

Reenergizing Public Health Through Precaution

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The precautionary principle has provoked a spirited debate among environmentalists worldwide, but it is equally relevant to public health and shares much with primary prevention. Its central components are (1) taking preventive action in the face of uncertainty; (2) shifting the burden of proof to the proponents of an activity; (3) exploring a wide range of alternatives to possibly harmful actions; and (4) increasing public participation in decision making.

Precaution is relevant to public health, because it can help to prevent unintended consequences of well-intentioned public health interventions by ensuring a more thorough assessment of the problems and proposed solutions. It can also be a positive force for change. Three aspects are stressed: promoting the search for safer technologies, encouraging greater democracy and openness in public health policy, and stimulating reevaluation of the methods of public health science.

IN MARCH 1999, THE LOS Angeles Unified School District, the nation's largest school district, announced a new policy on use of pesticides in its school buildings. The district committed to a policy of integrated pest management, giving priority to nonchemical approaches to pest control, and set a long-term goal of eliminating all chemical controls. In establishing this policy, the school district invoked the precautionary principle, saying:

The Precautionary Principle is the long-term objective of the District. The principle recognizes that:

1. No pesticide product is free from risk or threat to human health, and
2. Industrial producers should be required to prove that their pesticide products demonstrate an absence of [human health risks] rather than requiring that the government or the public prove that human health is being harmed.¹

By stating a set of basic tenets (all pesticides are potentially harmful, and nonchemical methods shall be preferred) and a long-term objective ("to provide for the safest and lowest risk approach to control pest problems while protecting people, the environment, and property"), the policy stimulates the search for safer alternatives without tying the hands of the district when no alternative to a pesticide can be found. The policy is also significant for what it does *not* include: there is no list of banned substances, nor a stipulation of an "acceptable" level of risk.

Whether or not one agrees with this approach to pesticide

management (we do), it seems clear that the school district's invocation of the precautionary principle raises important issues for public health scientists and activists.

In this commentary, we briefly describe the key elements of the precautionary principle, emphasizing several aspects important to public health. Our perspective is informed by a university–community collaborative effort to refine the meaning of the precautionary principle and develop strategies for applying it to environmental health policy.^{2,3} We argue that the precautionary principle is good for public health because it promotes the search for safer technologies, encourages greater democracy and openness in public health policy, and stimulates reevaluation of the methods of public health science.

PRECAUTIONARY PRINCIPLE DEFINED

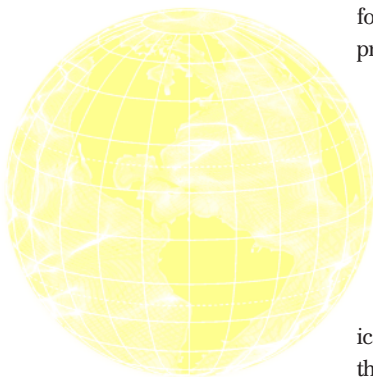
The definition of the precautionary principle developed for the Rio Declaration of 1992 is often cited,⁴ and the 1998 Wingspread Statement contains similar language: "when an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically."⁵ The statement also lists 4 central components of the principle: (1) taking preventive action in the face of uncertainty, (2) shifting the burden of proof to the proponents of an activity, (3) exploring a wide range of alternatives to

possibly harmful actions, and (4) increasing public participation in decision making.

The term "precautionary principle" was introduced into English as a translation of the German word *Vorsorgeprinzip*. An alternative translation might have been "foresight principle," which carries a connotation of anticipatory action—a positive, active idea—rather than precaution, which to many sounds negative. In German environmental policy, the *Vorsorgeprinzip* stimulates social planning for innovation, sustainability, and job creation.⁶

In the United States, the precautionary principle is being promoted by environmental and public health advocates.³ To these groups, US environmental policy often seems to be more reactionary than precautionary, requiring a high degree of certainty of harm before preventive action is taken and emphasizing management of risks rather than prevention. The precautionary principle is viewed as an opportunity to shift the terms of environmental debates by calling for preventive action even when there is uncertainty (but with credible evidence of potentially significant impacts), by shifting the burden of monitoring and hazard assessment onto those who propose potentially hazardous policies and by emphasizing alternatives and democracy.⁵

The American Public Health Association recently passed a resolution reaffirming its support of the principle and urging its application in the protection of children's health from environmental hazards.⁷ Strong support for pre-



caution is also found in the environmental policies of the European Union.⁸

The precautionary principle has been advocated for public health because of the importance of anticipating unintended health consequences of well-intentioned public health interventions.⁹ Seeking to avoid creating new problems while solving existing ones is an important aspect of the precautionary principle, but it is not the only way in which precaution can benefit public health.

FORESIGHT AND THE STIMULATION OF NEW TECHNOLOGIES

The identification of safer alternatives and opportunities for prevention is central to the precautionary principle. Too frequently, policymakers ask the question “How much risk does this activity pose, and is it significant?” or “What level of risk is acceptable?” These questions, deeply ingrained in the regulatory approaches of many government agencies, tend to focus on the quantification of potential hazards rather than the prevention of pollution.^{10–12} They often provoke a sharp debate about whether the risk has been characterized accurately. When public health advocates and environmentalists enter into this debate, they may inadvertently be ceding the most powerful position, that of questioning whether the hazardous substance or intervention is needed at all.

A different, and potentially more precautionary, way to think about uncertain risks is to begin from a different set of questions: Is the proposed activity needed, and if so, how much contamination can be avoided while still achieving societal goals? And Are

there alternatives to this activity that clearly avoid hazards? For example, chlorinated solvents fulfill a cleaning function that can often be accomplished by aqueous solutions. This shift in perspective requires a set of skills not always found in regulatory agencies—technology and product design, full-cost accounting and other management systems. It also requires the broadest possible perspective on the potential unintended consequences of policy choices.

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A variety of methodologies exist with which to evaluate policy alternatives and identify potential unintended consequences. Trade-off analysis has been proposed as an alternative to traditional cost–benefit analysis and risk assessment; in trade-off analysis, the full range of risks and benefits of competing technology options are assessed without the requirement to translate the potential impacts into a single quantitative figure.¹³ Health impact assessments provide a means to detect the negative health implications of non–health-related governmental policies.¹⁴ Work-environment impact assessments can be used to identify ways in which an intervention in the work environment may result in unanticipated health risks to workers,¹⁵ and the Pollution Prevention Options Analysis System provides a comprehensive semiquantitative approach to comparing and evalu-

ating the potential adverse effects of technologies designed to reduce chemical use and waste.¹⁶

Shifting the questions that frame the problem reorients the focus of environmental policy from quantification of risks to analysis of solutions and thus permits a broader examination of all the available evidence on hazard, exposure, uncertainty, and alternatives. The precautionary principle is a means of saying yes to innovative, cleaner technologies (although critics have argued

that it will only lead to stopping new technologies). A thorough alternatives assessment may identify needs for cleaner technologies, which in turn can inform the planning of sustainable economic development activity.¹¹

Quantitative risk assessment plays a central role in environmental health policy in the United States. Weighing policy alternatives will inevitably involve assessing and comparing risks, but the determination of whether a risk is too big depends in part on whether there are alternatives to reduce that risk. Availability of a safer alternative can obviate the need for a costly, contentious, and potentially misleading quantitative risk assessment.

The decision to ban the use of certain phthalate plasticizers in toys provides an illustration. The Danish Environment Agency justified this action with the following reasoning: There is evidence of children’s exposure and evi-

dence of toxicity to animals; children are particularly susceptible to many toxic substances; alternative materials exist; and the product serves no necessary function. The agency concluded that the plasticizers should not be used in toys (L. Seedorf, MS, Director, Chemicals Division, Danish Environmental Protection Agency, oral communication, May, 1999). The US Consumer Product Safety Commission reached a similar decision, but only after a costly, time-consuming quantitative risk assessment. The commission concluded that given uncertainties in the size of the risk, manufacturers should voluntarily remove these substances from toys.¹⁷ In the end the outcomes were the same, but the decision-making approach and the costs to the public were quite different.

Foresight should involve setting long-term goals, a practice that is fairly common in public health. Examples are the smallpox eradication campaign, the US Public Health Service Healthy People 2010 priorities, and national nutrition goals. Goal setting focuses not on what future events are likely to happen but rather on how desirable future outcomes can be obtained.¹⁸ Once established, goals help to focus attention on the development of policies and measures to achieve goals while minimizing social disruption and unintended consequences.

With regard to hazardous substances, goals could include reducing exposures to such substances, reducing production of hazards (e.g., phasing out the most hazardous chemicals), and reducing the incidence of environmentally related diseases. Another suggested goal is to reduce general population body burdens

of broad classes of potentially toxic substances by 5% to 10% per year.¹⁹ Such an effort is likely to have a positive health impact, even though it may never be possible to understand all of the ways in which mixtures of low concentrations of chemicals may affect health.

DEMOCRACY AND PRECAUTION

Participation and transparency are essential components of a more precautionary approach to public health decision making. Fiorino has identified several reasons for democratizing environmental decision making. First, because nonexperts think more broadly and are not bound by disciplinary constraints, they see problems, issues, and solutions that experts miss. Second, lay judgments reflect a sensitivity to social and political values and common sense that experts' models do not acknowledge. Third, the lay public may be better than experts at accommodating uncertainty and correcting errors.²⁰ Openness brings different perspectives, which may reduce the danger of an unintended consequence. Also, the weighing of alternative policies should include many points of view, because the benefits and costs of public health and environmental policy choices may accrue to different groups.

When there is much uncertainty about alternative courses of action, it is risky for experts to decide without input from affected communities. The usual strategy is to attempt to present the options as clear and the science as convincing. However, a long series of public health and environmental crises that were apparently unforeseen by scientists have undermined public

confidence, making it more difficult for simple reassurances to be effective. The list includes the Three Mile Island and Chernobyl nuclear accidents, Love Canal, the destruction of the ozone layer, and global warming. An increasingly educated citizenry has begun to challenge the apparent confidence of the experts. Add to this the successful campaigns of AIDS activists and breast cancer survivors to participate in the planning of health research, and it appears to be time to fundamentally change the way that the public participates in the use of public health science.

The precautionary principle represents a call to reevaluate the ways in which science informs policy, and in particular the ways in which scientific uncertainty should be handled.

Broader public participation processes may increase the quality, legitimacy, and accountability of complex decisions. Given the public nature of environmental decisions (which involve highly uncertain, contested values), more effective processes for involving affected communities could increase trust in government. Such processes must be both fair and competent, meaning that they allow all those who want to participate to have substantive access to the decision-making process from the beginning and that they provide financial and technical resources so citizens can participate on equal terms with experts.²¹ In addition, there must be clearly defined mechanisms by which citizen input is fed into the policymaking process.

A long-term educational strategy to increase the public's un-

derstanding of the strengths and limits of scientific evidence is needed as part of increasing public participation. The Danish Board of Technology has been experimenting for several years with innovative forms of decision making on broad technology policy decisions. These "consensus conferences" involve lay panels trained in the science and other aspects of a contemporary concern, resulting in a focused dialogue between the general public and experts. To date, more than 20 such conferences have been held in Denmark, informing government policy on topics includ-

ing genetically modified foods, the human genome project, and air pollution.²²

SCIENCE FOR PRECAUTION

Environmental scientists study highly complex, poorly understood systems, in which causal links between exposures and disease are difficult to quantify. In this uncertain terrain, what are the appropriate standards of evidence for science to inform public health policy? The answer must be tailored to the task. We believe that there are ways in which the methods of scientific inquiry often implicitly impede precautionary action, making it more difficult for policymakers to take action in the face of uncertainty.² Often, scientific research focuses on narrowly defined quantifiable aspects of a problem

while the reality is more complex, requiring systems-level thinking and interdisciplinary research methods.

Public health scientists may be able to assist in the cause of precaution by choosing research methods, well within the bounds of good practice, that would be more helpful to policymakers faced with high-stakes decisions and scientific uncertainty. For example, more and better investigation and communication of uncertainties (what we know, what we do not know, and what we cannot know) in study results will assist a more open decision-making process. Public health scientists could also use qualitative methods more effectively to characterize the complexities of the populations, communities, and ecosystems from which quantitative results are drawn.

Finally, the precautionary principle should challenge scientists to explore new areas of research—interactions, cumulative effects, and effects on different levels of systems (individuals, families, communities, nations)—and new collaborations between disciplines and scientists and the lay public. Multidisciplinary teams will be more likely to develop hypotheses that lead to insights not possible from narrow disciplinary viewpoints, as well as to identify data that may not be accessible to one particular group. The development of the environmental endocrine disruption hypothesis provides one example.²³

The precautionary principle represents a call to reevaluate the ways in which science informs policy, and in particular the ways in which scientific uncertainty should be handled. Scientific research plays an essential role in evaluating the costs, risks,

and benefits of proposed public health policies, but the scientific data are often limited by large areas of uncertainty. In these gray areas, activities that potentially threaten public health are often allowed to continue because the norms of traditional science demand high confidence to reject null hypotheses and so detect harmful effects. This scientific conservatism is often interpreted as favoring the promoters of a potentially harmful technology or activity when the science does not produce overwhelming evidence of harm. Being “conservative” in science is not the same as being precautionary.

When there is substantial scientific uncertainty about the risks and benefits of a proposed activity, policy decisions should be made in a way that errs on the side of caution with respect to the environment and the health of the public.²

PRECAUTION OR REACTION?

The precautionary principle has been criticized for being overly vague.^{24,25} To some extent the critics are correct, but much work is now under way to define what precaution means in practice and how it can improve decision making regarding uncertain, complex hazards.^{2,26,27} This is an opportunity for the public health community to affect the ways in which precaution is defined in practice. At the same time, there is a risk that proponents of the principle will be held to an unrealistically high standard—an assumption that all public health problems should somehow be resolved through the application of precaution. Where science and politics collide, there will always be ambiguity and contention,

and it seems unreasonable to expect any single new idea to sweep these away entirely. We should be careful not to overuse the precautionary principle, particularly when there is clear evidence that damage has been done or there is no reasonable evidence to suspect a risk to public health.

If the precautionary principle represents a desirable goal in public health, one may ask, What is the “not sufficiently precautionary principle” on which policies are currently based? Too often, we believe, public health and environmental policies are based on a principle of *reaction* rather than *precaution*. Government regulatory agencies are often put in the position of having to wait until evidence of harm is established beyond all reasonable doubt before they can act to prevent harm. A shift from reaction to precaution is entirely consistent with the core values of public health practice. We believe that public health officials, researchers, and advocates should embrace the precautionary principle as an opportunity to reinvigorate the great preventive tradition of public health action in the face of uncertainty. ■

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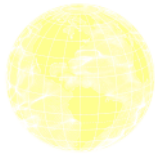
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The Precautionary Principle and Electric and Magnetic Fields

Current environmental regulation represents a paternalistic policy, more concerned to avoid false positives than false negatives, limiting opportunities for individuals to make choices between risk-avoidance and risk-taking alternatives. For example, many exposures to magnetic fields could be reduced at little or no cost but are not considered seriously, owing to the uncertainty of risk and the concern to avoid false positives.

Even though precautionary approaches that focus on avoiding false negatives often do not lead to adverse economic consequences or irrational choices, such approaches usually are not taken. The value of autonomy and the proper role of governmental paternalism with respect to environmental policy need to be considered more carefully in environmental decision making.

Dale Jamieson, PhD, and Daniel Wartenberg, PhD

A clear distinction should be made between what is not found by science and what is found to be non-existent by science. What science finds to be non-existent, we must accept as non-existent; but what science merely does not find is a completely different matter. . . . It is quite clear that there are many, many mysterious things.

His Holiness the Dalai Lama¹

THE PRECAUTIONARY

principle came to prominence in Europe in the 1970s, and over the last 2 decades it has increasingly figured in international law and policy.² It is best thought of as a family of principles rather than a single principle. Some versions would appear to virtually banish technology (e.g., “where potential adverse effects are not fully understood, the activities should not proceed”³), while other versions border on the trivial (e.g., lack of “full scientific certainty shall not be used as a reason for postponing cost-effective measures”⁴). At its core, the precautionary principle is related to the familiar adages “An ounce of prevention is worth a pound of cure” and “It is better to be safe than sorry.”

The precautionary principle can be contrasted with the “polluter pays” principle. The “pol-

luter pays” principle, which is based on a long and respected tradition in Anglo-American jurisprudence, holds that those who cause harm to others through their polluting activities should pay for setting things right. For this principle to be applicable, (1) it must be possible to identify the polluter, (2) the effects of the pollution must be reversible, and (3) it must be politically and socially feasible to compel the polluter to reverse the effects of the pollution.

Clearly, in many cases of pollution, conditions 1 and 2 are, at best, difficult to satisfy. In many cases it is difficult to identify the polluter, or the sources of pollution are so widespread that it is difficult to identify particular agents as polluters. Also in many cases, such as those that cause death or the loss of irreplaceable ecologic goods, the effects of pollution are not reversible, at least on human timescales. Although some economists argue that the loss of any good can be compensated in monetary terms, this argument is not widely accepted in society.

Another alternative to the precautionary principle is a cost–benefit approach. However, in cases in which the precautionary principle comes into play, mar-

kets play only a small role and good cost–benefit information is not available (although people often will perform cost–benefit calculations anyway). Even when costs and benefits can be reliably computed, there may still be questions about the distributions of benefits and costs.

In any case, it is when conditions 1 and 2 are difficult to satisfy that discussion of the precautionary principle comes into play. For a wide range of cases, it seems reasonable to institute the precautionary principle. When it is difficult to identify specific causes and to link them conclusively to specific individual deleterious effects, it may be plausible to regulate substances that may have such effects even if the relationship has not been proven.

However, for the precautionary principle to be applicable, some link must be established between an exposure and some possible harm, although it is not easy to say what threshold of confidence should be required. Will a single complaint suffice, a single case, a single animal study, a single human study, some combination, or more? Should the regulatory cost, both in dollars and to society, be part of the decision-making process? In addition, if one chooses to go for-