

## Epidemiology's dual social commitment: to science and health

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## **Abstract**

Matching epidemiology's aspirations to actual delivery of goods valuable for population health depends both on the scientific and operational capabilities of epidemiology and on the degree to which the goods meet its contract with society. Epidemiology's capabilities have remarkably advanced in recent decades, although research gaps have appeared during the current Covid-19 pandemic. Epidemiology's social contract reflecting a dual commitment to science and health could arguably be entirely met by producing research results under conditions variously described as objective, impartial, neutral, independent and handing such results to decision makers and the public at large. However a closer examination shows that the four adjectives address sharply distinct issues, with distinct practical implications, and that the epidemiologist responsibility is 'de facto' involved beyond providing research results. Hence the epidemiologist's engagement should encompass arguing from a science-for-health viewpoint and proactively driving the results into decision processes on public health issues.

### **Key words:**

Epidemiology's commitment  
Epidemiologist's engagement  
Epidemiologist's responsibility  
Responsibility for health  
Objectivity  
Impartiality  
Neutrality  
Independence  
Conflict of interest  
Covid-19 cohorts

In his essay “Reconciling epidemiology’s aspirations and capabilities”[1] David Savitz develops a deeply felt plea prompting epidemiologists to match their aspirations with the scientific goods they can actually deliver to society. This depends both on the scientific and operational capabilities of epidemiology and on the degree to which the goods meet the social contract that epidemiology, as any profession, underwrites formally and informally with society.

### ***Epidemiology’s scientific and operational capabilities***

The scientific and operational capabilities of epidemiology and its methodological , technical, and substantive achievements in the last decades are the subject of frequent review and discussion - embracing epidemiologists’ training as well - and I have myself considered several aspects, in particular related to Big Data and precision medicine[2]. Because of my current interest, inevitable for any epidemiologist, in Covid-19 [3,4] I cannot help noticing two main epidemiological research gaps of practical import.

First a gap in cohort studies. A July editorial of the New York Times on the SARS-Cov-2 virus asked: “How deadly is it?”, stressing the lack of clear answers, persisting to this day. On the world scale deaths represent slightly less than 2.5 % of the nearly 62 millions of laboratory confirmed cases of Covid-19 reported at end-November by the World Health Organization [5]: on May 1 the figure was close to 7% and on July 1 slightly less than 5%. This decreasing trend raises a question (recurrently asked, for instance at WHO web press-conferences) about its causes and implications for public health. There is however no way of answering the question at world, national or local level by focusing on such widely reported percentages [6,7,8], formally “Case fatality ratios (CFR)” , substantively crude risks of death over the whole epidemic period, however defined, for cases of unspecified severity and proportion of

asymptomatic persons. Answers can only come from comparisons in time of fatality rates estimated via survival analyses of cohorts of symptomatic patients, laboratory confirmed as Covid-19 cases, stratified by age, sex and indicators of severity at enrollment, with death as main but not the sole endpoint. In particular, comparison of cohorts enrolled in the early months of the epidemic versus those enrolled later on would throw needed light on whether ways have been found- and which- to improve patient care and prognosis, an issue of paramount practical relevance. I am not aware of any such calendar-related studies and more generally there is a dearth of rigorously conducted “real world” cohort studies (as opposed to randomized clinical trials testing specific treatments), notwithstanding the enormous numbers of Covid-19 patients hitherto accrued.

The second gap involves case-control studies. Policies to control the epidemic rely either on general lockdowns or on a variety of less tight and more articulated measures balancing health protection against a large spectrum of economic and social interest. In most nations these policies must be adapted to sub-national areas and be as far as possible evidence-guided. To this purpose essential areal indicators like incidence of daily new cases, hospitalized cases, and reproduction numbers should be supplemented by identification of locally prevailing hazardous circumstances for virus transmission. This information can be gathered by relatively simple and fast investigations exemplified by a recent case-control study in the USA [9] that explored the association of being a symptomatic confirmed Covid-19 case with a range of circumstances (e.g. shopping, office work, use of public transport): increased odds ratios were found for attendance to on-site eating and drinking places such as restaurants, bars and coffee-shops. Local, ‘simple’ studies of this kind are not exempt from potential biases, but once carefully interpreted are valuable to orient

public health actions. Such studies appear to be infrequent, or infrequently reaching publication (or both) and it remains to be seen whether this gap, as the gap involving the similarly valuable cohort studies, is contingent to present time or is going to persist along the pandemic evolution.

### ***Epidemiology's contract with society***

Savitz tersely states[1], and I agree with him : “Epidemiology is fundamentally an applied science, seeking to advance knowledge not just to satisfy intellectual curiosity but to advance public health”. In different words epidemiology aspirations and societal expectations of epidemiology concur in a social contract involving a dual commitment by epidemiologists: to science and to people health. Neat and widely consensual as an abstract principle this dual commitment becomes necessarily problematic when epidemiologists, each with a personal view, translate it into actual practice.

Consider the just mentioned case-control study on Covid-19 .If selection, information and confounding biases have been reasonably excluded as determinants of the association between Covid-19 infection and attendance to restaurants, bars, coffee-shops, a causal interpretation appears most credible given the multiple occasions of contacts, often prolonged, occurring in such places between people without masks. Does epidemiology's job end at this stage, handing the study conclusions to decision makers in charge of enacting measures to eliminate or mitigate the contagious hazard? It could be argued (and often is) that provided a research has been carried out in a way variously labelled as objective, impartial, neutral, independent (or all of these) no further engagement of the epidemiologist(s) is required beyond providing decision makers and society with the study results. This position looks at glance simple and clear but a closer examination shows that each of the four adjectives

addresses a distinct issue, with distinct practical implications, and that the epidemiologist responsibility is 'de facto' involved beyond providing research results .

### *Objectivity and impartiality*

The "Dictionary of epidemiology"[10] defines the adjective "objective" as "A perspective or method that is free of prejudice, bias, favoritism, special interest. Some authors believe that such perspectives do not exist in reality and that at best an objective view is simply an ideal to strive for". Without entering into philosophical territory my pragmatic view is that objectivity does exist but only as a collective property of science, not as an attribute of individual scientists' behavior. Scientific or 'objective' truths (with small t) emerge from the collective work of scientists reciprocally examining, checking, criticizing, each from his/her subjective viewpoint, other scientists' theories and results of empirical research. The objective truth concerning a specific scientific hypothesis, or more broadly a specific question, rests solely on the extent of agreement among scientists, based on shared principles of logic and evidence assessment, on the answer to that question: such answer is inherently provisional, as it can be changed by the addition of new results or fresh interpretative insights. A single, however outstanding and vastly knowledgeable scientist cannot replace the collective work: in this sense he/she cannot be objective, but can strive to be impartial, unselectively considering with uniform criteria all evidence available within his/her competence domain and pertinent to the question under study. Even impartiality, however, will never be absolute as each scientist is unavoidably conditioned by his/her personal viewpoint, shaped not only by scientific interests, experience and knowledge but also by conscious and even unconscious inclinations. For an individual epidemiologist objectivity is beyond reach, impartiality a 'must' and goal to constantly strive for.

### *Neutrality*

Scientific research in general is regarded as 'neutral', value-free, or -more accurately- guided by only a single value, the search of truths as previously discussed. Limitations on the investigations types are introduced when research is conducted in humans, reflecting respect for life and persons' autonomy [11], but granted these the key question for epidemiologists is whether engagement in the search of truths is enough to satisfy the dual commitment to science and health. My conviction is that it falls short of enough and that neutrality does not hold every time the interest of health conflicts with other legitimate (and 'a fortiori' illegitimate) interests in society. For instance an epidemiologist studying occupational risks in the energy producing industries should be neutral between possibly conflicting social, including economical, interests of nuclear and oil industries, but should not be neutral between such interests and health. This non-neutrality attitude has two main implications. First it orients all aspects of projects, be they original studies or overall evidence evaluations, towards maximizing the production of information both relevant and applicable to population health rather than information relevant to other more peripheral scientific aspects, however interesting and challenging 'per se'. Second it inclines to interpret the uncertainty in evidence from single or aggregated studies in the direction of protecting the population health: stated differently it bestows the benefit of scientific doubt first to people exposed to hazards (be they noxious or deficient protective agents or circumstances). Non-neutrality is also relevant to citizens' trust in epidemiologists and epidemiological results, essential for successful public health actions, because in a popular say: "People do not care how much you know until they know how much you care".

### *Independence and conflicts of interest*

Independence has no meaning without specifying from what or whom. Independence from interests other than science and health stands out as a key condition enabling to attain objective truths. On a previous occasion[12] I have discussed the main and widespread hurdle impairing such independence, namely conflicts of interest (COI), of which I reemphasize here just two features. First the importance of COI lies not on questionable ethical choices of a researcher (on which colleagues cannot and should not have a say) but on the public, societal relevance of possible erroneous scientific judgments resulting from such choices mostly via unintentional distortion of impartiality. Second COI are primarily dysfunctional components of contemporary research systems which hamper and slow down the attainment of scientifically valid evidence and by making research less efficient they increase its costs to society. Treatment of COI is therefore a high priority in fields such as epidemiology and public health, implementable by promoting and guaranteeing objective material and institutional conditions of independence to researchers and to specialist panels in public national and international institutes and organizations. An example is the approach that the International Agency for Research on Cancer has adopted for its Monographs program[13] on the identification of carcinogenic hazards to humans. Participants in the Working Group meetings of the Monographs act in different roles, full members, representatives of national or international health agencies or simply observers (e.g. from commercial companies or citizen's groups) admitted provided they abstain from influencing the proceedings: only full members, with no declared or otherwise known conflict of interest, are entitled to vote.

### *Responsibility for health*

To produce actual benefits for health the results of an epidemiologist's research, hopefully carried with impartiality, non-neutrality and independence from interests



extraneous to science and health, need to be entered into decision processes on public health issues (including those relevant to clinical practice). The transfer cannot simply consist of laying the results, typically in the form of publications, at the door of generically designated 'decision makers' who may consider them if, when and how they see it fit. Transferring implies proactively driving the results into the decision process and supporting them from a science-for-health viewpoint in the same way as other participants, representing other and often conflicting interests in society, will argue from their viewpoints. The responsible decision maker is not only the health or environment minister, the administrator or the clinician that signs an intervention prescriptive document but all having taken part in its elaboration. There are however epidemiologists that for a variety of reasons will rarely if ever engage beyond the stage of publishing research results in various forms. Yet even in this context it remains that all declared implications, of whatever content, for public health of a piece of epidemiological research could make a difference for a decision and should be regarded for what they are, a germ of decision and co-responsibility, and not merely as propaganda stressing the potential practical importance of the research: if it has practical importance it must entail also practical responsibility, or else it does not possess either. A practical hint may help not to lose sight of or, worse, occult one's co-responsibility: consider anything to be said or written from an '*intention to decide*' perspective, asking "if I had to decide alone here and now on this issue and bear the full responsibility of the decision, what would I say or write?"

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