resume life as normal. Simple hygiene measures, such as hand washing and staying home when sick should be practiced by everyone to reduce the herd immunity threshold. Schools and universities should be open for in-person teaching. Extracurricular activities, such as sports, should be resumed. Young low-risk adults should work normally, rather than from home. Restaurants and other businesses should open. Arts, music, sport and other cultural activities should resume. People who are more at risk may participate if they wish, while society as a whole enjoys the protection conferred upon the vulnerable by those who have built up herd immunity.”

The Great Barrington Declaration provides concrete suggestions for a strategy of focused protection. This includes a (non-comprehensive) suite of policies aimed at protecting people who are particularly vulnerable (e.g. the elderly) to mortality from COVID-19 infection. These policies differ depending on the particular living situation of vulnerable people. The current policies have failed to protect the vulnerable, as is evidenced by the large fraction of the COVID-19 deaths among the elderly in Canada. There have been many unnecessary deaths, and especially among the urban working class and poor.<sup>162</sup> Concrete examples of these failures include:

- Requiring older “essential” workers and members of the working class that cannot afford not to work to be put in work situations where they may be exposed to the virus.
- Failure to protect nursing home residents from exposure to the virus from staff members, visitors, and other residents.<sup>163</sup>
- No provision for elderly people living in multi-generational homes to be shielded, should a family member be exposed to the virus.

Focused protection of the vulnerable provides a better alternative to lockdown to protect the vulnerable. Below, in Section O, I outline ideas for focused protection.

---

<sup>162</sup> Kulldorff M and Gupta S (2020) Canada's COVID-19 strategy is an assault on the working class. Toronto Sun. Nov. 29, 2020. <https://torontosun.com/opinion/columnists/opinion-canadas-covid-19-strategy-is-an-assault-on-the-working-class>

<sup>163</sup> Kwiatkowski M, Nadolny TL, Priest J, Stucka M (2020) ‘A National Disgrace’: 40,600 deaths tied to US Nursing Homes. USA Today. June 1, 2020. <https://www.usatoday.com/story/news/investigations/2020/06/01/coronavirus-nursing-home-deaths-top-40-600/5273075002/>

In summary, the Great Barrington Declaration offers a policy alternative to lockdowns that reduces COVID-19 related mortality among the vulnerable via overwhelming resources devoted to focused protection where they live. For the non-vulnerable, the lifting of lockdowns provides an enormous benefit for physical and psychological health – including mortality risk – that offsets the harm from potential COVID-19 infection.

## O. Is There Lasting Natural Immunity After Recovering From COVID-19 Infection?

The scientific evidence is overwhelming that there is lasting immunity after SARS-CoV-2 infection among people who recover from the infection.

First, SARS-CoV-2 is a coronavirus and humans have been exposed to coronaviruses for millennia. Immunologists reviewing this evidence of immunity after coronavirus infection argue that we should use this knowledge to set prior expectations about human immune response to SARS-CoV-2 infection, and these priors suggest a robust and long-lasting immune response. In the *Journal of Immunology*, immunologist Nicole Baumgarth and her colleagues write:<sup>164</sup>

“[W]e argue that the normal cadence by which we discuss science with our colleagues failed to properly convey likelihoods of the immune response to SARS-CoV-2 to the public and the media. As a result, biologically implausible outcomes were given equal weight as the principles set by decades of viral immunology. Unsurprisingly, questionable results and alarmist news media articles have filled the void. We suggest an emphasis on setting expectations based on prior findings while avoiding the overused approach of assuming nothing. After reviewing Ab-mediated immunity after coronavirus and other acute viral infections, we posit that, with few exceptions, the development of protective humoral immunity of more than a year is the norm. Immunity to SARS-CoV-2 is likely to follow the same pattern.”

The direct evidence in favor of a robust and long-lasting immune response is also overwhelming. In a paper published in the journal *Immunity*, immunologist Deepta Bhattacharya (no relation) and his colleagues show that recovered COVID-19 patients show “durable antibody production for at least 5-7 months after infection.”<sup>165</sup> Several other studies, published in prominent immunology journals, confirm this report and show that the vast majority of people who are infected produce specific antibodies in response to the infection, which confer immunity or substantial protection against reinfection.<sup>166, 167</sup>

Over time, as is the normal course of an infection, the specific antibodies to SARS-CoV-2 infection fade. The immune memory persists in dormant or resting cells, called memory cells, which do not actively secrete antibodies, but nevertheless continue to provide lasting protection against SARS-CoV-2 infection. This is entirely consistent with a typical immune response to a challenge by a virus like SARS-CoV-2. Viral infections are most often addressed through CD8 T cells, which do not produce antibodies, but rather directly eliminate virus-infected cells to

---

<sup>164</sup> Baumgarth N, Nikolich-Zugich J, Lee FEH, Bhattacharya D. (2020) Antibody Responses to SARS-CoV-2: Let's Stick to Known Knowns.

<sup>165</sup> Ripberger TJ et al. (2020) Orthogonal SARS-CoV-2 Serological Assays Enable Surveillance of Low-Prevalence Communities and Reveal Durable Humoral Immunity. *Immunity* 53, 925–933. Nov. 17, 2020. <https://doi.org/10.1016/j.immuni.2020.10.004>

<sup>166</sup> Ni, Ling, et al. (2020) "Detection of SARS-CoV-2-specific humoral and cellular immunity in COVID-19 convalescent individuals." *Immunity*. <https://doi.org/10.1016/j.immuni.2020.04.023>

<sup>167</sup> Moderbacher CR et al. "Antigen-specific adaptive immunity to SARS-CoV-2 in acute COVID-19 and associations with age and disease severity." *Cell* 183.4 (2020): 996-1012. DOI:<https://doi.org/10.1016/j.cell.2020.09.038>

shortcut viral replication. Indeed, SARS-CoV-2 specific CD4 and CD8 T cells have been detected in convalescent patients.<sup>168</sup>

This T-cell mediated immunity is also long-lasting. A preprint study released last year documents this fact, and the title of the piece summarizes its result: “Robust SARS-CoV-2 specific T-cell Immunity is Maintained at Six Months Following Primary Infection.”<sup>169</sup> Another pre-print released last year identifies long-lasting protection after SARS-CoV-2 infection from memory B-cells, which can produce specific antibodies in response to reinfection by the virus.<sup>170</sup> This long lasting immunity provides protection against severe outcomes such as hospitalization and death after COVID-19 reinfection.

Finally, it is apparently the case that many individuals who have not been infected by SARS-CoV-2 possess T-cells that recognize it and can neutralize cells infected by the virus. The hypothesized mechanism involves infection by other coronaviruses, which share some molecular structural properties with SARS-CoV-2. A separate study published in *Nature* found both CD4 and CD8 T cells which recognize (and hence attack) regions of the SARS-CoV-2 virus in both convalescent patients and patients who had previously been infected with other coronaviruses including SARS-CoV-1, seventeen years after infection.<sup>171</sup> Summarizing this evidence, Francis Collins (Director of the National Institutes of Health) writes:

“Much of the study on the immune response to SARS-CoV-2, the novel coronavirus that causes COVID-19, has focused on the production of antibodies. But, in fact, immune cells known as memory T cells also play an important role in the ability of our immune systems to protect us against many viral infections, including—it now appears—COVID-19... This might potentially explain why some people seem to fend off the virus and may be less susceptible to becoming severely ill with COVID-19.”

All these conclusions are well reflected in the fact that despite millions of people infected worldwide to date, after 10 months living with the virus we have seen few patients who re-tested positive after being discharged. None of them showed evidence of being contagious and nearly all were either asymptomatic or presented with mild symptoms. Scientific evidence strongly suggests that recovery from SARS-Cov-2 infection will provide lasting protection against reinfection – either complete immunity or protection that makes a severe reinfection extremely unlikely.

---

<sup>168</sup> *Ibid.*

<sup>169</sup> Zuo J et al. (2020) Robust SARS-CoV-2-specific T-cell immunity is maintained at 6 months following primary infection. medRxiv. doi: <https://doi.org/10.1101/2020.11.01.362319>

<sup>170</sup> Dan JM et al. (2020) Immunological memory to SARS-CoV-2 assessed for greater than six months after infection. medRxiv. doi: <https://doi.org/10.1101/2020.11.15.383323>

<sup>171</sup> Le Bert, N., Tan, A.T., Kunasegaran, K. et al. (2020) SARS-CoV-2-specific T cell immunity in cases of COVID-19 and SARS, and uninfected controls. *Nature* 584, 457–462. <https://doi.org/10.1038/s41586-020-2550-z>



## **P. What Concrete Policies Would Provide Focused Protection of the Vulnerable?**

Focused protection is a term that refers to a suite of policies aimed at reducing the risk of viral exposure and severe outcomes for the elderly population and others who face a high infection fatality risk from COVID-19 infection. Contrary to some who have argued that protecting the vulnerable requires a draconian lockdown, focused protection provides an alternate, humane way to reduce exposure to the virus by the vulnerable.

What is necessary are policies that reduce the probability that infected people will have extended contact with vulnerable people in a context where the spread of the disease is likely. Focused protection is possible as long as public health experts deeply understand the particular living circumstances of the vulnerable and are creative in designing effective interventions based on that understanding. This requires different policies for different locations where the vulnerable live.

For example, to protect the vulnerable elderly living in nursing homes and other care settings, a focused protection strategy would include frequent testing of nursing home staff members who are not already immune, testing of visitors, and less staff rotation so that residents only interact with a limited number of staff people. Rapid antigen tests could be used to avoid a delay between sample collection and the development of test results and reduce the possibility of functional false-positive results in PCR testing. COVID-19 infected individuals should not be sent to nursing homes, and all new residents should be tested. Sequestering of care home residents who have COVID-19 until they are no longer infectious is also essential.

To protect older people living at home during high transmission times, older people should be offered home delivery of groceries and other essentials. When seeing friends and relatives, it is best to do it outdoors. Testing should be available for relatives and friends who want to visit. Free N95 masks should be provided for when they cannot avoid potential exposure.

Focused protection requires protecting older people still in the workforce. People in their 60s are at somewhat higher risk, and many are still in the workforce. Those that can work from home should be allowed to do so. For example, teachers in their 60s could teach online courses or help fellow teachers with grading exams, essays, and homework. Those that cannot work from home should be funded to take a 3 to 6-month sabbatical. In addition, workplace disability laws should require employers to provide reasonable accommodations to protect high COVID-19 risk workers without losing their jobs.

Focused protection requires protecting older adults living in multigenerational homes. University closures and the economic displacement caused by lockdowns have led millions of young adults to live with older parents, increasing regular close interactions across generations. We know that older people living with working-age adults have a greater COVID-19 risk than older

people living with other older people. There is no additional excess risk if also living with children, though.

Multi-generational homes are the most formidable challenge, and family-specific solutions must be found. If the working-age household members can work from home, they can isolate themselves together. If that is not possible, the older family member might temporarily be able to live with an older friend or sibling, with whom they can self-isolate together during the height of community transmission. As a last resort, empty hotel rooms could be used for temporary housing.

Focused protection also requires protecting younger people with chronic conditions like diabetes, severe asthma, or obesity that place them at higher mortality risk should they become infected. The focused protection plan for these individuals is the same as that for the elderly and will vary depending upon their living circumstances.

The deployment of a safe and effective SARS-CoV-2 vaccine – if people who are most vulnerable are prioritized for inoculation – offers an opportunity for near-perfect focused protection. For this population, the harms from COVID-19 infection are far greater than the possible harms from vaccination.

In addition to reducing COVID-19 related mortality, effective focused protection reduces the number of people who will need hospitalization for COVID-19 infection, since hospitalization risk, like mortality risk, rises sharply with patient age.<sup>172</sup> Thus, if effective focused protection is implemented, the probability of overcrowded hospital systems is greatly reduced.<sup>173</sup>

Empirical evidence from around the world shows that focused protection is possible. During the first wave of the epidemic, there was an unfortunately high rate of exposure of nursing home residents to COVID-19 infections – a failure of focused protection. In the US, nearly half of all COVID-19 deaths occurred in nursing home settings, fueled by policies – famously adopted by New York state – that sent elderly COVID-19 infected patients back to nursing homes that could not effectively quarantine them.<sup>174</sup>

The same was true in Quebec and elsewhere in Canada. The proportion of COVID-19 deaths in nursing homes dropped sharply during the second wave of COVID-19 infections over the

---

<sup>172</sup> US Centers for Disease Control (2020) COVID-19 Hospitalization and Death by Age. Aug. 18, 2020.

<https://www.cdc.gov/coronavirus/2019-ncov/covid-data/investigations-discovery/hospitalization-death-by-age.html>

<sup>173</sup> Chikina M, Pegden W. Modeling strict age-targeted mitigation strategies for COVID-19. *PLoS One*. 2020 Jul 24;15(7):e0236237. doi: 10.1371/journal.pone.0236237. PMID: 32706809; PMCID: PMC7380601.

<sup>174</sup> Perrett C (2020) Gov. Cuomo's controversial order requiring nursing homes to admit COVID-19 patients was reportedly removed from New York's health website. *Business Insider*. May 27, 2020. <https://www.businessinsider.com/new-york-deleted-cuomos-order-nursing-homes-order-2020-5>. Accessed Dec. 7, 2020.

summer, as these facilities adopted better policies to protect their elderly residents.<sup>175</sup> Finally, and most importantly, the new and effective vaccines make it relatively simple to implement a policy of focused protection. By prioritizing the older, most vulnerable population for vaccination, it is possible to provide near-perfect focused protection, even without adopting any of the policy suggestions outlined above. Certainly, no lockdown is necessary for reducing hospitalization and deaths from COVID, as long as the older population is prioritized for vaccination.<sup>176</sup>

In summary, replacing a lockdown policy with a policy of focused protection of the vulnerable would greatly reduce the lockdown harms for less vulnerable populations while protecting the vulnerable from COVID-19 risk.

The concrete suggestions outlined here are not comprehensive. With the advent of a safe and effective vaccine in December 2020, there should be no controversy over whether this policy is possible. It is a failure of public health officials across Canada that they have not engaged in developing strategies like those listed here. Reducing the risk of harm to the vulnerable and non-vulnerable alike from infectious (COVID-19 related) and non-infectious (lockdown related) causes should be the goal of public health policy. An aim that focuses solely on slowing disease spread – lockdown – ultimately increases both COVID-19 related and lockdown harms relative to a policy of focused protection.

---

<sup>175</sup> Ioannidis JPA, Axfors C, Contopoulos-Ionnidis DG (2020) Second versus first wave of COVID-19 deaths: shifts in age distribution and in nursing home fatalities. medRxiv. <https://www.medrxiv.org/content/10.1101/2020.11.28.20240366v1.full-text> (accessed Dec. 7, 2020)

<sup>176</sup> In Appendix A, I address discuss a commonly heard, but incorrect argument against a focused protection policy – that the experience of Manaus, Brazil, where there was a large second wave of COVID in late 2020, despite earlier Serio surveys that showed a high fraction of the population had been previously infected. This argument fails for at least two reasons. First, Brazil did not follow a strategy of focused protection – rather, it followed a more laissez-faire policy toward the epidemic, and did not enact policies to protect the elderly and other vulnerable populations. Second, the resurgence of the disease in Manaus does not demonstrate that there cannot be immunity to the virus – an assertion belied by vast evidence cited in this report – but rather that protection against the virus provided by high levels of population immunity depends on many factors not considered in standard compartment models.

## **Q. Does A Positive RT-PCR Test For the SARS-CoV-2 Virus Imply That A Patient Poses A Substantial Risk Of Infecting Others?**

The RT-PCR test for the SARS-CoV-2 virus is at the heart of the testing system adopted by Canada. As used in most laboratories in Manitoba and elsewhere, the RT-PCR tests likely register a positive test result even for non-infectious viral fragments. The RT-PCR test amplifies the virus – if present – by a process of repeatedly doubling the concentration of viral genetic material. If the viral load is small, many doublings are required before it is possible to detect the virus.

The problem arises from the fact that the implementation of the RT-PCR test for the SARS-CoV-2 virus requires that clinical laboratories decide in advance how many doublings of the genetic material they will require before deciding that a sample is negative for the presence of the virus. This threshold, known as the “cycle threshold” of the test, determines both the rate at which a positive test result will be returned when the original sample does not include viral concentrations in sufficient amount to be infectious (hereafter, the functional false positive rate) and the rate at which a negative test result will be returned when the original sample does include viral concentrations in sufficient amount to be infectious (hereafter, the functional false-negative rate).

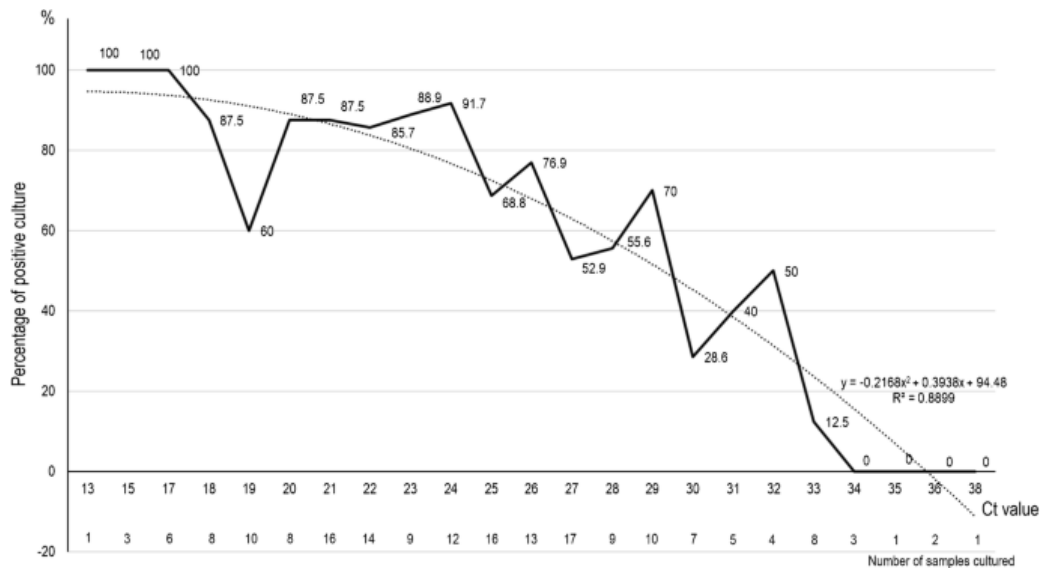
A higher cycle time threshold – requiring more doublings before declaring a negative test result – increases the functional false positive rate of the RT-PCR test because even if a non-infectious viral load is present in the sample obtained from the patient, a large number of permitted doublings could amplify whatever is present such that test result is positive. This positive test result would not mean that the individual was infectious or contagious in such a case.

The RT-PCR test is commonly known in the literature as the gold standard to check for the presence of the SARS-CoV-2 virus. This is beside the point. The critical question is not whether RT-PCR is a “gold standard” test for viral presence, but rather whether it is a gold standard test for determining whether a patient is infectious, which it is not. Instead, the gold standard test for infectivity involves checking whether a sample taken from the nasopharynx of a patient can infect, in vitro, a human cell culture. Infectious samples are known as “culture positive,” while non-infectious samples are known as “culture negative.” From an epidemiological perspective, infectivity measurement is more important than measuring whether the virus is present since a patient can have non-viable viral fragments present, a positive PCR test, and yet not be infectious.

The relevant question, then, is whether the RT-PCR test is sufficiently accurate to use as a tool to decide whether to sharply curtail the normal activities of more than 38 million people living in Canada, imposing untold harm on them related to the lockdown and the unfortunate answer is no.

A systematic review of the literature on cycle-time thresholds for the SARS-CoV-2 RT-PCR tests (encompassing 25 different published studies on the topic) concludes that “The evidence is increasingly pointing to the probability of culturing live virus being related to the amount of viral RNA in the specimen and therefore, inversely related to the cycle threshold. Thus, detection of viral RNA *per se* cannot be used to infer infectiousness.”<sup>177</sup> In other words, the scientific evidence now shows that the RT-PCR test for the presence of the SARS-CoV-2 virus will often generate a positive result even when an individual is not infectious (that is, it does not pose a danger of infecting other people.) The difficulty is that the RT-PCR test permits too many doubling cycles of viral particles before declaring a negative test. The functional false positive rate increases with the number of cycles (known as a Ct value) required to produce a positive result. The review recommends requiring clinical evidence of infection alongside a PCR result with a low cycle time count before designating a patient as a COVID-19 case.

Similar results were observed in a study<sup>178</sup> published in the *European Journal of Clinical Microbiology & Infectious Diseases*. The study aimed to determine when it would be safe to discharge COVID-19 patients in Marseille, France. The authors found a significant relationship between Ct value and culture positivity rate (see the figure below). Samples with Ct values of 13–17 all led to a positive culture. Culture positivity rate then decreased progressively according to Ct values to reach 12% at 33 Ct. No positive culture was obtained from samples with Ct  $\geq$  34.



**Percentage of positive viral culture of SARS-CoV-2 PCR-positive nasopharyngeal samples from Covid-19 patients, according to Ct value (plain line). The dashed curve indicates the polynomial regression curve.**

<sup>177</sup> Jefferson T, Spencer EA, Brassey J, Heneghan C. Viral cultures for COVID-19 infectious potential assessment - a systematic review. *Clin Infect Dis*. 2020 Dec 3:ciaa1764. doi: 10.1093/cid/ciaa1764. Epub ahead of print. PMID: 33270107.

<sup>178</sup> La Scola, B., Le Bideau, M., Andreani, J. *et al*. Viral RNA load as determined by cell culture as a management tool for discharge of SARS-CoV-2 patients from infectious disease wards. *Eur J Clin Microbiol Infect Dis* **39**, 1059–1061 (2020). <https://doi.org/10.1007/s10096-020-03913-9>

The study concluded that patients with Ct values equal to, or above 34, did not excrete infectious viral particles.

Further, according to a careful study published in *Eurosurveillance* (a top journal in the field of epidemiology), if 27 cycles are needed for a positive test, the false positive rate is 34%; if 32 cycles are needed for a positive test, the false positive rate is 72%, and if 37 cycles are needed for a positive test, the false positive rate is 92%.<sup>179</sup> If more than 40 cycles are needed for a positive test, the functional false positive rate is nearly 100%. Many laboratories in Canada run the RT-PCR test up to 45 cycles, so false positive results are not just a theoretical possibility.

Twenty-two top international scientists came to a similar conclusion in respect of false positive test results and cycle thresholds. On November 27, 2020, they submitted a retraction request letter<sup>180</sup> to the *Eurosurveillance* editorial board, requesting that the paper published by *Eurosurveillance* on January 23, 2020, entitled, “Detection of 2019 novel coronavirus (2019-nCoV) by real-time RT-PCR,”<sup>181</sup> (the “Corman-Drosten paper”) be retracted due to its severe flaws. (It was this paper that led to the worldwide usage of PCR tests to diagnose COVID-19.) In addition to their letter, these scientists submitted a Review report<sup>182</sup> of the Corman-Drosten paper outlining 10 fatal flaws in the paper. One of the flaws they listed was with the recommended cycle time value:

“In case of virus detection, >35 cycles only detects signals which do not correlate with infectious virus as determined by isolation in cell culture; if someone is tested by PCR as positive when a threshold of 35 cycles or higher is used (as is the case in most laboratories in Europe & the US), the probability that said person is actually infected is less than 3%, the probability that said result is a false positive is 97%.”

Even the World Health Organization recently published two Information Notices<sup>183 184</sup> warning users of PCR tests that it had “received user feedback on an elevated risk for false SARS-CoV-2 results when testing specimens using RT-PCR reagents on open systems,” that laboratories should report the replication number, and that a single test should not be relied upon without considering clinical COVID-19 symptoms, as Manitoba does.

---

<sup>179</sup> Singanayagam A, Patel M, Charlett A, Lopez Bernal J, Saliba V, Ellis J, et al. Duration of infectiousness and correlation with RT-PCR cycle threshold values in cases of COVID-19, England, January to May 2020. *Eurosurveillance*. 2020;25(32):2001483. 2020

<sup>180</sup> Retraction request letter to Eurosurveillance editorial board re: Corman-Drosten Paper, Dr. Pieter Borger et al., November 26, 2020, <https://cormandrostenreview.com/retraction-request-letter-to-eurosurveillance-editorial-board/>

<sup>181</sup> Victor M. Corman, Olfert Landt, Marco Kaiser, Detection of 2019 novel coronavirus (2019-nCoV) by real-time RT-PCR, *Eurosurveillance*. 2020 Jan 23; 25(3): 2000045 doi: [10.2807/1560-7917.ES.2020.25.3.2000045](https://doi.org/10.2807/1560-7917.ES.2020.25.3.2000045); this paper’s approval and publication in Eurosurveillance in January 2020 led many world nations to utilize the PCR test to diagnose COVID-19

<sup>182</sup> Pieter Borger et al. External peer review of the RTPCR test to detect SARS-CoV-2 reveals 10 major scientific flaws at the molecular and methodological level: consequences for false positive results., November 27, 2020, <https://cormandrostenreview.com/report/>

<sup>183</sup> WHO Information Notice for IVD Users, December 14, 2020, <https://www.who.int/news/item/14-12-2020-who-information-notice-for-ivd-users?fbclid=IwAR0Si8UnfvZc8iOppsSPO2kuzXJ-rMYMJvuHCtF4OfHODLchDsyUr7z2XXY>

<sup>184</sup> WHO (2021) “WHO Information Notice for IVD Users 2020/05” January 13, 2021. <https://www.who.int/news/item/20-01-2021-who-information-notice-for-ivd-users-2020-05>

This error in the test is a major problem, since public health authorities track “cases” per capita and percent positivity of test results to measure the spread of the disease in the population.<sup>185</sup> Both of these measures depend on the accuracy of the RT-PCR tests to determine whether an individual is infected with the virus.<sup>186</sup> For example, the text of Manitoba’s COVID-19 Surveillance Case Definition as of December 16, 2020 is reproduced on the next page:<sup>187</sup>

Since nucleic acid sequencing is uncommon, confirmed cases of COVID-19 are generally diagnosed with a positive result on a PCR test without the requirement for a clinical diagnosis by a qualified medical practitioner. It is problematic as without a clinical diagnosis of symptoms related to COVID-19, a positive PCR test alone is too unreliable to conclude that an individual is infectious with COVID-19, especially if that test is run at a high cycle threshold.

Another problem, again using Manitoba as an example, is counting “probable cases” as “cases” for official case surveillance, and a probable case can include an “un-tested person” who was in close contact with a confirmed case of COVID-19.<sup>188</sup> As previously stated, the method for confirming a case of COVID-19 using PCR tests is highly unreliable, so that an un-tested person may be counted as a COVID-19 case in error.

The PCR test’s inaccuracies imply that the criteria for reopening do not reflect the risk of community spread of the virus because a “high case count,” or positivity rate, may be due instead to functional false positive outcomes – that is, people who test positive for the virus at a high cycle threshold, but who are not infectious.

In summary, the scientific literature establishes the importance of cycle-time thresholds in interpreting RT-PCR SARS-CoV-2 results to establish the infectivity of the samples.<sup>189</sup> A reliance on a test that is run up to 40 cycles, (or any number of cycles higher than 30,) is certain to produce a very large proportion of false positive outcomes. Lockdowns that are imposed on the basis of “case” counts derived from PCR tests will be only marginally related to the threat posed by the spread of the SARS-CoV-2 virus. Given this scientific evidence, it is certain that

---

<sup>185</sup> Covid-19 Surveillance Report 2020 Technical Notes, webarchive December 16, 2020

<https://www.gov.mb.ca/health/publichealth/surveillance/covid-19/resources/Notes.html>

<sup>186</sup> Interim Guidance Public Health Measures, *Managing Novel Coronavirus (Covid-19) Cases and Contacts In Community*, December 16, 2020, [https://manitoba.ca/asset\\_library/en/coronavirus/interim\\_guidance](https://manitoba.ca/asset_library/en/coronavirus/interim_guidance)

<sup>187</sup> Covid-19 Surveillance Report 2020 Technical Notes, webarchive December 16, 2020

<https://www.gov.mb.ca/health/publichealth/surveillance/covid-19/resources/Notes.html>; See also: COVID-19 Epidemiology and Surveillance Definitions: Manitoba Health, Seniors and Active Living Version: June 10, 2020,

[https://www.gov.mb.ca/health/publichealth/surveillance/docs/es\\_definitions.pdf](https://www.gov.mb.ca/health/publichealth/surveillance/docs/es_definitions.pdf); See also: Interim national case definition:

Coronavirus disease (COVID-19) Last Updated: April 2, 2020, <https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/health-professionals/national-case-definition.html#nat>

<sup>188</sup> This is also an issue with classification of deaths in Canada – “Statistics Canada and provincial and territorial vital statistics agencies use two codes to identify COVID-19 reported as a cause of death: U071 for COVID-19 specified as confirmed by a positive test result and U072 for COVID-19 described as “possible,” “probable,” or “pending a (positive) test result”. The total number of deaths due to COVID-19 is determined by adding counts in these two categories. The former also includes those deaths where the certificate makes no specification as “positive”, “possible,” “probable,” or “pending”. In Canada, the majority of COVID-19 deaths were classified as U071 (86%).” See: Kathy O’Brien, et. al., “Covid-19 Death Co-Morbidities in Canada” Statistics Canada, November 16, 2020, <https://www150.statcan.gc.ca/n1/pub/45-28-0001/2020001/article/00087-eng.htm>

<sup>189</sup> Rita Jaafar, Sarah Aherfi, Nathalie Wurtz, Clio Grimaldier, Thuan Van Hoang, Philippe Colson, Didier Raoult, Bernard La Scola, “Correlation Between 3790 Quantitative Polymerase Chain Reaction–Positives Samples and Positive Cell Cultures, Including 1941 Severe Acute Respiratory Syndrome Coronavirus 2 Isolates”, *Clinical Infectious Diseases*, ciaa1491, <https://doi.org/10.1093/cid/ciaa1491>

lockdowns are being imposed – along with their attendant costs– even when the risk of community spread of COVID-19 does not warrant it.

### ***Surveillance Case Definition***

“Cases include both confirmed and probable cases. Surveillance case definitions are provided for the purpose of standardizing case classification and reporting. They are based on evidence, public health response goals, and are subject to change as new information becomes available. Please visit

[https://manitoba.ca/asset\\_library/en/coronavirus/interim\\_guidance.pdf](https://manitoba.ca/asset_library/en/coronavirus/interim_guidance.pdf)

for the most current case definition.

**Probable case** – A person who:

- has a fever (>38°C), **AND/OR**
- has new onset of (or exacerbation of chronic) cough or difficulty breathing, **AND**
- meets exposure criteria, **AND**
- for whom laboratory diagnosis of COVID-19 is:
  - inconclusive (inconclusive is defined as a positive test on a single real-time PCR target or a positive test with an assay that has limited performance data available),
    - NAATs must be validated for detection of the virus that causes COVID-19.
    - An indeterminate result on a real-time PCR assay is defined as a late amplification signal in a real-time PCR reaction at a predetermined high cycle threshold value. This may be due to low viral target quantity in the clinical specimen approaching the limit of detection of the assay or may represent nonspecific reactivity (false signal) in the specimen. When clinically relevant, indeterminate samples should be investigated further in the laboratory (e.g. by testing for an alternate gene target using a validated real-time PCR or nucleic acid sequencing that is equally or more sensitive than the initial assay or method used) or by collection and testing of another sample from the patient with initial indeterminate result.
- A (un-tested) person with:
  - Fever (over 38 degrees Celsius), **AND/OR**
  - Cough (new or exacerbated chronic); **AND**
  - Close contact with a confirmed case of COVID-19, **OR**
  - Lived in or worked in a closed facility known to be experiencing an outbreak of COVID-19 (e.g., long-term care facility, correctional facility)

**Confirmed case** – A person with a laboratory confirmation of infection with the virus that causes COVID-19 performed at a community, hospital or reference laboratory (NML or a provincial public health laboratory) running a validated assay. This consists of detection of at least one



specific gene target by a NAAT assay (e.g. real-time PCR or nucleic acid sequencing).”

## **Appendix A: Is The Case of Manaus, Brazil A Counter Example To The Possibility of Focused Protection?**

Some analysts have cited the case of Manaus, Brazil, as a counter example to the idea that focused protection of vulnerable populations is possible and that high levels of population immunity protect against the epidemic resurging in an area.<sup>190</sup> The basic fact cited is that Manaus has experienced two large epidemic waves and that high levels of population immunity achieved during the first wave did not protect the population from a large second epidemic wave.

The major problem with this reasoning is that it is based on a single, flawed, seroprevalence study conducted in Manaus in the middle of 2020. The study estimated a prevalence of 76% of the population infected in October 2020 in Brazil.<sup>191</sup> However, the 76% estimate was not based on a random survey but on blood donors, a very select group of people in the developing world. Moreover, the seroprevalence among the blood donors was 52%, which was adjusted upwards based on questionable mathematical modeling of the waning of anti-bodies. Hence, we do not know the level of immunity in Manaus before the massive epidemic second wave hit in late 2020.

Herd immunity – also known as endemic equilibrium – occurs when enough people have immunity so that most infected people cannot find new uninfected people to infect, leading to the end of the epidemic/pandemic. This means that the epidemic/pandemic will end before everyone is infected, although it will continue in endemic form with low rates of infections. Herd immunity is a scientifically proven phenomenon. Sooner or later, herd immunity will be reached either through natural infection or through a combination of vaccinations and natural infection.

Apart from the factual problem that Brazil had not reached a sufficiently high level of population immunity before late 2020 to prevent a second wave, there are several other explanations for the Manaus experience. These alternative explanations would need to be ruled out before accepting the proposition that herd immunity failed to protect against the second wave in Brazil.

First, residential segregation in Manaus (along socio-economic lines) could lead to a separation in the peaks of epidemics occurring in different communities. An unfortunate feature of the reporting of figures during this pandemic has been the misleading aggregation of data from different geographical locations. For instance, the impression of a bigger ‘second wave’ occurring within the same jurisdiction may be due to a more extensive area being affected during the second wave compared to the first. But even within the same location, residential and socio-

---

<sup>190</sup> Sridhar D and Guradsani D (2021) Herd Immunity by Infection is Not An Option. *Science* 15 Jan 2021. 371(6526): 230-1. DOI: 10.1126/science.abf7921

<sup>191</sup> Buss, L. F., Prete, C. A., Abraham, C. M. M., Mendrone, A., Salomon, T., De Almeida-Neto, C., ... Sabino, E. C. (2021). Three-quarters attack rate of SARS-CoV-2 in the Brazilian Amazon during a largely unmitigated epidemic. *Science*, 371(6526), 288–292. <https://doi.org/10.1126/science.abe9728>

economic segregation can create the conditions for a second wave to occur more or less independently of the first.

Second, the herd immunity threshold is not a single constant that is known in the literature but instead is likely to vary substantially from place to place and by season of the year since interaction patterns between people – and disease contagion risk – vary along these dimensions. The herd immunity thresholds differ sharply by location and time, depending upon factors such as population density, living arrangements, social interactions, climate, season, and hygiene. It is not a universal constant determined by the biological characteristics of the virus alone. One cannot learn much about herd immunity thresholds in Manitoba from the experience of Manaus, Brazil.

Third, based on a location (Manaus, Brazil) with a largely uncontrolled epidemic, it is impossible to conclude that lockdowns are a good strategy to control the epidemic. It is scientifically unconvincing to attempt to make inferences about lockdowns' efficacy from one location where lockdowns were not implemented. A similar serosurvey conducted in the Dharavi slums in Mumbai, India – the focus of an intense lockdown through May and only limited reopening in June 2020 – found a seroprevalence of 57% in early July 2020.<sup>192</sup> One of the researchers who conducted the study conveyed the hypothesis to me that the lockdown may have intensified the spread of the disease in the densely packed region by forcing residents to spend long days in packed rooms with poor ventilation. Similarly, nearly 40% of the population of Lima, Peru has SARS-CoV-2 specific antibodies, despite one of the longest-lasting and harshest lockdown policies in the world.<sup>193</sup>

Fourth, the experience of Manaus, Brazil does not rule out the possibility of replacing Manitoba lockdowns with a policy of focused protection with good results. Manaus, Brazil did not adopt a focused protection strategy. As expected with a largely uncontrolled epidemic, the seroprevalence was roughly equal across the age distribution in Manaus, which makes it similar to lockdown countries like Spain.<sup>194</sup> In contrast, in Sweden (which adopted something more akin to a focused protection strategy), seroprevalence was more than twice as high among ages 20-64 compared to those over 65, belying the assertion that focused protection is impossible.

---

<sup>192</sup> Biswas S (2020) India coronavirus: 'More than half of Mumbai slum-dwellers had Covid-19. BBC News. July 29, 2020, <https://www.bbc.com/news/world-asia-india-53576653>

<sup>193</sup> Andina: Agencia Peruana de Noticias (2020) Peru: Nearly 4 million people may already have had COVID-19 in Lima Metropolitan Area. Dec. 29, 2020. <https://andina.pe/Ingles/noticia-peru-nearly-4-million-people-may-already-have-had-covid19-in-lima-metropolitan-area-827959.aspx>

<sup>194</sup> Baral S, Chandler R, Prieto RG, Gupta S, Mishra S, Kulldorff M. Leveraging epidemiological principles to evaluate Sweden's COVID-19 response. *Ann Epidemiol.* 2021 Feb;54:21-26. doi: 10.1016/j.annepidem.2020.11.005. Epub 2020 Nov 23. PMID: 33242596; PMCID: PMC7682427.