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Research Project Summary

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Public Reactions to Annual Reports on Drinking Water Quality

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Abstract

Several survey experiments in New Jersey explored customer reactions to Consumer Confidence Reports (CCRs) on drinking water quality that utilities are required to make available to their customers each year. CCRs received from utilities are quickly forgotten; on average, reactions are positive, but evaluations of water quality change little. Qualitative reports (i.e., without the required water quality tables) were rated lower than quantitative CCRs. Adding information about protection of water source quality was welcomed. People reacted no differently to hypothetical CCRs with and without Maximum Contaminant Level (MCL) violations. Customers wanted all required CCR information and more. Reactions to required CCR formats and texts, and plausible alternatives, differed hardly at all. Many people could not identify hypothetical MCL violations in CCRs, and ranges of detected contaminant levels required in CCR tables were particularly hard to interpret in comparisons to MCLs. Attitudes to water quality seem shaped more by personal experience of tap water quality and of the utility than by CCR content. Improving tap water aesthetics, even beyond compliance with secondary standards, might most improve customers' views of its safety.

Introduction

The aim of annual reports of drinking water quality from utilities, required by the Safe Drinking Water Act Amendments of 1996, is to reassure customers if water quality is good and prompt improvements if not. However, neither the U.S. Environmental Protection Agency (EPA) nor the American Water Works Association did detailed study of the effects of proposed language and formats. A panel of risk communication experts was unable to answer EPA's detailed questions about how customers might respond to CCRs and their content on the basis of existing scientific literature. This paper summarizes the results of a series of studies in New Jersey intended to fill that gap.

Methods

Methods of the studies are summarized here; further details can be found in the individual reports referenced (Johnson, 2000; 2001; 2003a; 2003b; Johnson and Chess, 2003—see table for details, including dates, response rates and topics).

Most data were collected through seven mailed surveys; four surveys were mailed by the collaborating utility, the others by the researcher. Response rates were 50% to 62% for utility customers; 46% for a survey of people living within a mile of a factory; and 28% for a utility that chose to send only two (instead of the recommended three) mailings. Data were collected between the fall of 1998 (i.e., before the first CCR was required to be sent to customers) and early 2001. Different versions of experimental texts were randomly assigned to sample members; no experiment had significant demographic differences across sub-samples within a particular survey. Survey respondents were asked to react to (1) actual CCRs, (2) hypothetical CCRs that tested the effect of Maximum Contaminant Level (MCL) violations and changes in report content and format, and (3) specific texts and formats required by EPA in CCRs.

Consumer Confidence Reports

Actual CCRs. Only 26-30% of those receiving a survey three or four months after the utility mailed a CCR said they had received a water quality report from their utility in the last 12 months. For those who said they had received a CCR, about half rated the reports "excellent" or "good" for informing them about water quality (Study B-2).

Using a different question, 63-75% (A-2,D) said they felt informed by the CCR. From half to three-quarters of customers felt their CCR was "very" or "somewhat easy to understand." Half to three-quarters had shared the CCR with family members, and 66%-75% said they would read the next one carefully. However, 55%-61% in the three surveys examining response to actual CCRs reported the CCR did not change their opinions of the water's quality; 10%-38% said their opinion had improved; and 2%-5% said it had worsened.

Identifying MCL Violations. Three surveys asked respondents to identify whether the hypothetical CCRs or water quality tables they read indicated a violation of the

Study	Date	Response Rate	Topic	Publication
A-1	Fall 1998	28% (269/975)	Desired water quality information; response to alternative formats	Johnson, 2000
A-2	Fall 2000	50% (191/382)	Response to actual CCR	Johnson, 2003b
B-1	Spring 1999	62% (277/450)	Response to alternative formats of full hypothetical CCRs	Johnson, 2003a
B-2	Winter 2000	60% (158/263)	Response to actual CCR	Johnson, 2003b
C	Spring 1999	61% (215/349)	Response to USEPA-required texts and alternative texts	Johnson, 2001
D	Fall 2001	39% (288/741)	Response to actual CCR	Johnson, 2003b

Study letter refers to utility, number to multiple surveys with that utility. First number in Response Rate parentheses is completed responses, second is total deliverable addresses. 40% is minimally acceptable response rate (see text). Publication gives details of method, respondents and results, unless specified otherwise.

"standard" (i.e., the MCL). The first two surveys mentioned next included at least one experimental condition with a violation; no violations were reported in the third experiment.

The first survey (A-1) found that a violation narrative (required by EPA, to describe the violation's time, cause and solution), compared to a violation indicated only by numbers in the water quality table, was more likely to prompt agreement that a violation had occurred. However, agreement that a violation had happened was only 63% for the narrative and 32% for numbers only. These mock tables contained only two contaminants, so it should have been easier for people to decide whether a violation had occurred than with real CCRs.

The second survey (B-1) found that people in MCL-violation conditions were more likely to agree that the standard had been exceeded than people in no-violation conditions, but their proportion of correct answers was not significantly different. People in the violation condition also were more likely to perceive a serious health risk from the water. Among those who correctly answered the violation question, violation-readers had more concern, judged risk and intention to get the water cleaned up than no-violation-readers, but did not differ significantly on several other measures of judged water quality and utility performance.

EPA required in the final CCR regulations that utilities report ranges of detected contaminant levels, but the agency did not test whether this rule might confuse people about the safety or legality of the reported levels. The third MCL-violation survey (Study C) tested this effect by randomly assigning respondents to *see* one of three versions of a hypothetical single row from a water quality table: (a) a range falling entirely below the MCL; (b) a range with an upper bound above the MCL; and (c) a range identical to the second, plus an explanation of why the high end of the range was neither a MCL violation nor a likely health threat.

Most respondents rated this information as understandable, helpful and desirable as part of a water quality report, with no differences across the three groups. People who agreed, incorrectly, that a MCL violation had occurred comprised 36%, 40% and 24% of those reading the three versions, respectively (16%-24% could not decide). The explanation did lower the proportion of those who were incorrect about the MCL violation, but there was no statistically significant difference among the three versions.

In short, many in these utility audiences were unable to correctly identify that a MCL violation had occurred. This problem occurred whether the hypothetical report explicitly said that a violation had happened, showed a table contrasting a MCL with the detected level of contaminant, or explicitly said that no violation had occurred.

Required Formats and Texts. One experiment (Study A-1) examined several formatting issues raised by EPA discussions about the water quality information table before the final CCR rule. Expressed understanding or concern did not differ for reporting of contaminants by whole numbers versus decimals (e.g., 70 ppb vs. 0.07 ppm). Comparison of three-digit and one-digit MCLs found no significant difference in concern, judged risk, or claims of switching to bottled water if this report referred to one's own tap water. The federal goverment sets Maximum Contaminant Level Goals (MCLGs) at zero for carcinogens, and equal to the MCL for most other substances. Experimental tables with zero MCLGs were less likely than those with positive MCLs to evoke reported intention "...to get my water supply cleaned up"—and also less likely to be associated with inaccurate views on whether a MCL had been violated—but had no other effect.

Another experiment (Study C) examined response to several different EPA-required texts. These texts variously covered the topics of defining MCLs and MCLGs; explaining vulnerabilities to Cryptosporidium and Giardia; stating that contaminants do not necessarily represent a health risk; describing contaminants found in drinking water, whether tap or bottled water; and health effects language. Alternative texts (proposed, variously, by utilities, environmentalists, or the author) also were tested. Utility customers (80% or more) found all texts to be understandable, helpful, and desired in a water quality report. Most versions elicited strong reactions of concern; the proportion of people willing to claim that they would switch to bottled water entirely if this language appeared in their own utility's water quality report was much lower, but still substantial.

The proportion of significat differences between responses to EPA and alternative texts was about equal to what might be expected by chance. Health effects tests were concerned not with alternative language, but with variations in how EPA described the nature of such effects for different contaminants.

For example, it described contaminant levels potentially producing effects as "in excess of the MCL" and "well in excess"; EPA's definition of the latter was a level 1000 times the MCL. Only 7% reading that phrase thought it

meant more than one hundred times the MCL (the highest choice offered in the survey).

Comparison of contaminant levels to standards (i.e., MCLs) is required by EPA rules. The comparison implies that detected levels below the standard are acceptable to both regulators and the intended customer audiences. One experiment (A-1), however, found only half thought consumers of below-standard levels were "unlikely to suffer harm" (31% said they did not know). The fact that two-thirds thought above-standard levels would "definitely have health effects" suggests that the standard is more credible as a signal of potential harm than of safety. In another survey (Johnson and Chess, 2003), 57% agreed that "the state government" strictly regulates chemical amounts in drinking water (31% disagreed), but the same proportion distrusted the state to set "proper" limits. People who trusted the state tended to agree (69%) that it only considered public health in setting the standards; only 38% agreed among those who distrusted the state. An experiment within that survey presented a hypothetical scenario of chemical contamination of a surface water supply, at levels either just above or just below the standard. Post-treatment levels of the chemical were either just below the standard or considerably below it. Regardless of these pre- or post-treatment levels, three-quarters or more of respondents expressed concern, saw a serious health risk, and claimed they would switch to bottled water if this situation occurred for their own drinking water. This reaction, with no statistically significant differences across the three scenarios, suggests many consumers do not view MCLs as reliably protective of public health (Johnson and Chess, 2003).

Demand for Information. Surveys on actual or mock CCRs, or hypothetical water quality tables, asked respondents what other information they would like to have in these reports or tables. Most responses covered information already required in CCRs, including those that some customers received a few months before or with the survey. This implies that readers did not recognize or recall desired information in the report. CCR design, highlighting report content (e.g., with topic headings), and location of specific topics (e.g., with a table of contents) might reduce this problem.

Kinds of new information requested are given below, in no particular order. In most cases, these types were volunteered; in one survey (A-1) a list of information types was given, to which everyone responded (parentheses give the percentages who wanted that type of information):

- quality (e.g., why odor, taste, or color problems were occurring, what was being done to prevent them, whether they indicated health threats)
- health effects or outcomes
- "how much lower than the standards are levels of substances ... in the water" (71%)
- non-detected substances (89%; EPA rules only require detections be reported)
- testing frequency, location, or validity
- specific (versus EPA-required generic) contaminant sources (80%) and uses
- dynamics of contaminant levels (variations over time and space more detailed than the ranges of detected levels now required)
- how to protect oneself
- comparison of their own utility's tapwater quality to the quality of bottled water, or to that of other utilities in the state (63%) or nation

Judged Tapwater Quality and Drinking Water Management

In addition to examining reactions to CCRs, these studies also explored citizen views on tapwater quality. For example, all utility surveys asked people to rate the quality of their tapwater, overall, for "safety," and for "taste, odor, clarity or color." Although these ratings varied across utilities, in general about one-third of customers said they did not know how to rate the safety of their water, whether the question was asked before or after receiving a CCR. Analysis revealed a strong relationship between overall and aesthetic ratings of water quality. The implication is that aesthetic qualities are critical to customer evaluations of their water, including its safety; improving such qualities might help reassure customers about its overall quality. Half to three-quarters of survey respondents used some kind of home filtration or treatment, or used bottled water for at least half of their drinking water. Exclusive use of tap water was far less (26%-38%). A random survey of New Jersey found similar behavior: 60% of respondents used bottled water or home filtration/treatment, and 14% used use tap water exclusively (Star-Ledger/Eagleton-Rutgers Poll, 2000). While two-thirds (63%) in one survey agreed, correctly, that tap water and bottled water must meet the same standards, bottled water comparisons mentioning this fact did little to shift attitudes toward the quality of these respective drinking water sources (Johnson, 2002).

Conclusions

These results suggest the following conclusions:

- CCRs do not appear to have substantial impact yet on beliefs, attitudes and self-reported behaviors of utility customers.
- Personal experience with the aesthetic quality of tapwater appears to be a more important factor in customers' beliefs, attitudes and self-reported behaviors than an annual CCR. Improving compliance with secondary standards, or going beyond compliance to improve taste, color, and odor as much as possible, might be the most important step utilities could take to improve customers' views of the safety of their drinking water.
- Even if they do not dramatically change beliefs, attitudes and behaviors in the short- or long-term, CCRs can still be improved to maximize the positive impacts they do have. The following suggestions do not conflict with federal and state rules on CCR content or format. For example, a utility could (1) add information on its steps

to prevent contamination of raw water supplies; (2) consider adding other information customers have requested in these studies, such as testing, comparisons, and the like; (3) use a table of contents and headings in the CCR to highlight the fact that much information wanted by customers is already in the report; (4) clarify what is and is not a MCL violation; and (5) explain the ranges in the water quality table, and their relation to MCL violations.

- Adding information to the CCR might cause information overload to customers. However, removing the water quality table entirely in one experiment decreased trust and increased concern; customers in all surveys wanted all information provided and more; and lack of desired information reduced ratings of actual and hypothetical CCRs. Utility customers have high interest in their drinking water quality, at least potential concern that it is or might become contaminated, and a high degree of ignorance about drinking water quality management. Simply giving them "the facts," although helpful, will not remove all concern; even people who trust the authorities and grasp the water's safety intellectually may not accept it emotionally.

- CCRs and contamination episodes offer opportunities to educate customers about drinking water quality management, but not enough; other tools must be added to increase the frequency and credibility of such messages, particularly since contamination incidents might undermine positive beliefs and attitudes about the utility and the water.

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