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So Much Information: Covid-19 1st December 2021 - end of February 2022

Kevin Brewer

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orsettpsychologicalservices@phonecoop.coop

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Kevin Brewer BSocSc, MSc

An independent academic psychologist, based in England, who has written extensively on different areas of psychology with an emphasis on the critical stance towards traditional ideas.

A complete listing of his writings at http://psychologywritings.synthasite.com/. See also material at https://archive.org/details/orsett-psych.

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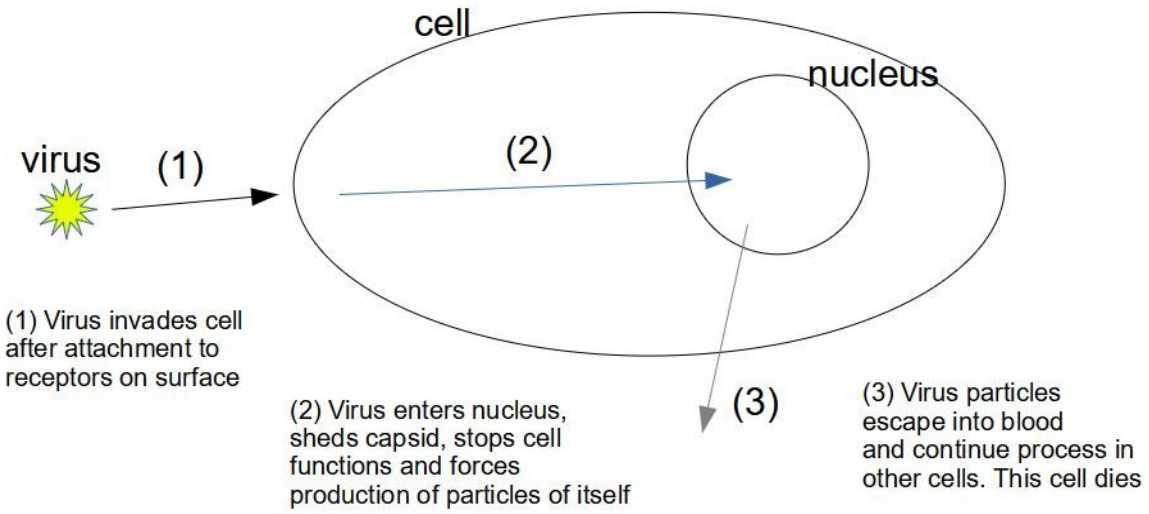
1. VIRUS INFORMATION

1.1. VIRUSES

"Although we humans have been focused on one particular nasty virus since early 2020, there are legions of other viruses out there waiting to be discovered" (Dance 2021 p23). Estimates of how many are astronomical (eg: 10^{31} individual viral particles in the oceans), particularly compared to the 9110 officially named species (of which 1044 were added in 2020 alone) (Dance 2021).

Viruses have two common characteristics - a genome encased in a protein-based shell (a capsid), and a need for a host in order to reproduce (figure 1.1). They are "obligate parasites" (appendix 1A)(Jones and Jones 1997). Viruses can vary from two or three genes (circoviruses)



(Based on figure 21.3 p479 Jones and Jones 1997)

Figure 1.1 - Basic life cycle of a virus.

to hundreds (mimiviruses) (Dance 2021). Ranging in size from 10 nanometres (nm) [1] to 300 nm in diameter (Jones and Jones 1997).

Viruses are important to ecosystems and evolution as they are "shuttling genes between hosts" (Dance 2021 p23).

In terms of their origin, there is probably no one common ancestor for "virus-kind", but they arose several times in the history of life on this planet (Dance 2021). Thus, classification (a phylogenetic tree) is difficult, but the International Committee on Taxonomy of Viruses recognises six realms. The largest is riboviria, that use an RNA-directed enzyme to replicate, and includes SARS-CoV-2 (Dance 2021) (table 1.1).

Realm	Characteristic	Number of species
Riboviria (eg: SARS-CoV-2)	Use an RNA-directed enzyme to replicate	3850
Duplodnaviria (eg: human herpesviruses)	Double-stranded DNA	2944
Monodaviria (eg: human papillomaviruses)	Single-stranded DNA	1416
Varidnaviria (eg: African swine fever)	DNA viruses with common shell structure	268
Adnaviria	Filament-shaped viruses that infect archaea	31
Ribozyviria (eg: hepatitis D)	Small, unusual RNA viruses	15

(Based on Dance 2021 figure p24)

Table 1.1 - Six realms of viruses.

1.2. ZOONOSIS

Covid-19 is probably a spillover of a zoonotic pathogen (ie: originating in a non-human animal host). There is also evidence of spillback, where human hosts have infected animals. This poses a risk of "secondary spillover", where new animal hosts transmit it (or a variant of the virus) to humans. There is some evidence of this already with a human infecting a mink, and a variant of SARS-CoV-2 from mink back to human in Denmark and the Netherlands (Fischhoff et al 2021).

[1] A nanometre is one billionth of a metre.

Analysing the structure of SARS-Cov-2, Fischhoff et al (2021) modelled which mammal species could be susceptible to spillback. The ACE2 receptor was key in a species as the virus binding to this receptor is its entry into host cells.

Over 5000 species were viewed as potentially susceptible, including:

i) Captive, farmed or domesticated species - Fischhoff et al (2021) noted that the "escape of farmed individuals into wild populations has implications for the enzootic [2] establishment of SARS-CoV-2... [and] implications for vaccination strategies, for instance, prioritising people in contact with potential bridge species (eg: slaughterhouse workers, farmers, veterinarians)" (p5).

ii) Live traded or hunted wildlife species - eg: high risk for Macaca (primates).

iii) Bats - High risk of secondary spillover, and many species are "confirmed reservoirs of other zoonotic viruses" (Fischhoff et al 2021 p8).

iv) Rodents - 76 potential rodent species.

Fischhoff et al (2021) emphasised the role of "computational predictions, laboratory experiments and targeted animal surveillance necessary to connect transmission mechanisms to the broader conditions underpinning zoonotic disease emergence in nature" (p8).

1.3. VARIANTS

Lawton et al (2021) asked in July 2021, "Will we live in fear of dangerous variants?", and replied, "Yes, is the short answer" (p11).

Dealing with new variants of SARS-CoV-2 depends on how the variants arise. The possible pathways include (Le Page 2021):

i) Gradual mutations as the virus moves between individuals (eg: beta and delta variants).

ii) Sudden appearance with many mutations from long-term survival in immunocompromised individuals (eg: HIV-positive) (eg: alpha and omicron possibly).

[2] Ie: becoming endemic in animal population or species.

iii) Reverse zoonosis after jumping from humans to non-humans and back (eg: omicron possibly).

iv) Drug-acquired mutation - eg: anti-viral medication molnupiravir, which induces multiple mutations in the virus as a means to kill it, could "backfire", leaving surviving mutated viruses.

v) Recombination of two viruses in an individual (eg: two variants of SARS-CoV-2, or SARS-CoV-2 and another human coronavirus).

All these pathways to mutations/variants are impacted in some way by measures that minimise transmission. So, "if we make it as hard for the virus to spread as possible, they [variants] may fizzle out rather than taking off" (Aris Katzourakis in Le Page 2021).

1.4. IMMUNITY

The nature and length of immunity to SARS-CoV-2 is a key concern. The main pillars of the immune system's response are cytotoxic T cells (that eliminate infected cells), neutralising anti-bodies (that prevent the virus from infecting cells), and T helper cells (which recognise the virus specifically). The latter cells, which co-ordinate B and T cells, are "immunological memory", and are based on previous contact with a virus (Radbruch and Chang 2021).

Initially, studies analysed the acute immune response to SARS-CoV-2 (ie: a few months after infection). With more time since the appearance of the virus, longer term immunity can be measured. For example, Turner et al (2021) tracked the concentration of anti-bodies against SARS-CoV-2 in the blood over one year. Blood samples were taken from seventy-seven individuals in the USA one month after onset of symptoms (mostly mild), and then at three-month intervals. Initially, anti-body concentrations were high, but this "levelled off and remained more or less constant at roughly 10-20% of the maximum concentration observed" (Radbruch and Chang 2021 p359).

Wang et al (2021), comparing anti-body concentrations at six months and one year after infection, found that the concentration of neutralising anti-bodies remained unchanged. Sixty-three US individuals who recovered from covid-19 were assessed at 1.3, 6.2 and twelve months after infection. "The good

news is the the evidence thus far predicts that infection with SARS-CoV-2 induces long-term immunity in most individuals" (Radbruch and Chang 2021 p360; writing in June 2021).

Research on other infections suggest that immunological memory could last a life time (eg: Amanna et al 2007), or at least seventeen years in the case of SARS identified in 2003 (eg: Anderson et al 2020).

1.4.1. Autoimmunity

Sometimes, the immune system attacks healthy tissues instead of pathogens. This is known as autoimmunity, and it may be involved in over eighty different diseases (Hodson 2021). For example, acute rheumatic fever, which is a rare complication of a throat infection caused by the bacterium Streptococcus pyogenes. "One of the bacterium's proteins is structurally similar to a cardiac muscle protein, leading the immune system to target both, and causing inflammation in the heart" (King 2021 pS49).

1.5. APPENDIX 1A - PARASITES

Parasites generally have an important role in ecosystems: "For example, they can drive host population dynamics, regulate co-existence and interactions among species and shape broad-scale patterns of biodiversity" (Huang et al 2021 p1). Parasites, Huang et al (2021) broadly defined as, "all disease-causing organisms from microscopic viral and bacterial pathogens up to metazoan athropods and helminths" (p1).

Huang et al (2021) outlined the key issues in understanding parasites (the "disease macro-ecology"):

i) Biogeography - This is the distance of parasites across space. "Because parasitic organisms by definition cannot survive or complete their life cycles without their hosts, the distribution of host species has always been considered the most limiting factor for parasite occurrences. In comparison, the direct effect of the external environment on parasite diversity and distributions, beyond effects on host distribution patterns, tends to be underappreciated" (Huang et al 2021 p2).

ii) Changes in time in host-parasite associations - Drawing from historical sources (eg: parasitic remains in

fossil hosts) to understand the future with climate change. For example, there is "the potential for climate change to promote novel cross-species parasite transmission. As host species shift their distributions in response to climate change, opportunities for contact among previously isolated host species may lead to the exchange of parasites and foster novel host–parasite associations" (Huang et al 2021 p3). SARS-CoV-2 could be seen as an example of this process already.

iii) Zoonotic risk - Changes as mentioned above will lead to the greater possibility of transfer from non-human hosts to humans. SARS-CoV-2 is most probably an example of this.

Rodent reservoirs of zoonotic pathogens are a particular concern with climate change, particularly in areas of high land use by humans (Garcia Pena et al 2021). Predicting the next species jump through modelling has been tried. For example, Majewska et al (2021) looked at 700 species of mammalian helminths (eg: tapeworms), and found that "the single most important predictor of whether a wild mammal helminth can infect humans is the ability to infect common companion animals (ie: cats and dogs)" (Huang et al 2021 p3). Also relevant is quantifying the drivers of zoonotic outbreaks - eg: deforestation; armed conflicts; international trade and travel (Huang et al 2021).

2. VACCINES

2.1. SPUTNIK V

The Sputnik V vaccine (Gam-COVID-Vac) was authorised in Russia in August 2020 even before phase I clinical trial results had been published. Epidemiologist Michael Toole said: "If the government's going to approve a vaccine before they even know the results of the trial, that does not build confidence" (quoted in Nogrady 2021).

Subsequently, data have suggested that it is safe and effective (table 2.1), "but questions remain about the quality of surveillance for possible rare side effects" (Nogrady 2021 p339). Rare side effects only appear with millions of doses. "It is not clear whether Russia is in a position to detect such rare events; however. Those associated with the Oxford-Astra-Zeneca vaccine first came to light through adverse-event monitoring in Austria, which prompted the EMA [European Medicines Agency] to review the vaccine's safety" (Nogrady 2021 p340). Furthermore, there is a cultural resistance to seeking medical care in Russia. Dmitry Kulish, biotechnology researcher, said: "Most Russian people will call [the] doctor only when they cannot breathe any more.. Furthermore, doctors in remote regions might not connect a stroke caused by blood clots, for example, to a recent vaccination" (quoted in Nogrady 2021).

Sputnik V uses an engineered adenovirus to delivery the genetic code for the SARS-CoV-2 spike protein to teach the immune system. It is similar to the Oxford/Astra-Zeneca, and Johnson & Johnson vaccines, though different adenoviruses are used for the first and second doses. "The two adenoviruses have slightly different methods of introducing their genetic material into a host cell..., which would theoretically improve the success rate of getting the viral genetic material where it needs to go" (Nogrady 2021 p340).

Study	Details
Logunov et al (2020)	76 adults in Russia; 2 doses three weeks apart; all participants produced anti-bodies; mild (expected) side effects
Logunov et al (2021)	Phase III trial: 14 964 adults given vaccine vs 4902 placebo in Russia; 16 covid cases in vaccinated group vs 62 in placebo group (= 91.6% efficacy); no severe covid vs 20 in placebo group; 73.6% efficacy for moderate to severe symptoms
Gamaleya Institute, Russia (unpublished data; April 2021)	3.8 million individuals vaccinated in Russia; 97.6% efficacy
United Arab Emirates Ministry of Health	81 000 vaccinated individuals; 97.8% efficacy in preventing covid; 100% success in preventing severe symptoms
Buenos Aires health ministry (unpublished data)	Sputnik Light (one dose only): 40 387 vaccinated vs 146 194 unvaccinated 60-70 years old; reduced symptoms by 78.6%, hospitalisation by 87.6%, and deaths by 84.9%
Pagotto et al (2021)	No adverse events among 683 vaccinated health workers in Buenos Aires
Montalti et al (2021)	San Marino (ROCCA study): 2558 adults one dose and 1288 two doses - no serious events

(Source of information: Nogrady 2021)

Table 2.1 - Early evidence about the Sputnik V vaccine.

2.2. COMBINATIONS

Mixing vaccines (ie: the first dose of one vaccine and the second dose of another vaccine) is one way to deal with supply problems, or safety concerns about a particular vaccine (Lewis 2021a).

The CombiVacS trial (Borobia et al 2021) was the first to show a strong immune response after a first dose of the Oxford-AstraZeneca vaccine, and 8-12 weeks later, a second dose of the Pfizer-BioNTech vaccine. But there was no comparison group of the same vaccine for both doses (Lewis 2021a).

Hillus et al (2021) did include such a group that received two doses of the Pfizer-BioNTech vaccine.

The studies, however, are small-scale and short-term (Lewis 2021a).

2.3. DISTRIBUTION

Even before "booster" vaccines (ie: a third dose) in some rich countries, the picture of vaccine distribution

to poorer countries was not good. Despite pledges of money and to share vaccines, it could be 2023 before many African countries, say, will be able to fully vaccinate their populations (Padma 2021).

"Pathogens must continuously change their genetic code to outmanoeuvre their hosts' immune systems. This means that when researching pathogens, such as bacteria and viruses, scientists require new samples of the pathogen from different hosts and different geographic locations. This is vital to public health: effectively combating emerging and re-emerging infectious diseases requires a co-ordinated international response which includes testing, surveillance, risk assessments and the development of strain-specific vaccines and other medical counter-measures" (Eccleston-Turner and Rourke 2021 pp825-826).

Thus, the informal international sharing of pathogen samples has been a global scientific norm. But this process is becoming legalised under a policy of "pathogen access and benefit sharing" (ABS) (eg: Convention on Biological Diversity). The ABS concept is "to create obligations on the users of biological resources to share the (ideally financial) benefits generated through their use and for the State to then channel those benefits into biodiversity conservation" (Eccleston-Turner and Rourke 2021 p827).

An example of ABS in international public health is the "Pandemic Influenza Preparedness Framework for the Sharing of Influenza Viruses and Access to Vaccines and Other Benefits" ("PIP Framework") of the World Health Organisation. A transactional approach is used where access to pathogen samples in a developing country, say, is in exchange for diagnostic kits, vaccines, and medical supplies, for instance (Eccleston-Turner and Rourke 2021).

"This transaction was framed as being particularly appealing for developing countries with the world's most vulnerable populations who, in a pandemic, may not be able to secure vaccines through purely commercial arrangements made directly with pharmaceutical companies" (Eccleston-Turner and Rourke 2021 p828). This has created a property right with pathogen samples (Eccleston-Turner and Rourke 2021).

The ABS approach has its supporters who see it as "a mechanism for delivering justice" (Eccleston-Turner and Rourke 2021 p828) to poorer countries. However, Eccleston-Turner and Rourke (2021) argued against a "market solution" of pathogen samples in exchange for

vaccines, say.

These authors pointed out that "ABS arose as a solution to address the market failure of extreme biodiversity loss and environmental collapse due to overexploitation: the unjust extraction and exploitation of biological resources (which later came to include pathogens) from developing countries" (Eccleston-Turner and Rourke 2021 p829).

Eccleston-Turner and Rourke (2021) continued that an ABS transactional approach to public health is "a high risk of failing because the incentive structures are flawed, leading to a loss of trust in the system from provider and user parties, a reduction in overall virus sample sharing and associated innovation, and a false sense of security for developing countries that base their pandemic response plans on the expectation that they will receive benefits in the form of vaccines and anti-virals" (p829).

These authors preferred an approach that sees the sharing of pathogen samples and vaccines as "a human right and a social good" (Eccleston-Turner and Rourke 2021 p830). Furthermore, the two aspects should be decoupled. Sharing pathogen samples is a common research good, while the fair and equitable distribution of medicines is a different, but desirable, goal (Eccleston-Turner and Rourke 2021).

2.4. MISCELLANEOUS

(1) Based on blood samples from thirty-five volunteers over seven months, it was found that a reduced dose (25%) of the Moderna mRNA vaccine was effective. This was a phase I trial of the vaccine (Mateus et al 2021).

In a small-scale phase I/II trial in Germany with the BioNTech-Pfizer vaccine, varied dosages were also tested (Sahin et al 2021).

(2) "Amid the devastation of the coronavirus pandemic, there has at least been one piece of undeniably good news: the success of mRNA vaccines" (The Leader 2021a p7). The swift production of the mRNA vaccines (Pfizer/BioNTech and Moderna) for covid-19 has raised the possibility of using this technology against other diseases, particularly those previously not considered as a condition for a vaccine (eg: some forms of cancer) (Le Page 2021).

The interest in the technology can be seen in that

in 2020 over seventy mRNA vaccine trial were started compared to two in 2018 (Le Page 2021).

2.4.1. Self-Spreading Virus Vaccines

Generally, virologists agree that "laboratory modifications of self-spreading viruses are genetically too unstable to be used safely and predictably outside contained facilities" (Lentzos et al 2022 p31). However, this is being challenged by the idea, for example, of self-spreading viruses to act as insecticides in agriculture, or as vaccines in health care. "Yet, glossed over by these proposals is that the self-spreading dynamics of a virus repeatedly passing from host-to-host (passaging) give it substantial potential to alter its biological properties once released into the environment" (Lentzos et al 2022 p31).

Self-spreading viruses are also called "transmissible", "self-disseminating", "contagious", or "horizontally transferable" viruses, but the point is that these artificially modified viruses "intentionally retain the capacity to transmit between individual hosts upon their release into the environment" (Lentzos et al 2022 p32).

Lentzos et al (2022) raised concerns about the use of these viruses, particularly in self-spreading vaccines. One proposal is a modified self-spreading virus as a wildlife vaccine to stop spillover events of as yet unknown pathogens. However attractive this idea, Lentzos et al (2022) pointed out that "the vast majority of virus species that currently exist are undescribed by science. This makes it very difficult to imagine how the considerable effort necessary to develop and test self-spreading vaccines could identify and then prioritise single viral species circulating in wildlife" (p31).

There are also the issues with unknown mutations that could spillover, and the practicality of wildlife vaccination.

"A more extreme application" (Lentzos et al 2022 p32) is self-spreading viruses in human vaccines. The simple idea is that one person could be vaccinated and they will pass the "good virus" on to other people. "The self-spreading vaccine provides some outwardly attractive opportunities if there is a need for rapid vaccination of whole populations or difficulties in accessing individuals (this relies on the rather unrealistic assumption that all individuals in the population remain naïve to infection by the self-spreading vaccine)"

(Lentzos et al 2022 p33).

Lentzos et al (2022) argued for regulation: "A clear priority for the international community must be to update existing phyto-sanitary, medical, and veterinary regulations to reflect contemporary societal values for responsible stewardship of science — and specifically with respect to environmental releases of self-spreading viruses. Key principles that should be endorsed and actively promoted include safety, intergenerational justice, accountability, and public engagement" (p33).

3. CONSEQUENCES

3.1. SYMPTOM SEVERITY

Why do some individuals suffer severe symptoms of covid-19 and others milder ones? This has emerged as an important question as soon as it became clear that there were greater differences among individuals to SARS-CoV-2.

The Covid-19 Host Genetics Initiative was set up to find an answer. It includes academic laboratories and private firms like "23andMe", with the focus on "genetic clues" (Callaway 2021).

A small number of genetic variants have been identified (Covid-19 Host Genomics Initiative 2021) (eg: a gene related to interferon; genes on chromosome 3) (Callaway 2021).

Most of the genomes studied come from individuals with European ancestry, and genome-wide association studies (GWAS) are the main methodology. "Some researchers feel that the GWAS approach, which has found common variants that raise an individual's risk only by a small amount, is less fruitful than spotting much rarer mutations that might explain why some otherwise healthy people are in intensive care with covid-19" (Callaway 2021 p348).

The Covid Human Genetic Effort has focused on these rarer mutations (eg: Zhang et al 2020).

3.2. COVID AND THE BRAIN

Many individuals with severe SARS-CoV-2 infection have neurological problems (eg: memory loss), and it was initially speculated that the virus could cross the blood-brain barrier and directly enter the brain. This is known now not to be so, but the impact on the brain may be multi-pronged (Marshall 2021):

a) Attack directly a type of brain cell called

astrocytes (eg: found in post-mortem brain samples in Brazil; Crunfli et al 2022).

b) Reduce blood flow to the brain - via infection of pericytes (cells found in small blood vessels called capillaries) and their constriction (eg: hamster brain; Hirunpattarasilp et al 2021). While Hussain (2021) argued that evidence from post-mortem and animal studies suggested via "an attack on the endothelium" (p3545).

c) Trigger an immune response that harms the brain via "auto-anti-bodies" (eg: Franke et al 2021).

Yang et al (2021) found supportive evidence for (a) and (c) in a genomic study of fresh-frozen post-mortem brain tissue from eight patients with covid-19. There was no molecular trace of SARS-CoV-2 in the brain, however.

Hussain (2021) emphasised that "neurological consequences are much more common following SARS-CoV-2 infection than post-vaccination" (p3545).

3.3. CLINICAL TRIALS

Clinical trials not related to covid-19 have been interrupted by covid-19, even stopped. Unger and Xiao (2021) calculated that only 57% of the usual number of trials in the USA were initiated in February-March 2020.

Changes were needed to continue some trials. "Investigators were allowed to deliver some experimental medicines to participants' homes, and participants could use online platforms to consent to taking part in a clinical trial. Investigators lengthened the time between doctors' visits for some study participants and performed more of those visits remotely. And participants were sometimes allowed to visit their local doctor for basic procedures and assessments, rather than travelling to a central study site" (Ledford 2021 p341).

3.4. DEATH RATES

Estimation the death toll from covid-19 is undergoing revision as new information emerges. India is a good example here. It appeared that India had a low mortality compared to other countries - for example, 340 covid-19 deaths per million people, which is about one-tenth of the US figure (Cohen 2022).

However, using data from an telephone survey of nearly 140 000 people who were asked if anyone in their household had died from covid-19, and officially registered deaths (Jha et al 2022), the death rate is estimated at 2300-2500 per million (Cohen 2022).

Other studies have compared all-cause mortality data from before the pandemic to during, including Lewnard et al (2021) for Chennai, India, and Karinsky and Kobak (2021) globally.

3.5. GENERATIONAL DIFFERENCES AND THE FUTURE

In order to understand the impact of the pandemic on different generations, Duffy (2021) outlined three key aspects - when individuals were born (cohort effects), the age of the time of the pandemic (life cycle effects), and the impact of the pandemic (period effects).

Events in the earlier years (up to early adulthood) can have a stronger impact on the individual's whole life (as a generalisation). But, at the same time, Duffy (2021) was critical of "generational stereotypes": "Some approaches that define swathes of the population purely on when people were born are closer to astrology than serious analysis" (p35).

An important point is that pre-existing differences will be exacerbated by major events like the pandemic. "Covid-19 may well turn out to be a generation-defining event. If so, it is because it has laid bare and amplified not just the pre-existing inequalities between generations, but those within them, too" (The Leader 2021b p5).

The future of work is a concern after the pandemic. "The pandemic has brought people's differing life circumstances and opportunities to work into clear disparity. There have been winners and losers. Sectors that are functionally dependent on the internet and offer remote work options are likely to be less affected relative to those involving face-to-face interactions... Many people have made the abrupt shift to working from home, whilst millions have lost their jobs" (Hughes et al 2021 p145).

The inequalities created or perpetuated where individuals cannot work from home is the issue. Prior to covid-19, there was talk about how work was changing in the 21st century (eg: automation), with ideals like "good jobs" (eg: in a "Green Industrial Revolution") and "bad jobs" (Hughes et al 2021). The United Nations has used

the term "decent work" with its "core standards" of "freedom from forced labour; freedom from child labour; freedom from discrimination at work; freedom to form and join a union; and to bargain collectively" (Hughes et al 2021 p146).

Career guidance and counselling will have a role to play "in supporting individuals to build and articulate their career identity and narrative through career constructionism and constructivism" (Hughes et al 2021 p148).

Bassingwaighte (2020 quoted in Hughes et al 2021) described four types of advocacy for career guidance professionals to address inequality and promote opportunity:

i) Self-advocacy by empowered individuals themselves.
ii) Professional advocacy by the career service as a bridge between individuals and those in power.
iii) Citizenship advocacy to promote fair societies.
iv) Public advocacy to inform policies.

Hughes et al (2021) ended: "The notion of sustainable economic growth, full and productive employment and decent work for all presents both challenges and opportunities" (p150).

3.6. MISCELLANEOUS

Allowing covid-19 to spread among vaccinated and unvaccinated individuals, who mostly have no severe symptoms, has three main risks - increased long covid cases, workplace absences and the consequent disruption, and the possibility of new variants emerging. There is also the risk of individuals relatively unaffected by covid-19 passing on the infection to vulnerable individuals (Lawton et al 2021).

Demographer Joshua Goldstein stated that covid-19 had "become a disease of the unvaccinated, who are predominantly young" by mid-2021 (quoted in Mallapaty 2021). This is the case in countries which vaccinated older adults first.

In terms of children, severe symptoms are rare, but repeated visits to the doctor for up to six months was observed in a Norwegian study (Magnusson et al 2021).

But the response of potentially vaccinating children raises ethical concerns. Jennie Lavine, infectious diseases specialist, asked: "Are we really better off

giving the vaccine to kids in rich countries than to older people [in less wealthy countries] where it might have a much bigger impact on people's lives?... It seems hard for me to imagine a really good argument for that" (quoted in Mallapaty 2021).

Anne Cori modelled the deaths from covid-19 in England between 2nd July 2021 and 1st June 2022 as from 9400 to 113 000, depending on a variety of factors, like the effectiveness of vaccines, and people's behaviour (Lawton et al 2021).

With the arrival of covid-19, the US Government has started investing in breeding more monkeys for biomedical research at its primate centres. "Genetically and physiologically similar to people, primate models offer a way to run tests and experiments before human trials or when human trials are not possible" (Subbaraman 2021 p633).

Despite opposition to the use of such animals in research, rhesus monkeys, for instance, "were absolutely critical in the early testing of [covid-19] vaccines and therapeutics", explained James Anderson, US National Institutes of Health official (Subbaraman 2021).

3.7. LONG COVID

Cervia et al (2022) reported the discovery of an "immunoglobulin signature" that predicted long covid (or post-acute coronavirus disease 2019 (covid-19) syndrome (PACS)). That is a particular response by the immune system when initially infected with SARS-CoV-2.

This finding was based on a prospective study (with up to one year follow-up) of 175 individuals with covid-19 in Switzerland and compared to forty healthy controls. Just over half of the mild covid-19 cases and over 80% of the severe covid-19 cases had PACS (ie: covid-19-related symptoms lasting at least twelve weeks). The researchers produced a "PACS score" based on the "immunoglobulin signature", and applied it to 395 individuals with covid-19 to predict PACS. It was particularly sensitive with severe covid-19 cases.

3.7.1. Children

Concern about long covid and children has risen in 2021. Buonsenso et al (2021), for example, reported that

around one-third of 129 6-16 year-olds in Italy diagnosed with covid-19 had lingering symptoms four months later. While one-quarter of children discharged from hospital in Russia had symptoms five months later (Osmanov et al 2021).

Official UK figures in early 2021 estimated that 10% of under 11s, and 13% of teenagers had at least one symptom five weeks later as compared to 25% of 35-69 year-olds (Lewis 2021b).

The problem with all these figures is that long covid includes fatigue, headache, and insomnia which could be caused by pandemic-related stress (what Blankenburg et al (2021) called "long-pandemic syndrome"). The studies also tend not to have control groups (Jakob Armann in Lewis 2021b).

To over come this later problem, Armann (part of Blankenburg et al 2021) collected blood samples from children in Dresden, Germany. Of 1500 children, around 200 had anti-bodies indicating previous SARS-CoV-2 infection. There was no difference in rates of long covid symptoms between the children with anti-bodies and those without (ie: never infected; a "pseudo-control group").

A surveillance study ("VirusWatch") in England and Wales of 23 000 households found persistent symptoms after four weeks in under 5% of children (Miller et al 2021).

4. BEHAVIOUR AND MENTAL HEALTH

4.1. BEHAVIOUR

Public health measures to reduce the spread of covid-19 depend on compliance/adherence by individuals (as with any intervention or treatment). Is it possible to characterise who will comply and who will not?

Urban et al (2021) divided into preventive behaviours into three clusters - use of a face mask and protective gloves; personal hygienic behaviours (eg: handwashing); and keeping a physical distance from others and avoiding social gatherings (appendix 4A).

Studies tend to be self-report surveys with convenience samples, and a high risk of social desirability bias (Urban et al 2021). However, Urban et al (2021) described the following patterns:

i) Gender - Men less adherence to all three clusters of preventive behaviours.

ii) Age - "Being of a younger age is an important predictor of non-adherence to preventive behaviours" (Urban et al 2021 p365).

iii) Cognitive factors - For example, perceived risk and susceptibility to serious infection were association with adherence. Put simply, individuals who do not see covid-19 as a serious threat to themselves do not take preventive measures. Men and younger individuals perceive less risk. A direct covid-related experience increased adherence, and while low self-efficacy (eg: fatalism) decreased adherence.

iv) Substance use - No studies found by Urban et al (2021), except for smokers. Despite an increased risk and worry about covid-19, Jackson et al (2021), for instance, found that current smokers reported less adherence than never smoked among a large UK sample.

Urban et al (2021) speculated that "both the physical and social contexts of substance use,

predisposing personality characteristics (impulsivity, low self-control, delinquency) and the marginalisation of these groups may make substance users less adherent to preventive behaviours, while preventive behaviours and isolation, on the other hand, may increase problematic substance use, making the users more vulnerable to covid-19 infection" (p366).

Abaluck et al (2022) reported a randomised trial to improve mask-wearing in rural Bangladesh between November 2020 and April 2021. Six hundred villages were involved. The intervention group received free masks, information on the importance of mask-wearing, role modelling by community leaders, and personal reminders for eight weeks. The control group had none of these things.

Mask-wearing was significantly higher in the intervention group (42% of participants) than the control group (13%). This translated as the "intervention induced 29 more people out of every 100 to wear masks" (Abaluck et al 2022 p7).

The researchers observed: "Contrary to concerns that mask-wearing would promote risk compensation, we did not find evidence that our intervention undermines distancing behaviour... Evidently, protective behaviours like mask-wearing and physical distancing are complements rather than substitutes..." (Abaluck et al 2022 p2).

The intervention had a greater impact on men and mask-wearing.

There were less covid-19 cases in the intervention than control villages.

The observers scoring the behaviours in the villages were not blind to the group. "However, staff were not informed about the exact purpose of the study. Even though surveillance staff were plain-clothed and were instructed to remain discreet, community members could have recognised that they were being observed and changed their behaviour" (Abaluck et al 2022 p8).

Abaluck et al (2022) continued on the limitations of the study: "Although control villages were at least 2 km from intervention villages, adults from control villages may have come to intervention villages to receive masks, reducing the apparent impact of the intervention. Although we did not directly assess harms in this study, there could be costs resulting from discomfort with increased mask-wearing, adverse health effects such as dermatitis or headaches, or impaired communication" (p8).

The intervention involved different elements, and testing each one separately for its impact would have been ideal.

4.1.1. Lockdowns

In a meta-analysis of twenty-four studies, Herby et al (2022) concluded that "lockdowns have had little to no effect on covid-19 mortality" (p2). The reduction in mortality was calculated, at the most, as 3%, and so the authors rejected lockdowns as a pandemic policy instrument, with their economic and social costs as well.

Non-pharmaceutical interventions (NPIs) were also rated as low impact on mortality reduction, whereas closing non-essential businesses (eg: bars) was calculated to reduce covid-19 mortality by over 10%. Border closures, school closures, and limiting gatherings had little impact. Voluntary behaviour changes are better, the authors felt.

Science Media Centre (2022) summarised some of the key criticisms with Herby et al (2022), including:

i) "Lockdown" needs to be defined clearly because it encompasses different policies in different countries.

ii) When the mortality rate is calculated in relation to lockdown as there is a delay of several weeks between the imposition of lockdown and its impact on death rates. Seth Flaxman (in Science Media Centre 2022) used this analogy: "It's as if we wanted to know whether smoking causes cancer and so we asked a bunch of new smokers: did you have cancer the day before you started smoking? And what about the day after? If we did this, obviously we'd incorrectly conclude smoking is unrelated to cancer, but we'd be ignoring basic science".

iii) Growth rates of cases or deaths over time is a better outcome measure than total cases or deaths.

iv) Disentangling the impact of individual NPI measures is "extremely challenging" as measures are usually combined. "Analysis has been further complicated by the accumulation of immunity (from infection and vaccination) in populations together with the emergence of new covid-19 variants" (Neil Ferguson in Science Media Centre 2022).

v) The inclusion and exclusion criteria of studies in the meta-analysis.

vi) A better measure of the impact of covid-19 and response policies would be overall excess deaths.

4.2. MENTAL HEALTH

Individuals with diagnosed mental disorders are particularly vulnerable to covid-19 in terms of physical health (eg: higher risk of health problems), and mental health (eg: exacerbated distress from the pandemic and lockdowns), as well as with unhealthy lifestyle behaviours (eg: alcohol and tobacco consumption) (Chapman et al 2021).

Chapman et al (2021) investigated the factors that made the pandemic a worse experience for individuals already with mental disorders. Data on fifty individuals in Australia were available from prior to covid-19 (Time 1 (T1): 2018 - March 2020), during lockdown (T2: May 2020), and post-lockdown (T3: July - September 2020). The measures included general psychological distress, loneliness, resilience and coping, social support, alcohol and tobacco use, sleep, diet, and exercise (table 4.1).

- Kessler-6 scale of psychological distress (K6) (Kessler et al 2003) - Six items covering the past month (eg: "so depressed that nothing could cheer you up"; "that everything was an effort"), scored from "none of the time" (0) to "all of the time" (4).

- World Health Organisation Well-Being scale (WHO5) (Newnham et al 2010) - Five items covering the past two weeks (eg: "I have felt cheerful in good spirits"; "I have felt calm and relaxed"), scored from 0 ("at no time") to 5 ("all of the time").

Table 4.1 - Psychometric scales used for outcomes measures.

Thirty-eight participants were classed as having psychological distress at all three T. Eight respondents moved from low (T1) to high psychological distress (T2), and five remained high at T3.

Psychological distress during the pandemic was exacerbated by reduced social support, increased alcohol consumption, poor sleep quality and diet, and co-morbid mental disorders. The latter factor had the strongest impact. The opposite of these factors improved well-being. "Interestingly, having a physical disease was associated with lower distress. This could be because people with a physical disease may receive additional support permitted during the pandemic which is protective against deleterious changes..." (Chapman et al 2021

p624).

Chapman et al (2021) ended: "Healthy lifestyle programmes that increase social connection may help people with multiple conditions improve health, which is particularly important for during and after the covid-19 pandemic" (p624).

4.3. BURNOUT

The medical and healthcare professions have always been demanding with the potential for "burnout", even before the increased workload of covid-19. For example, studies have reported burnout in 35-45% of nurses and 40-45% of doctors prior to covid-19 (Antonsdottir et al 2022) [3].

Maslach and Jackson (1981) defined burnout as "a set of symptoms involving a physical and psychological dimension, including negative attitudes derived from work and personal relationships that lead to exhaustion, fatigue, distress, and despair" (Rivas et al 2021 p1). The continuous exposure to stress is key. Resilience, defined as "a person's multi-dimensional learning capacity that enables them to function at a high level when dealing with adversity" (Rivas et al 2021 p2), can help.

Research has been performed into the specific risks of burnout and covid-19. For example, Rivas et al (2021) surveyed just over one hundred nurses in Spain in May 2020. The key measures were the Maslach Burnout Inventory (Maslach and Jackson 1981), and the Scale of Resilience of Connor-Davidson (CD-RISC-10) (Connor and Davidson 2003). The former has twenty-two items covering three dimensions - "emotional fatigue or emotional burnout" (EF) (eg: "I feel used up at the end of the workday"; "I feel frustrated by my job"), "cynicism" (C) (eg: "I don't really care what happens to some recipients") [4], and "personal fulfilment" (eg: "I have accomplished many worthwhile things in my job") (PF) - each scored 0 ("never") to 6 ("on a daily basis"). The 10-item CD-RISC-10 includes items covering the ability to adapt to change, a strong sense of purpose, and close social support.

The overall mean Maslach Burnout Inventory score was

[3] Medical and healthcare professionals have inter-disciplinary colleagues that include social workers, and chaplains/religious or spiritual advisors. There are fewer studies on burnout among these individuals (Antonsdottir et al 2022).

[4] Some versions of the Maslach Burnout Inventory have "depersonalisation" instead of or as well as cynicism.

74 (out of 132), while the means for the three dimensions were 30 (out of 54) for EF, 9 (out of 30) for C, and 36 (out of 48) for PF. There were no gender differences in the means, though only eight respondents were male.

Analysing the responses in more detail, the type of contract had some impact. Permanent staff scored significantly higher on EF and significantly lower on PF than temporary staff. Staff working in units with covid-19 patients scored significantly higher overall, and on EF, than nurses working in non-covid-19 units.

The overall mean score on the CD-RISC-10 was 28 (out of 40). This score significantly positively correlated with the PF score, and significantly negatively correlated with EF on the Maslach Burnout Inventory.

In summary, the "level of burnout in nurses was high, being higher on those who took care of covid-19 patients" (Rivas et al 2021 p1).

The study used standardised psychometric measures, but involved a volunteer sample from one hospital.

Mental health professionals also reported significant levels of psychological distress and burnout in a survey in January 2021 (Northwood et al 2021). One hundred and thirty-eight respondents were recruited from a large metropolitan mental health service in Queensland. They rated their anxiety on a scale of 0-100 currently and recalled March 2020. Two standardised measures were completed for current feelings - the Depression Anxiety Stress Scale (DASS-21) (Lovibond 1995), and the Copenhagen Burnout Inventory (CBI) (Kristensen et al 2005). The DASS measures anxiety, depression, and stress with 21 items (table 4.2), while the CBI covers two areas of burnout - work-related (eg: "Is your work emotionally exhausting?") and client-related (eg: "Do you find it hard to work with clients?").

- "I find it hard to wind down" (stress)
- "I was aware of dryness of my mouth" (anxiety)
- "I couldn't seem to experience any positive feeling at all" (depression)

Each item scored as "did not apply to me at all" (0) to "applied to me very much or most of the time" (3) in the past week.

Table 4.2 - Example of items from DASS-21.

Overall, the "majority of respondents felt that the pandemic had had a negative impact on their workplace

culture (encompassing raised workload intensity, high acuity of patients, and need to cover emergent leave), however this was contrasted with a perceived benefit of increased work flexibility afforded by telehealth/working from home" (Northwood et al 2021 p629).

Self-reported anxiety was significantly lower in January 2021 compared to recalled for March 2020.

On the DASS-21 responses, over half reported moderate to severe levels of depression and anxiety, but only one-fifth had moderate or severe stress scores. Moderate or severe work-related burnout was reported by around one-third, but patient-related burnout by less than 10% of respondents on the CBI.

Themes and quotes from the open-ended questions included:

- Increased workload "due to low staffing" (p631).
- Benefits of home working (eg: "working from home actually increased my productivity"; p631) versus frustration from those who could not (eg: "inpatient services were unable to work from home"; p631).
- Training opportunities reduced.
- Economic and social impact (eg: "unable to check on physically failing parents"; p632).

4.3.1. Moral Distress

"Moral distress" contributes to burnout. This is "when a clinician's integrity is threatened as a result of conflicting or unmet fundamental professional values that create dissonance between what an individual believes one ought to do and what one is actually doing... Witnessing, participating in or falling short of moral obligations under conditions of constraint or duress can lead to moral distress" (Antonsdottir et al 2022 p197). This can be combatted by "moral resilience", which is "the ability to preserve or restore integrity in response to moral adversity" (Rushton 2018 quoted in Antonsdottir et al 2022). It includes "a stance of stable and focused attention, clarity about what values one stands for and embodies, non-reactive discernment to determine actions, congruence with one's values, and at times, the courageous enactment to speak up and act in order to uphold fundamental moral commitments" (Antonsdottir et al 2022 pp197-198).

Antonsdottir et al (2022) investigated moral resilience and burnout in the USA among nurses and doctors, but also chaplains and social workers. Over six hundred staff from five hospital systems in the eastern USA responded to the online survey in 2018.

The Rushton Moral Resilience Scale (RMRS) (Heinze et al 2021) was used to measure moral resilience. This has seventeen items covering four areas - "responses to moral adversity" (eg: feeling powerless when faced with ethical challenges), "personal integrity" (the ability to uphold one's values in response to moral adversity), "moral efficacy" (the confidence to address ethical challenges), and "relational integrity" (eg: personal values that conflict with colleagues' values). A version of the Maslach Burnout Inventory, and the CD-RISC-10 were also included in the survey.

One-sixth of the respondents reported facing no ethical dilemmas in the last month, while around one-tenth had experienced nine or more such events. Staff from all the different disciplines experienced "some form or level of burnout" (Antonsdottir et al 2022 p204).

After controlling for work and demographic characteristics, burnout (Maslach Burnout Inventory scores) was found to negatively correlate with moral resilience (RMRS scores). Burnout was associated with longer time in the profession, and working in high-risk settings (eg: emergency department), for instance.

4.4. APPENDIX 4A - POST-PANDEMIC RESPONSIBILITY

Encouraging contagious individuals who do not feel very ill to stay away from the workplace is good practice with covid-19 (and other infections), but workers feel the pressure of "presenteeism" (ie: "continuing to work when sick or injured"; Goodman 2021 p23).

But why do workers not stay at home if infectious? "A central impetus stems from a rational assessment of the potential costs of taking time off. Self-employed people may simply go unpaid; those on zero-hour contracts risk losing their shifts permanently and those with apparently more stable employment risk being seen as unreliable... Workers with more senior or secure roles may feel an obligation to colleagues to do their fair share of the work..., or a need to set an example for less senior staff... Workers' self-conceptions as team players may also encourage presenteeism" (Levy and Savulescu 2021 p122).

Sick individuals who struggle to work are less

productive than healthy ones, and are more likely to make mistakes (Levy and Savulescu 2021).

Levy and Savulescu (2021) stated: "Pre-pandemic, unwell people would often be congratulated by bosses and co-workers for their fortitude in continuing to come into the workplace. This is a theme of many advertisements for cold and flu medications: they are alleged, for example, to allow the person to 'soldier on'. We argue that these norms should be reversed. Workplaces should discourage employees from working when unwell, inverting the current incentive structures. Senior management can model this behaviour; doing so seems to be effective in changing workplace culture" (p123). In other words, by changing norms.

Surveillance of citizens (eg: testing and contact tracing) can also help, as well as other structural changes (eg: school closures and support for parents).

Levy and Savulescu (2021) argued that the "response to covid-19 provides guidance as to what is possible and advisable in response to other infectious diseases and in particular seasonal influenza. Influenza is not the killer that covid is — not usually, in any case — but its annual toll is large, and its cumulative burden exceeds covid-19. Addressing it is not as urgent as addressing covid-19 (the cumulative toll is not paid at once, of course, so if we delay a year or two, we will still be able to reap most of the benefits) but it nevertheless extremely important" (p129).

The traditional randomised clinical trial (RCT) takes a long time and the need for answers with covid-19 has led some to look for quicker ways of answering questions about the medication that works. In the mid-2010s, for example, it was estimated that the average cost of the RCT of a new medication was $19 million, and took anything up to ten years to regulatory approval (Arnold 2021).

Two alternatives are adaptive trials (a shortened version of traditional RCTs and with a smaller placebo group), and platform trials (the testing of multiple drugs in different arms of the same trial). With the latter, the question moves from "is one particular drug effective" to "which drug is the best at treating a certain condition" (Arnold 2021).

The RECOVERY trial in the UK begun in March 2020 to test which drugs reduced the chances of dying from covid-19 is a platform trial. The I-SPY2 trial of drugs to slow breast cancer progression combines both alternative methods (Arnold 2021).

5. SOCIOLOGICAL ANALYSES

5.1. DATABASE GOVERNMENTALITY

Data on positive cases and test numbers, among other things, have accompanied covid-19, sometimes in "real-time updates... At the same time, nation states, local governments, and health officials cite ratios, averages, percentage rates, and mathematical models as discursive techniques of 'normalising' and 'rationalising' disease" (Chowdhury and Basu 2021 p2). Such data can be seen as "a tool of biopolitical governance" - ie: "making the 'population' knowable and manageable by measuring and analysing its behavioural characteristics" (Chowdhury and Basu 2021 p2).

But data are problematic and can be seen as constructed rather than discovered. Add to that controversies about the "deliberate downplaying of the extent of disease", especially in India, which Chowdhury and Basu (2021) discussed.

The authors referred to "database governmentality" as a version of biopolitical governance (appendix 5A), "which entails the translation, storage, and interaction of persons reconstituted as data and information across a multiplicity of databases" (Chowdhury and Basu 2021 p3). Singh (2019) talked of "transferring a nation-state into a vast database" (quoted in Chowdhury and Basu 2021).

Chowdhury and Basu (2021) considered covid-19 testing in this context: "The testing apparatus involved includes not just the testing kits themselves but also supply chains, administrative regulations, patient bodies, laboratory work, and administrative reporting: regulations determine who gets tested, bodies must be made available for testing, and labs are crucial as thresholds where bodily substance gets translated into barcodes and statistics that thereafter travel across different databases" (Chowdhury and Basu 2021 pp4-5).

Testing data in India have been plagued by problems

as the individual collectors pass on the information to state authorities and then to national authorities to produce the total numbers tested and positive cases. "Data problems include the 'duplication' of testing data across multiple databases; the 'unassignment' of positive tests to a location when states are unable to determine where the disease has been contracted; and the 'abandonment' of testing data that cannot be integrated into any database. The seemingly chaotic state of testing data in India would appear to give credence to Ian Hacking's [1982] argument that '[t]he fetishistic collection of overt statistical data about population has as its motto "information and control" but it would more truly be "disinformation and mismanagement"' (Chowdhury and Basu 2021 p6).

Chowdhury and Basu (2021) collected secondary data on covid-19 testing problems from March 2020 to January 2021 from newspaper articles, blog posts, social media, and other Internet sources.

The situation was this: test kits were presented as "'technologies of certainty', expected to produce knowledge about the pandemic, facilitate strategies, and build trust between the public and the government" (Chowdhury and Basu 2021 p8). But the reality was more fluid, ambiguous, and uncertain, specifically in relation to data collection. For example, the use of the "other" category for those who did not fit the official covid categories, and this category became a catch-all. There was a story of a doctor who discovered that PCR tests uploaded under the "other" category meant that the individuals were not allowed a retest if they developed covid-19 symptoms (Chowdhury and Basu 2021). "To what extent testing classifications and databasing have contributed to people's suffering during the pandemic is a matter of debate" (Chowdhury and Basu 2021 p11).

Chowdhury and Basu's (2021) point can be summed up thus: "Pandemic databases... are insufficient technologies for handling the complex lived realities of disease" (p20).

5.2. DIAGNOSTIC CITIZENSHIP

Concentrating on the USA, Price (2021) "described an oddity of SARS-CoV-2 diagnostic testing — referred to here as a 'persistent positive' — in which an individual can test positive for covid-19 for weeks or even months after initial infection despite no longer being

symptomatic or contagious" (p1). This was because, for instance in Florida, two negative tests were required before a healthcare worker could return to work.

Another issue is the testing regimen. "Once swabs are taken for testing, a machine detects fragments of the virus's RNA in the sample. This tells lab staff whether the genetic material is present — and that's all. We incorrectly conflate the presence of the virus's RNA with the presence of a virus capable of spreading. The way to tell if someone is actually contagious is to see if the sample can be cultured in the laboratory. If so, the virus can replicate and spread. With covid-19, viral debris or leftover RNA fragments can shed for extended periods after illness and be detected but not cultured. Data suggests that mild covid-19 cases are contagious for just around ten days" (Price 2021 p3).

A situation is created of "biological citizenship, perhaps a diagnostic citizenship... [where] certain people need a certain result, no matter what the result means biologically, to exercise certain rights... To fully realise this citizenship, they engage in a sort of calculus to find their way out of the testing problem: strategically navigating bureaucracy, constantly searching for testing sites, and repeatedly testing as a means of reclaiming their right to work" (Price 2021 p8) [5].

5.3. SCARED OF THE INVISIBLE

A scary aspect of infectious diseases is the spreader of the infection who shows no "perceptible clinical manifestations of disease" (Lowy 2021 p2).

The SARS epidemic in 2003, for example, was not like this. "Successful control of the SARS outbreak was attributed above all to the fact that only symptomatic patients were contagious. Visibility of infectious individuals facilitated their isolation, the strict quarantine of their contacts, the closing of infected sites, and the interruption of transmission chains" (Lowy 2021 p3). SARS-CoV-2, however, is transmissible by asymptomatic individuals. Thus, the importance of diagnostic and medical tests that spot the infection in individuals showing no overt symptoms.

[5] Price (2021) explained: "Significantly, we call it a diagnostic test and not a detection test. 'Diagnosis' implies a clinical condition and often contagion, whereas 'detection' implies a mere biophysical presence. Biology warns us about the possibility of persistent positives; it is not the problem. Rather, the problem arises when biology is mis-inscribed into biopolitics; that is, when those in power register detection as diagnosis and rework social life around a positive test result no matter its meaning" (p4).

"The propagation of pathogens by symptom-free individuals is an especially perilous situation because it conjugates two levels of invisibility — that of the pathogen itself and that of the danger of contact with the innocuous-looking people who spread it. Accusations that external or alien groups deliberately provoke epidemics have been made since antiquity" (Lowy 2021 p4). For example, "Typhoid Mary" in 1907 New York. She (Mary Mallon) was an Irish cook working for upper-class households in New York who was an asymptomatic carrier of typhoid bacilli. "Since typhoid fever was seen mainly as a disease of the urban poor, one of the most scandalous elements of Mallon's story was the repeated contamination of upper-class families — people who lived in houses with running water; tiled bathrooms; water closets; and modern, functional kitchens, and who trained their servants to respect hygiene rules" (Lowy 2021 p6).

Other examples from history include hookworm (a parasitic disease) which was blamed on rural "backwardness" in the early twentieth century in the USA, and HIV/AIDS which was initially viewed as a disease of male homosexuals and/or drug addicts (Lowy 2021). In each case, there is someone to blame (usually an outsider), even if that is scientifically incorrect. But who to blame for covid-19?

"Diagnostic tests can reduce the uncertainty pandemics cause, but cannot eliminate it entirely... The meaning of a positive test result is impossible to dissociate from the wider socio-technical, legal, cultural, and political networks in which it is embedded. Tests can be thus be described as belonging to the domain of 'trans-science' [Eyal 2019] — that is, of questions which can be asked of science and yet which cannot be answered by science alone" (Lowy 2021 p18).

Two approaches to covid-19 have been used by governments, in the main - eradication and containment. "Countries that adopt the eradication model [eg: New Zealand] wish to eliminate SARS-CoV2 from their territory. To achieve this goal, they need to diagnose — that is, unmask — all the pre-symptomatic/asymptomatic carriers of SARS-CoV2 present on the national territory, then ensure that they will not contaminate others by isolating them until they test negative for the virus. An eradication campaign implies zero tolerance of carriers of pathogens, be they mosquitoes or humans" (Lowy 2021 p19).

On the other hand, "[C]ountries that aim to contain covid-19 have a more modest goal. They seek to test all symptomatic people, their close contacts, and selected

'at-risk' groups, but recognise that it is not technically possible to 'unmask' all the symptom-free carriers of SARS-CoV2" (Lowy 2021 p20).

Measures to reduce transmission are important in both cases. But, in the USA, for example, such measures like face masks are rejected by some as a violation of individual liberty. "A reluctance to recognise one's potential responsibility in the dissemination of dangerous pathogens resonates with a long tradition of stigmatising 'pestilence spreaders'..." (Lowy 2021 p20). Individuals do not want to blame themselves as the cause of infection.

"Epidemics are frightening, and so are invisible — or 'masked' — carriers of pathogens. Their 'unmasking' by a diagnostic test is often presented as an essential step towards eliminating a threat. Such a view may promote the stigmatisation and ostracism of pathogen carriers and hamper efforts meant to persuade actual or potential spreaders of disease to adopt behaviour which minimises the risk to others" (Lowy 2021 p21).

5.4. TIME AND CAPITALISM

Suckert (2021) outlined a non-medical challenge of the covid-19 pandemic. It "requires a manner of dealing with time that is in many respects opposed to what we are used to... Growth, acceleration, efficiency: these are the virtues our capitalist system normally extols. Where time is money, things can never increase fast enough. Consequently, the coronavirus is not only a medical threat but also collides with the temporal logic inherent to capitalism" (Suckert 2021 p1163).

Suckert (2021) described five features of the "temporal order of capitalism":

i) Measurement and commodification of time - Historically as capitalism developed, so the measurement of time became established with clocks and calendars. "The standardised assessment of time is an essential condition for time to become a commodity. Only when it is conceptually separated from its bearer and context can time be considered an entity to be priced, exchanged, sold and bought. Major building blocks of capitalism, such as wage labour or interest rates, rely on the fundamental idea that time can be treated as an abstract commodity" (Suckert 2021 p1166).

ii) Temporal expansion - The "expansion" of time

under capitalism is seen as "capitalism has gained access to additional reservoirs of time by extending its logic to ever wider aspects of life. Previously unpaid private time is turned into paid public time...: free leisure time has been transformed into time for consumption and commercial forms of relaxation; and unremunerated efforts, like care work and household chores, into (low-)paid jobs" (Suckert 2021 p1167).

iii) Acceleration - This is the idea of doing more in the time available. "Capitalism pushes actors to outpace their peers, destroy the old, and search for new opportunities; to 'move fast and break things', as Mark Zuckerberg famously claimed. From the spinning jenny to new waves of digitalised algorithmisation, technological advances have thus been used to increase the pace of production, commercialisation and consumption... and expedite monetary accumulation" (Suckert 2021 p1167).

iv) Appropriation of the future - "Capitalism is driven by actors' unwavering faith in the open future. Any kind of entrepreneurship or investment depends on the propensity to imagine better days ahead" (Suckert 2021 pp1167-1168).

v) Unequal temporal autonomy - Though the above features are universal to individuals under capitalism, there are differences based on wealth. "Money makes it possible to speed up processes, buy back 'free' time or keep the future open. With the help of money, one may force others to wait or adapt their rhythms. Drawing on the concept of 'power-chronography, Sarah Sharma (2014) has for example shown how the capacity of the privileged to speed up or slow down at will is enabled by less privileged actor groups who are granted less temporal autonomy. Making others hurry or forcing them to wait represent two opposing but similarly effective modes of domination" (Suckert 2021 p1169).

All of these features suggest certainty and control of time, to some degree, and the covid-19 pandemic has challenged "the dubious illusion of a predictable future and forcefully re-establishes the radical uncertainty about what is to come. Wage earners, entrepreneurs and economic policy makers have become unable to plan for the next months, weeks or sometimes even days. The global scale of the crisis, affecting almost every national economy, industry, business or private household on the planet (though to different extents, of course) renders

the attempt to rationally predict the future illusionary. The instruments our capitalist society usually employs to cope with – or even take advantage of – the indeterminacy of the future, such as forecasts, insurance, risk analyses or risk scenarios..., are overwhelmed by levels of uncertainty unprecedented since the Second World War" (Suckert 2021 p1170).

But the temporal experience of the pandemic ("the redistribution of time budgets") has varied - for some, life has become busier (eg: key workers), while others have had long periods of movement restrictions (eg: stay-at-home orders).

Suckert (2021) hoped that the post-pandemic time will offer "pathways for mitigating and reducing the demands of the capitalist time regime to more manageable levels and empowering a culture of temporal diversity" (p1174).

5.5. VIRAL MORAL PANICS

Before the arrival of covid-19, "apocalyptic forecasts" about infectious diseases were evident in the last half century. Ungar (2013) explained: "As infectious diseases retreated in the first half of the twentieth century because of a combination of medical and socio-economic factors, the US Surgeon General informed Congress in 1969 that it was conceivable to 'close the book on infectious disease' (Garrett 1994). Perhaps the gods were riled by such hubris, as these diseases have resurfaced and become a major source of social anxiety. While penicillin seemed to provide a magical jab, new forms of resistant gonorrhea, followed by herpes and then AIDS revived the threat of sexually transmitted diseases. Tuberculosis made a comeback in a multi-drug resistant form and other bacteria, such as MRSA, also evolved in ways that rendered them exceedingly difficult to treat. Swine flu Fort Dix, Ebola, mad cow or CJD, West Nile, SARS, avian flu, and swine flu redux or 2009 H1N1 have all engendered dire warnings of runaway outbreaks and prompted concerted societal efforts to contain them" (p349).

The reaction to these concerns could be described as "moral panics" (Goode and Ben-Yehuda 2009). This idea is interesting as we stand post-arrival of covid. But Ungar (2013) argued that "fear generation is linked to enhanced contagion monitoring and associated technological innovations that render organised responses feasible and thereby create a moral incumbency on political and

medical authorities — the 'guardians of public safety' — to respond in a timely way" (p349).

Disproportionality is a key criterion of a moral panic. Yet there is a problem of "what constitutes a realistic level of concern, anxiety, or alarm" (Hier 2009 quoted in Ungar 2013).

"In the discovery of a novel (read, unpredictable) viral outbreak, medical and political officials are likely to feel that they are acting 'under the gun' and do not want to be caught holding the 'hot potato' should it turn out to be particularly lethal. The cost of over-reacting, of using positions of oversight to stoke moral panic, is a seemingly less costly option for guardians of public safety than to be rendered the targets of moral outrage for vacillating and not doing enough to prepare for the threat" (Ungar 2013 p355). This statement is interesting in a context where governments have been criticised for not reacting quick enough to covid-19.

Ungar's (2013) idea of "viral moral panic" is interesting, as I said earlier, looking back in a "covid world". What will it mean for future "mystery diseases" that appear, even more of a "moral panic" or will we be old hands?

5.6. PANDEMIC PREPAREDNESS

"The covid-19 pandemic has prompted many questions about how the world can prepare for and respond to emerging disease threats" (Thompson 2021 p2). One aspect of this is the relationship between humans and poultry. "As poultry numbers grow, the production process intensifies, bringing together people, birds, and microbes in new and transformative ways" (Thompson 2021 p3).

Preparing for a future pandemic is "not explicitly about prevention, but rather the development of techniques and technologies that build resistance and act as early warning systems" (Thompson 2021 p6). One technique is the hunting of signs from "sentinels" (akin to the "canary in the coal mine" to detect lethal odourless gas). This includes watching birds for signs of disease, which is increasingly common in south-east Asia, and to control viruses "at source" (Fearnley 2020). In fact, Keck (2020) described Hong Kong as a "global sentinel post".

Simulations for disaster management of future pandemics is another technique. For example, "microbiologists, public health officials, and

birdwatchers conduct different types of simulations in order to speculate on the different ways in which viral pandemics could be managed" (Thompson 2021 p9).

A further technique of preparedness is the stockpiling of biological samples by the World Health Organisation ("a new form of biovalue"; Keck 2020), for instance. "Thus, whereas storage produces value as it allows for the accumulation of viral samples to be shared, stockpiling and the hoarding of viral strains produces value through the anticipation of future outbreaks" (Thompson 2021 p10).

Keck (2020) ended that "the ecology of infectious diseases has showed that viruses are not intentional entities aiming at killing humans, but signs that the equilibrium between species in an ecosystem has been disrupted" (quoted in Thompson 2021). While Porter (2019) rejected the idea of one way of living with non-human species, and argued for "more inclusive, more-than-human worlds" (quoted in Thompson 2021).

5.7. NOT ALWAYS SAFE AT HOME

During lockdowns the home became the focus of experience, and Hopkinson and House (2021) explored the meanings related to this. Proximity and intimacy were key elements to the experience. However, these can be ambivalent. "Being socially close to others is potentially frightening because people recognise that their intimates, whom they understand themselves with and in relation to, are, by dint of their closeness, capable of doing great harm" (Hopkinson and House 2021 p4). For example, increased calls to domestic abuse support helplines during lockdowns (Hopkinson and House 2021).

Enforced lockdown played into domestic abuser's hands in, for example, the opportunity for increased surveillance, and isolation. "The increased proximities caused by limiting social contact outside of the normative household through, for example, furloughing, working from home, and loss of employment can make surveillance easier for abusers to perpetrate" (Hopkinson and House 2021 p11). Isolation is a tactic of control by abusers, and the consequent increased reliance of the victim upon them. In one survey in 2020 victims reported that abusers had gained more control since the pandemic began (Hopkinson and House 2021).

Hopkinson and House (2021) asserted: "Making the household the model of moral social proximity under lockdown reinforces the idea that domestic relations are

inherently affirming and 'safe'" (p13).

5.8. ACADEMIC INEQUALITY

The pandemic and lockdowns have disproportionately impacted women, particularly working women with children. For example, concentrating on academic researchers, studies have found fewer female authors on published papers since 2020 (table 5.1). The explanations for the difference include factors like "increased domestic responsibilities of women, access of men to covid-19 research, and gender discrimination in the peer-review process" (Ali and Ullah 2021 p146). Meanwhile, male academics have benefited from the support of their often non-working partners (Ali and Ullah 2021).

Study	Main Finding
Pinho-Gomes et al (2020)	Women authored only one-third of papers on covid-19 published up to May 2020.
Frederickson (2020)	Analysis of pre-prints at arXiv and bioRxiv in early 2020 found the majority of articles on STEM (Science, Technology, Engineering and Mathematics) were male.
Anderson et al (2020)	Female authors of articles about covid-19 in March and April 2020 was "particularly low".
Gabster et al (2020)	Female authorship of 159 papers on covid-19 in "Lancet" journal was around one-quarter.

Table 5.1 - Four studies on female academic authorship in 2019 and 2020.

Ali and Ullah (2021) explored the experiences of thirteen female academics in Pakistan via telephone or Internet-based interviews lasting between 30-50 minutes. Questions related to academic work, domestic responsibilities, and the impact of lockdown on well-being. Two over-arching themes emerged with various sub-themes:

1. "Academic responsibilities during covid-19" - Sub-themes included adapting to online teaching, research student supervision, and continuing with personal research work.

The change from face-to-face to online to teaching is summarised by "P [participant] 10": "Delivering a lecture to unresponsive students who had muted cameras and microphones was frustrating. I had no idea if they

were listening to me or watching a movie or scrolling through Facebook. I felt like I was speaking to the walls. Delivering 1.5 hours of the lecture was like walking on trail 3 [one of the many lively and challenging uphill trails in Margalla hills of Islamabad]. It was exhausting and stressful" (p149).

The lack of division between work and home was shown by this comment by "P5": "Before covid-19 I often met research students once a week or when needed to discuss anything. But after lockdown, I feel I am available for them 24/7. They can call and text me any time and I have to assist them instantly" (p149).

2. "Lockdown and family life" - This category included domestic chores, child care and care for older relatives, and the women's well-being.

"Some participants believed that working from home had reduced family time as women were busy either doing domestic work or academic tasks round the clock. They did not have time to sit and chat with their families. One participant who did not have children stated, 'I usually take my classes and meetings and perform official assignments in my room, I only come out either to cook or clean or eat so I feel that I am unable to spend time with them like before'(P8)" (Ali and Ullah 2021 p150).

This comment by "P4" summarised this theme: "Well-being at a personal level is rest and peace of mind. Sleepless nights and burdens have increased due to the increase in administrative and academic tasks along with the need to care for young kids. As a result, my self-care has deteriorated; I have put on weight and my skin is impaired. So I have served everyone but neglected myself" (p151).

Ali and Ullah (2021) summed up: "The findings show that women academics remained overwhelmed by the workload; lacked support; and endured a tiring struggle to manage their official duties and familial responsibilities. They were stressed and stuck in their children and family care and online teaching and had hardly any time for academic writing" (p145).

5.9. APPENDIX 5A - BIOPOWER AND SURVEILLANCE

"Surveillance" as conceptualised by Michel Foucault is "not only a form of a liberal governmental rationality seeking maximum effectiveness and managing the market and the population by observing, classifying and sorting

individuals, but is also intended to capture the contingent features of the 'uncertain'... that characterises our times" (Ceyhan 2012 p38). A specific aspect of this is "biopoliticised surveillance, that is surveillance taking the human body and its movements as the focal points..." (Ceyhan 2012 p38).

The dependence on information and communication technologies (ICTs) in the world today means that the " actual holders of power are not exclusively states but private organisations like Google where information about billions of people is offered to everybody as material for processing and assessing without limitation, hierarchical order and precise location. Hence the emergence of a new way of managing individuals, their life and living: an electronic and digitised (bio)power which is more open-ended, flexible and embedded in domestic life as opposed to the classical territorialised bio-power of the nineteenth century which was the attribute of first the sovereign and then the market" (Ceyhan 2012 pp38-39).

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7. ADDENDA

7.1. COMPLIANCE WITH PHYSICAL DISTANCING MEASURES

Over 180 countries have introduced some form of physical distancing policy in response to the covid-19 pandemic at some time (Junaedi et al 2022).

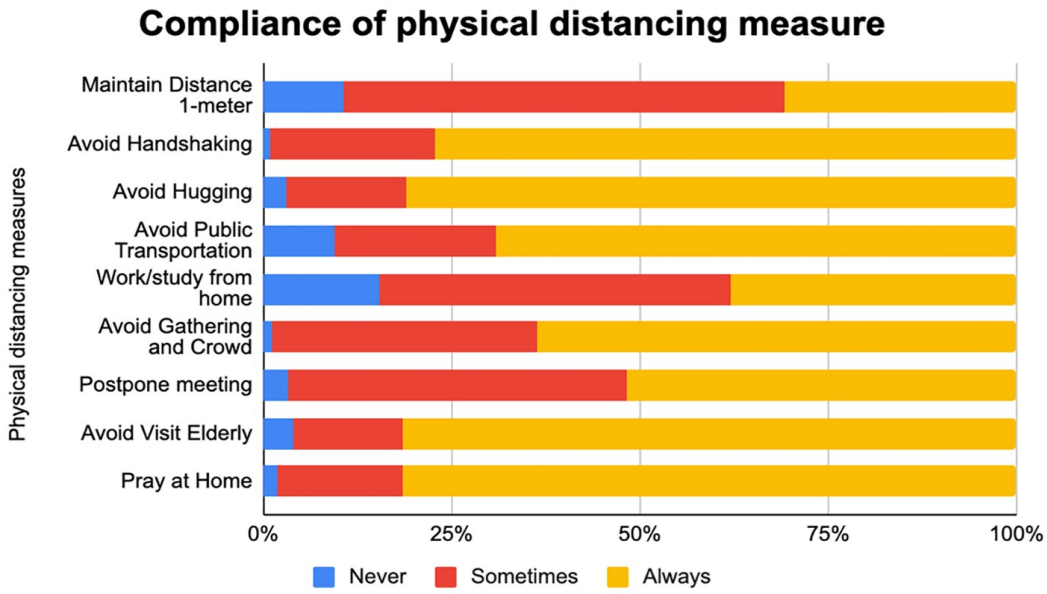
The success of such policies depends upon co-operation and compliance/adherence by the general population. Studies from previous pandemics (eg: H1N1 influenza in 2009) have suggested certain factors are associated with adherence to such policies, like knowledge of the disease, cultural values, social and psychological factors, and support for the policies (Junaedi et al 2022). For example, a study in Sierra Leone during the Ebola outbreak found that understanding of the term "isolation" was key to compliance with quarantine measures (Caleo et al 2018).

In relation to covid-19, Junaedi et al (2022) investigated compliance to physical distancing measures among young adults in the Jakarta Metropolitan Area, Indonesia, in July-August 2020. Data were collected from 330 20-33 year-olds vis online questionnaires and discussion groups. The participants were recruited via snowball convenience sampling from social media networks.

Nine measures of physical distancing were used, including "maintaining a one-metre distance", "avoiding handshakes", and "praying at home", and each was scored as "never" (1), "sometimes" (2), or "always" (3) to give a total score. A higher score signified greater compliance to physical distancing measures.

Eighteen participants agreed to join in online focus groups, and twenty-nine in "photo-voice" sessions (audio commenting on photographs - eg: three people in a lift).

The mean compliance score was 23.2 (out of 27). Compliance was lowest for the individual measures of "maintaining a one-metre distance", "work/study from home", "avoiding gatherings and crowds", and "postponing meetings" (figure 7.1). Overall compliance was physically associated with the tendency to work or study from home compared to choosing or having to physically be at a workplace or educational institution. Compliance was negatively associated with celebrating religious days, and living in the city.



(Source: Junaedi et al 2022 figure 1)

Figure 7.1 - Percentage of responses to nine physical distancing measures.

The following themes emerged from the discussions in relation to barriers and facilitators of compliance:

i) Implementation of government policy - eg: whether a company offered the option to work from home.

ii) Social pressure - eg: negative comments in the family about not attending a religious gathering.

iii) Clear and easy-to-understand indications of physical distancing - eg: cashier behind a transparent screen at a coffee shop.

iv) Workplace as a barrier and a facilitator - eg: a policy of 50% of employees in the office vs having to meet people face-to-face as part of the business.

v) Self-awareness - eg: not getting into a lift with other people.

In summary, compliance was high among the sample, and the opportunity to work or study from home (and to make use of it) was key. Junaedi et al (2022) stated: "The feasibility of adhering to physical distancing measures was also revealed as one of the factors associated with compliance. The ease of performing each

physical distancing measure encouraged compliance. When people had more pressing concerns, such as working or seeking medical treatment, they tended to ignore the rules" (p13).

The sample in this study was not representative of the population as a whole as it included only individuals with access to social media, who volunteered to participate. Around two-thirds of the respondents were female, and the sample was better educated and richer than the average. Individuals working in the "informal sector" were lacking, and such individuals were more likely to have to work in face-to-face situations.

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7.2. HERD IMMUNITY DISCOURSES

"Natural herd immunity" is "understood as indirect protection from an infectious disease due to sufficient immunity acquired by previous infection within the local community" (Zenone et al 2022 p1). It has been proposed by some scientists (eg: "Great Barrington Declaration" [6]) and governments (eg: Sweden) as a containment strategy for covid-19, while the WHO, for instance, has been critical as "the death toll from a herd immunity approach would be intolerable and overwhelm healthcare systems" (Zenone et al 2022 p2).

Rather than looking at the effectiveness of herd immunity as a strategy, Zenone et al (2022) explored the public discourses in the media around it in the UK and the USA. Newspaper articles published between 11th March 2020 and 31st January 2021 were searched, and this produced 400 relevant ones in the UK and 114 in the USA. The following criteria for inclusion were used: "(1)

[6] See https://gbdeclaration.org/.

herd-immunity is a primary focus of the article; (2) the article contains at least one direct quotation from stakeholder or quote attributable to a specific person or organisation relating to herd immunity; and (3) is a news article or editorial and not a letter to the editor or blog" (Zenone et al 2022 p3). Eight categories of stakeholder were distinguished, including "academic", "business", "government", and "public health/medicine" (table 7.1).

Stakeholder Type	Definition
Academic	Primary occupational attachment is an academic institution such as a university, college, think tank, research institute, or research-intensive organization.
Business	Primary occupational attachment is a for-profit business entity.
Government	Employed by a local, regional, or national government entity in established and ongoing role but not elected to the position. Does not include health-related advisors if advice is offered from peripheral public health-related organizations, agencies, or higher education institution.
Individual	Persons not attached to any specific stakeholder type in media reporting.
News/Media	Primary occupational attachment is a news, media, or knowledge dissemination organizations such as television, radio, or journalism.
Political	Persons elected to local, regional, national government public office.
Public Health/ Medicine	Primary occupational attachment is to a public health-related organization or health treatment organization such as a hospital or public health clinic.
Union	Primary occupational attachment is an industry-representing union.

https://doi.org/10.1371/journal.pgph.0000078.t001

(Source: Zenone et al 2022 table 1)

Table 7.1 - Categories of stakeholders and definitions.

Overall, 1243 statements agreeing or disagreeing with an aspect of herd immunity by 148 persons/groups were found. Of the UK articles, around half included comments agreeing with herd immunity, and three-quarters disagreeing (ie: some articles included both sides of the argument), while similar figures were found in the US articles.

The researchers then distinguished four concepts or aspects of natural herd immunity and how the articles addressed these (figure 7.2):

i) It is an appropriate and effective response - In both countries, the majority of comments were disagreeing, particularly by academic, and public health/medicine stakeh olders.

ii) The consequences of lockdown measures are

greater than the consequences of a herd immunity strategy - The majority of stakeholders disagreed, with the emphasis on the large number of deaths and suffering from a herd immunity approach.

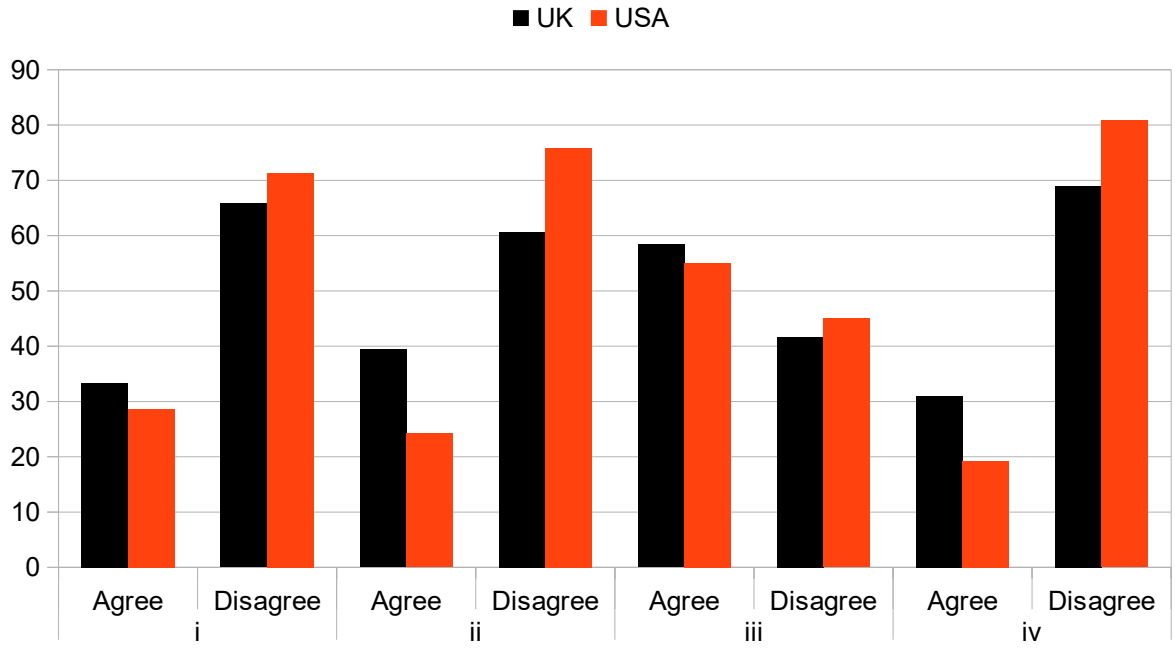
iii) At risk populations could be protected in a herd immunity approach - "Proponents argued that adopting a herd approach would not entail letting the disease spread to everybody in the population. They advocated for protecting at risk populations through isolation and other measures and letting groups low risk populations live normal lives to contract the virus and build immunity" (Zenone et al 2022 p8).

A small majority of stakeholders in both countries agreed with this idea.

Zenone et al (2022) questioned the feasibility of fully identifying at risk populations: "Many people in both the UK and US have undiagnosed health conditions that presents a higher risk of suffering or death from covid-19. Reliance on younger people experiencing lower mortality does not incorporate the suffering or long-term respiratory damage from infection" (p10). Furthermore, "populations perceived at low-risk work in frontline or healthcare jobs and interact often with those who are deemed high risk and can pass on the infection to such groups. For example, outbreaks in long term care homes during the pandemic were often introduced unintentionally despite strict precautions and led to excess deaths" (Zenone et al 2022 p10).

iv) Healthcare services would not be overwhelmed with a herd immunity approach - The majority disagreed that good management of services would allow this possibility.

Zenone et al (2022) summed up: "the media coverage around natural herd immunity portrayed a dismissal of the policy by the majority of academic and public health officials. However, considerable media attention was also given to a small, vocal, and heavily publicised coalition of scientists with prestigious credentials and prominent government advisors promoted and legitimised the strategy. As such, we observed evidence of false balance in the reporting among our sample of articles. Despite most actors disapproving from most stakeholder types, news coverage gave extensive attention to scientists promoting the strategy – notably, the Great Barrington Declaration and its authors. The false balance of reporting portrayed the natural herd immunity policy as



(i- herd immunity appropriate and effective response; ii - consequences of lockdowns greater than consequences of herd immunity strategy; iii - at risk populations can be protected in a herd immunity approach; iv - healthcare services would not be overwhelmed with a herd immunity approach)

(Data from Zenone et al 2022 tables 2 and 3)

Figure 7.2 - Overall percentage of stakeholders agreeing and disagreeing with four concepts of herd immunity in the UK and the USA.

one that was either accepted, or at least given reasonable consideration, by the scientific community. Public health officials in the media, however, were almost unanimously portrayed as against a herd immunity policy" (p10). The researchers were critical of the "false balance", which "may have contributed to confusion, misinformed opinions, and reduced confidence and acceptance of mitigation measures" (Zenone et al 2022 p10).

Reference

Zenone, M et al (2022) Analysing natural herd immunity media discourse in the United Kingdom and the United States PLoS Global Health 2, 1, e0000078 (Freely available at https://journals.plos.org/globalpublichealth/article?id=10.1371/journal.pgph.0000078)

7.3. EXCESS DEATHS

Counting the number of covid-19 deaths requires a sophisticated data collection system, which many countries do not have. The alternative is to count excess deaths compared to the average. "While excess mortality during the current pandemic may not exactly match the true number of covid-19-related deaths due to various reasons such as disruptions in treatment for other fatal diseases and socio-economic disparities in health care in different regions of a country, several works have shown that a significant portion of excess deaths in many countries are directly attributable to covid-19" (Ghafari et al 2022).

Ghafari et al (2022) applied this approach to Iran, where the Ministry of Health and Medical Education stopped releasing detailed data on covid-19 cases in late March 2020, but weekly all-cause mortality data from the National Organisation for Civil Registration were available.

Certain patterns emerged from the data, including a start of the epidemic in late December 2019 - early January 2020, and at the peak, excess mortality was roughly two and a half times higher than reported covid-19 deaths.

Reference

Ghafari, M et al (2022) A framework for reconstructing SARS-CoV-2 transmission dynamics using excess mortality data medRxiv (https://www.medrxiv.org/content/10.1101/2021.10.04.21264540v2)