Managing risk in statistics - "Attributable Risk"

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Introduction

In a previous article we discussed the value of determining the relative risk of developing a disease in relation to a specific exposure and thus its utility for assessing the exposure's etiological role in disease causation. This article focuses on attributable risk, another important measure, which assists us in determining what the impact would be of effectively intervening against a specific causative factor. It is determined by subtracting the risk in the unexposed group from the risk in the exposed group, that is, Risk $_{(exposed)}$ - Risk $_{(unexposed)}$. The underlying or background risk without the exposure is assumed to be the same in both groups. When the level of risk is the same in both groups, then the risk difference is 0 and one can conclude that the exposure makes no difference to the disease risk. However, if the risk difference is greater than 0, there is increased risk of the outcome in relation to the specific exposure under investigation. If it is less than 0, that is, a negative number, then the exposure under investigation would appear beneficial with a lower disease risk in the exposed group.

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Attributable risk

As defined, "attributable risk" is the risk in the *exposed* group minus the risk in the *unexposed* group. Let us review a study conducted by one of the foremost modern epidemiologists, Sir Richard Doll on cigarette smoking habits of British doctors using the same cohort over a 20-year period.[1] The relative mortality risk amongst cigarette smokers (mortality incidence among cigarette smokers compared to lifelong non-smokers of comparable age) was, for men under 70 years, about 2, while for men over 70 years, 1.5. To investigate the concept of attributable risk, age-adjusted death rates per 100 000 doctors (smokers and non-smokers) due to lung cancer and coronary heart disease were calculated. The age-adjusted death rates per 100 000 for lung cancer in smokers and non-smokers were 140 and 10 respectively. For coronary heart disease (CHD), these were 669 and 413 for smokers and non-smokers respectively (Table I).

The excess lung cancer attributable to smoking may be calculated as 140 – 10 = **130** per 100 000. Similarly, the excess of CHD attributable to smoking is 669 – 413 = **256** per 100 000.

What do these figures tell us about mortality in relation to cigarette smoking? Firstly, they indicate that if smoking is causal, eliminating cigarette smoking would save more smokers from CHD than from lung cancer. Secondly, the higher age-adjusted death rates per 100 000 for lung cancer (140 vs. 10) and CHD (669 vs. 413) in smokers than in non-smokers provides some support for the contention that cigarette smoking is an important causal factor for lung cancer and CHD, but the strength of this relationship is better explored through calculation of relative risk.

Attributable risk thus provides an indication of how much of the disease burden could be prevented if an effective prevention strategy for that causal factor existed. In this case, health education programmes on cessation of cigarette smoking, increased cigarette taxation and other effective public health prevention strategies may play the role of reducing deaths due to lung cancer and CHD in the community. In conclusion, the attributable risk is the difference between the incidence of disease in the exposed and unexposed groups.

Table I: Age-Adjusted Death Rates per 100 000 Male British Physicians1

	Smokers	Non-smokers
Lung cancer	140	10
CHD	669	413

Reference

Doll R, Peto J. Mortality in relation to smoking: Twenty years' observations on male British doctors. *Brit Med J* 1976; 2: 1525-1536.