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Sanjeev Sabhlok

(formerly of the) Victorian Treasury

Paul Frijters

*London School of Economics, MBSC
College and IZA*

Gigi Foster

University of New South Wales

Jay Bhattacharya

Stanford University

Ari R Joffe

University of Alberta

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IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

The Failed History of Quarantines, and Its Implications for Public Health*

This paper reviews the history of the practice of quarantines, rediscovering the 19th century ‘Sanitarian’ movement in Britain that sprang from a recognition that quarantines had failed to stop the spread of diseases and were not cost-effective. To our knowledge, the key figure among the Sanitarians was Charles Maclean, who conducted the first cost-benefit analysis of quarantines. MacLean heavily influenced, among others, Southwood Smith and Edwin Chadwick, who, together with Jeremy Bentham, championed reforms that form part of the Public Health Act of 1848, which led to the primacy of sanitation efforts (such as pressurised water supply, sewage management, and garbage collection and safe disposal) in public health policy in the UK and elsewhere. Maclean convinced the Sanitarians that quarantines were not grounded in health science but instead formed part of the business model of a public health bureaucracy uninterested in public health and which was prepared to falsify and ignore data to survive. Arguably, the same can be said today with the modern version of quarantines being the Covid lockdowns of 2020-2021. We sketch a few preliminary institutional options for freeing public health efforts from bureaucratic expansion and mission drift and tethering them more robustly to the public interest.

JEL Classification: I18, H00, N30

Keywords: public health, quarantines, social distancing, cost-benefit, excess deaths, health bureaucracy, mission drift

Corresponding author:

Gigi Foster
University of New South Wales
Sydney NSW 2052
Australia
E-mail: gigi.foster@unsw.edu.au

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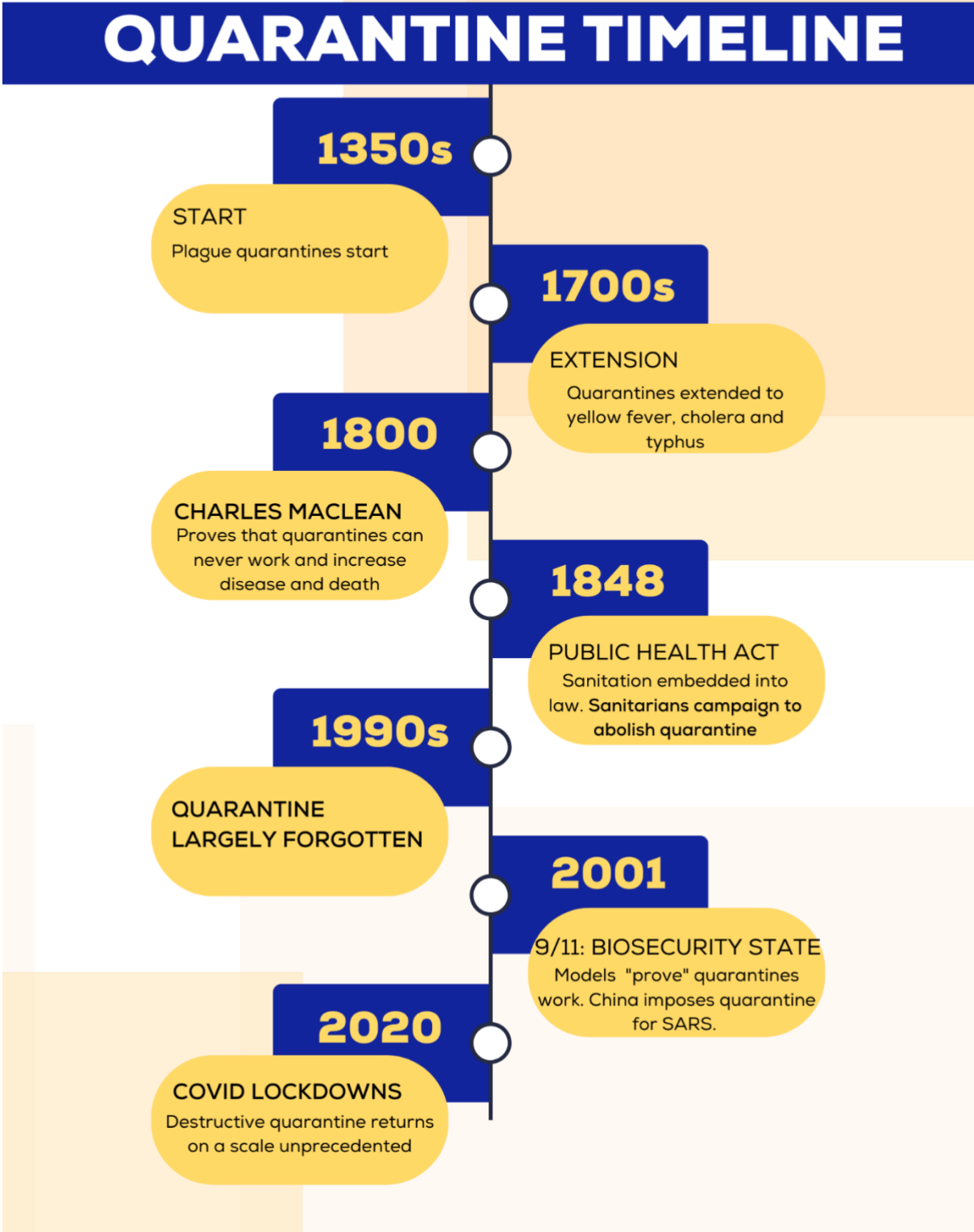


Figure 1: A schematic summary of the history of quarantine

1. Introduction

Maclean “was one of those extraordinary persons ... to whom, in future ages, the finger of the historian would point, as one of the greatest benefactors to his species”

- John Hobhouse, in the British Parliament, 30 March 1825

Until February 2020, the World Health Organisation’s (WHO) standing advice on pandemics (World Health Organization [WHO], 2019) was not to engage in lockdowns because of their prohibitive social costs and dubious benefits. Yet nearly all countries rapidly adopted some form of lockdown in March 2020 in response to SARS-CoV-2, symptomatic infection with which is now known as ‘covid’. The debate still rages in 2024 as to whether the lockdowns of healthy populations reduced the initial spread of covid and whether their net health effect was positive or negative (Foster & Frijters, 2024).

Lockdowns were a form of quarantine, defined by the WHO as “imposed separation or restriction of movement of persons who are exposed, who may or may not be infected but are not ill, and who may become infectious to others” (World Health Organisation, 2019).¹ The mass adoption of quarantine measures during covid naturally raises the question of what the historical record reveals about quarantines and what learned debates were held about them in history. This paper delves into this historical record, rediscovering papers and scientific controversies that had been lost in time but are highly relevant both for evaluating current policies and for the question of how, if at all, to restructure public health moving forward.

As it turns out, we have 650 years worth of extensive historical analyses of quarantines, with the Sanitarian movement of Victorian Britain providing a decisive historical break in scientific opinion. The analyses of the Sanitarians, particularly Edwin Chadwick, were pivotal to the passage of the first Public Health Act in 1848, which pushed sanitation rather than quarantine as the central method of public health policy (United Kingdom Public Health Act, 1848).² The break of that first Public Health Act with over 400 years of quarantine policy and thus of a quarantine bureaucracy was opposed by many (as documented in Roberts, 1979), but nevertheless led to a new understanding regarding quarantines that only broke down in 2020.

Amongst the Sanitarians was Dr Charles Maclean, whom we regard as the father of public health science. Maclean pioneered many insights still dominant today, 200 years after his time: the usefulness of cost-benefit analyses as a tool in policy evaluation, a focus on excess deaths, an emphasis on empirics over beliefs or assertions by those in authority, a deep awareness of the expansionary incentives within a bureaucracy, and an emphasis on sanitation as a key aim of public health policy. Writing before the discovery and acceptance of the

¹ At a practical level, exposure to an infection is not a necessary criterion for implementing quarantine. As J. Speakman et al. (2003) note: “in public health, ‘quarantine’ is distinguished as being applied to well persons, whereas ‘isolation’ is the separation for the period of communicability of an infected person”.

² The Act focused on managing sewage “so as not to be a Nuisance”; paving, lighting and cleansing of streets, with rubbish and filth to be collected and removed; draining and covering or filling up “Pools, open Ditches” to minimise “Filth, Water, Matter, or Thing of an offensive Nature, or likely to be prejudicial to Health”. In relation to water, the Act focused on “proper and sufficient” supply, mainly about “Pressure as will carry the same to the top Story of the highest Dwelling House within the District supplied”. That such water should be clean (in the modern sense) was a later advancement prompted by John Snow's studies of 1849 and 1854, although Chadwick had long insisted on the use of “pure soft water”, mainly rain water, for drinking (see *Health of Nations*, Volume 2); and separation of sewage from drinking water sources: “small pipe separate sewers seem to have been advocated first by the British sanitarian Sir Edwin Chadwick in 1842” – see Tarr (1979).

germ theory of disease, Maclean based his advice on the idea that a filthy environment leads to bad ‘vapours’, rather than that filth was a breeding ground for worms, insects, bacteria, and other spreaders of disease – something that led his contemporaries to label him an “anti-contagionist” (for example, Mullett, 1952). His policy advice, if not the mechanism he believed underpinned it, was empirically supported and far ahead of his time.

Consider the conclusions reached by Maclean based on the historical record of quarantines known at the time and his own careful empirical analysis of disease outbreaks in India, Turkey, Spain, and London:³

Were sanitary laws [quarantine] efficient for their proposed ends, we should have, in every epidemic, palpable proof of the fact. The moment the regulations enjoined by these laws were fully enforced, the sickness would necessarily cease: but the reverse of all this we find to be the case. There is not upon record a single instance of sanitary regulations having, even in appearance, proved efficient for their proposed ends. *Epidemics from ordinary causes have generally run their regular course, observing their usual laws the same as if no restrictions had been imposed; with this material difference however, that restrictions have invariably contributed greatly to augment the sickness and mortality:* it is unnecessary for me to do more than to show, that sanitary laws never stop the course of the disease (Maclean, 1825).

[P]ersons, in health, to be frightened into sickness, and abandoned. ... The destruction of lives, alone ... I roundly estimate at nearly a million of persons annually, throughout the world, since the period at which they began to operate, ... and the miseries of poverty and want inflicted upon many millions more (Maclean, 1817b).

A million lives lost per year, for several centuries, with a global population far lower than today, would put quarantines in a similar category of harmdoing as WWI, WWII, and the Great Leap Forward combined in the 20th century. The gravity of Maclean’s argument explains his huge impact on the early Victorians, leading Britain to advocate against quarantines in international agencies for much of the 19th century. There was much resistance from European countries but the use of quarantines did gradually fade throughout the West and then the world at large until, in 2020, they made a dramatic comeback.

We first examine the concept of quarantines and sketch the fundamental reasons why they might work or fail. We then briefly review learned opinion from before the 19th century and afterward, after which we delve into Maclean’s works, insights, and effects on policy, including the political economy of quarantines and the alternative he advocated of sanitary measures. We then revisit the key arguments discovered 200 years ago about why quarantines fail, supplemented with equivalent insights from the covid period.

The essential conclusion of Charles Maclean and his modern equivalents is that an established public health bureaucracy inevitably champions quarantines to expand its power, irrespective of costs to the public. This forces us to consider ways one might radically reform public health.

³ As in all subsequent quotes, italics were added by us.

2. A brief history of quarantines

The word ‘quarantine’ means ‘40 days’ in Italian and derives from the time of the bubonic plague in Europe. The first major recorded plague outbreak began during 541-542 CE in the Eastern region of the Roman Empire. It spread through the transport of black rats between and within cities for more than two hundred years across the Empire (Central Asia and likely East Africa) before receding (see World History, 2014 for support for this and ensuing claims about the history of the bubonic plague). Infected rats transported via the sea route from Egypt were the likely initial cause of this European outbreak. The next major appearance of the plague was in Europe in 1347, leading to the well-known Black Death of 1347-1400 that killed perhaps half of the entire population of Eurasia. This pandemic was likely initiated by rats and their fleas, with recent data suggesting that subsequent spread among humans was entirely sustained by human ectoparasites, i.e., body lice and human fleas (Barbieri et al., 2021; Bramanti et al., 2021; Bland et al., 2024).

Different authors record different dates for the commencement of the policy that came to be known as ‘quarantine’. Newman reports that “Italian urban authorities first began to use quarantine as a response to bubonic plague around 1348,” (Kira & Newman, 2012) while Tognotti writes that “quarantine was first introduced in 1377 in Dubrovnik on Croatia’s Dalmatian Coast” (Tognotti, 2013). What historians can agree on is that the idea of quarantine is nearly 650 years old.

A quarantine code for isolating ships and communities infected by some illness is said to have been “perfected” in Venice by 1448 (McDonald, 1951). The concept then expanded across Europe as communities attempted to slow the spread of the plague. Since no antibiotics existed and there was no understanding of the role of hygiene and cleanliness in forestalling disease, quarantine was the default “remedy” for almost any illness.

The basic idea of quarantine is to restrict the mobility of some groups of people to prevent infection. In practice, this has meant many different things. Some regions assigned islands or cordoned-off areas where all newcomers arriving on ships had to spend time before being allowed to enter the general community. Some authorities had rules saying that ships with ill people on board would not be permitted to dock until a specified period had elapsed. Some authorities surrounded infected towns with troops, not allowing anyone in or out, thereby establishing what came to be known as a ‘cordon sanitaire’. Some authorities designated special areas or whole hospitals just for people with specific symptoms. Leper colonies are a primary example and go back at least to biblical times.

The lockdowns of 2020 and beyond were justified by a similar aim of reducing or preventing the spread of a disease. However, they were unlike most historical quarantines in that not only the known infected or sick but whole healthy populations also had their mobility restricted by government decree. Lockdown policies ranged from shutting families inside their houses for weeks with food sometimes left on their doorsteps, to rules limiting the mobility of everyone in a district or state to within an hour’s drive of their residential address. Generally, modern lockdowns represent an ideology that regards all humans as biohazards.

The main circumstances in which quarantines could work, according to their terms of sale, are when i) the isolated and quarantined groups become healthier over time, ii) the transmission of disease occurs primarily through what one has isolated and quarantined, like people, iii) there is no significant leakage across the quarantine barrier, iv) one can accurately identify who or what is to be quarantined, and v) one is not preventing significant beneficial effects or causing damage via the act of mobility restriction. Quarantines are cost-effective from the public’s point of view when they both work on these terms and do so at a total cost lower than their benefits. Both costs and benefits should be understood more broadly than merely in terms of monetary considerations, by including effects on physical and psychological health, violations of human rights, and so on, all of which can be summarily, if imperfectly, measured using subjective population well-being.

It is important to realise that quarantines benefit those instigating and organising them via jobs, prestige, and the ability to purchase or to command other resources.

The main reasons for the failure of quarantines relate to violations of the logic justifying them, i.e., any breach of reasons i) to v) above. Quarantines can make the isolated less healthy and thus more dangerous to themselves and others both during quarantine and when released; transmission might be via something completely different than what was isolated, such as via rats or surfaces and other fomites; there may be high leakage due to necessarily imperfect isolation of air, goods, people, or other objects of quarantine, resulting from things like imperfect control or outright bribery; one might not know what to isolate at what moment, thus isolating the wrong things or persons; and restricting people's mobility might prevent the spread of health-improving things, including trade, social interactions, physical activity, healthcare access, and exposure to mild variants of infectious agents that bring immunity to more dangerous variants, while also raising stress that directly reduces immunity. Each of these reasons was recognised 200 years ago and amply documented (as discussed below), a quite remarkable achievement for an age that had not yet even conceived of viruses.

Let us review some canonical examples of quarantines in action over the ages.

2.1.1 *Sequestration inside homes*

During the Great Plague of London in 1665, entire families with any symptomatic person were sealed inside their houses, with watchmen posted outside. Others could move around relatively freely, including leaving London, which is what the wealthy did.

Here is an example of sequestration from Prussia:

In Prussia, once a single case had been detected and an area declared infected, no one was permitted to leave without undergoing quarantine. All houses with an illness or death were to be isolated, even those from which the afflicted had been removed. In Berlin, other residents who had already left were brought back and sequestered as well, while in Danzig those who returned to discover families stricken in their absence were forbidden to rejoin them. To seal off infected houses renters were to surrender their house keys, guards, armed with cudgels, were posted, and sometimes a string was suspended around the house to indicate the perimeter of sequestration. In Danzig, large crosses were painted on doors and staffs topped with a thatch of straw planted at the outer gates were quickly dubbed Plague Trees by local wags. In Liegnitz windows and doors were nailed shut, although in some cases use of a rope allowed doors to be opened a foot or so. The sequestered whose condition improved were subject to full quarantines, as were recovered patients and their caretakers and physicians. In the sickrooms exacting cleanliness was to be observed, tainted substances removed, especially excreta, fresh air assured and daily fumigations undertaken. Before the isolation of a house could be lifted, it had to be cleaned, fumigated and disinfected, the walls scraped down and whitewashed, the floors, windows and doors repeatedly washed with lye or a chloride of lime solution and the entire structure aired out for a fortnight. Structures not worth the effort could be burnt down.

If the disease showed itself in several houses or a neighborhood, the entire area was to be isolated and the sequestered provided with all necessities (Baldwin, 2004).

2.1.2 *Removal from homes*

Allegedly to fight the plague, authorities removed entire families outside the town:

...searchers in parishes who would determine the causes of death (typhus could be mistaken for the plague); if they found that someone had died in an "uncommon manner," as with the signs of the plague such as buboes—swellings in the lymph nodes that would show up in the groin or armpit—and carbuncles, this would be reported to a magistrate who would send physicians to investigate. Whole families could be ordered removed from their homes, the well and sick sent to separate places several miles from town (Zuckerman, 2004).

Also of note:

During the fever time, Livornese Lazzaretto di San Rocco was converted into an isolation hospital and the quarantine Guardians were seconded for the duty of forcibly removing individuals suspected of contagion from their homes and placing them therein (Chase-Levenson, 2020).

2.1.3 *Closure of national borders and use of medical passports*

Another quarantining method was to enforce strict national boundaries, as described below.

[F]or a century, from 1770, Austro-Hungarian authorities maintained a thousand-mile quarantine corridor along their imperial frontier, all the way from the shores of the Adriatic to the Transylvanian mountains. This epidemiological boundary was not simply a line but a buffer zone, thirty miles wide in many places, cutting a broad swath through modern-day Serbia, Bosnia, and Croatia. Inside this belt, every peasant was also a soldier, responsible for manning the sanitary cordon for at least one week in every eight, and more during an outbreak—up to a total of six months’ active service each year. A chain of two thousand lookout posts was constructed, each no more than a musket-shot’s distance from the next, and *soldiers were instructed to fire on any unauthorized traffic* (Manaugh et al., 2021).

Maintaining this protocol was by no means easy, particularly in times of war:

Prompted by plague epidemics in Prague and Vienna in 1713, the Imperial Health Commission in 1728 ordered the erection of a ‘perpetual plague cordon’ along the thousand-mile border with Moldavia and Wallachia. Already policed as a military frontier, and used temporarily (and ineffectually) in 1710 in an effort to prevent the entry of suspect carriers of disease, it now became a permanent sanitary barrier whose soldiers, nearly 100,000 of them when fully mobilized, had orders to shoot those who crossed the border without performing quarantine. *It could never be a wholly impregnable barrier*, especially in time of war. The final major plague in Europe, which killed 50,000 people in Moscow in 1770-1, was said to have come from Wallachia, where Russian and Ottoman armies were at war along the Danube and therefore, according to a Russian surgeon, made it ‘impossible to establish quarantine barriers’. There may have been other routes for plague into Europe, perhaps from the Ukraine and the Black Sea, which had to be protected later. (Slack, 2022).

Reductions in economic opportunities necessarily resulted from such efforts:

Belgians established a cordon around the Uele province, with sleeping sickness checkpoints and lazarettos making the colony’s border manifest. *Entire villages were cut off from their fishing grounds or trading partners*, forbidden to travel across quarantine lines without a medical passport (Manaugh et al., 2021).

The military frequently enforced these quarantines:

The military’s administrative responsibilities for preventive sanitary measures began in the 1730s, concurrently with the official formation of the permanent quarantine network. On 24 December 1737 Emperor Charles VI enacted an instruction which invested the military with a predominant role. This consequently *led to a sort of militarization of plague prevention*. Even back in the seventeenth century we can observe cases of systemic border closure by the military; limited, but burdensome, military cordons in the light of plague prevention were drawn in 1647 in Spain, in 1668 around Paris, in 1708 in Transylvania and in 1720 around Marseilles (Trubeta et al., 2021).

2.1.4 *Opening mail and reading it*

In Russia, the habits of quarantining gave rise to other infringements on personal rights, such as the abrogation of the privacy of personal correspondence:

Quarantine officials everywhere shamelessly opened and read official dispatches under the pretext of disinfection. One British diplomat complained that “in the name of public health,” the Russians “*had introduced a system of universal police and espionage*” (Manaugh et al., 2021).

3. Evidence and arguments before and after the 19th century

3.1 Evidence Before the 19th Century

Scientific thought and writings on quarantines arguably reached their zenith in the 19th century, something we credit largely to Charles Maclean, so we treat that century separately in Section 4. In this section, we first acknowledge the many learned voices that documented the failures of quarantines before or after the 1800s. Below, we reproduce the key remarks about quarantines made by the top ‘sceptical’ historical writers from other centuries since the Enlightenment, which we then condense for ease of reference into Table A1 in the Appendix.

Some doctors in the early 17th century in the Ottoman Empire came close to identifying the actual cause of plague transmission, bearing in mind that fleas live on both rats and cats. As MacLean notes:

The application of quarantine laws to our epidemic pestilential fever, is just as useless, as the order of the Sultan, Achmet I in the wasting plague of 1613, for transporting all the cats in Constantinople to the island of Scutari. The Jewish physicians told the Emperor, that the plague was occasioned by the cats, and the poor cats were dispatched into exile. Yet, this did not restrain the plague [because cats eat rats] (Webster, 1799).

Charles Maclean (1817) also cited the work of Pierre Gassendo (1658) who was an “arch-empiricist” and, according to the historian Edward Gibbon, the “greatest” philosopher of all time (Stanford Encyclopedia of Philosophy, 2024). Gassendo came to the view that quarantines do not work but cause great harm:

Gassendus (*Notitia Eccles Dimiensis*) relates, that, in a plague which affected Digne, in Provence, in 1619, out of ten thousand inhabitants, but fifteen hundred remained alive: and this mortality he imputes to the citizens having been so closely confined, that they were not suffered to go to their country houses: whereas, in another pestilence, which broke out in the same place a year and a half after, owing to the liberty being extended, there did not die above one hundred persons. Without imputing more than the due share of mortality to the operation of the restrictive measures employed upon this occasion, it is obvious, *not only that they did not tend to stop the progress of the disease, but that they must have greatly aggravated its severity* (Maclean, 1817a).

John Graunt, famed founder of demography and epidemiology (Connor, 2022), opposed plague quarantines. In 1676 he wrote: “That the troublesome seclusions in the *Plague-time* are not a remedy to be purchased at vast inconveniences” (Graunt, 1676). He also did not think the plague was transmitted via contagion (“...shews, that the Contagion of the Plague depends more upon the Disposition of the Air then upon the Effluvia from the Bodies of Men” (*ibid*; Graunt)). In that regard he was a precursor of Maclean.

John Graunt’s book is notable for its statistical analysis. He provided many tables derived from the Bills of Mortality maintained at the parishes of London, including one containing detailed causes of death in 1632, a non-plague year. He noted that during the 1625 plague (in which the authorities used quarantines (Kira, 2012)), an additional 11,000 people (around 25 per cent more than usual) were reported to have died from non-plague causes. Despite having raised concerns about seclusion and quarantine, he avoided the obvious implication that the additional deaths were caused by quarantine, and instead, proposed that the excess deaths must have been misreported, and that these were actually plague deaths:

8. In the said year 1625. there are said to have died of the Plague 36417. and of all other Diseases 18848. whereas in the years, both before and after the same, the ordinary number of Burials was between 7 and 8000 so that if we add about 11000 (which is the difference between 7. and 18) to our 35 the whole will be 46000...

9. From whence we may probably suspect that about part more died of the Plague then are returned for such. (*ibid*; Graunt)

According to Paul Slack, Dr Richard Mead, who had read Graunt, arrived at exactly this view: that the strong confinement of entire families in London caused additional deaths. Yet, Mead entertained the idea that there was a form of clever quarantine that would abandon the wholesale variety but keep some part of it:

Richard Mead, the architect and chief defender of the Quarantine Act, had no time for such doubts in his bestselling Short discourse concerning pestilential contagion (1720). ...He had read [John] Graunt, and been persuaded that *the English practice of shutting up all members of an infected family in their houses simply increased mortality*. In any future plague it should not be wholly abandoned, however, as Graunt might have hoped, but replaced by a policy of separating the sick from their contacts and housing both groups separately elsewhere (Slack, 2022).

Precisely this deduction, that quarantines cause excess deaths, was made in later plague pandemics by others. For instance, Paul Slack noted in 2012:

In 1708, a sanitary cordon around Konigsberg erected by the Prussian government had to be removed in the face of local protests that it killed more people than the epidemic itself (Slack, 2012).

A book published anonymously, *A Journal of the Plague Year* (apparently written by Daniel Defoe based on an alleged eyewitness account of his uncle, a saddler who lived in London during the 1665 Plague)¹ (H.F., 1722/Defoe, 1722), arrived at similar conclusions and influenced Maclean, who wrote about it in 1817 thus (Maclean, 1817b):

In 1665, the plague, in London, spread most rapidly, and *proved most fatal, at the very period, that the shutting up of houses, supposed to be infected, and other restrictions upon intercourse, were most rigorously enforced*: and it was after the houses were again laid open, and the people had abandoned all other precautions, in despair, that the spreading of the disease, and its mortality, suddenly diminished, and ceased (H.F., 1722/Defoe, 1722; Mead, 1665).

Critics of quarantines questioned both whether the plague was contagious and whether quarantines were doing harm. Graunt had questioned the cost-effectiveness of quarantine in 1676. As Margaret DeLacy wrote in 2016, he was not alone:

Critics of quarantines were never lacking; among the most furious and persistent was the obstetrician Sir Richard Manningham, author of *The Plague No Contagious Disease* (London: 1744) and *A Discourse concerning the Plague and Pestilential Fevers: Plainly Proving That the General Productive Causes of All Plagues of Pestilence, Are from Some Fault in the Air: or from Ill and Unwholesome Diet* (London: 1758) (DeLacy, 2016).

Charles Maclean noted in his 1817 book that Sir Richard Manningham and Dr. Maximilian Stole had questioned the contagion of the plague in 1758 and 1774 respectively, but also noted that “they do not appear to have entered upon the subject with a view to any general, or extensive range of investigation, or with the expectation of obtaining any great or permanent results” (Maclean, 1817b). By contrast, Maclean focused scientifically and systematically on examining the efficacy of quarantine while also expecting some change to how things were done.

Indirectly, some advocates of quarantines provided evidence for their failures. John Howard’s 1789 book, *Account of the Principal Lazarettos in Europe* (Howard, 1791), “described the practice of quarantine in Europe. He had the greatest respect for the Venetian code and deplored the state into which its practice had fallen: ‘In almost every department into which I had opportunity to look, *there is such remissness and corruption in the execution of these regulations, as to render quarantine almost useless*’” (McDonald, 1951).

Moreover, Howard explained that the Ottoman Empire did not follow quarantines since its inhabitants did not believe the plague was contagious. Maclean drew on him thus in his 1817 book (Volume 1):

¹ In the following extract from Maclean (Maclean, 1817b, p. 359), the “History of the Plague” by “H. F.” is the book that is now known as *A Journal of the Plague Year*: “we find, in the journal of an obscure sadler of Whitechapel, to which are affixed the initials of H. F. a surprising sum of applicative information.... This work, entitled ‘The History of the Plague,’ &c: to which I am indebted ... states, at p. 10, the author to have been a sadler, residing at Whitechapel, and an eye-witness of the calamities, which he has described. It bears unequivocal marks of being genuine. Upon what grounds it could have been attributed, as has generally been the case, to De Foe, who, if born in 1665, must have been in the first stage of infancy, I am wholly at a loss to conjecture.” Despite some controversy, scholarly opinions on balance support the book being a work of history rather than fiction. This controversy is discussed on Wikipedia at: https://en.wikipedia.org/wiki/A_Journal_of_the_Plague_Year for those interested in the authorship of this book.

Howard says, that “when the corpse is cold of a person dead of the plague, it does not infect the air with any noxious exhalations. This is so much believed in Turkey, that the people there are not afraid to handle such corpses”.

It is notorious that the clothes of the pestiferous persons, who die in the plague depots of the Levant, are regularly exposed to sale in the markets; that they are constantly in a state of transfer from the dead to the living. And, hence, if the disease were contagious, the infection, in all the towns of the Turkish Empire, would be constantly in a state of circulation.

In 1799, the lexicographer Noah Webster published *A brief history of epidemic and pestilential diseases*. He had previously supported quarantine, but after reviewing the data, he concluded that quarantine cannot work.

It is easy, I aver, to distinguish, in every case, the nature of pestilence; that is, whether it is an epidemic, proceeding from a state of the elements, or a disease generated solely by foul air, artificially collected. In a few weeks, if not a few days, a disease will show whether it proceeds from infection only or from a general elemental source; and when it appears to proceed from the elements, men may just as well attempt to save the cats, the wild animals or the fish in the ocean from the effects of that principle, as their own species, by laws enjoining quarantine and purification of ships. The same cause that destroys the cats or the fish in one case, destroys human life in the other; and that cause exists in the elements; it is at home; quarantine laws do not reach it... (Webster, 1799, p. 323).

In nine cases of ten, in which quarantine is enjoined, human efforts are opposed to the great laws of nature, and are therefore useless. [I]n all such cases, the pestilence which invades man will be found to arise solely from the uncontrollable laws of the elements; and quarantine will be utterly unavailing to guard cities against its introduction and ravages. The remedy is not applied to the source of the disease. Hence the *efforts of the police in London in the last century, and of Dantzick and Marseilles in this, were entirely useless*; and hence the failure of all health laws to save our cities from the late epidemics... (Webster, 1799, p. 332).

Mead’s attempts to prove the specific contagion of plague, aided by his popularity, had a most surprising success; his treatise was received as a standard of truth; it every where suspended enquiries and checked a spirit of investigation, which might have dissipated error; it was the basis of the present laws of quarantine, which are applied, in thousands of cases, where they are as improper and as little wanted, as if applied to prevent an epidemic pleurisy, or head-ache, *embarrassing commerce, without the shadow of necessity*. But these are not the worst effects. The erroneous system of specific contagion, has misled mankind into a fatal security, on the subject of the local causes of diseases. ... The quarantine enjoined on vessels from the West-Indies and United States, is utterly useless in guarding that country from this pestilence in the form of an epidemic. (Webster, 1799, p. 334).

What made Maclean sceptical of quarantines? Winslow claims that “Maclean’s suspicion [was] aroused on reading Benjamin Rush’s account of the 1793 Philadelphia yellow fever epidemic, that such diseases were not contagious” (Brown, 2008). By the end of the 18th century, Benjamin Rush had come to the view that maritime quarantine was unwarranted: “Rush is ... now vehemently opposed to all measures of maritime quarantine which he compares to the attempt to check the plague in Moscow by placing an ikon upon the city gate” (Winslow, 1944).

Further:

In 1805, Rush published (in the second edition of his *Medical Inquiries*, and also as a separate pamphlet) two additional essays which complete his contributions to epidemiology. The first of these is “An Inquiry into the Various Sources of the Usual Forms of Summer and Autumnal Disease in the United States.” The sources of such diseases are, first and foremost, decaying vegetable matter, of which the author lists 27 examples ... This essay closes with a *denunciation of quarantine procedures which have led to the waste of millions of dollars and to the sacrifice of thousands of lives* from “that faith in their efficacy, which has led to the neglect of domestic cleanliness” (*ibid*; Winslow).

3.2 Evidence in the 20th Century

Skipping the 19th century for the moment, let us now review opinions on quarantine from after 1900. In 1908, in a paper at the annual conference of the American Medical Association, Dr. H.M. Bracken declared that “Quarantine is an evidence of ignorance” (Bracken, 1908).

In a 1910 book, *The sources and modes of infection*, Charles Value Chapin wrote that “inland quarantine has never been successfully administered” for yellow fever (Chapin, 1910). He also wrote:

Why Does Isolation Fail? - The epidemiological *evidence is conclusive that the isolation of recognized cases of contagious diseases often fails to check outbreaks* which grow in spite of it; that it does not stamp out disease, and that it only reduces in a moderate degree the prevalence of the disease. We are forced to conclude that there is some defect in our procedures, or some other source of infection more important than the recognized cases.

Chapin seems to have been sanguine about the ability to address defects in procedures, arguing that “It is not that isolation is imperfect, for isolation in the hospital is well-nigh complete”. This extreme confidence in the perfectibility of procedures appears frequently in public health writings, apart from those of Charles Maclean and a few others. Chapin presented some empirical analysis, but to a degree insufficient to prove his claim, and did not analyze the costs of quarantine.

In 1919, a report called *Influenza* was published by the Ontario Provincial Board of Health. It noted:

As there is considerable difference of opinion among health officers, the profession and the public, with reference to the value of measures of prevention, such as the placarding and quarantine of premises where the disease exists, the Board has deemed it of sufficient importance to add some remarks giving the views of provincial and state officers of health in this respect as well as upon other points of interest.

With the view of learning the experience of the state and provincial health officers of the United States and Canada the Board addressed the following inquiry to all such officers, viz.:—”Does your province (or state) require the reporting, placarding and quarantine of influenza, and, if so, do you consider placarding and quarantine of such, practicable?”

Replies were received from the health officers of the nine Canadian provinces and from 43 state health officers. Four of the provinces of Canada reported that placarding and quarantine of influenza was impracticable. One states that “modified quarantine was working fairly well,” another said that “the law was not well obeyed,” a third stated “almost impossible in rural places,” and a fourth “many infractions but believe good effect”, a single officer only declared it practicable.

Of the reports from United States’ health officers, 29 out of the 43 or 67 per cent. state that placarding and quarantine in influenza are impracticable. Of the remainder of the replies nine report the law practicable, and five qualify their statement by such expressions as “seems to be of value,” “enforcement depends on local sentiment,” “law fairly obeyed,” “beneficial,” “believe quarantine should be included.”

Thus it will be seen that out of 52 health officers of the states and provinces of North America, 9 frankly state, as the result of their experience, that placarding and quarantine are practicable, 10 qualify their approval, and 33 *frankly state that these measures are impracticable*.

The real facts, considering the views of the American Public Health Association as well as of the public health authorities of the two countries, seem to be, as Sir Arthur Newsholme, Chief Medical Officer of the Local Government Board of England, says, “*I know of no public health measures which can resist the progress of pandemic influenza*” (Provincial Board of Health Ontario, 1919).

In fact, Arthur Newsholme presented a detailed paper entitled “Discussion on Influenza” on 13 November 1918, during the Spanish flu pandemic, in which he offers the following understanding of the impossibilities involved in quarantine attempts:

Warnings of possible “secondary waves” in the presence of much endemic influenza, or immediately after a superadded epidemic has declined, would be useful if a prophylactic were available (none except one in the early experimental stage has been suggested), or, if by issuing advice the progress of an epidemic could be stayed. Neither of these conditions can be fulfilled. We are at present unable to prevent the spread of influenza by communal means, and the experience of every family invaded by influenza demonstrates *the difficulty, amounting almost to impossibility, of preventing the spread of infection in the domestic circle*.

In each of the cases cited some lives might have been saved, spread of infection diminished, great suffering avoided, if the known sick could have been isolated from the healthy; if rigid exclusion of

known sick and drastic increase of floor-space for each person could have been enforced in factories, workplaces, barracks and ships; if overcrowding could have been regardlessly prohibited.

But we may consider the preventability of influenza from the standpoint of possibilities in time of peace, and *ask if we are prepared to pay the heavy price in personal restrictions which its prevention—if even then it be possible—will necessarily imply* until further means of prevention, so far undiscovered, become available.

The problem of preventing influenza is part of the wider problem of the prevention of the entire group of catarrhal diseases, with the added problem as to whether the occult causes of pandemicity of influenza can be discovered and their action averted. Hitherto we have no clue to these, and our only hope of improvement lies in means to be devised for preventing catarrhal diseases, by diminishing infection, by reducing susceptibility, or both.

An initial practical difficulty in such prevention is *that the patient for several days may not fully recognize his condition*, and it seems likely that infection is chiefly spread during these earlier stages. It remains true, however, as stated in my recent official Memorandum, that—

“If every person who is suffering from . . . catarrh . . . took all possible precautions, the present disability and mortality from catarrhal epidemics would be materially reduced” (Newsholme, 1918).

In 1921, Arthur Albert Mouritz of Honolulu wrote a book entitled “*The Flu*”: *A Brief History of Influenza in U. S. America, Europe, Hawaii*, in which he noted (Mouritz, 1921):

Inspection of arrivals from overseas ports, and even limited quarantine carefully carried out by competent officials, is not always an effective protection against the introduction of infectious and contagious diseases into any country. The following list of contagious and infectious diseases eluded the Quarantine officials at the port of Honolulu and infected the town, some later infected other Islands of the group.

Year.	Month.	Disease.
1853	May 13.	Small-pox.
1881	February 4.	Small-pox.
1895	August 22.	Cholera.
1899	December.	Plague.
1911	February 23.	Cholera.
1911	October 27.	Yellow Fever (?)
1918	June.	Influenza.

He further elaborated:

Quarantine and Isolation are beset with *difficulties owing to the extraordinary contagious nature of the Flu, due to the multiplicity of Contacts, Carriers, and mild undetected cases.*

It should be borne in mind that Influenza is a most refractory disease, and not at any time or season is it under our control, and to bring about this condition is as yet an unsolved problem.

It may attack us at any time, although its favorite period of appearance is the Autumn and Winter months.

Influenza is mainly a Respiratory disease, hence Isolation and Quarantine cannot be relied upon to prevent the spread of the Flu, and *both of these restraints of personal liberty and hindrances of commerce must fail*, besides being also unpractical and impossible.

People must meet to transact business in public places, must eat and drink in public, use telephones in public places, use public lavatories, and many other acts of public nature; all of these acts cannot be quarantined, nor can talking amongst crowds; even if rigid quarantine rules were enforced, the Flu has hitherto eluded them and spread outside of the quarantined limits. (ibid; Mouritz)

In his 1924 book, *The Great Plague of London*, Walter George Bell wrote of quarantine: “the evil policy had long precedent behind it, and had, unfortunately, the approval of the college of physicians. As a body, the magistrates were insistent, and the support of the Privy Council in this disastrous measure never wavered; *none in authority ever*

questioned the necessity of sealing all houses wherein infection lodged.” This sentiment is shared by modern writers on the Great Plague, such as Stephen Porter and Shrewsbury (Fischer, 2017).

Even as it (falsely) labels the Sanitarians as “anticontagonists”, the 1985 McGrew encyclopedia of medical history agrees that: “In modern terms, the anticontagonists *were justified in resisting quarantines as doing more social harm than medical good*” (McGrew, 1985).

In 1972, Nobelist F.M. Burnet opined that quarantine is futile for droplet-transmitted infections like colds, influenza and measles.

Suppose we leave the insanitary past and survey the conditions of present-day civilization from the same point of view. Several things have happened. First, we have found methods of preventing certain types of infection which were of the greatest importance in the old days, those spread by filth, or, to be more direct, by human faeces, and those transmitted by animal parasites or semi-parasites such as fleas, lice and mosquitoes. Efficient sewerage and water supply, plus ordinarily decent cleanliness, have thus rid us in temperate climates of typhoid, dysentery, cholera, plague, typhus and malaria. *We have not been able, and perhaps never will be able, to block the spread of those diseases which are transmitted by what is technically called ‘droplet infection’.* Colds, sore throats, influenza, measles and the like are all passed from person to person via tiny drops of saliva which are sprayed into the air during coughing, shouting and so forth. *As long as human beings in large communities have to go about their business, such dissemination of infection will continue* (Burnett & White, 1972).

In a 1986 paper covering cholera, yellow fever, TB, and other diseases, D.F. Musto showed that “sustained, effective quarantine for large numbers of persons has not been successful” (Musto, 1986).

In a 1995 review article entitled “Hamburg, Health, and Bourgeois Liberalism”, Jonathan Morris wrote about the “routine failure of quarantine measures to stop the spread of the [cholera] disease” (Morris, 1995).

3.3 Evidence in the 21st Century

More recent reviews and commentary about large-scale quarantine have also not been favourable. In a 2003 report, Joseph Barbera is cited as saying that quarantines have “always” failed.

Governments across the world have also been struggling to find ways to defend against the disease and many have invoked long-dormant quarantine laws. Several nations, including Vietnam, Malaysia, Taiwan, New Zealand and Australia, are either barring visitors from SARS-affected nations or are requiring them to wear masks for 10 days under threat of hefty fines. In Hong Kong and Singapore, the governments have placed thousands of people under forced quarantine.

“It’s totally predictable—those are the kinds of things that are going to occur,” says Joseph Barbera, co-director for the Institute for Crisis, Disaster and Risk Management at George Washington University. But such measures, Barbera says, are bound to fail. “*When you look carefully at quarantine history, it was always a failure,*” Barbera says. “The objective is to contain disease, not to contain human beings” (Mandavilli, 2003).

A WHO writing group in 2006 had this to say about quarantine for pandemic influenza:

In Australia in 1919... [a report] states that any benefits of land quarantine or interstate or intrastate travel restrictions were ‘very meagre’. In Canada in 1918... [a report wrote that] ‘These measures were nonetheless ‘lamentably inefficient in checking the spread of the disease.’ Quite simply, isolating individuals or families or quarantining entire communities did not work (World Health Organisation Writing Group, 2006).

A review in 2006 of measures to control pandemic influenza by epidemiologists at the Center for Biosecurity of the University of Pittsburgh noted:

A historical review of communities in the U.S. during the 1918 influenza pandemic identified only two that escaped serious mortality and morbidity. Both communities had completely cut themselves off for months from the outside world... Other studies have suggested that, except in the most extreme applications, disease mitigation measures have not had a significant impact on altering the course of an influenza pandemic... few analyses have been produced that weigh the hoped-for efficacy of such measures against the potential impacts of large-scale or long-term implementation of these measures (Inglesby et al., 2006).

In this 2006 review, Donald Henderson and his colleagues noted that:

medical authorities have expressed doubts about the efficacy and feasibility of large-scale and home quarantines ... The negative consequences of large-scale quarantine are so extreme (forced confinement of sick people with the well; complete restriction of movement of large populations; difficulty in getting critical supplies, medicines, and food to people inside the quarantine zone) that *this mitigation measure should be eliminated from serious consideration.* (*ibid*; Henderson)

This paper did not cite any extensive study of quarantines but rather conveyed an impressionist opinion from decades of practical experience. The surviving co-authors of this 2006 paper (Thomas V. Inglesby, Jennifer B. Nuzzo, and Tara O'Toole) went on to actively support the covid lockdowns in the USA (Inglesby, 2022; Nuzzo, 2022; O'Toole, 2022). Yet, no new data to support these measures were given, and Inglesby wrote, "Although there is limited evidence for these measures historically, there is some common sense behind them..." (Adalja et al., 2020).

In a 2006 paper, Tatem et al. cite P. Clarendon Haggett's view that quarantine is largely irrelevant in the modern world:

The speed and complexity of modern transport make both geographical space and the traditional 'drawbridge' strategy of disease control and quarantine increasingly irrelevant. (Tatem et al., 2006)

In his 2007 book, *Discover your Inner Economist*, Tyler Cowen noted:

When it comes to evaluating risks rationally, we also make mistakes at the level of national policy. Many policies for fighting an influenza pandemic focus on developing vaccines and quarantining the sick. Both methods reflect a mentality of control. The thought is: "If only we had the right vaccine, we could control the virus." Or: "If only we shut down travel, we can keep the virus in one place." But it is hard to develop the proper vaccine in advance, make enough doses quickly, and distribute the doses. *Quarantines work for small islands, but they would probably fail for a highly mobile nation of 300 million people.*

A different approach is to strengthen the response capabilities of our emergency rooms, in case of a pandemic. Many experts believe that this would be the best way to invest our limited resources. But of course that is a tough recommendation to swallow. *It forces us to admit that perhaps we cannot control the virus.* How many politicians like to say: "Yes, thousands or millions will die but we can save at least some of them." Even if true, that doesn't sound nearly as good as, "We will protect every American" (Cowen, 2007).

Notably, in 2020, Tyler Cowen abandoned this position and supported harsh 'anti-covid' policies.²

In a chapter entitled "Ethical and Legal Issues Impacting Migrant Health", Sana Loue noted in a 2007 book:

The past emphasis on the use of quarantine has diminished in favor of increasing reliance on epidemiological surveillance and the improvement of basic health services, in recognition of the *inability of even rigid quarantine measures to provide security against disease* (Apostolopoulos et al., 2007).

In a chapter entitled "Migration in a Mobile World", Brian D. Gushulak and Douglas W. MacPherson wrote in the same book:

The two factors of fear and lack of knowledge, working together in the 14th century produced one of the most enduring public health interventions: quarantine. ... Consideration of the use of quarantine as a method of infectious disease control is a recurring theme in situations involving new diseases. In late 2005, quarantine practices were included in national contingency plans to manage pandemic influenza (U.S. Homeland Security Council, 2005).... *antiquated public health practices* based on quarantine principles (*ibid*; MacPherson & Gushulak).

They asked for a risk-based approach:

² Friedersdorf (2020) cites Cowen as claiming that covid is an "existential threat", supporting the harsh closure and lockdowns of New Zealand and not once calling for a cost-benefit analysis.

When situations develop, where risk management and mitigation strategies are needed for all mobile populations, the systematic tendency is to return to the basic concepts and principles of isolation, exclusion, and inspection under quarantine practices, and denial of admission to the ill or potentially ill (Samaan et al., 2004). *The economic and social consequences of this rather blunt response will require the need to move away from a one size fits all approach to traditional public health to a more risk management-based approach that will strive to ensure that those at greater risk receive the attention required to manage the demand for effective but rational intervention.* This population-based, risk assessment and mitigation strategy will require fundamental and paradigm shifts in the policy structure, rationale, and practice of immigration and migration health (*ibid*; MacPherson & Gushulak).

In 2007, public health academic George Annas wrote:

Mass quarantine is a relic of the past that, in an era when air travel has replaced ships and horses, seems to be as much an anachronism as trench warfare and cavalry. As China's attempts to quarantine people shows, it is likely to do more harm than good (Annas, 2007).

In the 2008 *Encyclopedia of Pestilence, Pandemics, and Plagues*, the authors note regarding AIDS that:

At the onset of the epidemic in the early 1980s, initial responses were often guided by fear and ignorance. At that time, AIDS evoked intense fear in the United States, where many began a clarion call for quarantine—which historically has been the usual method of dealing with epidemics. *The call for quarantine was made in spite of the fact that previous efforts to control epidemics such as leprosy, cholera, tuberculosis, and drug addiction through quarantine of large numbers of people were never successful* (Bryne, 2008).

Concerning cholera, Margaret Kosek and Robert E. Black wrote in 2008:

The use of repressives such as *quarantine should be strongly discouraged because they are ineffective* and will predictably inhibit case reporting (Wallace et al., 2008).

In 2009, Dr. Martin Blaser, then chairman of medicine at NYU Langone Medical Center, reportedly said he “didn’t believe that quarantine and isolation were effective measures in the pandemic setting” (Siegel, 2020) However, on 25 January 2020, he emailed Anthony Fauci concerning covid, writing: “containment is so important – and although draconian, the Chinese government is doing the right thing (as far as we know)” (Anthony Fauci email dump, 2022).

In 2009, Dr Hudson Birden of Australia is cited as saying:

Despite numerous attempts throughout history, quarantine efforts have shown very little value in stopping an epidemic.

We know this and we know why. Infectious diseases are quite good at what they do, which is to be fruitful and multiply. Influenza, with its airborne droplet and casual contact transmission modes, is one of the most highly infectious of the lot. People nearing the end of the incubation phase of an infection, still feeling perfectly healthy, are shedding virus at maximum rates and are, therefore, maximally infectious. Thermal scanners won't pick them up (Birden, 2009).

A 2011 public health textbook notes:

Traditional public health methods to control an outbreak may include isolation and quarantine of infected persons, which may be ineffective after a short period (Goldsteen et al., 2011).

The October 2019 WHO pandemic influenza guidelines (World Health Organisation, 2019) *rejected the idea of quarantine even for exposed individuals* after an early stage of surveillance and information gathering for a flu-like pandemic.

Table 1. Recommendations on the use of NPIs by severity level

SEVERITY	PANDEMIC ^a	EPIDEMIC
Not recommended in any circumstances	UV light Modifying humidity Contact tracing Quarantine of exposed individuals Entry and exit screening Border closure	UV light Modifying humidity Contact tracing Quarantine of exposed individuals Entry and exit screening Internal travel restrictions Border closure

NPI: non-pharmaceutical intervention; UV: ultraviolet.

Figure 2: Extract from Table 1 of the NPI recommendations in the 2019 WHO guideline for pandemics

The WHO’s explanation for its recommendations includes the following statements: “Travel-related measures are unlikely to be successful in most locations because current screening tools such as thermal scanners cannot identify pre-symptomatic infections and afebrile infections”; “Home quarantine of exposed individuals to reduce transmission is not recommended because there is no obvious rationale for this measure, and there would be considerable difficulties in implementing it.”

The World Health Organization (WHO) Global Influenza Programme and the WHO Collaborating Centre for Infectious Disease Epidemiology and Control, School of Public Health, The University of Hong Kong collaborated to prepare these guidelines. Benjamin Cowling, who led the University of Hong Kong team, did not follow his own guidelines during the covid pandemic and instead supported restrictions in Hong Kong including traveler quarantine while suggesting that if the UK did not lock down, then hospitals would “overflow”.³

Howard Markel, a professor of the history of medicine, wrote on the *New York Times* on 27 January 2020:

...do quarantines contain a disease or might they actually contribute to spreading it? ...More often than not, health officials are several steps behind a spreading epidemic. And when they aren’t, the history books show, they tend to act too fast (costing a fortune) or unfairly (discriminating against some populations)... people who were segregated were rarely cared for, and many died. In numerous instances, too, quarantines were used to separate people considered to be dirty or undesirable (Markel, 2020).

Gauden Galea, the WHO’s representative in China, made the situation very clear on 24 January 2020: “trying to contain a city of 11 million people is new to science. The lockdown of 11 million people is unprecedented in public health history, *so it is certainly not a recommendation the WHO has made*” (Senger, 2020).

In 2022, Polly Price wrote in her 2022 book, *Plagues in the Nation*:

Quarantine of ships had been practiced for centuries in Europe and the Mediterranean region. But *even the strictest maritime quarantine could not prevent epidemics of smallpox, cholera, yellow fever, and other dread diseases* (Price, 2022).

In February 2020, Wendy Parmet, director of the Center for Health Policy and Law at Northeastern University Law School, said: “in some circumstances, a quarantine could actually make things worse ... It’s very hard to make a quarantine that isn’t leaky” (Koerth, 2020).

Anders Tegnell reportedly said in April 2020: “Closedown, lockdown, closing borders—nothing has a historical scientific basis, in my view” (Paterlini, 2020).

³ He stated in a tweet on 30 July 2020: “Imperial College already discussed the need for lockdown cycles back in March, that’s not a new concept. The U.K. government could choose not to lockdown early, and let hospitals overflow I suppose.” <https://twitter.com/bencowling88/status/1288492282618904577> (Cowling 2020b).

Stefan Baral, MD, Associate Professor and Infectious Disease Epidemiologist at Johns Hopkins School of Public Health, tweeted on 16 August 2020: “*I spent a decade in public health training and do not remember the lockdown lecture. At best, they drive inequities across socioeconomic lines. At worst, the same but no PH [public health] impact*”. He cited four journal articles to prove his case (Baral, 2020).

Professor Martin Kulldorff of Harvard Medical School said on 2 October 2020 that “Lockdown is a new invention of 2020. Every European country had prepared pandemic plans. We knew one was going to come along. Except for Sweden, all the countries threw it out of the window when Covid-19 arrived” (Benn, 2020).

In the Appendix, we supply a table with quotes from this long period by those who had a studied reason to reject quarantines.

4. Charles Maclean in the 19th Century

4.1 Scientific work

Charles Maclean's scientific contributions mainly relate to quarantine. In particular, he:

- argued (with empirical evidence) that quarantine cannot work, in part because he thought the diseases allegedly addressed by quarantine were non-contagious, but also because of human factors;
- argued (with a cost-benefit analysis) that the harms from quarantine are greater than its benefits;
- argued (with empirical evidence) that mass quarantine kills more people even from the disease from which protection is being sought (using the metric of excess deaths from that disease);
- argued (with empirical evidence) that sanitation investments (clean water, streets, air) are the primary cost-effective means of improving public health;
- argued (with empirical evidence) that support for quarantine followed the business model of bureaucracies and rulers. For them, quarantines are in their private interests, leading them to be willing to falsify, misrepresent, and ignore data and attack quarantine opponents with smear campaigns.

In hindsight, the primary weakness of Maclean's arguments is that he based many of his positions on the now-discarded notion of 'miasma' (the idea that illness comes not from small entities, like viruses or bacteria, but generally from bad air) as a causal mechanism. Nevertheless, his sanitation recommendations were justified by empirical evidence rather than being solely based on the flawed 'miasma' model that predominated when he was writing. Therefore, the policies Maclean recommended are sensible, empirically-based public health policies even 200 years later, but not for the theoretical reasons he gave.

For Maclean, observation and the scientific method were non-negotiable inputs to proper analysis, on top of which he fully recognised the political and psychological sources of hindrances to innovation in science. In a 1797 book, he wrote:

In endeavouring to promote knowledge, it may sometimes be as useful to correct ancient errors, as to promulgate new discoveries. *In medicine, doctrines of the greatest importance have been handed down, from generation to generation, which, although demonstrably false, have never once been called in question.* The supposed existence of contagion, in plague, dysentery, and fevers, appears to me, to be a very remarkable instance of this propensity in man, to pursue the beaten tract, however unprofitable or unsafe. Is not this conduct often the effect of selfishness, *choosing to avoid the responsibility of innovation?* And is it not for the same reason, that erroneous doctrines generally remain longer undisproved, in proportion to the extent of their influence upon practice?

Maclean was, by temperament and actions, volatile and inquisitive. He changed directions in his career, moved to different countries, was adventurous and took risks. He died of an unknown cause at the age of 58, but during the last three decades of his life, he wrote and researched about quarantine, making many enemies in the medical profession and among officials spruiking quarantine.

Maclean entered in the service of the East India Company in 1788. He learned about the nature of disease spread from his work in India and Turkey. He was impressed by the Turks' long-standing claim, going back a century or more, that the plague was not transmitted from person to person (a claim based on the inefficacy of quarantine).

Maclean's main works on quarantines and quarantine effectiveness are as follows (full citations available in bibliophy):

- 1796 or 1797: *Dissertation on the Source of Epidemic Diseases*. Calcutta. Further edition in 1800.
- 1817-18: *Results of an Investigation Respecting Epidemic and Pestilential Diseases* (1817: Volume 1- 492 pages, 1818: Volume 2- 524 pages),
- Pamphlet of 1817 (38 pages): *Suggestions for the prevention and mitigation of epidemic and pestilential diseases, comprehending the abolition of quarantines and lazarettos*

- 1818 book (489 pages): *Evils of quarantine laws, and non-existence of pestilential contagion: deduced from the phaenomena of the plague of the Levant, the yellow fever of Spain, and the cholera morbus of Asia*
- 1819-20: *Summary of facts and inferences, respecting the causes, proper and adventitious of plague, and other pestilential diseases; with proofs of the non-existence of contagion in theses maladies*
- c.1821-24: *Obligations of Governments to Abolish the Laws of Quarantine*¹
- 1823 book: *Remarks on the British Quarantine Laws: and the so-called Sanitary Laws of the Continental Nations of Europe, especially those of Spain*
- Maclean's petition to British Parliament (1825)
- 1824: *Observations on quarantine: being the substance of a lecture, delivered at the Liverpool Lyceum, in October, 1824*

Maclean documented that quarantines fail and also identified two main reasons why.

First, even if there were 'contagion' (i.e., person-to-person transmission, as with Spanish flu, for example), quarantine would still fail due to innumerable human factors. The idea that quarantine is *necessarily* porous and hence cannot work in practice 'as advertised' theoretically is a crucial insight based on a detailed understanding of human incentives and imperfect information.

Second, even assuming perfect implementation (an impossibility, as noted in point 1), for quarantine to make any scientific sense, Maclean argued that there must be person-to-person transmission. Quarantine cannot even theoretically stop any disease not transmitted from person to person. Maclean showed that many diseases for which quarantines had been used (e.g., yellow fever and cholera) were not interpersonally transmitted. This fact rendered quarantines for these diseases senseless in both theory and practice, rather than senseless only in practice.

4.2 Maclean's analyses of quarantine

Maclean's many books on quarantines present vast empirical evidence. The following extract from his 1817 pamphlet is an example.

There cannot be a clearer illustration of the inefficiency, as to their object, or of the perniciousness, in other respects, of the measures of precaution usually adopted against the propagation of epidemic diseases, than what happened in the plagues of London in 1605 and 1665; in both which instances, *whilst the houses were kept shut up, the disease continued to spread, and mortality to increase; and when they were allowed to be opened, mortality decreased, and the disease ceased to spread.*

On the former of these occasions, the houses were allowed to be opened in the beginning of September. The deaths, from plague, in the last week of August, amounted to 4218. The next week they were diminished to 3344; the week after to 2250; and the third week to 1612. These are undeniable facts.

In 1665, the circumstances were almost precisely similar: and it was when the houses had been thrown open, and all other measures of precaution abandoned in despair, that the malady suddenly declined and ceased. These facts shall be distinctly proved from historical records.

Thus it appears, that, with the prohibition of intercourse, the disease was aggravated and extended; whilst, with its restoration, it was mitigated and circumscribed. It would be incorrect, and cannot be necessary, to argue, that these circumstances were in the relation of cause and effect. But they clearly shew, *that measures of restriction have not the effect of arresting the progress, or mitigating the severity, of pestilential maladies.*

It is, indeed, evident, from the histories of, the plagues which have infested London since the year 1547, as far as we have authentic records, that *at least three-fourths of the mortality ought to be attributed to*

¹ This is currently best dated c.1821-24 instead of the 1830 listed in the JSTOR record, since Charles Maclean probably died during or just after 1825, the confirmed year of his last known publication. The Wellcome collection also dates his life as lasting until "approximately 1825".

the restrictions by which the inhabitants were confined to their houses, or, at any rate; to the town; since, if they attempted to depart, they were driven back, vi et armis, by the inhabitants of the neighbouring villages and country; to irregularity and deficiency in the supply of-provisions, from the dread of infection; to the want of attendance upon the Sick; and, to the other evils occasioned by the belief in contagion.

Maclean was very much interested in the precise timing of observed changes. Today, we might call this type of analytical method ‘event studies’. Demonstrating this penchant in his 1825 *Obligations of Governments to Abolish the Laws of Quarantine*, he wrote (noting that the term “Sanitary Laws” below refers to quarantine laws):

The injurious operation of the Quarantine Laws was particularly striking in the plague of 1665. There were three remarkable periods of that disease. The first, from November, 1664, to June, 1665; during which time, there being no Quarantine restrictions employed, the malady made but a slow and inconsiderable progress. The second from the beginning of July to the 19th of September, during which period, the Sanitary Laws being enforced with as much vigour as they ever admit of, the disease continued to spread with a rapid, decided, and appalling progress. The weekly mortality increased by thousands: on the 25th of July, for instance, the increase of deaths over those of the preceding week was 1,024; on the 8th of August, 1,030; on the 15th, 1,289; and on the 29th, 1,908. From the commencement of the operation of the Sanitary Laws, in the beginning of July, to their discontinuance about the 19th Of September, the weekly mortality increased from 1,006 to 8,297, making a difference of 7,291....

The third period includes from the 19th of September to the termination of the epidemic. At the former date, when sickness and mortality were at the highest, the shutting up of houses, and other Sanitary regulations, *were abandoned as fruitless, nothing being looked for but universal desolation. From that moment, the mortality diminished with a rapidity* proportioned to that with which it had previously increased during their operation. The weekly decrease, on the 26th of September, was 1,837; on the 17th of October, 1,743; and on the 24th, 1,413. From the discontinuance of the Sanitary regulations, about the 19th of September, to the 14th of November, being eight weeks, the weekly mortality diminished from 8,297 to 905, making a difference of 7,392. Thus, in eleven weeks, during which the Quarantine Laws were enforced, there was an increased weekly mortality of 7,291; and, in eight weeks, during which they were discontinued, a decreased weekly mortality of 7,392. This appears to me to afford a double demonstration of their injurious effects.

Maclean also analysed quarantines implemented in his own time, noting their failures and offering reasons for them. As an example, in 1820, he wrote:

After all that has been stated, it is scarcely necessary to add, *that quarantine is found to be wholly inefficient for its professed object.* In Gibraltar, and other towns of the Peninsula, the plague has appeared of late years, even more frequently than before the establishment of quarantine in these places, and more frequently than in other places where there is no quarantine. It prevailed at Gibraltar four times in the course of ten years, from 1804 to 1814, notwithstanding all the vigilance of the plague police; whilst, in Wallachia, and its capital, Bucharest, through which all travellers from Turkey pass in proceeding to Germany, and other parts of the North and West of Europe, and where there is neither quarantine, nor plague police, it has occurred only once in twenty years. On that occasion it observed the same periods of commencement and cessation with the epidemic, which happened at Malta the same year, although at the latter place there was a remarkably strict plague police. In 1813 when, in consequence of learning that the plague raged at Malta, the greatest possible vigilance was exercised by the plague police at Gibraltar, the disease commenced in that garrison precisely at the same period of its attack, run its usual course, and ceased at the usual time! (Maclean, 1820b).

Maclean wrote about many diseases, including yellow fever, for which, currently, the WHO “recommends vaccination for all international travellers, aged 9 months and older, going to areas determined by the WHO Secretariat as at risk for yellow fever transmission” (World Health Organisation, 2023). In Maclean’s time, William Pym, the head of the British quarantine establishment, insisted that yellow fever was contagious and that quarantine could exterminate yellow fever from the planet.

Maclean mocked him thus:²

Mr. Pym writes a book to prove, as he says, that it [yellow fever] is a highly contagious disease & that the Contagion, upon which it depends, is a native of Bulam, on the coast of Africa; that it is now, as it has been for a long time past, performing a tour of the earth, for the express purpose of propagating its sable race; and, finally, he proposes, by means of quarantine, lazarettos, and medical police, nothing less than its total extermination!

These marvellous institutions he of course thinks, although he has omitted to recommend it in express terms, should be multiplied throughout the universe, wherever this African monster is likely to shew his merciless face (Maclean, 1817b).

History so far has proven Maclean right on yellow fever. In 2010, the US Institute of Medicine released a book entitled *Infectious Disease Movement in a Borderless World: Workshop Summary, Institute of Medicine (US) Forum on Microbial Threats* (IOM 2010) that reported instances of sanitary quarantine for yellow fever, all quickly abandoned because of their impracticality.³

Beyond analyzing the spread of disease, Maclean was oriented toward calculating and comparing a policy's overall costs and benefits. He performed the first analyses of excess deaths in public health that we know of in *Obligations of Governments to Abolish the Laws of Quarantine*. In one such study, he deduced that approximately 76% of plague deaths were caused by (1) 'terror' (for example, starvation caused by the breakdown of supply chains, which itself was caused by fear; or effects of stress and loneliness on susceptibility to infection and death); and (2) the lethal impacts of restrictions that kept people at home (for example, lack of medical care for other illnesses, and lack of exercise). He did not know it, but the primary reason for these lethal impacts was that being locked inside crowded homes increased people's risk of exposure to rats and human ectoparasites.

During the eleven weeks that these restrictions were in operation; there perished of all diseases, 55,446; giving, if we deduct 300 per week as the average of ordinary mortality, 52,146 deaths from plague; of which, without exaggeration, 40,000 may be attributed to the joint influence of the terror inspired by the belief in contagion, and of the operation of the Quarantine Laws (Maclean, 1821-24).

In 1820, Maclean wrote about 'adventitious causes', which today we would call collateral damage.

[T]o the adventitious causes consisting of all the consequences of the belief in contagion, ought to be attributed by far the greatest proportion, perhaps nine-tenths of all the calamities incidental to pestilential diseases, wherever they occur in their higher forms, under the accredited operation of that belief (Maclean, 1820b).

4.2.1 *Quarantine in the case of contagious disease*

Maclean went to great lengths to point out that quarantines failed for practical reasons, such that even if plague and yellow fever had turned out to be contagious, quarantines would still have failed. He wrote:

upon the principles of the advocates for contagion themselves,

1. The laws of quarantine are absurd;
2. That plague police establishments are, in fact, inefficient for their object;
3. That they are injurious to health, navigation, and commerce;

² The book by William Pym to which Maclean refers appears to have been written in 1815. The specifics mentioned in Maclean's 1817 book of what was claimed by Mr Pym are found also in Pym's 1848 book, entitled *Observations upon Bulam, vomito-negro, or yellow fever*, which may be an updated version of his 1815 book, or at least represent a recycling of some of its contents. See <https://archive.org/details/b29337409/page/n17/mode/2up>

³ E.g.: "Inspections and treatments were highly labor-intensive and unlikely to succeed. The maximum charge for noncompliance that could be levied per container was \$1,000, hardly a deterrent when staff from the Division of Quarantine of the CDC could only make cursory inspection of at best 10 percent of all cargoes arriving at a few selected seaports (Figures 3-5A and 3-5B). After several years it was apparent that the effort was merely cosmetic, and the regulations were quietly withdrawn."

4. And a source of great and pernicious expenditure (Maclean, 1817a).

The sub-heading of his 1817 pamphlet expressed this view bluntly: “Absurdity of the Quarantine Laws, even according to the Doctrine of Contagion”.

In his 1824 book *Evils of quarantine laws...*, a bold heading reads: “SANITARY LAWS ARE IN THEMSELVES A POWERFUL CAUSE OF SICKNESS, MISERY, AND MORTALITY”. He notes in that book that “sanitary laws must always suffer violation, because *they are incapable of being duly enforced or observed.*”

In another undated pamphlet, he fervently opined that contagion need not be demonstrated to prove quarantine is bad policy:

Governments are not only warranted, but required to abolish the Laws of Quarantine, upon two grounds, either of which is separately sufficient, and both irresistible. 1. Pestilential contagion being proved to have no existence, laws to prevent its spreading can have no object. 2. In pestilences, whatever be there cause, *the Quarantine Laws are, in point of fact, invariably found to increase sickness and mortality.*

The first of these propositions I have repeatedly demonstrated, by every variety of proof, positive, negative, analogical, circumstantial and *ad absurdum*. But, as the question of the existence of such an agent as pestilential contagion has been mystified with almost unprecedented pertinacity, and as the establishment of the other proposition alone affords more than sufficient ground for requiring the abolition of the Quarantine Laws, to the proof of that I shall here entirely limit myself (Maclean, 1821-24).

Likewise, he wrote in his 1823 book (where “sanitary restrictions” again refers to quarantine):

Had the plague been proved to depend upon contagion, as certainly as the small pox, *it would by no means necessarily follow that sanitary restrictions would be efficient for preventing the introduction or spreading of the malady.*

In his 1817 pamphlet, Maclean acknowledged the high cost of implementing quarantine institutions and recognized that for a high enough benefit, they would still be worth it, presaging the method of cost-benefit analysis employed today to evaluate public policies:

Were the expense indeed twenty times as great, there is no doubt that if these establishments could be shewn to be unequivocally useful, it ought and would be cheerfully borne. But as it has, I think, been proved, that *whether contagion do or do not exist, they are insufficient for their object, and otherwise injurious,* it follows that if the expense were only one twentieth part of the actual amount, it ought to be forthwith discontinued.

In an 1820 book, he wrote: “even if contagion were admitted to exist in the Plague of Levant, quarantine could have no object in England” (Maclean, 1820a).

In sum, Maclean explicitly kept separate two core issues: (a) the unavoidable failure of quarantine, and (b) the lack of contagion of certain diseases for which quarantine had been employed, such as the plague, yellow fever, or cholera. He keenly observed the practical human reasons for the unavoidable failure of quarantine, which do not depend upon the presence or absence of contagion in the focal disease.

4.2.2 *The alternative: Sanitation*

Regardless of the source of his ideas, it is clear that Maclean was persuaded about the value of cleanliness in hindering disease by 1797, when he wrote (Maclean, 1800):

Pestilential diseases are neither so frequent nor so fatal in modern, as they were in ancient times. Cities are now more commodiously built; the mode of living is improved; and every circumstance that can contribute to the preservation of health better understood. Is it not from these changes, in the state of society, that London, Paris, Madrid, Lisbon, and Marseilles, are now much less subject to epidemic diseases than formerly? And in the progress of improvement, may not these diseases entirely disappear? The inhabitants of Grand Cairo, according to Mr. Savary, are heaped together by the thousands. Two hundred citizen there occupy less space than thirty at Paris. Thirty citizens of Paris occupy less space than ten citizens of London. Twenty citizens of Grand Cairo, therefore, occupy less space than one citizen of London. The manner in which the citizens of Grand Cairo are

thus crowded together, would alone seem sufficient, in a stagnant state of the atmosphere, to produce pestilential diseases of the highest degree.

The large commercial cities, which have been most frequently ravaged by the plague, are, for the convenience of sea ports, built low and unhealthy situations. Their streets have generally been irregular, crowded, and dirty. In these cities, therefore, pestilential diseases always commence.

Further, anticipating the effect of quarantine on so-called “essential workers” and marginalized populations (e.g., those facing poor housing, homelessness, multigenerational homes, and the like):

Let a person, in the height of a pestilential disease, be removed from the atmosphere which occasioned it, into one more pure, he will communicate the infection to no one. “It has been remarked,” says Dr. Rush, speaking of the yellow fever of Philadelphia “that this fever did not spread in the country, when carried there by persons who were infected, and afterwards died with it.” In another place he observes, “during four times that it occurred in Charleston, in no one instance, according to Dr. Lining, was it propagated in any other part of the state.” Convincing proofs these, that the disease did not depend upon contagion, but upon the state of the atmosphere at Philadelphia, in the one case, and at Charleston, in the other.

In 1817, anticipating the effect of quarantine on general health (e.g., via changes in physical exercise and diet, and mental health effects on immune responses), he wrote:

The plagues which prevailed in London, every year, from 1593 to 1611, and from 1636 to 1649, I suspect were generated in that city. The diminution of plagues in Europe, more especially in London, appears to have been produced by the great change in the diet, and the manners, of the people; also by the more commodious and airy forms of the houses of the poor, among whom the plague always makes its first appearance (Maclean, 1817b).

Maclean clearly preferred the theory of atmospheric causes of disease to the theory of contagion. He thought that disease-causing ‘marsh miasma’ was localized and particularly evident in low-lying areas (“Maclean identified marshes and damp, low-lying areas as sources of dangerous effluvia, which could corrupt the air” (Brown, 2008)). Yet his ‘miasma’ theory could not explain the plague’s seemingly random spread across wide distances. We now know that it is primarily the migration of rats that introduces the plague in this pattern.

While one way to improve the cleanliness of one’s living environment would be to implement sanitary measures in the modern sense, another way would be to move from the pestilence-stricken area to another, cleaner location. This option, used extensively by the wealthy in the past, was obviously impractical for the general community so that only a few could enjoy what we would now call ‘focussed protection’, as noted by Maclean:

The real causes of epidemic diseases being properly understood, and the public being at liberty, in times of pestilence, to consult their own safety in their own way, there can be no doubt that those who now shut themselves up would remove into another atmosphere; and that such part of a community as cannot go to the expense of a removal, and upon whom pestilences most heavily fall, would be removed by their governments or municipalities (Maclean, 1820b).

4.2.3 *The role of Maclean’s contemporaries in developing the idea of sanitation*

Maclean’s ideas about the value of clean living environments (especially air) and ‘manners’ clearly precede those of sanitary reformer Southwood Smith. Many others, both before and contemporary to him, came to similar conclusions. As Edward Glaeser notes in his 2011 book *Triumph of the City*:

In the United States, city governments, driven ... by intuition ... had begun the Herculean job of providing clean water at the start of the nineteenth century. Somehow they grasped that foul water played a role in disease outbreaks, and for years they fought for cleaner water. After yellow fever struck America’s cities in 1793 and 1798, Philadelphia and New York both decided to provide their citizens with water uncontaminated by nearby cesspools. Philadelphia, guided by the English architect and engineer Benjamin Latrobe, went the public route. Expenses for both construction and operation were far higher than Latrobe’s original estimate, but eventually the city had a well-functioning public system that drew from the upper reaches of the Schuylkill River (Glasser, 2011).

Others experimented with these theories independently of Maclean and found they seemed to work. For example, John Armstrong reported in a lecture about “A friend of mine, who practised long in Demarara”:

On one occasion typhus attacked a great number of the soldiers in the barracks; and walking one day round with an officer he observed that the pales were blackened at a particular spot, and as the wind blew from that quarter towards the barracks, it struck them, that the cause of the fever emanated from that spot. It was examined, and it was found to be an old drain, which had been filled up with vegetable matter then in a state of putrefaction. It was cleared out, and typhus disappeared from the barracks. My friend met with other examples of the same kind equally remarkable (Armstrong, 1825).

These ideas, due to Maclean, Southwood Smith, and others of similar mind, combined to drive the growth of the sanitary reform movement of the early 19th century, leading to public health as we know it. The essential message of Maclean and associated thinkers was: *stop quarantine, start clean living*.

4.2.4 *The productivity of anti-quarantine theories*

We now examine the path from the academic work of Maclean and other thinkers into practical policy, traced by the two leading sanitarian thinkers and policy implementers who adopted his thoughts: Dr. Southwood Smith and Edwin Chadwick, the latter a lawyer by trade who leaned upon others for his medical knowledge.

Dr Southwood Smith (1788-1861) earned a medical degree in 1816 and moved to London in 1820, where he entered a circle of reformers that included Jeremy Bentham and the two Mill philosophers (James and John Stuart) (Poynter, 1962). Southwood Smith recommended cleanliness and saw the two remedies of quarantine and sanitation as mutually exclusive. Nearly always, he demanded sanitation substitute for quarantine.

The principal ground on which objection is made to the continuance of quarantine is that the fundamental principle on which it is based is fallacious, and that the only means of preventing the origin and spread of epidemic disease is the adoption of sanitary measures. *Substitution of sanitary measures for quarantine restrictions would render the importation of any disease from one country into another in the highest degree improbable* (Baker, 1866).

At some point in this period, Southwood Smith became aware of Charles Maclean's work. It is unclear whether the two met (Maclean had returned to London in 1818), but judging from his anonymous article in the *Westminster Review* of 1825, Smith was impressed by Maclean.

From that point onwards, as the medical leader of the modern public health movement, Smith "drew heavily upon Maclean's work" (Brown, 2008). Smith's granddaughter's biography is particularly illuminating (Lewes, 1898). She describes the high regard in which Smith held both Maclean's abilities and his moral character:

Dr Maclean is spoken of as "one of those extraordinary men who is capable of concentrating all the faculties of his mind, and of devoting the best years of his life, to the accomplishment of one great and benevolent object." We are told how, "in order to demonstrate what epidemic diseases really are, and what they are not, and to put an end to errors which have so long and so universally prevailed on this subject, errors which he believes to be the source of incalculable misery and of certain death to millions of the human race, Dr Maclean, with an energy scarcely to be paralleled, has devoted thirty years—a large portion of the active life of man. In this cause he has repeatedly risked that life, and for its sake he has encountered all sorts of suspicion and abuse."

The author of another paper notes that "[r]eading Southwood Smith's articles alongside Maclean's writings, it is clear that most of his arguments and many of his examples are identical" and "Southwood Smith's text is so similar to Maclean's that it appears, at first sight, to be little more than plagiarism" (Brown, 2008).

With firmly established links between philosophy, science, and feasible practical measures, Southwood Smith and young Edwin Chadwick led the modern public health movement. Both were prolific writers, but Chadwick, being a lawyer, was later more influential in achieving policy reforms. These two men are the most famous of what are known as the Sanitarians, with many others later joining them.

4.2.5 *Major methodological advances by Charles Maclean and the Sanitarians*

The discipline of modern public health has largely forgotten the tremendous methodological advances that the Sanitarians produced.

Cost-benefit analysis

Charles Maclean’s methods were far ahead of his time. Possibly because Bentham influenced him,⁴ Maclean conducted perhaps the first cost-benefit analysis (CBA) of any public policy in history: in this case, of quarantine. He started moving in this direction in a pamphlet published in 1817 and followed up with detailed calculations in 1824. In 1817, he wrote of the costs of quarantine:

The destruction of lives, alone, depending upon the pernicious measures founded upon them, I roundly estimate at nearly a million of persons annually, throughout the world, since the period at which they began to operate, in 1547; not to speak of constitutions ruined, and the miseries of poverty and want inflicted upon many millions more.

In his 1824 book, he created a table listing the estimated costs of quarantine, which we reproduce below.

	Rs. Vn.
Ordinary expenses attending the administration of sanitary laws throughout Spain	50,000,000
Extraordinary expenses incurred by individuals in removing themselves and families during the existence of an epidemic, <i>communibus annis</i>	250,000,000
Loss on the trade and commerce of the empested cities, and all other parts of the Peninsula, or places connected with them in foreign nations during the existence of epidemics, on an average of years.	300,000,000
Expenses occasioned to navigation by the detention of ships, wages of crews, damage of cargoes, tear and wear of hulls and rigging, and other incidental expenses, in performing quarantine, on an average of years, throughout Spain	150,000,000
Expenses of troops for the service of the Cordons, of maintaining, transporting, and lodging the poor, and other incidental expenses, not included in the preceding items	100,000,000
	Rs. Vn. 850,000,000

This estimate of quarantine costs is incomplete in the context of modern methods of assessing costs, but 200 years ago, it was a good start. In addition to costs whose native units are in currency, like those above, Maclean recognised many indirect harms caused by quarantines, such as the alarm (“terror”) they caused in society; direct detriments to health (i.e., making the healthy sick); the desertion of friends, relations, and attendants; the creation of scarcity and inflation; the destruction of lives; the detriment to commerce and other normal relations between nations; and the loss of individual freedom.

⁴ Maclean is said to have been a “Benthamite” in the late 1810s and early 1820s (see Chapter 4, “A therapeutic revolution,” in Harrison (2010)). It is a question for further investigation whether Maclean had come across the work of Bentham, who was globally famous in his time.

As illustrated in previously excerpted quotations, Maclean was not dogmatic. He wrote that an even greater expense for quarantines would be justified in the hypothetical and counterfactual situation that they actually worked. It was his cost-benefit approach that led him to oppose them.

There was a later attempt to conduct a CBA for quarantine in the 19th century, as reported by Robert Andrew Lewis in his 1952 book *Edwin Chadwick and the Public Health Movement 1832-1854*. In a letter to Parliamentarian Thomas Thornely on 17 July 1854, Edwin Chadwick provided the results of a further CBA of quarantines (in which he ignored harm to the economy and society). R.A. Lewis reports:

The Board would be entitled to public support, he suggested to the Wolverhampton member, T. Thornely, if it had done nothing more than produce the reports which demonstrated to the medical authorities of the Continent the futility of quarantine with its obstructions to commerce which cost England alone upwards of two millions a year.

The CBA approach was subsequently applied to assess the policy of sanitary reforms. In an undated book that compiled his life's writings, Southwood Smith illustrates the fantastic gains from sanitation: "the mortality among the inhabitants of these dwellings is less than that of London generally, and far less than that of some of the filthy and neglected localities in London, the Potteries of Kensington for example; while the mortality among children under ten years of age, on an average of three years, is one-half less than that of the nation generally" (Barker, 1866).

In the USA, in his 1850 *Report of a General Plan for the Promotion of General and Public Health*, for which he was appointed Commissioner by the Massachusetts legislature, Lemuel Shattuck promoted sanitary reforms and provided a CBA of sanitation based on the UK experience, arguing that \$1 invested would yield \$1000.

This would be a wise expenditure of money. According to the estimate above presented, the State suffers, from its imperfect sanitary condition, an unnecessary annual loss of more than 7 ½ millions of dollars! and this arises, partly at least, from the non-adoption of a measure which will cost but about \$3,000. If saved, it would add that amount to the wealth of the State, besides the indefinite amount of increased happiness which would accompany it. Should any one consider this an extravagant estimate, let him reduce it to 3 millions, more than one half, and then the relation of expenditures to the savings, or to the income, will be as *one dollar to one thousand dollars!* And even if nine tenths of this latter sum be deducted, it will be like paying out *one* dollar, and receiving back again *ten*, as the return profit! What more wise expenditure of money can be desired?

It might be noted here that Lemuel Shattuck's report highly praised Chadwick's 1849 *Report on Quarantine* which called for the review of quarantine with a view to abolishing it: "The extremely valuable Report of the General Board of Health of England on Quarantine, published last year, is particularly commended" (*ibid.*).

Edwin Chadwick had used a cost-benefit framework (without calling it so) on innumerable occasions to justify sanitary reforms. For instance, in his 1887 Presidential address at the Association of Public Sanitary Inspectors, he outlined how sanitary reforms comfortably pay off their costs:

In all such instances the reduction of the death-rates is accompanied by a greater or less extension of what I call the "life rates," or the extended duration of life. Thus, in Leek, where the death-rate has been reduced by 9 in a thousand, the mean age of death has been extended from 24 to 33 years. Dr. Ogle, in his report from the Registrar-General's Office, shows that the mean annual mortality of England and Wales in the five years 1881-5 was 193 per thousand population, or 2.1 per thousand lower than the rate in the ten years 1871-80. This implies a saving of 281,000 lives in the five years, or an annual saving of 56,200 lives. Now, on Dr. Farr's estimate of the value of human life, these 56,200 lives, valued at £159 per head, give a money saving of £8,935,800, in round numbers nine million pounds sterling, or half a million more than a year's expenditure of the poor rates of the United Kingdom. ... It will be for each individual to estimate what the money value of five years' life is worth to him, in addition to the saving of rates, and the saving of the burden of insurance charges. The factors for effecting this work would be, a constant supply of pure water carried into every house or into every flat of the house; constant removal of all fouled water by the water closet and by the kitchen sinks through self-cleansing house drains; and the immediate removal of all dead matter from the house to the land outside the town by self-cleansing sewers. The cost of these factors (where the works were properly carried out) some years ago averaged threepence-half penny per house per week, or on the average of a population of five to each house of one halfpenny per week per head of the population.

The cost of labour has been increased since that time, but the prices of the chief material, the earthenware pipes, have been reduced by one half, so that the total cost of the works is now about the same. From works properly executed there would be no such deadly smells as have pervaded the Houses of Parliament, or as now pervade the public offices, nor any such smells as now pervade the streets, and are the subject of complaint along the whole sixteen miles of trunk-sewer of stagnant sewage. At the same time the estimated cost of the sickness, the loss of work, and the excessive deaths which the reduction of the death-rate in the metropolis by five in a thousand would remove—would not be less, on Dr. Farris estimate, than three millions and a-half per annum on the four millions one hundred and forty thousand of population of the inner ring of the metropolis (Chadwick, 1887).

This information could be formalized into a modern CBA, with the relevant concepts all there, e.g., estimation of direct and indirect costs and benefits, and the use of the statistical value of life.

4.3 The Sanitarians demand the abolition of quarantine

Charles Maclean, Southwood Smith, and Edwin Chadwick demanded the abolition of quarantine whenever they could. This demand resonated for the entire 19th century among a wide range of scientists.

As noted earlier, the Benthamite Sanitarians' reform advocacy led to the passage of the *Public Health Act* in 1848 in England, which established a General Board of Health. Southwood Smith and Edwin Chadwick (along with a few others) then published a *Report on Quarantine* as part of the First General Board in 1849. This report provided extensive details of the failure of plague, yellow fever, and cholera quarantines. It discussed the “signal failure of quarantine as a means of prevention, with reference at least to the most prevalent epidemics, in all the nations of Europe in which it has been tried in modern times”. It stated that “it must be futile to array such a machinery as that of quarantine, that is to say, a vessel placed at the entrance of one or two seaport towns, a line of soldiers guarding a few miles of the frontier of a particular country against morbid agents”. Further, “experience has fully shown the utter inefficiency of quarantine”.

R.A. Lewis noted in his 1952 book that: “The Board ... proposed the dissolution of the existing quarantine establishments, and their replacement by sanitary regulations” (Lewis, 1952).

An 1866 book, *The Common Nature of Epidemics: Also Remarks on Contagion and Quarantine* (Baker, 1866), compiles lectures and writings of Southwood Smith before his death in 1861. In these materials, Smith explains that “facts and observations place beyond all reasonable doubt the utter inutility of this system [quarantine]” and that “Substitution of sanitary measures for quarantine restrictions would render the importation of any disease from one country into another in the highest degree improbable.”

Southwood Smith also considered that “diseases such as smallpox and measles were contagious, in that they depend upon a particular animal poison, and . . . are propagated by the communication of that poison from person to person” (Brown, 2008). This underscores that the Sanitarian movement was not “anti-contagionist”. Since they were not anti-contagionists, they did not oppose, and in fact supported, the isolation of those who might be sick from a contagious disease. For instance, Chadwick wrote that “where such diseases continue to occur their spread is best prevented by the separation of the unaffected from the affected, by home treatment if possible; if not, by providing small temporary accommodation; in either case obviating the necessity of removing the sick to a distance, and the danger of aggregating epidemic cases in large hospitals—a proceeding liable to augment the death-rates during epidemics” (Richardson, 1887).

Edwin Chadwick fought against quarantine all his life. Even towards the end of his life, in 1883, he wrote about the widespread scientific, evidence-based consensus in the medical profession that “quarantines ... were of as little avail as they would be against the east wind”. Worse, they cause great harm: “cordons sanitaires, internal as well as external, ... aggravate instead of mitigating the evils to the population” (Chadwick, 1883).

4.4 The success of the Sanitarians in the 19th century

On 16 August 1804, US President Thomas Jefferson forwarded a letter from Dr Benjamin Rush to John Page to investigate the utility of yellow fever quarantine. Page was a friend and college classmate of Thomas Jefferson, and in 1804 the Governor of Virginia. The letter read:

DEAR SIR,

—I inclose for your perusal a letter from Dr. Rush, asking the favor of you to return it. On the question whether the yellow fever is infectious, or endemic, the medical faculty is divided into parties, and it certainly is not the office of the public functionaries to denounce either party as the Doctr. proposes. Yet, so far as they are called on to act, they must form for themselves an opinion to act on. In the early history of the disease, I did suppose it to be infectious. Not reading any of the party papers on either side, I continued in this supposition until the fever at Alexandria brought facts under my own eye, as it were, proving it could not be communicated but in a local atmosphere, pretty exactly circumscribed. With the composition of this atmosphere we are unacquainted. We know only that it is generated near the water side, in close built cities, under warm climates. According to the rules of philosophizing when one sufficient cause for an effect is known, it is not within the economy of nature to employ two. If local atmosphere suffices to produce the fever, miasmata from a human subject are not necessary and probably do not enter into the cause. Still it is not within my province to decide the question; but as it may be within yours to require the performance of quarantine or not, I execute a private duty in submitting Doctr. Rush's letter to your consideration. But on this subject "nil mihi rescribas, et tamen ipsi veni." Accept for yourself & Mrs. Page affectionate & respectful salutations.

Perhaps not sufficiently persuaded that Page had progressed the matter satisfactorily, the President's fifth annual message of 3 December 1805 to the Senate and House of Representatives called for a review of the effectiveness of quarantines: "The burthen of quarantines is at home as well as abroad. The efficacy merits examination" (Jefferson, 1805). Perhaps to avoid controversy, he wanted a focus on the commercial impacts of quarantine: "Although the health laws of the States should be found to need no present revisal by Congress, yet commerce claims that their attention be ever awake to them".

In 1831, a book was published with the following sub-title: *Ample evidence that this disease, under whatever name known, cannot be transmitted from the persons of those labouring under it to other individuals, by contact—through the medium of inanimate substances—or through the medium of the atmosphere; and that all restrictions, by cordons and quarantine regulations, are, as far as regards this disease, not merely useless, but highly injurious to the community* (Gillkrest & Fergusson, 1831). Although not stated clearly, its authors are purportedly James Gillkrest and William Fergusson. The book contains a letter from William Fergusson, Inspector-General of Hospitals of Scotland, on the "futility of quarantine restrictions", noting:

1. "In my last letter, I treated of the practicability of guarding our country against the now European and Continental disease, malignant Cholera Morbus, by quarantine"
2. "the utter nullity of quarantine guards against atmospherical pestilence"

In 1839, Arthur Todd Holroyd wrote:

If I can shew you, which I hope to be able to do in these pages, that *quarantine is useless and inefficient*, and that if the present laws may not be entirely repealed, at least they require and will admit of great modification without endangering the public safety; if I can demonstrate that the plague has passed the most careful barriers, and spread under the most rigid precautions; and lastly, if I can prove that *these regulations press unequally upon persons in the same quarantine*, I feel that I shall then have a claim to draw your attention towards endeavouring to make some alteration in the present system, more especially as these laws affect all who proceed from India to England by the way of the Red Sea, Egypt, and Malta (Holroyd, 1839).

He argued that quarantine was "unphilosophical in theory, or pernicious in practice [and full] of contradiction, absurdities, and inconsistencies kept up from ignorance or interested motives" (as cited in Peckham, 2015).

In his 1847 book, *The Cholera not to be Arrested by Quarantine*, Dr Gavin Milroy showed how cholera quarantine had always and comprehensively failed:

when we call to mind the indisputable fact that, *upon no one solitary occasion, have quarantine and other preventive measures of a like nature, however stringently and perseveringly employed, ever yet succeeded in keeping out the disease from any country* (Milroy, 1847).

In her 1863 "Notes on Hospitals", Florence Nightingale mocked quarantine rules: "according to quarantine laws, a live goose may be safely introduced from a plague country; but if it happens to be eaten on the voyage, its feathers cannot be admitted without danger to the entire community. There is no end to the absurdities connected with this doctrine" (cited in Byrne, 2008).

Max von Pettenkofer controlled the Cholera Commission for the German Empire in the 1860s and 1870s. Source analysis published by Harvard Library analysts reveals that “Quarantines were ... too blunt and all-encompassing to fit well into Pettenkofer’s localist approach. Thus, for the most part, Pettenkofer rejected disinfection and quarantine as being impractical. Instead, he advocated for improving local sanitary conditions as the best way to prevent or stop cholera epidemics” (Harvard Library, n.d).

Pettenkofer straddled the period when some links between water and cholera were in the process of being established, but before the bacterium, *Vibrio cholerae*, was identified as the causative agent.

Pettenkofer ... proceed[ed] to demolish the theory of the spread of cholera by contagion in the narrow sense of the word: “What has all the fumigation and disinfection of clothing and merchandise at the Cholera Quarantine Stations accomplished except to give the clothing a sickly smell and to damage the merchandise? How does it happen that the first cholera cases in an area are so often persons who have had no contact either with the sick or with visitors? Those persons who dedicate their powers with earnest endeavor exclusively to the care of the sick are in no greater danger than those who keep carefully shut up in their own chambers” (Winslow, 1944).

He offered arguments for the futility of quarantine for cholera.

[Pettenkofer] ... published in 1871 a book on the *Mode of Spread of Cholera in India* and accepted the conclusions of James Cunningham (Tenth Annual Report of the Sanitary Commissioner with the Government of India, 1873): “That if human intercourse plays any part in the dissemination of cholera, it must be a very secondary part”; “That the facts of individual outbreaks, and especially the remarkable immunity of attendants, are altogether opposed to the doctrine that the disease is spread by communication with the sick”; “That the cholera in India appears to be due to certain conditions of air and soil, or of both combined”; “That the great danger arises from exposure to these conditions and not from exposures to any emanations from the sick”; “*That even if the contagious character of cholera could be proved beyond all manner of doubt, any general system of quarantine sufficiently strict to be effectual is impracticable and must do much more harm than good*” (*ibid*).

This is the argument that Charles Maclean repeatedly made about the importance of human factors and how they undermine the efficacy of quarantine.

In 1883, the Surgeon-General of India, J.M. Cunningham, presented a paper in which he showed that quarantines have led to the “most disastrous consequences” and warned that unless quarantine is abolished, “there seems to be every reason to fear that these disastrous consequences may increase rather than diminish” (Cunningham, 1883). He was to be proven right with the 2020 covid lockdowns.

In an 1893 lecture in New York, Ernest Hart, editor of the *British Medical Journal*, called quarantine “a disgrace”. Although his precise lecture is not readily traceable, a report on it was published in the *British Medical Journal* in 1893:

The mischiefs on which he chiefly dwelt were the absolute inefficiency of any quarantine, which did not circumscribe the port to be protected as with a Chinese wall, and the corresponding danger which reliance on quarantine necessarily induces of inadequate attention to internal sanitation. *Quarantine be declared to be a disgrace and not a matter of congratulation to any nation*, for it was the measure of its sanitary neglects, and of its cowardice arising out of the consciousness of such defects. Quarantine made cholera contraband, and as such was sure to lead to smuggling of the disease (Hart, 1893).

The sanitary reform movement, though it was initially based on the now-discredited ‘miasma’ theory of disease, is widely credited to have saved billions of people:

The “great sanitary awakening” of the middle nineteenth century was based on the assumption that disease was generated by decomposing filth. Crude as this conception was, it had in it enough truth to work; for dirt, if not the mother, is the nurse of disease. When Chadwick and his followers cleaned up the masses of decomposing matter in which our forefathers lived (and died), the prevalence of typhus and typhoid and cholera was strikingly reduced (Winslow, 1944).

The template laid out by the Sanitarians, with focus on sanitation, was reiterated by Nobel prize winner F.M. Burnet in 1972:

Efficient sewerage and water supply, plus ordinarily decent cleanliness, have thus rid us in temperate climates of typhoid, dysentery, cholera, plague, typhus and malaria (Burnet & White, 1972).

Much later, Donald Henderson showed that quarantine is not appropriate even for smallpox (targeted isolation of the sick, as Henderson advises here and which even Edwin Chadwick recommended, is quite a different thing to isolation of the healthy):

Over the past 40 years, I have been deeply engaged in dealing with the control and eradication of one disease — smallpox. ... Two important caveats were learned very early in the program and generally applied. The first was never to use the police or military to enforce vaccination. ... The second caveat was **never to impose quarantine**, i.e. forcing contacts of patients who were otherwise well to be sequestered in their home or in a building. Isolation of patients was routine and most were kept at home, there being no effective therapy for smallpox. Family members were vaccinated, checked daily for symptoms but were otherwise free to come and go as they wished. When efforts were made to quarantine family members, it usually resulted in some families hiding cases and their contacts in consequence, not being vaccinated (Henderson, 2006).

5. Why quarantines (and lockdowns) fail

5.1 Reasons for quarantine failure according to the Sanitarians (including Maclean)

In this section, we review several key examples and arguments given by Maclean about the failure of quarantines, supplemented by equivalent observations in regard to the covid lockdowns of 2020-2023.

5.1.1 *Problems in data reporting*

One major problematic factor is the inherent susceptibility of a system of outcome measurement to falsification, bribery, and exceptions for the powerful, thus making quarantines leaky. An illustration:

Let us examine the practice. A single accident (the term used to denote death) from the plague, or, the report of an accident occurring in some obscure quarter of the great cities of Smyrna or Constantinople, whilst a ship is loading for, England, is deemed sufficient ground to refuse that ship a clean bill of health. (We have seen that even clean bills of health do not exempt from quarantine). But even this ground, such as it is, can never be a matter of certainty. There are no means of ascertaining the truth of these reports. The Consuls cannot themselves, nor any of those immediately connected with them, if they were so inclined, enter into personal inquiries, as this might subject them to quarantine, or, as is supposed, to danger of infection. These reports they are, therefore, obliged to take upon trust; and as they are often fabricated for purposes of commercial speculation, those who give them credit are very liable to be deceived. Indeed, those to whose department it belongs to grant bills of health, whilst they have reason to believe the reports that are in circulation to be fabricated, consider themselves as having no option, but to act upon them. Hence ships may be despatched without clean bills of health, when there is neither plague, nor any suspicious sickness; whilst those who have fabricated the reports upon which they have been refused, may have been despatching cargoes by circuitous routes, in order to arrive at our markets before our own can have finished their quarantine; and if this mischief can even be in any degree remedied by protecting regulations, it must still be at the price of additional restrictions upon navigation and commerce, and enhancing the value of the commodities of the Levant to the general consumer (Maclean, 1817b).

5.1.2 *Problems in detecting cases*

Similarly, Maclean was aware that the actual agents of disease could not be individually spotted in real time with any certainty. We now know this to be true because viruses and bacteria are microscopic, and there are incredibly many of them (in the order of 10^{13}) in any human body.

Maclean mocked the idea of the quarantine managers having the magical ability to “suspect” disease. In a footnote within Maclean (1817b), he noted:

“Simply suspected,” “grievously suspected,” and “most suspected,” are the terms of comparison, employed ... by the craft and mystery-men of the Lazarettos, in the Levant. *Howard on Lazarettos*, p. 47. This language reminds me of the “suspectees d’être suspectes” of the ferocious periods of the French revolution: and in both cases, the words were probably of equally ominous import, to the unfortunate persons, or cities, whom they designated.

5.1.3 *Problems with the rationality of the rules*

Maclean was also keenly aware of how actual information on infectiousness violated the rationality of particular rules. In Maclean (1820b), he described the contradiction between the 40-day rule and the claim that plague stays in the goods for many decades (p. 188):

And with respect to goods, the inutility of any length of quarantine is still more palpable. Even if it were undoubtedly true that contagion does exist in plague, and that goods, wares, and merchandise, as has been supposed, are capable of retaining, and of communicating the infection, after a period of

seven, fourteen, or twenty-one years, it is a flagrant absurdity to expect that any benefit could be derived from a quarantine of forty days, upon these articles.

With respect, however, to this presumed capability of merchandise to retain and propagate an infection that does not exist (there is no doubt of the capability of many articles to retain and to propagate the contagion of small-pox); the formation of a scale of different degrees of susceptibility has been nothing more than a mere exercise of the imagination. Thus the classification of goods into articles susceptible in the first degree, susceptible in the second degree, and non-susceptible of infection, is not founded upon any intelligible data, but a series of mere gratuitous assumptions.

Maclean was also profoundly aware that there were invariably things one did not know, and that it was hubris to claim one truly knew all the mechanisms of importance and could plan for them. This central contention, also a pillar of economists' analysis of why central planning systems fail, is nicely illustrated in his acknowledgment here of the mysterious variation in disease prevalence:

Epidemic diseases, in all countries, both cultivated and uncultivated, occur in some districts, in some towns of the same district, in some quarters of the same town, in some streets of the same quarter, in some houses of the same street, in some rooms of the same house, and even in some corners of the same room, more frequently than in others (Maclean, 1817b, p. 279).

This evidence implies causes other than person-to-person transmission, and suggested to Maclean the empirical futility of quarantine. Another example cited in Maclean, 1817b (p. 430):

During the plague at Malta, those who shut themselves up in their houses, and preserved a strict quarantine, were in general preserved from the plague; but no such immunity was enjoyed by the inhabitants of Gibraltar. Mr. Keeling, Mr. Lindblad, and Mr. Morison, respectable merchants, residing in Irish town, on the first alarm of fever, placed themselves and families in strict quarantine; yet they were all attacked with the disease. A Mr. Jacks, and his wife, who had retired to a place called Innes's farm, situated more than two thirds of the way up the rock, and at a considerable distance from any other house, some time before the fever made its appearance, and being supplied with every necessary on the first alarm, placed themselves in strict quarantine; yet they were both attacked with the disease, and perished. The fever attacked persons in different parts of the town at the same time, very remotely situated from each other; and those, who shut themselves up, and who may be considered to have placed themselves in quarantine, perfectly insulated, were attacked as readily, as those who mixed indiscriminately with the people.

In a similar vein, he later wrote (Maclean, 1825, p. 370):

very extraordinary differences may arise during epidemics, as to the fate of persons seemingly placed under circumstances nearly similar, precluding the possibility of rationally admitting such an agency as pestilential contagion... the case of the Maltese Hospital or Barrack of the Strada Vesco ... There the soldiers and the other inhabitants, it is true, were in the same building ; but the former were above, and the latter below. ... In the Levant, as elsewhere, persons who sleep on the ground-floor are much more liable to plague and other sicknesses, than those who inhabit the higher stories (Maclean, 1825).

Maclean thus noted how counter-intuitive things often emerge when one looks at actual data. As he remarked in Maclean, 1817b (p. 315):

it was after the shutting up of houses, and all other precautions had been abandoned in despair, and, whilst from thirty to forty thousand persons were still labouring under disease, that its farther propagation ... suddenly declined and ceased.

Lifting the quarantine evidently reduced illness, perhaps in that case because the home was where the rats and human ectoparasites could infect others.

Maclean was aware that people were ill for other reasons than mere exposure to infection. Though he did not know about the immune system, he was keenly aware of the importance of poverty and hunger. There is considerable evidence in Maclean's work of an awareness that famine often preceded plague.

Maclean's empiricism led him to doubt the dominant stories about diseases being infectious in the way claimed by authority. Maclean and the Sanitarians present considerable evidence that quarantine did not prevent the plague, which suggested to them that the plague did not spread from person to person. Conversely, placing people arriving from plague-infected countries into quarantine would be futile, since the plague does not

transmit from person to person. Vast numbers of travellers from “plague infected” countries were quarantined in Britain for over a hundred years, without a single case of plague having transmitted. If the plague did transmit person to person, then at least a few cases would have been detected in quarantine which amounted to the “congregation and confinement of the sick and of those who, though not actually sick, are suspected to have in them the seeds of disease, requiring only a few days or hours for their development”, as noted in the 1949 *Report on Quarantine* by the UK General Board of Health (UK General Board of Health , 1849). One Dr . John Mitchell was asked:

“Do you consider the fact of the plague not having appeared at the quarantine establishments for a hundred years to be any sufficient reason to infer from thence that the plague was not imported?” He replies, “There is the strongest reason to believe, that, if in the course of one hundred years it has not been imported, it is incapable of being imported.”

Detailed analysis of a quarantine facility in Malta was conducted:

The following table, furnished by Captain Bonavia, Superintendent of the Lazzaret at Malta, shows the number of persons annually detained in quarantine at that place during a period of seven years:—

Years	Passengers.	Troops.	Pilgrims.
In 1832	1123	1542	—
1833	946	299	—
1834	1160	933	599
1935	1267	—	362
1836	1813	—	906
1837	2494	—	93
1838 to 12 th Sept	1730	—	—

Captain Bonavia being asked “Of these numbers, have you ever known a case of plague occur when persons have been placed in the Lazzaret, of course excepting those removed from vessels where the plague was raging at the time of their removal?”—he answers— “Never.”

In other words, holding travellers in quarantine merely on suspicion of their potential prior exposure to the plague was an entirely wasteful (and harmful) exercise.

In a September 2020 paper, Jay Bhattacharya and Mikko Packalen explained why quarantine against the plague made things worse: “[the quarantine] indeed, may have intensified the epidemic given the poor sanitary conditions of the lazarettos”. Further, “as with the plague, contact tracing in this context likely had little effect on the spread of cholera”.

5.1.4 *Problems of false claims of success to support a desired narrative and enforce compliance*

We previously saw how Maclean mocked quarantine authorities' tendency to claim success, only to be found later to have failed.

To this day, there is a continuing history of simply claiming baselessly that quarantines work, including for the exact outbreaks on which Maclean based his damning empirical analyses. As noted previously, Maclean saw strong incentives among the quarantine authorities to ignore truth. Moreover, he saw that incentive even within governments he viewed overall as upright and competent, simply as a form of mimicry. With reference to the lavish praise showered by the French government in 1822 on quarantine supporters, he wrote about:

arbitrary Governments, or Governments wishing to be arbitrary, feel a strong interest in upholding this chimerical and senseless doctrine. It is one of those wretched props to which, in an enlightened age, despotism naturally clings, as to a sort of forlorn hope, in order to counteract or to retard the progress of knowledge and of freedom. Nor is it any arguments against this proposition, that sanitary institutions have been introduced into free countries, as Britain, America, and Holland; since free countries, *either in pure imitation, or without a due consideration of the consequences*, have frequently been known to import pernicious commodities from their enslaved neighbours (Maclean, 1825).

It is not hard to find modern examples of claims that run completely against everything that Maclean and the Sanitarian movement unearthed and championed over a century. For instance, Conti writes in the 2008 *International Encyclopedia of Public Health*:

From a historical point of view, quarantine has always been considered an effective public health measure adopted as a tool for managing infectious pathology outbreaks; in the course of time the attempt to control a large number of different transmissible diseases has involved quarantine, as has been previously illustrated for the plague, cholera, and yellow fever. In the twentieth century, other major epidemics have determined large-scale quarantine, namely tuberculosis and influenza (Conti, 2008).

Claims of quarantine effectiveness evidently continue to be made in the modern era, even for the plague, for which the failure of quarantines had been considered clear for well over a century. Importantly, Maclean's evidence on the plague is by no means the only text. In a 1980 paper, Andrew Appleby (apparently without awareness of Maclean's work) provided a good summary of how quarantine entirely failed to stop the plague in Europe:

The major difficulty the quarantine argument faces, however, is with trade within the Mediterranean. To be effective, quarantine had to prevent any infected vessel from docking anywhere in western Europe; any vessel, large or small, coming from the Levant or North Africa, or crossing the Adriatic to Italy from the Balkans, had to be scrutinized before it was permitted to land. *It is difficult to imagine that such close control was possible.* Surely smugglers brought goods into southern Italy, for example, without being observed—and with these smuggled wares came infected fleas or rats. Even where quarantine regulations were in force, the plague continued its intrusions. Many Mediterranean cities enforced plague regulations quite early, but to little effect. Venice, for example, built a lazaretto on an island two miles from the city in 1403. This lazaretto was improved and the city's health authorities were given greater power to enforce their regulations in 1485. A few years later, in 1504, the health officials were given the right to execute those persons who broke the plague ordinances. Finally in 1538 Venice enacted quarantine and health regulations that were to remain in force virtually unchanged until the nineteenth century. All these efforts, however, were to no avail: Venice suffered some 25 outbreaks of plague after building the lazaretto in 1403, ending only with the great epidemic of 1630. Venice was not unique; other Italian, French, and Spanish cities established sanitary cordons, lazaretti, and quarantines, but failed to halt the plague (Appleby, 1980).

In this quotation we see reference to the same human factors Maclean was so aware of, including criminality, the impossibility of having perfect information, the impossibility of perfect monitoring, unintended consequences, and so on. Claims of quarantine effectiveness against the plague are portrayed as uninformed, but supportive of the quarantine business. Maclean made exactly the same observations in his own time and essentially put them down to greed and the desire for power.

A good modern example is the story of the Ebola 'lockdowns' in Africa of 2014. Ebola is particularly suitable for medical isolation. It spreads when individuals are symptomatic and has a high case fatality rate. This meant that "Ebola, with its high case-fatality rate, petered out far sooner than expected; it simply exhausted all susceptible hosts in the feasible transmission area" (Billauer, 2017). In 2014, mass quarantines (lockdowns) were used to try to control Ebola in Africa (McNeil, 2014). These lockdowns created significant logistical and other challenges and impacted human rights. In 2019, Michael Owens explained how the Ebola lockdowns of 2014 failed due to the sorts of human factors that Maclean often emphasised:

[E]fforts to quarantine communities in Liberia were met with fear, violence and panic. Additionally, many individuals living in these communities forced themselves or snuck out of the quarantine zone, making contact tracing and public health monitoring efforts more challenging. ... Once the quarantine efforts were removed, this translated into improved contact tracing efforts, public confidence, public cooperation, and improved health-seeking behaviours (Owens, 2020).

According to Owens, the remedy lay in "implementing isolation [i.e., not mass quarantine] protocols and implementing aggressive contact tracing."

The 2014 Ebola lockdowns were reviewed by Rachel Kaplan Hoffmann and Keith Hoffmann in a paper entitled "Ethical Considerations in the Use of Cordons Sanitaires", in 2015. The Hoffmans evaluated these "cordon

sanitaires” according to the four fundamental medical ethical principles of autonomy, beneficence, non-maleficence, and justice:

[T]hese cordons have had variable effectiveness. Clinically, very small-scale cordons—quarantining individual patients and those with whom EVD [Ebola Virus Disease] patients have come into direct contact—have demonstrated effectiveness, while *medium- and large-scale cordons around neighborhoods, regions, and nations have proven ethically troubling, largely ineffective, and difficult to enforce.*

[P]ublic health officials should focus on the containment of EVD by zeroing in on those already infected and containing its spread through small-scale cordons sanitaires—like those that have been successful in Nigeria and Senegal—conducted in the most ethical manner possible. Fortunately this type of effort has demonstrated effectiveness; in their most recent report, the WHO states that on a national level, Guinea, Liberia, and Sierra Leone have achieved the capacity to isolate and treat all reported EVD cases and to bury all EVD-related deaths safely and with dignity.

Even while strictly enforcing small-scale cordons, public health officials should be vigilant to prevent unnecessarily harsh or capricious cordons as inappropriate quarantines raise ethical issues, may create public health panic, and waste resources.

In sum, Ebola lockdowns were not the success they were claimed to be in 2014, but this fact was only reported years later and is probably still relatively unknown to most medical professionals. Yet we see in the above analysis many of the key arguments of Maclean on why they fail, implying that both the tendency to claim success and the human factors that make them impossible have not changed in 200 years.

For the 2003 SARS epidemic, against which lockdowns have also been claimed to have helped, there is evidence both that disease spread was already on its way out before the lockdowns and that the disease had characteristics that made extinction likely (highly deadliness and low transmissibility). A set of experts reviewing the evidence thus wrote in 2013 that “it disappeared as inexplicably as it had appeared” (Wang & Cramer, 2013).

These modern stories call to mind Maclean’s theme that quarantine authorities often actively falsify or ignore important data that run counter to their commercial or political interests. Maclean pointed out in *Evils of quarantine laws, and non-existence of pestilential contagion* (1825) the strong incentives within governments to not investigate the truth and to take advantage of the ease with which the public can be terrorized.

Their partiality, in point of fact, to the institutions in question, is evinced by the readiness which they have always shown to adopt them, without the previous institution of any very strict inquiry into their fitness for their proposed ends; by the reluctance which they have manifested to examine that fitness when it has been called in question; and by the marked difference of treatment which has been invariably experienced by the medical supporters, and the medical opponents of the abolition of sanitary institutions. [They] have no reluctance to employ, for their particular purposes, engines thus placed by public credulity in their hands.

5.1.5 Problems of ignoring cost-benefit considerations

We have already discussed in Section 4.2.5 that Charles Maclean’s methods were far ahead of his time: he conducted cost-benefit analysis that showed the immense collateral damage (costs) caused by quarantines that outweighed any theoretical benefit.

5.2 Parallels to Maclean’s points during the SARS-CoV-2 pandemic

5.2.1 Problems in data reporting

During the SARS-CoV-2 pandemic, there were severe problems in data reporting through mass media channels. Consider first the particulars of the disease.

Cases and deaths were reported without context, denominators, qualifications, or in some cases, full transparency of what was actually being reported. Putting the risk in context would have shown that COVID-19 accounted for <5% of global deaths, fewer than the fraction of deaths from causes such as tuberculosis, motor vehicle collisions, under-5-year-old pneumonia or diarrhea, and far fewer than the fraction of deaths from causes such as tobacco or dietary risk factors (Joffe, 2021). Reporting the numbers of infections (not just cases or deaths) would

have revealed that the infection fatality rate was far lower than the detected case fatality rate (early in the pandemic, the IFR was robustly estimated, through seroprevalence studies and other sources, to be a median of <0.05% in people aged 70 years and younger) (Ioannidis, 2021).

In fact, the risk of covid was known from very early to be significant only for the elderly with severe comorbidities. Appropriate qualifiers in reporting about covid would therefore have included the caveats that those at risk were the elderly with multiple co-morbidities, in light of the >1000 times difference in infection fatality rate between those over 80 years old and children) (Ioannidis, 2021); that the case fatality rate was expected to be far higher than the infection fatality rate (Murphy, 2023) (the latter of which was estimated robustly by representative sampling of the seroprevalence of specific covid antibodies) (Sood et al., 2020); that the hospitalization numbers highly exaggerated the risk of covid *per se*, because it was unknown whether SARS-CoV-2 was the cause of or incidental to hospitalization (Fillmore et al., 2022; McAlister et al., 2023); and that without reporting the cycle threshold (Ct) values used in the polymerase chain reaction (PCR) tests used to count “cases”, case reports did not necessarily translate to new detected cases, since a positive test might represent a case from weeks earlier, with no active current infection (Tayyar et al., 2023; Hogan et al., 2021). Finally, it was rarely mentioned in reporting that that some data may have been inaccurately reported for financial reasons, as hospitals were paid large bonuses for treating covid patients.

One example of misleading reporting and its consequences is the varying and inaccurate baseline number of intensive care beds reportedly available in Alberta, Canada, which gave the public a misleading impression that surge capacity had been created and was being exceeded when it had not (Joffe & Milburn, 2022).

Then there was misreporting and censorship, yielding specific commercial and political benefits, surrounding vaccines and policy effects:

1. The randomized trials of mRNA vaccines did not examine vaccine efficacy for severe outcomes, hospitalization, or mortality; failed to test the product on all groups for whom it was later claimed to be “safe and effective” (e.g., pregnant women); were too small to identify rare serious adverse effects; and, at least for the Pfizer vaccine, did not even test most symptomatic participants (Doshi, 2020).
2. The observational studies of mRNA vaccines had several flaws that led to exaggeration of vaccine efficacy, including misclassification bias (such as only counting vaccine efficacy from 14 days after the second dose, which can make a placebo vaccine appear highly effective), and healthy vaccinee bias (leading to comparable calculated “vaccine efficacy” for mortality from COVID-19 (reported in the observational study) and for mortality from all other causes (not plausibly due to vaccine, and usually not reported in the observational study) (El Gato Malo, 2022; Fenton & Neil, 2023; Fung et al., 2023; Hama, 2021; Hoeg et al., 2023; Xu et al., 2023, Furst et al., 2024).
3. Significant but unreported rates of the adverse event of myocarditis/pericarditis, especially in young adult males, resulted in more hospitalization than from SARS-CoV-2 itself (Bardosh et al., 2022; Knudsen & Prasad, 2023), with potential for long-term cardiovascular effects (Yu et al., 2023).
4. Rapidly waning vaccine efficacy, as expected for a vaccine for a respiratory virus without a viremic phase necessary to cause severe illness (Menegale et al., 2023; Morens et al., 2023a; Morens et al., 2023b); and lack of vaccine efficacy for infection (as opposed to symptomatic detected infection), which means that vaccines did not prevent transmission of disease (Acharya et al., 2022; Kissler et al., 2021; Shrestha et al., 2023a; Shrestha et al., 2023b).

5.2.2 *Problems in detecting cases*

During the SARS-CoV-2 pandemic, the contact tracing methods used to try to track cases were plagued with problems. Contact tracing followed by quarantine of identified contacts was futile, yet often attempted with much financial and human capital investment (Bhattacharya, 2020). The virus was more widespread than case counts showed, as demonstrated by seroprevalence being far higher than the prevalence of detected cases, such that to make any significant difference to the spread of the virus, the scale of the contact tracing effort would have had to have been extreme. On top of this, the PCR test was neither accurate enough nor timely enough to allow effective contact tracing. For example, the test may give a false negative reading early in infection, while recovered noninfectious patients have nonviable viral fragments that can lead to a sustained false positive reading (assuming one is using the test to measure infectiousness). Contact tracing also created strong incentives for people to mislead

authorities and avoid voluntary testing, not wanting to put friends or co-workers under unwanted investigation or into quarantine.

5.2.3 *Problems with the rationality of rules*

Many rules that emerged during the SARS-CoV-2 pandemic could not be seriously defended as rational. Lockdowns were based on three flawed assumptions: that lockdowns are effective in reducing the spread of the virus; that if effective, the cost-benefit balance would favour lockdowns; and that there was no option other than to lock down (Joffe & Redman, 2021). However, as noted above, previous pandemic plans did not support these assumptions. Data rapidly accumulated that reaffirmed that these assumptions were incorrect, showing the lack of efficacy, the immensely unfavourable cost-benefit balance, and the preferability of more targeted approaches (such as focused protection) where possible (Joffe & Redman, 2021; Herby et al., 2022; Foster & Frijters, 2024; Bhattacharya et al., 2023; Joffe et al., 2024).

In addition, the lack of efficacy of specific components of lockdown-style policies was known before SARS-CoV-2 arrived, and was reconfirmed by data that rapidly accumulated during the pandemic. Examples include the lack of efficacy of community masking (Cowling, 2020a; Jefferson et al., 2020, 2023; Xiao et al., 2020), the lack of efficacy of and immense collateral harms from school closures (Bark et al., 2021; Ertem et al., 2021; Fenton et al., 2021; Fukumoto et al., 2021; Gandini et al., 2021; Goldfarb et al., 2021; Somekh et al., 2021; Walsh et al., 2021; World Health Organisation, 2019), and the lack of evidence base for determining exact social distancing requirements (e.g., 3 feet versus 6 feet) (Jones et al., 2020). Particular rules about behaviour in regions locked down to some degree – such as that when sitting in a restaurant one must mask, but not if standing; or that exactly one hour of exercise outdoors, but no more, was allowed – did not match the realities of viral transmission. These problems were exacerbated by an over-reliance on computer simulations based on inaccurate assumptions that were fed into non-transparent models where errors multiply during iterations, generating massively pessimistic predictions that failed to materialize (Foster & Frijters, 2024; Ioannidis, Cripps, & Tanner, 2022).

The irrational rules of the lockdown authorities were the product of many factors, including cascading expert failure, policy overreaction, cognitive biases, groupthink, and crowd effects (Frijters et al., 2021; Hafsi & Baba, 2023; Joffe, 2021; Joffe & Redman, 2021; Murphy, 2023).

Highly interconnected, certified and siloed medical experts, with their dismissal and discounting of information presented by other experts, led to groupthink and uniform expert advice (Murphy, 2023). Negative emotions and contagion of fear (exacerbated by the media and governments, e.g., “we are at war”) led to overreaction and isomorphic decision-making because reason (attention, memory, logic, learning, considering alternatives) is adversely affected by strong emotions (Hafsi & Baba, 2023). This led to extreme predictions, overconfidence, groupthink, and one-sided “performative scientism”, where experts seek credibility for their narrative by performing excessive deference to what they consider to be science, which prevents critical scrutiny of their evidence or lack thereof (Hafsi & Baba, 2023; Joffe, 2021; Joffe & Redman, 2021).

There arose from this morass an inability to scrutinise evidence critically, consider both harms and benefits, change course, or apologise for failure.

The blindered view of experts during the SARS-CoV-2 era mimicked the hubris of the quarantine-setting “central planners” of prior eras of disease who failed to conceive that perhaps their models were not capturing everything that was relevant (Henderson, 2022). For example, lockdowns were put forward on the optimistic and flawed assumption that if a complete stoppage of social interactions can prevent disease spread, then an incomplete stoppage of social interactions can reduce spread (Allen, 2023). However, lockdowns not only could not stop social interactions, but likely mainly moved them to places where more spread would occur (e.g., within multigenerational homes, and in so-called ‘essential’ businesses, waiting rooms, queues for testing, nursing homes, and so on.). Centralised expert advice failed to recommend adjustments to lockdown mandates that would respond rationally to specific contexts, whereas individuals – when they are permitted to do so – make adjustments endogenously to their behaviour based on their personal risk thresholds and contexts, based on information available to them but not to centralized experts.

Another source of irrational rules in the covid era was the prevalence of irrational beliefs around infectiousness. A significant risk of transmission from asymptomatic infected people, presumably (and sometimes explicitly) the logical basis of contact tracing and quarantine of asymptomatic people, has not been clearly shown in actual data. A recent human challenge study found that “very few emissions occurred before the first reported symptom (7%) and hardly any before the first positive lateral flow antigen test (2%)” (Zhou et al., 2023, p. e579). Thus, “viral emissions mostly occurred after participants developed early symptoms and began to test positive by lateral flow test (Zhou et al., 2023, p. e586).” That study also noted (p. e586) that “no other real-world studies have previously quantified presymptomatic viral emissions.” Another study found that overall, 21/242 (9%) of asymptomatic infected patients had detectable minus strand-specific PCR assay positive tests (indicating viral replication *may* have been occurring, which in turn means transmission *may* have been possible) (Tayyar et al., 2024). Moreover, a publication in November 2020 from China reported that a mass screening program in Wuhan detected 300 asymptomatic cases, with no positive tests amongst their 1174 close contacts (Cao et al., 2020).

Despite the lack of robust evidence for asymptomatic transmission, rules that presumed it was a major risk persisted. Consider for example the cruel visitation restrictions imposed on hospitalised patients, allegedly to prevent the spread of the virus in the hospital (Jones-Bonofiglio et al., 2023; Lee et al., 2023). A reasonable calculation of risk from an asymptomatic hospital visitor can be made as follows:

(Risk of a recent contact outside the hospital that resulted in an infection transmission to that visitor) * (Risk of asymptomatic transmission potential from that new case in the visitor) * (Risk of severe disease in a hospital contact exposed to said transmission) = (a generous 50%) * (a generous 7%) * (a generous 0.22% at age 10-19y and 0.99% at age 39y) = 0.0077% to 0.035% (likelihood of severe illness drawn from Herrera-Esposito & de los Campos, 2022).

If we want to know the risk of mortality to a person in the hospital from an asymptomatic hospital visitor, we exchange the last number in that calculation with the infection fatality risk specific to that person, which for a child will be 0.0003% (yielding a risk from the asymptomatic visitor of 0.0000105%), and for a 49-year-old healthcare worker will be 0.035% (yielding a risk from the asymptomatic visitor of 0.001225%) (likelihood of fatality drawn from Pezzullo et al., 2023).

Surely, such a risk is worth taking, especially given the adverse effects of isolation on the patient and family, no matter how you look at it. Even if one inflated the risk of a severe negative health effect in the event of asymptomatic transmission to the in-hospital contact to 50%, which is far higher than any reasonable number even for elderly or immunocompromised people exposed to covid, the total risk of this actually occurring as a result of contact with the asymptomatic hospital visitor would be less than 2% - arguably lower than the risk of severe negative health effects from the isolation policy itself (e.g., depression, anxiety, and compromised healing).

These are generously high estimates that do not account for many other realities. Transmission between patients and visitors will be even lower to the extent that they are not in direct contact. Infection hospitalisation rates and IFRs were likely more than 25 times overestimated (due to the Omicron variant being less virulent than earlier variants, the underestimation of seroconversion rates, the overestimation of hospitalisation rates (via combining hospitalisation merely with COVID-19 together with hospitalisation from and due to COVID-19), the protective effect of previous infections, and the effect of prior vaccinations) (Skowronski et al., 2023). A UK study using a smartphone app reported that the probability of transmission confirmed by a positive test increased initially linearly with duration of exposure (1.1% per hour); that transmissions typically resulted from exposures lasting one hour to several days (median 6 hours, IQR 1.4-28, 82% last more than 1 hour); and that fleeting contact of mean duration 0.4 hours resulted in transmission risk of 0.4% (Ferretti et al., 2023). Adverse effects of isolation were not considered. These adverse effects include not merely the stress and loneliness discussed above. Hospital isolation is known to be associated with adverse outcomes, including mortality, likely due to reduced mental health and reduced quality of care when requiring isolation precautions for any interaction with the patient (Jimenez-Pericas et al., 2020; Purssel et al., 2020; Tran et al., 2017).

Another example of irrational rules stemming from beliefs untethered to actual data concerns the need for staff to wear N95 masks in hospitals when performing so-called “aerosol-generating procedures”, including endotracheal intubation (inserting the breathing tube for using a ventilator), extubation (removing that tube), bag-mask ventilation (providing support for breathing manually using a mask), and non-invasive ventilation (including giving high-flow nasal oxygen, and using a mask to provide CPAP or BIPAP ventilation). These procedures created much fear among healthcare workers, leading to a belief in the desirability of early intubation in order to avoid the perceived risk for health workers of having to apply intubation at a later stage in a potentially emergency situation, without enough time to put on a N95 mask. Given the high risks to the patient from intubation and ventilation itself, this probably caused higher mortality than would have occurred if intubation timing had been the same as for other critically ill patients (Duggan et al., 2020). However, there was no evidence for the belief that these N95 mask protocols had any benefit. In fact, early on, it was shown that these procedures were not aerosol-generating and hence did not have a higher risk of infectiousness (Brown et al., 2021; Shrimpton et al., 2022; Wilson et al., 2021; Zhang et al., 2023).

5.2.4 *Problems of false claims of success to support a desired narrative and enforce compliance*

At many points during the SARS-CoV-2 pandemic, experts ignored or suppressed crucial evidence, leading to false appearances of policy success. Some examples of this have already been discussed above, including the repeated refusal to acknowledge and consider evidence that showed lockdowns to be ineffective and extremely cost-ineffective, with predictable massive collateral damage. The various omissions surrounding vaccines have also been mentioned already.

An erosion of civility occurred in academic discourse, with censorship of dissenting opinion, labeling of evidence-based views as misinformation, and discrediting of suggested alternative courses of action (e.g., the focused protection recommended in the Great Barrington Declaration, or following the Emergency Management process that is the same for any emergency, avoids groupthink, and demands cost-benefit analyses) (Arora & Bhattacharya, 2023; Joffe et al., 2023; Saltelli et al., 2023; Shir-Raz et al., 2022; Simandan et al., 2023).

By inducing an inflated perceived threat level, conflating compliance with virtue, and portraying non-compliers as a deviant minority (Rayner, 2021; Sidley, 2021), public health authorities caused fear in the public to induce compliance with public health mandates. The miscalibration of risk perception resulted in scapegoating of covid infected patients and unvaccinated individuals by the public (Graso, et al., 2021; 2023; Graso, 2022).

Lockdown proponents vilified Sweden in the early years for not imposing lockdowns, and produced dire predictions for Sweden’s health and economy that have not aged well. Sweden has one of the lowest all-cause age-adjusted excess death rates in the world since the start of the covid era. Also, Swedish students did not experience learning losses because public health authorities prioritized keeping schools open (Bjorkman et al, 2023; Danielsson et al, 2022, Forthun et al., 2024). Sweden’s experience demonstrates that, contrary to many dire warnings of covid-era authorities in the West, an alternative to mass lockdowns was possible. A well-designed emergency management process could have been used, for example, to avoid panic and policy overreaction, enabling policy decision-making with broad multidisciplinary representation and transparency. This process would have prioritised cost-benefit analyses using the best evidence available, with repeated updates as new evidence accumulates, and protected against censorship and groupthink by empowering critics, which may have led to better decisions and better outcomes (Joffe et al., 2023; Joffe et al., 2021; Redman, 2021a; Redman, 2021b).

Once a group has committed themselves and their careers to a narrative, it is nearly impossible for them to admit their own wrongdoing, which explains a preponderance of “expert” groups involved in the SARS-CoV-2 period claiming the success of their mandates. A recent Royal Society of Canada expert physician task force arrived at the following conclusion:

Despite pleas from intensivists and public health experts, some provinces delayed implementation of effective public health measures. This resulted in needless deaths and the eventual requirement to evacuate critically ill patients to ICUs in other provinces. Some provinces prematurely discontinued public health measures and ignored pleas from experts as COVID-19 cases surged. These actions serve as a precautionary tale on how not to manage a pandemic... The government of Canada must be prepared to

enact the necessary emergency powers to protect the citizens of Canada regardless of where they live (Gibney et al., 2022).

A recent multinational Delphi consensus claimed that:

“Relying on individual, voluntary compliance with transmission prevention measures is insufficient”; “Infection rates tend to increase when governments discontinue social measures, including NPIs, regardless of the level of vaccination”; “Wide use of high-filtration and well-fitting facemasks (for example, N95, KF94, KN95, FFP2/3) is important to reduce transmission”; “Most countries have not adequately protected children throughout the pandemic”; and “Governments, industry and NGOs should actively identify and expose individuals and networks that promote false health information about the COVID-19 pandemic” (Lazarus et al., 2022).

The Lancet Commission claimed that “basic tools of pandemic control” include physical distancing, face masks, protocols for safe international travel, scale-up of test-trace-and-isolate regimens, “permission for schools to implement stringent and evidence-supported control strategies early”, and “behavioral and social sciences research to develop and implement more effective interventions and policies to change behavior” (Sachs et al., 2022).

The evidence in this paper runs against this groupthink, and more evidence was discussed by the Norfolk Group (Bhattacharya et al., 2023).

5.2.5 *Problems of ignoring cost-benefit considerations*

Authorities in the covid era broadly failed to consider the immense collateral damage from lockdown. Experts plainly did not consider all the effects of their plans on their populations’ well-being (Foster & Sabhlok, 2022; Frijters et al., 2020; Frijters & Krekel, 2020). Very early during the pandemic, evidence of immense and unequal damage to populations emerged, including increasing poverty, hunger, domestic violence, missed healthcare with poor healthcare access to preventive services and treatment of acute illness, and education losses; adverse effects on other infectious diseases (e.g., tuberculosis, malaria, HIV) and childhood vaccination; and increased diseases of despair (e.g., alcohol and substance use) (Joffe, 2021). These effects were highly unequally distributed, and often not affecting the experts themselves, given their higher socioeconomic and employment positions (Schippers et al., 2022). Lockdowns also caused decreased exercise levels and increased body mass index, particularly in children, which will have lasting effects on noncommunicable disease rates, lifespan, and other future outcomes (Chaffee et al., 2021; Jarnig et al., 2021; Knapp et al., 2022; Neville et al., 2022; Woolford et al., 2021).

The impact of lockdown on mental health, in both children and adults, cannot be overstated. Even before the pandemic, it was known that loneliness and isolation were among the strongest risk factors for population lifespan and early mortality (Snyder-Mackler, 2020; Wang et al., 2023). The mental health effects of stress, depression, anxiety, loneliness, and isolation also affect the immune system, increasing susceptibility to severe respiratory viral infections, stroke, and other adverse outcomes (Jest et al., 2023; Ranger et al., 2023; Reddin et al., 2022). The condition called ‘long COVID’ has been (in most cases) attributed to these pandemic response effects that have caused the predisposing, precipitating, and perpetuating factors for this likely functional somatic symptom disorder (Joffe & Elliott, 2023). Exercise and social connection are often the best ways to improve mental health and somatic symptoms, but were diallowed during lockdown.

Since lockdown had minimal, if any, effect on SARS-CoV-2 transmission, and such markedly high and known, predictable costs, lifting lockdowns remained the rational thing to do throughout the pandemic. Thus, remarkably, covid lockdowns have had effects on population wellbeing similar to the effects Maclean discussed arising from ill-advised quarantine policies in bygone eras.

6. Policy implications for today

The following extract from Maclean (1825) shows his hope for a new era in which quarantines are discarded as a viable method of disease control:¹

The politico-medical avalanches, of pestilential contagion and sanitary laws, which were wont to hang over their devoted heads, being levelled with the ground, empested communities may henceforward look up to heaven, without the constant apprehension of being utterly destroyed. Disincumbered from those mortal enemies of health and life, and almost insurmountable impediments to knowledge, the subject will revert of right to the province of the physician; from which, by an extraordinary effect of superstition, it had been so long disjoined. The statesman, the legislator, the police, and even the municipal officer, will, in propriety, have no more to do with epidemic, than they have heretofore had with sporadic diseases. To the physician alone, untrammelled by Juntas or Boards of Health; unapprehensive for his personal security, and freed from the responsibility imposed by sanitary laws, will devolve the duties of directing, in the ordinary course of his profession, the means of prevention and of cure; —duties, which, under the sway of these laws, he could not have hoped to perform, either with safety or success.

Maclean does not mince words about the political economy reasons for continued quarantines, equating Boards of Health with juntas. His calculations implied that quarantines had caused the deaths of a million people per year, a death toll vastly exceeding combatant deaths in warfare.

In modern political economy, Niskanen (1975) echoes Maclean's argument, as does the Chicago School literature on rent-seeking (e.g., Nientiedt, 2023), the literature on the recent rise of corruption (Murray and Frijters 2022, 2017), and writings in the Austrian school of economics on the expansionary tendencies of bureaucracy at the expense of the public interest (e.g., Bartsch, 2022). The basic political economy argument is that once a bureaucracy derives status and jobs from activities detrimental to the public, it will continue to pursue those activities while falsifying the records and smearing opponents. The deeper economic motif is that health bureaucracies and private companies can make more money with more clients, even if that is by telling healthy people they need cures or are a threat to others when the opposite is true. Indeed, purely economically speaking, health bureaucracies and companies can make the most money by keeping everyone tethered to expensive cures, while neither killing nor truly curing anyone. Fear of death is then the ultimate source of income, milked by bureaucracy and corporations alike, though the perpetuation of this dire situation needs a population kept ignorant and not allowed to make their own health decisions.

Have such perverse incentives been noted by other scholars? Simon Carvalho and Mark Zacher's 2001 paper, "The International Health Regulations in Historical Perspective", gives a flavour of how economic incentives and politics, not health science, drove countries' positions on quarantine policy in the 19th century:

In the first sanitary conference of 1851, "Britain and some continental allies opposed the use of quarantine measures, while the Mediterranean states claimed the right to stop ships and travellers". The second conference in 1859 "and again saw Britain opposing quarantine and Turkey and Greece championing its use". In the fourth conference of 1874, "Upset by restrictions on vessels exporting Russian goods from Black Sea ports, Russia joined several northern European states in once again opposing quarantines, only to be countered by the positions taken by the Mediterranean states". At the 1885 meeting in Rome, "many states (France in particular) grew annoyed with Britain's persistent unwillingness to establish quarantine procedures between the Mediterranean and Red Sea" (Carvalho et al., 2001).

¹ When Maclean referred in this extract to "sanitary laws", he was referring to quarantine and lockdowns.

That quarantine was about optics, economic incentives and/or politics rather than about health is also seen in the statement by John Booker in his 2007 book that a “factor continually to influence their judgement was the realization that European Mediterranean powers would inflict punitive quarantine on British ships if London were judged neglectful in the international line of defence” (Bookser, 2007).

A 1958 book by the WHO, *The First Ten Years of the World Health Organization*, notes that the Sanitary conferences continued to endorse quarantine policy despite attempts to discredit it:

In an attempt to settle the question, a committee consisting of four physicians and three consular officials was appointed. They not only deprecated as futile the incarceration of passengers from infected ships but deplored the practice on the ground that the passengers should be dispersed by all possible means. Quarantine measures for cholera were “impossible and illusory, dangerous even in certain cases, and contrary to the purpose for which they were intended”. However, the convention which finally emerged from the conference provided for quarantine measures for cholera as for the other diseases (World Health Organization, 1958).

Hence there is a history of authors noting the non-health-related incentives that served to maintain quarantine policies over the years.

We must look the central incentive problem squarely in the eyes. This problem is that quarantines and lockdowns are big business. The health bureaucracy and its supporting academic institutions have latched onto this business and are now wedded to the narratives supporting the continuation of this business.

Why did health bureaucracies and governments succumb to the lure of the expansion of their activities to organize new quarantines during the covid era? Many theories supported by suggestive evidence surround us, ranging from deliberate planning by security agencies, to quick opportunism by commercial companies, to stampeding herds finding their abusing shepherds (Frijters et al. 2021). Yet the quarantine business model has been a lucrative one for many centuries, merely subdued for over a century by evidence and well-meaning public institutions. The temptation was always there for business and health bureaucracies to bolster their coffers by means of this ancient racket. One might say it was inevitable that something, whether a huge panic or a huge business plan, would lead large existing bureaucracies back to promoting quarantines. This threat continues to this day, as exemplified by the desire for a new Pandemic Agreement that, according to Bell and coauthors, “aims to consolidate coordination within WHO with greatly increased resource mobilization,” where the “urgent pandemic messaging of WHO, World Bank, and G20” is “inconsistent with their evidence base” - “the stated urgency and burden of infectious disease outbreaks, namely those of pandemic threat, is grossly misrepresented”, and the proposed more centrally managed system with compliance mechanisms “risks a significant opportunity cost through unnecessary diversion of financial and political resources away from global health priorities of higher burden.” (Bell et al., 2024; see also Bhattacharya and Kulldorff, 2023).

If we suppose that major misfires on public health policies – including continued reliance in crises on options like lockdowns that were discredited generations ago – are a somewhat inevitable part of the current dominant way of organising public health as a large, centralised bureaucracy in most countries, what can we do? What institutions are available that might arrest the parasitic expansion of public health into quarantines or other destructive activities?

Maclean did not offer deep answers to this question, apart from attacking the quarantine bureaucracies head on, calling for their abolition, and insisting instead on reason and evidence. He was part of the Enlightenment age that saw the rise of public intellectualism, an almost aristocratic pastime in which public commentary and advice on what authority should do became widespread. That model of ‘external opinion upholding reasonable views’ was arguably still in place in February 2020, with standing anti-lockdown advice from the WHO and anti-lockdown convictions at the top of public health institutions throughout the world. Yet, once it failed, it failed spectacularly. Bureaucracies found a way to brush aside the hold of reasoned intellectualism.

Apart from resurrecting the basic framework of 1848, what other innovations can we recommend? We close this article with our top ideas for reform.

1. To prevent the growth of an insider class of bureaucrats who benefit from expansion, have time-limited leaders appointed by citizen juries to run the specific bureaucracies. This breaks the bond of social resource allocators with outside money and internal political corruption.

2. Separate the determination of overall public health budgets rigorously from actual major spending and oversight decisions. Instead, create several agencies, each with leaders appointed by citizen juries, to be responsible for health-related resource allocation decisions. The top politicians would still set the overall budget, but as in Sweden, decisions on particulars would be made by independent actors whose understood role is to think for themselves, overseeing and being overseen by other auditing agencies.
3. Nurture completely alternative and independent health systems, for example in different geographical areas or informed by separately nurtured new schools of thought. Via systematically fostering diversity in health systems and health thinking, particular countries will have something to turn to when their chosen system spectacularly derails. In principle, this diversity is a public good, and one that can be maintained by deliberate funding of thinkers outside of the present mainstream.
4. Embed the systematic use of cost-benefit analysis to evaluate government policy, particularly using the WELLBY that is capable of counting policy effects in realms beyond merely physical health (as demonstrated in Frijters et al., 2021 and Foster and Sabhlok, 2022).
5. Reform emergency (health) powers such that whoever declares an emergency cannot personally benefit from doing so, and such that there is prompt external accountability of those who opt to trigger emergencies. Those involved in invoking and then using emergency powers during covid were personally shielded from the effects of their actions and failed to apply established protocols, such as the Emergency Management process (sketched in Appendix B), as those protocols were intended.²
6. Totally replace the leadership in charge during the covid era, particularly at the very top, with accountability for the actions they have taken over the past 4 years, acknowledgement of the damage those actions have caused, and apologies for those actions.

² For example, Step 1 of the EM process is to identify the hazard, Step 2 is to select and maintain the aim, and Step 4 is to conduct a risk-hazard assessment – but errors in measurement, data management, and lack of perspective by those in charge led to misidentification and misinterpretation of the hazard and the risks, while motivations other than public health promotion led to the selection of aims like “flattening the curve” rather than minimising the estimated total human losses from whatever policy was selected based on robust scientific analysis of real data. For more evidence of the failure to follow established protocols and scientific approaches to policy development in this era, see Estabrooks et al., 2023; Green, 2023; and Sebatu et al., 2020.

7. Conclusions

From about 500 years ago until the early 19th century, quarantines were the normal way authorities in Europe tried to contain diseases. Charles Maclean and the Sanitary movement following him re-examined the evidence for this method, finding that quarantines usually failed in their stated objectives, had far higher costs than benefits, and were maintained mainly because they were a lucrative business model for those who organised them. The Sanitarians managed to push quarantines out of widespread use in the latter 19th and 20th centuries, starting in Britain with the Public Health Act of 1848 which focused upon sanitation as the primary tool of public health. The standing advice in early 2020 from the World Health Organization reflected these conclusions of the Sanitarians, estimating the costs of lockdowns (the more modern word for quarantines) to be far higher than their gains.

Maclean wrote thousands of pages of analyses on the phenomenon of quarantines, including copious analyses of practices and data. He compiled the first cost-benefit analysis of quarantines, looked at the issue of excess deaths, realised the existence of natural immunity, noted the many human control failures that made quarantine failures inevitable, and assembled evidence that supported an alternative public health policy. His list of reasons for why quarantines fail, as well as how quarantine authorities try to maintain their hold on power via data falsification and simply ignoring unwanted evidence, have exact analogies in the covid quarantines of 2020-2023.

If we accept that Maclean was right and that in 2020-2023 we witnessed a repeat of the failed policies preceding the Sanitarians, then several major policy questions arise. The first is how to push back the current quarantine-oriented bureaucratic machinery, reducing it in size and power, and holding it to account for its deeds. The second is how to prevent it from growing again, an objective we suggest can be aided by greater separations between those deciding on responses to disease and those benefiting from them. The third is how to embed the systematic use of cost-benefit analyses as a precondition for major budgets to be unlocked. A fourth policy question is how to design a reformed mechanism for unlocking emergency powers, for which we suggest a separation between those declaring emergencies and those using the new powers under them. A fifth is how to deliberately nurture competing and diverging schools of thought on issues of health, in support of a return to a culture of debate and reason. A sixth is how to prevent the emergence of a coalition of commercial and entrenched bureaucratic interests that benefit from quarantines and other forms of bureaucratic over-reach, for which we suggest the use of citizen juries to appoint independent leaders of large state bureaucracies. A seventh is how to rediscover the Emergency Management process, with management of an emergency coordinated by an independent EM agency whose core business would include paying attention to the preceding policy points.

In terms of unexplored issues for which it is difficult to see what can be done, we want to mention the importance of panic. Maclean was highly aware of the devastation caused by panic.

The terror inspired during a pestilence, by the view of surrounding calamity, and by the apprehensions, whatever be its presumed cause, of being affected like others, forms an additional, and perhaps the most powerful cause of mortality. But under the belief in contagion the disease is deemed almost inevitable, and terror is still farther increased and when that opinion, sanctioned by medical authority, is accredited by governments and municipal bodies, and officially acted upon by the adoption of conformable measures of police, with a view of prevention, the panic is augmented in a dreadful ratio, the public mind is appalled, and destruction becomes incalculable. Under such circumstances the very rumor of a pestilence in any one quarter of the globe spreads universal alarm, and begets universal precaution in every other; and, in the progress of an epidemic, affecting several countries, the inhabitants of the most remote quarters from the scene of its commencement feel its baneful influence long before its approach (Maclean, 1820b).

In Volume 2 of his 1818 *Results of an investigation respecting epidemic and pestilential diseases: including researches in the Levant concerning the plague*, Maclean wrote:

the belief creates various adventitious causes of mortality and misery, where such calamities prevail, as restraint by quarantine, lazarettos, &c.; terror; a deficient supply of provisions; want of medical and

other attendance; the abandonment of friends and relations; death from absolute starvation; and frequently even the murder of individuals called infected, in order to prevent the imaginary danger of their infecting others (Maclean, 1818).

A common theme across most books and reports on pandemic panics is in particular medical panic, i.e., the fact that doctors typically panic and often flee (as indicated in the statement “want of medical and other attendance”).³

Yet, Maclean’s remedy was not much deeper than saying that authority should stick to the truth and be unperturbed. He had a positive view of the ability of people to remain rational. When calling for the abolition of quarantine, he dealt cursorily with the argument that people might actually want it (Maclean, 1824a):

If it should be alleged, that, in the event of the abolition of all sanitary laws, there would be danger of a popular reaction, I answer, that I do not believe it; and that, when such an evil arises, it will be time enough to apply the remedy. What! *Are laws notoriously bad, notoriously destructive, to be continued, only in order to humour popular caprices, supposing such caprices to exist?*

One is tempted to answer Maclean across the centuries with ‘yes, notoriously destructive policies can and will be done to humour popular caprices’. During the SARS-CoV-2 pandemic this certainly seemed to be true: what the population wanted was what they were told was needed, based upon inaccurate information, fear, and panic. This is a circular argument, basing response not on data and cost-benefit analysis, but upon what the population is told to believe and hence demands (Grasso et al., 2023). Still, as in Maclean’s age, where centuries of quarantine policies came to an end largely because of an outbreak of reason and respect for data over prior conceptions and models of causation, for our time too a return to reason is the first step. A new Enlightenment beckons.

³ This is a separate topic for analysis that is being considered as part of a first-principles review of public health being conducted by one of the authors of this paper. Those interested in the preliminary explorations in this regard may refer to the website: <http://ph.sabhlokcity.com>

Appendix A

Table A1: Key figures and their quotations about quarantines since the Enlightenment (excluding the 1800s)

Commentator	Statement(s)
Pierre Gassendo (1658)	not only that they did not tend to stop the progress of the disease, but that they must have greatly aggravated its severity
John Graunt (1676)	not a remedy to be purchased at vast inconveniences
Local protestors in Königsberg (1708)	it killed more people than the epidemic itself
Richard Mead (1720)	shutting up all members of an infected family in their houses simply increased mortality
Daniel Defoe (1722)	shutting up of houses, supposed to be infected, and other restrictions upon intercourse, were most rigorously enforced
Richard Manningham (1744)	[believed that plague was not caused by contagion, and on this basis, was strongly against quarantines]
John Howard (1789)	such remissness and corruption in the execution of these regulations, as to render quarantine almost useless
Noah Webster (1799)	laws of nature, and are therefore useless; embarrassing commerce, without the shadow of necessity
Benjamin Rush (1805)	have led to the waste of millions of dollars and to the sacrifice of thousands of lives from “that faith in their efficacy, which has led to the neglect of domestic cleanliness”
H.H. Bracken (1908)	Quarantine is an evidence of ignorance
Charles Value Chapin (1910)	is some defect in our procedures, or some other source of infection more important than the recognized cases
Ontario Provincial Board of Health (1919)	that out of 52 health officers of the states and provinces of North America, 9 frankly state, as the result of their experience, that placarding and quarantine are practicable, 10 qualify their approval, and 33 frankly state that these measures are impracticable
Arthur Newsholme (1918)	ask if we are prepared to pay the heavy price in personal restrictions which its prevention—if even then it be possible—will necessarily imply until further means of prevention, so far undiscovered, become available; difficulty, amounting almost to impossibility, of preventing the spread of infection in the domestic circle
Arthur Albert Mouritz (1921)	of the Flu, due to the multiplicity of Contacts, Carriers, and mild undetected cases; both of these restraints of personal liberty and hindrances of commerce must fail, besides being also unpractical and impossible
Walter George Bell (1924)	evil policy; disastrous measure; none in authority ever questioned the necessity of sealing all houses wherein infection lodged
F.M. Burnet (1972)	We have not been able, and perhaps never will be able, to block the spread of those diseases which are transmitted by what is technically called ‘droplet infection’
McGrew encyclopedia of medical history (1985)	the anticontagionists were justified in resisting quarantines as doing more social harm than medical good
D.F. Musto (1986)	sustained, effective quarantine for large numbers of persons has not been successful
Jonathan Morris (1995)	routine failure of quarantine measures to stop the spread of the disease
P. Clarendon Hagggett (2000)	The speed and complexity of modern transport make both geographical space and the traditional ‘drawbridge’ strategy of disease control and quarantine increasingly irrelevant
Joseph Barbera (2003)	When you look carefully at quarantine history, it was always a failure... The objective is to contain disease, not to contain human beings.
Donald Henderson (2006)	The negative consequences of large-scale quarantine are so extreme...that this mitigation measure should be eliminated from serious consideration
Tyler Cohen (2007)	Quarantines work for small islands, but they would probably fail for a highly mobile nation of 300 million people; perhaps we cannot control the virus; How many politicians like to say: “Yes, thousands or millions will die but we can save at least some of them.” Even if true, that doesn’t sound nearly as good as, “We will protect every American.”
Sana Loue (2007)	inability of even rigid quarantine measures to provide security against disease
Brian D. Gushulak and Douglas W. MacPherson (2007)	enduring public health interventions: quarantine; economic and social consequences of this rather blunt response
George Annas (2007)	likely to do more harm than good
Encyclopedia of Pestilence, Pandemics, and Plagues (2008)	previous efforts to control epidemics such as leprosy, cholera, tuberculosis, and drug addiction through quarantine of large numbers of people were never successful
Margaret Kosek and Robert E. Black (2008)	should be strongly discouraged because they are ineffective and will predictably inhibit case reporting
Hudson Birden (2009)	quarantine efforts have shown very little value in stopping an epidemic
World Health Organization (2019)	Not recommended in any circumstances
Howard Markel (2020)	More often than not, health officials are several steps behind a spreading epidemic. And when they aren’t, the history books show, they tend to act too fast (costing a fortune) or unfairly (discriminating against some populations)...people who were segregated were rarely cared for, and many died. In numerous instances, too, quarantines were used to separate people considered to be dirty or undesirable
Polly Price (2022)	even the strictest maritime quarantine could not prevent epidemics of smallpox, cholera, yellow fever, and other dread diseases
Wendy Parmet (2020)	It’s very hard to make a quarantine that isn’t leaky
Anders Tegnell (2020)	Closedown, lockdown, closing borders—nothing has a historical scientific basis, in my view
Stefan Baral (2020)	At best, they drive inequities across socioeconomic lines. At worst, the same but no PH [public health] impact
Martin Kulldorff (2020)	Lockdown is a new invention of 2020

Appendix B

A brief sketch of the Emergency Management process

The public health experts and medical advisory groups put in charge of managing the pandemic did not know of, or, if they did know, did not follow the established Emergency Management (EM) process for handling any widespread public emergency. To demonstrate this, we here sketch that process, and comment on the failures that occurred at each step.

A designated EM agency coordinates the four simultaneous EM critical functions of preparation, mitigation, response, and recovery (Redman 2021a). Mistakes were made at every step intended to achieve each of these critical functions.

Step 1: *Identify the hazard.* The hazard was SARS-CoV-2. By mistakenly identifying the hazard as COVID-19, leaders focused on case fatality rate (instead of infection fatality rate), and presented raw numbers without giving rates or stratifying by age, escalating public fear. Data were not fit for purpose and not transparently collected and used in decision making (Bubela et al., 2023).

Step 2: *Selection and maintenance of the aim.* The aim was to minimize the effect of the hazard and the response on the population. By serially mis-identifying the aim as to “flatten the curve” or “protect the healthcare system”, leaders focused only on COVID-19 while ignoring all other impacts on society.

Step 3: *Establish a governance task force.* This step requires the involvement of many diverse stakeholders. By mistakenly giving undue influence to public health and medical experts, leaders fell prey to groupthink.

Step 4: *Risk-hazard assessment.* Such an assessment would have identified the extreme age-dependent risk of severe disease and the degree of susceptibility of critical infrastructure (including healthcare). By mistakenly focusing on misleading slogans such as “we’re all in this together”, leaders neglected focused protection and maintenance of healthcare for conditions other than COVID-19 (Mishra et al., 2023).

Step 5: *Mission analysis.* The objectives of the response mission included maintaining confidence in government by reducing fear; focused protection of seniors in long-term care homes and in the community with multiple comorbidities (Estabrooks et al., 2023), and protecting critical infrastructure and essential services by ensuring continuity of healthcare, education, businesses, and the economy. By mistakenly defining the mission’s objectives to include the induction of fear (purportedly to ensure compliance with mandates) and to prevent COVID-19 cases to the exclusion of all else (by ending social interactions), leaders neglected the needs of the greater society and caused immense collateral damage.

Step 6: *Defining courses open.* For each grouping of tasks, this step identifies the available options (“courses open”) to achieve the mission objectives, including cost-benefit analysis of each course open, and planning for and preventing predictable collateral damage. Following this step would have included creating plans for focused protection, creating new healthcare surge capacity, public communication to reduce fear, and maintaining social functioning as much as possible. By mistakenly considering only those options instituted by neighboring countries (e.g., lockdowns, mask mandates, and school closures (Sebhatu et al., 2020)), and de-emphasizing expected severe collateral damage (e.g., silencing opposition, misleading slogans (e.g., “lives vs the economy”), and conveying consensus and certainty (Green, 2023)), leaders did not follow any of the helpful courses open while causing immense collateral damage.

Step 7: *Public issuing of the plan.* Transparency at this step would demonstrate due diligence. By failing to do this, leaders created confusion, fear, and lack of accountability.

Step 8: *Repeat the process as new information and public feedback accrues.* By rejecting this step, and by actively labelling information contrary to chosen courses open as ‘misinformation’, leaders continued to create fear and collateral damage while evading accountability.

REFERENCE LIST

- Acharya, C. B., Schrom, J., Mitchell, A. M., Coil, D. A., Marquez, C., Rojas, S., et al. (2022). *Viral load among vaccinated and unvaccinated, asymptomatic and symptomatic persons infected with the SARS-CoV-2 Delta variant*. *Open Forum Infectious Diseases*, 9(5):ofac135. <https://doi.org/10.1093/ofid/ofac135>.
- Adalja, A. A., Toner, E., & Inglesby, T. V. (2020). *Priorities for the US health community responding to COVID-19*. *JAMA*, 323(14), 1343-1344. <https://jamanetwork.com/journals/jama/fullarticle/2762690>
- Allen, D. W. (2023). *Lockdown: A final assessment*. In D. J. Boudreaux (Ed.), *COVID-19: Lessons we should have learned* (Collected Essays). The Fraser Institute. <https://www.fraserinstitute.org/sites/default/files/covid-19-lessons-essay5-lockdown-a-final-assessment.pdf>
- Annas, G. J. (2007). *Your liberty or your life. Talking Point on public health versus civil liberties*. *EMBO Reports*, 8(12), 1093-1098. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2267247/>
- Anthony Fauci email dump (2021). Retrieved from <https://s3.documentcloud.org/documents/20793561/leopold-nih-foia-anthony-fauci-emails.pdf>. [Note: This document contains emails sent by Dr. Anthony Fauci, obtained through a Freedom of Information Act request. The email dump provides insights into government handling of the COVID-19 pandemic and Dr. Fauci's communications during that time].
- Apostolopoulos, Y., et al. (eds) (2007). *Population mobility and infectious disease*. Springer
- Appleby, A. B. (1980). *The disappearance of plague: A continuing puzzle*. *The Economic History Review*, 33(2), 161–173. <https://doi.org/10.2307/2595837>
- Arora, R., & Bhattacharya, J. (2023, May 2). *The dangerous illusion of scientific consensus*. Substack. <https://www.magzter.com/stories/business/Indian-Economy-Market/THE-DANGEROUS-ILLUSION-OF-SCIENTIFIC-CONSENSUS>
- Baker, T. (1866). *The Common Nature of Epidemics: Also Remarks on Contagion and Quarantine from Writings and Official Reports by Southwood Smith, MD*. Philadelphia: J.B. Lippincott & Co. <https://www.gutenberg.org/files/61029/61029-h/61029-h.htm>
- Baldwin, P. (2004). *Contagion and the State in Europe, 1830-1930*. Cambridge University Press. <https://catalogue.nla.gov.au/catalog/1604056>
- Baral, S. [stefanbaral] (2020, August 16). [Tweet]. Twitter. <https://bit.ly/33XKHin>
- Barbieri, R. (2021). *Origin, transmission, and evolution of plague over 400 y in Europe*. *PNAS*, September 2021. <https://doi.org/10.1073/pnas.2114241118>
- Bardosh, K., Krug, A., Jamrozik, E., Lemmens, T., Keshavjee, S., Prasad, V., et al. (2022). *Covid-19 vaccine boosters for young adults: A risk-benefit assessment and ethical analysis of mandate policies at universities*. *Journal of Medical Ethics*. <https://doi.org/10.1136/jme-2022-108449>
- Bark, D., Dhillo, N., St-Jean, M., Kinniburgh, B., McKee, G., & Choi, A. (2021). *SARS-CoV-2 transmission in kindergarten to grade 12 schools in the Vancouver Coastal Health region: A descriptive epidemiologic study*. *CMAJ Open*, 9, E810–7.
- Bartsch, Z. (2022, February 11). *Mises's bureaucracy, a recap*. *Economist Writing Everyday*. <https://economistwritingeveryday.com/2022/02/11/misess-bureaucracy-a-recap/>
- Bell, D., Brown, G. W., von Agris, J., & Tacheva, B. (2024). *Urgent pandemic messaging of WHO, World Bank, and G20 is inconsistent with their evidence base*. *Global Policy*. <https://doi.org/10.1111/1758-5899.13390>
- Benn, A. (2020, October 2). *We are throwing the working class under the bus – an interview with Professor Martin Kulldorff*. *Reaction*. <https://reaction.life/we-are-throwing-the-working-class-under-the-bus-an-interview-with-professor-martin-kulldorff/>
- Bhattacharya, J., Bienen, L., Duriseti, R., Hoeg, T. B., Kulldorff, M., Makary, M., Selkinson, M., & Templeton, S. (2023). *Questions for a COVID-19 commission*. The Norfolk Group. <https://www.norfolkgroup.org/>

- Bhattacharya, J., & Packalen, M. (2020). *On the futility of contact tracing*. *Inference*, 5(3). <https://inference-review.com/article/on-the-futility-of-contact-tracing>
- Bhattacharya, J., & Kulldorff, M. (2023, November 13). *The COVID wars*. *Tablet Magazine*. <https://www.tabletmag.com/sections/news/articles/the-covid-wars>
- Billauer, B. P. (2017). *Weapons of mass hysteria, faulty bioterror predictions, and their impact on national (in)security: A case study of smallpox*. *Health Matrix*, 27(1), 347. <https://scholarlycommons.law.case.edu/healthmatrix/vol27/iss1/13>
- Birden, H. (2009, June 1). *Why quarantine won't stop swine flu*. *Crikey*. Retrieved from <https://web.archive.org/web/20100704015427/https://www.crikey.com.au/2009/06/01/swine-latest-why-quarantine-doesnt-work/>
- Bjorkman, A., Gisslen, M., Gullberg, M., Ludvigsson, J. (2023). *The Swedish COVID-19 approach: A scientific dialogue on mitigation policies*. *Frontiers in Public Health*, 11, 1206732. <https://pubmed.ncbi.nlm.nih.gov/37546333/#:~:text=Abstract,faced%20rapid%20and%20continuous%20criticism>
- Bland, D.M., Long, D., Rosenke, R., Hinnebusch, J. (2024). *Yersinia pestis can infect the Panlowsky glands of human body lice and be transmitted by louse bite*. *PLoS Biology*, 22(5):e3002625. <https://doi.org/10.1371/journal.pbio.3002625>.
- Booker, J. (2007). *Maritime Quarantine: The British Experience, c.1650–1900*. Routledge
- Bracken, H. M. (1908). *The quarantine of smallpox*. *JAMA*, 51(25), 2151–2154. <https://jamanetwork.com/journals/jama/article-abstract/428696>
- Bramanti, B., Wu, Y., Yang, R., Cui, Y., & Stenseth, N. C. (2021). *Assessing the origins of the European Plagues following the Black Death: A synthesis of genomic, historical, and ecological information*. *PNAS*, August 2021. <https://doi.org/10.1073/pnas.2101940118>
- British House of Commons (1825, March 11). *QUARANTINE LAWS—PETITION OF DR. MACLEAN*. Retrieved from <https://api.parliament.uk/historic-hansard/commons/1825/mar/11/quarantine-laws-petition-of-dr-maclean>
- British Medical Journal (1893). *Mr Ernest Hart on 'Quarantine: Its Merits, Mischiefs, And Mistakes'*. *The British Medical Journal*, 2(1713), 956. <https://www.jstor.org/stable/20226184>
- Brown, J., Gregson, F. K. A., Cook, T. M., Bzdek, B. R., Reid, J. P., & Pickering, A. E. (2021). *A quantitative evaluation of aerosol generation during tracheal intubation and extubation*. *Anaesthesia*, 76, 174-181. <https://doi.org/10.1111/anae.15292>
- Brown, M. (2008). *From foetid air to filth: The cultural transformation of British epidemiological thought, ca. 1780-1848*. *Bulletin of the History of Medicine*, 82(3), 515-544. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2646604/>
- Bubela, T., Flood, C. M., McGrail, K., Straus, S., & Mishra, S. (2023). *How Canada's decentralised covid-19 response affected public health data and decision making*. *British Medical Journal* 382:e075665.
- Burnet, F. M., & White, D. O. (1972). *Natural History of Infectious Disease (4th ed.)*. Cambridge, UK: Cambridge University Press.
- Byrne, J. P. (Ed.) (2008). *Encyclopedia of Pestilence, Pandemics, and Plagues*. Greenwood Press.
- Cao, S., Gan, Y., Wang, C., Bachmann, M., Wei, S., Gong, J., Huang, Y., et al. (2020). *Post-lockdown SARS-CoV-2 nucleic acid screening in nearly ten million residents of Wubun, China*. *Nature Communications*, 11, 5917. <https://doi.org/10.1038/s41467-020-19802-w>
- Carvalho, S., et al. (2001). *The international health regulations in historical perspective*. In A. T. Price-Smith (Ed.), *Plagues and Politics: Infectious Disease and International Policy*. Palgrave. https://link.springer.com/chapter/10.1057/9780230524248_12
- Chadwick, E. (1883, September 17). *Quarantines*. (Originally published in the *Pall Mall Gazette* and reproduced in *The Sydney Morning Herald*, Mon 17 Sep 1883, p.7). Retrieved from <https://trove.nla.gov.au/newspaper/article/13544862>

- Chadwick, E. (1887). *The jubilee of sanitary science: Being the annual address by Edwin Chadwick ... at the anniversary dinner of the Association of Public Sanitary Inspectors*. Retrieved from <https://wellcomecollection.org/works/crc5trtg>
- Chaffee, B. W., Cheng, J., Couch, E. T., et al. (2021). *Adolescents' substance use and physical activity before and during the COVID-19 pandemic*. *JAMA Pediatrics*, 175(7), 715-722. <https://doi.org/10.1001/jamapediatrics.2021.0541>
- Chapin, C. V. (1910). *The sources and modes of infection*. J. Wiley. <https://archive.org/details/sourcesmodesofi00chap/page/340/mode/2up?ref=ol>
- Chase-Levenson, A. (2020). *The Yellow Flag: Quarantine and the British Mediterranean World, 1780–1860*. Cambridge University Press.
- Connor, H. (2022). *John Graunt F.R.S. (1620-74): The founding father of human demography, epidemiology and vital statistics*. *Journal of Medical Biography*, 32(1), 57-69. <https://journals.sagepub.com/doi/full/10.1177/09677720221079826>
- Conti, A. A. (2008). *Quarantine through history*. In *International Encyclopedia of Public Health* (pp. 454–462). <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7150140/>
- Cowen, T. (2007). *Discover your inner economist: Use incentives to fall in love, survive your next meeting, and motivate your dentist*. Dutton.
- Cowling, B. J. (2020a). *Nonpharmaceutical measures for pandemic influenza in nonhealthcare settings – personal protective and environmental measures*. *Emerging Infectious Diseases*, 26(5), 967-975. <https://doi.org/10.3201/eid2605.190994>
- Cowling, B. (@bencowling88) (2020b). [Tweet]. Twitter. <https://twitter.com/bencowling88/status/1288492282618904577>
- Cuningham, J. M. (1883). *The sanitary lessons of Indian epidemics*. *Transactions of the Epidemiological Society of London*, 7, 117-122. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5529854/pdf/transepisoclon76061-0117.pdf>
- Defoe, D. (1722). *A journal of the plague year: Being observations or memorials of the most remarkable occurrences, as well public as private, which happened in London during the last great visitation in 1665*. E. Nutt at the Royal-Exchange; J. Roberts in Warwick-Lane; A. Dodd without Temple-Bar. [Note: While this piece of literature is advertised as a fictional recount, scholarly opinions on balance support the book being a work of history rather than fiction.]
- DeLacy, M. (2016). *The germ of an idea: Contagionism, religion, and society in Britain, 1660-1730*. Palgrave Macmillan.
- Doshi, P. (2020, November 26). *Pfizer and Moderna's 95% effective vaccines – let's be cautious and first see the full data*. *BMJ Opinion*. <https://blogs.bmj.com/bmj/2020/11/26/peter-doshi-pfizer-and-modernas-95-effective-vaccines-lets-be-cautious-and-first-see-the-full-data/>
- Duggan, L. V., Mastoras, G., & Bryson, G. L. (2020). *Tracheal intubation in patients with COVID-19*. *CMAJ*, 192(22), E607. <https://pubmed.ncbi.nlm.nih.gov/32357995/>
- El Gato Malo (2022, January 12). *Bayesian datacrime: Defining vaccine efficacy into existence. How the definitions of “fully vaccinated” and now “boosted” are exaggerating (and possibly creating from whole cloth) VE and turning the data into gibberish*. *Bad Cattitude Substack*. <https://boriquagato.substack.com/p/bayesian-datacrime-defining-vaccine>
- Estabrooks, C. A., Ewa, V., Keefe, J., & Straus, S. (2023). *The predictable crisis of covid-19 in Canada's long-term care homes*. *British Medical Journal*, 382, e075148. <https://www.bmj.com/content/382/bmj-2023-075148>
- Ertem, Z., Schechter-Perkins, E. M., Oster, E., van den Berg, P., Epshtein, I., Chaiyakunapruk, N., et al. (2021). *The impact of school opening model on SARS-CoV-2 community incidence and mortality*. *Nature Medicine*, 27, 2120-2126. <https://pubmed.ncbi.nlm.nih.gov/34707317/>
- Eurostat (2023). *Excess mortality – statistics*. *Statistics Explained*. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Excess_mortality_-_statistics
- Fillmore, N. R., La, J., Zheng, C., et al. (2022). *The COVID-19 hospitalization metric in the pre- and post-vaccination eras as a measure of pandemic severity: A retrospective, nationwide cohort study*. *Infection Control and Hospital Epidemiology*, 43(12), 1767-1772. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9021586/>

- Fenton, L., Gribben, C., Caldwell, D., Colville, S., Bishop, J., Reid, M., et al. (2021). *Risk of hospital admission with COVID-19 among teachers compared with healthcare workers and other adults of working age in Scotland, March 2020 to July 2021: Population-based case-control study*. *BMJ*, 374, n2060. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9021586/>
- Fenton, N., & Neil, M. (2023, May 2). *The illusion of vaccine efficacy revisited. How to make a placebo look 95% effective and guarantee repeat business*. Substack. <https://wherearethenumbers.substack.com/p/the-illusion-of-vaccine-efficacy>
- Ferretti, L., Wymant, C., Petric, J., Tsallis, D., Kendall, M., Ledda, A., Di Lauro, F., et al. (2023). *Digital measurement of SARS-CoV-2 transmission from 7 million contacts*. *Nature*. <https://doi.org/10.1038/s41586-023-06952-2>
- Fischer, C. J. (2017). *Unequal Implementation: The Impact of Government Anti-Plague Policies on the London Poor in 1665*. UVM Honors College Senior Theses, 178. <https://scholarworks.uvm.edu/hcoltheses/178>
- Ford, P. L. (Ed.) (1904-1905). *The works of Thomas Jefferson, federal edition (Vol. 10)*. New York and London: G.P. Putnam's Sons. Retrieved from <https://oll.libertyfund.org/title/ford-the-works-vol-10-correspondence-and-papers-1803-1807>
- Forthun, I., Madsen, C., Emilsson, L., Nilsson, A., Kepp, K. P., Bjork, J., et al. (2024). *Excess mortality in Denmark, Finland, Norway and Sweden during the COVID-19 pandemic 2020-2022*. *European Journal of Public Health*. <https://doi.org/10.1093/eurpub/ckae091>.
- Foster, G., & Frijters, P. (2024). *Hiding the elephant: The tragedy of COVID policy and its economist apologists*. *Australian Economic Papers*, 63(1). <https://onlinelibrary.wiley.com/doi/epdf/10.1111/1467-8454.12293>
- Foster, G., & Sabhlok, S. (2022). *Do lockdowns and border closures serve the 'Greater Good'?* Connor Court.
- Friedersdorf, C. (2020). *The Regulatory State is Failing Us*. *The Atlantic*, 29 March.
- Frijters, P., Clark, A. E., Kregel, C., & Layard, R. (2020). *A happy choice: Wellbeing as the goal of government*. *Behavioural Public Policy*, 4, 126-165. doi: 10.1017/bpp.2019.39. <https://www.cambridge.org/core/journals/behavioural-public-policy/article/abs/happy-choice-wellbeing-as-the-goal-of-government/ED3A4E384D726238CC2524932F868CBD>
- Frijters, P., Foster, G., & Baker, M. (2021). *The Great Covid Panic: What happened, why, and what to do next*. Brownstone Institute.
- Frijters, P., & Kregel, C. (Eds.) (2020). *Chapter 1: The case for wellbeing as the goal of government in the context of constraints on policy-making*. In: *A Handbook for Wellbeing Policy-Making: History, Theory, Measurement, Implementation, and Examples*. Oxford University Press.
- Friedersdorf, C. (2020, May). *The regulatory state is failing us*. *The Atlantic*. <https://www.theatlantic.com/ideas/archive/2020/05/the-regulatory-state-is-failing-us/612220/>
- Fukumoto, K., McClean, C. T., & Nakagawa, K. (2021). *No causal effect of school closure in Japan on the spread of COVID-19 in spring 2020*. *Nature Medicine*, 27, 2111-2119. <https://pubmed.ncbi.nlm.nih.gov/34707318/>
- Fung, K., Jones, M., & Doshi, P. (2023). *Sources of bias in observational studies of Covid-19 vaccine effectiveness*. *Journal of Evaluation in Clinical Practice*. <https://doi.org/10.1111/jep.13839>
- Furst, T., Bazalova, A., Frycak, T., & Janosek, J. (2024). *Does the healthy vaccinee bias rule them all? Association of COVID-19 vaccination status and all-cause mortality from an analysis of data from 2.2 million individual health records*. *International Journal of Infectious Disease* 2024;142:106976. <https://doi.org/10.1016/j.ijid.2024.02.019>.
- Gandini, S., Rainisio, M., Iannuzzo, M. L., Bellerba, F., Cecconi, F., Scorrano, L., et al. (2021). *Cross-sectional and prospective cohort study of the role of schools in the SARS-CoV-2 second wave in Italy*. *Lancet Regional Health - Europe*, 5, 1000. [https://pubmed.ncbi.nlm.nih.gov/34104904/#:~:text=Findings%3A%20SARS%20CoV%2D2,age%20\(P%20%3D%200.23\)](https://pubmed.ncbi.nlm.nih.gov/34104904/#:~:text=Findings%3A%20SARS%20CoV%2D2,age%20(P%20%3D%200.23))
- General Board of Health, UK (1849). *Report on Quarantine*. Retrieved from <https://wellcomecollection.org/works/rnjxkk67/items?canvas=72>

- Gibney, R. T. N., Blackman, C., Fan, E., Fowler, R., Johnston, C., et al. (2022). *COVID-19 pandemic: The impact on Canada's intensive care units*. Royal Society of Canada Policy Briefing. <https://rsc-src.ca/en/covid-19-policy-briefing-recent/covid-19-pandemic-impact-canada%E2%80%99s-intensive-care-units>
- Gillkrest, J., & Fergusson, W. (1831). *Letters on the Cholera Morbus*. (B. Ness, C. St. Charleskindt, & the Online Distributed Proofreading Team, Eds.). Retrieved from <https://www.gutenberg.org/files/28147/28147-h/28147-h.htm>
- Glaeser, E. L. (2011). *Triumph of the City: How Our Greatest Invention Makes Us Richer, Smarter, Greener, Healthier, and Happier*. Penguin Press.
- Goldfarb, D. M., Masse, L. C., Watts, A. W., Hutchison, S. M., Muttucumaroe, L., Bosman, E. S., et al. (2021). *SARS-CoV-2 seroprevalence among Vancouver public school staff in British Columbia, Canada: A cross-sectional study*. *BMJ Open*, 12(4), e057846. <https://pubmed.ncbi.nlm.nih.gov/35383082/>
- Goldsteen, R. L., et al. (2011). *Introduction to Public Health*. Springer.
- Graso, M., Chen, F. X., & Reynolds, T. (2021). *Moralization of Covid-19 health response: Asymmetry in tolerance for human costs*. *Journal of Experimental Social Psychology*, 93, 104084. <https://doi.org/10.1016/j.jesp.2020.104084>
- Graso, M. (2022). *The new normal: Covid-19 risk perceptions and support for continuing restrictions past vaccinations*. *PLoS ONE*, 17(4), e0266602. <https://doi.org/10.1371/journal.pone.0266602>
- Graso, M., Aquino, K., Chen, F. X., & Bardosh, K. (2023). *Blaming the unvaccinated during the COVID-19 pandemic: The roles of political ideology and risk perceptions in the USA*. *Journal of Medical Ethics*. <https://doi.org/10.1136/jme-2022-108825>
- Graunt, J. (1676). *Natural and political observations made upon the bills of mortality*. <https://archive.org/details/naturalpolitical0000grau/page/46/mode/2up?view=theater>
- Great Britain (1848). *An act for promoting the public health: 31st August 1848 (11 & 12 Vict., c. LXIII)*. https://www.legislation.gov.uk/ukpga/1848/63/pdfs/ukpga_18480063_en.pdf
- Green, K. P. (2023). *COVID-19, hygiene theatre, masks, and lockdowns: "Solid science" or science veneer?* In D. J. Boudreaux (Ed.), *COVID-19. Lessons We Should Have Learned*. Collected Essays. The Fraser Institute. Retrieved from <https://www.fraserinstitute.org/sites/default/files/covid-19-essay9-covid-19-hygiene-theatre-masks-and-lockdowns.pdf>
- Gutentag, A. (2022, January 30). *COVID affects your memory. Masks have never worked. Testing has always been problematic. Kids were never high-risk. The past has never been altered. Welcome to the COVID consensus, circa midterms 2022*. *Tablet Magazine*. <https://www.tabletmag.com/sections/news/articles/covid-affects-your-memory>
- Hafsi, T., & Baba, S. (2023). *Exploring the process of policy overreaction: The COVID-19 lockdown decisions*. *Journal of Management Inquiry*, 32(2), 152-173. <https://pubmed.ncbi.nlm.nih.gov/36814993/>
- Hallin, A. E., Danielsson, H., Nordstrom, T., & Falth, L. (2022). *No learning loss in Sweden during the pandemic: Evidence from primary school reading assessments*. *International Journal of Educational Research*, 114, 102011. <https://doi.org/10.1016/j.ijer.2022.102011>
- Hama, R. (2021, September 27). *Rapid response: The risk of vaccination may be higher by considering 'healthy vaccinee effect'*. *British Medical Journal*. <https://doi.org/10.1136/bmj-2021-068665>
- Harrison, M. (2010). *Medicine in an age of commerce and empire: Britain and its tropical colonies 1660-1830*. Oxford Scholarship Online. <https://academic.oup.com/book/7242/chapter-abstract/151921986?redirectedFrom=fulltext>
- Harvard Library (n.d.). *Max Von Pettenkofer, 1818-1901*, in *Contagion: Historical Views of Diseases and Epidemics*, a Curiosity Collection. Retrieved from <https://web.archive.org/web/20240319071533/https://curiosity.lib.harvard.edu/contagion/feature/max-von-pettenkofer-1818-1901>
- Henderson, D. A. (2006). *The Public's Trust and Help in an Epidemic*. *Center for Biosecurity, University of Pittsburgh Medical Center*. Retrieved from http://www.zero-pox.info/da_spch/j23_2006_public-trust.pdf

- Henderson, D. R. (2022). *The abject failure of central planning during COVID*. In D. J. Boudreaux (Ed.), *COVID-19: Lessons we should have learned* (Collected Essays). The Fraser Institute. <https://www.fraserinstitute.org/sites/default/files/covid-19-lessons-essay4-abject-failure-of-central-planning-during-covid.pdf>
- Herby, J., Jonung, L., & Hanke, S. H. (2022). *A literature review and meta-analysis of the effects of lockdowns on COVID-19 mortality*. Studies in Applied Economics II (SAE) No. 210. Johns Hopkins Institute for Applied Economics, Global Health, and the Study of Business Enterprise. <https://sites.krieger.jhu.edu/iae/files/2022/06/A-Systematic-Review-and-Meta-Analysis-of-the-Effects-of-Lockdowns-of-COVID-19-Mortality-II.pdf>
- Herrera-Esposito, D., & de los Campos, G. (2022). *Age-specific rate of severe and critical SARS-CoV-2 infections estimated with multi-country seroprevalence studies*. BMC Infectious Diseases, 22, 311. <https://doi.org/10.1186/s12879-022-07262-0>
- Hoeg, T. B., Duriseti, R., & Prasad, V. (2023). *Potential 'healthy vaccinee bias' in a study of BNT162b2 vaccine against Covid-19*. New England Journal of Medicine, 389, 284-285. <https://doi.org/10.1056/NEJMc2306683>
- Hoffmann, R. K., & Hoffmann, R. K. (2015). *Ethical considerations in the use of cordons sanitaires*. Clinical Correlations. <https://www.clinicalcorrelations.org/2015/02/19/ethical-considerations-in-the-use-of-cordons-sanitaires/>
- Hogan, C. A., Huang, C. H., Sahoo, M. K., Wang, H., Jiang, B., Sibai, M., et al. (2021). *Strand-specific reverse transcription PCR for detection of replicating SARS-CoV-2*. Emerging Infectious Diseases, 27(2), 632-635. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7853532/>
- Holroyd, A. (1839). *The quarantine laws: Their abuses and inconsistencies; A letter addressed to the Rt. Hon. Sir John Cam Hobhouse, Bart. M.P., President of the Board of Control*. London: Simpkin, Marshall & Co. Retrieved from <https://wellcomecollection.org/works/zd9rtcqg/items>
- Horgan, J. (2014, December 26). *Justinian's Plague (541-542 CE)*. World History Encyclopedia. <https://www.worldhistory.org/article/782/justinians-plague-541-542-ce/>
- Howard, J. (1791). *An account of the principal lazarettos in Europe*. Gale ECCO, Print Editions (26 May 2010).
- Inglesby, T. V., Nuzzo, J. B., O'Toole, T., & Henderson, D. A. (2006). *Disease mitigation measures in the control of pandemic influenza*. Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science, 4(4), 366-375. <https://www.liebertpub.com/doi/10.1089/bsp.2006.4.366>
- Ioannidis, J. P. A. (2021). *Infection fatality rate of COVID-19 inferred from seroprevalence data*. Bulletin of the World Health Organization, 99(1), 19-33F. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7947934/>
- Ioannidis, J. P. A., Cripps, S., & Tanner, M. A. (2022). *Forecasting for COVID-19 has failed*. International Journal of Forecasting, 38(2), 423-438. <https://doi.org/10.1016/j.ijforecast.2020.08.004>
- IOM (Institute of Medicine) (2010). *Infectious disease movement in a borderless world*. Washington, DC: The National Academies Press.
- Jarnig, G., Jaunig, J., & van Poppel, M. N. M. (2021). *Association of COVID-19 mitigation measures with changes in cardiorespiratory fitness and body mass index among children aged 7 to 10 years in Austria*. JAMA Network Open, 4(8), e2121675. <https://doi.org/10.1001/jamanetworkopen.2021.21675>
- Jefferson, T. (1804). *Letter to John Page, 16 August 1804*. In Jefferson, Thomas, *The Works, vol. 10 (Correspondence and Papers 1803-1807)*. G. P. Putnam's Sons, 1905.
- Jefferson, T. (1805). *Fifth Annual Message to the Senate and House of Representatives of the United States*. Retrieved from <https://www.presidency.ucsb.edu/documents/fifth-annual-message>
- Jefferson, T., Dooley, L., Ferroni, E., Al-Ansary, L. A., van Driel, M. L., Bawazeer, G. A., et al. (2023). *Physical interventions to interrupt or reduce the spread of respiratory viruses*. Cochrane Database of Systematic Reviews, 1(1), CD006207. <https://doi.org/10.1002/14651858.CD006207.pub6>
- Jimenez-Pericas, F., de Castro, M. T. G. V., Pastor-Valero, M., Remon, C. A., Miralles, J. J., Garcia, M. D. nC. M., & Anres, J. M. A. (2020). *Higher incidence of adverse events in isolation patients compared with non-isolated patients: A cohort study*. BMJ Open, 10(10), e035238. <https://doi.org/10.1136/bmjopen-2019-035238>

- Joffe, A. R. (2021). COVID-19: *Rethinking the lockdown groupthink*. *Frontiers in Public Health*, 9:625778. <https://doi.org/10.3389/fpubh.2021.625778>
- Joffe, A.R., Eappen, R., Milburn, C., Fulford, M., & Rau, N. (2024). *Putting meta-analysis findings in proper perspective: Comment on “The effects of nonpharmaceutical interventions on COVID-19 cases, hospitalizations, and mortality: A systematic literature review and meta-analysis.”* *AJPM Focus* 3(3):102223. <https://doi.org/10.1016/j.focus.2024.100223>.
- Joffe, A. R., & Elliott, A. (2023). *Long COVID as a functional somatic symptom disorder caused by abnormally precise prior expectations during Bayesian perceptual processing: A new hypothesis and implications for pandemic response*. *SAGE Open Medicine*, 11. <https://doi.org/10.1177/20503121231194400>
- Joffe, A. R., Kazemi, P., Eappen, R., & Milburn, C. (2023). *When claims of ‘revisionism’ and ‘misinformation’ are themselves misinformed: Implications for policy decision-making*. Preprints. <https://www.preprints.org/manuscript/202310.1271/v1>
- Joffe, A. R., & Milburn, C. (2022). *Avoidable intensive care resource of unvaccinated COVID-19 patients: Interpretation and policy implications*. Preprints, 2022. <https://www.preprints.org/manuscript/202211.0497/v1>
- Joffe, A. R., & Redman, D. (2021). *The SARS-CoV-2 pandemic in high-income countries such as Canada: A better way forward without lockdowns*. *Frontiers in Public Health*, 9, 715904. <https://doi.org/10.3389/fpubh.2021.715904>
- Jones, N. R., Qureshi, Z. U., Temple, R. J., Larwood, J. P. J., Greenhalgh, T., & Bourouiba, L. (2020). *Two meters or one: What is the evidence for physical distancing in COVID-19?* *BMJ*, 370, m3223. <https://doi.org/10.1136/bmj.m3223>
- Jones-Bonofiglio, K., Nortje, N., Webster, L., & Garros, D. (2021). *A practical approach to hospital visitation during a pandemic: Responding with compassion to unjustified restrictions*. *American Journal of Critical Care*, 30(4), 302-311. <https://doi.org/10.4037/ajcc2021611>
- Kissler, S. M., Fauver, J. R., Mack, C., Tai, C. G., Breban, M. I., Watkins, A. E., et al. (2021). *Viral dynamics of SARS-CoV-2 variants in vaccinated and unvaccinated persons*. *New England Journal of Medicine*, 385:2489-2491. <https://doi.org/10.1056/NEJMc2102507>.
- Knapp, E. A., Dong, Y., Dunlop, A. L., et al. (2022). *Changes in BMI during the COVID-19 pandemic*. *Pediatrics*, 150(3), e2022056552. <https://doi.org/10.1542/peds.2022-056552>
- Knudsen, B., & Prasad, V. (2023). *COVID-19 vaccine induced myocarditis in young males: A systematic review*. *European Journal of Clinical Investigation*, 53, e13947. <https://doi.org/10.1111/eci.13947>
- Koerth, M. (2020, February 28). *Quarantines won't save us from coronavirus*. *FiveThirtyEight*. <https://fivethirtyeight.com/features/quarantines-wont-save-us-from-coronavirus/>
- Lazarus, J. V., Romero, D., Kopka, C. J., Karim, S. A., Abu-Raddad, L. J., Almeida, G., et al. (2022). *A multinational Delphi consensus to end the COVID-19 public health threat*. *Nature*, 611, 332-345. <https://pubmed.ncbi.nlm.nih.gov/36329272/>
- Lee, L. A., Foster, J. R., Nikitovic, D., Garros, D., Ryan, M. J., Moghadam, N., et al. (2023). *“We aren't meant to go through the hardest parts of our lives alone”: Family experience with restricted PICU presence during the COVID-19 pandemic*. *Critical Care Explorations*, 5(11). <https://doi.org/10.1097/CCE.0000000000000989>
- Lewes, C. L. (1898). *Dr. Southwood Smith: A Retrospect*. Edinburgh: William Blackwood and Sons. <https://www.gutenberg.org/files/59510/59510-h/59510-h.htm>
- Lewis, R. A. (1952). *Edwin Chadwick and the Public Health Movement 1832-1854*. Longmans Green and Co. <https://archive.org/details/edwinchadwickpub0000rlew/mode/2up>
- Maclean, C. (1800). *The plague not contagious, or a dissertation on the source of epidemic and pestilential diseases*. Retrieved from <https://archive.org/details/b21504362/mode/2up?ref=ol>
- Maclean, C. (1817a). *Suggestions for the prevention and mitigation of epidemic and pestilential diseases; comprehending the abolition of quarantines and lazarettos: ... intended to serve as an introduction to a work, entitled, Researches in Turkey, concerning the Plague, etc.* <https://archive.org/details/b30377079>

- Maclean, C. (1817b). *Results of an Investigation, Respecting Epidemic and Pestilential Diseases: Including Researches in the Levant, Concerning the Plague (Vol. 1)*. Retrieved from <https://archive.org/details/resultsaninvest00maclgoog/page/n4/mode/2up>
- Maclean, C. (1818). *Results of an investigation, respecting epidemic and pestilential diseases: Including researches in the Levant, concerning the plague (Vol. 2)*. Retrieved from <https://wellcomecollection.org/works/gk54ykh>
- Maclean, C. (1820a). *Specimens of systematic misrule; or, immense sums annually expended in upholding a single imposture, etc.* Retrieved from https://www.google.com.au/books/edition/Specimens_of_systematic_misrule_or_immen/pajkAAAAcAAJ?hl=en&gbpv=0
- Maclean, C. (1820b). *Summary of facts and inferences, respecting the causes ... of plague, and other pestilential diseases; with proofs of the non-existence of contagion in these maladies: intended for ... the Select Committee of the House of Commons, for enquiring into the validity of the doctrine of contagion*. Retrieved from <https://wellcomecollection.org/works/z9ysxqzk/items>
- Maclean, C. (c.1821-24). *Obligations of governments to abolish the laws of quarantine*. Retrieved from <https://jstor.org/stable/60212441>
- Maclean, C. (1823). *Remarks on the British quarantine laws: And the so-called sanitary laws of the continental nations of Europe, especially those of Spain*. Retrieved from <https://wellcomecollection.org/works/ap3nkec5>
- Maclean, C. (1824a). *Evils of quarantine laws, and non-existence of pestilential contagion: Deduced from the phaenomena of the plague of the Levant, the yellow fever of Spain, and the cholera morbus of Asia*. Retrieved from <https://wellcomecollection.org/works/j75zgkrc>
- Maclean, C. (1824b). *Observations on quarantine: Being the substance of a lecture, delivered at the Liverpool Lyceum, in October, 1824*. Retrieved from <https://archive.org/details/b28740142/>
- Maclean, C. (1825). *Evils of quarantine laws, and non-existence of pestilential contagion: Deduced from the phenomena of the plague of the Levant, the yellow fever of Spain, and the cholera morbus of Asia* (2nd ed.). Retrieved from <https://digirepo.nlm.nih.gov/ext/cholera/PDF/63010090R.pdf>
- Manuagh, G., & Twilley, N. (2021). *Until Proven Safe: The History and Future of Quarantine*. MacMillan Publishers.
- Mandavilli, A. (2003). *SARS epidemic unmasks age-old quarantine conundrum*. *Nature Medicine*, 9(5), 487. <https://ncbi.nlm.nih.gov/pmc/articles/PMC7095793/>
- Markel, H. (2020, January 27). *Do Quarantines Even Work? The dirty history behind isolating the sick*. *The New York Times*. Retrieved from <https://web.archive.org/web/20200127062022/https://www.nytimes.com/2020/01/27/opinion/china-wuhan-virus-quarantine.html>
- McAlister, F. A., Hau, J. P., Atzema, C., McRae, A. D., Morrison, L. J., Grant, L., et al. (2023). *The burden of incidental SARS-CoV-2 infections in hospitalized patients across pandemic waves in Canada*. *Scientific Reports* 13:6635. <https://doi.org/10.1038/s41598-023-33569-2>
- McDonald, J. C. (1951). *The history of quarantine in Britain during the 19th century*. *Bulletin of the History of Medicine*, 25(1), 22–44. <https://www.jstor.org/stable/44443588>
- McGrew, R. E. (1985). *Encyclopedia of Medical History*. MacMillan.
- McNeil Jr., D. G. (2014, August 12). *Using a tactic unseen in a century, countries cordon off Ebola-racked areas*. *The New York Times*. <http://www.nytimes.com/2014/08/13/science/using-a-tactic-unseen-in-a-century-countries-cordon-off-ebola-racked-areas.html>
- Menegale, F., Manica, M., Zardini, A., Guzzetta, G., Marziano, V., d'Andrea, V., et al. (2023). *Evaluation of waning of SARS-CoV-2 vaccine-induced immunity. A systematic review and meta-analysis*. *JAMA Network Open*, 6(5):e2310650. <https://doi.org/10.1001/jamanetworkopen.2023.10650>
- Milroy, G. (1847). *The cholera not to be arrested by quarantine: A brief historical sketch of the great epidemic of 1817, and its invasions of Europe in 1831-2 and 1847; with practical remarks on the treatment, preventative and curative, of the disease*. Retrieved from <https://curiosity.lib.harvard.edu/contagion/catalog/36-990062611440203941>

- Mishra, S., Walker, J. D., Wilhelm, L., Lariviere, V., Bubela, T., & Straus, S. E. (2023). *Use and misuse of research: Canada's response to covid-19 and its health inequalities*. *British Medical Journal* 382:e075666
- Morens, D. M., Taubenberger, J. K., & Fauci, A. S. (2023a). *Rethinking next-generation vaccines for coronaviruses, influenza viruses, and other respiratory viruses*. *Cell Host Microbe*, 31(1):146-157. <https://doi.org/10.1016/j.chom.2022.11.016>.
- Morens, D. M., Folkers, G. K., & Fauci, A. S. (2023b). *The concept of classical herd immunity may not apply to COVID-19*. *Journal of Infectious Diseases*, 226(2):195-198. <https://doi.org/10.1093/infdis/jiac109>.
- Morris, J. (1995). *Hamburg, Health, and Bourgeois Liberalism*. *Journal of Urban History*, 21(2), 256-264. <https://doi.org/10.1177/009614429502100204>
- Mouritz, A. (1921). *The Flu: A brief history of influenza in USA, Europe, Hawaii*. Retrieved from <https://collections.nlm.nih.gov/catalog/nlm:nlmuid-101283076-bk>
- Mullett, C. F. (1952). *Politics, Economics and Medicine: Charles Maclean and Anticontagion in England*. *Osiris*, 10, 224–251. <http://www.jstor.org/stable/301815>
- Murphy, J. (2023). *Cascading expert failure*. *Journal of Institutional Economics*, 19, 52-69. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3778836
- Murray, C. K. & Frijters, P. (2017). *Game of Mates: How favours bleed the nation*.
- Murray, C. K. & Frijters, P. (2022). *Rigged: How networks of powerful mates rip off everyday Australians*. Allen and Unwin.
- Musto, D. F. (1986). *Quarantine and the Problem of AIDS*. *The Milbank Quarterly*, 64, 97–117. <https://doi.org/10.2307/3350043>
- Na, P. J., Jest, D. V., & Pietrzak, R. H. (2023). *Social disconnection as a global behavioral epidemic – a call to action about a major health risk factor*. *JAMA Psychiatry*, 80(2), 101-102. <https://doi.org/10.1001/jamapsychiatry.2022.4162>
- Neville, R. D., Lakes, K. D., Hopkins, W. G., et al. (2022). *Global changes in child and adolescent physical activity during the COVID-19 pandemic: A systematic review and meta-analysis*. *JAMA Pediatrics*, 176(9), 886–894. <https://doi.org/10.1001/jamapediatrics.2021.4338>
- Newman, K. L. S. (2012). *Shutt Up: Bubonic Plague and Quarantine in Early Modern England*. *Journal of Social History*, 45(3), 809–834. <https://doi.org/10.1093/jsh/shr114>
- Newsholme, A. (1918). *Discussion on influenza*. SAGE Publications. <https://journals.sagepub.com/doi/pdf/10.1177/003591571901200502>
- Nientiedt, D. (2023, May 5). *Carl Schmitt and the origins of Friedrich Hayek's thought on rent-seeking*. ProMarket. <https://www.promarket.org/2023/05/05/carl-schmitt-and-the-origins-of-friedrich-hayeks-thought-on-rent-seeking/>
- Owens, M. (2020). *What lessons learned can we use from Ebola outbreaks in Western Africa 2014 and Democratic Republic of Congo 2018-19 to improve international response?* *Journal of Business Continuity & Emergency Planning*, 13(4), 328-339. <https://pubmed.ncbi.nlm.nih.gov/32438953/>
- Paterlini, M. (2020, April 21). *'Closing borders is ridiculous': the epidemiologist behind Sweden's controversial coronavirus strategy*. *Nature*. <https://www.nature.com/articles/d41586-020-01098-x>
- Peckham, R. (Ed.) (2015). *Empires of panic: Epidemics and colonial anxieties*. HKU Press.
- Pezzullo, A. M., Axfors, C., Contopoulos-Ioannidis, C. G., Apostolatos, A., & Ioannidis, J. P. A. (2023). *Age-stratified infection fatality rate of COVID-19 in the non-elderly population*. *Environmental Research*, 216, 114655. <https://doi.org/10.1016/j.envres.2022.114655>
- Poynter, F. N. L. (1962). *Thomas Southwood Smith - the man (1788-1861)*. *Proceedings of the Royal Society of Medicine*, 55(5), 381-392. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1896581/>
- Price, P. J. (2022). *Plagues in the Nation: How Epidemics Shaped America*. Beacon Press.

- Provincial Board of Health Ontario (1919). *Influenza*. Retrieved from <https://www.gutenberg.org/files/60087/60087-h/60087-h.htm>
- Purssel, E., Gould, D., & Chudleigh, J. (2020). *Impact of isolation on hospitalized patients who are infectious: Systematic review with meta-analysis*. *BMJ Open*, 10(2), e030371. <https://doi.org/10.1136/bmjopen-2019-030371>
- Pym, W. (1848). *Observations upon Bulam, vomito-negro, or yellow fever*. Retrieved from <https://archive.org/details/b29337409/page/n17/mode/2up>
- Ranger, T. A., Kieran, A., Patone, M., et al. (2023). *Preexisting neuropsychiatric conditions and associated risk of severe COVID-19 infection and other acute respiratory infections*. *JAMA Psychiatry*, 80(1), 57–65. <https://doi.org/10.1001/jamapsychiatry.2022.3614>
- Rayner, G. (2021). *Use of fear to control behavior in Covid crisis was 'Totalitarian', admit scientists*. *The Telegraph*. <https://www.telegraph.co.uk/news/2021/05/14/scientists-admit-totalitarian-use-fear-control-behaviour-covid/>
- Reddin, C., Murphy, R., Hankey, G. J., et al. (2022). *Association of psychosocial stress with risk of acute stroke*. *JAMA Network Open*, 5(12), e2244836. <https://doi.org/10.1001/jamanetworkopen.2022.44836>
- Redman, D. (2021a). *An emergency management doctrine*. Preprints. <https://doi.org/10.20944/preprints202102.0367.v1>
- Redman, D. (2021b). *Canada's deadly response to COVID-19*. Frontier Center for Public Policy, Policy Series No. 237. https://fcpp.org/wp-content/uploads/FCPS237_CDADeadlyResponse_JL1621_F2.pdf
- Report on Dr Armstrong's Lectures on the principles and practice of physic: *On the Origin of Typhus Fever, in which its Contagious or Non-contagious nature is considered*. (1825). *The Boston Medical Intelligencer*, 3(13), August 9, 1825. [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(02\)94242-X/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(02)94242-X/fulltext)
- Richardson, B. W. (1887). *The health of nations: A review of the works of Edwin Chadwick (Vol. 2)*. Retrieved from https://archive.org/details/b21908400_0002/
- Roberts, D. (1979). *Paternalism in Early Victorian England*. Rutgers University Press. <https://www.routledge.com/Paternalism-in-Early-Victorian-England/Roberts/p/book/9781138194731>
- Sabhlok, S. [sabhlok] (2023, April 27). [Tweet regarding T. Inglesby]. Twitter. <https://twitter.com/sabhlok/status/1675269265161863169>
- Sabhlok, S. [sabhlok] (2023, April 27). [Tweet regarding J. Nuzzo]. Twitter. <https://twitter.com/sabhlok/status/1675280927440924672>
- Sabhlok, S. [sabhlok] (2023, April 27). [Tweet regarding T. O'Toole]. Twitter. <https://twitter.com/sabhlok/status/1675287597508345856>
- Sachs, J. D., Karim, S. S. A., Aknin, L., Allen, J., Brosbøl, K., Colombo, F., Barron, G. C., et al. (2022). *The Lancet Commission on lessons for the future from the COVID-19 pandemic*. *Lancet*, 400, 1224-1280. <https://pubmed.ncbi.nlm.nih.gov/36115368/>
- Saltelli, A., Sturmberg, J. P., Sarewitz, D., & Ioannidis, J. P. A. (2023). *What did COVID-19 really teach us about science, evidence, and society?* *Journal of Evaluation in Clinical Practice*. <https://doi.org/10.1111/jep.13876>
- Schippers, M. C., Ioannidis, J. P. A., & Joffe, A. R. (2022). *Aggressive measures, rising inequality, and mass formation during the COVID-19 crisis: An overview and proposed way forward*. *Frontiers in Public Health*, 10, 950965. <https://doi.org/10.3389/fpubh.2022.950965>
- Sebhatu, A., Wennberg, K., Arora-Jonsson, S., & Lindberg, S. I. (2020). *Explaining the homogeneous diffusion of COVID-19 nonpharmaceutical interventions across heterogeneous countries*. *Proceedings of the National Academy of Sciences*, 117, 21201–21208. <https://doi.org/10.1073/pnas.2010625117>
- Senger, M. P. (2020, September 16). *China's Global Lockdown Propaganda Campaign*. *Tablet*. Retrieved from <https://bit.ly/2RXS0RA>
- Shattuck, L. (1850). *The Shattuck Report*. Retrieved from <https://biotech.law.lsu.edu/cphl/history/books/sr/>

- Shir-Raz, Y., Elisha, E., Martin, B., Ronel, N., & Guetzkow, J. (2022). *Censorship and suppression of COVID-19 heterodoxy: Tactics and counter-tactics*. *Minerva*, 61, 407-433. <https://doi.org/10.1007/s11024-022-09479-4>
- Shrestha, N. K., Burke, P. C., Nowacki, A. S., Simon, J. F., Hagen, A., & Gordon, S. M. (2023a). *Effectiveness of the Coronavirus 2019 bivalent vaccine*. *Open Forum Infectious Diseases*, 10(6):ofad209. <https://doi.org/10.1093/ofid/ofad209>.
- Shrestha, N. K., Burke, P. C., Nowacki, A. S., & Gordon, S. M. (2023b). *Risk of Coronavirus Disease 2019 (COVID-19) among those up-to-date and not up-to-date on COVID-19 vaccination*. medRxiv (preprint). <https://doi.org/10.1101/2023.06.09.23290893>.
- Shrimpton, A. J., Brown, J. M., Gregson, F. K. A., Cook, T. M., Scott, D. A., McGain, F., et al. (2022). *Quantitative evaluation of aerosol generation during manual facemask ventilation*. *Anaesthesia*, 77, 22-27. <https://doi.org/10.1111/anae.15599>
- Sidley, G. (2021). *A year of fear*. *The Critic*. <https://thecritic.co.uk/a-year-of-fear/>
- Siegel, M. (2020). *COVID: The Politics of Fear and the Power of Science*. Turner Publishing Company.
- Simandan, D., Rinner, C., & Capurri, V. (2023). *The academic left, human geography, and the rise of authoritarianism during the COVID-19 pandemic*. *Geografiska Annaler: Series B, Human Geography*. <https://doi.org/10.1080/04353684.2023.2168560>
- Skowronski, D. M., Kaweski, S. E., Irvine, M. A., Chuang, E. S. Y., Kim, S., Sabaiduc, S., et al. (2023). *Risk of hospital admission and death from first-ever SARS-CoV-2 infection by age group during the Delta and Omicron periods in British Columbia, Canada*. *CMAJ*, 195, E1427-E1439. <https://doi.org/10.1503/cmaj.230721>
- Slack, P. (2012). *Plague: A Very Short Introduction*. Oxford University Press.
- Slack, P. (2022). *Perceptions of plague in eighteenth-century Europe*. *The Economic History Review*, 75(1), 138-156. <https://onlinelibrary.wiley.com/doi/epdf/10.1111/ehr.13080>
- Snyder-Mackler, N., Burger, J. R., Gaydos, L., Belsky, D. W., Noppert, G. A., Campos, F. A., et al. (2020). *Social determinants of health and survival in humans and other animals*. *Science*, 368, eaax9553. <https://doi.org/10.1126/science.aax9553>
- Somekh, I., Boker, L. K., Shohat, T., Pettoello-Mantovani, M., Simoes, E. F., & Somekh, E. (2021). *Comparison of COVID-19 incidence rates before and after school reopening in Israel*. *JAMA Network Open*, 4, e217105. <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2778940>
- Sood, N., Simon, P., Ebner, P., Eichner, D., Reynolds, J., Bendavid, E., & Bhattacharya, J. (2020). *Seroprevalence of SARS-CoV-2-specific antibodies among adults in Los Angeles County, California, on April 10-11, 2020*. *JAMA*, 323(23), 2425-2427. <https://doi.org/10.1001/jama.2020.8279>
- Speakman, J., et al. (2003). *Quarantine in Severe Acute Respiratory Syndrome (SARS) and other emerging infectious diseases*. *The Journal of Law, Medicine & Ethics*, 31(4), 63-64. <https://doi.org/10.1111/j.1748-720X.2003.tb00755.x>
- Stanford Encyclopedia of Philosophy (2013). *Pierre Gassendi*. <https://plato.stanford.edu/entries/gassendi/>
- Tarr, J. A. (1979). *The separate vs. combined sewer problem: A case study in urban technology design choice*. *Journal of Urban History*, 5(3), 308-339. <https://doi.org/10.1177/009614427900500303>
- Tatem, A., et al. (2006). *Global transport networks and infectious disease spread*. *Advances in Parasitology*, DOI: 10.1016/S0065-308X(05)62009-X. <https://pubmed.ncbi.nlm.nih.gov/16647974/>
- Tayyar, R., Kiener, M. A., Liang, J. W., Contreras, G., Rodriguez-Nava, G., Zimmet, A. N., et al. (2024). *Low infectivity among asymptomatic patients with a positive severe acute respiratory coronavirus 2 (SARS-CoV-2) admission test at a tertiary care center, 2020-2022*. *Infect Control Hosp Epidemiol* 45:241-243. <https://doi.org/10.1017/ice.2023.210>
- Tognotti, E. (2013). *Lessons from the history of quarantine, from plague to influenza A*. *Emerging Infectious Diseases*, 19(2), 254-259. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3559034/>

- Tran, K., Bell, C., Stall, N., Tomlinson, G., McGeer, A., Morris, A., Gardam, M., & Abrams, H. B. (2017). *The effect of hospital isolation precautions on patient outcomes and cost of care: A multi-site, retrospective, propensity score-matched cohort study*. *Journal of General Internal Medicine*, 32(3), 262-268. <https://doi.org/10.1007/s11606-016-3824-4>
- Trubeta, S., et al. (Eds.) (2021). *Medicalising Borders: Selection, containment, and quarantine since 1800*. Manchester University Press.
- United Kingdom Public Health Act 1848 (1848). <https://www.legislation.gov.uk/ukpga/Vict/11-12/63/contents/enacted>.
- Wallace, R. B., et al. (Eds.) (2008). *Public Health & Preventive Medicine*. McGraw Hill.
- Walsh, S., Chowdhury, A., Braithwaite, V., Russell, S., Birch, J. M., Ward, J. L., et al. (2021). *Do school closures and school reopenings affect community transmission of COVID-19? A systematic review of observational studies*. *BMJ Open*, 11, e053371. <https://pubmed.ncbi.nlm.nih.gov/34404718/>
- Wang, F., Gao, Y., Han, Z., et al. (2023). *A systematic review and meta-analysis of 90 cohort studies of social isolation, loneliness, and mortality*. *Nature Human Behaviour*. <https://doi.org/10.1038/s41562-023-01617-6>
- Wang, L., & Cramer, G. (2013, July 25). *SARS, MERS ...? Preparing for the next coronavirus pandemic*. *The Conversation*. <https://theconversation.com/sars-mers-preparing-for-the-next-coronavirus-pandemic-16359>
- Webster, N. (1799). *A brief history of epidemic and pestilential diseases: With the principal phenomena of the physical world, which precede and accompany them, and observations deduced from the facts stated (Vol. 2)*. <https://collections.nlm.nih.gov/catalog/nlm:nlmuid-2576058RX2-mvpart>
- Wilson, N. M., Marks, G. B., Eckhardt, A., Clarke, A. M., Young, F. P., Garden, F. L., et al. (2021). *The effect of respiratory activity, non-invasive respiratory support and facemasks on aerosol generation and its relevance to COVID-19*. *Anaesthesia*, 76, 1465-1474. <https://doi.org/10.1111/anae.15475>
- Winslow, C.-E. A. (1944). *The conquest of epidemic disease: A chapter in the history of ideas*. Princeton University Press. <https://archive.org/details/conquestofepidem0000wins/page/n13/mode/2up>
- Woolford, S. J., Sidell, M., Li, X., et al. (2021). *Changes in body mass index among children and adolescents during the COVID-19 pandemic*. *JAMA*, 326(14), 1434-1436. <https://doi.org/10.1001/jama.2021.15036>
- World Health Organization (1958). *The first ten years of the World Health Organization*. Retrieved from <https://apps.who.int/iris/handle/10665/37089>
- World Health Organization (2019). *Non-pharmaceutical public health measures for mitigating the risk and impact of epidemic and pandemic influenza*. <https://iris.who.int/bitstream/handle/10665/329438/9789241516839-eng.pdf?sequence=1>.
- World Health Organization (2023). *Yellow fever - African Region (AFRO)*. Retrieved from <https://web.archive.org/web/20240319022635/https://www.who.int/emergencies/disease-outbreak-news/item/2022-DON431>
- World Health Organization Writing Group (2006). *Nonpharmaceutical interventions for pandemic influenza, national and community measures*. *Emerging Infectious Diseases*, 12(1), 88-94. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3291415/>
- Xu, S., Huang, R., Sy, L. S., Hong, V., Glenn, S. C., Ryan, D. S., et al. (2023). *A safety study evaluating non-COVID-19 mortality risk following COVID-19 vaccination*. *Vaccine*, 41(3), 844-854. <https://doi.org/10.1016/j.vaccine.2022.12.036>
- Yu, C. K., Tsao, S., Ng, C. W., Chua, G. T., Chan, K. I., Shi, J., et al. (2023). *Cardiovascular assessment up to one year after COVID-19 vaccine-associated myocarditis*. *Circulation*, 148, 436-439. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10373639/>
- Zhang, M. X., Lilien, T. A., van Etten-Jamaludin, F. S., Fraenkel, C. J., Bonn, D., Vlaar, P. J., et al. (2023). *Generation of aerosols by noninvasive respiratory support modalities: A systematic review and meta-analysis*. *JAMA Network Open*, 6(10), e2337258. <https://doi.org/10.1001/jamanetworkopen.2023.37258>

- Zhou, J., Singanayagam, A., Goonawardone, N., Moshe, M., Sweeney, F. P., Sukhova, K., et al. (2023). *Viral emissions into the air and environment after SARS-CoV-2 human challenge: A phase 1, open label, first-in-human study*. *Lancet Microbe*, 4, e579-e590. [https://doi.org/10.1016/S2666-5247\(23\)00101-5](https://doi.org/10.1016/S2666-5247(23)00101-5)
- Zuckerman, A. (2004). *Plague and Contagionism in Eighteenth-Century England: The Role of Richard Mead*. *Bulletin of the History of Medicine*, 78(2), 273-308. <https://doi.org/10.1353/bhm.2004.0105>