

A drive to survive: COVID-19 implications for systemic resilience in ethics, data science and risk-management

Andro Košec, MD, MSc, PhD, FEBORL-HNS

Consultant Otorhinolaryngologist and Head and Neck Surgeon

University Hospital Center Sestre milosrdnice

Assistant Professor, School of Medicine, University of Zagreb

www.webbertraining.com

February 27, 2024

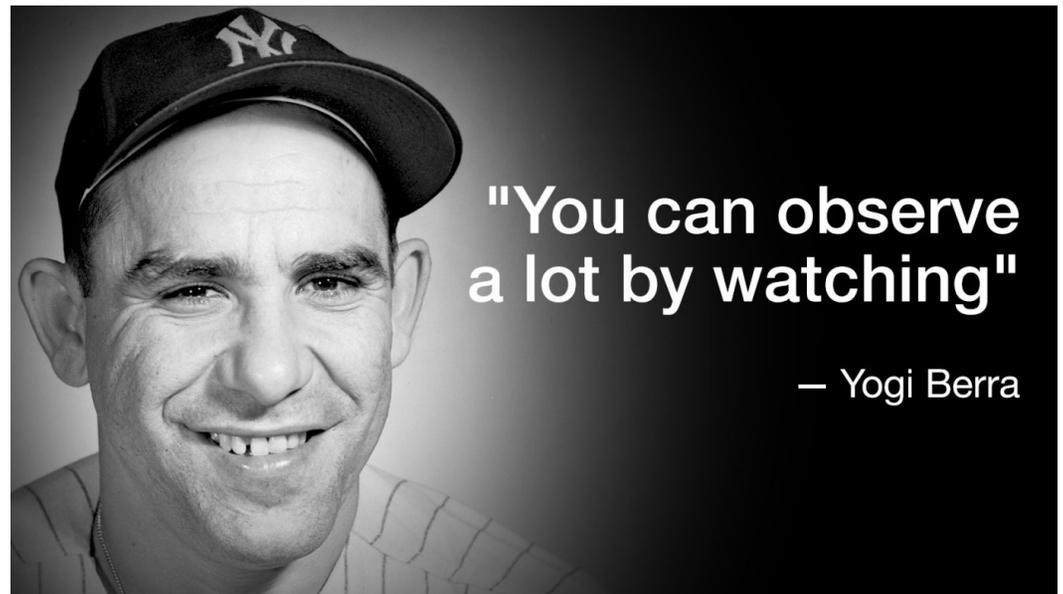
COI

- Some conflict of interest to disclose, but not the usual kind.



The Evidence-Based Medicine triad

(see D.L. Sackett et al, BMJ 1996; 312: 71-72)



**"You can observe
a lot by watching"**

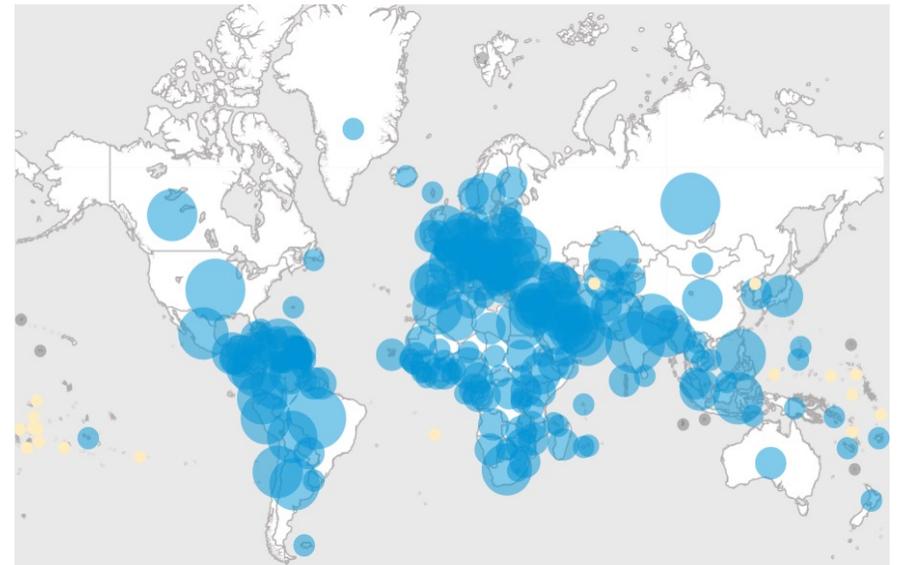
— Yogi Berra

Objectives:

- The intertwined nature of medical disasters and other man-made systemic constructs such as healthcare, disaster relief efforts, morality, professionalism, data access and curation has been put to the test very recently by the COVID-19 pandemic, and even more so, by the way we responded to it.
- The objective of the talk will target the systemic bias and underlying principles of action by human (moral) agents in dealing with a multisystem event requiring thinking outside the box when assessing its impact.
- The framework of resilience will especially be highlighted, as the high frequency of adverse (traumatic) events may even have positive effects and could even be viewed as a precursor to any progress.
- The enthusiastic listener will be confronted by data on the various pandemic aspects, but also possible implications on multiple catastrophes occurring together in the health system, and try to extricate meaning to our professional lives beyond the obvious, even after the pandemic is (hopefully) over.
- From a healthcare perspective, the common framework of understanding is the most important learning objective, since we were all affected as either providers, recipients of healthcare, as organizers, decision-makers, taxpayers, but most importantly - as human beings sharing a sense of a common threat.

Content

- COVID-19 setting
 - infectious threat
 - response
 - context
- Medical professionals
 - Whether we should be there?
 - Are we able to do the right thing?
- COVID-19 as a great opportunity



from: <https://covid19.who.int/>

Unprecedentedness

- unique, novel, unknown, serious
- „fight or flight”
 - simple solutions for complex issues
 - great (equally) disastrous potential



Series of publications connected by a framework targeting resilience

Ethics/Freedom

- Ćurković M, Košec A. Bubble effect: including internet search engines in systematic reviews introduces selection bias and impedes scientific reproducibility. *BMC Med Res Methodol.* 2018 Nov 13;18(1):130. doi: 10.1186/s12874-018-0599-2.
- Ćurković M, Košec A, Brečić P. Redistributing working schedules using the infective principle in the response to COVID-19 [published online ahead of print, 2020 Apr 21]. *Infect Control Hosp Epidemiol.* 2020;1-2. doi:10.1017/ice.2020.155
- Ćurković M, Košec A. The ethics (mis)used for filling the voids or harm of harm reduction ethics [published online ahead of print, 2020 May 8]. *J Geriatr Oncol.* 2020;S1879-4068(20)30240-X. doi:10.1016/j.jgo.2020.05.002

Information

- Ćurković M, Košec A, Ćurković D. Math and aftermath of COVID-19 pandemic and its interrelationship from the resilience perspective [published online ahead of print, 2020 Jun 13]. *J Infect.* 2020;S0163-4453(20)30401-1. doi:10.1016/j.jinf.2020.06.020
- Ćurković M, Košec A, Brečić P. Stay home while going out - Possible impacts of earthquake co-occurring with COVID-19 pandemic on mental health and vice versa [published online ahead of print, 2020 Apr 22]. *Brain Behav Immun.* 2020;S0889-1591(20)30634-6. doi:10.1016/j.bbi.2020.04.054

Resilience

- Ćurković M, Košec A, Ćurković D. Medical professionalism in times of COVID-19 pandemic: is economic logic trumping medical ethics? [published online ahead of print, 2020 Jul 19]. *Intern Emerg Med.* 2020;10.1007/s11739-020-02446-5. doi:10.1007/s11739-020-02446-5
- Ćurković M, Svetina L, Košec A. Double jeopardy; What happens when an epidemic is followed by an earthquake?. *Spat Spatiotemporal Epidemiol.* 2021;36:100402. doi:10.1016/j.sste.2021.100402

Risk management

- Ćurković M, Košec A, Roje Bedeković M, Bedeković V. Epistemic responsibilities in the COVID-19 pandemic: Is a digital infosphere a friend or a foe? [published online ahead of print, 2021 Feb 9]. *J Biomed Inform.* 2021;115:103709. doi:10.1016/j.jbi.2021.103709

Aftermath

- Svetina L, Košec A, Ćurković M, Nola IA. A case study of complex disasters within the resilience framework in Zagreb, Croatia: Two earthquakes in one pandemic. *Environ Res.* 2021;204(Pt B):112079. doi:10.1016/j.envres.2021.112079
- Svetina L, Košec A. Wearing masks to prevent one epidemic may mask another. *J Infect Prev.* 2023 Sep;24(5):228-231. doi: 10.1177/17571774231191335. Epub 2023 Jul 22. PMID: 37736126; PMCID: PMC10510661.
- Košec A, Hergešić F, Zdilar B, Svetina L, Ćurković M. Ethical implications of COVID-19 management – is freedom a desired aim, or a desired means to an end? *Frontiers Public Health* (under review).

A word cloud featuring various terms related to ethics and morality. The words are arranged in a roughly triangular shape, with the largest words being 'ETHICS', 'MORALS', 'TRUTH', and 'PHILOSOPHY'. Other prominent words include 'RESPECT', 'HONOR', 'VALUES', 'SOCIAL', 'CONVENTIONALITIES', 'ETIQUETTE', 'CHARACTER', 'FAITH', 'WORTHINESS', 'RESPONSIBILITY', 'INTEGRITY', 'HONESTY', 'THEORY', 'EQUALITY', 'RESPECTABILITY', 'TREATMENT', 'MOTIVATION', 'HYPOCRISY', 'AUTHENTICITY', 'TRUST', 'RULES', 'PERFORMANCE', 'FAIRNESS', 'CRITERIA', 'DECENCY', 'VIRTUE', 'STANDARDS', 'PURPOSE', 'ATTITUDE', 'ACCEPTANCE', 'INNOCENCE', and 'CONDUCT'. The words are rendered in different colors (blue, green, orange, red) and orientations (horizontal, vertical, diagonal).

1. Ethics/Freedom

- Most developed societies managed, due to their prosperity and resource abundance, to structure relationships among free individuals in such a way to leave them fundamentally unstructured.
- Lack of structure when facing collective threats makes it impossible to collectively and proportionately assess and manage its implications and consequences.



Primordial COVID dilemma

- What is a stronger moral imperative;
 - acting on substantial but known or fundamentally unknown, but more immediate threats?
 - Is it justified to tolerate (or even neglect) harms inflicted by well-known threats in order to protect from still unknown harms caused by more pressing threats?

COVID – from Hero to Zero

- Low-resource scenario - issues emerging around slippery slope arguments on end-of-life care.
- The ethical issue that emerged from pandemic context unique and previously incomprehensible outside of a battlefield - is it justified to limit (withhold or withdraw) lifesaving treatment to one person, even without their (or surrogates') consent, in order to save someone else's life?
- Public health strategies include the combination of containment and mitigation measures with the aim of delaying a pandemic peak effect, levelling the demands for scarce (and vastly neglected) health care resources while protecting the most vulnerable populations.

Commercial COVID

- Testing, tracing, isolation and vaccination are critical disease transmission control measures.
- Introduction of all-encompassing highly restrictive public health measures and their devastating consequences.
- In this scenario, everyone, whether voluntary or not, took their share of risks and rewards, based on a universal personal moral responsibility narrative.
- Coherent (re)allocation of resources upholding basic ethical principles, such as justice, beneficence, non-maleficence and transparency.
- Principle of autonomy (whether those of person in need or caregivers) is at greatest risk during this pandemic.

- There are not many things that most of global societies can unanimously agree on, even the importance of fundamental human rights, personal autonomy and personal possession being in peril.
- Some people are actually more endangered by the infection, and some by the responses applied.
- Is it permissible that someone, whoever that may be, alters the parameters of personal freedom in a situation where everyone is a compulsory participant of a tracking system and/or vaccine?



The Ethics of Free Speech

- Freedom is the possibility to be morally responsible of one's acts.
- Unfree individuals are neither members nor active subjects of the moral sphere, since they have no moral relationships.
- Norms necessary for survival are in conflict with universal norms that are necessary for full growth and development.
- Norms are always imposed through power and commercial interest.
- The pandemic has shown that freedom is a matter of degree.
- Those parts of society that generally have less freedom are the ones that are most willing to fight for it.

A man with dark hair, wearing a brown leather jacket, stands in a dimly lit room. He has a sword tucked into a scabbard on his back. He is looking slightly to the right with a serious expression. The background is dark and out of focus, showing some architectural elements.

but they'll never take... OUR FREEDOM!

- COVID-19 and our responses to it cumulatively contributed to a separation of winners and losers.
- Every individual must be wary of the inherent tendency of the powerful to conserve the existing status quo that provides privilege, and especially so when faced with threats to it.
- Inequalities and inequities as well as their consequences must be discussed publicly, including the scientific community, but the general public is also very keen on involving themselves in the scientific debate, causing further chaos, with mainstream and social media acting as catalysts.

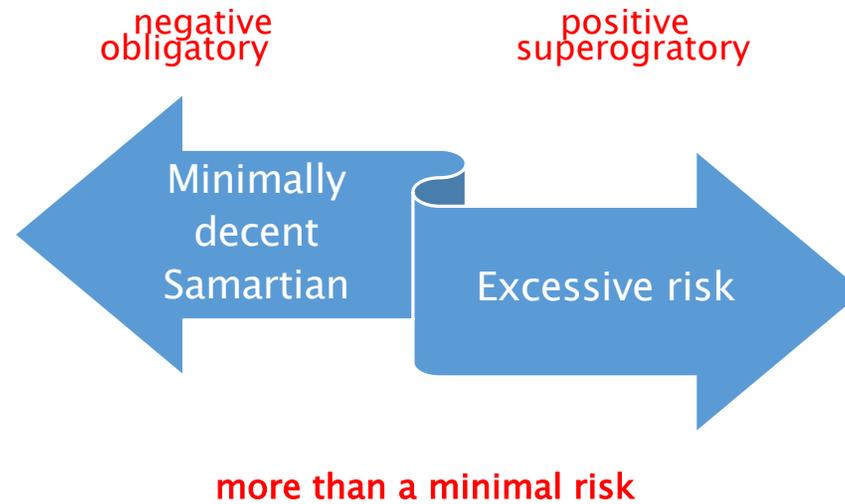
Medice, cura te ipsum!

- Medical professionals must be able to exert both categorical rationality (ability to identify and prioritize goals) and instrumental rationality (ability to select and adopt suitable means to reach set goals) at all times, and especially in a crisis.
- This responsibility cannot be altered or suspended by the issues of resource scarcity.
- In this pandemic, and perhaps in the entire medical profession, utilitarianism underpinned by economic values was (and often still is) placed above medical ethics.

Could-Is-Ought?

- Ethics and survival are rarely the same thing.
 - Being “left out” from critical treatment by any allocation strategy should not mean that person in need should not be cared for.
 - Frontline caregivers should be thoroughly exculpated from imposed ethical dilemmas with considerable and irreversible consequences they are currently facing, as they are merely actors in a drama where most of ethical judgements and decisions have already been made.

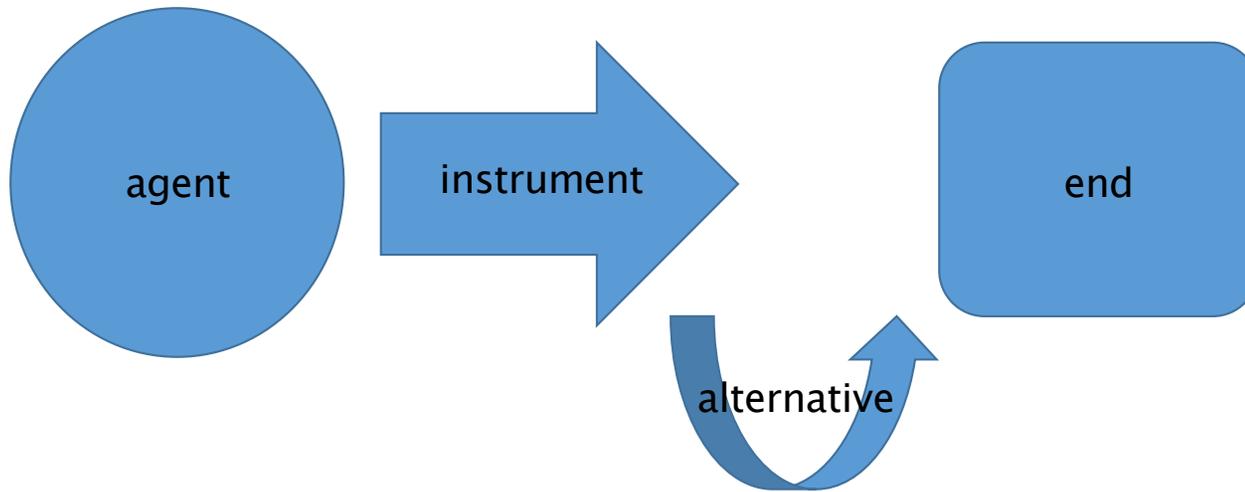
Duty to care – is this our fight?



„Pandemic treatment needs to be provided, but no individual in a healthcare role is specifically obliged to provide it.”

True responsibility

What should or ought to be done ?



Instrumental
rationality

Categorical
rationality

Curkovic M, Kosec A. The ethics (mis)used for filling the voids or harm of harm reduction ethics [published online ahead of print, 2020 May 8]. J Geriatr Oncol. 2020;S1879-4068(20)30240-X. doi:10.1016/j.jgo.2020.05.002

It is our fight but ...a rational one !

- **rationing, prioritization, allocation, redeployment**
- required shift of ethical focus:
 - individual patient-centered care (clinical ethics)
 - population-centered care (public health ethics)
- decisions:
 - based on best interest (best care)
 - based on resource considerations (acceptable, safe, „right”)
 - make the best use out of limited resources (maximise utility)
 - the number of lives/life-years saved
- denying a potentially beneficial treatment to a patient on the ground of scarcity (knowingly providing lower standard of care)

We are all in this together

- pandemic needs
- non-pandemic needs

- false dichotomy between saving lives and livelihoods

- syndemic - synergy of epidemics that co-occur, interact with each other and produce complex consequences while sharing common underlying societal drivers

- unequal/marginalized
 - most likely to be exposed to the threat
 - most susceptible to harm
 - most likely to experience negative outcomes

Tragic choices

- kind of decision in which every available option is unacceptable, but one must act
- moral distress – moral residue - moral injury
 - violation of ones moral values or codes
 - own action
 - own inaction
 - others actions / inactions
- norms established in the calm neutrality of a conference room begin to look suspect in a crisis
 - the ought is problem of ethics



2. Information

- Individuals in contemporary societies are immersed in a digitally mediated infosphere, an informational bubble.
- Any conduit of accessing digital information, such as social networks, Internet search engines, online news portals and forums, evidence repositories, shared databases, or any others that are available in digital format and may be used to gain information on the pandemic is a digital intermediary.
- Accessing, storing and retrieving data on the COVID-19 pandemic is almost exclusively performed through digital intermediaries.

Data curation

- Digital intermediaries also greatly contribute to creating a COVID-19 informational landscape, allowing a shared threat response.
- Informational intermediaries may be used to access several hierarchical dimensions of information;
 - data (factual information such as numbers, percentages, and statistic)
 - evidence (data that is relevant and supports a conclusion), since they are simultaneously used in acquiring, analyzing and disseminating information.

The Problem

- The provision of timely, accurate, truthful and valid information through various digital intermediaries such as media, the Internet or social networks is currently a matter of collective survival, both physical and psychological.
- The underlying mechanisms of some highly influential digital intermediaries like Internet search engines, social-media and most mainstream media are not oriented toward ensuring truthfulness of content that leads to actionable knowledge, but rather on user attention.

The Filter-Bubble Effect

- Informational content curation tools serve the commercial interests of a select number of globally relevant companies, whose primary interest is commercial success.
- Efficient prediction engines behind digital intermediaries responsible for data curation, such as Internet search engines and social media advertising and content recommendation are useful exactly because their representation of reality is not a true reconstruction of complex underlying systems.
- They prioritize informational content according to prediction of user needs, their societal and geographical context and digital footprint

The AI paradox

- Active, dynamic epistemological tool or agents with their own logic and purpose and one has to be aware of their contradictory functions.
- Extending our agency above and beyond what is inherently reachable.
- Provide a data-driven, extremely personalized experience, without the control of the user
- Tendency to undermine our agency
- Technology initially allowing a great expansion of our informational capabilities, has also become instrumental in downgrading our capacity for complex analysis, self-determination, self-control and construction of shared agendas, simultaneously undermining traditional verification mechanisms

The Future is Digital

- Digital information is free of comprehensive curation and left to the consumers (or followers) to assess for quality and integrity of content.
- In a pandemic scenario, this absence of mechanisms to ensure minimal validity and integrity of information raises many ethical, legal and social issues.
- Digital subjugation is an increasing threat if we do not consider ethical governance of digital data curation and dissemination, alongside forms of control of the truthfulness of its content.

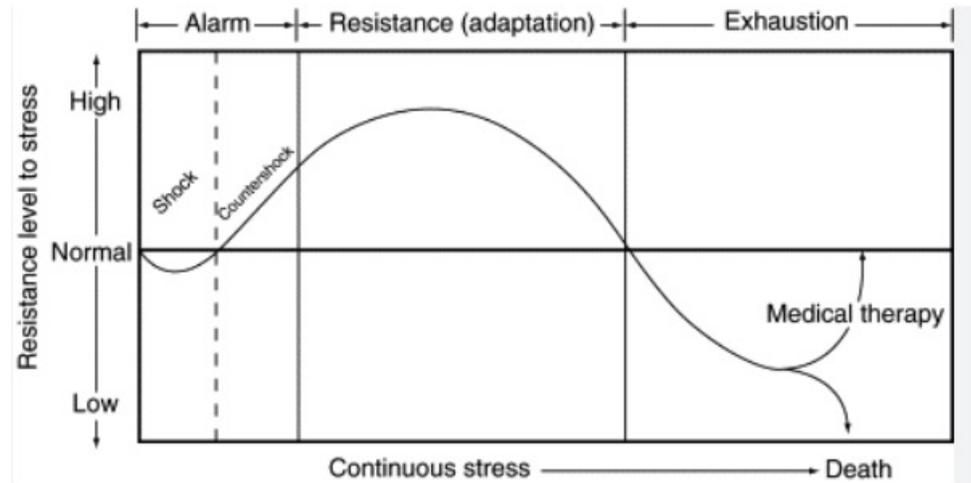
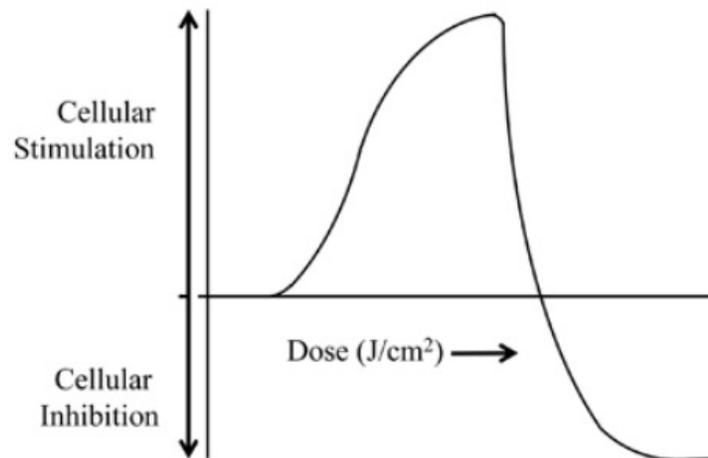
The Irony

- We cannot let Internet search engines and social media let us know only those things we wish to hear, even though we use them for precisely that reason.



3. Resilience

Arndt-Schultz Curve



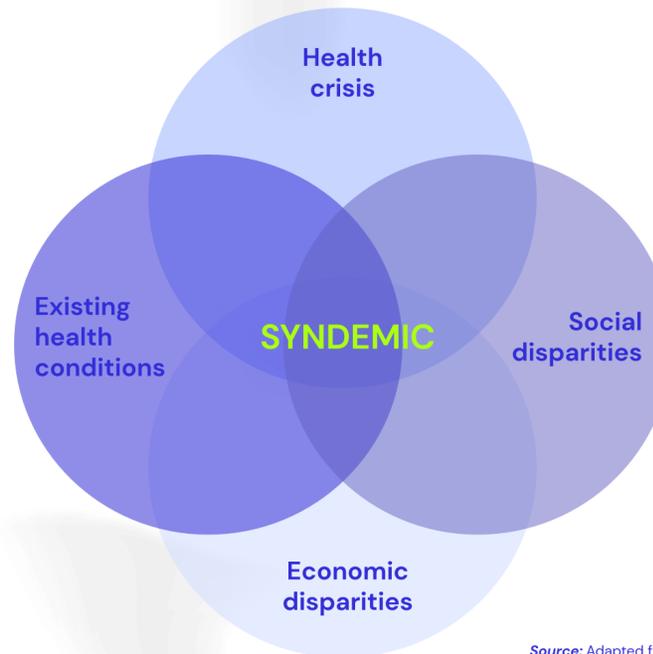
Košec A, Hergešić F, Zdilar B, Svetina L, Čurković M. Ethical implications of COVID-19 management – is freedom a desired aim, or a desired means to an end? *Frontiers Public Health* (under review).
Čurković M, Kosec A. The ethics (mis)used for filling the voids or harm of harm reduction ethics [published online ahead of print, 2020 May 8]. *J Geriatr Oncol.* 2020;51879-4068(20)30240-X. doi:10.1016/j.jgo.2020.05.002



Syndemic – True or False?

DEMOS
HELSINKI

What is a
SYNDEMIC?



Source: Adapted from Fishbein, D. (2020).
*The Pivotal Role of Prevention Science in this
Syndemic.*

Košec A, Hergešić F, Zdilar B, Svetina L, Čurković M. Ethical implications of COVID-19 management – is freedom a desired aim, or a desired means to an end? *Frontiers Public Health* (under review).
Curkovic M, Kosec A. The ethics (mis)used for filling the voids or harm of harm reduction ethics [published online ahead of print, 2020 May 8]. *J Geriatr Oncol.* 2020;S1879-4068(20)30240-X. doi:10.1016/j.jgo.2020.05.002

Crisis and Disaster

- A crisis is an immediate threat to the usual functioning of society, while disaster is an actual manifestation of a crisis with unfavorable outcomes.
- Resistance, resilience and vulnerability
- Crises and disasters are now even more critically socially constructed, and they often have more significant symbolic than material importance.

Neverending Disaster

- Although considered necessary, COVID responses were characterized by an unprecedented level of disruption of core social functions –itself fulfilling the definition of a disastrous event.
- Two most extensive earthquakes in Zagreb were 5.5 and 5.0 on Richter scale occurring on 6:24 and 7:04 AM, March 22nd, 2020.
- Zagreb was a COVID-19 pandemic “hot spot” in Croatia, counting 122 of total 254 of positive cases.



Fig. 1. Maternity ward in Zagreb being evacuated immediately after the earthquake at 7 am, March 22nd.

The Impact that Never Came

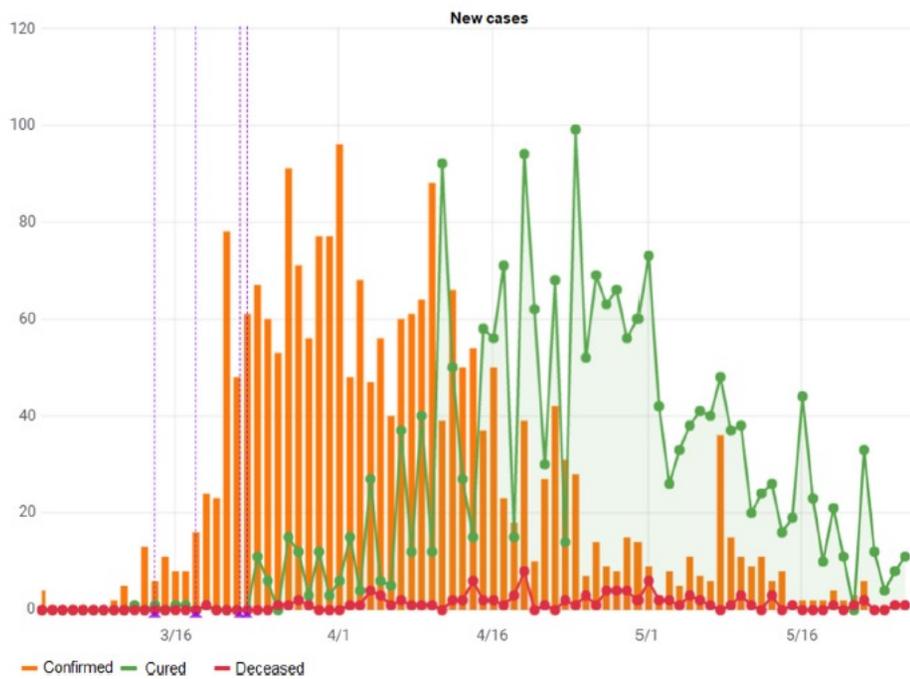


Fig. 3. Representation of newly diagnosed, cured and deceased patients during the epidemic.

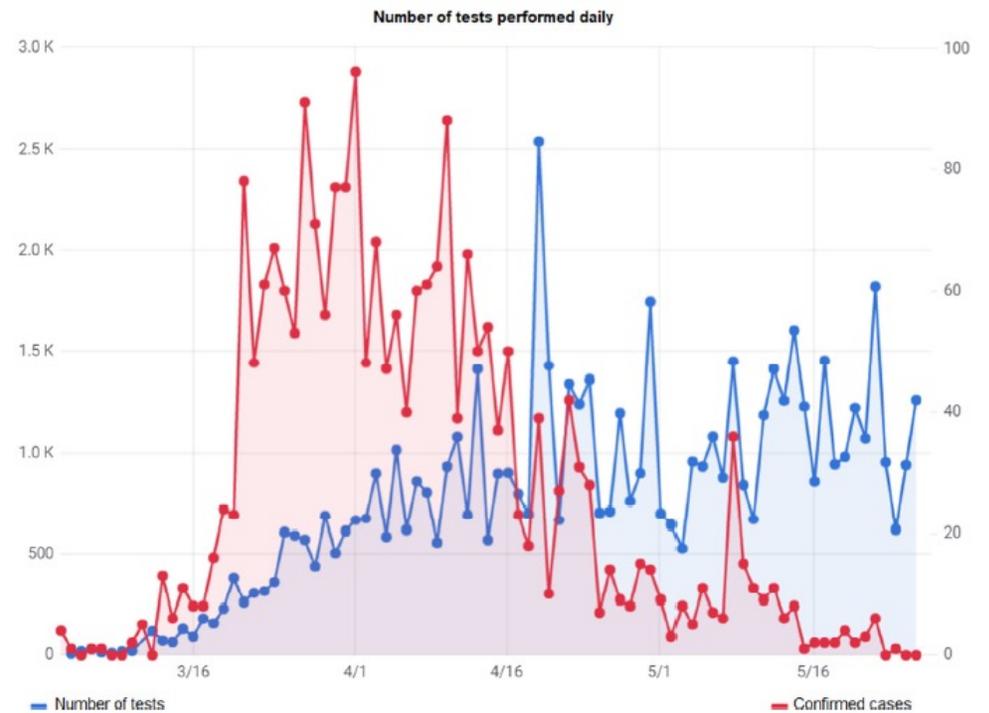


Fig. 4. Testing frequency during the earthquake and epidemic timeframe.

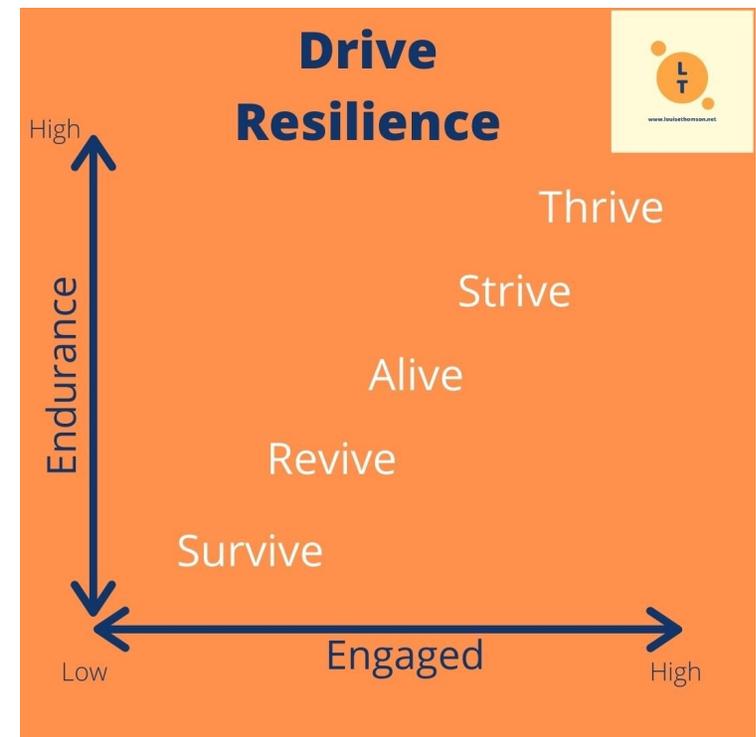
Košec A, Hergešić F, Zđilar B, Svetina L, Ćurković M. Ethical implications of COVID-19 management – is freedom a desired aim, or a desired means to an end? *Frontiers Public Health* (under review).
 Ćurković M, Kosec A. The ethics (mis)used for filling the voids or harm of harm reduction ethics [published online ahead of print, 2020 May 8]. *J Geriatr Oncol.* 2020;S1879-4068(20)30240-X. doi:10.1016/j.jgo.2020.05.002



what is
RESILIENCE?

4. Risk management

Disasters that occur in modern societies can have specific and unique characteristics whose outcomes are defined most often by preventive action - better preparedness for a particular type of crisis will make society more resilient to the consequences of that crisis. Resilience is the capacity to recover critical functions and adapt following a disruptive event.



Two Earthquakes in One Pandemic

- Within the framework of resilience, the high frequency of adverse (traumatic) events is often used in arguments that some may even have positive effects and could even be viewed as a precursor to any progress (Schulz, 1887).
- The analysis is observational, retrospective, exploratory, and theory-building, a reductionist approach considering the geo-environmental and health policy related factors to explain the factors influencing disease transmission dynamics within a resilience framework. The processes of the study are multiple. Its investigation model is interpretative (or disciplined configurative) intending to use established theories, such as Arndt-Schultz law to explain a specific case, with information from the same site collected at two different moments.

The Second One – And an Incredible Case Control Opportunity

- The sample - Zagreb, 0.7 million people and data was collected in two 14-day intervals (March and November 2020), after two significant earthquakes occurring in Zagreb.
- Six days after the reintroduction of lockdown measures, on December 29, Croatia was hit by a new earthquake measuring 6.4 on the Richter scale.
- 1350 new cases of the SARS-CoV-2 virus in Croatia, and 425 in Zagreb

Deja vu... All over again.

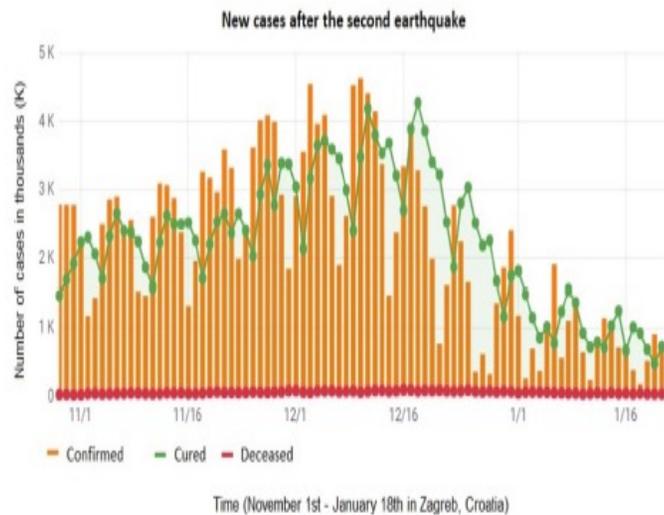


Fig. 5. New COVID-19 cases in Croatia ten days after the earthquake declined throughout 14 days, falling to about 740 new daily cases. (With 4900 total active cases on January 12).

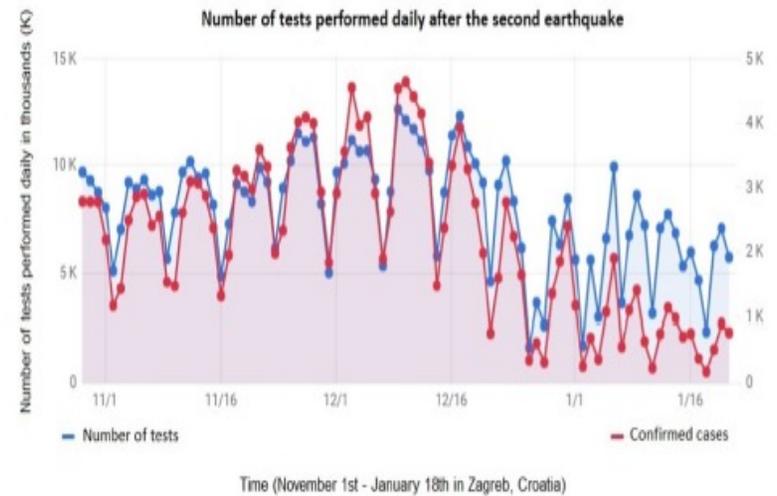


Fig. 6. The number of the daily test performed remained constant, but the number of new cases dropped.

Why nothing?

- No changes in national testing policy, number of tests performed, or a reduction in the number of tests due to supply chain disruptions.
- None of that changed before, during, or after both earthquakes.
- Dominant measures in pandemic management were containment and suppression in both time intervals, with core measures being proactive finding and managing cases, tracing and quarantining close contacts, and strict restriction or control of population movement.
- Multiple disasters occurring simultaneously will exhaust resilience quickly, making the response protocol impossible to improvise.

Arndt Schultz Law

- The interplay of repeated stress caused by earthquakes and the existing underlying response to the COVID-19 pandemic may be explained by the stimulating effects of optimal stress and the detrimental effects of maximum exposure on adaptive mechanisms of modern society.

Comparative analysis of the impact of COVID-19 in the period of earthquakes.

Earthquake	COVID-19 Pandemic
DIRECT DEVASTATING THREAT	Indirect high level of threat
PROLONGED PHYSICAL CONTACT DURING EVACUATION	Social distancing and wearing masks
IMMEDIATE HUMANITARIAN ASSISTANCE	Long term pharmaceutical intervention (vaccine)
ECONOMIC DAMAGE ASSESMENT	Statistical long-term analysis of mortality and morbidity
NO CONTAINMENT STRATEGY	Containment, suppression and mitigation
INFRASTRUCTURAL FACTORS PARAMOUNT IN PREVENTION AND MANAGEMENT	Professional factors and human resources paramount in prevention and management
SHORT DURATION OF DIRECT DANGER FROM INJURY	Prolonged period of direct danger from infection
URBAN WATER, SANITATION AND HYGIENE INFRASTRUCTURE, HEALTH AND LIVABILITY-DRIVEN URBAN DESIGN, AND DEVOLVING DECISION MAKING SYSTEMS	
COMMUNITY RESILIENCE	
SOCIOECONOMIC INEQUALITY	
NEW RESEARCH AND INNOVATIONS	

The Future is Not What it Used to be.

- Pandemic-capable infective agents will persist, as well as catastrophes.
- The possibility of experiencing several periods between pandemics of the same or different agents, as well as dealing with any other type of disaster will rise as well.
- Future disaster preparedness should involve multilevel points of view:
 - human resources, service provision, marketing, customer relations and communications, corporate social responsibility, finance, strategic planning, government assistance, and other operational strategies
- Improving the resilience framework may be achieved:
 - educational programs for leaders or managers, especially in strategic health departments, to recognize that the organizational failures
 - Increasing preparedness, response, and recovery (mitigation) for risk and crisis
 - Managing volunteer responses
 - Developing concepts and guidelines for the structured and strengthened involvement of the population in crisis situations



5. Aftermath

- Wearing masks to prevent one epidemic may mask another.
- Using NPI (non-pharmaceutical interventions) such as masks was a widespread strategy during the pandemic.
- Wearing masks in combination with other key population level measures caused an important effect on the epidemiology of all viruses transmitted by a respiratory route.
- Drop in measles (90%) and scarlet fever (95%) infection rates, tuberculosis (19.6%), pertussis (76.5%), influenza (22%), and mumps (52.1%) infection rates in China up to 2023.

The Empire Strikes Back

- The lifting of restrictions leads to a rebound in other respiratory viral pathogens, especially in light of general vaccination fatigue, COVID-19 boosters, and operational challenges in the healthcare system, as already witnessed in the Southern hemisphere and China.
- In the past 2 years - increase in the number of patients infected with common respiratory viruses, including RSV and human parainfluenza viruses that develop more severe diseases.

Immunological Debt?

- **Hypothesis: NPIs can cause net harm by indirectly causing epidemics of other respiratory viruses.**
- NPIs in place in 2020 and 2021 affecting pathogens with low R0 values and temporary immunity (influenza: 1.2–1.5) compared to those with higher R0 and lasting immunity (RSV).
- Inability to predict vaccine combination for influenza.
- RSV incidence and severity spikes.
- Shift in infection timing and rebound of influenza, RSV, norovirus, rhinovirus, and hand-foot-mouth disease targeting a younger population in 2022 than in 2019.

Disease Dynamic Models – A New Hope

- Permanently lowered infection/reinfection rate when coupling NPIs with vaccinating 80% of the population.
- Vaccination does not lead to a rise in susceptibility, while NPIs allow for effective transmission control that easily be modified seasonally.
- Bayesian model including the combined effect of NPIs and vaccination for SARS-CoV-2 resulted in a 53% (95% CI 42%–62%) reduction in infection and 38% in respiratory infective disease transmission, but the long-term effect of NPIs alone in reducing infection declined 12% within 1 year, and up to 50% in 2 years due to relaxing measures and increasing vaccination rates in the WHO European Region



We live in the best of all possible worlds.

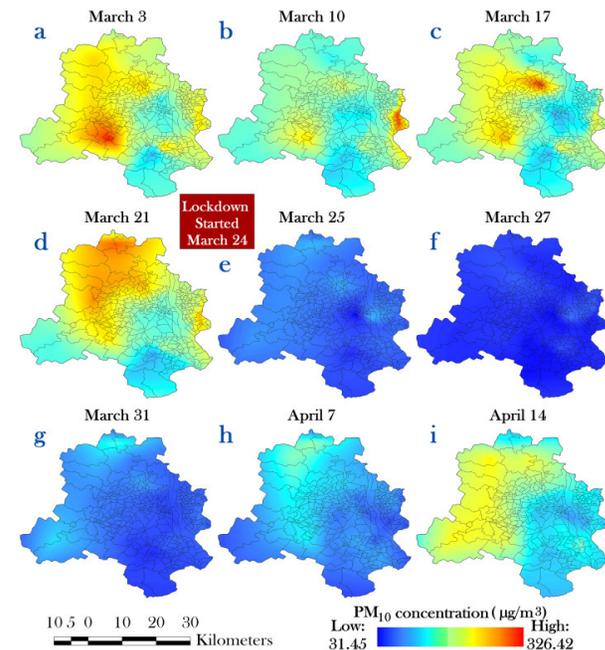
„Duty to treat is related to broader question – in what sort of society we want to live in.”
(Reid)

- physicianhood as disruptive, quasi-subversive work force
 - *„remaining willing to resist the application of entrenched assumptions about the structures and solutions necessary to perpetuate the practice of profession in the face of emergent uncertainties and disruptions”*
 - *„resist ritualistically applying routine solutions to complex problems”*
 - *„seek to disrupt very system that gave rise to that identity to begin with”*

COVID-19 – great opportunity

“Right now, people thought their bodies are showing what the problems are in our society.”
(Krieger)

- Lifeboat, compensatory, harm reduction ethics
 - gone too small (bioethics)
 - unable to address persistent and systemic issues (root causes)
- We should not prefer to guide decisions on tragic choices, we should prevent or reduce the need for them



Mahato S, et al. Effect of lockdown amid COVID-19 pandemic on air quality of the megacity Delhi, India. Sci Total Environ. 2020.

COVID-19 – great opportunity

„Restatement of the obvious is the first duty of intelligent person.”
(Orwell)

- need to transform the paradigm of health
 - Pasteurian paradigm vs. holistic approach
- focus on social determinants of health
- physicians responsible for their mitigation (duty to care?)
 - above and beyond their office or patients bed (Andrija Štampar)

„Zip code is a stronger determinant of health than genetic code”





www.webbertraining.com/schedulep1.php

February 29, 2024

[INFECTION PREVENTION THROUGH THE LENS OF IMPLEMENTATION SCIENCE](#)

Speaker: **Dr. Mireille Dekke**, Amsterdam University Medical Center, Netherlands

March 5, 2024

[\(FREE Teleclass ... Denver Russell Memorial Teleclass Lecture\)](#)

[WATER AS A RISK OF HEALTHCARE-ASSOCIATED INFECTION](#)

Speaker: **Prof. Jon Otter**, Imperial College London

March 7, 2024

[\(FREE Teleclass\)](#)

[INFECTION PREVENTION AND CONTROL CERTIFICATION: OBTAINING YOUR ENTRY LEVEL IPC CERTIFICATION THROUGH CBIC](#)

Speaker: **Jessica Dangles**, Certification Board of Infection Prevention and Control

March 14, 2024

[COVID-19 PREPAREDNESS – WHAT WENT WRONG? WHAT ARE THE NEXT STEPS? THE POINT OF VIEW OF A BIOMEDICAL ENGINEER](#)

Speaker: **Dr. Davide Piaggio**, University of Warwick, School of Engineering, UK

March 21, 2024

[EMERGING FUNGAL INFECTIONS: ENVIRONMENTAL CHANGES BRING ABOUT NEW CHALLENGES](#)

Speaker: **Dr. Tom Chiller**, Centers for Disease Control, Atlanta

Thanks to Teleclass Education
PATRON SPONSORS



diversey.com



virox.com



gamahealthcare.com