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A Case Study of Health Risk Communication: What the Public Wants and What it Gets*

Jeannette M. Trauth**

Introduction

The task of informing the public about various health risks is fraught with many problems. It is essential to overcome them if risk communication is to be improved. In 1989, the National Research Council (NRC) released a report¹ that is important for many reasons. In particular, it helped establish a conceptual framework for risk communication and identified a research agenda to improve risk communication practices. One area of need identified by the report was better use of case studies to understand, e.g., “how people react to different types of messages and channels; [and] what their actual concerns, frustrations, and data needs are” with regard to particular health risks.²

That report was the impetus for a case study described here. The overall goal of the study was to offer recommendations for improving the process by which information is communicated about environmental health risks. The specific objectives of the study were to: (1) identify the concerns, fears and frustrations of residents of three targeted communities downwind from the USX Clairton Coke Works (CCW) near Pittsburgh with respect to potential health problems caused by toxic air emissions from this facility;³ (2) identify the types

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¹ National Research Council, *Improving Risk Communication* (1989).

² *Id.* at 182.

³ U.S. Steel Corporation (USS) changed its name to USX Corporation (USX) in 1986. The CCW is part of the steelmaking division of USX. Thus, here “USX” and

of information those residents find most helpful in making personal decisions about possible health risks; (3) identify the most credible source(s) of information; and (4) examine health risk information about CCW emissions historically provided in local newspapers.

Background

The CCW is located in Clairton, a small community approximately eighteen miles southeast of Pittsburgh on the Monongahela River. It is the largest coke production works in the U.S. and can, when operating at full capacity, produce 12,500 tons of coke per day.⁴

Coke Production

Coke is essential to steel manufacturing. It is produced by baking coal at approximately 2000° F for 16–34 hours.⁵ During this process, several chemically complex emissions are released into the air. Although the CCW facility is designed to recover all volatiles, emissions occur because of, e.g., lack of or improper use of engineering controls, structural defects in the ovens and improper work practices.⁶ Also, after coke is made, it is quenched with water; this releases large volumes of smoke, steam and particles.

Community Health Concerns

Since 1987, residents of Glassport, Port Vue and Liberty Boroughs have become quite concerned about possible health effects faced from exposure to various gases and respirable particulates released from the CCW during coke making. Although the facility has been there since the turn of the century, coke making declined during the early and mid-1980's due to a downturn in the steel industry, and air quality in "USS " refer to the same organization.

⁴ Personal communication with Mr. Bill Grazier, USX Corporation, June 2, 1993.

⁵ World Health Organization, International Agency for Research on Cancer, *Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans* (1984) (IARC Monograph). See also, John D. Graham & David R. Holtgrave, *Coke Oven Emissions: A Case Study of Technology-Based Regulation*, 1 Risk 243, 244–47 (1990).

⁶ IARC Monograph, *supra*, at 104. See also, Graham & Holtgrave, *supra*, at 260–65.

the surrounding communities improved. By the late 1980's, however, the steel industry recovered to the point that USX sought and obtained permission from the Allegheny County Health Department (ACHD) to restart two rebuilt coke batteries in addition to ten already in operation. After these batteries were restarted, air quality once again declined. Also, a series of twelve accidents in 1987 and 1988 released raw oven gases for time periods between 30 minutes and several hours, in turn causing a great deal of public concern and outrage, numerous complaints to be filed with the ACHD and establishment of a very vocal environmental group.⁷

Health Effects of Coke Oven Emissions

Several constituents of coke oven emissions are known human carcinogens:⁸

The toxic constituents [of coke oven emissions] include both gases and respirable particulate matter of varying chemical composition. Greatest attention has been focused on the toxic effects of the particulate phase of the coal tar pitch volatiles emitted from coke ovens.... In addition, ...there is concern over the potential carcinogenic and/or cocarcinogenic effects of aromatic compounds (e.g., beta-naphthylamine, benzene), trace metals (e.g., arsenic, beryllium, cadmium, chromium, lead, nickel), and gases (e.g., nitric oxide, sulfur dioxide), which are also emitted from coke ovens.

Epidemiological studies of the carcinogenicity of coke oven emissions have focused on occupational exposures. These suggest that workers have increased risk of lung, trachea, bronchus, kidney and prostate cancer — depending on where and how long they worked, as well as on the intensity of exposure.⁹ However, there are no well-designed studies of the health effects of coke oven emissions on residents of communities downwind from a coke oven facility.

⁷ See also, Graham & Holtgrave, *supra* note 5, e.g., at 254–55.

⁸ U.S. Environmental Protection Agency, *Carcinogen Assessment of Coke Oven Emissions 1* (1984).

⁹ *Id.*

Methodology

To find the quantity and quality of information available to citizens and to learn their health concerns and information needs, data were collected by analyzing local newspaper coverage of health risks associated with CCW toxic emissions and by surveying residents.

Newspaper Analyses

Local newspaper coverage of the CCW was analyzed to understand generally what the public had been told over a 40 year period about health risks associated with coke emissions and how this information had been presented.

When this research was conducted, two major, daily newspapers served Pittsburgh and the three targeted communities. However, only one, The Pittsburgh Press, maintained an extensive clipping file of articles about the CCW. A total of 531 covered the period between May 1950 and December 1990, and they were analyzed by the author to determine how health and environmental risks from plant emissions were reported over time. A coding sheet was used to record the title and date of each article, as well as a short content description, whether the article contained any statement(s) about a health and/or environmental risk from the CWW (a risk statement) and, if the risk statement was attributed to anyone, those persons' identities. Articles containing risk statements were further analyzed to identify which ones also contained information that might help readers better understand the nature of the hazard (interpretive information).

Telephone Survey

Households in Glassport, Port Vue and Liberty Boroughs were targeted because they are immediately downwind from the CCW, and one would assume that any health effects caused by airborne plant emissions would be greatest in this area.

A telephone survey was conducted to identify residents' concerns, fears, frustrations and information needs. Residents were also asked to identify the organization, individual or group considered to be the most trustworthy source of information on health risks. A sample of 749 telephone numbers was randomly selected from a published list of

of all phone numbers in the target area. A total of 655 households were identified as eligible for the study based on their location and the availability of a person at least 18 years of age to answer the survey. Interviewers at the University of Pittsburgh contacted the survey between April 22, 1991 and May 4, 1991, and 401 interviews were completed for a response rate of 61.2%.

Summary of Newspaper Analyses

Overview of Risk Statements Identified

Of the 531 articles mentioned above, only 81 (15%) contained one or more risk statements. A total of 94 risk statements appeared, most often in articles focused primarily on pollution. When risk statements were attributed to anyone, it was most often ACHD officials. Table 1 shows a breakdown of sources to which risk statements were attributed.

Table 1
Sources of Risk Statements in 81 Articles

<i>Source</i>	<i>Percentage</i>
Allegheny County Health Department	18%
Environmental Groups	14%
Newspaper Statements without Attribution	14%
Individual Researchers/Research Organizations	12%
Other Government Officials	12%
USX Officials	11%
United Steel Workers Union Officials	11%
Editorials	3%
References to Statements made in Legal Documents	3%
Other	2%
Total (n = 94)	100%

A little less than half (n = 38) of the articles containing risk statements had any interpretive information to help readers understand the statement, and 53% (n = 43) had none whatsoever. During 1988–90, the interpretive information contained in the articles was

more in-depth; half of 28 articles with risk statements also contained such information.

Articles Containing Interpretive Information

Overall, interpretive information found in articles throughout the 1960's and to the mid-1980's is brief — from a sentence to a paragraph — and articles make numerous risk statements that are not explained, leaving readers with an inadequate understanding of their meaning. By the mid-1980's, articles with risk statements began to provide more explanation. This may have been caused by changes in staff or editorial policy or new legal obligations for companies to annually public report their toxic emissions. The sheer quantity of such information, alone, is apt to encourage more depth.

Not until 1966, was an article found¹⁰ with any interpretive information about air pollution from the CCW. It concerned a new process for collecting 95% of the sulphur dioxide and hydrogen sulfide emitted during coke making and mentioned that “[t]hese two gases have been a considerable nuisance in the Clairton district, where 300 million cubic feet of coke oven gas is given off daily.” It went on to say that “the hydrogen sulfide stains and darkens lead house paints and gives off a rotten-egg odor, while the sulphur dioxide has been described as a possible health hazard.” Yet, the article provided little information about hydrogen sulfide or sulfur dioxide, suggesting that the former is mainly an annoyance and failing to indicate the nature or extent of any “health hazard” from the latter. The major shortcoming of the article is that it leaves the reader wondering: What can sulfur dioxide do to me? Over what period of time?

At the end of 1970, U.S. Steel (USS) sought a waiver from county air pollution regulations, claiming that it could not bring coke quenching operations into compliance. At that time, quenching involved pouring a combination of process waste water from the facility mixed with river water onto red-hot coke after it came from the ovens. This gives off a tremendous amount of steam laden with chemicals including phenols and cyanide. In an article concerning this request,

¹⁰ Detailed citations are not provided here but are available from the author.

when discussing this request, a USS official mentioned only esthetic considerations:

[W]e recognize that visible, odorous pollutants are associated with the coking operation. Although esthetically undesirable in the community, most of the compounds have odor thresholds far below the levels of toxic concentration.

In contrast, the Chair of the County Air Pollution Appeals Board (CAPAB) discussed the issue of installing air pollution equipment in moral and legal terms. The CAPAB Chair was also reported as saying that USS officials were trying to blackmail authorities into granting a waiver by holding the jobs of 30,000 workers over their heads — and charging USS with corporate irresponsibility for not pursuing air pollution improvements until forced to do so.

Thus, we see the beginnings of a clash between local officials and USS that was the main focus of an article in 1971 that contained the first statement regarding the health effects of CCW emissions on the general population. In this article, the CAPAB Chair emphasized that:

[I]t is undeniable that the substances being emitted from the coke plant present a potential hazard to the public health. ...

[P]henol, ammonia, hydrogen sulfide and cyanide are all highly toxic [and] there can be no question that the particulates (solid matter) cast into the air from the quench water contribute to a public health problem—the only question is how much.

While this article provides some explanatory information (e.g., it defines “particulates” and acknowledges uncertainty about the extent of the health problem), public health issues are framed very broadly and in terms of corporate social responsibility to communities where plants are located and from which significant profits are derived.

In February 1972, another significant article discussed a suit against USS concerning sulfur dioxide emissions and the use of contaminated water for coke quenching and called for immediate use of the best available technology to reduce employee exposure to large quantities of hydrocarbons alleged to cause cancer. However, the article did not

discuss, e.g., possible types of cancer, or quantities or duration of exposure that might cause harm.

Later in 1972, USS was reported to have signed a consent decree that called for reduced sulfur dioxide emissions and elimination of the use of contaminated water for quenching. Several articles assessed the impact of that consent decree and referred to county health officials' assessments of the volume of pollutants emitted, control devices to be used and expected air quality improvements. Yet, the focus is again on esthetics, i.e., the look and smell of air, not on public health. For example, one article explained:

[T]he orange and yellow smoke which now blows from the coke ovens during the charging process (loading the coal into the ovens)... will be reduced by 75 to 85 percent by the end of 1973, [and] the black smoke, emitted from the ovens during the pushing process (removing the finished coke from the ovens) will be reduced by 70 percent.

Throughout the 40 years examined, air pollution alerts were periodically issued by the ACHD. Typical alerts stated that residents with heart or chronic respiratory problems, the elderly, and pregnant women should stay indoors and avoid physical activity. Only occasionally was additional information provided. For example, a 1974 article stated that air pollution monitors in the Clairton area registered at 184 and mentioned that "on the pollution scale, anything over 35 is considered unsatisfactory." However, it provided no information concerning pollutants being monitored or the likely health effects of pollutants at that level.

The first article to focus entirely on health effects did not appear until June 1976. It discussed two reviews of an EPA study of a four-day air pollution crisis that had occurred in the Monongahela River Valley the previous November. Referring to the principal investigator of that study, it reported that:

[H]is investigative team determined that only one event here could have caused the deaths of "at least 14 persons." And, he said, that was the air pollution episode "which was the only observable unusual condition in

November, 1975 that could have caused expected mortality to deviate so widely.”

The article also extensively quoted critiques by the two teams of reviewers — one from the University of Pittsburgh, the other from California — and laid out reasons that reviewers believed the EPA study to be flawed, e.g., incomplete information, erroneous assumptions, inconsistencies and inaccuracies. For example, it reported that the Pitt team had determined that 200 persons, rather than 213, had died during the period and that the California reviewers had scolded the EPA for undertaking a report:

with incomplete data and proceeding to (their) conclusion through a sad mix of unrelated health effects, inadequate adjustment for missing data, inattention to chance effects, failure to seek explanations for mortality deviations, oversimplification of statistical concepts and neglect of important cofactors in disease causation.

The article is important not only because it is the first to focus on health, but also because it provides some insight into how relevant research might be evaluated. Yet, it did little to make that information really meaningful to average readers.

Also, in June 1976, a major article, “Cancer — The Human Element in Coke Oven Dispute,” addressed the need for national pollution standards to mitigate the health impact of emissions on workers and the positions of various parties, including the United Steelworkers Union (USW), USS and federal officials regarding these matters. It discussed a 1970 joint study by the University of Pittsburgh and the federal government that found:

coke workers as a group are 2 1/2 times more likely than other steelworkers to die of lung cancer, [and that] the risk is seven times as great for men working atop the ovens... and after five years working top-side the risk is 10 times as great. Kidney-cancer deaths among coke workers were reported 7 1/2 times greater than among other workers.

It also reported that the joint study had led USS, in 1972, to admit that exposure to coke ovens had resulted in an employee’s lung cancer.

The USS admission is said to have led, in turn, to federal proposals to sharply limit particulate pollution near the ovens.

The rest of the article addressed the economic impact and technical feasibility of implementing a national standard and reported that USS believed that, because "the precise component or components of coke-oven emissions responsible for the excess in lung cancer have not been isolated, the proposed particle limit is an unrealistic... guesstimate" and "it does not seem at all worthwhile to make unnecessary major expenditures to attempt to implement an unattainable standard based on data that has been seriously questioned."

Not until 1988, did interpretive information regularly begin to appear. That year, two articles, in particular, were unusual in providing in-depth discussions of issues relevant to understanding health risks from CCW emissions. The first concerned a community health effects feasibility study undertaken at the University of Pittsburgh and explained the purpose of the study, the type of data to be collected and why. It also gave critical background information, explaining, e.g., that no definitive study of effects of coke oven emissions on nearby residents had ever been undertaken. It mentioned that residents of the Clairton area had complained to county officials about pneumonia, allergies and colds, and went on to point out that such complaints do not constitute hard evidence. The article hints that proof of CCW emissions having health effects requires more than anecdotal information.

After federal reporting requirements made additional information available, a second 1988 article discussed total annual CCW emissions. It presented the most comprehensive information about health and environmental risks to date, providing a list of the types and amounts of toxic chemicals released to the air, water and land in 1987 and explaining known immediate and long term health effects. It indicated that most released chemicals were known respiratory irritants. It also mentioned, e.g., that naphthalene and toluene may cause fetal damage; xylene, liver and kidney damage; and benzene, leukemia. Moreover, it reported that, e.g., scientists consider toxic air pollution to be more

dangerous than water pollution because people are exposed to more air than water, no emission standards exist for the ten air pollutants released in largest quantities in Allegheny County, and six of those are released by the CCW. The interpretation offered about these statements is that without emission standards one can't tell whether people are being exposed to harmful concentrations. Finally, it implicitly distinguished "release" and "exposure," noting that:

[T]he reports do not show what levels of the chemicals people are being exposed to, and only scant information on exposure is available from other sources. As a result, public health authorities, environmentalists and industry officials say it is virtually impossible to say what health risks the releases pose.

That statement is important because research shows that people tend to equate those terms.¹¹ While the article is generally an excellent example of risk communication, with regard to the last, it could have also directly explained why people do not necessarily come into contact with released substances.

Later articles also provided readers with sophisticated discussion of health risks posed by CCW emissions. These discussed the results of three studies — two performed by the EPA on coke oven and benzene emissions, and one conducted by a consulting firm for USX. All were quoted in practically every article written about the CCW in 1989. Still, the articles mostly reported various views of how the public and policy makers should interpret the studies, with little help to readers in evaluating those views.

Summary of Survey Data

Outdoor Air Pollution

Most residents of the three surveyed communities (79%) believed that their air is polluted; of those, the vast majority identified the CCW as the source.

¹¹ David B. McCallum et al., *Public Knowledge and Perceptions of Chemical Risks in Six Communities: Analysis of a Baseline Survey (1990)* (Report prepared for U.S. EPA).

Health Concerns of Residents

Respondents were evenly divided as to whether they are or are not concerned about their health as a result of air emissions from the CCW. Those concerned are worried mainly about respiratory problems, but long-term health effects and cancer were also cited.

Respondents also believed a variety of health problems already experienced to be related to air pollution. Those problems included (in descending frequency) sinus irritations; eye, nose and throat irritations; pounding headaches; lung irritations; dizziness and nausea.

Moreover, about a third of those surveyed reported that they or some member of their household suffered from asthma or another breathing problem, and a third said that either they or another person in the household had to stay indoors or reduce physical activities occasionally because of air pollution advisories issued by the ACHD.

Sources, Credibility and Adequacy of Health Risk Information

When asked where they got information concerning risks of chemicals in their community, respondents ranked local media first. Environmental groups followed. State and federal government officials and industry officials were last.

When asked which source of information they trusted "a lot" when it comes to finding out about the risks of chemicals in their community, respondents ranked family physicians first, followed by environmental groups, the ACHD, local media and friends or relatives, local emergency planning committees, national media, federal government officials, state government officials, and industry officials.

Approximately two-thirds of those interviewed did not feel that they had enough information to understand possible health risks from the CCW. When asked what types and sources of additional information would be helpful, they most frequently said that they wanted more information about CCW emissions and health effects — in readily available sources such as newspapers, flyers or newsletters.

Knowledge about Released Substances

In spite of proximity to the CCW, 77% of those interviewed said they do not know what type of chemicals are released at the CCW. Only 19% (n =77: 49 sulfur, 28 benzene) could give an example of a released chemical.

As mentioned earlier, the public remains confused about the important concepts of "release" and "exposure." This is supported by the fact that 81% of the respondents agreed with the statement: "If an industrial facility in the Mon Valley RELEASES some amount of a toxic chemical into the air in your community, this means that you have been EXPOSED to the chemical."

Citizen Action

Respondents expressed willingness to learn more about the effects of emissions on public health and the environment; 63% said they would attend an educational program if it was available.

When asked about engaging in activities to deal with CCW emissions, respondents showed considerable willingness to be involved in constructive, educational activities but indicated more interest in activities that could be pursued alone and ones that were not confrontational.

Discussion and Recommendations*Media*

Media information about risks has recently come to be more thoroughly explored. As Singer and Endreny note in a comprehensive analysis of national news media coverage of a wide range of hazards,¹² media may not tell the public what to think, but it often tells it what to think about.¹³ News helps determine what is salient in both public and private debates. Thus, the media has a unique role and some responsibility for public education. This may not be a role with which journalists are entirely comfortable, but it is one that they must certainly consider.

¹² See, e.g., Eleanor Singer & Phyllis M. Endreny, *Reporting on Risk* (1993).

¹³ *Id.* at 4.

One topic examined by Singer and Endreny, particularly relevant here, was the kind of information that print media provide about hazards. They found that a certain minimum of information is needed for readers to assess a risk. Such information would include:¹⁴

the annual mortality associated with the hazard..., the size of the population at risk..., any delays in the onset of consequences, how long the risk associated with the hazard persisted, and whether or not the hazard affected more than one generation.

Such specific information about health risks associated with CCW emissions was generally missing from reports analyzed in this study.

As has been shown in this and other studies,¹⁵ the media — particularly local newspapers — play a major role in influencing public perceptions of risk. Notwithstanding exceptions, in this study newspaper coverage of public health issues was found to be minimal over the 40 years analyzed. Articles focusing primarily on public health historically have received the least coverage (2% of the articles about the CCW in *The Pittsburgh Press*). Based on that and findings that the public wants increased coverage, local newspapers should publish more articles concerning known effects of emissions on public health.

Only 15% of *Pittsburgh Press* articles concerning the CCW contained risk statements. Although they provided balanced viewpoints,¹⁶ to evaluate health information readers need more than balance. Readers need criteria for judging the merits of various viewpoints, and less than half of the articles with risk statements contained any information to help readers understand the statements. Those that did had many shortcomings including:

1. failure to define terms unfamiliar to average readers, e.g., chronic health hazard, acute health hazard, and ambient air.

¹⁴ *Id.* at 87.

¹⁵ *See, e.g.*, McCallum et al., *supra* note 11 and The Roper Organization, Inc., U.S. Environmental Protection Agency survey number 88-6 (1988).

¹⁶ For a discussion of the importance of this, *see, e.g.*, Peter M. Sandman, *Explaining Environmental Risk* (1986).

2. failure to explain what we do *and do not* know about the health effects of exposure to various chemicals or information relating dosage and length of exposure to particular health outcomes.

3. failure to translate information about the magnitudes of risks into meaningful terms.

4. failure to explain quotations containing highly technical information; e.g., one article went so far as to quote a scientist's criticism of a study as revealing "oversimplifications of statistical concepts and neglect of important cofactors in disease causation."

Some failures can easily be addressed; some, as discussed below, may require the cooperation of people other than journalists.

Family Physicians

This and other surveys indicate that respondents trust their family physician more than any other source of information about the risks of chemicals in their community. Ironically, however, it also seems that family physicians do not provide this information.

This survey indicates that half of the respondents are concerned about their health as a result of air pollution. They worry mainly about respiratory problems, but they are also concerned about other health risks, including cancer.

Family physicians have the opportunity to engage in individualized, face-to-face discussions and should use it to provide patients with more and better information.

Local Health Agencies

This study found the ACHD to be one of the most trusted sources of public information. Also, it found most citizens willing to learn more about the effects of chemical emissions on health and the environment and willing to attend workshops if available. Local reporters and physicians might also find them helpful.

Assuming that other local health agencies are equally credible, such agencies should be more aggressive in sponsoring community forums to exchange information and develop a dialog on managing health risks.

Local Colleges and Universities

Freimuth et. al. studied how the top 50 largest daily newspapers in the U.S. reported on cancer in 1977 and 1980.¹⁷ One central question was: "To what extent does news coverage of cancer provide information that individuals need to know to understand or seek help for themselves?"¹⁸ They found that news stories did not provide "information on the topics of prevention, risks, detection, and treatment of cancer, information considered vital to individuals' ability to understand and take action concerning the disease."¹⁹ and concluded that news coverage could be improved if journalists themselves had better information regarding what scientists and researchers consider priorities for public information needs.

Because public knowledge about and attitudes toward various hazards are influenced by media coverage, it is imperative that journalists understand health risk concepts and terms. For example, the survey reported here indicates that the vast majority of people do not understand the distinction between the basic terms, "release" and "exposure." Such confusion and misunderstandings about such key concepts need to be eliminated. If journalists do not understand themselves, they cannot report fully or accurately.

Thus, in the final analysis, colleges and universities and, in particular, schools of public health, need to play a major role in risk communication. They should develop, possibly in cooperation with local health agencies, seminars for reporters and editors, as well as for others such as family physicians, to better equip them to, in turn, prepare citizens to participate in critical personal and social decision making.



¹⁷ Vicki S. Freimuth et al., *Covering Cancer: Newspapers and the Public Interest*, 34 J. Comm. 62 (1984).

¹⁸ *Id.* at 65.

¹⁹ *Id.* at 67.