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Introduction

Environmental controversies are full of numbers that often confuse the media and the public. Particularly in complex risk issues involving such concerns as Alar, dioxin, radioactive wastes or air or water pollution, conveying numbers to and interpreting numbers for the public is important so that people can better understand the controversy and how it affects them. Risk numbers and effective explanations of them help show the public how a controversy is shaped by science, economics and politics.

Unfortunately, the media do not play the environmental risk numbers game very well, partially because the issues and the numbers themselves are complex and hard to explain. Another reason is that media constraints such as short deadlines, limited amounts of space or airtime that can be devoted to issues, and editorial beliefs about what readers or viewers want to read or see limit information presented on numbers. A third reason is that many reporters do not have much science, mathematical or statistical training and are uncomfortable with numbers.

For this article's purpose, a number can be an actual number such as one in a million or four picocuries per liter, or it can be an implied number such as very high or negligible risk. Implied numbers are used much more frequently in the mass media than actual numbers because they seem simpler, but they can confuse readers and viewers too. For example, my review with Carole Gorney and Brenda Egolf of U.S.

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coverage of the Chernobyl accident found that the newspapers and television networks we studied made little use of actual numbers in providing radiation levels for readers and viewers. Instead, they relied on implied numbers such as "high" or "low," "safe" or "dangerous." But what "safe" actually meant was unclear, since these media outlets rarely explained what normal or background radiation levels were.

Even if actual or implied numbers are used by the media, they need to be accompanied by explanations and background information. Like scientific risk estimates themselves, they should not stand alone or they can mislead people. A fairly good example of providing both numbers and some explanation appeared in a 1992 medium-length article by an Associated Press reporter.[1] According to a study reported there, in New York state, 30 infants per 1,000 are born with birth defects, but if mothers lived within one mile of a chemical dump, 34 per 1,000 are born with birth defects. The rate was even higher — 49 per 1,000 — for mothers living near 90 high-risk sites.

Given the headline and figures at the beginning of the story, readers could interpret a close link between birth defects and toxic dumps. However, if readers stayed with the story, they found out that the study did not account for other factors possibly related to birth defects, including alcohol consumption and cigarette smoking. The article also included an outside expert who cautioned that neighbors of toxic waste sites are usually poor with bad diets, poor hygiene and the dirtiest jobs. Since any or all of these factors could have caused the defects, these explanations were necessary. The numbers alone would have misled readers. Unfortunately, this and other good reporting examples are far outweighed by the many articles that do not provide such explanations and background information.

In particular, when reporters venture into the murky and complex world of risk assessment and the scientific uncertainty that surrounds it, they face two primary problems. First, the risk assessment process itself is complicated and confusing, making it hard for reporters to

1 *Birth Defects, Toxic Dumps Tied,* The Morning Call (Allentown PA), July 28, 1992, at A5.

understand and even harder for them to explain, particularly since they must simplify this information for readers and viewers. Second, reporters often do not know about the subtleties involved in developing a risk assessment and therefore do not know the type of questions they need to ask to effectively relate risk issues to the public.

Reporters frequently do not reflect the uncertainty that haunts the assessment process. They do not tell the public that risk assessors must make assumptions and extrapolations, and that policy decisions affect whether a risk assessor uses an estimate that is conservative or moderate. They do not let readers or viewers know that risk estimates will vary depending on which computer model is used, and they rarely discuss the scientific disagreement over the threshold theory and whether it was or was not applied in a particular risk assessment.

As a result, they frequently report only a bare risk estimate without any of the caveats that need to be applied. By not reporting the uncertainties, assumptions, extrapolations and policy decisions, they make it difficult for the public to understand why experts reach different estimates about the same risk. Often, people complain about this lack of agreement and ask why scientists cannot come up with a definitive answer about levels of risk for a substance or pollutant. Technical experts view such a question as naive and irrational. Yet, if the media do not completely inform, how can the public know that there are no simple or definitive answers in risk assessment? Instead of painting a complete picture, reporters concentrate on the controversy caused by expert disagreement, telling too simple a tale about a particular risk.

The Case of Alar

Alar is an excellent example of an environmental controversy where the central arguments were over policy judgments as reflected in risk estimates and other numbers. In early 1989, the Natural Resources Defense Council (NRDC) mounted a major public relations campaign designed to force the hand of the Environmental Protection Agency (EPA) to speed up pesticide regulation. Using actress Meryl Streep and

others, the NRDC focused the public's attention on the dangers of pesticide residues on food, in particular, on the cancer risk to children of Alar, a growth-regulating chemical sprayed on apples. In this complicated and multifaceted issue, government agencies, the NRDC, and the apple industry all used different numbers to argue their cases, and the numbers the media reported influenced public response.

The media covered the controversy by throwing implied and a few actual numbers into stories with little explanation. For example, in the opening two minutes of CBS's "60 Minutes" story that kicked off the public controversy on February 26, 1989, actual or implied numbers were used twelve times. Ed Bradley of "60 Minutes" pointed out in his introduction: "The average preschooler drinks *eighteen times* more apple juice than his or her mother. If those apples were treated with daminozide, the cancer *risk is perilously high."* The NRDC's Janet Hathaway explained: "Just from these eight pesticides, the risk of developing cancer is *approximately 25 times what EPA says is an acceptable level* of cancer in our population." John Moore, EPA Acting Administrator, noted: "There is no question that if the risk is greater than *one in a million calculation,* it's a cause for concern to this agency" [my emphasis].

Was this "numbers overkill"? Some people think so; others do not because numbers were at the heart of the Alar controversy. In fact, four major points of disagreement between the NRDC and either the EPA or the apple industry involved numbers. First, they used different risk figures; second, they had different estimates of the cancer potential of Alar; third, there were different estimates of how many apples had been treated with Alar; and fourth, there were differences in opinion about how many apples children would need to eat to be in danger. These disagreements were mostly due to use of different data sets and various ways of interpreting them.

Because of these major differences, understanding the numbers was crucial in the Alar controversy. The public needed to know what these numbers meant, how they were derived and how sure scientists were about their validity, but "60 Minutes" did not provide this information.

Nor did other media outlets. My research with Kara Villamil, Robyn Suriano and Brenda Egolf on Alar coverage in thirteen major newspapers across the country found very few actual risk numbers and even fewer risk comparisons in the articles we reviewed. We did find limited use of implied numbers such as high risk or negligible risk, but such numbers are imprecise and one person's high risk can be another's low risk. We found even fewer explanations of how the risk estimates were derived and why they were different.

Because the implied or actual numbers were confusing, and the risks frequently were reported as high but not clearly described, people panicked. Schools in ten cities including New York, Atlanta, Chicago and Los Angeles banned apples and apple products in school lunches. The apple industry estimated that it lost more than $100 million in apple sales — some say closer to $250 million. And most importantly, Americans' faith in the safety of the nation's food supply was shaken.

This is just one example of how coverage of environmental risk numbers without providing explanation and context can have serious consequences. To make a rational decision about Alar, the public needed to know just how risky it was for children compared to other risks; why the risk estimates differed; and how good the science was that provided the risk numbers — what was known, what data were missing, what the scientific consensus was. They did not get this information from most of the mass media.

The Dioxin Controversy

The dioxin controversy is another case of public confusion over risk estimates, but it differs from the Alar case in that it is not just a tale of dueling risk estimates. It is a case of differing policy views, brought about by changes in the nature of the science of dioxin. This controversy not only involves scientists who disagree, but also journalists who have been arguing with each other about which policy, which approach, and which set of numbers should be used by the federal government and reported by the media to the American public.

Due to the media's handling of the dioxin reassessment controversy — in particular, many reporters' scanty treatment of various risk estimates and related scientific uncertainties — the public is not sure what to believe about how harmful this chemical is. Before the current controversy developed, the media, quoting experts, had told the public that dioxin was one of the most deadly man-made chemicals ever known. But, in 1991, Vernon Houk of the Centers for Disease Control and others, including representatives from the paper and pulp industry, questioned whether dioxin was really as harmful as experts had thought. For several years now, the EPA's reassessment and conflicting scientific opinion have caused serious, in-depth and extended debate in the scientific community about dioxin's role as a carcinogen and its effect on the immune and reproductive systems. However, the coverage of this debate by the mass media has been superficial, pitting expert against expert and providing, with several notable exceptions, little background about the risk assessment and scientific and political problems involved in re-evaluating the harmful effects of dioxin.

Had reporters dug more deeply, they would have found a significant disagreement among experts about dioxin safety levels even earlier in its history. Dorothy Patton, executive director of EPA's Risk Assessment Forum, pointed out that this disagreement was exemplified in a 1988 EPA draft report, which showed a wide range of assessments of the dose of dioxin expected to cause the risk of one additional cancer in one million people. These assessments were all based on essentially the same study. Made by various U.S. and foreign regulatory agencies during the 1980's, they ranged from .006 pg/kg/day to more than 10 pg/kg/day, a span of almost five orders of magnitude![2]

Most reporters trying to pick their way through the dioxin controversy have not explained why there was such scientific disagreement and uncertainty in the 1980's or even now. Nor have they detailed the background behind the old or new dioxin risk assessments and risk numbers. Recently, several journalists for major newspapers

2 U.S. Environmental Protection Agency, A Cancer Risk-Specific Dose Estimate for 2,3,7,8 TCDD, 4 (Draft June 1988).

have instead used the dioxin reassessment to question federal environmental policies on toxic chemicals. This questioning has led to a major debate among reporters about the quality of environmental media coverage, with much of the argument centered about which scientific sources and views of risk should be presented to the public.

The catalyst for the debate was a series of 1993 articles in The New York Times that questioned many standards used by EPA for regulating toxic chemicals by, in part, highlighting the dioxin controversy. One of the authors, Keith Schneider, the environmental reporter for the Times, wrote that "new research indicates that dioxin may not be so dangerous after all." He noted that many scientists and public health specialists say "billions of dollars are wasted each year in battling problems that are no longer considered especially dangerous, leaving little money for others that cause far more harm."[3]

This reflected a theme Schneider had developed in stories in both 1991 and 1992 — that of a less-hazardous view of dioxin. In a 1991 article, he wrote that "several top Federal health authorities are backing away from the position that the chemical compound dioxin is toxic enemy No. 1." He noted that: "Exposure to the chemical, once thought to be much more hazardous than chain smoking, is now considered by some experts to be no more risky than spending a week sunbathing."[4]

This analogy or risk comparison credited to "some experts" and reprinted by a number of other newspapers, was actually Schneider's invention, according to journalist Vicki Monks, who wrote in a highly critical article that Schneider "acknowledges that no scientist had made the comparison between dioxin and sunbathing. He says he and his editors came up with the analogy by reviewing charts of risk factors for other hazards." Monks said that Schneider explained he had checked the comparison with Houk and two other epidemiologists.[5]

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3 Keith Schneider, *New View Calls Environmental Policy Misguided,* The New York Times, Mar. 21, 1993, at A1.

4 Keith Schneider, *U.S. Backing Away from Saying Dioxin is a Deadly Peril,* The New York Times, Aug. 15, 1991, at A1.

5 Vicki Monks, *See No Evil,* American Journalism Review, June 1993, at 22.

The analogy was not the only concern Monks had about Schneider's dioxin articles. She criticized his evaluation of the science used to assess dioxin, charging that many of his conclusions about the chemical's risks were wrong. "Many experts in and outside of the federal government say there is no scientific basis for suggesting that dioxin is less dangerous than previously thought," she explained. Monks quoted Dr. William Farland, the EPA official in charge of the agency's dioxin reassessment, as saying that "the latest research has raised concerns that dioxin may cause immune and reproductive system problems even at the minute levels in the general population."[6]

Articles in several other publications also questioned Schneider's choice of data and scientific sources in his dioxin articles. They pointed out that skeptics about dioxin's potency for harm are in the minority, not scientific majority as Schneider seemed to imply. Rae Tyson, environmental reporter for USA Today, said that "Schneider and others have failed to explain the origins of the current dioxin reassessment rage: the pulp and paper industry." Tyson noted that Schneider had relied on "questionable science to prove his point."[7]

Schneider, in defending his work, called Monks' article a "vicious, one-sided, scientifically dishonest, inaccurate, poorly reported piece." He charged that she had missed "the richness in the dioxin debate" and ignored "the fact that the World Health Organization in 1991 officially increased the amount of dioxin it considered safe for people to ingest daily to a level that is 1,600 times higher than the one set by the EPA."[8]

While the debate about dioxin and environmental reporting will probably rage for some time, it is important to note that, even in criticizing one another, these journalists repeated what they usually do in media articles. They resorted to arguments that presented numbers and views about levels of risk out of context instead of discussing a range of estimates, with background and caveats about the various

6 *Id.*, at 19.

7 Rae Tyson, *Controversy Has Up and Down Sides,* SEJournal, Fall 1993, at 8.

8 *Keith Schneider of The New York Times... as seen by Keith Schneider,* Environment Writer, Sept. 1993, at 9.

estimates, the differing views of risk and the changing science of dioxin. Unfortunately, the richness of the dioxin debate that Schneider referred to did not find its way into this journalistic debate. More importantly, it also is missing from most mass media coverage of the dioxin reassessment, even in one of the nation's most prestigious newspapers from which smaller news organizations often reprint articles. As a result, the public is unaware of many of the important factors involved in the dioxin controversy.

Public Perceptions and Risk Coverage

Inadequate or misleading media coverage can contribute to people's fear of environmental risks such as Alar and dioxin. Many technical experts believe that the public has exaggerated environmental fears and that these fears — instead of scientific expertise — are setting priorities for regulations and research. The experts argue that media attention and public pressure on legislators and government agencies skew environmental decision making. Even the courts can be affected. In 1993, the New York Court of Appeals ruled that electric utilities in the state must reimburse property owners whose property value has dropped as a result of public fear of electromagnetic fields. The court noted that while property owners must prove an actual drop in value, they need not prove that the public's fears are scientifically justifiable.[9]

While the media play an important role in influencing policy decisions and regulations, they are not alone in affecting people's responses to risk situations. Other factors also come into play, as identified by social scientists. Still, the media's role is important enough that they have a responsibility to try to improve risk coverage, particularly related to risk assessment and numbers. Reporters must realize that even if they cannot place important risk assessment information into stories because of space or time limitations, they must understand this information to ask the right questions of sources and be sure they cover all of the important points.

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9 *"Cancerphobia" Upheld in Court,* Occupational Hazards, Dec. 1993, at 21.

Journalism educators also must become involved, particularly in helping students become more comfortable with science, numbers and statistics. They should no longer accept the situation that one journalism professor described where students cannot do even simple percentages, let alone handle spreadsheets or understand statistical inferences.

People have a right to know the degree of environmental risk facing them, accompanied by the details of that risk — numbers, explanations, caveats and background information. Although journalistic constraints will make this difficult, reporters must strive to tell the public the nuances behind the numbers. For the media to provide less, shortchanges everyone.