

Evidence and Precaution for Legal Health Interventions: Learning From the COVID-19 Pandemic

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During the COVID-19 pandemic, far-reaching restrictions on normal life were implemented by laws and regulations to prevent disease transmission and protect people and society. In the absence of evidence for the most appropriate legal mitigation measures, decision makers often cited principles of precaution as the basis for implementing restrictive laws and regulations and unprecedented measures such as lockdowns, curfews, and school closings (1).

To avert harm in crises, many people consider precaution as a morally correct concept for action. Many regard authorities who act with precaution as alert and responsive, fulfilling obligations to take care of people in times of uncertainty. Critics have castigated political leaders who failed to act with caution, particularly when disastrous consequences apparently followed from failure to take strong preventive measures.

Soon after the start of the pandemic, investigators initiated a surge of clinical trials for drugs and vaccines, which have been enormously valuable and contributed to evidence-based improvements in clinical care and disease prevention. However, for public health, such mitigation measures as the 3- and 6-foot distancing rules, strategies for school openings, or quarantine duration remain untested in clinical trials. Their comparative benefit-harm ratio is still guided by the precautionary principle rather than by empirical evidence.

THE PRECAUTIONARY PRINCIPLE

The precautionary principle was developed to act on environmental risk when there is uncertainty about optimal risk management. In 1992, the United Nations (UN) introduced it as a principle for environmental protection (2). In 1993, the European Union (EU) incorporated the principle into its legislative framework (the Maastricht Treaty).

The 1992 UN declaration did not consider potential harms or burdens of protective measures, but in 2000, the EU Commission introduced evidence-based risk assessment for public health measures under the precautionary principle. It explained that application of the precautionary principle should include a “scientific evaluation, as complete as possible . . . identifying at each stage the degree of scientific uncertainty” (3).

EVIDENCE-BASED RISK ASSESSMENT IN TIMES OF CRISIS

Three factors must be considered in evidence-based risk assessment of public health measures: the absolute magnitude of morbidity and mortality from the threat, the expected benefits of measures against the threat, and the expected harms and burdens of the measures. Often,

one or several of these are difficult to quantify, but as a prerequisite for moral action, authorities should explicitly appraise all 3 using the best available evidence (3).

Some mitigation measures against COVID-19, such as improved hand hygiene, have little harm or cost. Others, including closures of schools and workplaces, curfews, or travel restrictions, have serious harms and burdens. Such measures need structured evidence evaluation for all 3 components of evidence-based risk assessment to be recognized.

Against this background, it may not be surprising that on 12 December 2020, the Constitutional Court of Austria declared the country's COVID-19 emergency school closure laws unconstitutional because of a lack of evidence-based risk assessment (4). The court explained that the Austrian government had not provided estimates of expected benefits and harms of school closures. The court did not dismiss school closure as a reasonable public health measure itself but—in keeping with the EU commission (4)—established the need for transparent quantification for proportionality of mitigation measures. On the basis of similar reasoning, the district court of The Hague in February 2021 ruled a Dutch curfew law to be unconstitutional (5).

EVIDENCE GENERATION IN TIMES OF CRISIS

In times of crisis, authorities first need to use evidence-based risk assessment to identify knowledge gaps underlying public health interventions introduced by emergency regulations. Next, they must ensure that these gaps are efficiently filled through empirical testing. This is scientifically, morally, and legally superior to the precautionary principle.

Although it remains unthinkable for the U.S. Food and Drug Administration and similar agencies to approve new drugs or vaccines without proper testing in randomized trials, many COVID-19 public health measures are still based on legal process derived through politics, modeling, and expert opinion (1). In some cases, authorities have even actively blocked such evidence generation, as for randomized comparison of school openings (6) and training facilities (7) in Norway. The Norwegian authorities argued that their primary obligation in times of crisis is to protect life and well-being by being cautious, not to facilitate evidence through research.

Admittedly, clinical trials for public health interventions are complex to perform. Political challenges need to be addressed, and stakeholders at the national, regional, and local level (such as schools and parents, or businesses and customers) must be actively involved. But examples such as the Danish randomized trial for face masks against COVID-19 show that such trials are

possible and may provide valuable information in crises (2, 8).

EMBEDDED TESTING

Because health interventions introduced through laws are binding, evidence generation needs to be embedded in legal implementation and application. Recently, new concepts have been proposed that can be applied to testing of legal mitigation measures (9, 10).

So-called learning health systems can facilitate testing in clinical trials and high-quality observational studies that are seamlessly embedded in the implementation and de-implementation process of legal health interventions. This approach combines best research methodology with concepts of evidence-based policy making.

The concept of learning health systems consists of cycles of comparative testing of interventions. When analyses reveal that one approach is better than the other, the superior strategy is universally adopted. When new policy arises, test cycles start again—for example, by randomization to the current standard for social distancing of 6 feet versus a newer alternative of 3 feet. Cluster randomization of schools, classes, or neighborhoods or stepped-wedge designs with sequential implementation generate valid results. Opt-in and opt-out consent and information strategies are thoroughly considered to ensure ethical testing (10). If randomized testing is not possible, creative new observational study designs, such as causal inference emulation methodology with standardized data collection to simulate clinical trials, may be applied.

Embedded testing allows investigators to find the least restrictive yet effective legal interventions against a new health threat, such as COVID-19. The concept can be applied to many legal health interventions during crises, such as comparing different types of masks or varying strategies for school openings. It allows safer reintroduction of normal business and reduces risk exposure because only persons who are assigned to the new intervention in each testing cycle are at potential risk for incremental harm.

CONCLUSIONS

The precautionary principle is a powerful tool that can be used to implement far-reaching restrictions while bypassing standard procedures for legal and medical risk assessment. However, uncritical application of the principle for legal health interventions prevents opportunities to gather new evidence for better handling of future crises. The remarkable drug and vaccine development during the COVID-19 pandemic has shown that rapid generation of high-quality empirical evidence is possible in crises. The same commitment should be given to generating high-quality evidence for legal health interventions and mitigation measures. It will enable decision makers to better quantify expected benefits, harms, and burdens; maintain trust and understanding; and preserve democratic processes.

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