

Environmental Assessment and Risk Analysis Element



Research Project Summary

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Public Reactions to Risk Comparisons

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Abstract

"Risk comparisons"—comparison of specific risk values (e.g., of ambient air or soil pollution) to standards or to risk levels from other activities or at other locations—have been urged to help the public "put risks in context." However, little research has been conducted on actual public reactions to risk comparisons. Focus groups and a series of survey experiments with New Jersey residents explored those reactions. People rated risk comparisons as informative, wanted similar risk comparison information from government agencies or companies, and (usually) felt the information in the comparisons was understandable. However, risk comparisons had modest to weak impacts on people's risk views. For example, people's reactions to various hazards seemed driven more by their beliefs about risks in general or by who they were (e.g., women were more concerned) than by the format or content of comparisons about the hazards' risks. When a risk comparison did seem to have an effect, such as reducing judgments of risk magnitude, criticism of the comparison could undermine its effects; however, mentioning potential criticisms when the comparison was first presented offset the effect of the criticism. Adding an explicit claim about risk acceptability—"So our factory's risks should be acceptable to you"—did not appreciably affect reactions to the comparisons, despite speculation that such claims would alienate audiences. Overall, the results suggest that risk comparisons can be appreciated by public audiences, but they require careful design and pre-testing before use, and their effects can be qualitatively or quantitatively different from what the advocates of such comparisons expect.

Introduction

One proposed way to improve communications between environmental agencies and their constituencies involves risk comparisons. "Risk comparisons" involve a contrast between a risky activity or item of interest, and some other risk, so as to "put into context" the target risk. Often the goal of this comparison is to persuade the audience to "accept" the target risk (e.g., an industrial facility's emissions are considered "safe"); sometimes it is to show that the risk (e.g., radon) is serious enough to deserve action. Some types (e.g., comparisons to the relevant public health or emissions standard, or to past levels of the risk) are used often by NJDEP; others (e.g., risk-benefit comparisons) are less common. Often fierce debates over which approaches might be more effective, if indeed any risk comparisons can be used successfully or ethically, have proceeded with almost no empirical evidence. This project aimed to gather empirical data to help NJDEP determine whether and how to use risk comparisons to inform its many publics.

Methods

The following studies (references to full reports in parentheses) are summarized here:

- Two focus groups on lay attitudes toward risk comparisons in general (Johnson, 1999).
- A survey experiment to test predictions about kinds of risk comparisons (such as to a standard versus to unrelated risks) preferred by citizens (Johnson, 2003a).
- A survey experiment to test the effect of a risk comparison when its validity is criticized by its user's opponents (Johnson, 2002b).
- A survey experiment on different comparison formats (for example, one versus many ways to report mortality) hypothesized to differ in value for informing public audiences (Johnson, 2003c).
- Two survey experiments to test citizens' claims that they would welcome comparisons of tap water quality with bottled water quality (Johnson, 2002a).
- An experiment to test whether an explicit claim that the comparison showed the risk is "acceptable" would evoke outrage (2003b).
- A survey and experiment to test whether people were reassured if pollution levels were below emissions limits and health standards (Johnson and Chess, 2003).

Survey experiments involve questionnaires in which the format or content of information provided (in this case, risk comparisons) are systematically varied. Each person reads and reacts to only one version. The water quality experiments involved random samples of customers of two water utilities; the other experiments largely or wholly opportunity samples (e.g., volunteers from parent-teacher organizations or Scout groups). The focus groups involved 22 people; each experiment involved hundreds of respondents. Details of methods are discussed in the project's Final Report, or in the published articles from this research cited in References.

Results

General Reactions. The focus groups volunteered that comparisons of "dissimilar" items (e.g., of industrial risks to tobacco smoking or car driving) were unwelcome. They wanted "apple-to-apple" comparisons, such as tap water to bottled water, or of different options for energy generation. They were uneasy to hostile about risk comparisons regarding activities of businesses and governments (e.g., about an operating or proposed facility), because they did not feel that they controlled such decisions. But they wanted comparisons that would inform their own decisions, about drinking water, recycling, radon or other household-level decisions. This is an area as yet largely ignored by government, a gap these citizens wanted government to fill.

Different "Reference" Risks. Scholars proposed that the public would vary in acceptance of 14 risk comparison types, with the best involving the same risk at two different times, comparisons with a standard, and different estimates of the same risk, and the worst involving comparisons of unrelated risks (e.g., of industry emissions to lightning). A subsequent test of this hypothesis used a scenario in which the manager of a hypothetical ethylene-oxide factory wished to explain its risks to local residents. He asked his "friend" living elsewhere (the study participant) to rate each comparison on clarity, information need, trust-building, reassurance, and need to include it in the talk. The resulting rankings, based on mean scores of each scale, had no correlation with predictions. Critics suggested that a "more realistic" scenario—conflict over the safety of the factory in the respondent's own town, and the plant manager unknown to the rater—would generate risk comparison rankings closer to predictions.

This study tested both the original and a "conflict" scenario; neither scenario produced respondent rankings similar to the rankings of the 14 risk comparison types predicted by scholars. Predictions also did not correlate with rankings by people who either did or did not report anger when reading the scenario, concern about local industrial pollution, living in a town with residents angry about industrial pollution, frequent worry about long-term effects of pollution, or living near industry.

Despite valid criticisms of these comparisons by study participants, on average all comparisons got positive ratings.

The Effect of Criticisms. Criticism of agency communications (e.g., through the mass media, at public hearings, or in lawsuits) can undermine their impact; could this happen with risk comparisons? A previous study used a scenario about a lawsuit over "unreasonable risk" from asbestos properly installed in a school; participants had the role of jurors. People reading a comparison of the asbestos risks to unrelated risk sources (e.g., eating peanut butter; radiation from a brick building; etc.) judged risk and the installer's guilt to be lower than if they read only background information (e.g., explaining what asbestos is). Risk and guilt judgments rebounded to background-only levels when an expert witness criticized the comparison. Thus, opponents' criticism might nullify any positive effects of risk comparisons (e.g., lowering or raising perceived risk) in a conflict.

This research found similar, but smaller, shifts due to the comparison and criticism, with initial risk and guilt judgments lower among this adult (mean age=52) sample than in the earlier college-town sample. Criticism's rebound effect weakened or vanished when the defendant's expert added an "inoculation" in which he anticipated criticisms and argued that they were wrong or irrelevant or inevitable. But the effects of comparison and criticism on judgments of risk and guilt were small relative to effects of beliefs about risk (e.g., exposure to a carcinogen means eventual cancer) and risk management (e.g., it is acceptable to impose small risks on people), and to effects of social location (e.g., sex, age, ethnicity, education, income).

Alternative Formats. People received comparisons varying on dimensions compared (e.g., annual deaths only, versus deaths plus annual injuries/illnesses, etc.); units of comparison (e.g., annual deaths versus chance of death per million per year); effect of a narrative to explain and justify the risk comparison; and hypothetical role of the participant (juror versus parent). Multi-dimensional comparisons evoked concern more than did one-dimensional comparisons; different ways of presenting mortality data had no effect; people found less risk or guilt in the presence of the justifying narrative; a parental decision frame did not evoke higher concern than a juror one. Concern about personal health risks from asbestos and prior risk beliefs (e.g., on effects of exposure to a carcinogen) seemed to dominate risk and guilt judgments, with format variations in risk comparisons of little consequence.

Bottled versus Tap Water. Earlier research found interest in comparisons of tap water quality with bottled water quality, or with water from other utilities. Customers of two utilities saw a mock water quality report (using real data) that included a short or long bottled water comparison, a comparison to other utilities' water quality, or no comparison. People wanted these comparisons from their own utilities, particularly if it was personally important for them to know about their water quality. People thought better of the quality of their own water after seeing the other utility comparison, but not after the bottled water comparison. Neither comparison reduced reported concern about safety of their own

tap water, or changed intentions on bottled water use or home treatment of water. Attitudes toward tap water quality and the utility drove people's concerns, not risk demographics, or exposure to comparisons.

Acceptability Claims. Another experiment tested two hypotheses. The first hypothesis was that public rankings would match scholar-predicted rankings of the 14 risk comparison types if their texts (see "Different 'Reference Risks,' above) omitted information that did not actually compare risks (such as promises of risk reduction efforts). The second hypothesis tested was that the presence of an explicit acceptability claim ("So our factory's risks should be acceptable to you") attached to these comparisons would make them unacceptable.

Once again, the predictions of public preferences among comparisons were not supported, either for the entire sample or for the majority of individual rankings of risk comparisons. People varied widely in their rankings, but on average all comparisons received positive ratings on all measures and in all conditions. The acceptability claim did not worsen ratings relative to the conditions lacking this claim, and readers who did not see such claims were equally likely to infer an attempt to persuade them to accept the risk from the comparison. Exposure to risk comparisons in this form is often assumed to reduce judged risk magnitudes; in this case, judged benefits of the factory increased significantly but judged risks did not shift significantly.

Comparison to Emissions Limits and Standards. People living near factories were asked about government limits on emissions and on public health standards. About half of them were dubious that government would set these properly, and thought that economics were considered as well as health in deciding on such pollution benchmarks. Scenarios were created varying the amount of an industrial chemical found in a drinking water source (either just above or just below the standard); the scenarios also varied the amount found after treatment of the water (either just below or at a concentration that was half of the standard). People did not vary in their responses to these different scenarios; all elicited high concern about their drinking water.

Conclusion and Recommendations

Overall, people tend to have positive attitudes toward risk comparisons, and this positive tendency is little affected by the type of comparison used or whether a sense of conflict and controversy was aroused by the experiments. Only in the explicit discussions of focus groups did people decry certain comparisons (e.g., unrelated risks) as hypothesized by earlier researchers. There is scanty and only anecdotal evidence that people may have more positive reactions to such risk comparisons when written than when comparisons are conveyed personally (e.g., in focus groups or large public meetings). This possibility is worth further study, since it would affect whether research results can be extrapolated to how agencies communicate comparisons.

On the other hand, risk comparisons had far less effect than presumed by their advocates. In several of these experiments prior beliefs about risk or demographic contexts seemed to be far more important to people's reactions to the hazard than were comparisons. The modest effects of comparisons that did occur were mixed and unpredictable: e.g., the explicit addition of a risk-acceptability claim did not affect reactions to comparisons; risk comparisons affected benefit judgments but not risk judgments; criticism of a comparison reduced its risk-lowering impact but could be offset by prior mention and dismissal of potential criticisms. The high variability in responses and rankings implies that no single risk-comparison approach will work (or have the same effects) on all members of public audiences.

These results suggest that research would be useful in evaluating whether the kinds of comparisons used by NJDEP staff—particularly comparisons to regulatory benchmarks, such as a public health standard or emissions/discharge limit—have their intended effects. Despite the problems noted above, these comparisons are common enough and legitimate to enough citizens that finding ways to make them more informative and appropriate could benefit both the agency and its audiences.

Given the wide variability in public reactions to various kinds of risk comparisons, and the fact that this research used texts not necessarily applicable to NJDEP programs, its findings cannot be translated into detailed guidance for specific programs. However, some preliminary suggestions seem plausible:

- 1) Although risk comparisons can be a useful part of any risk communication, agency staff should not treat them as a panacea or as the central element of their communications. These studies confirmed a long-standing finding that citizens are far more interested in what is being done to reduce the risks or protect people from exposure to them than they are in the size of the risk. Furthermore, a single brief reading or hearing of a risk comparison may not change strongly-held ideas about risk and risk management. It is likely that risk comparisons will have their most substantial impact if—once they are demonstrated to have the desired effect—they are communicated often and by multiple (trusted) sources, not just by the NJDEP.
- 2) Ingrained beliefs and habits do not change as a function of exposure to a single brief message, as demonstrated in this research. For the same reason, any intended effects of risk comparisons could be vulnerable to criticism. Noting potential criticisms—and refuting them, where appropriate and accurate—when the comparison is used may reduce the impact of subsequent criticism.

- 3) An explicit claim that the comparison showed that the risk is “acceptable” did not change people’s ranking of the different comparisons and increased trust in the communicator. This suggests that making such a claim is not inherently “toxic” to communications. However, anecdotes that suggest otherwise have tended to come from use of comparisons to unrelated risks in large public meetings (e.g., “driving to this meeting was riskier for you than the emissions from this factory”). Prudence suggests that, if NJDEP staff wish to use a claim that a risk is “acceptable” (or “unacceptable,” as for radon) in the context of a risk comparison, they emphasize that acceptability is judged by the agency and that individuals may draw different conclusions.
- 4) The strong positive response by the public to comparisons that would inform their own household-level decisions—e.g., on radon or drinking water—and the increasing need to encourage voluntary environmentally-protective behavior for success in environmental management suggests that development, testing and use of risk comparisons as part of this encouragement would be particularly valuable.
- 5) Language that promised a continuing search for ways to further reduce risk got particularly positive responses. This positive kind of risk-acceptability claim is not itself a risk comparison, implying that even if people welcome the risk information in comparisons it might not be the most reassuring information that institutions could provide. Making a sincere and redeemable promise about continuing risk reduction, regardless of whether risk levels are below a pertinent benchmark, might better help government and industry efforts to build trust with the public than would risk comparisons alone.
- Democratic Society: What People Say They Do and Do Not Want,” Risk: Health, Safety & Environment, Summer, 10, 221-230.
- Johnson, Branden B. (2002b) “Stability and Inoculation of Risk Comparisons’ Effects Under Conflict: Replicating and Extending the ‘Asbestos Jury’ Study by Slovic et al.,” Risk Analysis, 22, 789-800.
- Johnson, Branden B. (2003c) “Varying Risk Comparison Elements: Effects on Public Reactions,” Risk Analysis, forthcoming.
- Johnson, Branden B. and Caron Chess. (2003) “How Reassuring Are Risk Comparisons to Pollution Standards and Emission Limits?,” Risk Analysis, 23,999-1007.

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References

- Johnson, Branden B. (2003a) “Are Some Risk Comparisons More Effective under Conflict?: A Replication and Extension of Roth et al.,” Risk Analysis, 23, 767-780.
- Johnson, Branden B. (2002a) “Comparing Bottled Water and Tap Water: Experiments in Risk Communication,” Risk: Health, Safety & Environment, Spring, 13, 69-94.
- Johnson, Branden B. (2003b) “Risk Comparisons, Conflict, and Risk Acceptability Claims,” Risk Analysis, forthcoming.
- Johnson, Branden B. (1999) “Risk Comparisons in a

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