

How did the Covid pandemic response harm society? A global evaluation and state of knowledge review (2020-21)

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Abstract

Early in the Covid pandemic concerns were raised that lockdown and other non-pharmaceutical interventions would cause significant multidimensional harm to society. This paper comprehensively evaluates the global state of knowledge on these adverse social impacts, with an emphasis on their type and magnitude during 2020 and 2021. A *harm framework* was developed spanning 10 categories: health, economy, income, food security, education, lifestyle, intimate relationships, community, environment and governance. The analysis synthesizes 600 publications with a focus on meta-analyses, systematic reviews, global reports and multi-country studies. This cumulative academic research shows that the collateral damage of the pandemic response was substantial, wide-ranging and will leave behind a legacy of harm for hundreds of millions of people in the years ahead. Many original predictions are broadly supported by the research data including: a rise in non-Covid excess mortality, mental health deterioration, child abuse and domestic violence, widening global inequality, food insecurity, lost educational opportunities, unhealthy lifestyle behaviours, social polarization, soaring debt, democratic backsliding and declining human rights. Young people, individuals and countries with lower socioeconomic status, women and those with pre-existing vulnerabilities were hit hardest. Societal harms should challenge the dominant mental model of the pandemic response: it is likely that many Covid policies caused more harm than benefit, although further research is needed to address knowledge gaps and explore policy trade-offs, especially at a country-level. Planning and response for future global health emergencies must integrate a wider range of expertise to account for and mitigate societal harms associated with government intervention.

Introduction

The Covid pandemic was the most disruptive global crisis since the Second World War. Impacts across countries and social groups went far-beyond the mortality and morbidity burden of the virus itself. The use of unprecedented government restrictions transformed a health emergency into a worldwide societal crisis, the impacts of which will be felt for decades. In an effort to control Covid, governments implemented a range of legal mandates and policies to restrict human movement and social behaviour starting in March/April 2020; national lockdowns were imposed in roughly 150 countries (Hale et al. 2021). Governments then maintained and/or reimposed different containment and closure policies, economic responses and health system responses throughout much of 2020 and 2021 (see Table 1). Some of these policies remained in place as late as 2022-23.

Table 1: The range of Covid policies implemented worldwide*

Containment and closures	School closing, workplace closing, cancel public events, restrictions on gathering size, close public transport, stay-at-home requirements, restrictions on internal movement, restrictions on international travel
Economic responses	Income support, debt/contact relief for households, fiscal measures, giving international support
Health systems	Public information campaign, testing policy, contact tracing, emergency investment in health care, facial coverings, vaccination policy.

* According to the Oxford Covid government response tracker (Hale et al. 2021).

The use of these non-pharmaceutical interventions (NPIs), including lockdown, represented the most consequential set of policies in modern public health history. Whole societies and economies were shut down, billions of people were confined to their homes, social interactions were deemed unsafe and outlawed, markets and transport were stopped and democratic processes were suspended under emergency law. From the beginning, there were major concerns that lockdown and other NPIs would cause widespread social harm, especially among vulnerable and poorer communities (Bavli et al. 2020; Broadbent et al. 2020). Other early work sought to cast doubt on these concerns using selective data points (Meyerowitz-Katz et al. 2021).

A vigorous and consequential public and scientific debate has continued about these disease control policies. Using the cumulative research data generated so far, this paper aims to answer the question: *how did Covid pandemic policies harm society?* In approaching this question, four issues are worth noting.

First, there is a general tendency for the public health community to be overly optimistic about the benefits of their interventions and under-play or ignore their harm. This has been acknowledged as a neglected area of research in the academic literature (Allen-Scott et al. 2014; Bonell et al. 2015); Lorenc and Oliver (2014) put it this way: “*Public health contrasts markedly with clinical medicine, where there is a substantial literature on adverse events and patient safety, and the Hippocratic injunction to ‘do no harm’ is arguably more salient.*” There are a number of pertinent social science concepts and analytical traditions that can help guide an analysis of the harms of the pandemic response (Table 2).¹ Some of these have already been used in various publications: unintended consequences (Turcotte-Tremblay et al. 2021), social harm (Briggs et al. 2021), collateral damage (Green and Fazi, 2023) and cost benefit analysis (Allen, 2022; Cornwall 2020; Miles et al. 2021; Lally 2022; Yakusheva et al. 2022; Fink et al. 2022). This paper integrates these concepts and aims to advance this neglected area of public health research.

Second, concerns about harms are grounded in the long-standing consensus that ‘health’ is much more than disease control; the World Health Organization defines health as “*a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.*” Decades of mainstream public health research have shown that human health is influenced by the *social determinants of health*, operating in multifaceted ways over a lifespan. The US Department of Health and Human Services defines this as: “*the conditions where people are born, live, learn, work, play, workship and age that affect a wide range of health, functioning and quality-of-life outcomes and risks.*”² This

¹ An additional metaphor comes from medicine itself: one of the main biological pathways that leads to Covid mortality is the cytokine storm, generated by an excessive immune response rather than the virus

² See: <https://health.gov/healthypeople/priority-areas/social-determinants-health>

means that any meaningful evaluation of the Covid pandemic response should use a broader conceptual framework to consider impacts beyond Covid disease.

Table 2: Useful social science concepts

Concept	Description
Unintended consequences	Considered a “law” of purposive social action, according to sociologists. Some consequences should be anticipated. Generally supports the idea that policy decisions often involve ‘trade-offs’ or the ‘lesser of two evils.’ Political decision-making with high-levels of adverse unintended consequences often involve: error, ignorance, intentionality, value-based decisions and groupthink. See: Turcotte-Tremblay et al. (2021); De Zwart (2015).
Social harms	From the field of criminology. “Crime” is conceptualized as a social construct. Shows that anti-social behaviors that are legal are also harmful and that social structures and the lack of safety nets cause harm to individuals, families and communities. Critiques crime control and the criminal justice system as ineffective. See: Briggs et al. (2021); Canning and Tombs (2021); Hillyard et al. (2004)
Collateral damage	From political science, having gained popularity after the Vietnam war. Warzone statistics about civilian casualties is highly political and challenging to determine. Critics argue that the term itself is an “inhumane euphemism” that aims to make civilian casualties palatable to the public. It is not clear what level of noncombatant casualty is acceptable. Precision-guided weapons are believed to have reduced civilian casualties. See: Rosén (2016); Condra and Shapiro (2012)
Iatrogenic harm	From the social critique of medicine meaning, “harm caused by medical care.” This involves diagnosis, intervention, negligence and error. Related to the concept of over-medicalization, which occurs at clinical, social and cultural levels. See: Illich (1976); Panagioti et al. (2019); Hodkinson et al. (2020); Makary and Daniel (2016).
Compound risk	From disaster studies: the idea that multiple hazards occur at the same time and that vulnerability builds on itself. Also related to other ideas in disaster management such as the broken window fallacy, second disaster and anti-politics. See: Kruczkiewicz et al. (2021)
Cost benefit analysis	From economics: focused on assessing if benefits are likely to outweigh costs and risks of a set of actions and policies. Cost-benefit analysis is influenced by data, quantification techniques and model projections. Relies on both monetized metrics (QALY, GDP) and non-monetized metrics (well-being-adjusted life-year; subjective well-being measures). See: Aldred, 2022; Allen (2022); Cornwall (2020); Fink et al. (2022); Heinzerling, (2000); Miles et al. (2021); Lally (2022); Yakusheva et al. (2022).

Third, the evidence-base for the effectiveness of many Covid interventions remains contested, with considerable disagreement and scientific debate. It is important to appreciate that, prior to Covid, many in the public health community supported a cautious skepticism about the types of government restrictions and mandates widely used in 2020-21. Fear-based messaging, punitive rules and lengthy restrictions on normal human interaction were seen as counter-productive, lacking strong evidence and, in many cases, unethical or unconstitutional (Jamrozik, 2022). There was reluctance expressed in pandemic influenza plans and during the West African Ebola outbreak to implement large-scale quarantines, school and business closures and movement restrictions that

would disrupt social life (Abramowitz et al. 2015; Eba, 2014; Inglesby et al. 2006; WHO, 2019). These concerns were both epidemiological and social. Now that the acute phase of the Covid crisis has passed, scientific evaluations are re-visiting assumptions about the justification for NPIs that were presented to the public as self-evident in 2020-21. This paper contributes to this important debate.

Finally, evaluations of Covid policy are dependent on the *politics of knowledge*, including the range, visibility, and quality of research data. In our current ‘data-driven’ technological society what is not measured, or easily measured and grasped, can more readily be ignored. There is a degree of imbalance in trying to mentally weigh the control of one virus (e.g. Covid) against the wide-range of social consequences from control policies: Covid statistics are much simpler to understand and communicate to the public. This cognitive process is partially the reason why public health responses frequently make use of war metaphors. In contrast, a multitude of different types of societal harms may appear diffused, hypothetical and difficult to measure. In this regard, methodological and epistemological limitations have restricted the public debate. Certain types of knowledge have also been more valued, and provided more weight, compared to other data.³ This paper aims to address this imbalance. It aims to make more fully visible and transparent the wide-ranging interdisciplinary research on these social impacts. It also reflects on the state of global academic research, knowledge debates and data gaps.

Now that the crisis has passed, we can evaluate the collateral damage with a substantial amount of research data. In summary, this paper aims to: (1) further theoretical engagement with harm from public health interventions; (2) integrate a broad social determinants of health framework to evaluate the global Covid response; (3) further the scientific debate about the appropriatedness of non-pharmaceutical interventions; and (4) raise the visibility of interdisciplinary empirical research on societal impacts.

³ There are many reasons for this. One appears to have been a form of motivated reasoning (which I call *covidization*) that over-emphasized the benefits and necessity of Covid interventions and downplayed their risks and societal costs. Covidization has meant that people were much more willing to accept greater multidimensional societal harm for hypothetical benefits against the virus. This report does not attempt an analysis of this complex phenomenon.

Methodology

Research questions

This paper aims to comprehensively answer two important questions:

- 1) *What types of adverse societal impacts occurred worldwide due to the Covid pandemic response in 2020-2021?*
- 2) *What does current research studies tell us about the magnitude of these impacts?*

To accomplish this, a conceptual framework was developed to guide the literature review and analysis. The literature review aimed to find the highest quality evidence across a large range of topics and scientific fields. A ‘societal harm’ framework of the findings from the state of knowledge review was created based on 10 main categories. The paper is focused on the impacts of non-pharmaceutical interventions; the author has previously written about the role of social science in pandemic response (Bardosh et al. 2020) and on the unintended consequences of Covid vaccine policy (Bardosh et al. 2022).

Conceptual framework

The conceptual framework (Figure 1) accounts for different drivers of societal change, contextual factors, social effects, scales of impact and different forms of evidence. These are briefly outlined here.

Drivers of change: Four main drivers that are hard to isolate from one another influenced the societal response to the Covid pandemic. This includes the various non-pharmaceutical interventions (and vaccination programs that began in 2021) as well as viral infection itself and voluntary behaviour changes in the face of a novel virus. This is further complicated by psychological and social feedbackloops since risk perceptions were shaped by government policies; e.g. lockdowns, other NPIs and media framings created and reinforced high levels of fear, anxiety and concern. Although this paper does engage with these issues to some degree, by citing studies that distinguish between these different drivers of change, further work is needed in this area. Efforts were also made to account for resilience and relief efforts that aimed to mitigate harms.

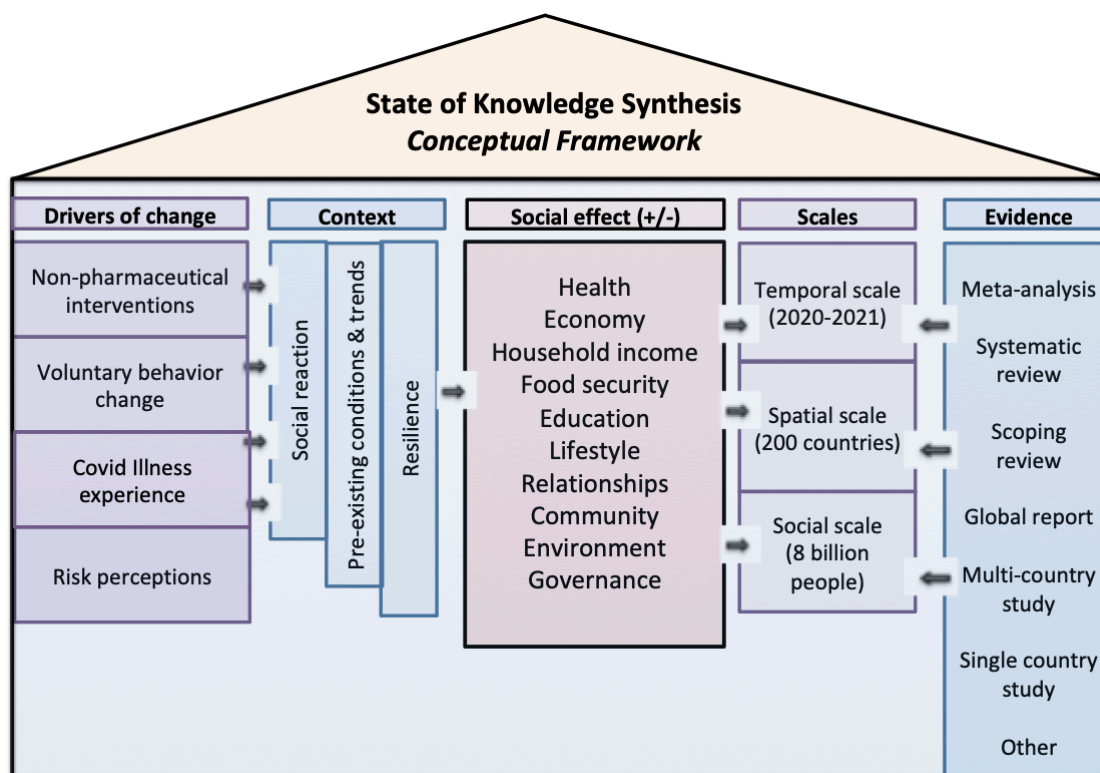


Figure 1: Conceptual Framework

Context: A second methodological issue was the need to account for contextual factors in making claims about societal effects. Social reactions are influenced by a large variety of human experiences, perceptions and structural conditions. Some social groups and countries are more resilient to crises than others. Pre-existing conditions and trends are difficult to account for; e.g. estimates of excess mortality must take into account variations in age demographics and are influenced by the timeframe used to determine ‘normal’ mortality rates, etc. Another example of this relates to increases in global food insecurity, which was increasing prior to the pandemic.

Social effects: The main aim of the analysis was to identify the types of adverse societal consequences from the pandemic response and to explore relevant research data on their magnitude. This required intellectual flexibility and an inductive approach to build interpretative understanding. The framework presented below went through various iterations, with a final 10 categories and over 50 sub-categories of harm (see **Figure 2**).

Of course, not all social effects were negative for all people (e.g. the initial lockdown period was experienced as an opportunity to spend more time with family by a proportion of people; natural ecosystems showed some recovery, etc). Some of these positive impacts are mentioned in the paper. The goal of the analysis was not to conduct a systematic cost-benefit analysis or to weigh different positives and negatives. Rather it was to review the research data on adverse consequences.

Scales: The paper synthesizes data at different scales. Temporally, public reactions and government policies changed considerably over time in 2020 and 2021. Countries also pursued very different response strategies. Substantial variation occurred in the different psychological, socio-economic and cultural responses and experiences of 8 billion people. Nonetheless, generalizations are possible; although the analysis approached this with caution.

Evidence: A large range of research evidence was used during the analysis: meta-analyses, systematic and scoping reviews, reports from recognized international bodies such as the UN system and civil society watchdogs, multi-country studies, single country studies and various commentaries and conceptual analyses. These are described in more detail below.

Literature review strategy

The literature review was conducted in three phases between September 2022 and March 2023. In total, 604 documents are included in the body of the analysis (Table 3).

Table 3: Literature included in the state of knowledge review

Systematic reviews	Meta-analyses*	Reviews	Reports**	Multi-country studies	Single country studies	Other***
107	45	83	86	116	183	29

* All meta-analyses were also systematic reviews and hence are included in both categories.

** All papers were published in peer-reviewed journals except for the reports and 5 pre-print papers.

*** This included papers that reflected on methods as well as commentaries and conceptual analysis.

First, an initial conceptual framework guided the literature review strategy from previous work by *Collateral Global* (<https://collateralglobal.org>), which was divided by: education, mental health, economy, physical health, ethics, culture, inequality, and social health. For each of these categories, a rapid literature review was conducted using Google Scholar and PubMed. The goal was to find meta-analyses, systematic reviews, scoping reviews and expert commentaries on each topic. For each paper of interest, the abstract (and, in many cases, the full research paper) and reference list were scanned and a citation-based search using Google Scholar was used to identify additional studies of interest. From this original search, roughly 100 categories of harm were first identified.

A second literature search was then conducted on each of these 100 harms using Google Scholar. The first 10 pages were searched with the terms: [harm] and review, and [harm] and meta-analysis. Publications of interest were read in full and citation-based searches were used to identify further articles of interest. A separate search using Google was used to identify model predictions and studies from recognized international organizations such as the UN system and civil society groups.

The goal was to build a conceptual understanding of the debate in each field and to present generalizable trends and findings. This included reading broadly across a large range of scientific disciplines in order to assess if there was a consensus about the consequences of the pandemic and sufficient data to make claims about magnitude, social difference and causation. Hence, the literature review required diving into a large number of additional papers that are not included in the final analysis. Due to the large amount of research publications available, priority was given to studies that were published in 2022 and 2023 over those in 2020 and 2021. Studies that were prioritized included: meta-analyses; longitudinal cohort studies with pre- and during- pandemic data; and evaluations of earlier model predictions about harms. Many fields did not have meta-analyses or systematic reviews. Some reviews and studies were of poor quality. For this reason, the analysis includes a substantial number of multi- and single-country studies that were deemed to be high quality. Effort was made to select studies that included a

range of countries with different socio-economic status. As the analysis shows, there remain significant gaps in the available academic literature.

The literature review strategy was then validated in March 2023, by conducting a systematic literature search using Web of Science. The original attempt to search for 'review' and 'Covid' generated 37,275 results in Web of Science and 36,975 results in PubMed. Screening this level of data was not possible. Instead, Web of Science was searched for 'meta-analysis' or 'systematic review' and 'Covid' in the title. This yielded 5,831 results in Web of Science. Titles and abstracts were then screened. Protocols, commentaries, posters, bibliometric studies, intervention evaluations and all reviews having to do with the management of Covid clinical disease were excluded. A total of 315 papers were reviewed for analysis. The overwhelming majority of these were either already included in the analysis, were too specialized (e.g. a systematic review of online anatomy teaching during the Covid pandemic) or were of marginal overall value. Only 9 were deemed to be of interest and were included in the final paper. Most of the higher quality systematic reviews and meta-analyses of relevance had already been retrieved through the literature search strategy described above.

An analysis of this type is subject to multiple limitations, which are outlined in the discussion section of this paper.

Results: Societal harm framework

This paper summarizes the current global state of knowledge on the negative social consequences of the Covid response (2020-2021). Societal harms are analyzed across 10 categories and over 50 sub-categories, based on 600 research papers and evidence syntheses. Categories include: health, economy, income, education, food security, lifestyle, intimate relationships, community, environment and governance (Figure 2).











THE SOCIETAL HARMS OF THE COVID-19 PANDEMIC RESPONSE				
Health  Medical services Care seeking Morbidity Mental health Excess mortality	Economy  Growth Trade Business Inflation Supply chains Government debt	Income  Labor Inequality Earnings Remittances Extreme poverty	Education  Learning loss Dropouts Lost potential	Food security  Hunger Food systems Nutrition
Lifestyle  Physical exercise Sleep Screen use Diet Addiction Drug use Obesity Frailty Personality Child Development	Relationships  Child abuse Violence Family Fertility Sex	Community  Social network Stigma Mobility Crime & law Trust Mass protests Media Elections	Environment  Pollution Wildlife Ecosystems Plastic waste	Governance  Armed conflict Democracy Freedom Human rights Institutions

Figure 2: Societal harm framework

1. Health and medical services

1.1. Excess mortality

The World Health Organization (WHO) and others have estimated an increase in all-cause mortality of 14-18 million in 2020-21 (Msemburi et al. 2022; Shang et al. 2022; Wang et al. 2022), highest in middle-income countries (Alon et al. 2022). Reported Covid deaths account for 5-6 million. Numerous methodological challenges exist with current models and data (Beaney et al. 2020; Ioannidis, 2021; Kepp et al. 2022; Moeti et al. 2023; Nepomuceno et al. 2022). While many research papers suggest a large under-reporting of Covid mortality, others suggest lower total excess mortality rates (Levitt et al. 2022) and some over-counting of Covid mortality (Friss et al. 2023; White et al. 2022). The proportion of increased mortality from non-Covid deaths remains unclear, with little data currently available outside high-income countries.

Table 4: Changes in non-Covid excess deaths, identified by Sanmarchi et al. (2022)

1. Cardiovascular diseases
2. Cancer
3. Diabetes
4. Suicide
5. Cerebrovascular diseases
6. Road accidents
7. Chronic lower respiratory diseases
8. Diseases of the respiratory system (excluding Covid)
9. Infectious diseases (excluding Covid)
10. Ischemic heart disease
11. Unintentional injuries
12. Influenza and pneumonia
13. Alzheimer's disease
14. Hypertensive diseases
15. Kidney disease
16. Digestive system disease
17. Dementia
18. Mental and behavioural disorders
19. Diseases of the nervous system and sense organs
20. Diseases of the genitourinary system

Two meta-analyses and one systematic review were found on this topic. Lu et al. (2022) found an 18% general increase in excess mortality from non-Covid causes in 2020 while Lau et al. (2022) found a 5% increase in mortality for non-COVID illness compared with pre-pandemic data. However, the limited number of studies meant these conclusions had low certainty. A systematic review (116 studies) found statistically significant changes across 20 disease conditions (Table 4) (Sanmarchi et al. 2022).

Recent high-quality studies from North America suggest 20% of excess mortality was from non-Covid causes in 2020-21: 27% in Mexico (Palacio-Mejia et al. 2022), 17% in USA (Chan et al. 2021; Mulligan and Arnott 2022; Stokes et al. 2021)⁴ and 18% in Canada (McGrail, 2022).⁵ This rose to 70% for those less than 45 years old in the United

⁴ An earlier study by Woolf et al. (2021) found that 28% of excess mortality in the first year of the pandemic in the USA was not accounted for in official Covid statistics, and likely related to undocumented Covid infection, delayed medical care and other factors.

⁵ Half (5) of Canada's 10 provinces had more non-Covid excess deaths than Covid deaths, 2020-21.

States (Beesoon et al. 2022; Lee et al. 2023; Zalla et al. 2021), and was also higher among non-White ethnic groups (Cronin and Evans 2021; Habibdoust et al. 2022; Luck et al. 2022; Todd and Scheeres, 2022). Mortality increases were mainly found from hypertension and heart disease, diabetes, drug-overdoses, homicide, Alzheimer's, and motor vehicle fatalities.

Other studies, conducted early in the pandemic, have found higher proportions in: Greece (62%), Portugal (51%), Italy (40%), Poland (38%), and England (26%) (Kontopantelis et al. 2021; Kondilis et al. 2021; Odone et al. 2021; Pikala et al. 2022; Vieira et al. 2020). A 25% increase in hospital-based mortality from non-Covid causes in 2020 was reported in Dang et al. (2022) and Gasch-Illescas et al. (2023). Research from middle-income countries, e.g. Brazil (Guimaraes et al. 2022) and Peru (Cajachagua-Torres et al. 2022), also show substantial increases in non-Covid mortality but do not provide an overall proportionate estimate.

Three issues are worth noting: suicide, influenza and child deaths. Despite predictions that the economic recession would increase suicide (Glozier et al. 2022) evidence does not support an overall short-term increase in most countries in 2020-21, although small increases did occur in specific demographic groups (younger ages) and some countries (Borges et al. 2022; Pirkis et al. 2022; Webb et al. 2022 Knipe et al. 2022). However, disaster research suggests suicide increases may be delayed by a few years (Horney et al. 2020).⁶ Secondly, the epidemiology of endemic pathogens, including influenza and other seasonal respiratory viruses, were disrupted during the pandemic contributing to less mortality in 2020-21. A subsequent resurgence of influenza and RSV occurred in 2022 due to immunity displacement (Cohen et al. 2021; Cohen et al. 2022).⁷ Finally, mortality data is unavailable to evaluate model estimates regarding increases in general child mortality in low- and middle-income countries (LMICs), which ranged from 100,000 to 500,000 (Cardona et al. 2022; Shapira et al. 2021; Osendarp et al. 2021). Using health

⁶ Some of the increases in drug-related mortality may also be interpreted as suicide-related (Rahimi-Ardabili et al. 2022).

⁷ Interestingly, recent studies suggest that endemic coronavirus cross-immunity, which is thought to have reduced during the pandemic, may help protect against severe Covid outcomes (Filmore et al. 2022).

utilization data from 18 LMICs (all with low overall Covid mortality), Ahmed et al. (2022) estimated that 113,962 of 597,422 total excess deaths (19%) were due to excess under 5-child mortality. By comparison, and according to data from UNICEF, 4,480 children under 5 died with a reported Covid diagnosis during this time.⁸

Excess non-Covid mortality is predicted to remain elevated in the years ahead for many conditions, including anticipated increases in cardiovascular disease (Banerjee et al. 2021) and cancer (Lawler et al. 2022).⁹

1.2. Health services and outcomes

Reviews by WHO identified numerous adverse effects on non-Covid healthcare services (WHO, 2021; WHO, 2022). Two meta-analyses on health utilization were available. Molyniham et al. (2021) found a 37% reduction in health service utilization across all categories up until May 2020 across: visits (42%), diagnostics (31%), therapeutics (30%) and admissions (28%). A second review found a 56% decrease in outpatient care¹⁰ across: diagnostics (63%), primary care (60%), specialty care, (58%), in-person visits (56%), emergency care (49%), and treatment (36%) (Dupraz et al. 2022). In addition, two large-scale studies, based on National Health Service data in low- and middle-income countries (LMICs), found 13% to 40% declines in outpatient volume in 2020 (Arsenault et al. 2022; Ahmed et al. 2022). Pulse survey data suggest disruptions persisted in early 2021, with 48% and 22% of countries reporting disruptions to primary care and emergency services (WHO and IBRD, 2021). Systematic reviews found large disruptions in cancer care (Ferrara et al. 2022; Teglia et al. 2022; Li et al. 2023; Van Vliet et al. 2023), cardiovascular services (Nadarajah et al. 2022), infectious disease programs (HIV, tuberculosis, malaria) (Baral et al. 2022), neurological services (Garcia-Azorin et al.

⁸ See: <https://data.unicef.org/resources/covid-19-confirmed-cases-and-deaths-dashboard/>

⁹ For example, excess mortality was 19% higher across Europe in December 2022 (77,000 additional deaths) compared to pre-pandemic trends (Eurostat, 2023a).

¹⁰ This estimate is for in-patient services and does not account for the proportional increase in tele-services, which increased during the pandemic. It is unclear how widely tele-services were available and how much they mitigated the reduction in in-person care. Tele-services were limited in low- and middle-income countries (Eslami Jahromi and Ayatollahi, 2023).

2022), immunizations (Cardoso Pinto et al. 2022) and maternal health (Chmielewska et al. 2021).

Service disruptions increased non-Covid morbidity and mortality. For example, a large-scale cohort study (61 countries, 15 cancer types) found 15% of patients in regions with full lockdowns did not receive elective cancer surgery, in comparison to 5.5% in moderate lockdowns and 0.6% in regions with light restrictions (Collaborative, 2021). A review of non-Covid cardiovascular disease (158 studies) noted that “*there was substantial global collateral cardiovascular disease damage*” (especially in LMICs) and that clinical effects were similar in magnitude between wave 1 and 2 in 2020 (Nadarajah et al. 2022). No review was found on diabetes services, although individual studies in UK and Mexico show significant negative effects (Bello-Chavolla et al. 2022; Valabhji et al. 2022). A review of emergency services (98 studies) showed delayed presentation and treatment for heart attack, brain aneurysm, diabetes, and appendicitis (Mogharab et al. 2022). A review (30 studies) by Chmielewska et al. (2021) found increases in stillbirths, maternal deaths, ruptured ectopic pregnancies and maternal depression. How these service disruptions impacted both short and medium-term mortality and morbidity are unclear. In Europe alone, Lawler et al. (2022) estimated that up to one million new cancers went undiagnosed in 2020-21.

1.3. Mental health

Systematic reviews and meta-analyses confirm negative impacts on mental health but show large differences between point surveys and longitudinal cohort data (Husky et al. 2021; Kessler et al. 2022), with only limited clinical data available. Early reviews by Santabárbara et al. (2021) and Bueno-Notivol et al. (2021), based on self-reported rates of anxiety and depression, estimated 300% and 700% increases during lockdown compared to pre-pandemic rates. Leung et al. (2022) argued that the mental health toll of the pandemic was likely equivalent to major natural disasters and armed conflict. Meta-analyses have found varied self-reported population prevalences during the first half of 2020: 13-50% psychological distress, 16-28% depression, 15-33% anxiety, 24-30% insomnia, and 17-25% post-traumatic stress disorder symptoms (Cenat et al. 2021;

Nochaiwong et al. 2021; Leung et al. 2022). A review of systematic reviews found a 32% prevalence of depression and anxiety among children and adolescents (Harrison et al. 2022). A second meta-analysis by Panda et al. (2021) found 79% of children had adverse behavioral and psychological impacts and 52% and 21% of parents/caregivers developed anxiety and depression, respectfully.

However, meta-analyses of studies with longitudinal cohorts, comparing pre- and during-effects (mostly from high-income countries), show a overall small population effect size (SMD, -0.20, rising to -0.39 during the first 2 months of the pandemic), with considerable heterogeneity, suggesting that lockdowns did not have uniformly detrimental effects on mental health across society (Prati and Mancini, 2021; Robinson et al. 2022; Salanti et al. 2022). Longitudinal studies suggest mental health deterioration was high among children and adolescents (Kauhanen et al. 2022), although existing studies have a high degree of heterogeneity and variation in study design (Newlove-Delgado et al. 2023). Based on longitudinal cohort studies, Santomauro et al. (2021) estimated an additional 53 million cases of major depressive disorder globally (a 28% increase) and 76 million cases of anxiety disorders globally (a 26% increase) in 2020. A review of data from the United States estimated a larger increase, with 30% to 50% increases in anxiety and depression during 2020, but lower than the 500% to 800% increase estimated in US nonprobability surveys (Kessler et al. 2022).

Pandemic restrictions disproportionately worsened mental health for certain individuals. Psychological studies, from Argentina and Canada, using latent-class analysis identified distinct classes of people, roughly 15% of individuals, more prone to mental health deterioration (Fernandez et al. 2022; Frounfelker et al. 2022). The pandemic created barriers to help-seeking for mental health problems (Yonemoto and Kawashima, 2022). Efforts have also been made to measure excessive fear or phobia of Covid itself (Muller et al. 2021), as well as the reasons for the over-estimation of personal risk (Graso, 2022). Reviews have shown that those with pre-existing psychiatric disorders (Carvalho et al. 2022; Theberath et al. 2022; Milea-Milea et al. 2023), mothers of young children (Racine et al. 2022), marginalized groups (socioeconomic disadvantaged, migrants, ethno-racial

minorities, homeless people) (Camara et al. 2022) and younger adults (Santomaur et al. 2021), also suffered greater adverse mental health effects.

A third source of evaluation are from clinical data. A systematic review of research from 18 countries found an increase in pediatric emergency department visits for attempted suicide and self-harm (Madigan et al. 2023). Two reviews by Meier et al. (2022) and Devoe et al. (2022) both reported an increase in eating disorders, including a 48% increase in US hospital admissions, highest among women and children and adolescents. An Italian study found an increase in somatic psychiatric disorders among children (4-14 years) during the pandemic period (Turco et al. 2022).

Few studies explore changes in mental health deterioration over time (Wade et al. 2023). A review of longitudinal studies found that depression, anxiety and loneliness peaked in May 2020 (and was highest in North America), although other mental health problems (such as PTSD and psychological distress) were higher after July 2020 (Cénat et al. 2022). Salanti et al. (2022) also found a peak for depression and anxiety during the first two months of the pandemic in 2020. A review of 11 longitudinal cohort studies in the UK found a sustained worsening in psychological distress throughout 2020 (Patel et al. 2022). A meta-analysis of data (2020-22) from children and adolescents found increases in depression and anxiety over time (Deng et al. 2022). Data is now emerging about longer-term effects, and individual studies (e.g. from Argentina, South Africa, Norway and Ghana) suggest mental health deterioration may not have improved in 2021 (Hoffart et al. 2022; Fernández et al. 2022; Durizzo et al. 2022).

2. Economy

2.1. Economic growth

According to the World Bank (2022), *“Mobility restrictions, lockdowns, and other public health measures necessary to contain the pandemic rapidly produced the largest global*

economic crisis in more than a century.”¹¹ Economic contraction affected 90% of countries in 2020, with GDP per capita declining by 3.1%: 6.7% in emerging markets, 4.6% in advanced economies and 3.6% in low-income countries (Alon et al. 2022). A sharp U-shaped global recession occurred, with real GDP growth outpacing pre-pandemic growth in 2021 at 5.9% (vs 3.4% average growth, 2013-2019) (OECD, 2022). The rebound in growth was fast but uneven. Macroeconomic impacts are believed to have been most severe in middle-income countries due to higher NPI stringency, low levels of government relief and high job dependence on social interaction (Alon et al. 2022; Gagnon et al. 2023).¹² However, despite the U-shaped recovery in 2021, global economic growth has since stalled; the IMF (2022) predicts that “*the global economy is headed for stormy waters*” in 2023 and the World Bank (2023) warned that “*the crisis facing development is intensifying.*” Growth forecasts for 2023 from the World Bank (2023) have been downgraded, from 3% GDP growth to 1.7%. By the end of 2024, GDP levels in emerging-market and developing economies are predicted to remain 6% below levels expected pre-pandemic. The precise contribution of the pandemic to future economic growth trends are unclear. However, international financial institutions worry that the 2020s may see a replay of the “lost decade” of development that occurred across Latin America and Sub-Saharan Africa in the 1980s (World Bank, 2022). The *Human Development Index* (HDI) declined globally in 2020 and again in 2021 (the first time since it began in 1990), dropping in 87% of countries in 2020 and 51% in 2021 (UNDP, 2022), suggesting that declines in human capital will have longer-term effects.

2.2. Trade and industry

Global trade and financial markets experienced historic declines in 2020, followed by rapid recoveries in 2021. The economics literature describes far-reaching demand and supply shocks affecting nearly every industry in the first two-quarters of 2020 (Brodeur

¹¹ Please note: the claim that lockdowns and mobility restrictions were ‘necessary’ requires more critical debate and is outside the scope of this paper. The World Bank report (as with many reports and studies from international agencies) simply assumes this to be the case. Such reports rarely discuss which policies were necessary or unnecessary, appropriate or excessive.

¹² In contrast, younger age demographics, lower Covid restriction policy stringency and large agricultural economies in low-income countries helped buffer recession effects, while historic government spending programs occurred in high-income countries (Alon et al. 2022).

et al. 2021; Delardas et al. 2022; Goncalves and Moro, 2023; Panwar et al. 2022). This renewed debates about the nature of contemporary globalization, political economy and geopolitics (Schneider-Petsinger, 2023). According to UNCTAD (2022), global trade declined by an estimated 9% in 2020 but then quickly rebounded 13% higher than 2019 levels in 2021, outpacing more pessimistic predictions. A similar trend occurred with global foreign direct investment (UNCTAD, 2022), global manufacturing (UNIDO, 2022) and financial markets, although the rapid recovery is also believed to have increased volatility and systemic risk (Fang et al. 2023; Jana et al. 2022; Jebabli et al. 2022; Liu et al. 2022). Commodity prices (oil, metals, minerals) rose significantly right after the 2020 lockdown period, contributing to record-high price hikes and a global cost-of-living crisis (UNCTAD, 2022). Impacts were felt across all economic sectors in 2020-21: agriculture, energy, mining, construction, manufacturing, utilities, retail, finance, tourism and education (Delardas et al. 2022). Oil consumption reduced globally, reaching an estimated 18% decline in the United States in 2020 (Wang et al. 2022). Maritime trade (responsible for 80% of the global trade in goods) declined by 4% in 2020, leading to soaring freight costs, a global supply chain crisis and a reduction in the number of connected ports in non-lucrative markets (UNCTAD, 2022). The combination of supply and demand shocks and unprecedented government fiscal stimuli helped precipitate a 9% increase in global inflation in the second half of 2022, the highest level since 1995 (Hall et al. 2023; World Bank, 2023). The IMF (2023) predicts that global inflation will remain above pre-pandemic levels in 2023 (7%) and 2024 (4%).

2.3. Business

The *World Bank Business Pulse Survey* collected data from over 100,000 businesses worldwide and found 70% closed at the peak of the first wave and 25% remained closed 6 weeks into the crisis (Apedo-Amah et al. 2020). A second survey with businesses across 50 countries found that 15% remained closed in October 2020 (Facebook/OECD/World Bank, 2020). In the first half of 2020, nearly 50% of surveyed

businesses worldwide expected to fall into arrears within 6 months (World Bank, 2022)¹³ and 19% reported laying off workers (Apedo-Amah et al. 2020). While varying by country and sector, firms experienced a 51% drop in revenue on average (highest in South Africa, Bangladesh, Nepal, Honduras, India, and Jordan), which remained at 40% reduced revenue 4 months into the crisis (World Bank, 2020). In Europe, Janzen and Radulescu (2022) found that lockdowns reduced sales growth by 63% while a study from India showed a 15% average drop in firm profits in 2020 (Jain and Kumar, 2023). Takeda et al. (2022) found that most small and medium-sized businesses (SMEs) recovered towards late 2020 in Asia, although certain hard-hit industries deteriorated (e.g. textiles, tourism, food and drink services and education). In general, research studies found that firms with more physical exposure to the public, less liquidity, more debt, lower productivity, younger age, female-headed and without a digital presence were hit hardest (Alekseev et al. 2023; Bozkurt et al. 2022; Cirera et al. 2021; Chang et al. 2022; Muzi et al. 2022). Trends of remote work are predicted to remain high in the years to come, shifting labor and business arrangements in the face of increasing automation and digitalization (Barry et al. 2022).

Lockdowns and other NPIs raised concerns about mass business failures. Although reviews have explored multiple impacts of the pandemic on business (Belitski et al. 2022; Brodeur et al. 2021), no meta-analysis exists that estimates worldwide business closures (known as *excess firm death*). The *Global Entrepreneurship Monitor* found early-stage entrepreneurial activity and established business ownership declined between 2021 and 2019 in ~60% of 34 sampled countries (Hill et al. 2022). Recent estimates of excess firm deaths in the USA vary between 185,000 to 330,000 in 2020 (Barnes and Edelberg 2022; Crane et al. 2022; Decker et al. 2022), disproportionately impacting small and medium-sized businesses (Fairlie et al. 2022) and higher in states with tighter restrictions (Dore and Mach, 2022). Across 17 European and Asian countries, Kalemli-Ozcan et al. (2022) estimated that an 8-week lockdown would increase failure by 9% in the absence of government support, rising to over 30% in hard-hit industries. Research from Japan

¹³ According to the World Bank (2022), the average business had cash reserves for less than 51 days to cover basic expenses.

estimated a 20% increase in firm exists in 2020 compared to 2019 (Miyakawa et al. 2021) while a Chinese study found 18% of small and medium-sized businesses had permanently closed between February and May 2020 (Dai et al. 2021).

Governments responded to the crisis by introducing unprecedented fiscal stimulus programs. Research from the USA and Japan suggest these were not well targeted to smaller at-need businesses and had small overall effects on employment (Auerbach et al. 2022; Chodorow-Reich et al. 2022; Granja et al. 2022). Evidence from Latin America, Asia and Africa show that smaller and informal firms faced multiple barriers to accessing aid (Guerrero-Amezaga et al. 2022; Takeda et al. 2022; Aga and Maemir 2022); Wu (2023) found only 14% of firms across 10 developing countries received stimulus money.

Firm deaths (bankruptcies) were less than expected in the short-term in many higher income countries due to the rapid U-shaped recovery, government relief and a corresponding surge in new business entry in late 2020-2021. An estimated 1 million new firms were operational in late 2021 compared to 2019 in OECD countries with an estimated 450,000 more in the US alone (Economist, 2022). It is unclear why this occurred. Some economists have called the pandemic a form of “*creative destruction*” that has spurred self-employment and entrepreneurship; others are worried that large-scale government relief has upheld less productive ‘zombie’ firms that will rapidly fail now that state support has been withdrawn (Bruhn et al. 2021; Honda et al. 2023). Recent data from Germany and the UK show a backlog of insolvencies (Dorr et al. 2022; Witchell and Webster, 2023). Data from the EU shows that the last quarter of 2022 had the largest increase in bankruptcies since records began in 2015 (Eurostat, 2023b). Wu (2023) found that firms in developing countries who reopened in 2021 had increased fragilities, including higher debt and less liquidity. It is unclear how the economic shock of the pandemic will shape the economy in the years ahead.

2.4. Government spending and debt

Government fiscal intervention to manage the crisis led to historic levels of spending and debt accumulation that now threaten to drive large-scale public austerity (IMF, 2022;

World Bank, 2022). According to the IMF (2021), \$18 trillion was spent by governments up to September 2021 (88% in advanced economies): \$11 trillion in direct revenue and \$7 trillion for business liquidity support.¹⁴ Only 8% of spending (\$1.5 trillion) was directed to the health sector. The fiscal response is estimated to have been equivalent to 20% of GDP in high-income countries, 10% in upper-middle income countries and <5% for lower-middle and low-income countries (World Bank, 2022).

Fiscal support precipitated the largest one-year increase in global debt since the Second World War, which rose 30% in 2020 to 263% of global GDP (Gaspar et al. 2022; Kose et al. 2021a,b). This increase was broad-based across private, public and household debt and the majority of countries, building on debt increases since the 2009 financial crisis. Government gross debt rose roughly 14% of GDP in high-income and upper-middle-income countries and 7% of GDP in lower-middle and low-income countries (World Bank, 2022). The crisis also led to the generation of new financial fragilities including deteriorations in country credit ratings, currency devaluations, liquidity problems and risk for debt defaulting and distress (World Bank, 2022).

The impact of fiscal measures are predicted to drive future government austerity in the context of a looming debt crisis (Kose et al. 2021b). Based on IMF projections, Kentikelenis and Stubbs (2022) estimated that 44% of countries (83 of 189) will face contractions in public spending in 2023, with 2.3 billion people exposed to budget cuts, mostly in middle-income countries (spending in low-income countries is predicted to stagnate). Others have predicted larger budget cuts (Ortiz and Cummins, 2021), directly associated with IMF Covid loans (Tamale, 2021). A recent World Bank-UNESCO (2022) report found 40% of low- and middle-income countries reduced education spending in 2020 (by 14% on average), which continued to remain below 2019 levels in 2022. Analysis by *The Commitment To Reducing Inequality Index 2022* found total spending on health decreased in 44% of countries between 2019 and 2021, while roughly half reduced education and social protection spending (Walker et al. 2022).

¹⁴ This is likely a significant under-estimate. For example, a reported \$11 trillion was spent by the US government alone during the crisis, only 5% of which was directed to the health sector, see: <https://www.covidmoneytracker.org>

3. Income and employment

3.1. Labour inequality

The pandemic recession in 2020-21 reversed the per capita income convergence of the last few decades, increasing global inequality and the wealth gap between and within countries (Adarov et al. 2022; ILO, 2022b, IMF, 2022; Narayan et al. 2022; World Bank, 2022). According to the *International Labour Organization* (ILO), workers lost roughly \$6 trillion in direct income during 2020-22 compared to a 2019 baseline.¹⁵ At the same time, the wealth of billionaires nearly doubled (Chancel et al. 2022), increasing by an estimated \$4 trillion according to Oxfam (2022a,b). A 19% loss in global working hours occurred at the peak of worldwide lockdowns (ILO, 2021b).¹⁶ Overall, ILO estimated a loss of 9% of global working hours and 114 million jobs in 2020, higher for women and young workers, and in Latin America and the Caribbean, Southern Europe and Southern Asia (ILO, 2021a). Self-reported survey data from 80 countries (subject to bias) suggests that employment for working age adults was 31% less than pre-pandemic levels in April-June 2020 (Brunckhorst et al. 2023). A full recovery stalled in 2021, mainly in lower-middle and low-income countries, with employment levels remaining an estimated 8% below prepandemic levels (Brunckhorst et al. 2023) and global working hours remaining 4% below (ILO, 2021b). Labor market impacts continued in late 2021 in low- and middle-income countries, including job displacement into lower paying jobs that were more informal and agriculture-based (Brunckhorst et al. 2023; He et al. 2023). According to a counter-factual analysis by the World Bank, at the end of 2021 there were still 40 million less jobs worldwide; in Pakistan alone, an estimated 1.6 million additional young adults were jobless (Schady et al. 2023). In the USA, an estimated 2.5 million workers were unable to work or worked at reduced hours in March 2022 because of Covid-related business losses or closures, down from 50 million in May 2020 (US Bureau of Labor Statistics, 2022). Real wage growth declined for the first time this century by 1.4% worldwide, according to ILO (2022b). While most higher-paid wage groups recovered to

¹⁵ This total estimate is based on synthesizing results from ILO (2021a,b) and ILO (2022a,b), and does not account for government relief and assistance programs.

¹⁶ In April 2020, the unemployment rate reached 14% in the United States; in Europe, 42 million people were dependent on job-retention schemes (Ebbinghaus and Lehner, 2022).

pre-pandemic levels, global employment levels among the lowest-paid group of workers remained below 2019 levels in 2022 (ILO, 2022b). There is evidence of a shift in the labour market, with an uneven recovery and lower-quality employment accounting for a large share of growth in developing countries (Narayan et al. 2022). Inequalities are now being compounded by inflation and the global cost-of-living crisis. Christensen et al. (2023) estimated that 1.7 billion workers worldwide have seen inflation outpace their wages in 2022.

The crisis reshaped class divisions between those able to work-from-home (teleworkers) and essential and non-essential workers. Reviews have explored the positives and negatives of teleworking on work-life-balance, work productivity and burnout (Newman et al. 2022; Shirmohammadi et al. 2022; Islam, 2022). According to the ILO (2021c), only 8% of workers worldwide worked from home prior to the pandemic, which rose to 17% (total 557 million people) during April-June 2020, and was highest in Canada (39%), Malaysia (36%), USA (35%) and UK (33%). This is roughly in line with other studies (Dingel and Neiman, 2020), including an analysis from Italy that showed 12% worked remotely in 2020, rising to 70% for employees of large firms (Crescenzi et al. 2022). The pandemic is predicted to increase work-from-home employment in the years ahead. Barrero et al. (2021) estimated that the percentage of remote workdays will rise from 5% to 20% in the USA post-pandemic. Some studies suggest that this will disproportionately increase professional opportunities for employees who are older, male and higher-educated (Bonacini et al. 2021).

The pandemic response also increased the risks of forced labour exploitation and modern slavery (Washburn et al. 2022), although the exact proportion is unclear. Private forced labour exploitation and sexual exploitation increased by an estimated 1.3 million and 1.5 million (to 27.6 million total) from 2016 to 2021 (ILO et al. 2022). Estimates suggest that 9 million additional children were at risk of being pushed into child labour by the end of 2022 (ILO and UNICEF, 2021), with emerging empirical data confirming an increase due to the pandemic response in some countries (Mohammed, 2023; Nuwematsiko et al. 2022).

3.2. Household income

The World Bank's *Poverty and Global Prosperity Report* (2022) estimated that global median income declined by 4% in 2020. Large-scale empirical surveys found that pandemic policies caused 30% to 65% of the global population to suffer financially in 2020 (Bundervoet et al. 2022; Egger et al. 2021; Khetan et al. 2022). The magnitude of income losses were substantial (Miguel and Mobarak, 2022), disproportionately affected lower income earners and countries (Chen et al. 2022; Khetan et al. 2022), and were associated with the stringency of public health policies (Hammond et al. 2022; Maredia et al. 2022). A large-scale World Bank study (n=41,000, 34 LMICs countries) found 64% of households reported decreased income and 36% stopped working during the first wave (42% of women lost their job, compared to 31% of men) (Bundervoet et al. 2022). This is roughly equivalent to other studies (Bottan et al. 2020; Egger et al. 2021; Kesar et al. 2021; Josephson et al. 2021; Wellcome, 2021). A retrospective survey across 16 countries found 32% reported suffering financially during the pandemic (higher in lower income countries) and included: job loss (8%), inability to meet essential needs (15%) and the use of savings (16%) (Khetan et al. 2022).¹⁷ World Bank survey data suggests household income continued to be below pre-pandemic levels in 2021: 30% of respondents in high-income countries and 70% in low-income countries reported some income losses compared to pre-pandemic levels (World Bank, 2022; Brunckhorst et al. 2023). Longitudinal household data exploring the longer term effects of the lockdown recession and other NPIs are limited but show lingering impacts on household income and poverty (Jha and Lahoti, 2022; Mahmud and Riley, 2022; Rönkkö et al. 2022).

Individual research studies support the conclusion of a World Bank (2022) report: income losses were largest among youth, women, those in the informal sector, small business owners and casual workers (Bonaccorsi et al. 2021; Blundell et al. 2022; Barletta et al. 2022; Flor et al. 2022; Ge et al. 2022; Gummerson et al. 2021; Oyando et al. 2021; Richter and Patel, 2022; Schotte and Zizzamia, 2022). Some show larger adverse effects in urban areas, suggesting agricultural households were less negatively affected overall

¹⁷ This study excluded low-income countries, where impacts reported by other surveys were more severe.

(Bundervoet et al. 2022; McDermott and Swinnen 2022). Few (1-15%) households in low- and middle-income countries (LMICs) received government or NGO assistance in 2020 (Egger et al. 2021; Maredia et al. 2022), although some data suggests this rose significantly in 2021 reaching an estimated 19% in low-income countries and 52% in upper-middle-income countries (Brunckhorst et al. 2023). According to Ratha et al. (2022), predictions that global remittances (worth \$500 billion in 2019) would fall by 20% in 2020 did not occur (est growth rate +0.6%), although they declined by 8% in Africa and 7% in East Asia; however, the decline in informal transfers due to NPI restrictions means that the absolute reduction is likely much larger than official estimates (Dinarte et al. 2021).

3.3. Poverty

Global poverty increased for the first time in a generation in 2020 (Mahler et al. 2022; World Bank, 2022). Precise model estimates vary depending on the poverty metric used (Moyer et al. 2022; Sumner et al. 2022).¹⁸ The most comprehensive estimates were provided by the World Bank's *Poverty and Shared Prosperity Report 2022*, using three different poverty lines to account for differences between countries. They estimated that 90 million fell into extreme poverty (<\$2.15, used in low-income countries), 167 million fell below the \$3.65 poverty line (used in low-middle income countries) and 152 million fell below the \$6.85 poverty line (used in upper-middle income countries). This would suggest that 409 million more people were below one of three global poverty lines in 2020 due to the crisis. In an earlier analysis, Ferreira et al. (2021) estimated that 300 million fell into poverty in 2020 based on national poverty lines.¹⁹ While some recovery occurred in 2021, current data suggests that food price increases and other factors stalled

¹⁸ It is worth noting that nearly half of the global human population (over 3 billion people) live on less than \$6.85 per day (World Bank, 2022).

¹⁹ Another way to estimate global poverty is the societal poverty rate, which is a population-weighted average of the country-specific poverty line. The World Bank (2022) report does not provide a global estimate of changes in the societal poverty rate. The authors provided one on request; they estimated: 222 million people fell below the societal poverty line in 2020: 120 million in South Asia, 75 million in East Asia and the Pacific, 19 million in Sub-Saharan Africa, 10 million in the Middle East and North Africa, 8 million in Europe and Central Asia, 4 million in Latin America and the Caribbean and -13 million in the rest of the world (unpublished data, communication with the authors).

the recovery in 2022, with absolute numbers remaining roughly similar to those from 2020 (World Bank, 2022). Other analyses suggest larger increases in poverty. Laborde et al. (2021) estimated an additional 150 million people fell below the extreme poverty line in 2020 (a 20% increase), concentrated in urban areas of South Asia and sub-Saharan Africa. UNICEF (2021) estimated 100 million additional children were in multidimensional poverty in 2021, compared to 2019. Survey results from Maredia et al. (2022) suggested 19 million more people were living in extreme poverty in July 2020 in five African countries; by comparison, the World Bank (2022) analysis mentioned above estimated only 7.5 million fell into extreme poverty across all of Africa in 2020.²⁰ A recent report by Oxfam (2022a,b) estimated that 263 million more people (compared to 2019) were pushed into poverty by 2022 due to the combined impact of Covid and increases in inequality and food prices.

4. Food security

Hunger and food insecurity increased worldwide, with varying estimates across emerging and developing economies. According to the UN's flagship report, *The State of Food Security and Nutrition in the World* (FAO et al. 2022), 350 million more people were pushed into food insecurity from 2019 to 2021: 207 million became severely food insecure (especially in Africa) and 143 million moderately food insecurity. Food insecurity trends were increasing before the pandemic, however. A study by Balistreri et al. (2022) estimated that in 2020, 63% of an estimated 263 million additional food insecure people were due to the economic shock of the pandemic, and concentrated in Asia (India, Bangladesh, Pakistan), Sub-Saharan Africa and Latin America and the Caribbean. The study estimated 174 million more people remained food-insecure in 2021. *The Global Network Against Food Crises* (2022) estimated that 58 million more people (193 million total) were in acute food crisis or worse in 2021 compared to 2019, with 15 million more in emergency food crises (39 million total) and 460,000 more at

²⁰ These five countries account for 25% of the total population of Africa. Extrapolating the survey results from Maredia et al. (2022) would suggest 76 million people fell below the extreme poverty line in July 2020 in Africa. This is a very rough estimate but points to some of the methodological problems with understanding poverty impacts during the crisis.

famine levels (570,000 total). More than half of the increase in severe food insecurity was attributed to the pandemic economic shock. Additional estimates of increasing food insecurity were provided by Baquedano et al. (2021) and Laborde et al. (2021).

Empirical studies show that food access was disrupted much more significantly than food availability, due primarily to the recession and household socio-economic decline (Bene et al. 2021; McDermott and Swinnen, 2022; Vos et al. 2022). Large-scale surveys in low- and middle-income countries found that 45% of households were forced to miss or reduce meals during the 2020 lockdown period (Bundervoet et al. 2022; Egger et al. 2021), and that food insecurity was strongly associated with pandemic restrictions (Hammond et al. 2022).²¹ Although most studies show a sharp initial decline followed by a gradual recovery (Rudin-Rush, 2022), food insecurity remained below 2019 levels in most studies (Bloem and Farris, 2022) and some research suggests declines continued in 2021 (Orjakor et al. 2023).

Food systems did show resilience in 2020, although the vast majority of small-scale farmers and those in the informal sector faced serious economic difficulties. Widespread and severe impacts occurred on food purchasing, sales and access to crop inputs and markets (Hammond et al. 2022). A review by Bene et al. (2021) noted that the pandemic redistributed food system profits away from small-scale outlets, markets and informal enterprises and towards larger grocery stores and supermarkets. According to the UN Food and Agricultural Organization, global food prices remained stable in 2020 but then rose sharply in early 2021, reaching their highest ever recorded level in 2022 (FAO, 2023), after having been compounded by the Russian-Ukrainian war.²²

²¹ Methodological issues with pandemic phone-surveys and food security in Africa are discussed in Bruck and Regassa (2022).

²² Diop and Asongu (2022) found that while both the Covid pandemic and Russian-Ukrainian war increased food prices across 25 fragile states, the war led to a much higher increase.

5. Education and learning loss

The pandemic crisis has been described as “*the most severe disruption to global education in history*”, with 1.6 billion students across 190 countries impacted in 2020 and in-person education closed for 141 days on average between 2020-2021 (UNICEF, 2022). An estimated 771 million children missed 1.5 years or more of school (Schady et al. 2023). A modeling study by UNICEF (2022) estimated a sharp 13% increase in global learning poverty, which rose from 57% in 2019 to 70% in 2022. They estimated that pandemic school closures led to 1 out of every 8 children in LMICs dropping into learning poverty, erasing all global educational gains achieved since 2000. Effects were largest in regions with the longest school closures including South Asia (average of 273 days) and Latin America and the Caribbean (average of 225 days).²³

UNICEF’s model assumes that one year of school closures is equivalent to 80-95% annual lost learning. A review by Moscoviz and Evans (2022) found that empirical studies showed less impact, although students from low socioeconomic households and in lower income countries suffered disproportionately.²⁴ A meta-analysis by Patrinos et al. (2022) found an average 0.17 standard deviation learning loss, roughly equivalent to one-half year of learning. A second by Betthäuser et al. (2022) found an average learning loss of 35% of a school year’s worth of learning. However, most studies were from high-income countries. A study from Brazil found a 0.32 standard deviation decrease in test scores in 2020, equivalent to three-quarter of a year’s worth of learning (Lichand et al. 2022), roughly equivalent to a study from South Africa (Ardington et al. 2021). An assessment by the World Bank estimated that 30 days of school closures led to 32 days of learning loss in low- and middle-income countries, which accounted for the erosion of

²³ Within these regions, there was substantial variation between countries. For example, schools were closed for 510 days in the Philippines, 448 days in Uganda and 326 days in Saudi Arabia; but only 47 days in Vietnam, 61 in Tanzania and 107 in Morocco (Schady et al. 2023).

²⁴ A large body of research has explored how educational systems adapted to remote schooling and the implication of this for post-pandemic education. It is worth noting, however, that an estimated two-thirds of children worldwide lack internet access at home (Schady et al. 2023). Research studies also question the effectiveness of remote learning even during short-term school closures in high-income countries (e.g. Netherlands) with high internet connectivity (Engzell et al. 2021).

previous learning (Schady et al. 2023). As noted by Schady et al. (2023), the 14.5 months of school closures in Bangladesh led to nearly 26 months of learning lost, when accounting for forgone learning and forgotten learning. Interestingly, a study in Swedish primary schools, which remained open, found no effect of the pandemic on reading comprehension scores (Hallin et al. 2022).

Early estimates by UNESCO (2020) predicted 24 million students were at risk of not returning to educational institutions in 2020 due to higher dropout rates and lower enrolment, especially in South and West Asia and sub-Saharan Africa: 11 million at primary and secondary levels, 8 million in tertiary education and 5 million in pre-primary. The only review of empirical data found dropout rates ranging from 1% to 35%, and highest for households with lower socioeconomic status, adolescents and females (Moscoviz and Evans 2022). For example, a study from Malawi found 14% of students did not return to school, rising to over 30% for girls aged 17-19 (Kidman et al. 2022). No recent comprehensive global estimate was available. A recent analysis found that 150,000 students (K-12) were unaccounted for and likely dropped out across 21 US states (Dee, 2023). A study from South Africa estimated an additional 725,000 learners were out of school in April/May 2021, four times larger than pre-pandemic years (Shepherd and Mohohlwane, 2022).

Learning loss and early school dropout are estimated to have long-term consequences. UNICEF (2022) called pandemic school closures an ‘intergenerational inequality shock’ and estimated the current generation of students may lose upwards of \$21 trillion in earnings during their lifetime. Learning deficits could accumulate in Africa to more than 2 years of lost learning by grade 10 (Angrist et al. 2021), with intergenerational mobility in educational attainment decreasing by 10% (Neidhofer et al. 2022). Some data is more re-assuring; Singh et al. (2022) found that two-thirds of learning loss was made up within 6 months of schools reopening in Tamil Nadu, India.²⁵ De la Maisonnette et al. (2022) estimated productivity losses built up over a lifetime of 0.4% to 2.1% after 45

²⁵ It is worth noting that Tamil Nadu has long had much higher overall social development scores compared to most other Indian states.

years; Fuchs-Schündeln et al. (2022) found average losses of 3.3%. A World Bank report suggested that children affected by the pandemic, especially due to learning loss, could have earnings in adulthood that are roughly 25% lower than expected in the absence of pandemic disruptions (Schady et al. 2023).

6. Lifestyle changes

6.1. Sedentary behaviour

Multiple systematic reviews show reductions in physical activity across all age groups due to pandemic restrictions (Kharel et al. 2022; Larson et al. 2021; López-Valenciano et al. 2021; Oliveira et al. 2022; Stockwell et al. 2021; Wilms et al. 2022; Wunsch et al. 2022). Meta-analyses found average decreases in physical exercise among children in 2020 of 20% (Neville et al. 2022) and 26% (Chaabna et al. 2022), ranging from reductions of 11mins/day to 91mins/day compared to pre-pandemic levels (Rossi et al. 2021). Decreases in physical activity were greatest among children dependent on school and sports-based programs (Do et al. 2022) and in homes/neighbourhoods with less access to outdoor space (Liu et al. 2022; Yomoda and Kurita, 2021). Nature contact and soundscapes (noise levels) changed, with adverse consequences reported depending on the severity of restrictions and neighbourhood geography (Hasegawa and Lau, 2022; Labib et al. 2022). The transition to working from home may have increased musculoskeletal disorders due to poor ergonomics (Cruz-Ausejo et al. 2022). Greater physical activity during the pandemic was associated with better mental health (Marconcin et al. 2022). There are few longitudinal studies currently available; one US study found that reductions in physical activity persisted into late 2021, after most restrictions were removed (Desine et al. 2023).

6.2. Sleep and screens

Lifestyle changes included sleep disturbances and increases in screen use and eye problems. A meta-analysis found a 41% global prevalence of sleep disturbances during 2020-21, higher during lockdown and for children and adolescents (Jahrami et al. 2022).

Sleep duration, quality and dream state were negatively affected (Drumheller and Fan, 2022; Gorgoni et al. 2022). An estimated 17% of people worldwide suffered from insomnia (14% moderate and 2.5% severe insomnia) (AlRasheed et al. 2022) which was associated with the level of NPI restrictions (Scarpelli et al. 2022). A meta-analysis by Madigan et al. (2022) found a 52% pooled increase in screen time among children (especially adolescents) in 2020, rising from 2.7 hours/day to 4.1 hours/day. Trott et al. (2022) found larger increases in primary aged children (1.4 hours/day) compared to adolescents and adults (~1 hour/day). Increases in screen use were associated with the stringency of lockdown (Kharel et al. 2022) and with risks for metabolic syndromes in adolescents (Musa et al. 2022). According to a small US study, screen use remained elevated by 1.1 hours/day in May-August 2021 (Hedderston et al. 2023). Increases in myopia (average 0.46 dioptre change) and other eye problems were found in systematic reviews, especially among children and those with pre-existing myopia (Abounoori et al. 2022; Cortes-Albornoz et al. 2022; Li et al. 2022).

6.3. Diet

Systematic reviews on diet show varied results. A review by Gonzalez-Monroy et al. (2021) found a decrease in healthy diets and increase in ultra-processed foods, while Mignogna et al. (2022) found improvements in nutritious food consumption, especially in some high-income countries. Pourghazi et al. (2022) found decreases in fruit and vegetable consumption among children. In general, studies show decreases in fast food but increased overall food intake, snacking, calorie-dense carbohydrates and sweets (Bakaloudi et al. 2022; Gligoric et al. 2022). Some negative dietary habits were maintained in the post-lockdown period (Mekanna et al. 2022). The large increase in food insecurity in low- and middle-income countries (LMICs) noted above drove many households to switch to cheaper and less nutritious (staples) foods, reducing dietary diversity, including less animal protein, legumes and nuts (Bloem and Farris, 2022; Picchioni et al. 2021). Exact estimates are unavailable. It is unclear what effects social distancing and lifestyle changes had on the human microbiome and the implications of reduced microbial diversity on human health (Finlay et al. 2021; Hurley et al. 2023).

6.4. Obesity

Pandemic lifestyle changes increased risks for obesity (Daniels et al. 2022). A review of longitudinal cohort studies by Anderson et al. (2023) found a 2% increase in childhood obesity and a 1% increase among adults in 2020 (low certainty evidence), as well as an average increase of 1.65 kg for children and 0.93 kg for adults. A study from the US found a 3% increase in adult obesity prevalence in 2020 compared to 2019 (Restrepo, 2022). In Israel, Shalitin et al. (2022) found that 11% of children with normal pre-pandemic weight became overweight or obese during 2020, highest in those 2-6 years old; in the US, Koebnick et al. (2022) showed larger weight gain among Black and Hispanic youth. Other reviews by Khan et al. (2022), Bakaloudi et al. (2022) and Chang et al. (2021) found that weight gain and body mass index (BMI) increases from pandemic confinements occurred predominately among already overweight or obese people, including those with type 2 diabetes (Ojo et al. 2022). There is evidence that weight gain was maintained among children after most restrictions were removed in 2021, although no review was available (Azrak et al. 2022; Long et al. 2022; Siegel et al. 2022; Hernandez-Vasquez et al. 2022; Koebnick et al. 2022).

6.5. Child development

Research studies show adverse effects on child growth and development. A meta-analysis of 8 studies (all from high-income countries) found communication and personal-social impairments at age 12-months for children born in 2020 compared to pre-pandemic cohorts (Hessami et al. 2022). Other studies have shown reductions in early learning and motor skills (Byrne et al. 2023; Deoni et al. 2021). Since relative risk reductions were small in most studies, some have assumed impacts may be quickly reversed. One uncertainty relates to any possible increase in more severe disorders (e.g. autism spectrum disorder or schizophrenia), only noticeable in the future (Lavallee and Dumitriu 2022). Child development may have been adversely affected by the high rate of perinatal maternal depression and other related mental health deteriorations (Federica et al. 2023; Kokkinaki and Hatzidaki, 2022; Shorey et al. 2021), with some recent studies associating this with infant negative affect and temperament (Buthmann et al. 2022; Lopez-Morales

et al. 2022). Some studies suggest effects on early child development and socialization from mask wearing (Carnevali et al. 2022; Gori et al. 2021; Ramdani et al. 2022), although no comprehensive review was available. A study on school closures from Uruguay with children (4-6 years) found reductions in motor and cognitive development as well as attitudes towards learning compared to pre-pandemic cohorts (Gonzalez et al. 2022). A Chinese study found reductions in height growth after school closures (Wen et al. 2021).

Early modelling by Osendarp et al. (2021) and Headey and Ruel (2022) estimated that millions more children could suffer from wasting by 2022. However, there was no review available on childhood stunting and wasting and it is not possible to validate these model predictions with current data. Some empirical studies do show various negative effects (Alam et al. 2022; Jayatissa et al. 2021; Miller et al. 2022; Win et al. 2022; Zhu et al. 2022). Results from Win et al. (2022) suggest that food relief and rapid employment recovery likely helped to prevent severe population-level effects in Bangladesh.

6.6. Personality

Only a few studies have explored personality change during the pandemic. In the US, Sutin et al. (2022) found small declines in extraversion, openness, agreeableness and conscientiousness (2019-2022), equivalent to roughly one decade of normal personality change. Young people showed disrupted maturity (increased neuroticism, decreased agreeableness and conscientiousness). Interestingly, these changes were not apparent in the 2020 data but only emerged in 2021 and 2022. Smaller studies from Germany found slightly different results (Krautter et al. 2022; Rudolph and Zacher (2023)). A review of personality type found neuroticism and anti-social personality traits were impacted more negatively during the crisis (Starcevic and Janca, 2022).

6.7. Frailty

Research also suggests an increase in frailty among the elderly, including various functional impairments (Hirose et al. 2023; Felipe et al. 2023; Saraiva et al. 2021; Richardson et al. 2022) and cognitive decline including a worsening of dementia (Noguchi et al. 2021; Prommas et al. 2022). Data on the magnitude of these effects were not readily available.

6.8. Addiction and drug use

A review of addiction disorders found that food, social media and internet addictions increased during the lockdown period (Alimoradi et al. 2022). Gaming addictions and disorders also appear to have increased among some children and adolescents (Han et al. 2022). Although alcohol, smoking and other drug use did not increase at a population-level in 2020, increases did occur in a proportion of the population, especially among those with addictive disorders (Marsden et al. 2022). A meta-analysis by Acuff et al. (2022) based on studies from 56 countries found alcohol consumption increased for 23% of people in 2020 and decreased for 23%. Some countries did experience overall increases (e.g. USA) while others (e.g. Australia) showed a decrease (Sohi et al. 2022). Heavy-drinking patterns intensified in some countries in 2020, with alcohol-related deaths increasing by 25%, 20% and 5% in the US, UK and Germany (Card-Gowers et al. 2021; Kilian et al. 2022a,b; White et al. 2022). Consumption of hard drugs, such as opioids, and drug-related mortality also increased in North America (Imtiaz et al. 2021; Simha et al. 2022). Similar trends occurred with smoking. A meta-analysis by Sarich et al. (2022) found 27% of people who smoked increased their smoking in 2020, while 21% decreased and 50% remained unchanged (2% of non-smokers started smoking). Almeda and Gómez-Gómez (2022) found an overall decrease in smoking. A review by Chong et al. (2022) found youth substance use (alcohol, cannabis, tobacco, e-cigarettes/vaping, and recreational drugs) declined in 2020, although increases were found among sub-groups (Layman et al. 2022).

7. Intimate relationships

7.1. Child abuse

Concerns that NPIs would increase child abuse and maltreatment (WHO, 2020) are in general supported by research findings, although the precise magnitude continues to be debated (Katz and Fallon, 2022; Klika et al. 2023). Research shows heterogenous results from different countries and unresolved discrepancies between a decrease in official reports and, in some studies, pediatric hospital visits and increases in self-reported abuse and risk factors (Klika et al. 2023; Letourneau et al. 2022). A meta-analysis by Lee and Kim (2022) estimated an 18% and 39% global prevalence of physical and psychological child abuse in 2020, both of which were greatest in low-income countries, but the limited number of studies and lack of baseline data prevented estimates regarding pandemic effects. Reviews by Huang et al. (2022) and Rapp et al. (2021) found increases in physical, psychological and sexual abuse. These analyses, and others (Katz et al. 2022; Marmor et al. 2021), suggest associations between increased child maltreatment and lockdown measures, a decline in official child maltreatment reporting and increases in the severity of reported cases. For example, Shusterman et al. (2022) found a 39% drop in child maltreatment reporting in 2020 in the United States, equivalent to 191,000 fewer reports, especially due to drops from educational personnel and daycare providers. Ribeiro et al. (2022) reported a 13% increase in requests for help in Portugal from child and adolescent victims in 2020 compared with 2019, which rose to a 101% increase during the lockdown period. Research from pediatric hospital studies are varied (Brown, 2022). In France, Obry et al. (2023) found a doubling of abusive infant head trauma during lockdown while Brown (2023) found a lag-time, with rates only increasing in 2021.

7.2. Domestic violence

Empirical data supports an increase in intimate partner violence (IPV), including emotional and sexual violence (Bhuptani et al. 2022; Macy, 2022; Thiel et al. 2022), as well as under-reporting in official police and emergency department records (Anderberg et al. 2022; Letourneau et al. 2022). This has been called the ‘shadow pandemic.’ In April

2020, modeling by the United Nations Population Fund (UNFPA) predicted 31 million additional IPV cases due to lockdown over 6 months, mostly in low- and middle-income countries. Data is currently unavailable to sufficiently evaluate this claim (Kim and Royle, 2023) and shortcomings of this model were discussed in Lokot et al. (2021). A meta-analysis by Piquero et al. (2021) based on early studies mostly from the United States found a 8% increase in IPV during lockdown and stay-at-home orders in 2020. A study across 13 LMICs by *UN Women* (2021) in mid-2021 found that 68% of women believed the incidence of physical or verbal abuse had increased during the pandemic. Studies from LMICs are limited. Research from India found a 135% increase in domestic violence complaints in May 2020 in districts with the strictest lockdown measures, which remained elevated in 2021 (Ravindran and Shah, 2023).²⁶

7.3. Intimate relationships and family

Intimate partner and family relations experienced substantial stress during the crisis. Andrade et al. (2022), Bevan et al. (2023), Estlein et al. (2022) and Yates and Mantler (2023) reviewed a large body of qualitative research on changes to intimate family, sibling and romantic relationships, finding both positive and negative consequences, including increases in the care responsibility of women that widened gender inequality (Flor et al. 2022; Moyano et al. 2022). Pandemic restrictions had some negative impacts on the experience of new parents during pregnancy, childbirth and in newborn bonding and attachment (Adesanya et al. 2022; Zheng et al. 2022). No global systematic review was found on marriage and divorce rates. Data from the US (Manning and Payne, 2021; Westrick-Payne et al. 2022) and Japan (Ghaznavi et al. 2022; Komura and Ogawa 2022) found that new marriages in 2020 reduced by 10% while divorce rates declined by 12% (US) and 27% (Japan). According to the *International Labour Organization* (ILO) et al. (2022), the number of forced marriages rose globally by nearly 7 million between 2016 and 2021, to 22 million; however, data on specific pandemic-related increases were unavailable. Child marriages likely rose. Predictions by UNFPA in early 2020 estimated

²⁶ This study also found a decrease in rape and sexual assault complaints, which they ascribed to reductions in human mobility, although reporting issues may also be involved.

that child marriages would increase by upwards of 13 million (UNICEF, 2021). Yukich et al. (2021) modeled increases in five countries responsible for 50% of all child marriages (Bangladesh, Brazil, Ethiopia, India, and Nigeria) and estimated that total global increases until 2035 would range from 3.6 to 10 million. Empirical data remain sparse (Esho et al. 2022), which complicates current estimates (Lokot et al. 2021).

7.4. Fertility and sex

Research from high-income countries suggests that a drop in birth rates occurred in some countries during the pandemic. Other data show that sexual activity among women reduced significantly and unwanted pregnancies likely increased. Pomar et al. (2022) found a 14% reduction in live births in January 2021 across 24 European countries, associated with the stringency of lockdown (no reduction occurred in Sweden). Sobotka et al. (2022) analyzed birth trends across 37 high-income countries and found two short-term reductions in births, in January 2021 and early 2022. They hypothesize that the pandemic may have small but lasting effects on fertility rates, depending on future economic recovery. Wolff and Mykhnenko (2023) found a 4% drop in births across 900 European cities in 2020. A US study found that declines in birth rates were associated with the stringency of NPIs, and were higher in democrat-controlled states (Adelman et al. 2023). Silverio-Murillo et al. (2023) found a 12% reduction in fertility in Mexico, which returned to pre-pandemic levels by end of 2021. Some data suggests fertility declines were disproportionately among wealthier and older women (Mooi-Reci et al. 2022; Silverman et al. 2022). No review was available, however.

Consistent reductions in women's sexual activity was reported across multiple systematic reviews, with most reporting decreases in sexual intercourse and increases in solitary sexual behavior (de Oliveira and Carvalho, 2021; Toldam et al. 2022; Hessami et al. 2022; Gleason et al. 2022). Individual studies found an increase in sex toy sales (Qalati et al. 2022) and pornography use (Lau et al. 2021). Reviews have also found small reported changes in menstrual cycles (Tayyaba Rehan et al. 2022), erectile dysfunction (Bakr and

El-Sakka, 2022) and earlier average onset and progress of puberty among girls (Prosperi et al. 2022). No review was available on sexual activity outside the home during lockdown; however, a UK study found 10% of respondents reported disobeying lockdown rules to have sex with someone outside their household (Maxwell et al. 2022).

Early estimates by UNFPA suggested that upwards of 15 million additional unwanted pregnancies would occur across 132 low- and middle-income countries (LMICs), based on a 10% drop in sexual and reproductive health services (Riley et al. 2020). This was revised in January 2021 after data suggested much lower disruptions to family planning services; UNFPA (2021) then estimated only 1.4 million unintended pregnancies across 115 LMICs (range 500,000 to 2.7 million). This lower estimate assumed an average of 12 million women (range 4 to 23 million) were unable to access family planning services, mostly during the first 4 months of the pandemic. However, there are few studies available to evaluate these estimates. Some studies show reductions in fertility intention (Rahman et al. 2022) while others found increases in unwanted pregnancies (Druetz et al. 2022; Molla et al. 2022). A few studies show drops in abortion during lockdown including a 25% decline in Italy and 40% decline in Mexico, suggesting a reduction in unwanted pregnancies in some countries (Marquez-Padilla and Saavedra 2022; Guzzetti et al. 2022).

8. Community

8.1. Social relationships

A large body of research during the pandemic focused on how to promote compliance with public health recommendations by altering social norms and interactions; however, much less is known about their adverse effects on social relationships. The crisis functioned as a *social shock* disrupting social networks, support, interaction and intimacy, and reshaping cultural etiquettes and routines of work, school, care, social life and meaningful events (e.g. marriage, birth, adulthood, illness and death) (Lannutti and Bevan, 2022; Long et al. 2022). Quantitative data on changes to social relationships are limited. A review by Buecker and Horstmann (2021) found increases in loneliness

compared to pre-pandemic data and a deterioration in the quality of social relationships. Despite a transition to digital platforms, longitudinal data from 23 countries showed that online connection did not address feelings of loneliness and isolation for most people (Van Breen et al. 2022). Qualitative reviews have been published on specific changes; for example, the adverse consequences of blanket hospital visitation policies (Iness et al. 2022), restrictions at long-term care facilities (Saad et al. 2022; Veiga-Seijo et al. 2022) and regulations associated with mourning and funerals (MacNeil et al. 2021; Van Schaik et al. 2022). Some studies from North America and Europe suggest a decline in adolescent and young adult interpersonal connections and friendship (Kulcar et al. 2022; Kozak et al. 2023; Lowe et al. 2023; Smith et al. 2022); however, others suggest some strengthening effects (Juvonen et al. 2022; Lee et al. 2023). A longitudinal US study found decreased feelings of friendship and increased social hostility in May 2020 compared to pre-pandemic data (Philpot et al. 2021). Two studies from the Netherlands found that social networks became smaller and more focused on family ties in 2020 (Steijvers et al. 2022; Volker, 2023). A longitudinal qualitative study from the UK and Colombia found that a *belongingness gap* emerged and persisted among roughly one-third of older adults, who also experienced a loss of autonomy (Derrer-Merk et al. 2022a,b). Reduced social contact was especially difficult for more vulnerable populations, including people with disabilities and the elderly (de Vries et al. 2022; Li et al. 2023), as well as young families (Zeduri et al. 2022). Although research is limited, some studies suggest that posttraumatic growth may be inhibited by the increase in social isolation that occurred during the pandemic period (Collazo-Castineira et al. 2022; Matos et al. 2021; Ulset et al. 2022).

8.2. Stigma

The crisis generated negative psychosocial reactions, partially driven by media narratives, heightened fear and social conformity to NPI rules. A meta-analysis found 35% of people had experienced some form of stigma and social stereotyping and avoidance, higher among Covid patients, those with lower income and health care workers (Yuan et al. 2022). Another review explored heightened xenophobia among migrants (Silva et al. 2022). Although no review is available, individual studies suggest that social pressure to

conform to NPI rules played a role in stigma as well as hostile vigilantism (Biswas et al. 2021; Doucet et al. 2022; Graso et al. 2022; Peters et al. 2022; Tei and Fujino, 2022). Studies on media representations from Canada and the UK found a strong moralization discourse that blamed and shamed specific groups (e.g. Asians, young people, non-conforming individuals) and divided the population into: “the virtuous” rule followers (considered selfless and smart) and the deviants (e.g. Covidiot; immoral, stupid and selfish), who questioned or criticized the NPI rules and/or did not respect the rules (Capurro et al. 2022; Lennon and Gill, 2022; Labbe et al. 2022). Other studies have explored the emergence of *essentialism* in public discourse: children were framed “as a risk” (e.g. vector) rather than at risk of adverse consequences from NPIs (Ciotti et al. 2022) and the elderly were framed as a homogenous group of “vulnerable” people, reinforcing prolonged isolation and paternalism (Derrer-Merk et al. 2022b).

8.3. Mobility

Pandemic policies led to changes in every-day mobility and international and domestic migration flows. Over 100,000 international travel restrictions were implemented globally in 2020, with significant impacts on economic migrants, asylum seekers, refugees, international students and others (McAuliffe and Triandafyllidou, 2021). No comprehensive review or meta-analysis was available on this topic. An analysis of 15 advanced economies found declines in immigration in 2020 in all but Finland, highest in Australia (60%), Spain (45%) and Sweden (36%) (Gonzalez-Leonardo et al. 2023). NPIs also had variable effects on human mobility patterns across and within countries. Geospatial studies show less reductions in mobility in lower-income areas with higher population density and more informal livelihoods; this is sometimes referred to as the “luxury of social distancing” (Castells-Quintana et al. 2021; Long and Ren, 2022; Jiang et al. 2022). Some research from North America suggest that mobility reductions were short-lived (only 3-6 weeks) despite them remaining legally in place for much longer (Navazi et al. 2022). Lockdown conditions were particularly difficult for internal migrants, which are estimated at 100 million in India alone, many of which were unable to return home and placed into relief camps with poor living conditions (Jesilne et al.

2021). Using Google data from 124 countries, Czech et al. (2021) found that countries with a higher *Human Development Index* (HDI) had greater internal human mobility reductions in 2020-21 compared to countries with a lower HDI.

Anecdotal reports of an *urban exodus* are supported by research findings in some countries. A large-scale analysis of European cities found that population growth slowed to -0.03% in 2020, with 28% of cities experiencing significant population loss due to reduced in/out-migration (773,000), excess deaths (300,000) and lower births (4%, ~150,000) (Wolff and Mykhnenko, 2023). A study of 62 cities across North America found that only 27% of downtown cores had recovered to 75% of their pre-pandemic mobility levels in May 2022, with 44% remaining 50% or below (Chapple et al. 2022). Mobility reductions were highest for larger vs medium cities and those in the north vs southern cities. While some studies suggest this trend may be temporary (Gonzalez-Leonardo et al. 2023; Rowe et al. 2023), others suggest urban flight from downtown cores will continue, partially due to inflated property markets and work-from-home trends (Borsellino et al. 2022; Colomb and Gallent, 2022; Gupta et al. 2022; Kotsubo and Nakaya, 2022). Data from the US (2021-22) show large out-migration in California and New York (with more restrictive NPIs) and in-migration in Florida and Texas, which had less restrictive NPIs (Zinberg et al. 2023).

8.4. Crime

No systematic review was available on crime and law enforcement. Across 23 countries, Nivette et al. (2021) found an average 37% reduction in police-recorded crime during the 2020 lockdown period, with larger reductions associated with more stringent movement policies. While property-based crimes decreased, homicide was relatively unchanged and crime increased to pre-Covid levels after lockdown in mid-2020. Other studies have been country and/or issue specific. The homicide rate in the US increased by 45% from 2019 to 2021 (equivalent to 6,000 additional deaths in 2021 alone) (Kegler et al. 2022; Murray and Davies, 2022; Simon et al. 2022). Massenkoff and Chalfin (2022) found that although most violent crimes declined in the US, the risk of street crime (robbery and

assault) actually rose 15-30% in 2020. Studies from India found lockdowns directly and indirectly contributed to increased property crime and missing person cases (Paramasivan et al. 2022a,b). A qualitative study from Nigeria found that crime increased due to the economic crisis in 2020 (Ardo et al. 2022).

There is evidence of a global increase in cybercriminal activity (Buil-Gil et al. 2021; Regalado et al. 2022) and online and financial fraud, especially related to historic government assistance programmes (Levi and Smith, 2022; Valiquette L'Heureux, 2022; Zhang et al. 2022). Griffin et al. (2022) estimated 10-15% of loans from the \$800 billion Paycheck Protection Program (PPP) in the US, a relief program for businesses (operational from April 2020-May 2021), engaged in potential fraud. It is unclear how much of the total \$6 trillion spent by the US government was misappropriated by fraudsters. Although there are major concerns that the pandemic led to a rise in corruption, including in the healthcare sector (Teremetskyi et al. 2021), there is a lack of data available for analysis (Moya-Espinoza, et al. 2022).

Pandemic policies also criminalized social behaviour and expanded police powers to arrest and fine the public for non-compliance. Again, no review was available. An *Amnesty International* (2020) report documented police abuses across 60 countries, including allegedly detaining 85,000 people for non-compliance with curfew in the Dominican Republic and 100,000 in the Philippines. The *Policing the Pandemic Mapping Project* found over 10,000 Covid police enforcement incidents across Canada in the first half of 2020 (totaling \$13 million in fines) related to social distancing rules (McClelland and Luscombe, 2021). Studies from Argentina, Nigeria and Australia highlight increases in “resistance to authorities” arrests, growing distrust of police due to selective enforcement and corruption and police discrimination (Shodunke 2022; Perez-Vincent et al. 2021; Russell et al. 2022).

8.5. The legal system

Covid policies impacted the criminal and legal justice system, although the available data is limited. A unique study by Godfrey et al. (2022) from the UK found a backlog of half-

a-million court cases in May 2021, with outstanding Crown cases increasing by 30% from a 2019 baseline. They noted the substantial impact on all court users of this backlog: victims, witnesses and defendants, the legal professions, and overall public trust in the law system. A study from Brazil also found a large increase in court backlogs (Castelliano et al. 2021). Other studies have explored the impact of the crisis on policing (Maskaly et al. 2021; Martin et al. 2022) and norms in jurisprudence (Berger, 2022). Less than 6% of the global prison population benefited from efforts during the first Covid wave to promote decarceration to prevent infection; studies have shown a severe deterioration in global prison system conditions in 2020, including increases in solitary confinement and prison riots (Buchanan et al. 2020; Johnson et al. 2021; Maruna et al. 2022; Penal Reform International, 2021).

8.6. Trust

Trust has been a central concept during the crisis, although only one early review was available (Devine et al. 2021). Most research has focused on the correlates of trust for compliance and disease control (Bollyky et al. 2022; Sulik et al. 2021) rather than longitudinal societal trends. There are significant methodological problems with trust measurement and analysis that have been discussed (Brosius et al. 2022; Wollebaek et al. 2021). Nonetheless, some general trends are discernable. A meta-analysis of surveys across 27 high-income countries in 2020-21 found trust in government increased by roughly 4% (to 44%) whereas support for democracy declined by the same amount (to 65%) (Foa et al. 2022). According to the *Wellcome Global Monitor Project*, high degrees of trust in science (41% of respondents) and scientists (43%) increased worldwide by 10%, comparing 2018 with late 2020, whereas trust in ones neighbours (29%) decreased by 5% (Wellcome, 2021). An analysis of data from 46 countries found that average trust in media increased by 6% (44% reported they trust news most of the time) (Newman et al. 2021).

Heightened trust in 2020 contributed to a ‘rally-around-the-flag’ effect (Bol et al. 2021), increasing trust in political leaders, healthcare workers, the media and scientific experts

(Algan et al. 2021), partially associated with public levels of fear (Eggers et al. 2022; Van der Meer et al. 2023). However, increased political discontent, perceptions of competence and economic concerns decreased trust over time in 2020, which has been shown to have been associated with socio-economic status, personality type and political affiliation (Algan et al. 2021; Bromme et al. 2022; Gualano et al. 2022; Graffigna et al. 2021; Davies et al. 2021; Nielsen et al. 2021; Jorgensen et al. 2022; Starevic et al. 2022; Wu et al. 2022). A longitudinal Canadian study found those who had *less* trust in society before the pandemic lost more trust (roughly 20% of respondents, correlated with lower socio-economic status) while those with *more* pre-existing trust (typically with higher socio-economic status) *gained* more trust (Wu et al. 2022). There are few studies about public perceptions of scientific policy advice during the crisis (Schultz and Ward, 2021). Pandemic policies have also contributed to increases in social polarization, although no review was available; a survey by PEW found 61% of respondents across 19 countries believed their country was more divided in 2022 compared to prior to the pandemic (rising to >70% in USA, Netherlands, Germany, Canada and France), compared to 32% who believed society was more united (highest in Singapore, Sweden and Malaysia). A large-body of research has explored the associations between low social and political trust and alternative explanations (or conspiracy theories) during the pandemic (Tsamakis et al. 2022; van Mulukom et al. 2022). The influence of public health restrictions in driving social polarization and distrust is not well characterized in the academic literature.

8.7. Mass protests

According to a global assessment by the *Armed Conflict Location and Event Data Project* (ACLED, 2021; 2022), public demonstration activities rose globally by 3% in 2020 (vs. 2019) and 9% in 2021 (vs. 2020). While the first four months of the pandemic (lockdown period) saw a 35% drop, this was followed by quick reversals and overall increases especially in anti-government protests and, in the US, Black Lives Matter protests in the summer of 2020. An estimated 19% of global protests were pandemic-related in 2020, and 16% in 2021 (with significant increases in Europe). Studies in

Germany found 20% of people were sympathetic to anti-containment protests and 10% had participated (Hunger et al. 2023; Borbath, 2023). However other studies suggest that polling data has over-simplified public support for lockdown and other NPIs and under-emphasised concerns about their side effects (Foad et al. 2021). Covid-related protests continued in early 2022 in North America and Europe, initially sparked by the *Canadian Freedom Convoy*. The pandemic's indirect effects on protest movements and civil unrest may also play out in the medium term (Bank et al. 2022).

8.8. Media

Research has generally shown that the pandemic increased public consumption of media while also challenging journalistic standards and exacerbating threats to media freedom, including in established democracies (Edgell et al. 2021; Papadopoulou and Maniou, 2021; Pajnik and Hrzenjak, 2022; Holtz-Bacha, 2022). Media watchdogs, such as the *International Press Institute*, documented incidents of verbal and physical attacks, arrests and criminal investigations, information restrictions, censorship, and excessive fake news regulation (Palmer, 2022; Pomeranz and Schwid, 2021).²⁷ The weakening of press independence also occurred through new economic pressures, which saw significant job insecurity, declining advertising revenue, outlet closures and dependence on government funding, which some studies suggest was disproportionately available to pro-government outlets (Holtz-Bacha, 2022; Papadopoulou and Maniou, 2021; Libert et al. 2022; Posetti et al. 2020; Santos and Mare, 2021).

Studies show an increase in global news consumption in 2020, mainly for TV news (including live briefings), social media and Internet news (Mihelj et al. 2022; Newman et al. 2021; Van Aelst et al. 2021). Increases in media use were associated with a decline in mental health (Strasser et al. 2022; Marciano et al. 2022). Studies generally show that political sources dominated the crisis reporting, revealing the central influence of the state and biomedical experts in constructing pandemic news, with some indication that critical scrutiny of policy decisions were minimal (Matthews et al. 2023; Mellado et al.

²⁷ See: <https://ipi.media/covid-19-tracker-in-graphics/>

2021; Morani et al. 2022). A review of risk communication found that uncertainty was not adequately communicated to the public in the early stages of the pandemic (Ratcliff et al. 2022) while some research also shows widespread inadequacies in journalistic reporting of epidemiological data (Ratcliff et al. 2022). There was a sharp decline in print newspapers, especially local outlets, due to lockdown and fears about infection control. Some studies suggest this may hasten the demise of printed newspapers and local and/or small-scale news outlets (Santos and Mare, 2021; Mihelj et al. 2022; Newman et al. 2021; Van Aelst et al. 2021).

There is wide agreement that the crisis represented a pivotal moment for digital journalism (Quandt and Wahl-Jorgensen, 2021; Papadopoulou and Maniou, 2021). The pandemic response involved unprecedented steps at controlling the spread of online information with warning labels, bans and removal for ‘misinformation’ (Krishnan et al. 2021); a large-body of research has been focused on the psychology of misinformation susceptibility (Chu et al. 2022; Nan et al. 2022; Yu et al. 2022). However, recent scientific data shows that the alarmist narrative about misinformation has been overblown (Altay et al. 2023). One large-scale analysis found that only 2% of web traffic and 14% of Facebook engagement in 2020 went to untrustworthy news outlets (Altay et al. 2022).²⁸ The dominant framing of the ‘infodemic’ appears to have provided a cover for governments to strengthened misinformation laws, censorship and Internet blackouts (Rodrigues and Xu, 2020; Pomeranz and Schwid, 2021), which may have long-term effects on media independence and free speech.

8.9. Elections and political attitudes

According to the *International Institute for Democracy and Electoral Assistance* (IDEA), at least 80 countries postponed elections, mostly in 2020. Of 108 elections, 66% had lower voter turnout in 2020-21 with a 10% mean decline (declines >20% in Venezuela, Iran, Kyrgyzstan, Benin, Bahamas, Central African Republic, Hong Kong, Gibraltar, Syria); 34% had higher turnouts (8% mean increase, >20% in Togo and Zambia) (IDEA,

²⁸ The authors rely on the News Guard rating system, and acknowledge that “sharp, binary distinctions between trustworthy and untrustworthy sources are fraught, and people will have strong views about how some brands are labeled.”

2022). Various studies have explored impacts of the crisis on political campaigning and voter sentiment, although no review was available. Some studies from France and the US suggest restrictions led the public to rally around the incumbent politician or ‘safe candidates’ (Bisbee and Honig, 2022; Giommoni and Loumean, 2022). Research has found different results regarding the pandemic’s effect on the 2020 US election (Mitchell, 2022; Algara et al. 2022) and populism (Bayerlein and Metten, 2022). In some cases Covid restrictions were used as a pretense for the arbitrary detention of opposition candidate (Oswald, 2021). A body of research suggests heightened fear was associated with increases in authoritarian attitudes and political orientation (Filsinger and Freitag, 2022; Graso et al. 2022; Hirsch, 2022; Volk and Weisskircher, 2023; Winter et al. 2022). Political scientists have also highlighted the potential impacts on public sentiment related to globalization, expanding state power and trust in multilateral institutions (Bieber 2022; Ciravegna and Michailova, 2022).

9. Environment and ecosystems

Reviews on the environmental effects of the pandemic response show both positive and negative consequences for global ecosystems (Bates et al. 2021; Jiang et al. 2022; Primack et al. 2021). Air pollution and greenhouse gas (GHG) emissions reduced significantly during the lockdown period (Bakola et al. 2022). However, the overall growth rates of greenhouse gases did not decrease and increases in methane and ozone occurred in 2020-21, the reasons for which are still not fully understood (Laughner et al. 2021; Guevara et al. 2022; Qu et al. 2022). Ecological studies found some transient improvements for wildlife populations and natural ecosystems, sometimes referred to as the ‘*anthropopause*’ (Manenti et al. 2020; Soto et al. 2021; Warrington et al. 2022). However, other studies have shown adverse consequences. Souza et al. (2021) found that public interest in national parks declined globally due to mobility restrictions and park closures, reducing revenue and increasing vulnerability to development pressures. In Italy, Manenti et al. (2020) found that invasive species increased during lockdown due to reduced wildlife conservation and management activities. Although no review was available, studies from India and Nepal showed increased wildlife hunting and poaching

during lockdown (Aditya et al. 2021; Behera et al. 2022; Koju et al. 2021). Some studies have also found increases in illegal forestry practices (Tleimat et al. 2022) and illegal commercial and recreational fishing (Ben et al. 2022; Quimbayo et al. 2022). A large-scale study found that deforestation trends did not deviate from historical projections in the Americas and Asia in 2020, although increases were found in Peru and Africa (Cespedes et al. 2022).

A number of studies suggest that the pandemic reversed a decade-long momentum to reduce plastic waste pollution (Li et al. 2022; Peng et al. 2021; Yuan et al. 2021). Precise effects on global plastic pollution are unclear due to data limitations, although there is agreement that personal protective equipment (PPE) waste and single use plastics substantially increased. Peng et al. (2021) estimated more than 8 million tons of mis-managed pandemic-associated plastic waste was generated by mid-2021 (especially from hospital medical waste, and from Asia), and that 26,000 tons were discharged into the ocean (representing 1.5% of all riverine plastic discharge). However the OECD's (2022) *Global Plastic Outlook* analysis estimated that plastics declined worldwide by 4.5% in 2020, equivalent to 10 million less tons. The analysis found that declines were largely driven by the economic contraction in manufacturing and construction; by comparison, they found that household plastic use, medical waste and municipal waste increased; they also found that recycling and waste management was negatively impacted (OECD, 2022).²⁹ Precise estimates of the number of face masks used in 2020 also vary widely, from 450 billion (Li et al. 2022) to 126 billion (OECD, 2022). A number of studies raise concerns about the increased discharge of micro-plastics from PPE and medical waste into aquatic ecosystems (OECD, 2022; Peng et al. 2021; Oliveira et al. 2023) as well as the health and environmental consequences of an increase in the use of various disinfectant chemicals, especially for children (Dewey et al. 2021).

²⁹ The two estimates by Peng et al. (2021) and OECD (2022) are not necessarily mutually exclusive; it is possible that the decline of plastics in manufacturing (10 million tons, as estimated by OECD, 2022) was offset by the growth of plastics in the medical sector (8 million tons) (as estimated by Peng et al. 2021).

10. Governance

10.1 Political violence

Security experts predicted a rise in violent conflict and insecurity in 2020, although others hoped the crisis would promote global ceasefires (Basedau and Deitch, 2021). According to the *Armed Conflict Location and Event Data Project* (ACLED, 2021, 2022), total worldwide political violence decreased by 16% in 2020 and 17% in 2021 compared to 2019, although few conflicts ended. However, this aggregated data hides significant worsening of conflict dynamics in Southeast Asia, Africa and South America and shifts in the activity of non-state actors, who appear to have used the crisis to their advantage (ACLED, 2021; Ide, 2021). Studies consistently found increased political violence in Africa (Bank et al. 2022; Gutiérrez-Romero 2022); according to ACLED (2021), violent conflict in Africa rose by 40% in 2020 and 48% in 2021 compared to 2019. Violence against civilians by state military and police forces increased during lockdown (Bank et al. 2022); a rise in coup attempts (known as ‘*Covid coups*’) and successful coups was reported by Chin (2021). While the exact contribution of the pandemic response is hard to isolate (Basedau and Deitch, 2021; Hanieh and Ziadah, 2022; Hilhorst and Mena, 2021) the crisis does appear to have played some role in igniting coups (e.g. Tunisia) and armed conflict (e.g. Ethiopia) (Bank et al. 2022; Chin, 2021) and increasing vulnerabilities in ongoing conflict zones (e.g. Afghanistan and Yemen) (Rahmat et al. 2022; Islam et al. 2022). The legacy of the pandemic response and ongoing global economic crisis may increase conflict and instability in the years ahead (Basedau and Deitch, 2021).

10.2. Democracy and freedom

According to *The Economist’s Democracy Index* (2020), the world experienced the largest rollback of individual freedom in 2020 “*ever undertaken by governments during peacetime (and perhaps even wartime).*” The index found that 70% of countries experienced declines in governance scores due primarily to government-imposed restrictions. Analysis by *Freedom House* (2021) also found the largest annual decline in democracy and freedom of the last two decades: 73 countries experienced declines in

2020 while only 28 showed improvements.³⁰ This downward trend continued in 2021 (Boese et al. 2022; Democracy Index, 2021). Other measurements, such as the *Human Development Index* (2022) and the *Ibrahim Index of African Governance* (2023), show declining or stagnating progress in governance since 2019. Analysis of the *Pandemic Violations of Democratic Standards Index* across 144 countries found most governments engaged in some violation of democratic standards in 2020 (Edgell et al. 2021): roughly 70% implemented restrictions on media freedom, 50% engaged in abusive enforcement, 40% did not have time limits on states of emergency, 30% engaged in official disinformation campaigns, 20% limited the legislature, 20% engaged in discrimination measures and 10% suppressed non-derogable rights. A large-scale meta-analysis of public surveys across 27 countries in 2020-21 found an erosion of support for core democratic attitudes (Foa et al. 2022). Some studies suggest that fear played a fundamental role in driving public acceptance for civil liberty restrictions (Vasilopoulos et al. 2022). Reviews of the legal basis for pandemic states of emergency have found that they sometimes went *against* legal precedence and expanded executive power (Grogan 2022; Bjørnskov and Voigt, 2022); however, courts, legislatures and sub-national governments did employ some checks and balances on executive power (Ginsburg and Versteeg, 2021).

According to *Transparency International* (2022), 27 countries had historically low progress fighting public sector corruption in 2021. Some studies show a reduction in government transparency and violation in laws ensuring public access to information (Cifuentes-Faura, 2022; Marti, 2022). The crisis opened up opportunities to abuse state resources for political and financial gain (Guasti and Bustikova, 2022) as well as for lobbying and corporate influence, although this is not well characterized in the academic literature.

³⁰ Between 2019 and 2021, the percentage of ‘free countries’ and ‘partly free countries’ dropped 1% and 3% while ‘not free countries’ rose 4%. An estimated 156 million people living in partly free countries were downgraded to not free while 1.48 billion people transitioned from free to partly free, largely due to the historic downgrading of India.

10.3. Human rights

Covid policies generated a large body of descriptive work on how they adversely impacted basic human rights including restrictions to individual freedom of movement and assembly (Chiozza and King 2022). The *Human Rights Measurement Initiative* found that nearly all of 39 sampled countries experienced declines in respect for human rights in 2020 (Clay et al. 2022). In total, 89% of human rights practitioners noted decreases in economic and social rights (work, education, food, health, housing), 82% in civil liberties (freedom of assembly, expression and political participation) and 63% in physical integrity rights (freedom from torture, arbitrary arrest, and disappearance). A review on human rights and Covid policies in Africa noted the exclusion of vulnerable people from policy decisions and increased socio-economic vulnerability and precarity (Manderson et al. 2022). A survey by *Amnesty International* (2021) across civil society groups in 28 countries emphasized the increase in criminalization, stigma and discrimination experienced by socially marginalized people due to pandemic restrictions. A review of emergency orders from 39 countries found half included criminal sanctions for lockdown violations, and few fully complied with human rights legal requirements (Sun et al. 2022). Research has also highlighted the negative human rights implications of new mass surveillance technologies (e.g. digital health passes used as part of track and trace systems in China) and use of data for financial profit, known as ‘datafication’ (Boersma et al. 2022).

10.4. Scientific advice and research

The pandemic response involved an unprecedented expansion of scientific advice and research into crisis management and everyday life. While no comprehensive meta-study was available, four main consequences are worth noting from the literature, mostly from high-income countries. First, policy studies from 2020 largely agree that Covid task forces over-represented biomedical experts and excluded many forms of scientific expertise, including in mental health, ethics and economics (Bruat et al. 2022; Colman et al. 2021; Camporesi et al. 2022; Mulgan et al. 2022; Rajan et al. 2020; Pykett et al. 2022; Wenham and Herten-Crabb, 2021). In many countries, power was concentrated in a

select number of science advisors who disproportionately shaped policy and public narratives, revealing the inadequacies of ad hoc science advisory mechanisms (Pielke, 2023; Rangel et al. 2022; van Dorren and Noordegraf, 2020).³¹ Second, decisions to lockdown and implement other restrictive NPIs heavily politicized science, blurring the lines between science and politics and challenging scientific norms and ethical frameworks (Boin and Lodge, 2021; Christensen and Laegreid, 2022; Van Dooren and Noordegraaf, 2020). Research from the sociology of science has shown that ‘normal science’ was suspended and, in its place, a ‘scientific consensus’ was manufactured to support mainstream political narratives motivated by urgency, precaution and imperatives for social control (Askim and Christensen, 2022; Berger, 2022; Cairney, 2021; Rangel et al. 2022). This privileged certain scientific *interpretations*, represented in simplistic slogans, models and images (e.g. ‘following the science’), most of which promoted a maximalist approach to NPIs and downplayed concerns about their social harms (Hodges et al. 2022; Pykett et al. 2022). Ethical analyses suggest that many policies would be considered unacceptable according to pre-pandemic public health ethical principles (Jamrozik, 2022),³² although it is unclear exactly how the crisis has re-shaped ethical decision-making frameworks.³³

Third, some studies on science networks show that experts who opposed government policy and the mainstream consensus were marginalized and denigrated, including in government-led censorship campaigns (Gesser-Edelsburg et al. 2021; Ioannidis 2022; Shir-Raz et al. 2022). This narrowed the range of acceptable scientific opinion for much of 2020-21 and obscured legitimate expert disagreements about alternative policy options and levels of uncertainty, evidence and policy trade-offs (Askim and Christensen, 2022; Caceres, 2022; Mormina, 2022). The unfavourable framing of the Swedish pandemic

³¹ This included, for example: Anthony Fauci in the US, Christian Drosten in Germany, Jerome Salomon in France and Jaap van Dissel in the Netherlands (van Dorren and Noordegraf, 2020).

³² This includes: proportionality, transparency, the need for evidence, the least restrictive alternative, equity, reciprocity, and due legal process (see Jamrozik, 2022).

³³ For example, despite mask mandates having been widely implemented around the world, a recent meta-analysis showed that the evidence for community mask mandates is weak and few RCTs have been conducted (Jefferson et al. 2023). The evidence-base for the effectiveness of lockdown and many other NPIs are similarly disputed as are the various risk communication strategies used by government to influence and shape public perceptions and behaviours, including fear-based and nudge techniques.

approach in English-language Western media is a good example of this polarization. Fourth, the crisis drove a massive increase in Covid-specific scientific publications and research. There are concerns about research quality and the normalization of ‘fast science’ on overall scientific integrity (Bramstedt, 2020; Khatter et al. 2021; Vickery et al. 2022) and the dominance of Covid in the broader scientific research ecosystem (Ioannidis et al. 2022).

Overall, it is unclear what effect these dynamics have had on viewpoint diversity in higher education, science-based policymaking and the public understanding of science.

Discussion

There are many lessons that can be drawn from this analysis. Five key issues are worth briefly discussing here.

1. Harms are known, far-reaching and alarming

The promotion of lengthy social distancing restrictions by governments and scientific experts during the Covid crisis had severe consequences for hundreds of millions of people. Many original predictions are broadly supported by the cumulative research data presented above: a rise in non-Covid excess mortality, mental health deterioration, child abuse and domestic violence, widening global inequality, large increases in debt, food insecurity, lost educational opportunities, unhealthy lifestyle behaviours, increased loneliness and social polarization, democratic backsliding and human rights violations. These harms are multifaceted. Some are short-term and more discernable, while others are harder to apprehend and will shape individual and collective lives and livelihoods for many years ahead. Research on the social determinants of health has shown how adverse changes in life opportunities, especially in younger ages, shape future health outcomes and socio-economic well-being during an individual’s lifespan. Lost human capital are hard to recover, and can create downward spirals of lost opportunity. The pandemic response leaves behind a legacy of poverty, mental health illness, learning loss, debt, food insecurity, social polarization, erosion of respect for human rights and elevated

excess mortality for non-Covid health conditions. These consequences are unequally distributed: the younger generation, individuals and countries with lower socioeconomic status, women and those with pre-existing vulnerabilities were hit hardest and will bear the brunt of future consequences.

2. Important knowledge gaps need to be filled

Academic knowledge about this harm is contingent on the availability and quality of research studies and the range of expert debate and agreement.³⁴ This analysis has highlighted large gaps in the existing research data and differences between scientific fields and countries. For many issues, there is a noticeable lack of data from low- and middle-income countries. Some areas of research, e.g. mental health and lifestyle changes, have a disproportionate number of meta-analyses and systematic reviews while other areas lack them altogether. This is partially due to the fact that some social effects are simpler to measure and understand in comparison to others, especially over time (e.g. obesity is easier to measure compared to democracy). However it also reflects the lack of longitudinal cohort studies in many countries for important social issues such as household income, social relationships and political attitudes. In addition, very few systematic reviews of qualitative and ethnographic studies were found, which provide a vital source of knowledge to deepen and triangulate quantitative social changes. In particular, it was surprising to find a lack of comprehensive evidence syntheses for the following areas: non-Covid excess mortality, business failures, unemployment and household income, food insecurity, childhood malnutrition, intimate relationships, trust and democratic backsliding. Future systematic reviews should be conducted on these topics.

There are also incongruities between studies, expert disagreements and polarized debates in some fields, which were discussed to some degree in the analysis above. For example, systematic reviews of systematic reviews were available for mental health, domestic violence and child abuse, and highlighted the wide range of variation in research design, methodologies, findings and gaps in current knowledge. Social distancing itself shaped

³⁴ Other forms of knowledge, such as artistic and creative expression, personal experience and work from the humanities are also important sources of knowledge that should not be discarded.

data quality by disrupting the ability for in-person research. This precipitated a high dependence on online surveys and observational and cross-sectional studies with high-risk of bias. Large variation in study designs and period of data collection was also a problem noted in many reviews, and this influenced selection bias and levels of confidence in data analysis. As discussed in the methods section, and when possible in the analysis above, there is also a need to account for how societal harms were influenced by existing trends in place prior to the pandemic and other confounding factors, and how different levels of resilience mediated their impacts. Further work should engage with the methodological issues of the data presented in this paper.

There were temporal limitations to the available research. The data on changes during the initial few months of the crisis, e.g. the first lockdown, were much more numerous than other periods. Limited research followed changes through time in the same cohort or using representative samples. Another challenge relates to the sheer volume of new research being published on the pandemic. For this reason, publications from 2022 and 2023 were prioritized during the analysis. Further important analyses will be available after the publication of this paper, and a future update may be warranted.

Further work is required to monitor and follow changes through time in the recovery phase that can be traced back to the pandemic response and specific policies. This includes longer-term effects on mental health, chronic diseases, household income, government debt and austerity, financial markets, poverty and food insecurity, educational outcomes, child development, obesity and screen use, among many others. A challenge for this type of research will be the ability to account for feedback loops and non-pandemic related systemic vulnerabilities (e.g. to pick one example: the effect of the Russian-Ukrainian war on global food insecurity).

The sheer range of harms that occurred across different spatial, temporal and social scales are at times difficult to integrate and appreciate in general terms. Attempting to evaluate the 'global' impact of the Covid pandemic response comes with inherent epistemological challenges, and many important nuances and interpretative judgements could not be

adequately discussed in this analysis. Although the analysis attempted to outline as many societal impacts as possible, it is likely some were missed or not given the full attention they deserved. Individual country-level and comparative studies that engage with the complexity of these impacts, in their unique socio-cultural context, are important to advancing theoretical and practical debates. For this reason, future research should use this report and societal harm framework to systematically review research evidence at a country level, preferably comparing a select number of countries. This would help provide more granularity and nuance, and could also be useful to inform national pandemic evaluations, social policy, capacity building efforts to support better academic research and planning for future health emergencies.

3. Harms should challenge our mental model of the pandemic

The Covid pandemic response created a distinct set of policy narratives that shaped public opinion and human behaviour in ways that justified the use of very disruptive non-pharmaceutical interventions by governments. These policies were unprecedented in their scope, duration and consequence. The research data presented above questions foundational aspects of these original narratives, and has significant implications for the historical memory and interpretation of the crisis, as well as efforts to prepare for the next global crisis. Certain public and scientific narratives have grown-up around the pandemic, but many of these do not adequately engage with the myriad of harms created by the Covid response itself. There are two important lessons from the harm research in this regard.

First, the pandemic was not only a Covid health emergency but should rather be interpreted as a *whole-of-society crisis* that required a much broader set of policy expertise and public engagement beyond biomedicine. The pandemic response was based on assumptions that frequently ignored social conditions and inequalities. From a global perspective, and based on this analysis, older individuals from wealthy countries benefited the most from mandatory NPIs while younger individuals from poorer countries were most harmed. Many of the larger systemic risks and vulnerabilities that were created or exacerbated will remain for many years, shaping the individual lifespans

of hundreds of millions of people and broader sociocultural, economic and political realities.

Societal harms occurred in the *name* of public health, and were promoted through a ‘global’ policy domino effect. Pandemic policies were based on fundamental contradictions: isolate yourself to stay healthy. As discussed above, not all people are safe at home, nor are most able to stay home. Social distancing has social consequences. Constant public messaging about death and hospitalization statistics, especially when they are not accompanied by risk stratification, have psychological consequences. The creation of a state of exception for much of 2020-21 and the promotion of a ‘new normal’ of mandatory social distancing regulations, and social conformity to them, created a set of *unhealthy* social conditions.

Second, the use of lockdown itself and other NPIs went against many pre-Covid pandemic plans and public health consensus. In general, these supported more targeted and less draconian interventions during a respiratory virus pandemic, including promoting voluntary behavior change and protection of the most vulnerable rather than blanket government laws and restrictions. This conventional wisdom emphasized the need to maintain the normal functioning of society, reduce exaggerated levels of fear and panic, communicate uncertainty and risk distribution, minimize scapegoating and moralization and avoid collateral damage. What happened? Why? And how can it be prevented in the future? Many of the harms described above were and should have been anticipated.

Further research should help clarify how pandemic policies were formulated and how the perceived social consensus was manufactured or curated, including through public opinion polls, special interest groups and group psychology.

4. More research on trade-offs is needed

The aim of this analysis was to document the type and magnitude of societal harms from the Covid response based on the existing academic literature. Future research should compare and contrast the real-world benefits of non-pharmaceutical interventions with the findings in this paper. While some efforts have been made in this regard, it is not readily apparent how existing frameworks for cost-benefit assessments (e.g. econometric methods, quality-of-life assessments and sociological analysis) can meaningfully engage with the range of data documented above. Further work is needed in this regard, and should draw more substantially from ethics, political philosophy, anthropology, economics and law. Interdisciplinary dialogue is also critical with epidemiologists, modellers, public health professionals, physicians and virologists.

This analysis lays the groundwork, a *societal harm framework*, for a more rigorous real-world evaluation of the multifaceted costs vs benefits of government policies during the crisis. It is highly likely that many Covid policies caused more harm than benefit, although further research is needed to explore policy trade-offs, especially at a country-level. This is not to say that NPIs had no beneficial effects or that they were not needed or justified. It is essential that public debate move beyond the false dichotomies that have clouded rational discourse and debate. These are the product of tribalistic impulses and epistemic gatekeeping hiding under the guise of scientific thinking. Specific policies may have been more beneficial in some countries and at certain times than in other countries and at different times. There is no one-size-fits-all approach to a global crisis. Additional research on trade-offs may be able to define a range of preventable social harms that could have been mitigated had certain countries pursued less strict or different types of NPIs or certain social protection policies. This would require counter-factual analysis and other methodologies. It should also consider the appropriateness of a *shielding* or *focused protection* strategy that sought to prioritize social distancing measures for high-risk vulnerable groups in order to minimize harms. There is also a need for more research to engage with data on social protection policies from a comparative perspective.

The ignoring of state dictates and civil disobedience (sometimes called *creative compliance*) to strict government mandates likely buffered the effects of socio-economic impoverishment in many communities, as well as a range of other harms. Some forms of non-compliance can be viewed, counter-intuitively, as *health enhancing*, or beneficial. Meta-studies of human behavior during the crisis (especially of qualitative and ethnographic data) are needed to understand actual levels of compliance and coping strategies; research has been over-reliant on online surveys subject to significant biases.

Any trade-off analysis of costs and benefits of NPIs will face substantial challenges deciding the range of metrics to include and excluded, and how to compare interventions with marginal, medium or large benefits with marginal, medium or large societal harms. The temporal, spatial and social scale of the analysis will also be important. There is a spectrum of current expert opinion about the effectiveness of most Covid policies. This includes analysis of school closures, mask mandates, lockdowns and an assortment of other NPIs (e.g. closing businesses, small gatherings bans, track and trace, psychological nudge techniques, bans on worship, etc). Some early models and even empirical analyses that found benefits from specific NPIs were used to promote maximum Covid suppression (e.g. Zero Covid) and prolonged non-pharmaceutical interventions. However, greater availability of data, new analyses and multi-country comparisons continue to be published, some of which question previous assumptions. The benefits of NPIs have likely been over-stated in many early studies. Scientists have generally been in support of NPIs in line with the perceived societal and government consensus. The scientific community must be willing to relinquish strong past assumptions about hypothetical benefits and recognize the excesses of non-pharmaceutical interventions as they were implemented in the real world rather than in idealized models focused exclusively on Covid disease.

Finally, there is a need to review studies that attempt to isolate the impact of government policies from one another and from voluntary behavior change. It is difficult to disentangle one NPI from a range of policy responses, although this can be achieved through country comparisons or unique natural experiments. As noted above, studies that

attempt to distinguish between restrictions and voluntary behavior change must account for the role of government risk communication in shaping behavioral responses and public opinion through feedback loops. These studies also struggle with empirical data on the actual level of population compliance and behavioural practices, and instead rely on models or assumed levels which may over-state real-world conditions. These types of analyses are relevant both for knowledge about societal harms and the benefits of NPIs. One priority in this regard is to compare and contrast countries that did not pursue stringent Covid policies (e.g. Sweden, Nicaragua, Tanzania, etc) with their neighbours both in terms of Covid epidemiology and the range of societal harms. There is also a need to consider the relationships between NPI policies and Covid vaccine programs.³⁵

The various research priorities mentioned above are essential to ongoing efforts to better prepare for future health emergencies, including epidemics and pandemics, and should be integrated into current global and national policy debates.

5. There are many lessons beyond the Covid pandemic

There are numerous lessons from the pandemic response for health and social policy, emergency management and our understanding of human societies more generally. It is not possible to summarize them all here but a few particular issues are worth noting. First, the data on harms should promote a greater awareness about the complexity of large-scale policy experiments in social distancing and government management of social life. This should support a higher level of healthy skepticism about simplistic narratives and technocratic governance that aim for unrealistic goals presented to the public as urgent moral imperatives. There are certainly many lessons about the need for a rejuvenated civil society, academic freedom and a broader range of mechanisms for more diverse expert policy advice in times of social crises. The pandemic also offers us a mirror into contemporary social trends and problems, and there are many opportunities for scholars to use the pandemic as a natural experiment to re-think fundamental assumptions about social life and human nature. There is also a need to rectify the many harms described in this report in the years ahead through deliberate social policy to

³⁵ The social consequences of Covid vaccine mandates and passports have been outlined in Bardosh et al. (2022).

mitigate the collateral damage, especially in low- and middle-income countries. This will not be easy, but is essential to ensuring a future of human flourishing.

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