

# Extent of Recreational Incidents and Determinants of Liability Insurance Coverage for Hunters and Anglers in Mississippi

Changyou Sun, Sangita Pokharel, W. Daryl Jones, Stephen C. Grado, and Donald L. Grebner

## ABSTRACT

Private landowners refrain from opening their lands for recreational use in fear of potential liability. This study examined the extent of actual bodily injuries and property damages sustained by hunters and anglers in Mississippi during the hunting and fishing seasons from 2002/03 to 2004/05. The percentage of liability insurance coverage on hunters and anglers and determinants of the pattern were also analyzed. Data were acquired from a telephone survey on a random sample of adults who purchased Mississippi hunting and fishing licenses for the 2004/05 season. The survey revealed that 1% of respondents had incidents related to their recreational activities from 2002/03 to 2004/05. About 17% of respondents had liability insurance coverage in the 2004/05 season. Age, years of hunting, and income were positively related to the purchase of liability insurance. In addition, Caucasians or nonresidents of Mississippi had a higher likelihood of having insurance coverage. The results revealed that special liability insurance has been helpful in reducing monetary losses from recreational use, and furthermore, liability insurance may be more effectively promoted in several ways.

**Keywords:** bodily injury, fee access, hunting, liability insurance, private landowners, property damage

Demand for, and participation in, outdoor recreational activities in the United States have been growing steadily over the past decades (Cordell et al. 1998). Outdoor recreational activities are diverse and typical examples include hunting, fishing, hiking, boating, wildlife-watching, skiing, swimming, camping, rock climbing, and sightseeing (Thomas and Schumann 1993). In 2001, a national survey of hunting and fishing revealed that 82 million US residents, 16 years and older, participated in wildlife-related recreation. Their spending totaled \$108 billion, or 1.1% of the U.S. gross domestic product (USDI and USDC 2002).

Supply of outdoor recreation relies on the availability of lands and related resources, most of which are related to forest lands and some agricultural lands. Nationwide, about one-third of the US land area, or 747 million acres, is forestland, and most is privately owned (Smith et al. 2001). Public forests have been the traditional and major supplier of outdoor recreation, either with user charges (e.g., parks with entry fees) or without any direct charges (e.g., dispersed recreation, parks without entry fees). With the growing demand for outdoor recreation, public forests have become increasingly congested (Teasley et al. 1999). Therefore, it has long been recognized that access to privately owned forest lands must play a strategic role in meeting the rising demand for outdoor recreation (Baen 1997, Cordell and Tarrant 2002, Porter et al. 2002).

In the past, private forest industrial firms have quickly responded to the growing demand for outdoor recreation. A survey on industrial hunting lease programs revealed that 38 southern forest firms leased 76.6% of their lands to hunting clubs and individuals in 1999, and additionally 7.1% to state wildlife management areas

(Morrison et al. 2002). In contrast, nonindustrial private forestland (NIPF) landowners have been much slower responding to the growing demand for outdoor recreation. In Mississippi, Jones et al. (2001) reported results from two surveys of nonindustrial private landowners who provided fee hunting opportunities. The percentage of respondents that charged for hunting privileges ranged from 8 to 14%. In Alabama, Zhang et al. (2006) found that NIPF landowners had similarly low participation rates in providing fee access recreation. In addition, nationwide recreation statistics for hunters and anglers on private lands also implied the same conclusion (Teasley et al. 1999). In 2001, 38 million US residents hunted or fished. Of their total expenditures of \$70 billion, 28% was for trip-related items (e.g., food), 59% for equipment, and only 13% for items like land leasing, licenses, and other miscellaneous items (USDI and USDC 2002).

The low supply of fee access recreation by NIPF landowners may be explained by several factors. One that has been widely cited is the potential for injuries to recreational users and damage to properties and, therefore, possible liability for landowners (Benson 2001, Jones et al. 2001). Common-law tort usually governs landowner duties and obligations to recreational users. Recreational users can be categorized as invitees, licensees, or trespassers. Among the three categories, landowners owe the greatest duty to invitees, then to licensees and trespassers. As a result of liability concerns, many landowners have been reluctant to open their land to recreational use for fear of liability resulting from user accidents (Wright et al. 2002).

This study has been motivated by these unaddressed issues related to outdoor recreation and liability concerns raised by private

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landowners. As a part of a larger project, the overall goal of this study was to examine the extent of recreational incidents and liability insurance coverage from the perspective of recreationists by a direct telephone survey. At first glance, this may seem related to recreationists as consumers and their welfare only. However, as revealed by the above motivation and the following detailed literature review, private landowners have been deeply involved in this issue as suppliers of land and related resources for outdoor recreation. Recreational incidents and liability issues have been, and will continue to be, a concern for private landowners in opening their land for recreational use. In addition, specialized liability insurance policies are needed to manage the unique risk of outdoor recreation not only for recreationists, but also for landowners and society as a whole.

Specifically, the study objectives were to identify the actual bodily injury and property damage patterns in Mississippi over the three hunting seasons from 2002/03 to 2004/05, and to examine patterns of liability insurance coverage on recreational users in Mississippi during the 2004/05 season. The results of this study provided landowners with useful information to evaluate the magnitude of the liability burden in opening their land for outdoor recreation. It also revealed that special liability insurance has been helpful in reducing financial losses from recreational use. Furthermore, the analysis suggested several ways of promoting liability insurance and increasing its coverage.

## Literature Review

### Liability Concerns of Landowners and Incidents

The promotion of outdoor recreation on private lands, especially fee-based recreation, has several benefits (Jones et al. 2001). It can help meet the increasing demand for outdoor recreation by the public. Private landowners can derive additional income from hunting, fishing, and nonconsumptive activities such as bird watching and ecotourism. Furthermore, income from fee-based recreation provides the landowner with incentives to manage their lands in a more environmental-friendly way. Landowners can improve wildlife habitat quality to increase game quality and the recreational value of their land. Nonetheless, given these broad benefits, a landowner's choice in providing outdoor recreation may still vary widely from prohibitive use, open to friends only, fee-based recreation, and totally free access to the public. The choice can be influenced by various factors (Wright and Fesenmaier 1988): resource attributes (e.g., acreage, wildlife habitat availability and quality); landowner characteristics (e.g., ownership objectives and sociodemographics); and recreational user behavior (e.g., property damage, bodily injury, litter, fire risk).

Among these factors, it was widely recognized that liability has acted as one of the major disincentives for landowners to open their lands to the public. According to Jones et al. (2001), among Mississippi landowners involved in fee hunting, liability expenditures were one of the largest, second to managerial expenses only. Poaching and trespassing were the highest-rated problem incurred, followed by accident liability. Landowners not engaged in fee hunting also expressed that they were not involved because of concerns over loss of land control and privacy, accident liability, property damages, poaching, and trespassing.

Despite widespread concern for liability issues, there have been limited studies documenting actual bodily injuries and property damages resulting from recreational activities in the United States. This lack of knowledge further increases the liability concern for landowners. Among the limited studies, Wright et al. (2002) con-

ducted a comprehensive case review for historical litigation involving recreational injuries in the United States. From 1965 to 2000, there were 637 court cases being heard. These cases were analyzed based on landowner characteristics (i.e., private or public), recreational activities pursued at the time of injury (e.g., hunting, fishing, swimming), and actual liability exposure. Liability on landowners was found in about one-third of these cases. The analysis concluded that the myth and perception of landowner liability appeared to be greater than the actual liability risk. Supplemental to the incident evidence revealed from legal cases, another way to examine actual recreational incidents is to make inquiries of recreational users such as hunters and anglers and collect relevant information directly. Because no studies have attempted to do that, there is a need to understand the scale of recreational incidents by using instruments such as a survey.

### Liability Insurance as a Way to Reduce Liability

No matter how cautiously recreational users behave, outdoor recreational activities can inevitably produce some bodily injuries or property damages. Various ways exist to reduce the negative impact from liability and a number of studies have been conducted to address these questions. At first, concerns related to incidents and liability of providing outdoor recreation has been an active research topic in law. Several studies approached the issue from the perspective of social efficiency and equity, and some also closely examined the court's interpretation of relevant laws (Barrett 1977, Becker 1991, Lee 1995). In particular, Miceli et al. (2001) examined theoretically whether landowner immunity would promote efficient provision by landowners and efficient entry by recreational users. The analysis concluded that, when land was undeveloped, a policy of landowner immunity from liability would be more socially efficient than one of landowner liability.

Currently, each state in the United States has passed the Recreational Use Statutes (RUS) (Lee 1995, Wright et al. 2002). The RUS was intended to encourage landowners to make their lands available for public recreational use. These statutes are similar in limiting landowner tort liability and altering the common-law duty of care. Most do not provide liability protection when a landowner charges an access or use fee. Nonetheless, during the last several decades, there has been a trend to relax the fee restriction. At present, 19 states allow landowners to impose limited fees and charges for recreational use and still retain protection from the RUS. Overall, the RUS has provided limited protection concerning landowner liability involving outdoor recreation.

Liability insurance is another way to reduce landowner liability. Although insurance cannot completely prevent a landowner from being sued, it does provide a landowner with two major benefits: payment of damages to a third party for injuries covered by the insurance policy up to the amount under the policy; and an entity (i.e., the insurer) with a duty to defend the landowner against all actions on any allegation of facts and circumstances potentially covered by the insurance policy, including groundless or fraudulent claims (Noble 1991). Of course, landowners can only receive these benefits after they pay their insurance premiums.

It should be noted that many commonly held insurance policies are inadequate for the purpose of reducing liability involving outdoor recreation. For example, a standard automobile insurance policy is designed to cover liability arising from injuries from ownership, care, maintenance, operation, or use of a vehicle. If there is any independent, intervening cause of the accident, there is no coverage

under the policy. Given these limitations on liability coverage, the standard automobile insurance policy is inadequate to cover all potential liability arising from recreational access. Generally, the same conclusion also applies to insurance policies for homeowners, farmers, and other purposes (Noble 1991). Therefore, specialized insurance policies are needed to deal with the unique risk associated with outdoor recreation.

There are various specialized liability insurance policies for outdoor recreation on the market. For example, the Mississippi Forestry Association (MFA), teaming up with an insurance company, currently offers complete liability insurance for hunting clubs and timberland owners who lease land for hunting. The claim limit is \$1 million per occurrence. The policy premium is \$0.19/ac/yr for hunting clubs or \$0.38/ac/yr for landowners (MFA. Available online at <http://msforestry.net>; last accessed on May 21, 2007).

In practice, liability insurance for outdoor recreation can be carried by landowners or recreational users. State law may require recreational enterprises to carry a specific amount of liability insurance (Noble 1991). As an alternative to insurance carried by the landowners, landowners may require recreational users to carry insurance for recreational use. This is a common arrangement between landowners and groups, such as hunting clubs, which lease land. As a term of the lease, the landowner requires the lessee to carry liability insurance on both the lessee and landowner.

Currently, the degree of liability insurance coverage on recreational users has attracted limited attention. A variety of questions are still unanswered. For example, what percent of hunters and anglers are aware of accidental insurance and have liability insurance coverage? Who pays for the insurance, landowners or users? Furthermore, the relationship between insurance coverage and sociodemographics of recreational users also merits further examination. Because the relationship between hunting participation and sociodemographics of hunters has been well analyzed (Stedman and Heberlein 2001, Floyd and Lee 2002), the determinants of liability insurance coverage may be similarly inspected.

## Methodology

### Data and Telephone Survey

The data set for this study came from a telephone survey conducted by the Survey Research Unit of the Social Science Research Center at Mississippi State University. The survey was completed in Dec. 2005, following Dillman's method for telephone surveys (Dillman 1978). A random sample of survey participants was first drawn from the database of Mississippi hunting and fishing license sales, maintained by the Mississippi Department of Wildlife, Fisheries, and Parks. The database contained basic information about hunters and anglers (i.e., name, address, birth date). Persons included in the sample were at least 18 years old and had purchased a Mississippi hunting or fishing license for the 2004/05 season. For those selected, their names and addresses were then used to find their telephone numbers. The success rate of a match between names and telephone records was 64%. The sampling error for the total data set was no larger than  $\pm 2.4\%$  at the 95% confidence level. Sampling error is the error in selecting the sample from the population. It depends on the proportion of the sample to the population and percentage of respondents that could be involved in the survey to the sample selected (Dillman 1978).

The survey questionnaire was designed to achieve the study objectives and consisted of three parts. The first part was to collect information about bodily injuries and property damages associated

**Table 1. Recreational bodily injury and property damages sustained by Mississippi license holders during the three hunting and fishing seasons from 2002/03 to 2004/05.**

Questions	Frequency
1. What year did the incident occur?	
2002/03	3
2003/04	6
2004/05	8
2. What recreational activities led to the injury or damage?	
Hunting	10
Fishing	5
Boating	1
Swimming/hiking	0
3. What equipment was directly involved in the incident?	
Boat	3
Fishing hook	2
Archery	1
4. Did the incident result in a lawsuit?	
Yes	0
No	17
5. Did the incident occur on public or private land?	
Public land	8
Private land	9
6. Was there a fee charge on the recreational activity related to the incident?	
Yes	4
No	13
7. Who had the bodily injuries?	
Myself	10
Companions	2
Persons not in my group	1
8. Whose properties were damaged?	
Myself	5
Companions	2
Landowners	0
9. What were the total costs for injuries or damages? (\$)	
<100	7
(101–2,000)	3
(2,001–5,000)	2
(5,001–50,000)	0
>50,000	2
10. Who paid the costs for the injuries or damages?	
Myself	8
Insurance company	7
Companions or landowner	0

Total incident number from the survey was 17. For some questions, only major categories were reported or the answers from some respondents were "Do not know."

with recreational activities in Mississippi during three hunting and fishing seasons (2002/03 to 2004/05). Questions were first asked whether a hunter or angler had experienced any bodily injuries or property damages. If yes, respondents were further queried to provide details about the incident, which included the date, activities and equipment involved, ownership of recreation land, fee charged, and costs and payments of these incidents. Detailed questions are listed in Table 1.

The second part of the survey asked whether a hunter or angler had any liability insurance in 2004/05 season to cover recreational activities. If the respondent had liability insurance, then he or she was queried on who provided insurance coverage and how much the insurance premium was. Detailed questions and responses are listed in Table 2. The last part of the survey collected information on respondent experiences, hunting and fishing activity, license type, and sociodemographic characteristics. Respondents were asked

**Table 2. Pattern of liability insurance coverage by hunters and anglers in the 2004/05 hunting and fishing season in Mississippi.**

Telephone survey questions	Frequency	Percent
1. Did you have liability insurance?		
Yes	277	16.8
No	1,376	83.2
Total	1,653	100.0
2. Who provided your insurance coverage?		
Sports club	122	44.0
Myself	79	28.5
Landowner who leased the land	32	11.6
Others (e.g., Do not remember)	44	15.9
Total	277	100.0
3. How much was the insurance premium (\$/yr)?		
<100	4	12.9
(101, 500)	21	67.7
(501, 4,000)	6	19.4
Total	31	100.0

about the number of years they have been hunting and fishing, and the kinds of licenses they purchased in the 2004/05 season. A set of sociodemographic questions were asked about gender, age, race, marital status, education, income, and population size of the town or city of residence.

### A Logit Model for Liability Insurance Coverage

Although descriptive statistics can answer most questions related to the two study objectives, a logit regression was developed to provide a more in-depth analysis for the second objective with regard to insurance coverage patterns. Various factors may influence the dichotomous status of liability insurance coverage. A logit regression allows a detailed analysis of the impacts of these factors on the status.

Let  $Y_i$  represent the status of liability insurance coverage for a hunter or angler. Let  $Y_i = 1$  if there is insurance coverage and  $Y_i = 0$  if not. A binary logit model can be estimated as follows:

$$\Pr(Y_i = 1) = P_i = \frac{e^{X_i\beta}}{1 + e^{X_i\beta}}, \quad (1)$$

$$\Pr(Y_i = 0) = 1 - P_i, \quad (2)$$

$$X_i\beta = \beta_0 + C_i\beta_1 + S_i\beta_2 + T_i\beta_3 + \varepsilon_i, \quad (3)$$

where  $P_i$  is the probability of an insurance coverage for person  $i$ ;  $\beta$  is the set of parameters to be estimated;  $X$  is the vector of independent variables; and  $\varepsilon_i$  is the error term (Greene 2003). Independent variables in  $X_i$  included several groups of information: recreational experience of a person (i.e.,  $C_i = \text{Injury, HuntYrs}$ ), license type (i.e.,  $S_i = \text{Nonres, Lspman, Lnong}$ ), and sociodemographic characteristics (i.e.,  $T_i = \text{Gender, Age, Race, Marital, Edu, Inc, TownPop}$ ) [1].

Specifically and first, *Injury* was the frequency of bodily injuries or property damages experienced by a person during the three seasons. *HuntYrs* was the years a person has been hunting. Both *Injury* and *HuntYrs* were supposed to have a positive impact on the decision of liability insurance coverage.

Second, in recent years there have been approximately 20 types of hunting and fishing licenses in Mississippi (Grado et al. 2005). They can be divided into licenses for residents or nonresidents. The most popular resident licenses were the Resident Sportsman (\$32 per season in 2004), the Resident All Game Hunting and Fishing (\$17), and Resident Freshwater Fishing (\$8). In 2004, the license of the Resident Sportsman comprised 22% of the total quantity of license

sales and 24% of total revenues. Among nonresident licenses, the most popular ones were the Nonresident All Game Hunting (\$300 per season in 2004), the Nonresident 7-day All Game Hunting (\$125), and the Nonresident Freshwater Fishing (\$30). In 2004, the sale of the Nonresident All Game Hunting license contributed 3% of the total quantity and 29% of total revenues. Given this information, three dummy variables were used in this study to characterize license information: *Nonres* = 1 if a person was a nonresident, = 0 if a resident; *Lspman* = 1 if the license was a Resident Sportsman, = 0 otherwise; *Lnong* = 1 if the license was a Nonresident All Game Hunting, = 0 otherwise. All three variables were expected to be positively related to liability insurance coverage of a recreational user.

Finally, seven sociodemographic variables were included in the model: *Gender* = 1 if male, = 0 if female. *Age* represented the respondent's age in 2005. *Race* = 1 if the respondent was Caucasian, = 0 otherwise. *Marital* = 1 if the respondent was married, = 0 otherwise. *Edu* was years of education for the respondent, starting from primary school. *Inc* was the household income in 2005 for the respondent. Finally, *TownPop* was the population size in the town or city where the respondent lived.

### Empirical Findings

During the telephone survey, 4,033 numbers were called. Among them, 2,380 calls did not generate qualified records and included 1,116 invalid phone numbers, 638 calls with no answers, 316 incomplete interviews, 174 persons who had not purchased hunting or fishing licenses during the time frame of the study, 81 refusals, and 55 persons unable to participate because of communication or health problems. In the end, 1,653 persons completed the phone interview successfully, resulting in a completion rate of 57% (i.e.,  $1,653/(4,033 - 1,116)$ ).

### Pattern of Injuries and Damages

Among the 1,653 respondents, 15 persons reported 17 incidents of bodily injury or property damage related to recreational activities from 2002/03 to 2004/05. Although most had only one incident, two did report two incidents. Overall, the incident rate in this sample was 1% for respondents. In Table 1, the frequency distributions of 10 questions are reported. Among the 17 incidents, three occurred in 2002/03, six in 2003/04, and eight in 2004/05. Respondents involved in these incidents were then asked to describe their recreational activities and equipment involved. Incidents included being accidentally stabbed with an arrow, running into a tree, impaled by a fishing hook, and gored by a deer antler. Ten incidents were related to hunting activities, five to fishing, and one to boating. None were related to swimming or hiking. Various types of equipment were involved, including a boat, fishing hook, 4-wheeler, truck, and trailer.

None of the incidents resulted in a lawsuit. This seems consistent with the review results by Wright et al. (2002). In their case review from 1965 to 2000, 637 cases related to recreational injuries were identified nationwide and only one was in Mississippi. In addition, concerning the ownership of recreation land where the 17 incidents occurred, the distribution was eight on public land and nine on private land. Furthermore, the majority (i.e., 13 of 17) did not pay for the recreation access whereas four did. Finally, the survey asked who had bodily injuries and whose property was damaged. As a result, the respondent had bodily injury in 10 incidents, companions in two, and individuals outside the group in one. In five cases,



**Table 3. Definitions and means of variables in the logit regression of liability insurance coverage in the 2004/05 hunting and fishing season in Mississippi.**

Variable	Definition	Mean
<i>Y</i>	Binary dependent variable = 1 if had liability insurance in 2005; = 0 otherwise	0.17
<i>Injury</i>	Times of bodily injuries or property damages in the past three years	0.01
<i>HuntYrs</i>	Years of hunting	27.40
<i>Nonres</i>	Dummy = 1 if nonresidents; = 0 if Mississippi residents	0.09
<i>Lspman</i>	Dummy = 1 if purchased the license of resident sportsman; = 0 otherwise	0.54
<i>Lnong</i>	Dummy = 1 if purchased the license of nonresident all game; = 0 otherwise	0.07
<i>Gender</i>	Dummy = 1 if male; = 0 otherwise	0.95
<i>Age</i>	Age of the hunter or angler	44.94
<i>Race</i>	Dummy = 1 if Caucasian; = 0 otherwise	0.92
<i>Marital</i>	Dummy = 1 if married; = 0 otherwise	0.84
<i>Edu</i>	Years of education	13.28
<i>Inc</i>	Household income in 2004 (1,000)	66.85
<i>TownPop</i>	Population size of the residence town (1,000)	15.80

**Table 4. Results of logit regression analysis of liability insurance coverage against 12 independent variables from the 2004/05 hunting and fishing survey in Mississippi.**

Variable	Coefficient	<i>t</i> -Ratio	Marginal effect	<i>t</i> -Ratio
<i>Constant</i>	-3.986	-5.513***	-0.519	-5.866***
<i>Injury</i>	0.245	0.466	0.032	0.466
<i>HuntYrs</i>	0.014	2.402**	0.002	2.412**
<i>Nonres</i>	0.761	1.910*	0.121	1.613*
<i>Lspman</i>	0.057	0.367	0.007	0.368
<i>Lnong</i>	-0.341	-0.785	-0.040	-0.875
<i>Gender</i>	-0.252	-0.782	-0.036	-0.727
<i>Age</i>	0.011	1.701*	0.002	1.704*
<i>Race</i>	1.646	3.527***	0.133	6.750***
<i>Marital</i>	-0.203	-1.043	-0.028	-0.997
<i>Edu</i>	-0.010	-0.328	-0.001	-0.328
<i>Inc</i>	0.004	1.867*	0.001	1.873*
<i>TownPop</i>	0.002	1.029	0.000	1.030
Observations	1,653			
Log-likelihood	-718.87			
Chi-squared	56.64			
Prediction	83.30%			

Note: \*\*\* Significant at the 1% level; \*\* Significant at the 5% level; \* Significant at the 10% level.

the respondent had property damages whereas companions had in two cases. No property damages were identified on landholdings by this survey. Additionally, the survey tried to determine the total costs for injuries or damages and who paid for them. Consequently, most injuries or damages were small; seven respondents reported costs of less than \$100, and three between \$101 and \$2,000. However, some incidents were indeed more expensive with two cases between \$2,001 and \$5,000, and two cases over \$50,000. Overall, the average loss from these incidents reached \$7,892. Eight respondents paid the costs themselves and seven by insurance companies. Records of individual respondents revealed that those with large losses were in fact compensated by insurance companies.

#### Pattern of Liability Insurance Coverage

Among the 1,653 respondents, 277 or 16.8% of them had liability insurance coverage during the 2004/05 hunting and fishing season (Table 2). For those with liability insurance, further questions were asked with regard to who provided the coverage. As a result, sports clubs provided coverage for the majority (i.e., 122 or 44% of 277 respondents). Following that, 79 or 28.5% purchased the insurance themselves, 32 or 11.6% received coverage from landowners who leased the land, and the remainder did not remember. Respondents also were asked to release information about their insurance premiums for the 2004/05 season. Only 31 could remember or were willing to do so. On an annual basis, four of 31 paid less

than \$100 for liability insurance, 21 between \$101 and \$500 and six more than \$500. Overall, insurance cost was \$484/year ( $n = 31$ ) on average, with the lowest at \$25/year and the highest at \$3,700/year.

#### Results of Logit Regression of Liability Insurance Coverage

Descriptive statistics of variables used in the logit regression are reported in Table 3. Average hunting experience of the sample respondents was 27.4 years. Out of 1,653 observations, there were 149 respondents holding nonresident licenses, 114 holding Nonresident All Game Hunting, and 885 holding the Resident Sportsman. With regard to sociodemographic characteristics, 92% were Caucasian, 84% married, and 95% male. In addition, on average, sample respondents had 13.28 years of education, a household income of \$66,850 in 2004, and they lived in a town or city with an average population of 15,800.

Estimated results of the logit regression are presented in Table 4. The chi-squared value of the regression was 56.64 with 12 degrees of freedom. The overall correct prediction rate was 83.3%. Among the 12 independent variables, five were significant at the 10% level or better.

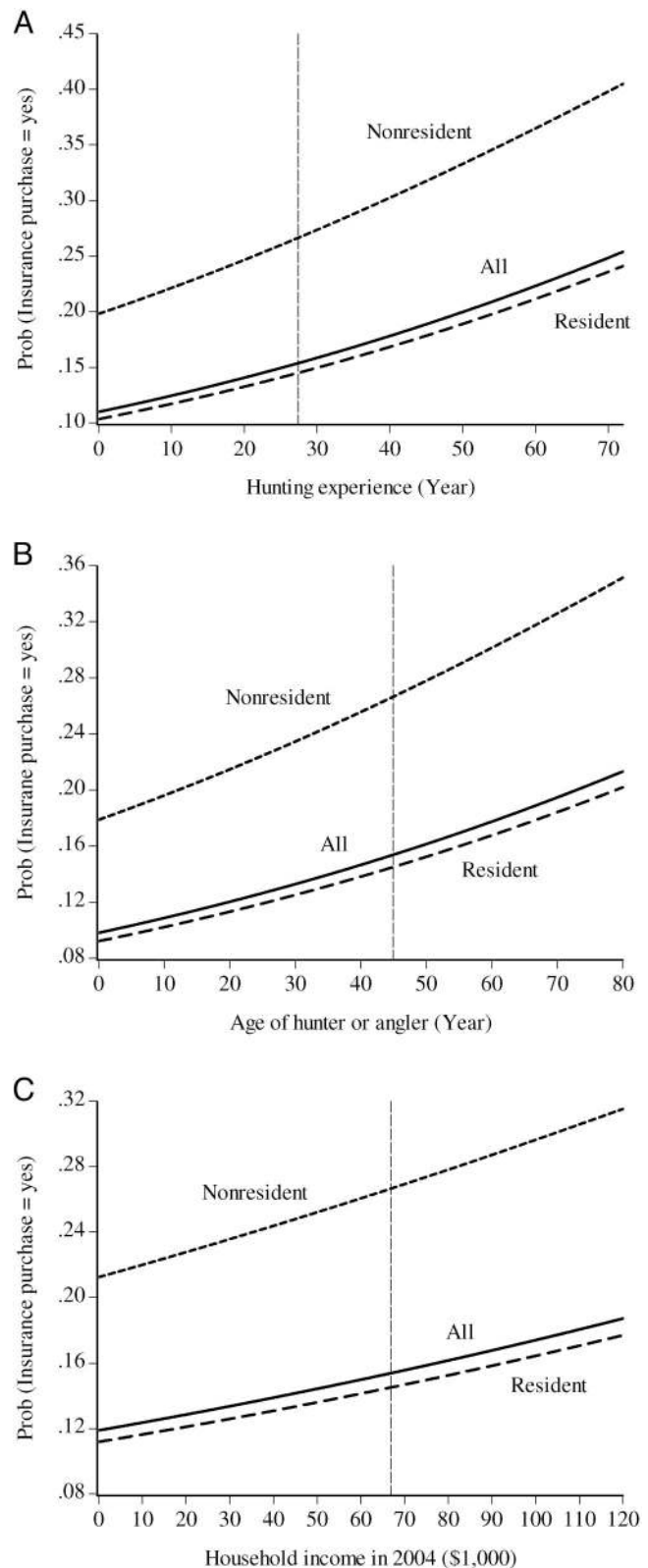
Specifically, for the two variables representing a respondent's experience in hunting and fishing, the variable of incident times showed a positive but insignificant sign, probably because of the small number of observations (i.e., 15 of 1,653). The variable of hunting years did show a positive and significant sign at the 5%

level. It indicated that the longer a person's recreational experience, the higher probability for the person to have liability insurance. Among the three dummy variables for license information (i.e., nonresidents, resident sportsman, and nonresident all game licenses), only the variable of nonresidents had a significant and positive sign. Therefore, nonresident license holders had a higher likelihood of having liability insurance coverage. Considering that nonresident license holders paid much higher license fees and related recreational costs, it was reasonable to expect that these individuals were more committed to hunting and fishing activities and had more liability insurance coverage. Among the seven sociodemographic variables, age, race, and household income of recreationists had positive and significant signs whereas gender, marital status, education, and population size of the place of residence of recreationists did not. Thus, the elderly were more likely to own insurance than younger individuals. Caucasians had a higher coverage of liability insurance than respondents with other ethnic backgrounds. Furthermore, a person's household income was positively correlated to the decision of acquiring liability insurance coverage.

Because a logit regression is nonlinear in nature, the marginal effect of an independent variable depends not only on the magnitude of the coefficient but also on the level of the variable. In Table 4, the marginal effect was also reported for a one-unit change at the mean of each variable. Among the significant marginal effects, the variable of race had the largest magnitude at 0.133. For the variable of age, the marginal effect was 0.002, so a year increase in age would increase the probability of insurance coverage by 0.2%. Similarly, an increase of \$1,000 in household income would raise the probability by 0.1%. One more year of hunting experience would be associated with a larger probability of 0.2%.

In contrast to the marginal effect at the variable mean as reported in Table 4, a more comprehensive observation of the quantitative marginal effects can be demonstrated by showing the probability of having liability insurance (i.e., vertical axis) over the whole range of an explanatory variable (i.e., horizontal axis). This was displayed for three continuous variables (i.e., hunting years, age, household income of recreationists) (Figure 1). For each variable, there was one curve for all observations ( $n = 1,653$ ), and two stratified curves for nonresident license holders ( $n = 149$ ) and resident license holders ( $n = 1,504$ ), respectively.

Several observations can be drawn from the graphical interpretation. First, the slope of the curve was the marginal effect of the variable on the horizontal axis. The upward trend of the curves indicated a positive relationship between the explanatory variable and the probability of having liability insurance. Taking the variable of hunting years as an example, for all the respondents, the sample mean was 27.4 years and the corresponding slope of the middle curve (i.e., marginal effect) was 0.002. So these marginal effects in Table 4 were the point estimates in Figure 1. Second, the marginal effect of the dummy variable of nonresidents was defined as the vertical difference between the two stratified curves at the sample mean. At the sample mean of 44.94 years for age, the vertical difference of the probability between the curves was 0.121 (Table 4). Finally, the curve for residents was very close to the curve for all respondents and at a much lower position than the curve for nonresidents. This was consistent with the fact that nonresident license holders had a higher coverage of liability insurance.



**Figure 1.** Probability response curves showing the effect of age, hunting experience, and household income of recreationists on liability insurance purchase, stratified by the residence status in 2004/2005. Dash lines indicate variable means on the horizontal axis.

## Discussion

There has been widespread concern about the incidents and liability related to outdoor recreation on forest lands. In this study, the

extent of recreational incidents and liability insurance coverage of hunters and anglers in Mississippi from 2002/03 to 2004/05 were examined. In 2005, a survey of hunters and anglers holding Mississippi hunting and fishing licenses was conducted. A logit regression was used to analyze the determinants of liability insurance coverage. Several results from the survey and analyses have clear policy implications and merit more discussions.

First, an extrapolation of the extent of incidents from the survey sample to the state level can provide additional insights. The survey revealed that only 1% of hunters and anglers holding Mississippi licenses experienced bodily injuries or property damages related to recreational activities during 2002/03 to 2004/05 seasons. Among the reported incidents, there was a wide distribution of losses. Most incidents had losses less than \$2,000 but a few large incidents had losses over \$50,000. As a result, the average of all reported losses reached \$7,892. Overall, the relative percentage of recreational incidents and losses for most of these seemed small. Nevertheless, at the state level, the absolute loss from recreational incidents may still be quite expensive, given the large volume of recreational activities. In 2004, Mississippi Department of Wildlife, Fisheries, and Parks sold 498,380 licenses to hunters and anglers (Grado et al. 2005). Because the study sample was randomly drawn, a simple extrapolation of the results suggested that, at the state level, there were 4,983 incidents with a total loss of \$39.3 million over the three seasons covered. Therefore, combining the large scale of recreational activities and the low probability of incidents further illustrates the extent of recreational incidents and the importance of the issue.

Second, the study results provide landowners with helpful information to evaluate the risk and possible liability in opening their land for outdoor recreation. From the perspective of landowners, no property damages on landholdings were identified in this survey. This might reflect the minimal extent of actual damage on landowner properties. It is also possible that some recreationists in the survey might be reluctant to admit damage actually happened on a property. If that is the case, it may result in an underestimation of the damage on landowner properties so the result should be interpreted with caution. Nevertheless, it should be emphasized that the impact of recreational incidents on landowners comes not only from the damages on landowner properties, but also from the liability of bodily injuries or property damages on others. In other words, forest landowners, as providers of recreational services, may still bear the liability burden from recreational incidents.

Third, the results reveal that special liability insurance has been useful in reducing the monetary losses from recreational use. Among the incidents reported, most injuries or damages were inexpensive, whereas the costs of several incidents were over \$50,000. Eight respondents paid the costs themselves and seven were paid partially by insurance companies. Those with large losses were usually reimbursed by insurance companies. Hunting and fishing activities always have the potential to generate severe injuries and damages, and consequentially, considerable financial loss. The survey results emphasize that liability insurance can be an effective way to mitigate the concern of a liability burden on both recreationists and landowners.

Fourth, the analysis points out several ways to promote liability insurance and increase its coverage among recreationists. During the 2004/05 hunting and fishing season, 17% of respondents had coverage. Given the importance of liability insurance, this low liability insurance purchase rate suggests that there is a great need to promote liability insurance coverage. The survey revealed that sports clubs provided coverage for 44%, followed by users themselves (28.5%),

and landowners who leased the land (11.6%). Thus, promoting liability insurance through sports clubs could be effective. Furthermore, the logit regression quantitatively evaluated the impact of a set of factors on the likelihood of liability insurance coverage. Statistically positive impacts were found for several variables, including a person's recreational experience, nonresident license holder, age, race, and household income. Therefore, the promotion of liability insurance can be more effective by targeting these recreationists. For instance, the Mississippi Department of Wildlife, Fisheries, and Parks might consider sending information to nonresident license holders to further increase their likelihood of obtaining liability insurance coverage. Education and promotion programs can also be provided to recreationists about the unique risk and liability issues related to outdoor recreation.

For future studies, more analyses are still needed to improve our understanding of liability insurance for outdoor recreation. Information from companies or organizations that have provided liability insurance may reveal the market evolution over time. There is also a need to analyze existing insurance policies in the market (i.e., type, coverage, claim limit, premium) and examine how to improve these policies to meet demand from landowners and recreational users.

## Endnote

[1] A variable was constructed for years of fishing but finally dropped because of its correlation with the variable of years of hunting. Other variables (i.e., dummy variable for the Resident All Game Hunting and Fishing license) were also tried but failed to produce significant results.

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