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The authors thank Richard de Blaquiere and Dr. Robert Oldendick for their contributions. The Savannah River Stakeholder Study is a five-year cooperative agreement between the Consortium of Risk Evaluation with Stakeholder Participation (CRESP) and the U.S. Department of Energy.

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Frequency of Use and Perceived Credibility of Information Sources and Variations by Socioeconomic Factors among Savannah River Stakeholders*

Bryan L. Williams, Alex Vallei, Sylvia Brown & Michael Greenberg**

Introduction

The U.S. Department of Energy (DOE) has had trouble effectively communicating risks to the public and involving the public in future site activity. Historically, residents living near DOE sites such as nuclear weapons facilities have voiced distrust and uncertainty about the environmental policies of the DOE complexes.[1] Those living near DOE nuclear weapons facilities assert that they are poorly informed about various activities at the sites and that the DOE does not listen to their concerns and needs.[2] Residents living near the DOE's Formerly

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1 *See* S.E. Binney et al., *Credibility, Public Trust, and the Transport of Radioactive Waste through Local Communities*, 28 Env't and Behav. 283 (1996); Michael E. Kraft & Bruce B. Clary, *Citizen Participation and the NIMBY Syndrome: Public Responses to Radioactive Waste Disposal*, 44 W. Pol. Q. 299 (1993); Paul Slovic, *Perceived Risk, Trust, and Democracy: A Systems Perspective*, 13 Risk Anal. 675 (1993); Bryan Williams, Sylvia Brown & Michael Greenberg, *Determinants of Trust Perceptions Among Residents Surrounding the Savannah River Nuclear Weapons Site*, 31 Env't and Behav. 354 (1999).

Utilized Sites Remedial Action Programs (FUSRAP) also report being inadequately informed about various remediation activities at the sites.[3] Lack of public awareness concerning such issues at DOE sites has resulted in lowered and exaggerated public concern and a lack of public involvement in policy decision-making.

The DOE is attempting to find better ways to involve and communicate with stakeholders. Such an endeavor involves understanding factors that impact stakeholders' willingness to be involved with the DOE, including stakeholder perceptions, beliefs, demographic characteristics, and communication sources. This paper describes an effort to investigate these factors among residents living near the DOE's Savannah River Nuclear Weapons Site (SRS). To understand the problems the DOE has with its stakeholders or residents living near the SRS, it is necessary to first delineate the importance of risk communication and how it is conceptualized in the context of risk-related remediation efforts.

Importance of Risk Communication

Risk communication is defined as "an interactive process of exchange of information and opinion among individuals, groups, and institutions."[4] This definition encompasses different types and levels of risk and the various methods of managing risk, and relies on two-way communication between the public and policymakers.[5] Risk communication is a process of sharing of risk-related decisions occurring among members of the public who have a specific stake in the remediation of a contaminated site. Those who have a concern or interest in the activities that occur at a site, and who should be involved in providing input concerning the decision-making process at a site, are considered stakeholders. For example, stakeholders are the residents that have a role in defining the problem and in determining the range

2 *See* Sally O'Connor et al., Inventory of Public Concerns at the Savannah River Site (1995).

3 *See* David L. Feldman & Ruth A. Hanahan, *Public Perceptions of a Radioactively Contaminated Site: Concerns, Remediation Preferences, and Desired Involvement,* 104 Envtl. Health Persp. (1996).

4 National Research Council, Improving Risk Communication (1989).

5 *Id.*

of alternatives and the criteria that will be used in the remediation-related activity. That is, they are the individuals who have a vested interest or stake in remediation-related activities.[6]

Risk communication should be a process that fosters collaborative decision-making between an environmental entity and its various stakeholders. In such a framework, risk communication would not only emphasize the physical attributes of a hazardous technology, but also incorporate both the social and cultural context of the stakeholders' community.[7] As a result, public perception, not scientific understanding, would serve as the basis for the collaborative risk communication process between the stakeholders and the environmental entity or policymakers.[8]

Communicating environmental risk to the public challenges scientists, government officials, planners and advocacy groups. Yet, risk communication is pivotal to effective risk management. For example, risk communication may be used to improve dialogue and reduce unwarranted tension between communities and environmental agencies.[9] However, a number of factors complicates this open "exchange of information." For instance, public distrust, conflicting scientific opinions, environmental injustices, and the social and political values of the participants or stakeholders affect this open "exchange of information." These value-laden factors are increasingly critical components in the environmental risk communication process because they represent some of the barriers that prevent successful risk communication.[10] Furthermore, these factors provide the foundation for many of the decisions that determine the conduct of risk assessment. In fact, these factors are so important to the risk communication process that they may impede the development of a clear distinction between the actual facts of risk assessment and the values of risk assessment. Therefore, the purpose of risk communication

6 *See* J.A. Bradbury, *Risk Communication in Environmental Restoration Programs,* 14 Risk Anal. 357 (1994).

7 *Id.*

8 *See* Jon B. Klauenberg & Erick K. Vermulen, *Role for Risk Communication in Closing Military Waste Sites,* 14 Risk Anal. 351 (1994).

9 *See* New Jersey Department of Environmental Protection, **Improving Dialogue with Communities: A Short Guide to Government Risk Communication** (1988).

10 *See* Klauenberg & Vermulen, *supra* note 8.

is to develop a mechanism that identifies value differences between different risk assessors and other stakeholders so that these values are acknowledged and dealt with early in the risk management process.[11]

One way to facilitate the development of this mechanism and to deal with value-laden factors is to make sure that the public is adequately informed about the risk situation before a crisis occurs. Current literature reveals that the best way to inform the public of risk-based information is to have this information disseminated at the community level by individuals who are trusted by the community because they understand the values and concerns of their target audience.[12] The target audience's characteristics and source credibility are important elements in creating an effective way to deal with various socio-cultural values from different communities.[13] The following literature review highlights the importance of stakeholder characteristics and source credibility in furthering the development and maintenance of effective risk communication between stakeholders and policymakers.

Literature Review

Risk Communication and Stakeholders

In 1996, Chipman, Kendall, Slater, and Auld compared consumer reactions to four media formats (video news release, video public service announcement, print news release, and newsprint column).[14] The purpose of this study was to determine whether their targeted audience would react differently when they received the same risk communication from different media. Each message from these media formats conveyed the same risks/benefits/options on the use of agricultural chemicals in food production. Consumers were distinguished with respect to their level of concern or involvement with agricultural chemicals in the food supply, as this concern related to

11 *See* Bradbury, *supra* note 6.

12 *See* New Jersey Department of Environmental Protection, *supra* note 9; Commission on Risk Assessment and Risk Management, Risk Assessment and Risk Management in Regulatory Decision-Making (1997); E. Vaughn, *The Significance of Socioeconomic and Ethnic Diversity for the Risk Communication Process,* 15 Risk Anal. 169 (1995).

13 *See* Vaughn, *supra* note 12.

14 *See* H. Chipman et al., *Audience Responses to a Risk Communication Message in Four Media Formats,* 28 J. of Nutrition Educ. 133 (1996).

personal health and the environment. The authors found that respondents who indicated a high concern or were highly involved with the pesticide/food safety issue responded more favorably to the two print formats than respondents who indicated a low concern for this issue. In addition, low-concern participants preferred the broadcast medium. Chipman et al. revealed in their study the importance of acknowledging individual differences in various target audiences, and how these differences may influence perceptions of risk-related messages between different media formats.[15]

Similarly, a theoretical treatise of recent findings of empirical research on risk communication found that socioeconomic and ethnic variability were also important individual difference variables for the development and maintenance of effective risk communication. Specifically, socioeconomic status and ethnic diversity of a community shape the psychological responses that precede the adoption of self-protective behavior by a community when a risk situation is encountered. Thus, acknowledging the socioeconomic and ethnic circumstances, as well as the perception of legitimacy and influence of risk of a targeted community, will determine whether a source will adopt an environmental justice or scientific/economic frame in communicating risk.[16] Research has also shown that the most important factor in risk communication efforts is credibility attributed to the source of a risk communication by the stakeholders or targeted audience.[17]

Risk Communication and Source Credibility

Source credibility is a characteristic of information sources and should be interpreted as a specific characteristic of a source that leads to greater acceptance of a persuasive message.[18] There are two source characteristics that can affect an individual's susceptibility to a message:

15 *Id.*

16 *See* Vaughn, *supra* note 12.

17 *See* V.T. Covello, *Risk Perception and Communication,* 86 Canadian J. of Pub. Health 78 (1995); D.B. McCallum, S. Hammond & V.T. Covello, *Communicating About Environmental Risks: How the Public Uses and Perceives Information Sources,* 18 Health Educ. Q. 349 (1991); J. Mitchell, *Perception of Risk and Credibility at Toxic Sites,* 12 Risk Anal. 19 (1992).

18 *See* Binney, *supra* note 1; M.B. Brewer & W.D. Crano, Social Psychology (1994).

expertise and trustworthiness. Expertise refers to the credentials that bear on the validity of a source's assertions, and trustworthiness refers to the source's manipulative intent. When an environmental harm is imminent, the believability of the information provided by the source depends upon the level of credibility that the stakeholders attribute to the risk communicator. For example, if the risk communicator is viewed as having a compromised agenda (i.e., not trustworthy) or incompetent (i.e., lack of expertise), then a concomitant attenuation in the believability of the information disseminated by this source occurs.[19]

In a study of six communities, McCallum et al. (1991) found that the targeted audience cited credibility over level of knowledge attained as the most important attribute of an environmental information source.[20] It was also determined that while the news media were the most predominant source of environmental information, they were not considered the most credible source concerning environmental issues. McCallum et al. concluded that a strong understanding of community dynamics (i.e., a greater understanding of the targeted audience) with respect to environmental information is necessary to build credible or effective communication sources and channels.[21]

In another study, an investigation was conducted of factors that determine the perceptions of credibility in environmental risk communication.[22] In that study, the key to increasing perceptions of credibility in the six communities was to overcome common negative stereotypes of industry, government, and citizen groups. Perceptions of openness and honesty, knowledge and expertise, concern and care, and commitment or both dedication and commitment combined, were found to be important determinants of credibility.[23] In a study conducted by Binney, Mason, Martsolf, and Detweiler (1996), telephone interviews of stakeholders (28 community leaders) living near

19 *See* R.G. Peters, *A Study of the Factors Determining Perceptions of Trust and Credibility in Environmental Risk Communication: The Importance of Overcoming Negative Stereotypes,* 68 Int'l Archives of Occupational and Envtl. Health 442 (1996).

20 *See* McCallum et al., *supra* note 17.

21 *Id.*

22 *See* Peters, *supra* note 19.

23 *Id.*

the planned route for the transportation of radioactive waste expressed concern with the DOE's credibility as a message source.[24] Credibility was found to be an important issue for understanding the risk communication of waste transport, and the authors suggested that the DOE could increase its credibility by creating a partnership with the local citizens.

Rationale for the SRS Study

None of the studies discussed in the literature review differentiated findings based on socioeconomic factors of the targeted audience. In the previous studies, the importance of the targeted audience's socioeconomic factors was acknowledged and corresponding information was collected, but this information was not incorporated into the analyses to provide a framework for understanding these factors in the context of risk communication. Thus, these omissions represent a major limitation of previous studies on risk communication as it relates to source credibility and stakeholders. In contrast, the present study includes this limitation by analyzing findings based on the different socioeconomic variables that have social and cultural implications for the targeted audience, so that a mechanism for understanding risk communication as it relates to the SRS can be created.

The literature review also suggests that stakeholders often have varying opinions about the credibility of a given channel of communication.[25] Information sources that lack public credibility are not typically utilized with great frequency and, thus, are not useful tools for risk communication. In order to communicate successfully with the public, one must know "with whom they are communicating" and "how to communicate to their intended audience." This involves identifying and characterizing both a target audience and various channels for communication.[26] Risk communication has traditionally focused on examining and implementing persuasive communication techniques.[27] Such efforts involve a detailed investigation of source

24 *See* Binney, *supra* note 1.

25 *See* Max R. Lum & Tim L. Tinker, **A Primer on Health Risk Communication Principles and Practices**, Agency for Toxic Substances and Disease Registry (1994).

26 *Id.*

credibility, message clarity, efficient use of communication networks, and individual perceptions and characteristics of the target audience.[28] Additionally, results from the previous literature review emphasize examining the social context in which risk communication takes place.[29] All of these factors have been incorporated into the analysis of the SRS Stakeholder Study.

The Savannah River Stakeholder Study

As part of a five-year cooperative agreement between the Consortium of Risk Evaluation with Stakeholder Participation (CRESP) and the DOE, the authors of this paper are studying social, economic, psychological, demographic and political factors that impact environmental risk communication and stakeholder involvement at the Savannah River Nuclear Weapons Site. In order to help us understand the various characteristics of SRS stakeholders, we conducted a cross-sectional study of residents living near the SRS to answer three basic questions: (1) What sources of information are used and found most credible by SRS stakeholders? (2) How does source use and credibility vary by race, income, and other factors? and (3) To what extent do SRS stakeholders participate in public activities?

Methods

A cross-sectional study of variables related to environmental risk perception, policy, and management/remediation was conducted in the fourteen-county region surrounding the DOE's SRS in Georgia and South Carolina. Three local institutions — the University of South Carolina's School of Public Health, the Institute of Public Affairs, and Georgia Southern University — served as on-site collaborators with CRESP researchers. Given the complexity of this investigation, a detailed description of the research methodology is beyond the scope of this paper. A complete review of the research methodology is provided in Williams, Brown and Greenberg.[30]

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27 *See* William Leiss, *Three Phases in the Evolution of Risk Communication Practices*, 545 The Annals of the Am. Acad. of Pol. and Soc. Sci. 85 (1996).

28 *Id.; see also* V.T. Covello, D. von Winterfeldt & P. Slovic, Risk Communication: Background Report for the National Conference on Risk Communication (1986).

29 *Id.*

30 *See* New Jersey Department of Environmental Protection, *supra* note 12.

Instrumentation

An open and closed-ended telephone survey was developed for use in this study. Agency representatives, local citizen groups, and environmental experts helped construct and revise the Risk Communication Profile Instrument (RCPI) prior to its implementation. The RCPI contains six intact Likert and dichotomous scales. It was also divided into two versions for the purpose of decreasing respondent burden, thus increasing response rates. Both versions consist of a minimum of 82 core items. Version A contains nine additional items while Version B contains two additional items. Only items that proved effective during field-testing were included in the final Versions A and B. Both versions share six intact scales and common demographic items. However, Versions A and B differ in two areas. Version A contains a Risk Perception by Human Pathway Scale (RPHF) (nine-item close-ended Likert-type scale) that is not included in Version B of the RCPI. Version B contains two rank-ordered items that require respondents to interpret risk statements and to prioritize the importance of factors related to hazardous waste management.[31] Finally, item analysis was used to validate all research questions. Local interviewers were trained and tested by the local institutions using study-developed standardized protocols and procedures. Local interviewers, in conjunction with the CRESP researchers, administered the RCPI.

Sampling

A total of 1,671 randomly selected respondents were interviewed. They were drawn from a fourteen-county region within an approximately 86 mile radius of SRS. Eight counties were located in South Carolina, while six were located in Georgia. The obtained sample achieved and surpassed the target level of precision, which was a +2% and a +3% margin of error for the entire fourteen-county region and a +8% and a +10% margin of sampling error at the county level. The estimated total population of the fourteen counties was 841,128.[32]

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31 *See* Williams, Brown & Greenberg, *supra* note 1.

32 *See* U.S. Bureau of the Census, County and City Data Book: 1994 (1994).

Treatment of Data

This paper focuses on the Communication Source Characterization and the Stakeholder Background Items with an ultimate goal of identifying the sources of information residents find most useful. The following three-tiered approach was used to accomplish this task.

First, we sought to identify the stakeholders. To do this, we analyzed the data for demographic, social, and location characteristics. We examined income distribution by race, using nine income categories (<$5,000, $5,000-$9999, $10,000-$14,999, $15,000-$24,999, $25,000-$34,999, $35,000-$49,999, $50,000-$74,999, $75,000-$99,999, ≥$100,000) and six racial categories (African American, White, Hispanic, Native American, Asian, Other). Low-income respondents were defined as those reporting family incomes less than $15,000 per year. The proportion of missing data per race was also calculated in order to address any concerns regarding missing data bias.

Our examination of racial and income differences helped to identify four key groups of stakeholders: Low-income African Americans, Low-income Whites, Non-low-income African Americans and Non-low-income Whites. Differences and similarities among these four groups were explored with respect to other demographic, social, and location characteristics. Numerous variables were analyzed. (Refer to Appendix I for details.) The Chi-Square statistic was used to assess differences in proportions, with the Fisher Exact being used when cells were less than five. Relative risks were calculated to examine the direction and magnitude of differences for dichotomous variables, t-tests were performed to examine differences in means for continuous variables, and the non-parametric Wilcoxon test was used when continuous variables were not normally distributed.

Next, we focused on sources of information. The RCPI gathered credibility and frequency of use communication data using two approaches. The first involved the naming of sources of information. Version A respondents were asked to specify in order what they felt was the first, second and third most credible source of information. Version B respondents were asked to specify, in order, the three sources of information they used most frequently. These open-ended responses were categorized into eleven sources of information and analyzed accordingly. In the second approach, respondents rated the credibility

and frequency of use for each of the eleven sources of information. A five-point Likert Scale, reflecting increasing perceived credibility or frequency of use, was used.

Finally, we used the results from the above analyses to determine the association of income and/or racial differences among SRS stakeholders with respect to the use and credibility of communication sources. Low-income Whites, Low-income African Americans, and Non-low-income African Americans were compared to Non-low-income Whites for each source of information. Frequencies and proportions were used in these analyses, and the Chi-Square statistic was used to test for significant differences. Differences at the 0.10 level were deemed important since this is exploratory sociological data.

Findings

Who are the stakeholders?

There were a total of 1,671 respondents in the RCPI survey (Table 1). Of those who identified their race (n=1,524), 28% (n=424) indicated that they were African Americans, and 71% (n=1076) indicated they were White. A total of 205 respondents had incomes less than $15,000, with the numbers divided evenly between African Americans (n=101) and Whites (n=100). Since Hispanics, Native Americans and Asians constituted only 1.6% of the surveyed population (n=24), they were excluded from the follow-up analyses.

The proportion of African Americans living in poverty (<$15,000 per year) was statistically greater than the proportion of Whites with similarly low incomes ($p<0.001$). African Americans were found to be approximately two-and-one-half times more likely to have incomes less than $15,000 than Whites (RR=2.56, 95% CI: 1.99, 3.30). With respect to missing data, the proportion of African Americans and Whites who failed to answer the income question approximates their respective representation in the survey population. Therefore, missing data bias is not a significant concern.

Numerous stakeholder characteristics were examined for the four largest groups of SRS stakeholders: Low-income Whites, Low-income Blacks, Non-low-income Whites and Non-low-income Blacks.

Table 1
Distribution of Income By Race

	African American *n=424* *27.8%*	*White* *n=1,076* *70.6%*
Low-income		
<$5,000	27	14
	64.3%	33.3%
	(8.6%)	(1.6%)
$5,000-$9,999	34	32
	50.7%	47.8%
	(10.9%)	(3.6%)
$10,000-$14,999	40	54
	41.7%	56.3%
	(12.8%)	(6.1%)
Total Low-income <$15,000	101	100
	49.3%	48.8%
	(23.8%)	(9.3%)
Non-Low Income		
$15,000-$24,999	59	131
	30.7%	68.2%
	(18.8%)	(14.8%)
$25,000-$34,999	57	154
	26.6%	72%
	(18.2%)	(17.4%)
$35,000-49,999	54	193
	21.6%	77.2%
	(17.3%)	(21.8%)
$50,000-$74,999	31	180
	14.5%	84.1%
	(9.9%)	(20.3%)
$75,000-$99,999	6	71
	7.6%	89.9%
	(1.9%)	(8.0%)
≥$100,000	5	56
	7.8%	87.5%
	(1.6%)	(6.3%)
Missing Data		
Income	111	191
	36.3%	62.4%
Income & Race	-	-

Numbers in "( )" represent percentage within race group. Numbers *not* in "( )" represent percentage within each economic group.

Significant differences at the 0.05 level were found between and among the groups for most variables of interest. Notably, African Americans, regardless of income, were more likely to be Baptist and less

likely to live in a county highly dependent on SRS, but they were neither more nor less likely than Whites to be employed full time. And, while there was no significant difference between Non-low-income African Americans and Whites with respect to full-time employment, Low-income African Americans were more likely to be employed full time than Low-income Whites.

As evidenced by the socioeconomic characteristics of SRS residents, low-income Whites and low-income African Americans appear to be more similar than different. Significant differences between the two groups existed with respect to religion, full-time employment, age, neighborhood rating, and willingness to exchange health risks for economic gain. However, no statistical difference between the two groups surfaced for the remaining seventeen characteristics. Moreover, other relationships remain complex. For example, low-income respondents, regardless of race, and African Americans in general were less likely to participate in neighborhood activities than Non-low-income Whites. However, there was no significant difference in level of participation between low-income African Americans and low-income Whites. Differences also disappear for Trust and Control and willingness to accept hazardous waste variables. Such socioeconomic mimesis among Low-income African Americans and Whites is not atypical for the southern region of the United States. (See Appendix I.)

What Sources of Information Do SRS Stakeholders Use Most Frequently and Find Most Credible?

The most credible and frequently used information sources are illustrated in Table 2. Overall, respondents relied on Mass Media — Television, Newspapers, Other Written Media and Radio — for their information. Approximately 90% used Mass Media most frequently, with Television (43%) and Newspapers (35.2%) accounting for the first choice of most respondents. The majority of respondents (> 62%) also found Mass Media the most credible. However, more than one-third found non-mass media sources the most credible, especially Personal Contacts (10.5%), Professional Contacts (6.9%) and Religious Groups (5.9%). Community Organizations and Government Agencies were cited less often than any other communication source, with proportions ranging from 0.1% to 2.5%.

Table 2
Most Credible and Frequently Used Sources of Information /All Respondents

	Credibility			*Frequency*		
	1st (n=707)	*2nd (n=653)*	*3rd (n=539)*	*1st (n=721)*	*2nd (n=622)*	*3rd (n=438)*
Mass Media						
Newspapers	20.1%	22.4%	19.3%	35.2%	21.9%	19.6%
Other Written Media	6.6%	8.1%	12.4%	3.1%	7.9%	14.2%
Television	32.5%	24.8%	13.5%	43.0%	38.1%	11.9%
Radio	4.5%	14.4%	17.6%	7.6%	20.4%	21.9%
Other Sources						
Employer	2.0%	1.2%	3.3%	0.8%	1.0%	2.7%
Professional Contacts	6.9%	6.3%	4.5%	0.7%	1.1%	2.3%
Personal Contacts	10.5%	9.3%	13.7%	6.0%	6.1%	18.5%
Government Agencies	1.4%	2.1%	1.9%	-	0.6%	-
Religious Groups	5.9%	4.0%	5.8%	0.7%	-	2.7%
Community Organizations	1.6%	2.5%	2.6%	0.1%	1.0%	0.9%
Computer Information	2.8%	1.7%	2.2%	1.9%	1.3%	3.9%
Other Sources	5.1%	3.2%	3.2%	0.8%	0.6%	1.4%

Numbers represent the percentage of each *all respondents* choosing the specific source of information.

How Does Source Use and Credibility Vary by Race, Income, and Other Factors?

We examined variations in frequency of use and credibility by race, income, and other factors (Tables 3, 4). Most notably, African Americans, regardless of income, and Low-income Whites found Television statistically more credible ($p=0.01$ and $p=0.05$) than Non-low-income Whites. Mass Media frequency of use varied more than Mass Media credibility. Low-income African Americans and Low-income Whites used Newspapers less often ($p<0.01$) and Television ($p<0.01$, $p<0.05$) more often than Non-low-income Whites. No statistical differences were found between non-low-income respondents, regardless of race, regarding the use of any of the Mass Media sources.

Few differences occurred in the frequency of use and credibility of non-mass media sources. As compared to Non-low-income Whites, Low-income Whites found Religious groups more credible and Professional Contacts less credible at the 0.10 level. Also, Non-low-income African Americans used community organizations slightly more frequently than non-low-income Whites. Frequency of use and

credibility of government agencies and community organizations remained very low, with no statistical difference among the groups.

A closer look at low-income respondents, using the rating scale (Table 5) reinforces the supposition that low-income respondents rely on, but are skeptical of, Mass Media. For example, while 82.7% frequently or always use Television, only 41.3% find it frequently or always credible. Conversely, low-income respondents are less skeptical of non-mass media sources than their usage would reflect. For example, only 2% of this population use computer information frequently, while 38.9% find such information usually or always credible. While the proportions remain small, this disparity between use and credibility also exists for community organizations and government agencies.

The second approach to obtaining source of information, using a Likert scale, provided results consistent with the named approach. Therefore, additional specifics are not reported here. (See Appendix II.)

Table 3
Most Credible Source of Information by Income and Race

Race	*African American*		*White*	
Income Level	*<$15,000*	*≥$15,000*	*<$15,000*	*≥$15,000*
	n=43	*n=148*	*N=40*	*N=460*
Mass Media				
Newspapers	18.6	21.62	10.00	20.65
Other Written Media	2.33	4.05	7.50	7.61
Television	46.51***	39.86***	45.00**	28.04
Radio	4.65	2.03	10.00	5.00
Other Sources				
Employer	2.33	2.03	0.0	1.96
Professional Contacts	9.30	4.05*	0.0*	8.26
Personal Contacts	6.98	10.14	10.00	10.56
Government Agencies	0.0	1.35	0.0	1.74
Religious Groups	9.03	6.08	12.50*	5.22
Community Organizations	0.0	2.03	0.0	1.74
Computer Information	0.0	2.70	2.50	3.04
Other Sources	0.0*	4.05	2.50	6.09

Numbers represent the percentage of each group choosing the specific source of information comparison group is white non-poor (income>$15,000). *p<.10; **p<.05; ***p<.01

Table 4
Most Frequently Used Source of Information by Income and Race

Race	*African American*		*White*	
Income Level	*<$15,000*	*≥$15,000*	*<$15,000*	*≥$15,000*
	n=49	*n=151*	*n=53*	*n=445*
Mass Media				
Newspapers	14.29***	34.44	20.75***	40.00
Other Written Media	2.04	1.99	7.55*	2.92
Television	61.22***	45.70	54.72**	38.43
Radio	6.12	7.95	7.55	7.42
Other Sources				
Employer	0.0	0.0	0.0	1.35
Professional Contacts	2.04	0.0	1.90	0.67
Personal Contacts	10.20	4.64	3.77	6.07
Government Agencies	-	-	-	-
Regilious Groups	2.04	0.66	0.0	0.67
Community Organizations	0.0	0.66*	0.0	0.0
Computer Information	2.04	1.99	3.77	1.80
Other Sources	0.0	1.99	0.0	0.67

Numbers represent the percentage of each group choosing the specific source of information comparison group is white non-poor (income>$15,000). *p<.10; **p<.05; ***p<.01

Table 5
Comparative Ratings of Sources of Informtion. A Closer Look at the Poor: Low-income African Americans and Low-income Whites (Combined)

	Credibility (N=97)		*Frequency (N=104)*	
	Not Rarely Sometime	*Usually Always*	*Never Rarely Sometimes*	*Frequently Always*
Mass Media				
Newspapers	64.1	36.0	52.0	48.0
Other Written Media	63.6	36.4	62.5	37.5
Television	58.7	41.3	17.3	82.7
Radio	66.3	33.7	47.1	52.9
Other Sources				
Employer	56.3	43.7	85.9	14.1
Professional Contacts	51.1	48.9	70.3	29.7
Personal Contacts	58.9	41.1	44.7	55.3
Government Agencies	81.6	18.4	91.3	8.7
Religious Groups	52.7	47.3	56.3	43.7
Community Organizations	57.1	42.9	74.8	25.2
Computer Information	61.1	38.9	98.0	2.0

How Much Do SRS Stakeholders Participate in Public Activities?

We examined self-reported participation in nine categories of public activities over the past two years. The categories included the following: (1) attended a public meeting; (2) contacted an elected official; (3) called the police; (4) volunteered at a civic or church function; (5) organized a neighborhood function; (6) wrote a letter to newspaper editor; (7) signed a petition; (8) participated in a public protest; and (9) participated in labor union activities. Participation in church and civic functions drew the most response, with 54% of respondents reporting such involvement. A much lower percentage of respondents reported being involved in public meetings (24.9%), contacting government officials (24.6%), calling the police (24.7%), and signing a petition (27.8%). The lowest levels of reported participation were in organizing a neighborhood function (14.2%), writing an editorial letter (7.3%), public protest (3.7%), and labor union activity (3.5%). Overall, an average of 80% of the respondents had not participated in these least-cited public activities over the past two years.

Discussion

From this study, television surfaced as the most frequently used and highly credible source of information for the population sample analyzed, regardless of income or race. According to Willis (1992), simply differentiating results among race or income categories provides little understanding of how people process and evaluate sources of information.[33] However, acknowledging individual differences among stakeholders, as these differences relate to the social and cultural factors in a community, facilitates a greater understanding of which socioeconomic variables affect stakeholders' attribution of credibility to sources of information. For instance, source credibility may be a function of circumstances and situational responses related to stakeholders' involvement with issues. This level of involvement may be based on stakeholder socioeconomic factors that change due to social and cultural circumstances or situations in the community. Source characteristics perceived as functional (useful or relevant) to

[33] *See* Albert C. Willis, *Biased Press or Biased Public: Attitudes Toward Media Coverage of Social Groups,* 56 Pub. Opinion Q. 147 (1992).

stakeholders receiving these messages may change from one social and cultural circumstance or situation to another. Thus, it is misleading to assume that there are general dimensions that individuals employ in their evaluation of a source.[34] Source credibility and how a stakeholder evaluates a source can be best understood by investigating the social and cultural context of the source's functional relevance to stakeholders or receivers. This functional relevance relates to the different criteria stakeholders use in assessing specific functions a source is expected to provide in certain risk communication situations, and these criteria manifest the social and cultural factors present in a community.[35]

Residents living near the SRS may evaluate the credibility or relevance of a source based on specific criteria related to the social and cultural contexts of the particular risk communication situation. This dynamic between the source and the stakeholder represents the functional relevance that a risk assessor or stakeholder assigns to a specific source. The credibility of a source relies on the functional relevance the source has for the stakeholder. Additionally, functional relevance of source credibility is based on criteria that develop from the social and cultural factors specific to a community of stakeholders.

Other highly-regarded and frequently-used communication sources include Newspapers, Radio, Personal Contacts, and Religious Groups. These findings conform to the literature. Media-related information sources (e.g., Newspaper, Radio, and Television) demonstrated similar high frequency of use in previous studies.[36] In a recent study of food hazard information sources, 65% of the most frequently cited sources were media-related.[37] Like this study, newspapers were cited as being the most trusted. However, unlike the SRS study, television was not reported as being a highly credible source.[38] Also, although the majority of respondents cite media-related sources as being most

34 *See* D.J. O'Keefe, Persuasion: Theory and Research (1990).

35 *Id.; see also* Vaughn, *supra* note 12.

36 *See* Lynn J. Frewer et al., *What Determines Trust in Information about Food-related Risks? Underlying Psychological Constructs,* 16 Risk Anal. 473 (1996); Lynn J. Frewer & Richard Shepard, *Attributing Information to Different Sources: Effects on the Perceived Qualities of Information, on the Perceived Relevance of Information and Effects on Attitude Formation,* 3 Pub. Understanding Sci. 385 (1995).

37 *Id.*

38 *Id.*

credible, over one-third cite personal and professional contacts and religious groups as being the most credible. In short, a substantial proportion of the SRS public appears to actively seek information from face-to-face or more personable, familiar contacts. Consequently, public outreach and risk communication efforts at SRS should employ a diverse range of information sources to adequately address the preferences of the surrounding population.

Government Agencies and Community Organizations are neither frequently used nor perceived as credible by SRS residents in this sample. The economically disadvantaged portion of the sample was especially distrustful of these sources of information. Not a single low-income African American or White respondent designated Government Agencies as the most credible or most frequently used source of information. These findings are consistent with current literature, which suggests that people are increasingly skeptical and distrustful of government as a source of information.[39] The DOE itself encountered public distrust and dissatisfaction.[40] Nonetheless, government personnel and subcontractors spearhead and serve as spokespersons for public outreach initiatives across the nuclear weapons facilities. It is reasonable to conclude that such initiatives are doomed because of the public's overt skepticism and distrust of "big government."

As evidenced by the study, current outreach and risk communication initiatives undertaken by SRS appear to be substantively incompatible with the reported preferences of the SRS resident sample. SRS currently employs a number of public outreach and education activities.[41] The SRS educational outreach programs include pre-college student programs, continuing education, public forums/workshops, public tours, public Internet sites, press releases, public comment hearings, and educational conferences.[42] However,

39 *See, e.g.,* M. Greenberg et al., *Bombs and Butterflies: A Case Study of the Challenges of Post Cold War Environmental Planning and Management for the US Nuclear Weapons Sites,* 40 J. of Envtl. Plan. and Mgmt. 739 (1997); P. Slovic, J.H. Flynn & M. Layman, *Perceived Risk, Trust, and the Politics of Nuclear Waste,* 264 Sci. 1603 (1991).

40 *See, e.g.,* Binney et al., *supra* note 1.

41 *See* R.E. Petty, J.T. Cacioppo & R. Goldman, *Personal Involvement as a Determinant of Argument-based Persuasion,* 41 J. of Personality and Soc. Psychol. 847 (1981).

these programs do not use the mass media and personal approaches that SRS residents actually use and find credible. Additionally, absolutely no evidence demonstrates that current programs have any impact on SRS stakeholders. In fact this study may provide evidence to the contrary. Of the 1,671 respondents surveyed, not one mentioned any of the SRS programs.

It is possible that SRS outreach programs have done little to influence public participation in policies concerning the site. Although SRS officials employ several techniques to reach the public, none of these approaches are likely to overcome the public's general distrust of government in general, and of the DOE in particular. SRS residents seem unaware of SRS's outreach efforts such as public meetings and SRS's encouragement of stakeholder presence at such events.[43] In fact, a large proportion of stakeholders living within 80 miles of SRS do not even know that this DOE site exists.[44] Moreover, as is true at other DOE sites, SRS residents often question the true intent of outreach efforts.[45] Overall, participation in public activities such as attending public meetings is a very low priority among SRS residents, with 80% of them reporting no involvement in such activities. This is consistent with the findings of other studies at DOE FUSRAP sites, which indicated that about 78% of residents living near the sites do not participate in public activities.[46] Perhaps a change of venue would spark more public involvement in DOE meetings. This study found that SRS residents are twice as likely to be found at a church function than a public meeting. Yet, how often has DOE used churches around SRS as a forum for public dialogue? In summary, SRS officials must examine alternative outreach and communication techniques that are both accessible and acceptable to the public.

SRS outreach programs must be more appropriately targeted or tailored toward stakeholders in order to be effective. Outreach and education programs at SRS would be well served by using mass media approaches to educating and conveying risk to stakeholders. Using

42 *Id.*

43 *See* O'Connor et al., *supra* note 2.

44 *Id.*; Williams, Brown & Greenberg, *supra* note 1.

45 *See* O'Connor et al., *supra* note 2.

46 *See* Feldman & Hanahan, *supra* note 3.

highly credible and personable spokespersons such as religious figures, respected community leaders, and local citizens would likely enhance the credibility of any such risk communication message. The use of such credible figures has been found to significantly hasten the diffusion of information and new ideas across a given population.[47]

Effective risk communication goes beyond characterizing communication sources or information channels. It requires a thorough understanding of various stakeholder attributes. Stakeholder attributes play an important role in stakeholders' perceptions of the fairness or credibility of mass media.[48] An individual's involvement with or level of personal relevance to an issue may be the key to understanding to what degree a stakeholder scrutinizes media or source content.[49] For example, stakeholders who are highly involved in an issue may examine media content severely, as opposed to stakeholders who are not highly involved in an issue. This higher involvement increases the probability that an individual or stakeholder will be more critical of the source of media content (i.e., television, newspapers, radio, etc.).[50] The level of stakeholder involvement may be able to explain why more than 62%, or the majority of the stakeholder respondents, found mass-media sources to be the most credible, and why one-third found personal and professional contacts and religious groups as the most credible.

Degree of involvement may represent a crucial element in understanding media credibility and its relationship to source credibility.[51] For example, as an issue becomes less important to a stakeholder, differences in source credibility may become more relevant for individuals who have low involvement in an issue. But for an issue that stakeholders are highly involved in, source credibility may have minimal effect.[52] According to O'Keefe (1970), this paradoxical conclusion may be explained by considering that individuals who

47 *See* Frewer et al., *supra* note 36; Frewer & Shepard, *supra* note 36.

48 *See* Willis, *supra* note 33.

49 *See* O'Keefe, *supra* note 34.

50 *See* Willis, *supra* note 33.

51 *Id.*

52 *See* R.J. Rhine & L.J. Severance, *Ego-involvement, Discrepancy, Source Credibility, and Attitude Change*, 16 J. of Personality and Soc. Psychol. 175 (1970); Westinghouse Savannah River Company, *SRS Educational Outreach Programs* (visited 1/29/1998) <http://www.srs.gov/general/sroppty/edoutrch.htm>.

perceive an issue as being irrelevant will be content to allow the credibility of the source to influence their assessment of a situation.[53] These individuals may not believe that analyzing the details of the argument surrounding an issue is worth expending effort to understand. Yet, for highly-relevant issues, individuals will focus on the details of a topic, scrutinize arguments and evidence, and delve into the details of the arguments surrounding an issue. These individuals will expend the effort to analyze issue content, and source credibility will be less important.

SRS residents exhibit several attributes that warrant attention. Economic stress is a particularly salient characteristic of SRS residents that should be considered in public outreach initiatives. There is a substantial sector of SRS stakeholders that is economically disadvantaged and likely under-served. As evidenced by this study, many impoverished Whites and African-Americans live near SRS. Economically-stressed communities often suffer a greater burden of environmental problems in comparison to their wealthier counterparts.[54] Environmental inequities such as substandard housing, occupational hazards, air pollution, inequitable distribution of hazardous waste sites, etc., occur more frequently in disenfranchised communities. Individuals living in these conditions may not realize that they can speak up for or participate in environmental policy changes. Hence, public outreach efforts must overcome a degree of human inertia or resistance in disadvantaged communities.

Unfortunately, disenfranchised communities, such as those represented in the sample, are often unable or reluctant to act as advocates on their own behalf.[55] Disadvantaged minority communities are typically inadequately represented in environmental discussions, assessments, research, and program development.[56] The

53 *See* O'Keefe, *supra* note 34.

54 *See* M. Greenberg & D. Schneider, Environmentally Devastated Neighborhoods: Perceptions, Realities, and Policies (1996); Charles Piller, The Fail-Safe Society: Community Defiance and the End of American Technological Optimism (1991).

55 *Id.*

56 *See* M. McClain, J. Montes & G. Sanchez, *Presentation on Community, Tribal, and Labor Involvement in Public Health Service Activities at Department of Energy Facilities* (1994) (unpublished manuscript); *see* Ralph M. Perhac, Jr., *Environmental Justice: The Issue of Disproportionality,* 21 Envtl. Ethics 81 (1999).

Commission for Racial Justice and Public Access states that "there has been a growing desire by those affected communities at contaminated sites to have a greater role in the decision making and problem solving process."[57] Consequently, risk communication efforts should focus heavily on informing and empowering disadvantaged SRS stakeholders. Outreach should not focus exclusively on minority stakeholders, a population in which environmental justice communication efforts have historically been targeted. Substantial funds have been expended for environmental justice-related outreach at SRS.[58] However, these programs appear to neglect impoverished and environmentally-stressed populations living near the site. Therefore, public outreach and education initiatives at SRS should target the entire range of economically-disadvantaged and environmentally-stressed populations surrounding the site.

Appendix I
Stakeholder Characteristics by Race and Income

Race	*African American*		*Whites*		
Income Level	*<$15,000*	*≥$15,000*	*<$15,000*	*≥$15,000*	
	n=101	*n=323*	*n=100*	*n=976*	*Groups**
Dichotomous Variables (proportions)					
Baptist	72.28	66.56	50.00	44.26	1, 2, 3, 6
Employed Full Time	43.00	61.22	26.00	56.91	1, 3, 4, 5
High Economic Dependence	25.74	30.65	30.00	39.34	2, 3,6
Medium Economic Dependence	47.52	39.94	29.00	22.23	2, 1, 3, 6
Low Economic Dependence	26.73	29.41	32.00	38.42	2, 6
Participates	67.43	71.83	58.00	79.92	1, 2, 4, 5, 6
Lives Up River	50.00	56.66	59.00	57.58	-
Owens Home	66.34	73.67	75.00	86.18	1, 2, 5, 6
Female	75.25	60.25	72.00	56.56	1, 2, 4, 5
High Trust	29.70	20.87	29.00	33.54	2, 6
Extrinsic Control	44.55	41.61	38.78	33.92	2, 6
Accept Health Risks for Economics	56.52	34.98	36.08	38.66	1, 3, 4
Workers Accept Higher Health Risks	58.06	45.07	36.96	37.96	1, 2, 4, 6
Accept Hazardous Waste	19.54	17.75	13.95	24.31	2, 4, 5
Current SRS employee	0.0	2.89	1.00	3.84	1
Previous SRS employee	4.95	7.07	1.00	4.47	-

Continued

57 United Church of Christ, Commission for Racial Justice and Public Access, Inc., Toxic Waste and Race in the United States: A National Report on the Racial and Socioeconomic Characteristics of Communities with Hazardous Waste Sites (1987).

58 *See* Williams, Brown & Greenberg, *supra* note 1.

Continuous Variables (means)					
Age (18-92)	42.63	41.14	56.27	47.18	1, 2, 3, 5, 6
Neighborhood Stressors (0-26)	6.46	5.60	5.88	5.57	-
Neighborhood Qualities (0-13)	6.28	5.67	5.74	5.57	5
Categorical Variables (3 categories each)					
Education: Highest Degree	None HS		College +		1, 2, 4, 5, 6
County Population	Low	Medium	High		1, 2, 5, 6
Perceived Distance for SRS	<10miles	10-< 20miles	>=20miles		2
Rating of Current Neighborhood	Excellent	Good	Fair/Poor		1, 2, 3, 4, 6

• Group differences (p<.05) as follows: 1=low-income (Whites & African Americans) vs. non-low-income (Whites and African Americans); 2=African Americans vs. Whites; 3=low-income African Americans vs. low-income Whites; 4=low-income African Americans vs. non-low-income African Americans; 5=low-income Whites vs. non-low-income Whites; 6= non-low-income African Americans vs. non-low-income Whites.

Appendix II
Comparative Ratings of Sources of Information
Differences by Income and Race
Source of Information Ratings Based on Scale of 1-5

	Credibility			*Frequency of Use*		
	Poor African Americans vs. Whites	*African Americans Low-income vs. Non-low-income*	*Whites Low-income vs. Non-low-income*	*Poor African American vs. Whites*	*African Americans Low-income vs. Non-low-income*	*Whites Low income vs. Non-low-income*
Mass Media						
Newpapers	p<.102	p<.069	p<.675	p<.292	p<.056	p<.091*
Other Written Media	p<.020	p<.137	p<.844	p<.193	p<.547	p<.019*
Television	p<.021	p<.148	p<.881	p<.993	p<.903	p<.255
Radio	p<.030	p<.069	p<.646	p<.446	p<.240	p<.437*
Other Sources						
Employer	p<.853	p<.285	p<.746	p<.047	p<.175	p<.031
Professional Contacts	p<.032	p<.366	p<.551	p<.430	p<.054	p<.020
Personal Contacts	p<.719	p<.851*	p<.466	p<.799	p<.842	p<.623
Government Agencies	p<.160	p<.617*	p<.359	p<.183	p<.990	p<.001
Religious Groups	p<.124	p<.160	p<.451	p<.392*	p<.586*	p<.025*
Community Organizatins	p<.041	p<.016	p<.319	p<.291	p<.686	p<.084*
Computer Information	p<.140	p<.130	p<.552	p<.013	p<.053	p<.040

Includes only those who answered 1-5 (not, rarely, sometimes, usually, always) (i.e., excludes NA, DK and missing.) Except where noted (*), Fisher's Exact Test was used in place of Chi Square due the occurrence of counts less than 5.