How Much Are Human Lives and Health Worth?

By using new assumptions on the dollar value of a human life, among other things, John Graham hopes to determine which regulations deliver the biggest bang for the buck

The Bush Administration's Clear Skies plan for cutting the emission of air pollutants from power plants looks like a great deal for public health. Cleaning up the air will, by 2020, prevent some 12,000 premature deaths each year and thousands of cases of bronchitis. Economists at the Environmental Protection Agency (EPA) say the value of these and other health benefits totals $93 billion—14 times the $6.5 billion cost of reducing emissions. But the agency adds a caveat: An "alternative analysis" states that

Apples and apples? Recent OIRA calculations suggest that vehicle safety regulations save lives more cheaply than a smog (NO_x) rule and one protecting workers from methylene chloride.

the benefits add up to just $11 billion, for a much slimmer benefit-to-cost ratio of 2:1—barely worth the effort, some might say.

The lower figure comes compliments of White House budget officials, who urged EPA to plug different numbers into its formulas for calculating benefits—for example, by assuming that old people's lives are worth less than those of younger folks. It is part of a push from the Office of Information and Regulatory Affairs (OIRA) within the Office of Management and Budget (OMB) to get agencies across government to change the way they do cost-benefit analyses for major rules. The goal is both "quality" and uniformity: "OMB has a strong interest in cross-agency comparisons," says OIRA director John Graham, who says they can help "allocate scarce resources."

Activists and some government economists, however, assert that these techniques are an excuse for inaction, as the new analyses invariably eat away at the benefit side of the equation. Although the new math is too recent to have swayed a regulatory decision, Wesley Warren, a former OMB official now at the Natural Resources Defense Council (NRDC) in Washington, D.C., predicts it soon will: "Once [OIRA has] got the framework in place, they can consistently justify a weaker level of protection."

Although economists generally support the call for more rigorous cost-benefit analyses, some question whether OIRA's techniques are ready for prime time. Especially controversial is Graham's proposal that agencies incorporate into environmental regulations some measures used in health care. "People are both apprehensive and expectant about the effects" on regulation, says environmental economist Alan Krupnick of Resources for the Future (RFF), a think tank in Washington, D.C.

Graham came to Washington 2 years ago hoping to bring more rigor to the setting of regulatory priorities (*Science*, 14 December 2001, p. 2277). A former Harvard professor, Graham has long championed the idea that the billions of dollars spent on cutting environmental pollution might actually improve health more if they funded less costly health and safety interventions, such as preventing accidents. But the inconsistency in how various agencies add up costs and benefits posed

an obstacle. On 3 February, in draft guidelines updating OMB's guidance on risk analysis, Graham laid out new procedures that make it easier to compare alternatives.

Some of the specific approaches OIRA is encouraging can drastically lower economic benefits. A key variable in calculating benefits of health regulations is the dollar figure put on a human life. EPA's original Clear Skies analysis values a human life at $6 million, an average derived mostly from studies of wages for high-risk jobs and surveys asking people what they think a life is worth. OIRA considers the wage studies unreliable because they reflect the preferences of workers, not the general population. At the office's urging, EPA redid the analysis using a figure of $3.7 million per life, based on surveys alone. OIRA also asked EPA economists to assume that the lives of people over 70 are worth just 63% of this amount, based on a 20-year-old British survey that found that older people valued their lives less than younger people.

When EPA factored in these and other changes, the benefits from the Clear Skies initiative shrank by one-seventh. To Warren, this means that a tougher (and more expensive) proposal in Congress probably won't go anywhere.

Similarly, EPA originally calculated that

Cost per Life Saved for Selected Regulations

Regulation	Agency	Net costs per year[*]	Lives saved per year	Cost per life saved[*]
Head-impact protection	DOT	$390 M–$516 M	611–732	$665,000–$705,000
Child restraints	DOT	$54 M–$122 M	25–35	$1.5 M–$4.9 M
State NO_x rule	EPA	$1265 M[†]	152–342	$3.7 M–$8.3 M
Methylene chloride	OSHA	$112 M	8.8	$12.7 M
Enhanced surface water treatment	EPA	<$0–$95 M	14–64	<$0–$6.8 M

[*] Dollars in 2001 values. [†] In 2007.

a proposed rule cutting emissions from snowmobiles and other off-road vehicles would yield benefits by 2030 of $77 billion; when the agency redid the analysis using OIRA's instructions, the benefits shrank to $9 billion. Another controversial Graham recommendation—assigning less value to an avoided cancer death—will also likely push down the benefits for water and pesticide regulations, say activist groups.

Al McGartland, director of EPA's National Center for Environmental Economics, acknowledges that there are legitimate arguments about what specific numbers should be used. Krupnick and colleagues at RFF, for instance, take issue with the practice of valuing the lives of the elderly at 63% of those of the

Wielding the Data-Quality Cudgel

John Graham, the White House's enforcer of regulatory policy, has a new instrument that his predecessors didn't have—a so-called data-quality act that took effect last October. It allows anyone to challenge the accuracy of agency reports and rules in the name of improving government decisions.

Although its goals may be laudable, many scientists, legal experts, and environmentalists fear that this law could block agencies from using new, emerging science and bog down regulations. In a broad swipe at global warming research, for example, one business-oriented group last month asked the White House to withdraw the 2000 *National Assessment of Climate Change*, saying that the report by a federal advisory committee was based not on solid facts but on "meaningless" computer models. "I am completely freaked out about the data-quality act," says Wendy Wagner, an environmental law expert at the University of Texas, Austin. "The potential [for harm] is tremendous."

The law, slipped into a 2001 spending bill in response to lobbying by an industry group, says that government-issued information has to meet standards for "quality, objectivity, utility, and integrity." Studies used in "influential" documents have to meet a higher standard than publication in a peer-reviewed journal; agencies must provide enough details to "facilitate the reproducibility [of a study] ... by qualified third parties."

Ellen Paul of the Ornithological Council in Washington, D.C., worries that the law will trigger complaints that "will burden staff and discourage scientists from working for the government." And the law "will be exploited to slow regulations," asserts Virginia Sharpe of the Center for Science in the Public Interest in Washington, D.C. It could even "choke" discussion of preliminary findings, so that "none of us will really ever know what the agency has excluded," says Wagner.

Test case. Industry groups are using a new "data-quality" law to challenge the government's use of studies finding that the herbicide atrazine is harming frogs.

Of the handful of petitions filed so far, one criticizing the Environmental Protection Agency's (EPA's) review of the herbicide atrazine could be an important test case. The petition, filed by corn growers and others, concerns studies published last year suggesting that low levels of atrazine in the environment are deforming the reproductive organs of frogs (*Science*, 1 November 2002, p. 938).

The petitioners argue that the agency cannot use these studies to regulate until it has developed valid test methods for such hormonelike pollutants, or endocrine disrupters. Otherwise, the frog studies are "unreliable" and do not satisfy the data-quality act, the petition says. "We feel you cannot use EPA's weight-of-the-evidence test," which says that all relevant studies should be considered, says Jim Tozzi of the industry-supported Center for Regulatory Effectiveness in Washington, D.C., a co-petitioner.

EPA has sidestepped this argument for now in a January response to comments on its atrazine risk assessment. The agency noted that it was already planning to soon have a scientific advisory panel review the frog studies. Jon Devine of the Natural Resources Defense Council in Washington, D.C., is encouraged that EPA "didn't exclude data simply because there wasn't a protocol." And EPA risk assessment chief William Farland insists that the agency can use studies that don't follow standardized test methods. "Reproducible," he says, means that the methods have been explained and that "scientific principles were followed."

Industry groups say they're preparing more petitions and are ready to go to court against EPA with the right case. Legal opinion is mixed on whether courts will deem the data-quality act subject to judicial review, Wagner says. But if they do, "it could create an entire new avenue of challenging regulations."

–J.K.

With reporting by Erik Stokstad.

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young. In their recent surveys in Canada and the United States, they say, the elderly put nearly the same value on their lives. Others have disputed OIRA's push to use a higher "discount rate"—a technique to account for what money spent on regulations would earn if it were instead invested—of 7% rather than the 3% EPA normally uses. (OIRA's new draft concedes somewhat on this point.)

Also problematic, say a number of economists, is OIRA's proposed requirement that, in addition to calculating costs and benefits, environmental economists assess regulations based on health tradeoffs—an example of a process known as cost-effectiveness analysis. This approach doesn't put dollar figures on the benefits of different health outcomes; it converts them to health units, such as reduced illness or lives saved.

For example, health economists use surveys to rank outcomes on a 0 to 1 scale, with 1 being a year of perfect health and 0 death. They then multiply this value by the years of illness—so 4 years of avoided heart disease might be $0.6 \times 4 = 2.4$ years of health, known as Quality of Life Years (QALYs). If the same number of QALYs can be gained with, say, a $1000-per-year new heart drug as with a $10,000 surgery, then a doctor might recommend the cheaper drug.

Many economists agree that such health-outcome measures could be useful for comparing environmental alternatives—for example, reducing radon in water versus air. But Graham wants to use them to compare regulations across agencies to determine the "biggest bang for the buck." Harvard risk analyst James Hammitt cautions, however, that health-outcome measures, which place a premium on years of perfect health, are biased against the elderly and infirm. Critics say that means environmental regulations, which often protect the weakest, tend to look less effective compared to, say, use of child car seats.

The QALY approach for air pollution, EPA economist Bryan Hubbell has found, makes the value of saving elderly lives dwindle compared to that of avoiding bronchitis

cases in younger people. He concludes that QALYs "may not be appropriate" if the goal is the best outcome for the entire population. Nor does cost-effectiveness analysis take into account subjective factors such as people's greater fear of involuntary risks and nonhealth benefits. But OIRA's guidelines say that agencies can't use these nonquantifiable effects as "trump cards" to overturn the hard numbers.

Objections aside, Graham has asked agencies to supply raw data on cost effectiveness so OIRA can do its own comparisons of regulations across agencies (see table). Ultimately, he says, OMB will use these comparisons to help set agency budgets.

Graham acknowledges that the analyses he recommends have limitations and says OIRA will revise the draft guidance in response to comments. But critics doubt that tweaking the details will mean much to the public and policy-makers, who pay attention only to the final numbers. Says NRDC's Warren: "These numbers take on a hyperreality of their own."

–JOCELYN KAISER