

The environment goes to the doctor — but is the treatment evidence based?

Discussion paper by Janet Salisbury (May 2001)

Whilst most health care related decisions are now based on evidence obtained from systematic reviews of the literature ('evidence-based medicine'), environmental resource management decisions are still largely based on the collective ignorance of environmental managers about the effects of the environmental remediation measures taken.

In 1972, British epidemiologist Archie Cochrane drew attention to the collective ignorance of health professionals about the effects of health care (Cochrane 1972). He recognised that many treatment-related decisions were not based on reliable reviews of the available evidence but on an ad hoc selection of information from the a vast scientific literature, expert opinion and, worst of all, trial and error.

Initially, Cochrane's ideas were slow to catch on but during the 1980s a number of systematic reviews of the scientific literature on health-related issues were published, notably on pregnancy and childbirth, where considerable controversy reigned over the effectiveness of different treatments. At the same time, the scientific quality of many previously published reviews was shown to leave much to be desired: in fact, it wasn't difficult to find examples of accepted clinical practice that was doing more harm than good. A systematic review (a) brings together all the available evidence on a topic (including unpublished and negative evidence wherever possible); and (b) includes a critical analysis of the evidence, based on an agreed ranking system so that the best evidence carries more weight than the less certain evidence (in the case of clinical trials the 'best evidence' is represented by a well conducted randomised controlled trial).

The approach gathered momentum in the early 1990s. A Cochrane Centre was opened in Oxford in 1992 and the first annual Cochrane Colloquium was organised by the New York Academy of Sciences in 1993. This led to the founding of 'The Cochran Collaboration' in the same year as an international movement to further Cochrane's approach to what became known as 'evidence-based medicine'.

The Cochrane Collaboration aims to help people make well-informed decisions about health care by preparing, maintaining and ensuring the accessibility of systematic reviews of the effects of health care interventions. Since 1993, the collaboration has expanded to become the first point of contact for anyone wanting to find the most comprehensive review of evidence on a health care issue. During this time, clinical epidemiologists, quick to rise to the new challenges of this approach, have analysed in detail the nature of study types typically used in medical research and developed methods to identify and rank the most reliable evidence (ie free of bias and other confounding factors). These methods have now been adopted widely and used outside the Cochrane Collaboration itself by epidemiologists, health professionals, health care providers and policy makers, alike.

All this activity has led to the development of 'clinical practice guidelines' which provide guidelines for best clinical practice, based on the available evidence, as well

as a plethora of other evidence-based procedures for making sound health decisions (eg the validity of diagnostic screening for cancer, or the efficacy of new health technologies or drugs compared to existing ones). Promotion of these principles has also led to improved clinical trial design so that modern trials are more likely to yield reliable evidence than in the past. Where, 20 years ago, a GP or specialist doctor may have relied on her training, knowledge acquired in an ad hoc way from the literature, the opinions of colleagues, or trial and error, now they can turn to systematic reviews and clinical practice guidelines to help them and their patients make informed decisions. These developments have gone hand in hand with health care consumers' demands to be better informed on decisions that affect their health and to work in partnership with their health professional rather than assuming the more traditional and subservient role.

So what has this to do with the environment? If we think of environmental management as the 'medicine' of the environment, then environmental resource managers are about where doctors were in 1979s before Archie Cochrane's ideas caught on. That is, while there is a vast amount of research going on all around the world on every aspect of environmental management, including biodiversity, dry-land salinity, soil erosion, irrigation, pollution and so on, there is no central repository for all this evidence and no emerging statistical methodologies for critically appraising and ranking the evidence and for planning new research.

Even at the most basic level, environmental research seems to be lagging behind biomedical research. For biomedical research there are a plethora of online databases (Medline and the like) that can be searched to obtain citation details of any research paper back to the 1960s. These days, it is also usually possible to access the abstract and, increasingly, the whole articles directly from the web. There is no such organised database for the environmental literature, which needs to be searched using generic search engines. At the next level up, there does not appear to be a culture in environmental research of 'systematic review' — that is, reviews that attempt to gather **and** critically evaluate all the evidence on a topic using agreed standardised methods.

In clinical medicine, an 'intervention' is the term used for any course of action recommended by the health care professional to improve the health of the patient (eg taking a drug, changing diet, having an operation). Similarly for the environment, an intervention to 'treat' dry-land salinity may be new tree plantings, change in irrigation practices, groundwater draining or changed land-use strategies. A glance at some of the studies that have been done to show the efficacy of these interventions may reveal an inconsistent mixture of answers. A closer examination of all the relevant studies, however, with appropriate weighting for study designs that most effectively eliminate bias (by, for example using a randomised allocation of sites into a trial comparing tree planting and changed land use) may provide the vital information needed to guide sound management decisions. Communities will then be able to work in partnership with policy makers to achieve sustainable outcomes.

Clinical epidemiologists have another weapon in their armoury for evaluating evidence — applicability. That is, how well the results of one study can be applied to another situation (eg another ethnic group or age group). Again, this issue is approached by rigorous analysis of the components that may or may not affect the

transfer from one place or group in the population to another. As environmental effects can differ widely from one location to another, applicability would also be an essential component in critical appraisal of environmental research.

For an 'evidence-based environmental management' movement to develop, environmental scientists and statisticians need to work together to assess the design of studies relating to environmental management against criteria for elimination of bias and for applicability from one area to another. I suspect that most environmental researchers believe this is too difficult to do as the 'environment is too complex' but I believe it can and must be done, and the sooner the better, before we muddle along for another couple of decades possibly doing more harm than good.