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Cover Page Footnote

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Risk and Recreation: Differences Due to Gender, Age and Education*

Joanna Burger**

Introduction

In the coming decades, the Department of Energy (DOE) will be making decisions regarding their mission for future land uses of many of its former weapons production sites in 34 states.¹ The DOE is considering seven land use options: agriculture, residential, recreational, open space/recreation, open space, industrial/commercial, and storage/disposal. Several groups will provide information to influence future land use decisions, including local state and federal governments, tribal governments, site-specific advisory boards, affected communities, interest groups, and community organizations.² It is becoming increasingly clear that the decisions concerning future land use of the DOE sites must be made with input from the groups mentioned above.³ Moreover, the role of local government officers and public planners is critical to the process.⁴ Failure to include the views of

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¹ See DOE, *Charting the Course: The Future Use Report DOE/EM-0283* (1996).

² See *id.*; see also National Research Council, *Improving the Environment: An Evaluation of DOE's Environmental Management Program* (1995); see also National Research Council, *Building Consensus Through Risk Assessment and Management of the Department of Energy's Environmental Remediation Program* (1994).

³ See Report of the Commission on Risk Assessment and Risk Management (1996); Thomas P. Grumbly, *Risk in the Republic: Comparative Risk Analysis and Public Policy*, Address at the *Society For Risk Analysis* (Nov. 15 1996).

⁴ See Karen Lowrie & Michael Greenberg, *Placing Future Land Use Planning in a*

stakeholders will lead to difficulties and inequities in the final decisions.⁵ Information on risk, economics, mission, and cultural values will be used to make decisions about remediation, restoration, and cleanup.⁶

Determining the risks to people from land use options requires information on the types of activities, types and duration of exposure, types of populations, and characteristics of exposed people, such as ethnicity, gender, age, and other factors. Without population based information it will be difficult to determine risk levels or compatible future land uses. Determining the level of cleanup is also dependent upon predicting exposure scenarios and future land uses.

Of the seven land use types being considered by DOE, two involve recreation (recreational and open space/recreational), making it critical to develop information on recreational rates.⁷ Site-specific information is important for all of the potential land use categories, but this may be less obvious than the need for information of potential agricultural or industrial options. Further, since recreational rates may vary in different parts of the country, it is essential to have site-specific data for assessing those rates.

In this paper I examine recreational rates of people living near the Idaho National Engineering and Environmental Laboratory (INEEL) located near Idaho Falls, Idaho. I was particularly interested in determining whether gender, age, education, and location of residence influenced recreational rates. Since hunting and fishing are important activities for the residents of Idaho, I was also interested in differences in consumption rates for self-caught fish and game.⁸ I predicted that there would be gender differences in recreational rates (males engaging in higher rates than females), but that there would be no differences in recreational rates by residence location, age, or education.

Regional Context: The Savannah River Site, Fed. Facilities, Spring 1997 *Envtl. Jnl.* at 51.

⁵ See K.E. Jenni et al., *The Rise and Fall of a Risk-Based Priority System: Lessons From DOE's Environmental Restoration Priority System*, 15 *Risk Anal.* 397 (1995).

⁶ See *Improving the Environment: An Evaluation of DOE's Environmental Management Program* (1995), *supra* note 2; see also *Building Consensus Through Risk Assessment and Management of the Department of Energy's Environmental Remediation Program* (1994), *supra* note 2.

⁷ See DOE (1996), *supra* note 1.

⁸ Data on Hunting and Fishing Rates, U.S. Fish & Wildlife Service (1991).

In its recent future use report, DOE used 14 days as a reasonable maximum number of exposure days for recreationists who might use a DOE site.⁹ In earlier work, I showed that many hunters and fishermen living near the DOE's Savannah River Site in South Carolina may use the site for more than 14 days.¹⁰ It seemed unlikely to me that this 14 day estimate would be reasonable for people living in Idaho, including Native Americans and other residents.¹¹ Thus, the present research was partly designed to examine that particular question.

DOE holds vast quantities of land consisting of over 130 sites in 34 states, that were once used for nuclear weapons production. With the end of the Cold War, the DOE changed its focus toward environmental management and devoted considerable attention both to its future mission, and to future land uses on its sites.¹² However, the DOE must remediate huge quantities of chemical and radioactive wastes. Its facilities are in various stages of cleanup exacting enormous costs and heightened worker, public safety, and ecological risks.¹³ The current research is part of on-going studies to examine the relationship between ecological resources, ecological risk, and future land use by the Consortium for Risk Evaluation with Stakeholder Participation. One overall objective of the study was to develop risk methodologies for assessing both human and ecological health.

Methods and Study Area

INEEL was established in 1949 as an isolated facility to build, test, and perfect nuclear reactors. The facility comprises 2,308 km² of

⁹ See DOE (1996), *supra* note 1.

¹⁰ See Joanna Burger et al., *Risk Perception, Federal Spending, and the Savannah River Site: Attitudes of Hunters and Fishermen*, 17 *Risk Anal.* 313 (1997); see also Joanna Burger, *Recreation and Risk: Potential Exposure*, 52 *J. Tox. Environ. Health* 269 (1997); see also Joanna Burger, *Environmental Attitudes and Perceptions of Future Land Use at the Savannah River Site: Are There Racial Differences?*, 53 *J. Tox. Environ. Health* 255 (1998).

¹¹ See Joanna Burger et al., *Risk Concerns, Land Use, and the Idaho National Engineering and Environmental Laboratory: Attitudes of the Shoshone-Bannock and other American Indians*, (manuscript on file with Environ. Res.).

¹² See DOE (1996), *supra* note 1.

¹³ See *Improving the Environment: An Evaluation of DOE's Environmental Management Program* (1995), *supra* note 2.

federally owned and administered land on the upper Snake River Plain. About 6% of INEEL's lands are devoted to roads and facilities. The rest of the restricted-access land, containing important sagebrush-steppe biome, was designated a National Environmental Research Park in 1975.¹⁴ INEEL employs about 8,000 people. Lands immediately beyond the boundaries of the INEEL facility are desert, foothills or agricultural fields. Livestock are allowed to graze on the peripheral 60% of the INEEL, away from the centrally located major facilities.¹⁵

On May 23, 1997, we interviewed 262 English-speaking people at the 42nd Annual Fisherman's Breakfast in St. Anthony, Idaho located 66km from INEEL. Approximately 6,000 people attended this festival. Our sample was primarily white Americans (94%), with the balance of Hispanic decent. Of those people sampled, only 9% had hunted or fished on INEEL, and 11% had actually worked at the facility.

Subjects were interviewed while they waited in a long line for breakfast. We moved along the line interviewing people. Thus, the sample was not randomly selected; but there is no reason to believe it was not representative of those attending the festival. When approached with an explanation of what we were doing (and why), most people readily agreed to be interviewed.

Our questionnaire was divided into several parts: 1) demography (age, sex, occupation, ethnicity, and residence); 2) recreational activities; 3) consumption patterns; and 4) future land use, environmental problems, and specific concerns about INEEL (not discussed in this paper). Subjects also were asked whether they smoked and to rank their health from 1 (well below average) to 5 (well above average).

The questionnaire was essentially identical to the one used at events in South Carolina near the Savannah River Site (SRS, Palmetto Sportsman's Classic) and at several events near the INEEL.¹⁶ The interviewers were the same for both the Idaho and South Carolina sites.

¹⁴ See DOE, Office of Energy Research, *National Environmental Research Parks*, (1994); see also R. G. Mitchell et al., *Idaho National Engineering and Environmental Laboratory: Site Environmental Report*, Environmental Science and Research Foundation (1997).

¹⁵ See Joanna Burger et al., *Risk Perception, Federal Spending and the Savannah River Site: Attitudes of Hunters and Fishermen*, *supra* note 10.

¹⁶ *Id.*

Six trained assistants conducted the interviews. The interview usually required about fifteen minutes to complete.

Subjects were asked how many days they engaged in different recreational activities including hunting, fishing, hiking, camping, and photography, as well as how many hunting guns, fishing rods, binoculars, and cameras they owned. They were then asked whether they ate different species of game, whether the game from INEEL was safe to eat, whether they would recreate on site if it were open to the public, and if they would pay to do so. Finally, the questionnaire asked the subjects their age, occupation, ethnicity, and educational level.

We divided the respondents into three age categories: under 30, 30-49, and 50 years or over. We divided educational level into three categories: non-high school graduate (< 12 years), high school graduate or some college (12-15 years), and those with a college degree or more (16+ years).

Finally, we divided the respondents into two locational categories: those who lived in counties adjacent to the site, and those who lived elsewhere.

Results

Non-parametric Wilcoxon X^2 tests were used to examine differences between groups, and Kendall tau coefficients were used to examine correlations of lead among tissues. We used an analysis of variance (ANOVA) test to determine whether there were differences among variables as a function of gender, age and residence. We used a Duncan Multiple Range Test to determine the overall differences.¹⁷

Recreational rates varied significantly by gender (Table 1), with males engaging in higher rates, except for photography. As might be expected, men owned more guns, fishing rods, and binoculars, but there were no gender differences in ownership of cameras.

There were several significant differences in recreational rates as a function of age (Table 1). There were no significant age-related differences in hunting and fishing rates, however, hiking rates were highest in people over 50 years, and camping rates were highest in people under 30 years of age. There was a positive correlation of age with possession of guns, fishing rods, binoculars and cameras (Table 1).

¹⁷ See SAS Institute, SAS/STAT User's Guide for V.6.03, SAS Institute (1988).

Table 1

Recreational activities and equipment ownership compared to age for people interviewed at St. Anthony. Means \pm SE with NS=not significant. Dissimilar letters differ significantly using a Duncan Test.

AGE	14-29	30-49	50-84	WILCOXON χ^2 (p)
Sample	89	105	58	
<i>Mean days engaged in:</i>				
Hunting	8.06 \pm 1.78	12.98 \pm 3.83	6.92 \pm 1.99	3.92 (NS)
Fishing	18.18 \pm 3.40	21.54 \pm 4.93	18.97 \pm 5.99	1.05 (NS)
Hiking	16.52 \pm 3.02	16.77 \pm 4.15	20.85 \pm 8.50	13.24 (0.002)
Camping	18.92 \pm 2.63	16.36 \pm 3.70	10.59 \pm 1.99	12.14 (0.003)
Photography	37.5 \pm 6.95	27.03 \pm 5.81	48.82 \pm 10.9	2.71 (NS)
<i>Number owned:</i>				
Guns	2.64 \pm 0.52	3.91 \pm 0.55	5.91 \pm 1.14	9.23 (0.01)
Rods	2.47 \pm 0.30 (A)	4.52 \pm 0.38 (A,B)	5.63 \pm 0.99(B)	17.67 (0.001)
Binoculars	0.83 \pm 0.09 (A)	1.50 \pm 0.12 (B)	2.13 \pm 0.51 (B)	23.74 (0.001)
Cameras	1.47 \pm 0.09 (A)	2.19 \pm 0.15 (B)	2.48 \pm 0.21 (B)	18.06 (0.001)

Supporting my initial prediction, there were no differences in recreational rates as a function of either educational level or location of residence. Similarly, there were almost no differences in the possession of equipment as a function of education or location of residence, except that the number of fishing rods increased with education. Fishing rod ownership ranged from 2.4 + 0.6 (less than high school graduate), 3.7 + 0.3 rods (high school graduate), to 5.1 + 0.7 rods for college graduates ($X^2 = 6.0$, $P < 0.05$). People who lived adjacent to the site had more guns (5.6 + 1.0 vs 3.6 + 0.5, $X^2 = 5.8$, $P < 0.02$) and more binoculars (2.1 + 0.6 vs 1.2 + 0.1, $X^2 = 3.9$, $P < 0.05$) than those who lived farther away.

There were many significant correlations between the rates of different recreational activities for men, but not for women (Table 1). For men, hunting, fishing, hiking, and camping were all interrelated. For women, only hiking and fishing were correlated. Similarly, for men, the possession of different types of recreational equipment was highly correlated, but this was less so for women.

The percentage of women and men that ate different types of fish and game is shown in Table 2. Except for deer, where there was no gender difference, a significantly higher proportion of men ate all other species of game than did women. Over 85% of all men ate deer, elk, and self-caught fish, while only 73-77% of women ate those species. The disparity was greater for other game species (Table 2).

Most people interviewed had not eaten game from INEEL lands. However, 12% of men and 3% of women had eaten antelope from INEEL ($X^2 = 5.6$, $P = 0.02$); 4% of men and 1% of women had eaten elk from INEEL (not significant). Only 10% of men, and 13% of women said they would be concerned about eating the game from INEEL.

Table 2
Gender differences in consumption of game for people interviewed at St. Anthony

	% FEMALE	% MALE	WILCOXON X^2 (p)
Sample	87	131	
Deer	76.5	85.6	NS
Elk	72.8	87.9	7.75(0.005)
Antelope	34.6	50.0	4.85(0.03)
Waterfowl	33.3	59.1	13.32 (0.001)
Grouse	33.3	58.3	12.56(0.001)
Rabbit	23.5	47.7	12.49(0.001)
Squirrel	3.7	12.9	4.97(0.03)
Dove	16.3	35.6	9.20(0.002)
Self-caught Fish	75.3	88.6	6.49(0.02)

When asked whether they would recreate on INEEL, 47% said yes, and nearly half of those said they would pay to recreate there.

Discussion

Methodological Considerations

One of the difficulties with examining recreational rates is that it is not necessary for a person to engage in each activity separately. That is, some of the subjects may have considered that they were hunting and hiking at the same time, and others may have considered that they camped when they hunted. Thus it is difficult to determine total

exposure from recreational activities. At one extreme, it is realistic to simply add up all the days that a person engages in each of the activities to arrive at total days devoted to recreation, while in others this would not be the case. At the very least, however, the maximum for any one activity represents a minimum potential exposure.

It would have been ideal to have information on income. However, previous work made clear that most people object to divulging their income, but will readily admit their education level.¹⁸ Thus, I used schooling as a partial surrogate for income. In this study, years in school was a significant variable for some aspects, notably for sports equipment.

Another methodological problem was in the use of "recreate". We used the term to refer to all recreational activities, including hunting and fishing. It became apparent during some of the interviews that subjects considered recreation to be camping and hiking, and not hunting or fishing. If anything this would be a conservative bias, since it would underestimate the number of people who said they would recreate on INEEL.

Finally, it was odd that there was not congruence between the percent of men and women that ate different game animals, since presumably men and women are eating together in the same houses. The difference might be explained partly by the consumption of some game species while on the hunt. Indeed, some men said that they camped while they were hunting, and ate some of their game while camping.

Recreation and Risk

Recreation is one possible future land use for INEEL. However, in DOE's future use report, INEEL did not list recreation, although they did include open space/grazing as an option for large portions of land away from the current industrial/ nuclear sites, which currently occupy 10-15% of the land.¹⁹ Previous work suggests that many local residents would like the opportunity to hunt, camp, and hike on INEEL.²⁰ Some people currently hunt on the edges, either legally or

¹⁸ See Burger, *supra* note 15.

¹⁹ See DOE (1996), *supra* note 1.

²⁰ See Burger, *supra* note 11.

illegally, but clearly there is wide-spread local support for recreational uses on the site.

With the commitment of DOE to include stakeholders in management, remediation, and future land use decisions, an emphasis on recreation may come to the fore. If limited recreation were allowed on INEEL, it is imperative to understand recreational rates of people living close enough to make use of any opportunities there.

In its future use document, DOE used 14 days as the reasonable maximum number of exposure days for recreationists who might use DOE sites.²¹ In earlier work I showed that many hunters and fishermen living near the DOE's Savannah River Site in South Carolina recreate far more than 14 days a year, and therefore might use the site for over 14 days, if it were open to the public.²² Similarly, the data from the present study indicate that many people in Idaho engage in outdoor recreation for more than 14 days a year. For example, men fished an average of 31 days a year, camped an average of 20 days a year, and hiked an average of 19 days a year. Women hiked an average of 16 days and camped an average of 12 days a year.

Although it is unlikely that any one person would engage in all of his or her recreational activities at any one site, it is conceivable that people living near the site may use the site intensively. Nearly half of the people interviewed said they would recreate on INEEL. Further, people reported that the elk and antelope herds on INEEL are extensive, and that they would love to hunt there. There is currently limited hunting on the edges of the site by special permit.²³ Presumably the risk would be greater for people who live in counties adjacent to the site compared to those living farther away, because of the ease of access.

Our results suggest that gender had a substantial effect on recreational rates. Overall, men engaged in higher rates of hunting, fishing, hiking and camping than women. Gender differences in environmental attitudes and recreational attitudes have been reported

²¹ See DOE (1996), *supra* note 1.

²² See Burger et al., *Risk Perception, Federal Spending, and the Savannah River Site: Attitudes of Hunters and Fishermen*, *supra* note 10; see also Burger, *Environmental Attitudes and Perceptions of Future Land Use at the Savannah River Site: Are There Racial Differences?*, *supra* note 10.

²³ See Idaho Department of Fish and Game, *Big Game Rules* (1997).

extensively.²⁴ Although considerable attention has been devoted to examining gender differences in attitudes toward environmental problems, few studies have examined such differences with respect to their implications for risk. Dr. Burger examined gender differences in recreational rates of people living near the Savannah River Site (SRS), and found significant gender differences, particularly for African-Americans.²⁵

Toth and Brown recently explored the racial and gender meanings of why people fish, noting that there are many different reasons, including holistic concepts such as liking the outdoors, being with family/friends, relaxing, enjoying a sport, and providing fish for fish fries, to give away, to sell, or for subsistence.²⁶ They postulated that since fishing is fulfilling so many needs besides subsistence, changing fishing practices may be difficult. A similar analysis could be completed for other recreational activities, such as hunting, camping and hiking. I suspect that hunting provides a wide range of pleasures and cultural benefits, not the least of which is giving away meat to friends and family.

The social, economic, and holistic meanings of leisure also contribute to gender differences in recreation, in most cases, resulting in higher rates for men than women.²⁷ From a risk perspective, that indicates men might be more directly exposed to on-site contaminants than women. However, in the case of hunting and fishing, risk derives not only from direct on-site exposure, but from consumption as well. A surprisingly high percentage of both men and women interviewed eat a variety of fish and game species. That provides for direct immediate consumption risk, but also a later risk since many people freeze game meat for later consumption. Large animals such as deer and elk are

²⁴ See James Flynn et al., *Gender, Race, and Perception of Environmental Health Risks*, 14 *Risk Anal.* 1101 (1994); see also C.J. Brody, *Differences by Sex in Support for Nuclear Power*, 63 *Social Forces* 209 (1984); see also J.M. Gutteling & O. Wiegman, *Gender-specific Reactions to Environmental Hazards in the Netherlands*, 28 *Sex Roles* 433 (1993); see also P.A. Gwartney-Gibbs & D.H. Lach, *Sex Differences in Attitudes Toward Nuclear War*, 28 *J. Peace Res.* 161 (1991).

²⁵ See Burger, *Risk Perception, Federal Spending and the Savannah River Site: Attitudes of Hunters and Fishermen*, *supra* note 10.

²⁶ See J.F. Toth, Jr. & R.B. Brown, *Racial and Gender Meanings of Why People Participate in Recreational Fishing*, 19 *Leisure Sciences* 129 (1997).

²⁷ *Id.*

certainly frozen for food during the winter and spring. Over 70% of both men and women reported eating deer and elk, and over 35% reported eating antelope. Since these animals are common on INEEL, the potential for consumption is high, if hunting were completely open on INEEL. Those interviewed did not express concern about the safety of the fish and game from INEEL, as they rated eating the game the lowest of all concerns.²⁸ Whether consumption of wild game translates into risk depends upon levels of contamination and levels of consumption.

Conclusions

The DOE is facing a reevaluation of the mission and future uses of its extensive lands. Although the initial steps in this process have been completed, there will be many more discussions with various governmental agencies, tribal nations and other stakeholders before final decisions are made. Understanding potential exposure from the seven land uses noted by DOE is essential before decisions about cleanup levels, remediation, and restoration can be made.

Results of the current survey of people living around INEEL indicated: 1) people living in the counties surrounding INEEL engage in high levels of recreation; 2) rates for hiking and camping are particularly high for both men and women; 3) hunting and fishing rates are high for men; 4) half of those interviewed said they would recreate on INEEL; 5) over 70% of men and women interviewed said they ate deer and elk meat; and 6) only 10% said they had concerns about eating the game from INEEL. Those data suggest that potential utilization for on-site recreation by local residents would likely far exceed the 14-day recreational risk assumption of DOE, if the lands were opened for hunting and other recreation. Further, consumption of game might also be high because of the high recreational rates, high consumption rates, and high confidence that the game from INEEL is safe to eat.



²⁸ See Joanna Burger et al., *Attitudes and Perceptions About Ecological Resources, Hazards, and Future Land Use of People Living Near the Idaho National Engineering and Environmental Laboratory*, *Environ. Monit. Assess.* (1999).

