One may suppose that prevention, as well as treatment, should be based on scientific evidence. However, no decision regarding public-health policy depends solely on epidemiological or toxicological data. To this regard, Rothman affirms that ‘the optimists among us hope that the fruit of scientific labour will enlighten the political process that ultimately decides the policy, but let us not be deluded into thinking that policies are or should be chosen solely by the evaluation of data’. In fact, public health is not necessarily a science but a form of ‘social activism’, and decision makers may be unaware of, or even choose to ignore, scientific results. Although it would be desirable to implement an intervention only when there is strong evidence of a causal relationship between exposure to a given factor and a disease event, other factors influence public-health decision-making (e.g., social, religious, cultural, and political factors, such as rights and liberties and economic considerations), which may be obstacles to the implementation of evidence-based interventions such as anti-smoking or safe-sex campaigns.

Increasing concerns and emotional reactions regarding the potential hazards of innovative technology may lead to unnecessary interventions despite the absence of (definitive) evidence (i.e., based on observations of marginal effects or inconsistent results), adopting what is currently defined as the ‘principle of precaution’. Examples of cases in which this principle has been recently advocated (yet also contrasted) are the use of genetically manipulated organisms (GMO) and mobile phones and, to a lesser extent, blood transfusions, depleted uranium, and electromagnetic fields.

Detractors of the precaution principle, such as Harris and Holm, conclude that it is an invalid epistemic rule for rational decision-making and that its use in public health (e.g., prohibiting the consumption of GMOs or removing electromagnetic stations) may further alienate the science of epidemiology from public health and distract consumers and policymakers from known significant threats, diverting the limited public-health resources from genuine and far greater risks. On the other hand, advocates of the principle, which has been formally accepted by the European Community, claim that precaution defines a new scientific paradigm and that it is relevant to public health and shares much with primary prevention. Adopting the principle of precaution would mean implementing regulatory measures for preventing or restricting even those exposures that pose only conjectural threats to human health, whereas refusing the precaution principle would expose individuals to a hazardous substance/agent until a causal relationship were proven (or disproved). In other words, the precaution principle may lead to acting against ‘false-positive’ risks, which should be weighed against the evidence of the human, ecological, and economic costs of not taking precautions in cases of ‘false-negative’ risks, as learned from past experience.

With the precaution principle, the burden of proof shifts from demonstrating the presence of risk to demonstrating its absence. Thus interventions for reducing the potential risks of exposure to potentially hazardous sources should be implemented until the hypothesis is definitively proven to be false. Although the hypothesis would be in principle falsifiable, corroboration of the null hypothesis (i.e., GMOs are unsafe), by definition, would never be satisfied, because of the early implementation of a ban. As in a reversed Popperian paradox, the intervention would continue unless/until the no-evidence hypothesis were falsified. This would not allow sufficient knowledge to be acquired from observational data (i.e., the possible verification of harmful effects) for making rational decisions regarding possible intervention, unless independent research in the field were carried out.

The above considerations highlight the need to identify a scientific framework for the precaution principle, defining the criteria for its adoption. To this regard, Douglas L. Weed, assuming that public-health decision-making has always involved acting on evidence below the level of ‘proof’ or ‘certainty’, concludes that decisions are often based on imperfect and uncertain evidence. Thus the challenge is to find the level of evidence that provides an appropriate balance between what we know and our desire to benefit others.

If science is not able to provide evidence of effects (or lack thereof), the adoption of public-health measures, such as the precaution principle, will solely depend on the contingent political sensitivity. In this context, the precaution principle should not become the paradigm of public-health actions, yet it may not be discarded ‘a priori’ in case of limited but plausible and credible evidence of likely and substantial harm, thus the risks and benefits of its application (or failure to do so) should be carefully evaluated on an individual basis (i.e., caution with precaution). In any case, the precaution principle should not represent an obstacle to freedom in research; rather, independent research should be encouraged and promoted to falsify the hypothesis leading to an (in)appropriate intervention.

References

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The principle of precaution-based prevention: a Popperian paradox?

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