EMERGING THEMES IN EPIDEMIOLOGY
UNOFFICIAL IMPACT FACTOR 2.59

Analytic perspective

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Seven mistakes and potential solutions in epidemiology, including a call for a World Council of Epidemiology and Causality

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Emerging Themes in Epidemiology 2009, **6**:6 doi:10.1186/1742-7622-6-6

Additional issues to be considered by a World Council of Epidemiology and Causality

James Scanlan (2010-04-08 08:45) James P. Scanlan, Attorney at Law, Washington, DC USA

Bhopal identifies seven important mistakes of methodology or presentation in epidemiology and makes a timely call for a World Council of Epidemiology and Causality to address these and related issues.[1] I suggest adding the following items to the list.

1. Discussing differences between outcome rates without consideration of the extent to which the differences are affected of the overall prevalence of an outcome.

In over a hundred references made available on the Measuring Health Disparities page of jpscanlan.com[2] (the most important of which are probably references 3-5 below), I discuss the ways that standard measures of differences between outcome rates are affected by the overall prevalence of an outcome. Most notably, the rarer an outcome, the greater tends to be the relative difference in experiencing it and the smaller tend to be the relative difference in avoiding it. Absolute differences between rates and odds ratios are also affected by the overall prevalence of an outcome, though in more complicated ways (as most fully discussed on the Scanlan's Rule page of jpscanlan.com [6]). While the aforementioned references usually have addressed these patterns with regard to their implications for interpreting data on health inequalities – that is, in the context of discussion of the ways race/ethnicity or socioeconomic status affects an outcome rate – the patterns are equally relevant to discussion of any effort to determine the extent of some association. But, in health inequalities research or otherwise, the implications of overall prevalence have been almost invariably ignored in the discussion of strengths of association.

In recent years, others, including some quite prominent epidemiologists, have reached similar, if not necessarily identical, conclusions about the way that standard measures of differences between rates are affected by the overall prevalence of an outcome and the need to consider the implications of overall prevalence in interpreting measures of differences between outcome rates.[7-9] They have also noted some of the dangers in ignoring such issues.[10] If either my own views or the views of others just mentioned are correct in substantial part, much standard epidemiological methodology warrants reconsideration. A World Council of Epidemiology and Causality is precisely the forum in which to address such issues.

2. Discussing effects of factors on mortality and survival (or the two outcomes in any dichotomy) interchangeably without recognition that the effects on one outcome may be, or even will tend to be, the opposite of the effect on the other.

One of the implications of the pattern whereby the rarer an outcome the greater tends to be the relative difference in experiencing it and the smaller tends to be the relative difference in avoiding it is that as an outcome like mortality decreases in overall prevalence, relative differences in mortality rates tend to increase while relative differences in survival rates tend to decline. Similarly, within subpopulations where adverse (or favorable) outcomes are rare, relative demographic differences in experiencing such outcomes will tend to be large while relative differences in avoiding the outcomes will tend to be small. Because these patterns are little understand, however, researchers may often talk about effects on things like mortality and survival interchangeably. In doing so, they typically assume that an effect observed with regard to one outcome will automatically hold for the other outcome. In fact, however, not only may the opposite effect hold for the other outcome, there is reason to expect that commonly to occur. This seems especially to be a problem in discussion of cancer mortality and survival issues, as discussed in the Mortality and Survival sub-page of the Scanlan's Rule page of jpscanlan.com.[11]

3. Carelessness in characterization of differences between rates with respect to the size of a relative difference and the failure to distinguish percents from percentage points.

I maintain a web page [12] showing the quite surprising predominance in major medical and other scientific journals (with the notable exception of the New England Journal of Medicine) of the characterization of, for example, a 3% outcome rate as "three times greater than" a 1% outcome rate. Giving the matter the least thought, one ought to recognize that 3% is either "three times as great" as 1% or "two times greater than" 1% and that the figure "three times greater than" 1% would be 4%. Scientific journals ought to be giving the matter more than the least thought.

I also maintain a web page [13] addressing the pattern whereby researchers will state, for

example, that something increase a rate by 10%, requiring the reader to go several pages into the article to learn whether in circumstances where the first rate is 20% the second rate is (a) 22% or (b) 30%. Whether or not is technically incorrect to say 10% when one means (b), it is the simplest thing in the world to use the term "percentage points" when one means (b).

Both of these issues lend themselves to treatment in guidelines issued by a World Council.

4. Treating nonsignificant associations as if they provide no evidence of an association or provide evidence of the absence of an association.

That an association be statistically significant has reasonably been regarded as a necessary condition for researchers to conclude that there is an association. Frequently, however, when a study shows an association in nonsignificant terms (and sometimes even when the association approaches significance) researcher will report the result as if it indicates that absence of an association. Sometimes researchers even then proceed to opine on why there is no association. But a nonsignificant finding as to an association still will be some evidence that there exists an association. Even if it is quite week evidence, it is still the best evidence available as to whether there exists an association. That is not a reason why researchers should commonly rely on nonsignificant associations to suggest that there is an association that might be revealed were the study sample larger. But it is a reason why the observed directions of effects should be reported even when they are not significant. It is also a reason why nonsignificant associations should never be reported as suggesting the absence of an association.

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11. Mortality and Survival sub-page of Scanlan's Rule page of jpscanlan.com:
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12. Times Higher/Greater Issues sub-page of Vignettes page of jpscanlan.com:
http://www.jpscanlan.com/vignettes/timeshigherissues.html

13. Percentage Points sub-page of Vignettes page of jpscanlan.com:
http://www.jpscanlan.com/vignettes/percentgepoints.html

Competing interests

None

The eighth mistake of epidemiologists

top

Saeed Dastgiri (2010-04-08 08:45) Tabriz University of Medical Sciences ✉

Dear Editor,
I read with interest the paper published by Professor Raj Bhopal in an earlier issue of the Emerging Themes in Epidemiology entitled "Seven mistakes and potential solutions in epidemiology, including a call for a World Council of Epidemiology and Causality" (1). The article describes the details of seven major mistakes made by epidemiologists giving seven solutions to avoid them. Professor Bhopal has finally called, as a conclusion, for a World Council of Epidemiology to help to apply the epidemiologic works in human populations.

There is another discipline beside "Epidemiology" which is usually called "Biostatistics or Medical Statistics". Although epidemiologists and biostatisticians have been working and collaborating together since many years ago, and they are even located in some universities and research institutes under a unique umbrella inside a department, there is now a clear distinction in the

definition of the "epidemiology" and ""Biostatistics or Medical Statistics".

Epidemiologists are scientists working on the population health. They try to identify the population health problems while biostatisticians working on the data modeling and analysis in every aspects of biomedicine including very specific clinical issues and population health. It seems now that it is time for epidemiologists and biostatisticians to see themselves as independent scientists in the field of medical sciences. I would therefore like to add one more mistake usually made by epidemiologists as they consider themselves as biostatisticians sometimes. Obviously an epidemiologist should know deeply the statistical concepts as the same as other scientists in the other fields of biomedicine. However epidemiologists should be aware that "Epidemiology" is now a separate field from "Biostatistics or Medical Statistics".

In summary, I would like to recommend the eighth mistake as follows:

8. Insufficient attention to the definition of epidemiology and population health by epidemiologists. (VIII Work on population health only as the field of "Epidemiology".)

Sincerely,
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1. Bhopal R: Seven mistakes and potential solutions in epidemiology, including a call for a World Council of Epidemiology and Causality. Emerg Themes Epidemiol 2009, 6(6):1-9.

Competing interests

there is no competing interest

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top