LEADING ARTICLES

Monitoring trends in occupational illness

Last year the British government launched a new long term strategy for occupational health in an initiative entitled "Revitalising health and safety".[1] Among other things, this set a target of a 20% reduction in the incidence of work related ill health to be achieved by the year 2010. In general, it is good practice to identify criteria against which the success of such initiatives will be assessed, provided that they reliably reflect policy intentions and can be measured satisfactorily. A goal of reducing occupational illness and injury is clearly desirable and easy to sell to the public. On closer examination, however, the target is not straightforward.

For a start, it is unclear what exactly is meant by "the incidence of work related ill health". One interpretation might be "the incidence of all disorders that could have been caused or made worse by work". As an example, with this definition, all cases of lung cancer in coke oven workers would be classed as work related as the disease is known to be a hazard of that occupation. Such an approach would be unsatisfactory, however, because for many disorders occupational factors account for only a small fraction of cases, even in the occupations most at risk. It follows that even the most stringent control measures in the workplace might not be capable of reducing their incidence by as much as 20%.

A better interpretation would be "the excess of illness that is attributable to work". This has the merit that it directly represents the impact of occupation on health at a population level. Moreover, it encompasses not only injuries and diseases caused by work, but also occupational exacerbation of symptoms and disability in pre-existing disorders—for example, asthmatic attacks precipitated by irritants in the workplace. However, it is not so easy to measure.

Some disorders can be ascribed to work with confidence in individual patients, either because they only occur as a consequence of an occupational hazard—for example, coal workers' pneumoconiosis—or because they can be linked to work by specific clinical features or investigations—for example, injuries resulting from accidents in the workplace, and asthma caused by occupational exposure to sensitisers. In these circumstances, the associated burden of illness can be measured simply by counting cases.

How this is done will depend on the nature of the disorder. For example, in the United Kingdom, cases of coal workers' pneumoconiosis can be ascertained from data on social security compensation; accidental injuries at work from statutory reporting by employers (only reliable for more severe injuries) and population based surveys of self reported work related ill health[2 3]; and occupational asthma through the SWORD reporting scheme.[4] Such sources do not always cover all of the national workforce, and ascertainment of cases is often incomplete. However, provided that the proportion of cases identified does not change importantly over time, they can be used to monitor trends.

More challenging is the situation in which the incidence of a disease is increased by an occupational hazard, but there is no reliable way of attributing individual cases to work even when the people affected are known to have been exposed to the hazard. For example, a given cumulative exposure to benzene might increase a worker's risk of acute non-lymphatic leukaemia (ANLL) by 50%, but there are no special features of ANLL caused by benzene that allow it to be distinguished from the same disease in people who have not been exposed to the chemical. It follows that when such a worker develops ANLL, there is no way of determining whether or not the illness would have occurred without the exposure. All we can say is that in this circumstance, on average, about one in three (50/(100+50)) cases will be attributable to work.

In general, the fraction of exposed cases of a disease that can be ascribed to occupation will vary according to the relative risk associated with the exposure. If the relative risk is high—for example, adenocarcinoma of the nasal sinuses in furniture manufacturers—almost all exposed cases will be attributable, and their number will provide a good index of the impact of the hazard. More often, however, relative risks are lower (especially in people with minor exposures), and this approach is not valid. Instead, to derive attributable numbers it is necessary to combine information on patterns of exposure in the national population and on the risk in people with a representative spectrum of exposure compared with that in unexposed people. This approach has been used, for example, to estimate the number of people in the United Kingdom with finger blanching caused by occupational exposure to hand transmitted vibration.[5]

Similar problems may arise when the effect of a hazard is to aggravate a pre-existing disorder. In this situation it would be inappropriate to attribute all of a person's symptoms and disability to work, and the true impact of the hazard is best assessed by first comparing patterns of illness in representative samples of exposed and unexposed workers who have the disease, and then relating the findings to estimates of the number of exposed workers with the disorder.

Further difficulty is encountered because many of the more common disorders associated with work—such as low back pain, non-specific upper limb pain, and occupational stress—can only be ascertained through subjective report of symptoms. There is strong evidence that people's propensity to complain of such symptoms

is subject to cultural and psychosocial influences,[6] many of which are unrelated to work. Thus, changes in these non-occupational influences could confound and perhaps totally obscure any benefits from improvements in working conditions. This may explain, for example, why the prevalence of reported low back pain in Britain has risen over recent years, at a time when the physical demands of work have generally been declining.[7] It is even possible that by increasing awareness of the disorders against which they are targeted, preventive measures could lead to a paradoxical rise in symptoms.

Another factor that must be taken into account when interpreting temporal trends is the long latent interval between first exposure to some occupational hazards and the eventual manifestation of disease. In this circumstance, control measures cannot be expected to have an impact on incidences over a period as short as 10 years.

Given all these problems, where does the way ahead lie? It is clear that no single method of monitoring will be appropriate to all occupational disorders. In particular, the Health and Safety Executive's surveys of self reported work related illness,[2 3] which are often quoted as a basis for global estimates of the frequency of work related illness in the United Kingdom, cannot provide all the answers. These surveys collect information about illness that participants perceive as being caused or made worse by work, and as already discussed, for many occupational disorders, meaningful attribution is not possible in the individual case.

Instead, the starting point should be to define a list of the most important occupational disorders and the hazards with which they are associated. For each combination of hazard and disease, an appropriate monitoring strategy should then be devised. For some disorders, this will entail counting cases, either from existing sources of data or through the creation of new disease registers. For others, more complex epidemiological investigation will be needed.

In some cases it may be possible to exploit data that are already collected for other purposes—for example, repeated analyses of occupational mortality might be used to assess trends in fatal pneumonia resulting from exposure to metal fume. However, for non-fatal disorders that are relatively common, the best approach may be through repeated ad hoc surveys of representative populations. One possibility might be to augment the self reported work related illness surveys with questions about selected types of illness and occupational exposures, to be reported irrespective of whether they occur in combination. If data were also collected on potential confounders, estimates could then be made of relative risks and of the prevalence and number of cases nationally with relevant exposures.

Where the risk of a disease only increases many years after first exposure to a hazard, consideration should be given to monitoring intermediate markers of outcome as well as the attributable number of cases. For example, it would be helpful to know whether the prevalence and intensity of occupational exposure to asbestos is declining, even if any effect on rates of mesothelioma would only be expected much later.

For all disorders, the limitations of the monitoring methods that are adopted must be clearly articulated. These will include statistical uncertainties and the scope for bias and confounding of trends, as well as the impossibility of short term impact on diseases that occur with a long latency. As far as possible, this exercise should be carried out before data are collected and trends are analysed. Otherwise there is a danger that important scientific messages will be lost in a morass of political wrangling and point scoring.

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Monitoring occupational diseases: response

The Health and Safety Executive (HSE) welcomes this informed contribution to the debate on measuring progress against the government's targets for occupational health and safety. We recognise the importance of identifying criteria against which the success of the "Revitalising health and safety"[2] and "Securing health together"[3] strategies will be assessed, and also the difficulty of doing so.

We agree that in the area of occupational health, measuring progress against targets presents particular challenges. Three were highlighted by Coggon[1]:

- The difficulty of meaningfully attributing individual cases to work: and the fact that such attribution will be done differently by different people—for example the people themselves, their doctors, or their employers.

- The effect of cultural or psychosocial factors on reporting of symptoms: including the possibility of improved awareness leading to a "paradoxical" rise in symptom reporting (especially in the early years of a new strategy or campaign).
- The latent interval after exposure: so that the incidence of some diseases—such as cancers—will not be affected by actions taken during the 10 year period of the strategies (in such cases, monitoring exposures may give a more immediate measure of progress).

To these we would add the special challenges associated with measuring change over time:

- The degree of statistical uncertainty, especially in population based surveys, which may be such that the percentage target improvement lies within the likely margin of error.
- Concerns about the stability of the sources, in terms of consistency of coverage, timeliness, and frequency, and securing the flow of data in the longer term.

For all these reasons, the HSE agrees that no single method of monitoring can provide all the answers. Over the years we have worked with others to develop a range of different data sources for occupational ill health, including household surveys, reporting by specialist doctors, administrative data from compensation schemes and elsewhere, and the calculation of attributable fractions. Each of these is more appropriate for some disorders than for others, and each will have a part to play in monitoring progress.

Coggon concluded by suggesting that "the limitations of the monitoring methods that are adopted must be clearly articulated . . . before data are collected and trends are analysed". To this end, the HSE statisticians—in consultation with stakeholders—have recently produced a "Statistical note on progress measurement", which is now available on the HSE website (www.hse.gov.uk/hsestats/statnote.pdf).

This describes the challenges already mentioned. It explains how existing sources will be refined and new ones developed and sets out the statistical techniques which will be used to monitor progress against the targets. These will include the integration of data from the different sources, to arrive at an overall judgement about progress against the targets; we think that such an approach is novel in the field of occupational health, although it has been successfully used in other area of statistics—such as the National Accounts.

By setting out in advance the principles which will be followed when assessing whether the targets have been achieved, the statistical note is intended to avoid the danger mentioned by Coggon, of scientific judgement being obscured by "political wrangling and point scoring".

The HSE sees this very much as a developing area. The statistical note has been subject to a process of external consultation, including a workshop in December 2000 attended by around 30 experts in the field. As we build on the foundations set out in the note we will continue to seek the involvement of stakeholders, including the scientific community. We do not underestimate the scale of the work still to be done but our overriding aim is that progress measurement for the occupational health and safety targets should be robust, credible, and transparent.

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1 Coggon D. Monitoring trends in occupational illness. *Occup Environ Med* 2001;**58**:591–2.
2 http://www.hse.gov.uk/links/revital.htm
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