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Predictability of Hunting:

A Logistic Regression Analysis of Western Canadian Hunters

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This study uses logistic regression analytical techniques to examine the predictability of hunting for the three Canadian Prairie Provinces, using data from the 1996 Survey on the Importance of Nature to Canadians*. The main objective was to examine several demographic predictor variables for potential correlation with a discrete dependent variable (hunted wildlife or not in 1996). Key findings include: men are 10 times more likely to hunt wildlife than females, rural residents are almost three times more likely to hunt than urban residents, those not working are less likely to hunt, those with a high school diploma or less are more likely to hunt than those with post-secondary education, and older people (50 years or more) are less likely to hunt than younger people. By use of an effective analytical tool and basic survey data, this study demonstrates that logistic regression may help improve decision-making practices for wildlife managers and policy makers.*

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1 Introduction

Hunting as a sport has been changing in recent times with the advancement of new equipment and techniques, and has been extensively commercialized throughout North America and Europe. Yet, certain demographic changes in hunters themselves may be even more drastic. In their study of American hunters, Farnham and Jacoby (1992) claim that today's hunter is less likely to be male, is aging but better educated, more likely to be a professional or manager, and earns more (mean income of US $43,120) than hunters just five years earlier. If true, then careful analysis of Canadian hunter demographics should be able to confirm or refute such predominantly U.S.-based studies.

This article examines the relationship of several demographic predictor variables (e.g. gender, age, education, marital and employment status, place of residence), with a dichotomous, or discrete, dependent variable - "hunted wildlife in 1996" - using logistic regression analytical techniques. A logistic regression model is similar to linear regression except its dependent variable is dichotomous rather than continuous. The central problem posed in this article is if it can be predicted who is most likely to hunt.

Several sources were consulted for demographic and attitudinal attributes of hunters. The *1996 Survey on the Importance of Nature to Canadians* contains basic statistics on hunting wildlife by Canadians.[1] In 1996, 20 million Canadians spent $11.0 billion on a variety of nature-related activities (Leigh *et al*. 2000).[2] Of the total expenditures, almost $824 million was spent on hunting wildlife and $1.2 billion went for other nature-related activities. About one in 20 Canadians (5.9%) hunted wildlife, but 'interest in participating' in hunting was twice as high as the rate of active participation. Compared to the general population, hunting was more common among men, those between the ages of 25 and 55 years, and rural residents (Leigh *et al*. 2000). Hunting participation rates were highest in most Atlantic Provinces (Newfoundland, Nova Scotia, New Brunswick), Quebec, Saskatchewan, and the Yukon.

In a 1997 Alberta study undertaken of 758 respondents (McFarlane, Boxall, and Adamowicz 1999), two categories of hunters were classified: (1) *occasional hunters* (had not hunted at least 1 year from 1991 to 1996) and (2) *committed hunters* (had hunted every year since 1991 and intended to hunt in 1997). According to this study, since the early 1980s Alberta has experienced a decline in hunting participation for three main reasons: (1) inadequate time to hunt, (2) rising costs of hunting licenses, and (3) increasing complexity of hunting regulations. In addition, a greater proportion of occasional hunters compared to committed hunters lived in an urban area with a population of at least 100,000 (38.8% and 21.8%, respectively), grew up in an urban environment (23.1% and 13.9%), had a university education (30.9% and 19.5%), and had household incomes of $70,000 or more (52.9% and 42.4%).

Gender is another factor that also appears to be shifting commonly held perceptions of hunters. In Alberta, women historically comprise 3-5% of hunters; recent surveys in the western U.S. indicate that figure is rising to 15-17% (Sillars 1997). It has been estimated that thousands of Alberta women have taken up hunting in the past two decades; "they are not making up for the heavy loss of male hunters, but they are slowing the decline" (Sillars 1997:31).

Based on the available literature, then, it is speculated that a typical hunter in the Canadian Prairie Provinces is male, well-educated, age 30-49 years, employed, highly appreciative of wildlife and nature, resides in a rural area, and has higher than average family income. It must be noted that while family income may be higher for hunters compared to non-hunters, this attribute could not be verified by logistic techniques given the unreliability of the income data and high number of missing cases in the dataset. This limitation notwithstanding, adequate data existed to conduct a logistic analysis and meet the principal research objectives.

The hypothesis for this study is that the "likelihood of hunting" for a given individual can be predicted on the basis of selected demographic characteristics. The principal objective is to build a hunter profile using a logistic (or *logit*) model to determine who is most likely to hunt. An additional objective is to demonstrate the worthiness of employing a rather straightforward but effective technique to examine correlations among either discrete or continuous data. This is especially true if said data may preclude the possibility of bivariate or multiple regression methods, which are generally much more demanding with respect to assumptions of normality, linearity, homoscedasticity, and type of data collected. Information generated from the application of logistic regression techniques could be very useful in recreational planning and survey analysis aimed at specific types of hunters.

2 Methodology

This study was based on the 1996 Survey on the Importance of Nature to Canadians (Nature Survey) conducted by Statistics Canada by a "stratified random sample" of 86,951 Canadians.[3] The sample design can be considered "stratified" since the survey was first divided into three regions (urban, rural, and remote), and then further subdivided by population density (high and low) for rural areas, and by area frame (regular, high income, or low population) or apartment list frame (low income or regular) for urban areas. A panel design was employed with six rotation groups of approximately equal size.[4] All members 15 years old and over of responding Labour Force Survey (LFS) households were mailed the Nature Survey questionnaire. A total of 60,789 completed and usable questionnaires (69.9%) were processed.

For this research, the three Prairie Provinces (Alberta, Saskatchewan, and Manitoba) from the 1996 Nature Survey were collapsed and recoded into one variable for a total of 12,640 respondents (20.8% of all respondents) for three reasons: (1) these provinces have relatively similar socio-economic conditions; (2) there were insufficient cases of hunters for each individual province (e.g. Alberta had only 177 hunters, or 3.8% of respondents); and (3) the possibility of empty cells in subsequent statistical analyses (e.g. crosstabs) is reduced by aggregating data. The distribution of respondents surveyed by province in relation to the rest of Canada (except for Northwest Territories) was 36.9% (4,670) for Alberta, 28.1% (3,556) for Saskatchewan, and 34.9% (4,414) for Manitoba.

A total of 5.0% (629 out of 12,640) of respondents from the Prairie Provinces said that they had hunted wildlife in 1996.[5] For this research, those who hunted were assumed to be *hunters* (i.e. committed and occasional hunters pooled); those who did not were classified as *non-hunters*. As the 1996 Nature Study did not differentiate between committed and occasional hunters, this article considers hunters in general (whether occasional or not) compared to non-hunters in Western Canadian.

Since the nonlinear model assumed by logistic regression requires a full set of data, SPSS provides only for LISTWISE deletion of cases with missing data. The logistic model had 11.1% or 1,409 missing cases out of a total of 12,640 respondents, which was not considered high enough for concern. If *weekly income* had been used as a predictor variable, however, it would have increased the missing cases to 54.6%. Among those who did report income, the recorded values had been grouped by Statistics Canada into discrete categories ranging from $99 or less to over $1500 of weekly earnings, which further diminishes the utility of this variable for logistic regression. Also, since *age* had a miscoded missing value of '9' (age group for 50-54 years), missing values for this variable were changed to '99' to match the suppressed values.

The discrete dependent variable was HUNT, which was based on two possibilities to the question "In 1996, did you hunt wildlife in Canada?" – either 'yes' (coded 1) or 'no' (coded 0). The following predictor variables were used: *gender* (male or female), *place of residence* (rural or urban), *marital status* (married or not married), *employment status* (working or not working), *age* (three categorical levels of 15-29 years, 30-49 years, and 50 or more years), *education* (high school or less, or some post-secondary education), *wildlife appreciation* (some/great interest or no interest in watching, feeding, photographing, or studying), or *was a member of, or contributed to, a naturalist, conservation or sportsman club*.

Prior to the logistic regression analysis, all predictor variables were recoded into dummy variables; where more than one level existed (such as age group), these were recoded into dichotomous categories. Since gender is a dichotomous predictor, one category (females) was treated as the baseline, or reference category (coded 0), and the other category (males) as the comparison group (coded 1), with the variable recoded as MALE. All other variables were dummy coded to compare the largest category (reference) against the smallest category (comparison). For age, the reference category was 30-49 years and the other two levels, or variables compared against it, were 15-29 years and 50 or more years. Education was originally recoded into three categorical levels (less than high school diploma, high school diploma, and some post-secondary education), but due to both theoretical and empirical correlation,[6] education was recoded into two levels with high school diploma or less as the comparison group.

It is worth noting here some of the advantages of logistic regression over other multiple regression techniques. Unlike the Ordinary Least Squares (OLS, or linear regression), for example, logistic regression is more robust since: (1) the dependent variable need not be normally distributed; (2) a linear relationship between the dependent and independent variables is not assumed; (3) the dependent variable need not be homoscedastic for each level of the independent(s); (4) normally distributed error terms are not assumed; (5) independents can be categorical; and (6) it does not require that the independents be interval or unbounded.

Hence, logistic regression is popular in part because it enables the researcher to overcome many of the restrictive assumptions of OLS regression. It may handle nonlinear effects even when exponential and polynomial terms are not explicitly added as additional independents because the *logit* link function on the left-hand side of the logistic regression equation is non-linear. It is also possible and permitted to add explicit interaction and power terms as variables on the right-hand side of the logistic equation, as in OLS regression, and other assumptions of OLS regression still apply (Garson 2001). With 629 hunters and 12,011 non-hunters in this research, the sample size was large enough to avoid problems of reliability associated with the maximum likelihood estimation (MLE) assumption of large-scale asymptotic normality (Garson 2001).

There were also enough respondents and variables to run a logistic model, based on the sample size rule that there should be at least 50 times as many subjects as predictors[7] (Wright 1995). A linear relationship between the *logit* of the predictor variables and hunting was assumed to be present. The predictor variables were checked for multicollinearity (which if present may inflate the standard error of the coefficients) but none were highly correlated with each other; therefore, causally irrelevant variables were likely not present. A correlation matrix of all predictor variables used in this analysis was also prepared (Table 1).

Table 1: *Correlation Matrix of Predictor Variables*

	Constant	Male	Not Married	High School or less	15 to 29 years	+50 years	Not Employed	Wildlife not watched	Club Member	Rural
Constant	***1.000***	-.162	-.174	-.367	-.245	-.295	.000	-.256	-.426	-.344
Male	-.162	***1.000***	.033	.014	-.006	.050	-.090	.048	-.013	-.049
Not Married	-.174	.033	***1.000***	-.104	-.477	.073	-.172	-.012	.043	.065
High School or less	-.367	.014	-.104	***1.000***	-.030	-.090	-.106	-.064	.111	-.175
15 to 29 years	-.245	-.006	-.477	-.030	***1.000***	.334	-.100	-.050	.064	.029
+50 years	-.295	.050	.073	-.090	.334	***1.000***	-.379	-.022	-.007	-.041
Not Employed	.000	-.090	-.172	-.106	-.100	-.379	***1.000***	-.005	.003	.027
Wildlife not watched	-.256	.048	-.012	-.064	-.050	-.022	-.005	***1.000***	.178	-.007
Club Member	-.426	-.013	.043	.111	.064	-.007	.003	.178	***1.000***	.005
Rural	-.344	-.049	.065	-.175	.029	-.041	.027	-.007	.005	***1.000***

3 Results

Basic demographic data for hunters and non-hunters of the Canadian Prairie Provinces were obtained using cross-tabs procedures. As illustrated in Table 2, more hunters than non-hunters were male (90.3% to 45.8%), from a rural area (50.9% and 26.6%), married (69.6% and 64.7%), employed (78.0% and 61.8%), in the age group 30-49 years (47.2% and 40.2%), appreciated wildlife more (78.0% and 55.2%), and belonged or contributed to a sportsman or conservation club (31.6% and 6.2%). Hunters also had less post-secondary education (43.3% and 48.3%) than non-hunters.[8] The main job of respondents was not analyzed since it is difficult to collapse 14 categories into meaningful groups. Additionally, since some percentages such as education and marriage were relatively close to each other, it is both desirable and imperative to conduct further analysis as now demonstrated.

Table 2: *Crosstabs on Selected Variables*

Variable	Hunted in 1996	Did not hunt in 1996
Gender		
male	90.3%	45.8%
female	9.7%	54.2%
Place of Residence		
rural area	50.9%	26.6%
urban area	49.1%	73.4%
Marital status		
married	69.6%	64.7%
not married	30.4%	35.3%
Employment status		
employed	78.0%	61.8%
not employed	22.0%	38.2%
Age		
15 to 29 years	25.2%	24.7%
30 to 49 years	47.2%	40.2%
50 or more years	27.5%	35.1%
Education		
up to high school	56.7%	51.7%
up to college degree	43.3%	48.3%
Wildlife appreciation		
some or high interest	78.0%	55.2%
no interest	22.0%	44.8%
Sportsman or naturalist club member		
Yes	31.6%	6.2%
No	68.4%	93.8%

A summary of the logistic regression conducted on SPSS 10.0 using the nine predictors on the discrete dependent variable HUNT is shown in Table 3. The Method used was "Enter" which builds the equation by entering all variables at once. *Logit coefficients* are labeled *B* and correspond to *b* (unstandardized regression) coefficients in OLS regression, with positive values indicating an increase and negative values signifying a decrease in HUNT. The Wald statistics are mostly high which indicates significance; that is, except for those *younger than 30 years old* and *marital status*,[9] most variables had a significant effect on hunting predictability. The overall likelihood ratio statistic is a Chi-square of 977.90, with 9 degrees of freedom (Table 4). The probability p < .000, inferring that at least one of the population coefficients differs from zero.

Table 3: *Logistic Analysis Summary of Socio-demographic Predictors of Hunting*

Variables in the Equation^	*B*	SE	Wald	df	Sig*	Exp(*B*)	5% CI for Exp(*B*)	
							Lower	*Upper*
Male	2.34	0.15	259.89	1	0.000*	10.39	7.82	13.81
Lives in rural area	.98	0.10	106.17	1	0.000*	2.67	2.22	3.22
Not married	-0.04	0.12	0.13	1	0.717	.96	0.75	1.22
Not employed	-0.36	0.12	8.84	1	0.003*	0.70	0.55	0.88
Age: 15 to 29 years	0.21	0.13	2.51	1	0.113	1.24	0.95	1.61
Age: 50 or more years	-0.27	0.12	4.70	1	0.030**	0.77	0.60	0.97
Education: up to high school	0.38	0.10	14.95	1	0.000*	1.46	1.21	1.78
No interest in viewing wildlife	-0.86	0.11	61.14	1	0.000*	0.42	0.34	0.53
Sportsman or naturalist club member	1.64	0.11	228.56	1	0.000*	5.14	4.15	6.35
Constant	-5.04	0.16	943.11	1	0.000*	0.01		

NOTE: CI=confidence interval; ***significant at ? <0.01;*** ***significant at ? <0.05*
^The discrete, dependent variable HUNT measures the question "In 1996, did you hunt wildlife in Canada?"

Table 4: *Omnibus Tests of Model Coefficients*

	Chi-Square	Df	Sig.
Step	977.902	9	0.000
Block	977.902	9	0.000
Model	997.902	9	0.000

An example of the 95% confidence interval (C.I.) for the male odds ratio is as follows: 2.34 – 2(.15), or 2.04 for lower confidence limit, and 2.34 + 2(.15), or 2.64 for upper confidence limit. Raising *e* to the power of the upper and lower limits gives a 95% C.I. for the odds ratio: 7.69 to 14.01. Thus, with 95% confidence, one can infer that in the population, the odds of hunting are between 7.69 and 14.01 times greater for a male than a female.[10]

*Hosmer and Le*meshow's Goodness of Fit Test has a Chi-square of 10.57 (8 d.f.), p=.227. Since this is greater than .05, we fail to reject the null hypothesis that there is no difference, implying that the model's estimates fit the data at an acceptable level. Nagelkerke's R-Square indicates that 25% of HUNT may be explained by all predicted variables included (Table 5).[11]

Table 5: *Model Summary*

-2 times likelihood	Cox & Snell R^2	Nagelkerke R^2
3507.316	0.083	0.253

Considering that only a few variables were used (and 30% as acceptable minimum), the model achieves a fair degree of adequacy for predicting hunting.[12] The classification table predicts *which* value of HUNT (yes/no) is observed in the data a remarkable 95% of the time (Table 6). Removing two *non-significant* variables (*marital status* and *15 to 29 years*) did not affect *Nagelkerke's R-Square* or the overall percentage correctly predicted. Likewise, testing the original categories of *education* did not affect the results in any significant way. The observed groups and predicted hunting probabilities are shown in Table 7.

Table 6: *Classification Table*

		Predicted hunt		Percentage Correct
		No Hunt	Hunt	
	No Hunt	10,640	25	99.8
Observed hunt	Hunt	521	45	8.0
Overall percentage				95.1

Table 7: *Observed Groups and Predicted Probabilities of Hunting*

```
    8000 |                                                             |
         |                                                             |
         |                                                             |
F        |                                                             |
R   6000 |                                                             |
E        |                                                             |
Q        |0                                                            |
U        |0                                                            |
E   4000 |0                                                            |
N        |0                                                            |
C        |0                                                            |
Y        |0                                                            |
    2000 |00                                                           |
         |00                                                           |
         |0001                                                         |
         |000000                                                       |
Predicted ______________|______________|______________|______________|
  Prob:   0            .25            .5            . 75             1
  Group:  000000000000000000000000000000111111111111111111111111111111

          Predicted Probability is of Membership for 1.00
          The Cut Value is .50
          Symbols: 0 - .00  (did not hunt in 1996)
                   1 - 1.00 (did hunt in 1996)
          Each Symbol Represents 500 Cases.
```

4 Discussion

The logistic regression model as illustrated in Table 3 indicates: (1) Males are 10 times *more* likely to hunt wildlife than females;[13] (2) Rural residents are almost three times *more* likely to hunt than urban residents; (3) High school (or less) educated persons are 1.5 times *more* likely to hunt than those with at least some post-secondary education; (4) Older people (50 years and up) are *less* likely to hunt than younger people; (5) Persons not working are *less* likely to hunt than employed persons; (6) Persons that do not appreciate wildlife are *less* likely to hunt; and (7) Contributors to (or members of) sportsman's or naturalists clubs are five times *more* likely to hunt than those that do not contribute (or belong).

Some hypothetical examples based on the logistic model of probabilities are shown in Table 8. For example, the probability is 57% that a 40 year-old, married, high school educated, employed male from a small (rural) town and who belongs to a sportsman's club hunts. This is the "best-case scenario" based on the logistic model in terms of probability.

Table 8: *Logistic Model Examples of Hunting Predictability*

(1) *Profile of a male, rural, married, employed, 40 year old, high school educated, sportsman or naturalist club member:*

	G = -5.04 + (2.34*1)+(0.98*1)+(0.38*1)+(1.64*1)
numerator, anti-log not taken	0.30
anti-log of numerator	1.35
Probability = anti-log/(1+anti-log)	**0.574**
(Probability = exp(equation)/1+exp (equation)	

The probability is 57% that a man who is married, employed, 40 years old, lives in a rural area and belongs to a sportsman club is a hunter.

(2) *Profile of a male, urban, single, employed, college educated, 25 year old who belongs to a sportsman club:*

	G = -5.04 + (2.34*1)+(-0.04*1)+(1.64*1)
numerator, anti-log not taken	-1.10
anti-log of numerator	0.33
Probability = anti-log/(1+anti-log)	**0.250**

The probability is 25% that a single, urban, 35 year old, college educated male who belongs to a sportman club hunts.

(3) *Profile of a female, urban, single, unemployed, college educated, 52 year old who does not belong to a sportsman club:*

	G = -5.04 + (-0.04*1)+(-0.36*1)+(-0.27*1)
numerator, anti-log not taken	-5.71
anti-log of numerator	0.00
Probability = anti-log/(1+anti-log)	**0.003**

The probability is less than 1% that a single, urban, unemployed, college educated female who does not belong to a sportman club hunts.

NOTE: *G* = the overall likelihood statistic

The results obtained show that logistic regression can be a potentially valuable technique when only dichotomous (categorical) dependent variables may be available. This study concurs with other research that has demonstrated the usefulness of qualitative multivariate regression techniques, such as for wildlife managers interested in understanding the probability of a particular constituency (e.g. rural or urban) or person participating in specific wildlife-related recreational activities (Boxall and McFarlane 1995). The model predicts with a fair degree of accuracy that someone in the Canadian Prairie Provinces may hunt (or not) based on certain independent variables. Most results correspond with an Alberta study by McFarlane, Boxall, and Adamowicz (1999), with two major exceptions: this research shows that Canadian prairie-based hunters are not as likely to have a university education as non-hunters, and are more likely to be from a rural area. Nonetheless, this is explainable since McFarlane *et al*. (1999) were comparing occasional hunters with committed hunters, not simply hunters versus non-hunters.

The results also concur with Farnham and Jacoby (1992) and Leigh *et al*. (2000), confirming that Canadian hunters (Prairie Provinces) are most likely males who grew up in an rural environment, are middle aged (30-49 years), and more likely to be employed. Likewise, the results correspond with previous studies and perceptions that males are more likely to hunt. Still, there may be a trend to increasing female hunters in Alberta as indicated by Sillars (1997), and confirmed by this study showing that almost 10% of hunters in the Canadian Prairie Provinces in 1996 were females (up from 3-5% historically for women proportion of total hunters).

As for unemployed persons, it is speculated that they are less likely to hunt due to the high costs involved for equipment, transportation, accommodation, and licensing fees. Although they did not specifically target those not working, Farnham and Jacoby (1992) and McFarlane *et al*. (1999) indicate that hunting is increasingly expensive, hence detrimental for maintaining participation levels. It also makes sense that those who enjoy watching, studying, feeding, or photographing wildlife, or those that are members of sportsman's or naturalist's clubs, may also be more likely to hunt. This corresponds with McFarlane *et al.* (1999) who found that appreciative-oriented reasons for hunting were ranked the most important (e.g. 95% listed 'seeing wildlife and signs of wildlife' as important).

Although this research has demonstrated its practicality for analysis of Canadian hunters, there are several shortcomings that must be addressed. Most notably, several potentially key variables were not included in this analysis. The lack of reliable income data may have significantly influenced the results obtained. For instance, personal incomes of hunters were higher than those of the Canadian population as a whole, with 64.7% reporting incomes higher than $20,000 compared to 45.6% for the Canadian population (DuWors *et al*. 1999). Likewise, although not part of the 1996 Nature Survey dataset, ethnic background is an important variable that could be examined in subsequent research. For instance, as the provision of game meat for consumption is of vital importance for many Canadian aboriginal people, they may hunt more frequently than non-aboriginal Canadians.

Future logistic regression research on hunting in Canada could compare between provinces, or even *within* provinces since northern regions and rural or isolated towns may be distinguished by greater hunting activity. Previous years could also be contrasted with the 1996 Nature Survey dataset (or other sources) to determine if hunting profiles and trends have changed over time (such as the trend toward higher educated hunters which was not borne out by this study). Comparing hunter categories is another area of research interest (e.g. male versus female, rich versus poor, rural versus urban) that may help shed light on why hunting has been in decline since the 1980s.

It is hoped that this research has not only demonstrated the utility of predicting hunting, but may be an appropriate technique for any recreational or natural resource-based activity in which only dichotomous, discrete variables are available. Future research could investigate predictability of other outdoor recreational activities, including fishing, bird watching, and tourism. Ideally, it may lead to improved decision-making practices by providing wildlife and nature managers and policy makers with a valuable analytical tool.

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Notes

[1] The *1996 Survey on the Importance of Nature to Canadians* (Environment Canada 2000) assessed the social and economic value of nature-related activities to Canadians, drawing on a nationwide partnership of 16 federal, provincial, and territorial agencies. The survey examined the popularity of nature-related recreational activities, participation in these activities according to the natural areas in which they take place, and significant benefits to the economy resulting from spending on such activities.

[2] Unless otherwise indicated, dollars are in Canadian currency.

[3] Canadian residents 15 years of age and over were selected in conjunction with the provincial Labour Force Survey (LFS) sample.

[4] All dwellings in a rotation group remain in the sample for six consecutive months after which time they are replaced (rotated out of the sample) by a new panel of dwellings selected from the same or similar clusters.

[5] There were regional differences among those who hunted in 1996; out of a total of 12,640 respondents, 3.8% (177) of Alberta, 5.6% (199) of Saskatchewan, and 5.7% (253) of Manitoban residents hunted wildlife. These provinces also differed somewhat for the national average of $692 of *yearly hunting expenditures*; Alberta ($843) exceeded it, Saskatchewan ($723) was near average, and Manitoba ($584) just below it.

[6] Their correlation was .378, and both were significant at a=.01 when included in the logistic model.

[7] Since nine predictor variables were used, at least 450 respondents in the category of interest (hunters) were needed to carry out logistic regression in this research.

[8] Additional crosstabs were run on hunters compared to non-hunters; for example, regarding industry of main job, more hunters worked in agriculture (16.6% and 7.2%) but less in community services (6.6% and 14.4%), including education, health, welfare, or religious organizations.

[9] Although not significant at *a*=.05, it was not expected that either variable should be statistically significant.

[10] Values obtained for confidence limits differ from Table 3 due to rounding.

[11] Nagelkerke's R^2 divides Cox and Snell's R^2 by its maximum in order to achieve a measure that ranges from 0 to1.

[12] After removing *male* as a predictor variable, *Nagelkerke's R-Square* dropped to 14.7%.

[13] Another way of stating this is the odds of hunting are 10 times greater for males than for females.