EVALUATING HEALTH & ENVIRONMENTAL SCIENCE

| A Guide for Legislators |

Scientific evidence is the underpinning for policy decisions regarding health. This checklist offers guidance for legislators listening to and assessing scientific testimony and scientific arguments on these often difficult questions.

Maryland Environmental Health Network

1. How certain is "certain enough" to act?

Good science doesn't aim for proof, but instead looks for a preponderance of the evidence. While good scientists routinely disclose elements of uncertainty in their research, they confirm 'certainty' based on their understanding of a preponderance of evidence.

What you need to know: Is there a preponderance of evidence regarding possible harms that warrants taking action? Is there a preponderance of evidence of safety to justify inaction?

Example: Based on the preponderance of evidence of likely harm, we passed seat belt laws and prevented children from drinking alcohol.

Preponderance of Evidence or Weight of the Evidence:
This term refers to a judgment in the scientific community that most studies to date confirm a particular conclusion. Scientists are always open to new findings, so they may avoid using terms like "certainty", "100%" or "we are sure". But *Preponderance of Evidence* indicates strong consensus among scientists that a conclusion is correct.

2. Are the findings influenced by funding source, trade secrets, or suppression of data?

The design of a scientific study may be influenced by the source of its funding. This has been well documented by independent observers. It is therefore reasonable and prudent for legislators to ask all scientists and those who cite scientific research about their sources of funding.

What you need to know: What are the sources of funding for the work being cited? Were any data omitted due to trade secret protections or similar reasons? Sometimes: **1)** The source of funding for a study can influence important findings or cause contrary results to be omitted from the study's report. **2)** Important data that an industry provides to a federal agency before marketing will not be in the public domain and may not have been subjected to peer review.

3. What is the purpose, and what is the source of the research being presented?

Studies that a manufacturer must undertake to submit a chemical or drug for federal registration are not as thorough as studies performed by independent scientists who research impacts of chemicals on humans, animals, or the ecosystem. Also, manufacturers have no incentive to study beyond the limited government protocol needed to get a product registered.

What you need to know: Is the research being presented based on mandated government review of industry-provided research or is it the result of independent research?

4. Have the studies been peer-reviewed?

Independent scientific research is subject to review by a panel of "peers"; these are other scientists with no stake in the findings and no conflicts of interest. Peer review establishes the study as valid science and worthy of publication in

a scientific journal. This is a transparent process. It is notably more rigorous than non-peer-reviewed research that federal agencies receive from manufacturers.

What you need to know: Are the studies being cited peer reviewed? If not, consider the source. Blogs and newspapers are not peer-reviewed materials, but they may link back to a peer-reviewed source.

Peer Reviewed

A panel of independent experts in the same scientific field and who have no connection to the study and no conflicts of interest have reviewed it and judge it to be valid and worthy of publication.

5. Are the scientists being too cautious?

Scientists are conservative regarding "certainty." They use a "95% confidence test" in order to conclude that two observations that happen together are more than accidental and probably causal. Public and environmental health experts recommend action long before the 95% confidence test has been met.

Why Being 95% Confident May be Dangerous for Public Health:

Imagine deciding whether to send a child across a busy highway. Using the 95% confidence interval, if there is only a 94% chance that she will be hit, you will let her cross. This is because, using a 95% confidence test, you have not proved it is dangerous.

What you need to know: What risks might we run and who could be harmed if we wait for more research instead of acting with what we already know about the weight of the evidence?

Example: Laws limiting human exposure to DDT, lead, tobacco and alcohol were all passed long before a 95% confidence test was met. These laws were based on a *preponderance of evidence* rather than 95% certainty.

6. Has anyone addressed the economic harm associated with inaction?

Policy-makers must weigh not only the cost of taking action but also the cost of inaction. Science offers insight into the costs of inaction. For example, a 2015 peer reviewed study estimated the costs to the EU of human exposure to endocrine disruptors at $209 billion annually in medical care and lost productivity.

(Trasande et al J Clin Endocrinol Metab. 2015 Apr; 100(4): 1245–1255.)

What You Need to Know: What public and private costs may be incurred if we do not take action on this proposed policy?

Note: The fiscal note on a bill will not typically assess the costs of inaction. It addresses only the costs of adopting the policy, and usually only the costs to government.

7. Have long term effects been assessed?

Early life exposures can create high risks in later life. An example is the link between lead poisoning and long-term harms to children, or between tobacco and cancer. Over time, human exposures to multiple chemicals will have interactive effects that may be quite different from the effects of a single chemical.

What you need to know: Does the science presented also address the long-term effects of exposure? If not, is that because the research does not exist?

Note: Federal agency review does not establish absolute safety. The US EPA registers chemicals based on "reasonable certainty of no harm" and has yet to address the synergistic effects of chemicals in real life, such as interactions with other chemicals in the environment, medications, and illness.