Development of a Hunter Avidity Model to Assess and Improve R3 Participation

Study Conducted by
Sportsmen's Alliance Foundation
Archery Trade Association
RTS Strategies
Responsive Management

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The views expressed in this report may not be those of the Association of Fish and Wildlife Agencies; rather, they are the responsibility of Responsive Management based on the research.

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1. OVERVIEW

This project's primary purpose was to develop a Hunter Avidity Model so that the hunting community will be able to employ a more sophisticated and targeted approach to R3 (recruitment, retention, and reactivation). This project builds on the Outdoor Recreation Adoption Model (ORAM)—an essential resource for understanding how people become introduced and initiated into hunting—by providing a better understanding of participation characteristic central to the latter stages of ORAM: avidity.

The resulting Avidity Model will facilitate the development of targeted marketing and regulatory strategies to encourage hunters' progression through the ORAM. This project will benefit hunter R3 in all 50 states.

1.1. BACKGROUND

States are limited to a binary system to measure hunting participation: individuals either purchase a hunting license or they do not. However, this is only one indicator of an individual's commitment. Not all licensed hunters participate at the same level, and they differ in experience and overall connection to hunting and conservation. Beyond simply increasing the number of licensed hunters, the R3 community must also increase hunters' avidity, such as more hunting days, additional hunting methods used, more variety of species hunted, and stronger encouragement of hunting mentorship.

The ability to assess avidity will reveal the complete picture of an individual's hunting participation. This research entailed the development of a Hunter Avidity Model that can be applied to hunters in their respective state databases. The research identified key variables to assign an avidity value to each hunter.

The project results are described in three sections:

- Identification of potential variables that were used as indicators of avidity and that were included in the Hunting Avidity Model.
- Survey of a representative sample of hunters nationwide.
- The development of the Hunter Avidity Model for use in R3 outreach. This includes recommendations on its use for R3.

1.2. SUMMARY OF THE RESEARCH STEPS

The full methodology is included in the final chapter of this document, "Research Methods," but a summary is included here to help explain to the reader the results that are presented.

One of the initial tasks as part of this research was the acquisition of state license databases for use in the analyses and in the subsequent survey of licensed hunters. Simultaneous to the effort to obtain databases, the research team examined past hunter surveys to assess the variables that surveys have obtained that might relate to avidity.

Once the databases were made available to the research team, a systematic effort was undertaken to identify the variables that are included (and, ergo, tracked by agencies) in the

databases themselves. This examination of variables available in the databases allowed for the final selection of states to include in this part of the analyses. Next, the research team conducted statistical analyses of the selected databases to identify correlations between measures of avidity and other characteristics.

The project also included the aforementioned survey of licensed hunters. This entailed the development of a survey instrument, the preparation of the sample for surveying, the establishment of contact protocols, and the selection of modes for data collection. The survey was conducted in June and July 2022.

The final part of the research project entailed the development of the Hunter Avidity Model for use in R3 outreach, which is presented in this report. Tasks within this part of the overall effort included the analysis of survey data and the consideration of those survey data with the previous analyses of the databases. Both of these analyses efforts were used to develop the Hunter Avidity Model.

1.3. PRESENTATION OF DATA IN THIS REPORT

The levels of avidity based on license sales were labeled and defined as follows:

- Avid: Purchased at least 4 of the past 5 years or purchased a lifetime license in the 5-year time period.
- Churner: Purchased a license in 2 or 3 of the 5 years (and none of the licenses were a lifetime license).
- One-Timer: Purchased a license in only 1 of the 5 years (and the license was not a lifetime license).

2. IMPLICATIONS OF THE RESEARCH

This section summarizes the important findings of the research and then presents the Hunter Avidity Model.

2.1. SUMMARY OF SURVEY FINDINGS

This summary has the same thematic sections as the survey findings. It is based on the survey findings and the statistical analyses conducted on those results.

BASIC AVIDITY MEASURES: YEARS HUNTED, DAYS HUNTED, MENTORING

- Avids have higher numbers of days hunting, as was expected, compared to the other groups. Of somewhat more interest is that churners and one-timers are quite similar regarding the number of days that they go hunting in a particular year.

- Avids have higher numbers of years of hunting experience, compared to the other groups. Like with days, an important finding is that churners and one-timers again are quite similar to each other.

- The desire to hunt is somewhat strong in churners and one-timers in that nearly three quarters of each group say that they "plan to go hunting every year" (the specific wording used in the question), while the rest plan to go at lesser frequencies or do not know, and churners and one-timers are not statistically different on this. Avids, as was expected, have a statistically significant higher percentage who plan to go hunting every year.

- Nearly all hunters do some mentoring activities: either taking their own kids, taking friends or acquaintances hunting, or otherwise helping hunters if not actually going with them. Avids do this mentoring at a slightly greater rate than churners and one-timers—the latter groups are statistically the same.

SPECIES HUNTED AND HARVEST

- In species hunted, avids have a greater rate, compared to the other avidity groups, of hunting deer, wild turkey, squirrel, coyote, waterfowl, and mourning dove. And except for wild turkey, churners and one-timers are similar to one another on species sought. Regarding wild turkey, one-timers have a greater rate of hunting it than do churners.

- Harvest may have an effect on avidity, or vice-versa, as the analyses do not determine directionality of cause. Some hunters may become more avid because they start to have more harvest success, while other hunters who are avid already may then, through experience, become more efficient hunters. Nonetheless, avids had a statistically significant higher percentage in the top harvest success category, compared to the other groups.

HUNTING EQUIPMENT

- Avid hunters use archery and muzzleloaders at statistically higher rates than the other groups. However, there is not a linear relationship in use of equipment because churners in the survey had slightly lower rates of use compared to one-timers. In other words, one-timers were closer to avids than were churners.

- While avids had higher rates of use of any type of shooting equipment (other than air rifles), which means that they also had a higher rate of people using multiple types of equipment, there was not any marked differences in percentages who had stopped using a particular type of equipment. There was interest in learning if avids might be more inclined to drop the use of particular equipment to specialize in a single type—those who stop firearm hunting to hunt with archery equipment would epitomize this. However, rates of dropping any type of equipment show no meaningful relationships to avidity level.

- Specialization in hunting as an effect on equipment may play a role in purchases. Avids are more likely to purchase hunting clothing, archery equipment, tree stands, muzzleloaders or muzzleloading equipment, and hunting dogs/associated supplies. The only statistically significant difference between churners and one-timers occurred in the purchase of hunting clothing; the groups are the same on the other items mentioned above.

- There was interest in seeing if AR-platform rifles were more popular among avids than others, but there were no marked differences in the avidity groups regarding purchases in this category.

HUNTING LOCATIONS

- The types of land used had no marked differences among avidity groups—they all are using the same types of land at about the same rates. This includes land owned by the hunters or the hunters' families or land owned by friends or neighbors. Furthermore, while avids had a slightly higher rate of paying for access, compared to the other groups, avids were closer to one-timers than they were to churners. In other words, the relationship was *not* linear in the sense that avids were the most likely to pay for access and then that rate moved down as avidity went down, because that was not the case. In fact, one-timers had a higher percentage who paid for access than did churners—the opposite of a linear relationship.

- In typical travel distance, the most important finding is that all three avidity groups have the same median distance—there just are not important differences. There is no linear relationship in mean distance, as churners have the highest mean, followed by one-timers and then avids.

- One-timers are the most likely to have hunted out of state in the previous 5 years. Meanwhile, avids and churners are about the same on this.

MOTIVATIONS AND SATISFACTIONS FOR HUNTING

- Motivations were explored in two ways. The first way asked hunters to rate the importance of various motivations when they started hunting and then again now. As shown in the results, three motivations become more important in general from first hunting experiences to the latest (connecting with nature, for the challenge or sport, and for exercise), but they rise for all three avidity groups—so the groups are the same as far as that goes. In looking at the individual questions, starting with motivations for first hunting, avids have a slightly higher mean rating of going hunting to be with friends, compared to the other groups—this is the only statistically significant difference in that question. In motivations now, avids have a higher mean rating to be with family and to be with friends (as well as for exercise and to get a trophy, although those motivations are low down in the next question discussed below).

- In the second way to look at motivations, the survey asked hunters to choose their most important reason for hunting now. However, there are no statistically significant differences in the three avidity groups on this.

- An additional analysis was made based on the two ratings questions. Hunters were categorized for each possible motivation as having had that motivation decrease in importance, stay the same, or increase. Between first hunting and now, to be with family had the highest percentages who said that this motivation went down in importance, followed by to be with friends and to get meat. However, the percentages whose ratings of importance went down on these is about the same among the three avidity groups.

- The reasons that had the highest percentages whose ratings went up are for connecting with nature and for exercise, with avids more likely than the other groups to give a higher rating now compared to when they first hunted for these reasons. Avids have a markedly higher percentage whose rating went up for getting meat and for getting a trophy, as well.

- The survey examined four possible satisfactions, as well: harvesting game, seeing game, harvesting large animals, and getting the bag limit. On these, the importance ratings are not statistically different. (However, as noted elsewhere, harvest success does have a correlation to avidity.)

CROSSOVER ACTIVITIES

- In looking at other outdoor activities, the analyses had some important findings. First of all, the rates of fishing and sport shooting among the avidity groups are not statistically different. Secondly, avids are less likely than the other groups to do several of what are termed non-consumptive outdoor activities: camping, hiking, and canoeing/kayaking/non-motorized boating. Avids are also less likely to do some very active activities: running/jogging, bicycling, and soccer. Motorboating is statistically the same among the three groups.

INVOLVEMENT IN ORGANIZATIONS

- Among all three groups of hunters, there are no statistically significant differences in saying that they have donated to or been members of an organization devoted to conservation, wildlife, and related outdoor activities.

INTRODUCTION TO HUNTING

- While growing up in a hunting family has been shown to be associated with becoming a hunter, the three avidity groups are not statistically different on this. Avids do have a higher rate, but just slightly. (For targeted marketing, the age and gender breakdown of the groups defined by this question were presented in that section of the report.)

- In examining the person who first took hunters hunting, avids, churners, and one-timers are similar—there are no statistically significant differences in first hunting companion. While avid hunters generally come from a hunting household and were introduced into hunting by their father or other male family member, it is the same with churners and one-timers, too.

- Avids more often started hunting early in life—before the age of 15—compared to the other groups. Churners and one-timers are statistically the same on this.

DEMOGRAPHIC CHARACTERISTICS

- Avids have a higher rate of male gender than the other groups, a statistically significant difference.

- Avids have a higher rate of Boomer II and a lower rate of Gen Z than the other groups, statistically significant differences.

- Whites and a category consisting of all others were tested; there were no statistically significant differences.

- Avids have a lower percentage in large city/urban area and a higher percentage in rural area, compared to the other groups; these are statistically significant differences.

- Avids are markedly lower than the other groups in the upper education level (Master's, etc.), a statistically significant difference.

- Income had no statistically significant differences.

- Regarding comfort level talking about hunting, there was interest to see if avids were greatly different from churners and one-timers; however, there are no statistically significant differences in being very comfortable talking about hunting to others. All three groups have overwhelming percentages being comfortable talking about their hunting, with low percentages being uncomfortable—only 3% of each avidity group indicated being generally uncomfortable talking about their hunting.

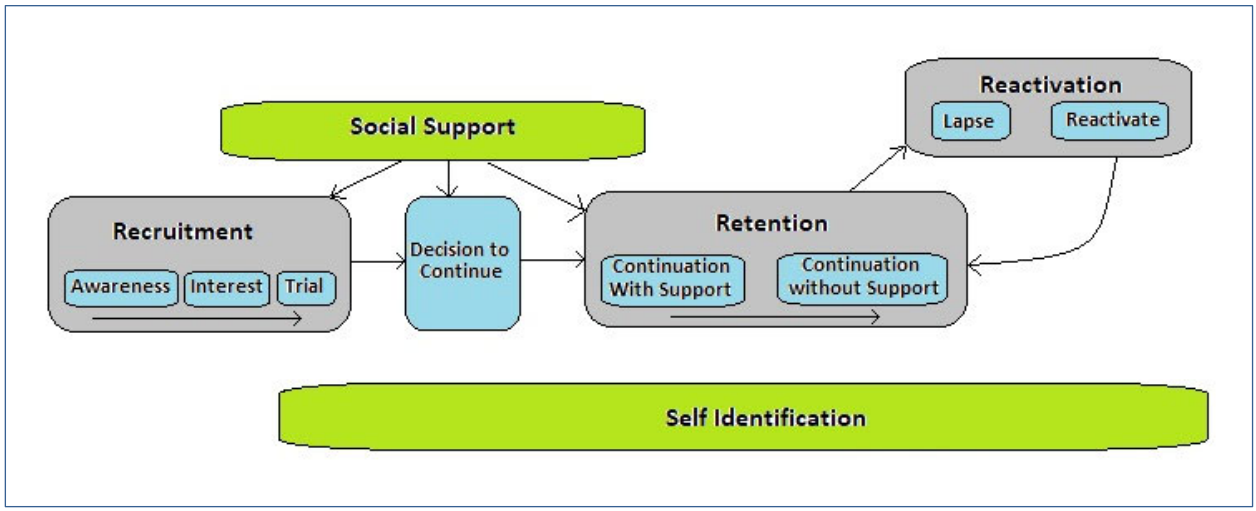
2.2. HUNTER AVIDITY MODEL

The Hunter Avidity Model starts with the Outdoor Recreation Adoption Model (ORAM), which is described first, followed by a discussion of ORAM as it relates to avidity levels. Then each part of the model is examined in the context of the above results.

ORAM AND ITS RELATIONSHIP TO RECRUITMENT, RETENTION, AND REACTIVATION

People go through stages when they become recreation participants. The first three stages of the ORAM (awareness, interest, and trial activity) are addressed by recruitment efforts. These initial stages lead to the next stages: the decision to continue, continuing participation with social support, and then continuing participation without social support. These continuation stages are addressed by retention efforts. Individuals who do not continue to participate are referred to as lapsed participants—the remaining stages of the ORAM. Lapsing may be further divided into individuals who are short-term lapsed and those who are long-term lapsed. These lapsed stages are addressed by reactivation efforts.

Outdoor Recreation Adoption Model (ORAM)



Note that not all participants go through all the stages—the model is not meant to be strictly linear from beginning to end but contains loops—as some people move through the continuation stages into the lapsed stages and then back into the continuation stages (if they become reactivated), and some (ideally) stop at the continuation without support stage. The ORAM is reproduced below. The model was recreated based on the figure in Appendix A of *AFWA President's Task Force on Angler R3* published in 2018.

ORAM AND AVIDITY LEVELS

In broad terms, avids are in the "continuation without support" stage of ORAM. They self-identify as hunters, and they show robust participation.

Churners can be in almost any stage, but they most fit into either the "continuation with support" stage or the "reactivate" stage.

One-timers also can be in any stage, but they most fit into the "trial" stage leading into the "decision to continue" node, although they also fit into the "lapse" stage leading into (the hunting community would hope) the "reactivate" stage.

RECRUITMENT

Beginning hunters in general, although there are exceptions, go for only a few days in a given year to start. Based solely on days, however, there are not major differences between churners (who would be further along on ORAM leading up to continuation without support) and one-timers.

At this stage, harvest may still be elusive.

Avid hunters put slightly greater importance on hunting with friends when they started hunting, compared to the other groups. This may mean that avids started with robust support groups. This suggests the importance of friends at the early stages.

There is evidence that early recruitment is positively associated with avidity. Avid hunters started earlier than did churners and one-timers.

DECISION TO CONTINUE

Although many hunters say that harvest is not their favorite aspect of hunting, there is evidence that harvest success is associated with avidity. This, in turn, suggests that some harvest success is a factor in the decision to continue.

In general, three motivations become more important as hunters gain experience: connecting with nature, for the challenge or sport, and for exercise. These motivations for hunting should be tapped into and encouraged to develop avid hunters, but there is not a great difference between avidity groups on this—these rise in importance for all groups. On the other hand, the motivations of being with family and being with friends fall for many hunters.

RETENTION: CONTINUATION WITH SUPPORT

Hunters start to approach a high number of days hunting. However, as was noted, the differences between churners and one-timers were negligible on days hunted, so there may be little apparent difference vis-à-vis days hunted and where a hunter falls in ORAM.

Harvest levels at this stage are in the middle and starting to approach the high harvest success of avids. However, note that there was not a great difference between churners and one-timers on harvest success—only the avids were different on this.

At this stage, hunters may or may not be specializing in shooting equipment. The analyses found that avids use archery and muzzleloading equipment more than do the other groups, but one-timers did not have the lowest use—churners did. So equipment use does not define this stage of ORAM, as lower use rates could be among hunters in many of the stages.

As hunters move through this stage, there is some evidence that the importance of friends and family as hunting partners may diminish a little. They diminish for all three groups. However,

avids still rated these reasons higher than the other groups—so this is a mixed result. Connecting with nature becomes more important.

Although crossover activities have some association with hunting participation—other surveys by Responsive Management have shown that hunting initiation is more effective among people who already do outdoor activities—the most avid hunters had a lower rate of camping, hiking, and canoeing/kayaking than did churners and one-timers. While interest in hunting can be piqued through contact with outdoor recreationists, at some point the most avid hunters may do these other activities at lower rates than churners or one-timers.

RETENTION: CONTINUATION WITHOUT SUPPORT

At this stage, hunters are hunting many days.

Hunters plan to go hunting every year when in this stage.

The overwhelming majority of avid hunters do mentoring activities. However, with the exception of those in the recruitment part of the model (i.e., before the decision to continue node), all hunters do mentoring activities: the survey found high percentages of churners and one-timers who also had done mentoring.

Avid hunters have a greater rate of hunting most important species (important in terms of the number who hunt them) compared to churners and one-timers. Related to the species hunted is harvest success—the analyses found a correlation between harvest success and being an avid hunter.

At this stage, avids show signs of specialization—they use archery and muzzleloaders more than do the other groups. They buy hunting clothing, tree stands, and hunting dogs at a higher rate than the other avidity groups.

There is some evidence that avid hunters may concentrate more on hunting than on camping, hiking, and canoeing/kayaking at this stage (although substantial portions still, nonetheless, do those activities—just not at the rate that less avid hunters do).

REACTIVATION

It was apparent that hunters in this stage had or continue to mentor other hunters—an obvious conduit to reactivating themselves. While avids are the most likely to mentor, very large percentages of all groups do so, and churners and one-timers are not different (only the avids showed a statistically significant difference).

SOME NOTABLE CHARACTERISTICS THAT DID NOT HAVE DIFFERENCES

The use of AR-platform rifles does not seem to have a correlation to hunting avidity—purchases of AR-platform rifles and associated equipment and supplies has no statistically significant relationship to avidity.

There was interest in testing whether the dropping of use of certain equipment had any relationship with avidity—in other words, were avid hunters stopping the use of some types of

firearms or equipment in favor of using other equipment? Were they dropping rifles to hunt with archery or muzzleloaders? The survey did not find marked differences in the rates of dropping the use of any types of equipment among the avidity groups. Therefore, it appears that all avidity groups are dropping the use of some types of equipment in favor of others.

Only one type of land showed any correlation with avidity—paying for access. Avids had done this more than churners or one-timers. But churners had done it less than one-timers, so the correlation to avidity is not consistent. Other types of land, including using one's own land/family land or a friend's/neighbor's land shows no statistical correlation.

Travel distance does not show any marked correlation to avidity.

Avids and churners were about the same on hunting out of state. (The highest rate of hunting out of state was among one-timers.)

Motivations were explored both through a series of ratings importance (reported above) as well as through a question that asked hunters to choose their single most important motivation. In this regard, there are no statistically significant differences in the avidity groups on this.

In the ratings of four possible satisfactions with hunting that were asked about in the survey, there were no statistically significant differences. Those satisfactions were harvesting game, seeing game, harvesting large animals, and getting the bag limit. This is perceived rating of importance; note that elsewhere harvest success was correlated to a higher level of avidity.

There was no statistically significant difference in avidity groups and whether they have donated to or been members of an organization devoted to conservation, wildlife, and related outdoor activities.

Growing up in a hunting family has been shown to be associated with becoming a hunter, but the three avidity groups are not statistically different on this.

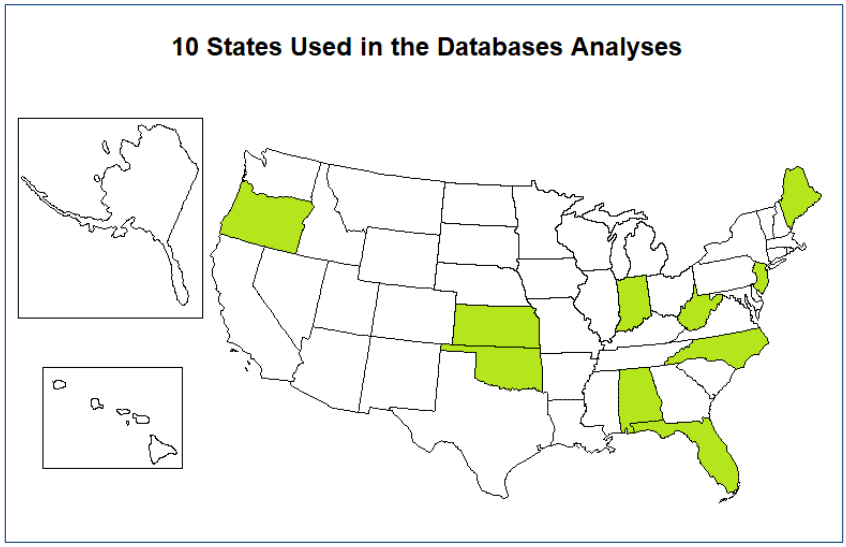
Regarding who first took hunters hunting, there are no statistically significant differences in first hunting companions among avids, churners, and one-timers. They all most commonly were first taken by their father.

3. RESEARCH THAT SUPPORTS THE IMPLICATIONS

This section of the report encompasses the initial analyses of databases used to help identify potential variables related to avidity, the collection and tabulation of survey data, statistical analyses of those data, and finally the Hunter Avidity Model.

3.1. INITIAL ANALYSES OF DATABASES AND IDENTIFICATION OF POTENTIAL VARIABLES

As explained in the methodology, the initial steps in the project identified the states that had databases that met the criteria for the study. Ultimately, ten states were used in the initial analysis, shown in the accompanying map.



DEFINING AVIDITY

Based on the 5 years of license purchasing records available, avidity was defined for each record. Lifetime license purchases typically do not entail any further license purchases, so lifetime license holders were considered as explained below.

The levels of avidity were defined and labeled as follows:

- Avid: Purchased at least 4 of the past 5 years or purchased a lifetime license in the 5-year time period.
- Churner: Purchased a license in 2 or 3 of the 5 years (and none of the licenses were a lifetime license).
- One-Timer: Purchased a license in only 1 of the 5 years (and the license was not a lifetime license).

The analyses explored how this avidity variable was affected by other variables: location, generation, gender, and license type(s). These are explained in the next section.

OTHER VARIABLES IN THE DATABASE USED IN THE ANALYSES

The databases included fields that allowed the determination of several variables that were used in the analyses.

- Location. These were based on zip codes in the database. A categorization was used to put all hunters into a rural-urban continuum with out-of-state residency added in as a locationally defined group. Rural and urban designations of in-state hunters were based on the Economic Research Service Rural-Urban Continuum Codes, a classification scheme that distinguishes metropolitan counties by the population size of their metro area and nonmetropolitan counties by degree of urbanization and adjacency to a metro area. This resulted in three categories:
    - Rural residents.
    - Urban residents.
    - Out of state residents.
- Generational Age. The databases contained either the age of the hunter or the birthdate. For the age variable, the generations were defined as being born in the years indicated:
    - Post War: 1928-1945
    - Boomer I: 1946-1954
    - Boomer II: 1955-1964
    - Gen X: 1965-1980
    - Millennials: 1981-1996
    - Gen Z: 1997 or later
- Gender. This variable was included in most of the databases, as recorded by the state fish and wildlife agencies. In Alabama and Florida, the gender variable was not available in the databases. For that state, a software package maintained by the R Foundation as part of the Comprehensive R Archive Network (CRAN) called "Predict Gender from Names Using Historical Data" was used to impute gender name. This package considers the name and spelling as well as historical data on male/female ratios in the state on people who had that name at the time of the person's birth (i.e., also considering the time period that the name was given).
- License Type. Each states has its own suite of license types. For the analyses, each state's licenses were categorized into logical groupings. This categorization was not exactly the same in each state simply because license types varied in each state.

ANALYSES OF VARIABLES' EFFECTS ON AVIDITY: GENERAL REMARKS

The analyses were carried out on 10 states. For each state, license holders were first categorized into groups based on the avidity variable. Subsequently, the other variables were tested to see how they affected the avidity variable. Each state's analyses is reported separately. Each state's writeup is considered as a stand-alone section. For this reason, some explanations about the analysis are repeated for each state.

MEASURING HUNTER AVIDITY IN ALABAMA

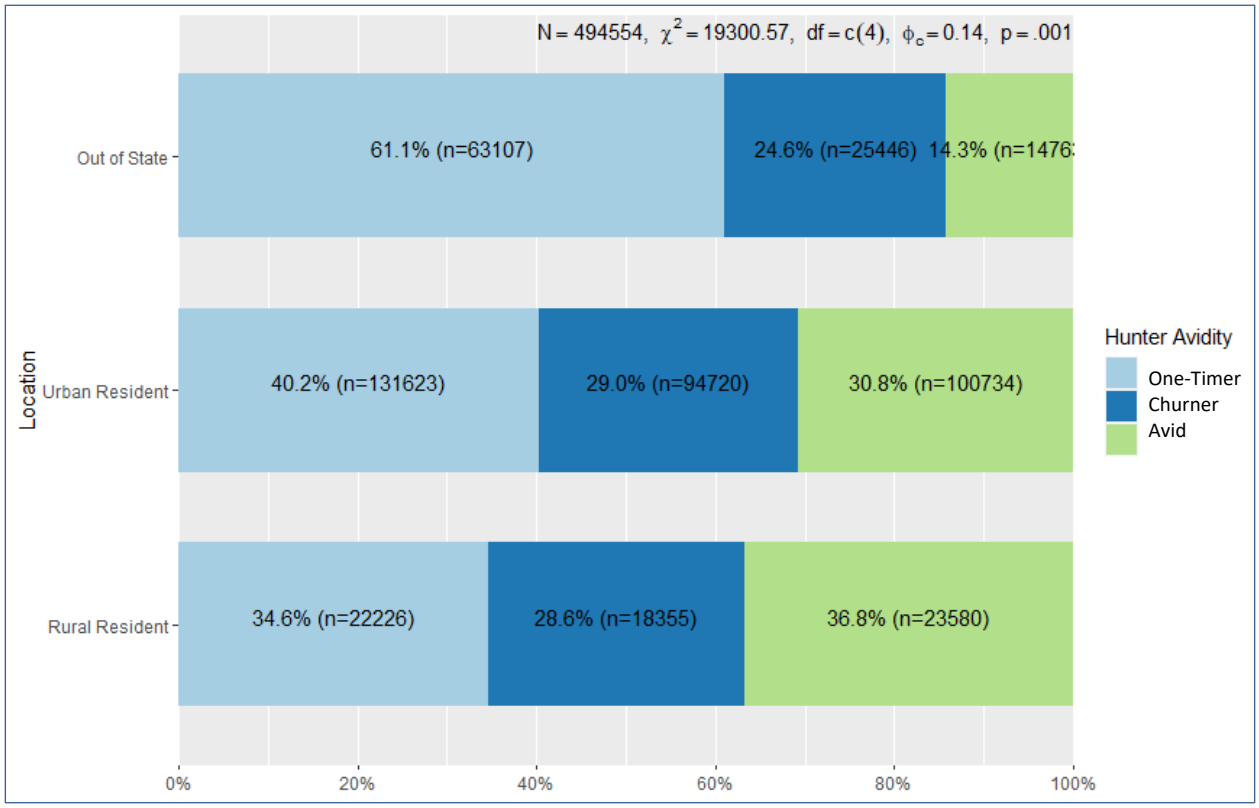
Avidity Group

The avidity groups for Alabama are provided in the table below. One-timers make up the most hunters in Alabama (44%), with the churner and avid groups of similar size (both at 28%).

Number and Percentage of Hunters in Avidity Categories				
	One-Timer	Churner	Avid	Total
Number	216,956	138,521	139,077	494,554
Percentage	43.9	28.0	28.1	

Location

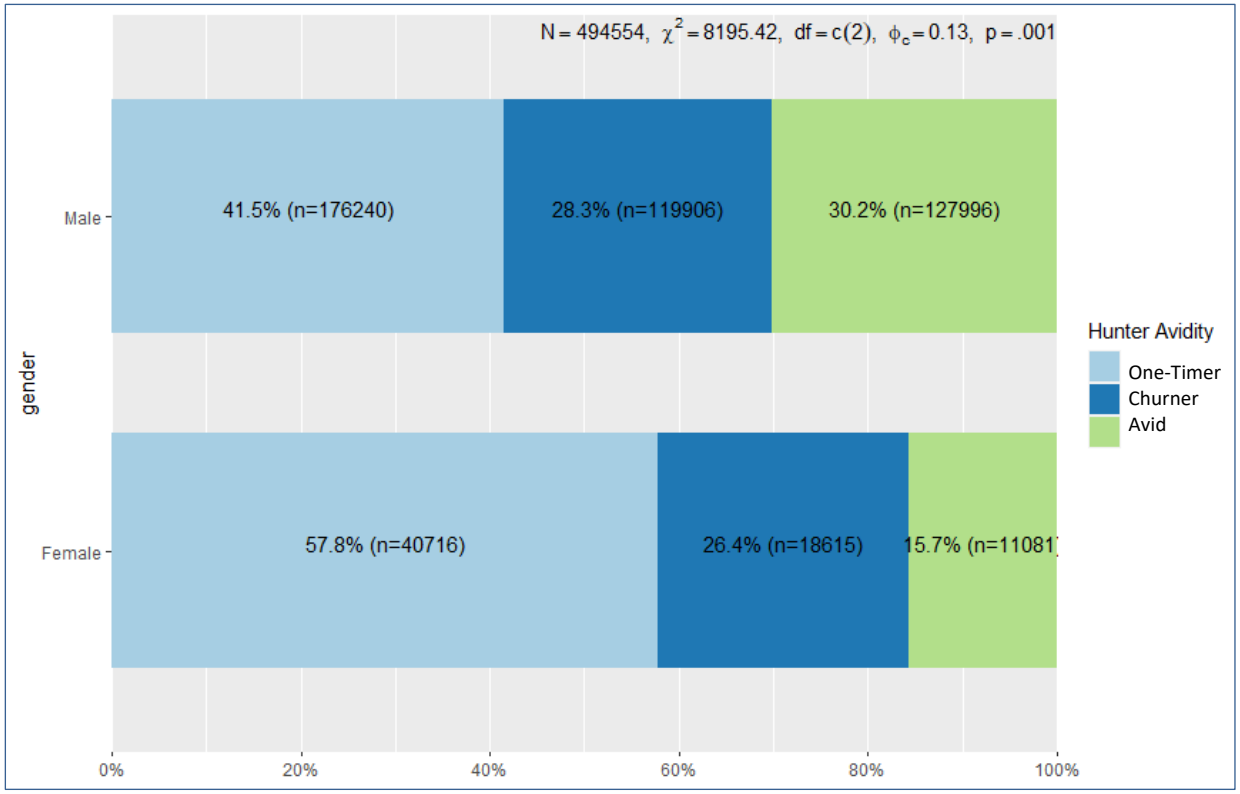
Hunters that resided in rural areas of the state were more likely to be avid than those living in urban centers or who came from out of state to hunt. A contingency table, also known as a cross-classification table, describes the relationships between two or more categorical variables. The null hypothesis proposes that hunter avidity and location of the hunter's residence are independent of one another. This means the occurrence of one kind of event does not depend on the other kind of event (i.e., they are not associated). As can be seen in the figure below, the p-value of the Chi Square Test is highly significant ($p<0.001$) indicating that the location frequency varies among the three kinds of hunter avidity.



Contingency Table for Location and Hunter Avidity, Alabama					
Avidity Group		**Rural**	**Urban**	**Out of State**	**Total**
One-Timer	Number	22,226	131,623	63,107	216,956
	Percentage of One-Timer in Location	10.2	60.7	29.1	
	Percentage of Locational Group That Are One-Timer	34.6	40.2	61.1	43.9
Churner	Number	18,355	94,720	25,446	138,521
	Percentage of Churner in Location	13.3	68.4	18.4	
	Percentage of Locational Group That Are Churner	28.6	29.0	24.6	28.0
Avid	Number	23,580	100,734	14,763	139,077
	Percentage of Avid in Location	17.0	72.4	10.6	
	Percentage of Locational Group That Are Avid	36.8	30.8	14.3	28.1
Total	Number	64,161	327,077	103,316	494,554
	Percentage of Total in Location	13.0	66.1	20.9	100.0
$\chi 2=19300.574 \cdot df=4 \cdot$ Cramer's $V=0.140 \cdot p=0.000$					

Gender

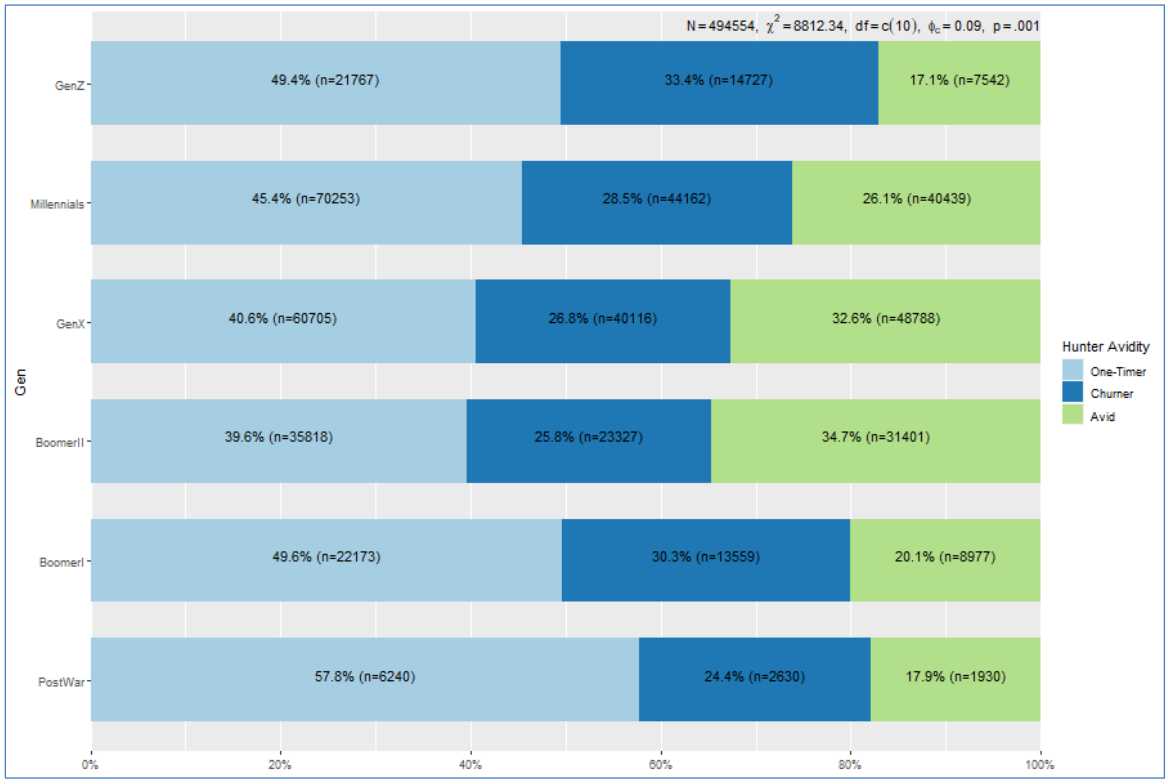
The null hypothesis regarding gender proposes that hunter avidity and the hunter's gender are independent of one another. Once again, the Chi-Square test is highly significant indicating a strong relationship between gender and hunter avidity in Alabama. In this situation, the incidence of high avidity is much more prevalent for male hunters (30 percent versus 16 percent female).



Contingency Table for Gender and Hunter Avidity, Alabama				
Avidity Group		**Female**	**Male**	**Total**
One-Timer	Number	40,716	176,240	216,956
	Percentage of One-Timer in Gender Category	18.8	81.2	
	Percentage of Gender Group That Are One-Timer	57.8	41.6	43.9
Churner	Number	18,615	119,906	138,521
	Percentage of Churner in Gender Category	13.4	86.6	
	Percentage of Gender Group That Are Churner	26.4	28.3	28.0
Avid	Number	11,081	127,996	139,077
	Percentage of Avid in Gender Category	8.0	92.0	
	Percentage of Gender Group That Are Avid	15.7	30.2	28.1
Total	Number	70,412	424,142	494,554
	Percentage of Total in Gender Category	14.2	85.8	100.0
				χ2=8195.424 · df=2 · Cramer's V=0.129 · p=0.000

Generational Age

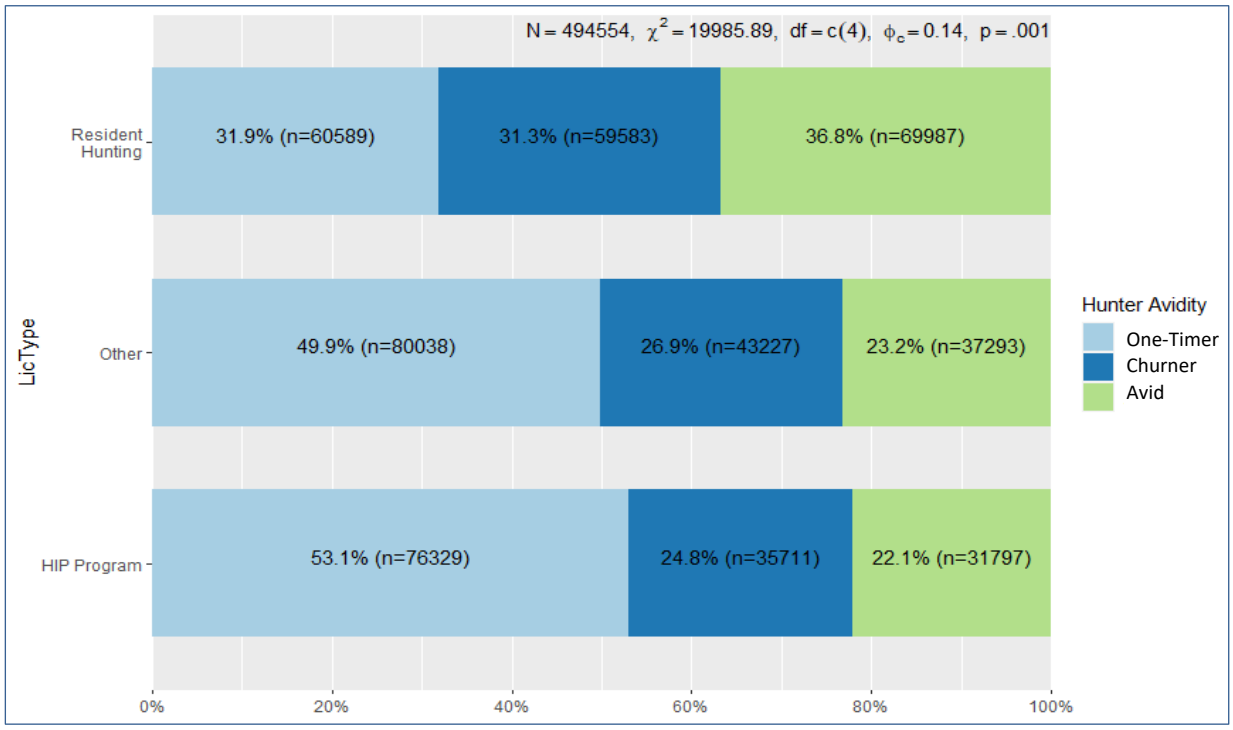
Based on widespread consensus as well as new Gen Z analyses by the Pew Research Center and the generation defined by the U.S. Census Bureau as Baby Boomers, date of birth can be used to define generation groups. The researchers examined the relationship between hunter avidity and generational age. The generational age of a hunter is also shown to influence hunter avidity based on the significant Chi-square test result. High avidity was most prevalent in the mid-age groups represented by Boomers II and Gen X, where more than a third of hunters were highly avid. Avidity drops below 20% for both older and younger age generations, suggesting that they are much less likely to be avid hunters.



Contingency Table for Generational Age and Hunter Avidity, Alabama								
Avidity Group		**Post War**	**Boomer I**	**Boomer II**	**Gen X**	**Millennial**	**Gen Z**	**Total**
One-Timer	Number	6,240	22,173	35,818	60,705	70,253	21,767	216,956
	Percentage of One-Timer in Age Group	2.9	10.2	16.5	28.0	32.4	10.0	
	Percentage of Age Group That Are One-Timer	57.8	49.6	39.6	40.6	45.4	49.4	43.9
Churner	Number	2,630	13,559	23,327	40,116	44,162	14,727	138,521
	Percentage of Churner in Age Group	1.9	9.8	16.8	29.0	31.9	10.6	
	Percentage of Age Group That Are Churner	24.4	30.3	25.8	26.8	28.5	33.4	28.0
Avid	Number	1,930	8,977	31,401	48,788	40,439	7,542	139,077
	Percentage of Avid in Age Group	1.4	6.5	22.6	35.1	29.1	5.4	
	Percentage of Age Group That Are Avid	17.9	20.1	34.7	32.6	26.1	17.1	28.1
Total	Number	10,800	44,709	90,546	149,609	154,854	44,036	494,554
	Percentage of Total in Age Group	2.2	9.0	18.3	30.3	31.3	8.9	
$\chi 2=8812.336 \cdot df=10 \cdot$ Cramer's $V=0.094 \cdot p=0.000$								

License Type

In Alabama there are two broad categories of licenses, resident hunting and HIP Program, and several specialty licenses, which were grouped into "other," the base category. A high percentage of avid hunters (37 percent) were associated with the resident hunting type of license.



Contingency Table for License Type and Hunter Avidity, Alabama					
Avidity Group		**HIP Program**	**Other**	**Resident Hunting**	**Total**
One-Timer	Number	76,329	80,038	60,589	216,956
	Percentage of One-Timer in License Type	35.2	36.9	27.9	
	Percentage of License Group That Are One-Timer	53.1	49.8	31.9	43.9
Churner	Number	35,711	43,227	59,583	138,521
	Percentage of Churner in License Type	25.8	31.2	43.0	
	Percentage of License Group That Are Churner	24.8	26.9	31.3	28.0
Avid	Number	31,797	37,293	69,987	139,077
	Percentage of Avid in License Type	22.9	26.8	50.3	
	Percentage of License Group That Are Avid	22.1	23.2	36.8	28.1
Total	Number	143,837	160,558	190,159	494,554
	Percentage of Total in License Type	29.1	32.5	38.5	
χ2=19985.887 · df=4 · Cramer's V=0.142 · p=0.000					

Multinomial Logistic Regression

Logistic regression is a statistical technique used when the dependent variable is categorical (or nominal). For Binary logistic regression the number of dependent variables is two, whereas the number of dependent variables for multinomial logistic regression is more than two. As with other types of regression, multinomial logistic regression can have nominal and/or continuous independent variables and can have interactions between independent variables to predict the dependent variable. Multinomial logistic regression is often considered an attractive analysis because; it does not assume normality, linearity, or homoscedasticity.

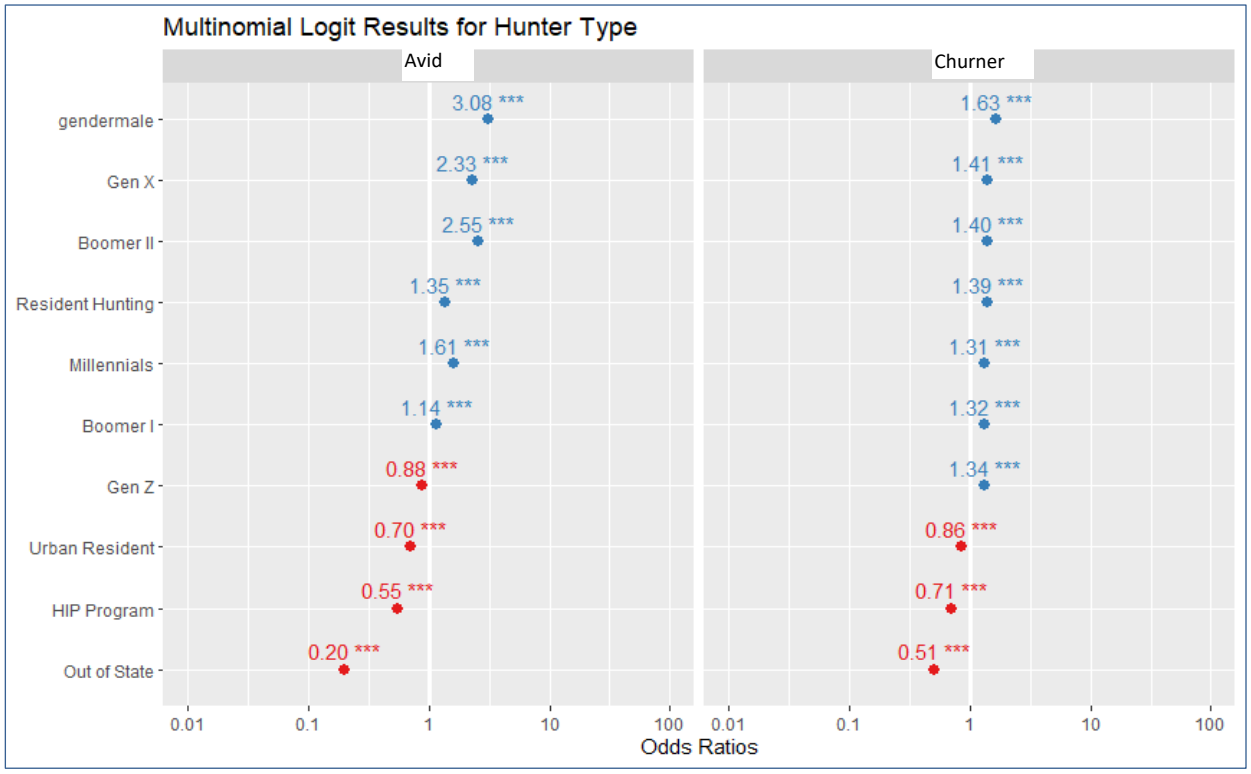
This approach does have assumptions, such as the assumption of independence among the dependent variable choices. This assumption states that the choice of or membership in one category is not related to the choice or membership of another category (i.e., the dependent variable). Furthermore, multinomial logistic regression also assumes non-perfect separation. If the groups of the outcome variable are perfectly separated by the predictor(s), then unrealistic coefficients will be estimated, and effect sizes will be greatly exaggerated.

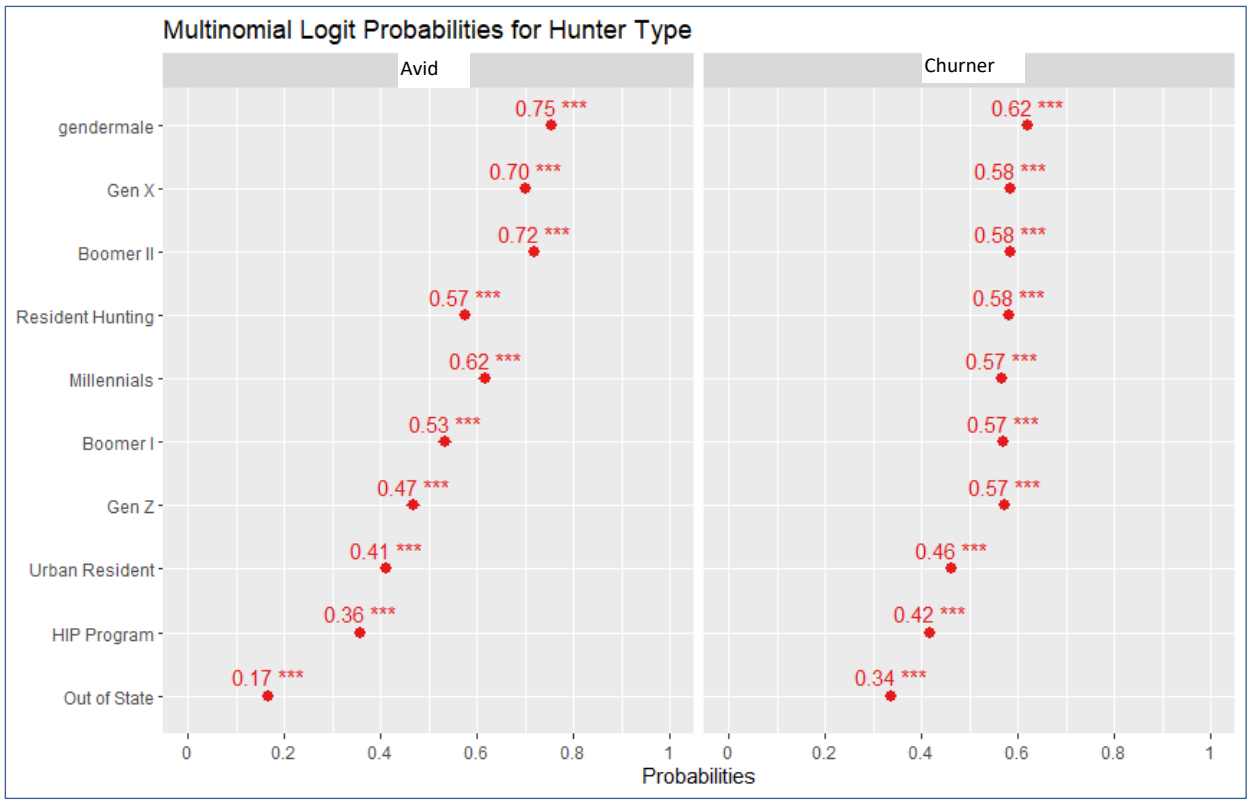
Predictors	**Avidity**			
	Odds Ratios	**CI**	**p**	**Response**
(Intercept)	0.40	0.38 – 0.42	**<0.001**	Churner
(Intercept)	0.24	0.23 – 0.26	**<0.001**	Avid
gendermale	3.08	3.01 – 3.15	**<0.001**	Avid
gendermale	1.63	1.60 – 1.66	**<0.001**	Churner
Rural Resident	*Reference*			
BoomerI	1.14	1.08 – 1.21	**<0.001**	Avid
Urban Resident	0.86	0.84 – 0.88	**<0.001**	Churner
BoomerII	2.55	2.41 – 2.69	**<0.001**	Avid
Out of State	0.20	0.19 – 0.20	**<0.001**	Avid
GenX	2.33	2.20 – 2.46	**<0.001**	Avid
PostWar	*Reference*			
GenZ	1.34	1.27 – 1.41	**<0.001**	Churner
BoomerI	1.32	1.26 – 1.39	**<0.001**	Churner
Millennials	1.61	1.52 – 1.70	**<0.001**	Avid
BoomerII	1.40	1.33 – 1.47	**<0.001**	Churner
GenX	1.41	1.34 – 1.48	**<0.001**	Churner
HIP Program	0.55	0.54 – 0.56	**<0.001**	Avid
GenZ	0.88	0.83 – 0.94	**<0.001**	Avid
Millennials	1.31	1.25 – 1.37	**<0.001**	Churner
Resident Hunting	1.35	1.32 – 1.38	**<0.001**	Avid
Other	*Reference*			
Out of State	0.51	0.49 – 0.52	**<0.001**	Churner
HIP Program	0.71	0.70 – 0.73	**<0.001**	Churner
Resident Hunting	1.39	1.36 – 1.42	**<0.001**	Churner
Urban Resident	0.70	0.68 – 0.71	**<0.001**	Avid
Observations	494554			
R2 Nagelkerke	0.114			

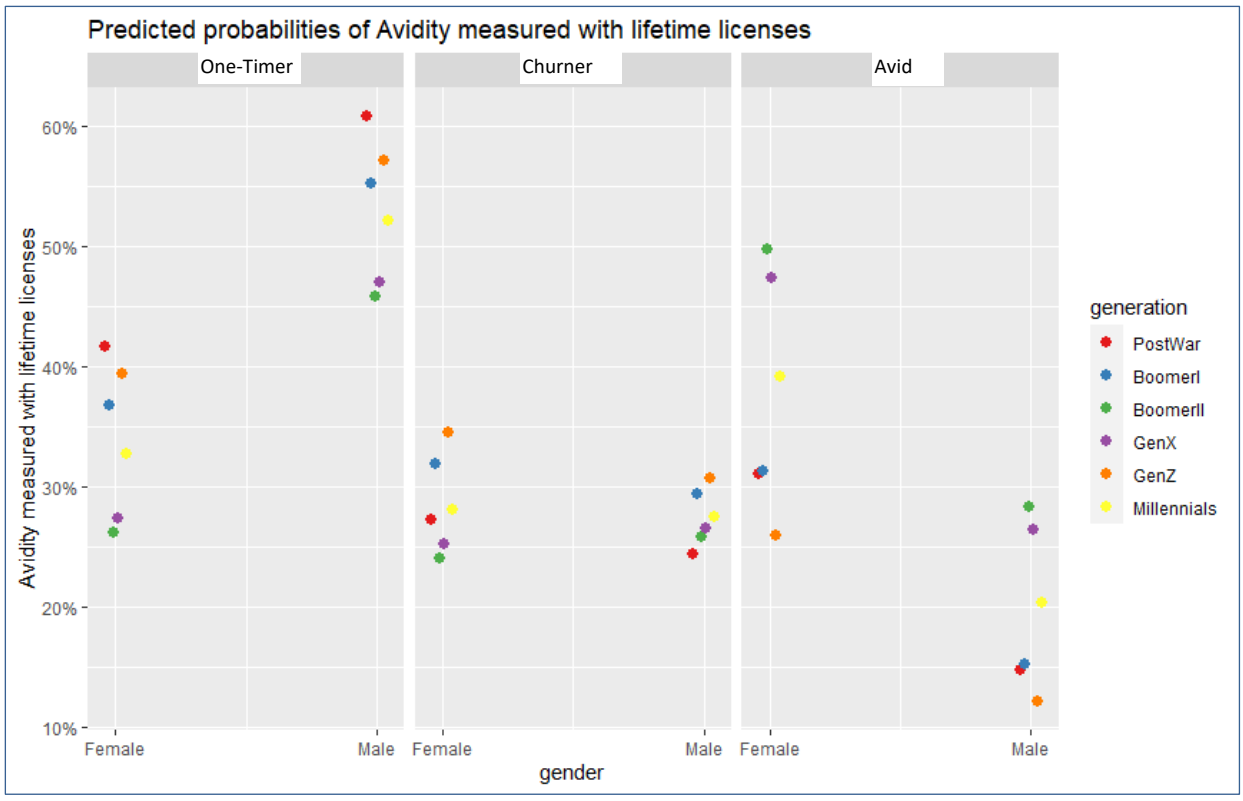
The ratio of the probability of choosing one outcome category over the probability of choosing the baseline category is often referred as relative risk (and it is sometimes referred to as odds, described in the regression parameters above). The relative risk is the right-hand side linear equation exponentiated, leading to the fact that the exponentiated regression coefficients are

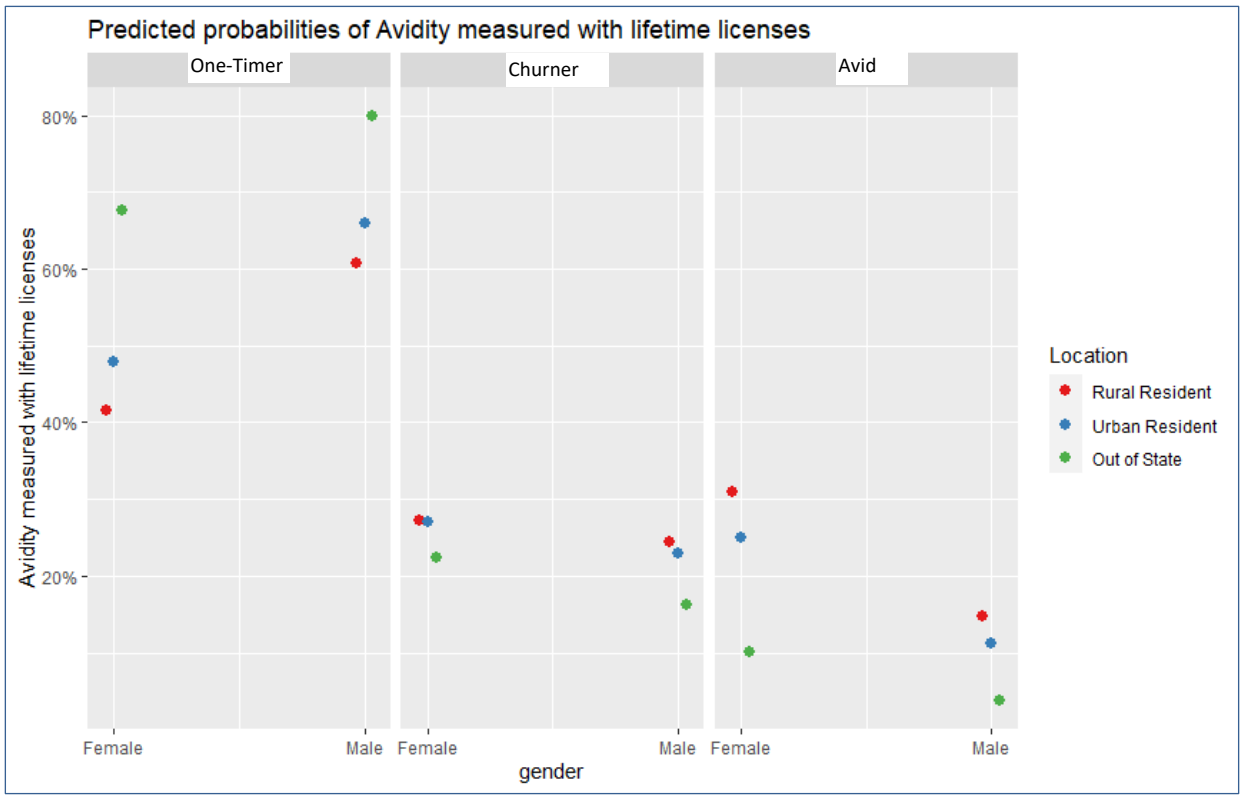
relative risk ratios for a unit change in the predictor variable. We can exponentiate the coefficients from our model to see these risk ratios. Odd ratios greater than 1.0 indicate a positive effect from the variable in question.

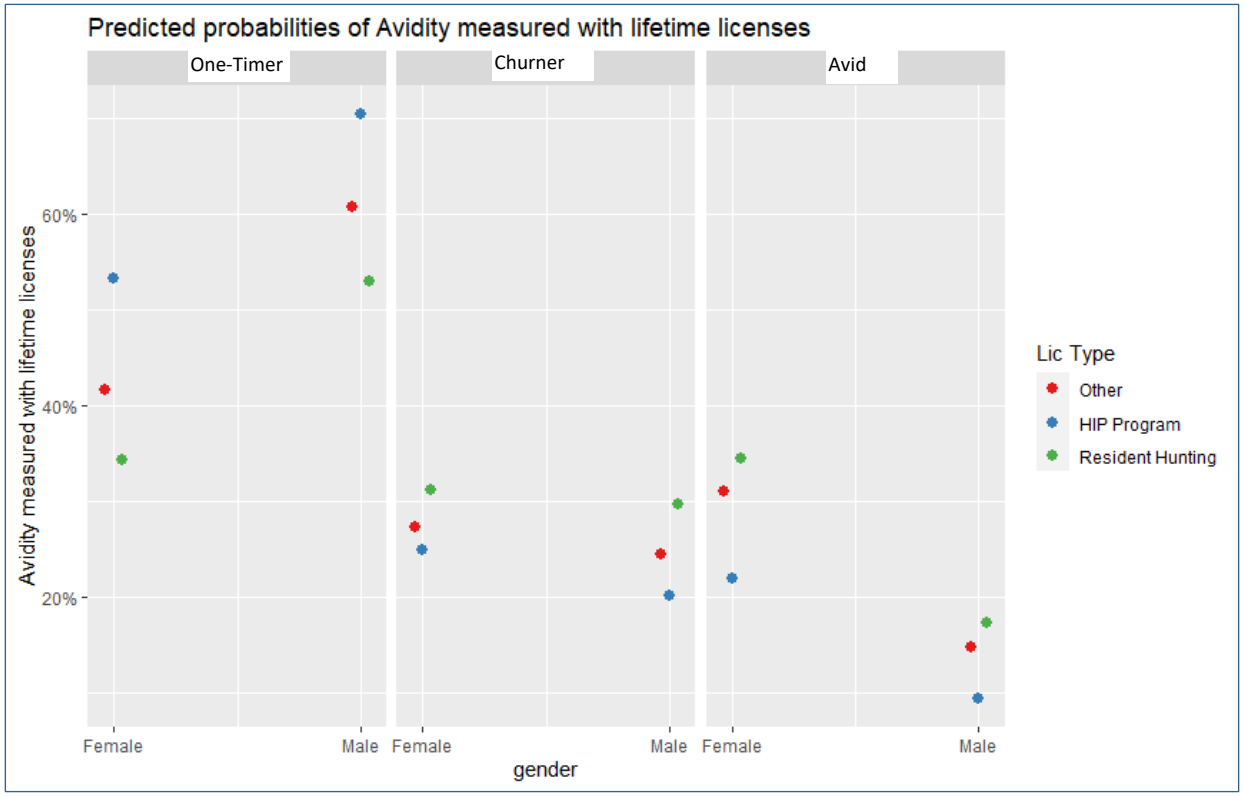
Hunter generation was the most influential variable in distinguishing both avid and churner hunter groups from one-timers. Those from the Boomer II and Gen X were much more likely to be avid hunters. Location was also important in distinguishing between avid and one-timers, with out of state hunters much more likely to be one-timers.




Multinomial Logit Probabilities for Hunter Type
Avid
Churner
gendermale
Gen X
Boomer II
Resident Hunting
Millennials
Boomer I
Gen Z
Urban Resident
HIP Program
Out of State
0.75 ***
0.70 ***
0.72 ***
0.57 ***
0.62 ***
0.53 ***
0.47 ***
0.41 ***
0.36 ***
0.17 ***
0.62 ***
0.58 ***
0.58 ***
0.58 ***
0.57 ***
0.57 ***
0.57 ***
0.46 ***
0.42 ***
0.34 ***
0
0.2
0.4
0.6
0.8
1
Probabilities


Predicted probabilities of Avidity measured with lifetime licenses
One-Timer
Churner
Avid
Avidity measured with lifetime licenses
60%
50%
40%
30%
20%
10%
Female
Male
gender
generation
PostWar
BoomerI
BoomerII
GenX
GenZ
Millennials


Predicted probabilities of Avidity measured with lifetime licenses
One-Timer
Churner
Avid
80%
60%
40%
20%
Avidity measured with lifetime licenses
Female
Male
Female
Male
Female
Male
gender
Location
Rural Resident
Urban Resident
Out of State


Predicted probabilities of Avidity measured with lifetime licenses
One-Timer
Churner
Avid
Avidity measured with lifetime licenses
60%
40%
20%
Female
Male
gender
Lic Type
Other
HIP Program
Resident Hunting

MEASURING HUNTER AVIDITY FLORIDA

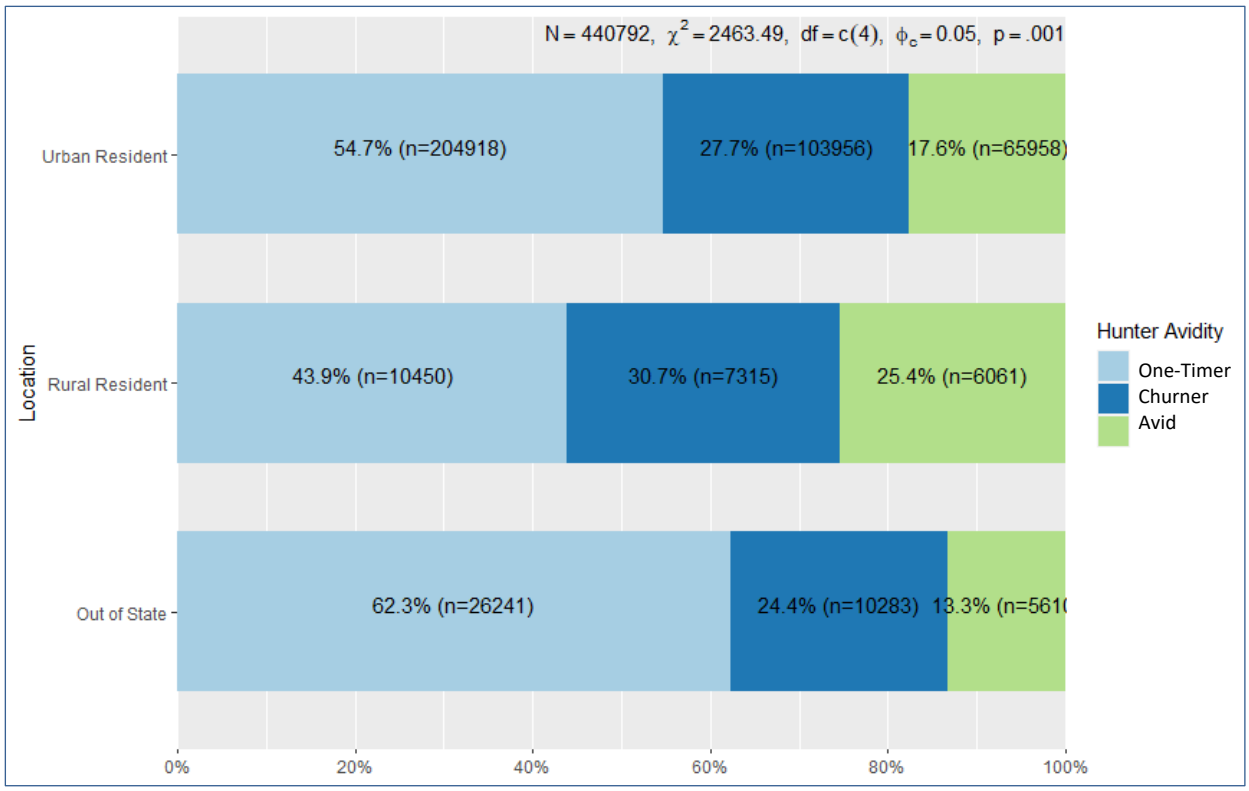
Avidity Group

The avidity groups for Florida are provided in the table below. A majority of Florida hunters (55%) were considered one-timers. The smallest group during the study period were avid hunters (18%). About a fourth of hunters fell somewhere between, having purchased a license in 2-3 years of the 5-year period.

Number and Percentage of Hunters in Avidity Categories				
	One-Timer	Churner	Avid	Total
Number	241,609	121,554	77,629	440,792
Percentage	54.8	27.6	17.6	

Location

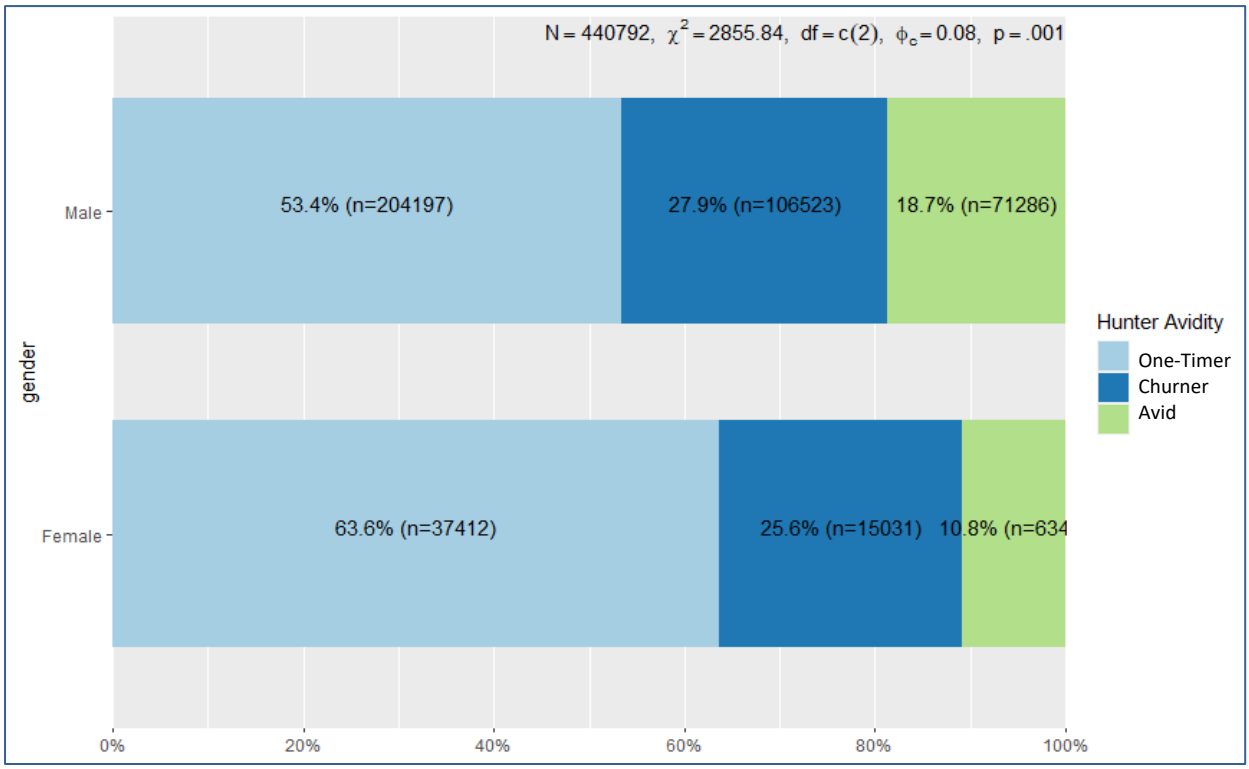
Hunters who resided in rural areas of the state were more likely to be avid than those living in urban areas or those who came from out of state to hunt. A contingency table, also known as a cross-classification table, describes the relationships between two or more categorical variables. The null hypothesis proposes that hunter avidity and location of the hunter's residence are independent of one another. This means the occurrence of one kind of event does not depend on the other kind of event (i.e., they are not associated). As can be seen in the figure below, the p-value of the Chi Square Test is highly significant ($p<0.001$), indicating that the location frequency varies among the three kinds of hunter avidity.



Contingency Table for Location and Hunter Avidity, Florida					
Avidity Group		**Rural**	**Urban**	**Out of State**	**Total**
One-Timer	Number	10,450	204,918	26,241	241,609
	Percentage of One-Timer in Location	4.3	84.8	10.9	
	Percentage of Locational Group That Are One-Timer	43.9	54.7	62.3	54.8
Churner	Number	7,315	103,956	10,283	121,554
	Percentage of Churner in Location	6.0	85.5	8.5	
	Percentage of Locational Group That Are Churner	30.7	27.7	24.4	27.6
Avid	Number	6,061	65,958	5,610	77,629
	Percentage of Avid in Location	7.8	85.0	7.2	
	Percentage of Locational Group That Are Avid	25.4	17.6	13.3	17.6
Total	Number	23,826	374,832	42,134	440,792
	Percentage of Total in Location	5.4	85.0	9.6	100.0
χ^2=2463.488 · df=4 · Cramer's V=0.053 · p=0.000					

Gender

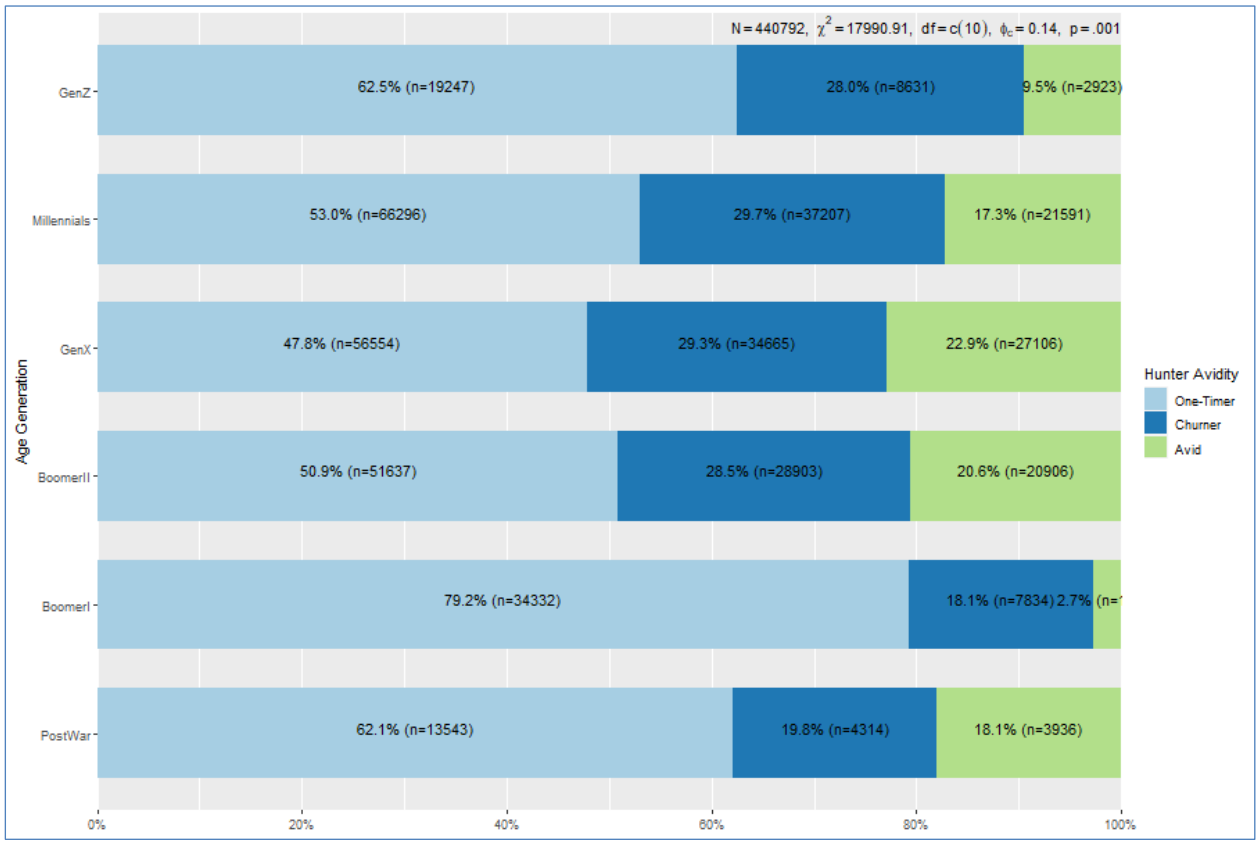
The null hypothesis regarding gender proposes that hunter avidity and the hunter's gender are independent of one another. Once again, the Chi-square test is highly significant, indicating a strong relationship between gender and hunter avidity in Alabama. In this situation, the incidence of high avidity is much more prevalent for male hunters (44% versus 30% female).



Contingency Table for Gender and Hunter Avidity, Florida				
Avidity Group		**Female**	**Male**	**Total**
One-Timer	Number	37,412	204,197	241,609
	Percentage of One-Timer in Gender Category	15.5	84.5	
	Percentage of Gender Group That Are One-Timer	63.6	53.5	54.8
Churner	Number	15,031	106,523	121,554
	Percentage of Churner in Gender Category	12.4	87.6	
	Percentage of Gender Group That Are Churner	25.6	27.9	27.6
Avid	Number	6,343	71,286	77,629
	Percentage of Avid in Gender Category	8.2	91.8	
	Percentage of Gender Group That Are Avid	10.8	18.7	17.6
Total	Number	58,786	382,006	440,792
	Percentage of Total in Gender Category	13.3	86.7	100.0
				χ^2=2855.844 · df=2 · Cramer's V=0.080 · p=0.000

Generational Age

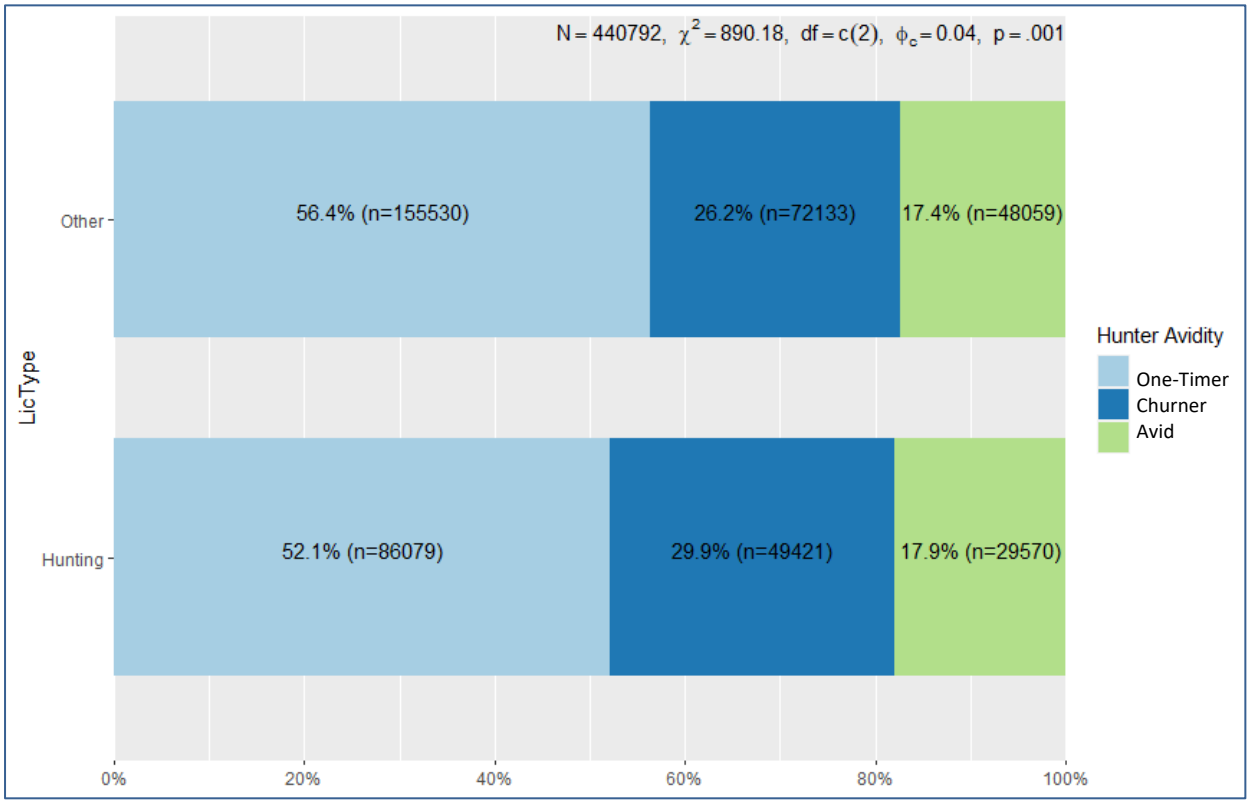
Based on widespread consensus as well as new Gen Z analyses by the Pew Research Center and the generation defined by the U.S. Census Bureau as Baby Boomers, date of birth can be used to define generation groups. The researchers examined the relationship between hunter avidity and generational age. The generational age of a hunter is also shown to influence hunter avidity based on the significant Chi-square test result. High avidity was most prevalent in the mid-age groups represented by Boomers II and Gen X, where at least 20% of all hunters were highly avid. The lowest percentage for avidity was for those in the Boomers I generational age.



Contingency Table for Generational Age and Hunter Avidity, Florida								
Avidity Group		**Post War**	**Boomer I**	**Boomer II**	**Gen X**	**Millennial**	**Gen Z**	**Total**
One-Timer	Number	13,543	34,332	51,637	56,554	66,296	19,247	229,853
	Percentage of One-Timer in Age Group	5.6	14.9	22.5	24.6	28.8	8.4	
	Percentage of Age Group That Are One-Timer	62.1	79.2	50.9	47.8	53.0	62.5	54.6
Churner	Number	4314	7,834	28,903	34,665	37,207	8,631	117,640
	Percentage of Churner in Age Group	3.5	6.7	24.6	29.5	31.6	7.3	
	Percentage of Age Group That Are Churner	19.8	18.1	28.5	29.3	29.7	28.0	27.9
Avid	Number	3936	1,167	20,906	27,106	21,591	2,923	73,843
	Percentage of Avid in Age Group	5.1	1.6	28.3	36.7	29.2	4.0	
	Percentage of Age Group That Are Avid	18.	2.7	20.6	22.9	17.3	9.5	17.5
Total	Number	21,793	43,333	101,446	118,325	125,094	30,801	421,336
	Percentage of Total in Age Group	4.9	10.3	24.1	28.1	29.7	7.3	
χ^2=17990.913 · df=10 · Cramer's V=0.143 · p=0.000								

License Type

There were only two broad categories for licenses in Florida. They each had similar distributions of avid hunters (17% and 18%).



Contingency Table for License Type and Hunter Avidity, Florida				
Avidity Group		**Hunting**	**Other**	**Total**
One-Timer	Number	86,079	155,530	241,609
	Percentage of One-Timer in License Type	35.6	64.4	
	Percentage of License Group That Are One-Timer	52.1	56.4	54.8
Churner	Number	49,421	72,133	121,554
	Percentage of Churner in License Type	40.7	59.3	
	Percentage of License Group That Are Churner	29.9	26.2	27.6
Avid	Number	29,570	48,059	77,629
	Percentage of Avid in License Type	38.1	61.9	
	Percentage of License Group That Are Avid	17.9	17.4	17.6
Total	Number	165,070	275,722	440,792
	Percentage of Total in License Type	37.4	62.6	
				χ^2=890.178 · df=2 · Cramer's V=0.045 · p=0.000

Multinomial Logistic Regression

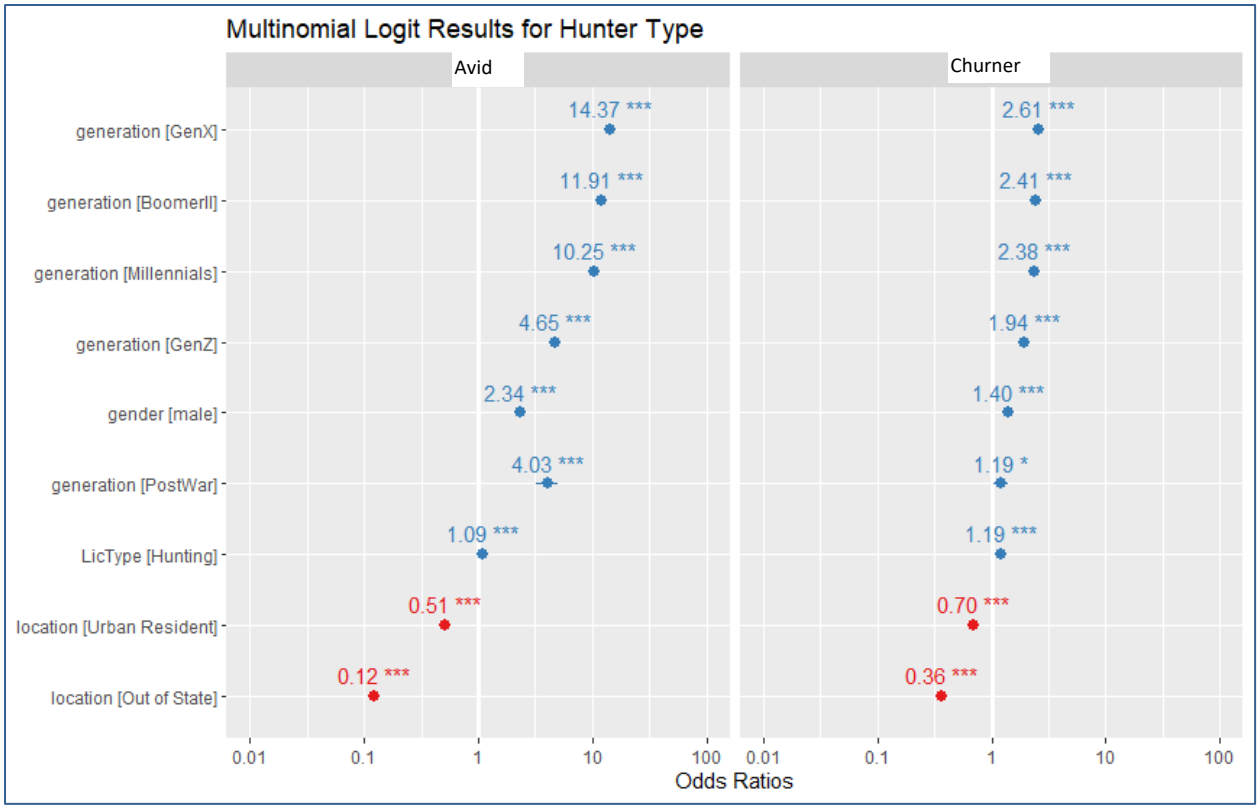
Logistic regression is a statistical technique used when the dependent variable is categorical (or nominal). For binary logistic regression, the number of dependent variables is two, whereas the number of dependent variables for multinomial logistic regression is more than two. As with other types of regression, multinomial logistic regression can have nominal and/or continuous independent variables and can have interactions between independent variables to predict the dependent variable. Multinomial logistic regression is often considered an attractive analysis because; it does not assume normality, linearity, or homoscedasticity.

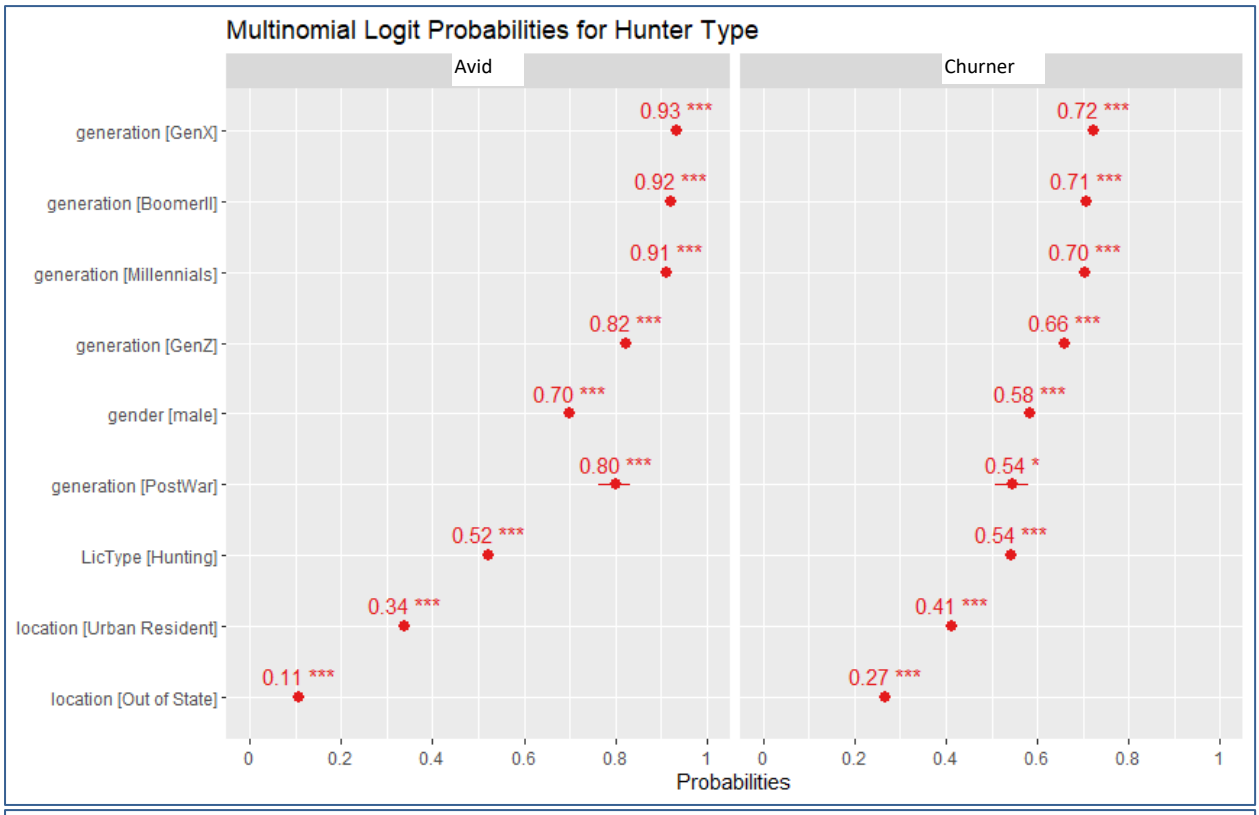
This approach does have assumptions, such as the assumption of independence among the dependent variable choices. This assumption states that the choice of or membership in one category is not related to the choice or membership of another category (i.e., the dependent variable). Furthermore, multinomial logistic regression also assumes non-perfect separation. If the groups of the outcome variable are perfectly separated by the predictor(s), then unrealistic coefficients will be estimated, and effect sizes will be greatly exaggerated. Estimation of multinomial logistic regression randomly chooses one target class as the reference class and fits the number of classes-1 regression models that compare each of the remaining classes to the reference class. In this situation, the refence class is one-timers. The coefficients and odds ratios represent how different the avid and churner groups are from one-timers with respect to the explanatory variables.

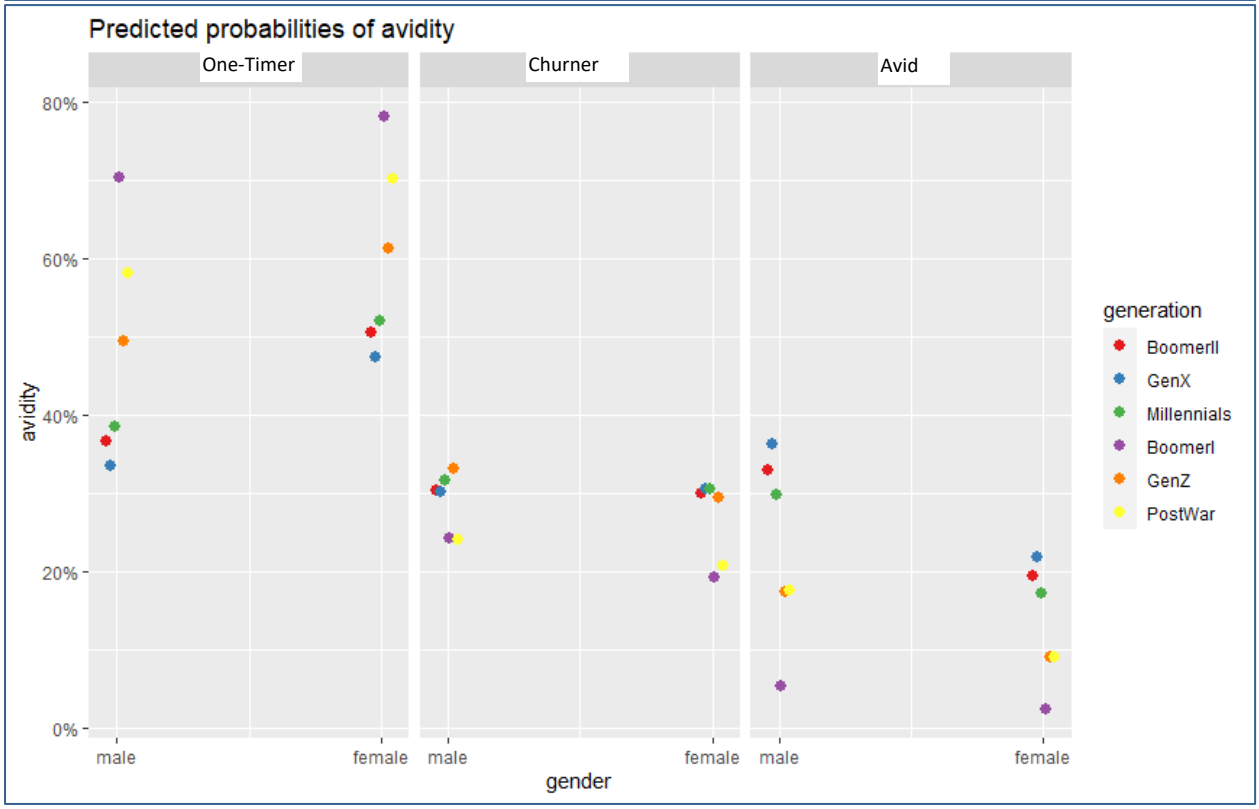
Predictors	**Avidity**			
	Odds Ratios	**CI**	**p**	**Response**
(Intercept)	0.25	0.23 – 0.26	**<0.001**	Churner
(Intercept)	0.03	0.03 – 0.04	**<0.001**	Avid
gendermale	1.40	1.36 – 1.43	**<0.001**	Churner
gendermale	2.34	2.26 – 2.43	**<0.001**	Avid
generationBoomerII	2.41	2.32 – 2.49	**<0.001**	Churner
generationBoomerII	11.91	11.06 – 12.83	**<0.001**	Avid
generationGenX	2.61	2.52 – 2.70	**<0.001**	Churner
generationGenX	14.37	13.35 – 15.48	**<0.001**	Avid
generationGenZ	1.94	1.86 – 2.03	**<0.001**	Churner
generationGenZ	4.65	4.26 – 5.08	**<0.001**	Avid
generationMillennials	2.38	2.30 – 2.47	**<0.001**	Churner
generationMillennials	10.25	9.51 – 11.05	**<0.001**	Avid
generationPostWar	1.19	1.04 – 1.38	**0.014**	Churner
generationPostWar	4.03	3.24 – 5.01	**<0.001**	Avid
Rural Resident	*Reference*			
Hunting	1.09	1.07 – 1.12	**<0.001**	Avid
Out of State	0.36	0.34 – 0.38	**<0.001**	Churner
Urban Resident	0.51	0.49 – 0.53	**<0.001**	Avid
Out of State	0.12	0.11 – 0.13	**<0.001**	Avid
Other	*Reference*			
Hunting	1.19	1.17 – 1.21	**<0.001**	Churner
Urban Resident	0.70	0.67 – 0.73	**<0.001**	Churner
Observations	273913			
R^2 Nagelkerke	0.294			

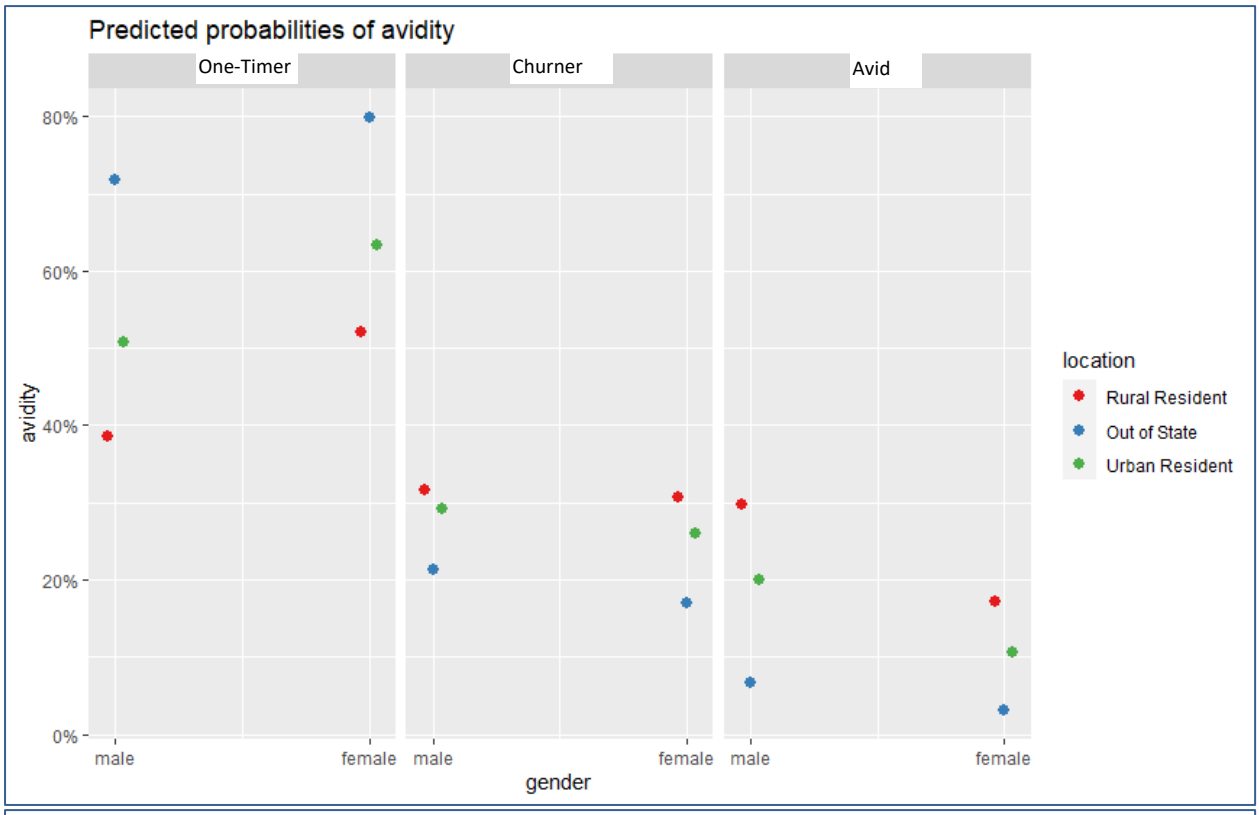
The ratio of the probability of choosing one outcome category over the probability of choosing the baseline category is often referred to as relative risk (and it is sometimes referred to as odds, described in the regression parameters above). The relative risk is the right-hand side linear equation exponentiated, leading to the fact that the exponentiated regression coefficients are relative risk ratios for a unit change in the predictor variable. The researchers can exponentiate the coefficients from the model to see these risk ratios. Odd ratios greater than 1.0 indicate a positive effect from the variable in question.

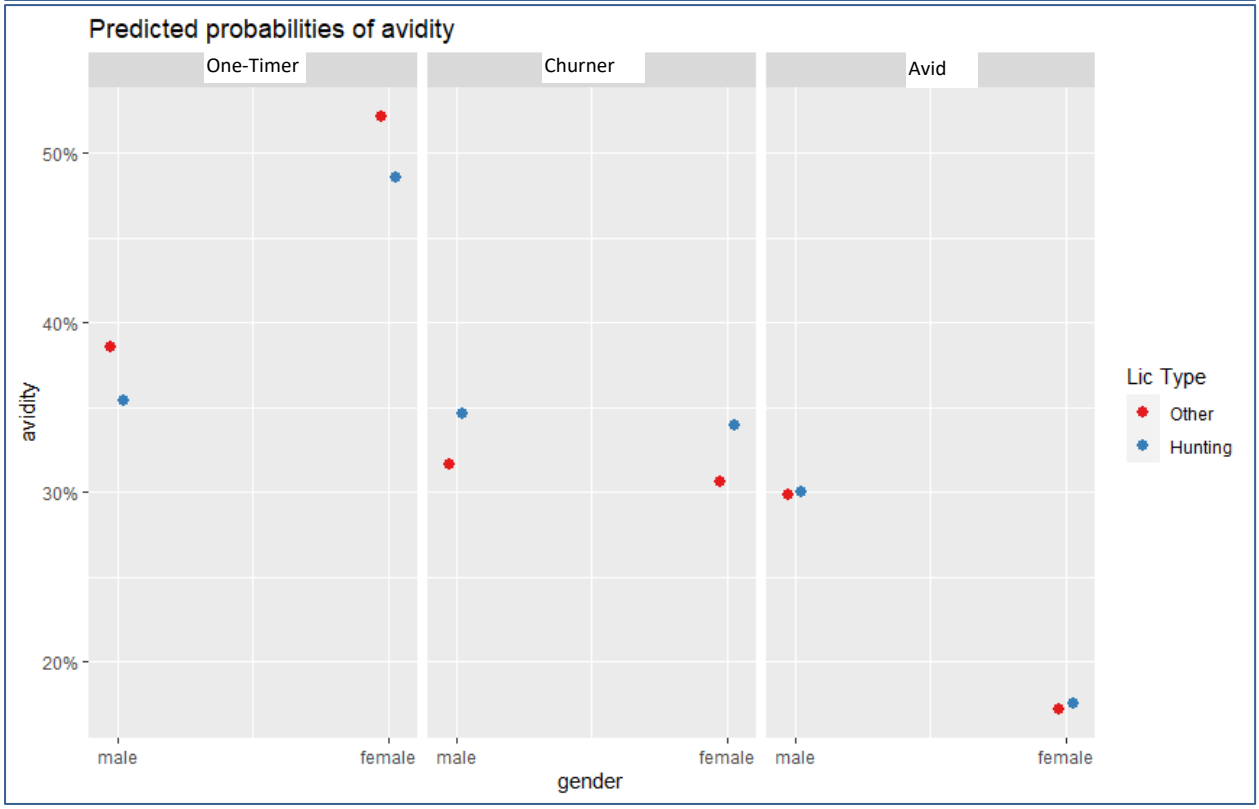
Hunter generational age was the most influential variable in distinguishing both avid and churner hunter groups from one-timers. Those from the Boomer II and Millennials were much more likely to be avid hunters. Location and gender were also important in distinguishing avid and one-timers, with male hunters having a higher probability of being avid, and both rural and urban Florida residents more likely to be avid than out-of-state residents. Being a male hunter (as compared to being a female) is associated with a 65% increase in the odds of being avid. With a p-value less than 0.001, this coefficient is statistically significant at the 5% level.




Multinomial Logit Probabilities for Hunter Type
Avid
Churner
generation [GenX]
generation [BoomerII]
generation [Millennials]
generation [GenZ]
gender [male]
generation [PostWar]
LicType [Hunting]
location [Urban Resident]
location [Out of State]
0.93 ***
0.92 ***
0.91 ***
0.82 ***
0.70 ***
0.80 ***
0.52 ***
0.34 ***
0.11 ***
0.72 ***
0.71 ***
0.70 ***
0.66 ***
0.58 ***
0.54 *
0.54 ***
0.41 ***
0.27 ***
0
0.2
0.4
0.6
0.8
1
Probabilities


Predicted probabilities of avidity
One-Timer
Churner
Avid
80%
60%
40%
20%
0%
avidity
male
female
gender
generation
BoomerII
GenX
Millennials
BoomerI
GenZ
PostWar


Predicted probabilities of avidity
One-Timer
Churner
Avid
80%
60%
40%
20%
0%
avidity
male
female
gender
location
Rural Resident
Out of State
Urban Resident


Predicted probabilities of avidity
One-Timer
Churner
Avid
50%
40%
30%
20%
avidity
male
female
gender
Lic Type
Other
Hunting

MEASURING HUNTER AVIDITY INDIANA

Avidity Group

The table below shows the avidity groups in Indiana. The largest percentage of hunters in Indiana are considered avid (39%), exceeding those in the churner group (26%) and slightly higher than the one-timer group (35%).

Number and Percentage of Hunters in Avidity Categories				
	One-Timer	Churner	Avid	Total
Number	160,686	119,910	176,985	457,581
Percentage	35.12	26.21	38.68	

Location

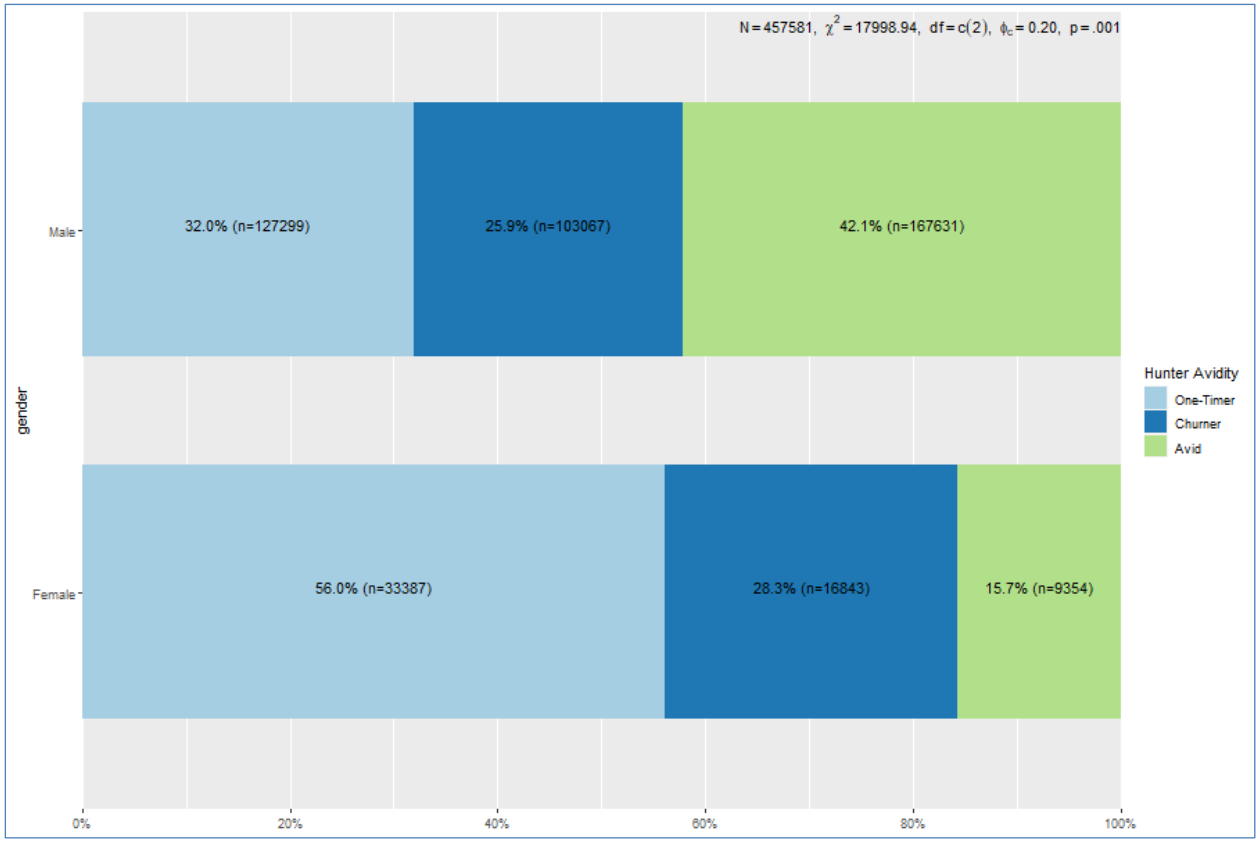
Hunters who resided in rural areas of the state were more likely to be avid than those living in urban areas or those who came from out of state to hunt. A contingency table, also known as a cross-classification table, describes the relationships between two or more categorical variables. The null hypothesis proposes that hunter avidity and location of the hunter's residence are independent of one another. This means the occurrence of one kind of event does not depend on the other kind of event (i.e., they are not associated). As can be seen in the figure below, the p-value of the Chi Square Test is highly significant (p=0.000), indicating that the location frequency varies among the three kinds of hunter avidity.

Contingency Table for Location and Hunter Avidity, Indiana					
Avidity Group		Out of State	Rural	Urban	Total
One-Timer	Number	1,558	27,280	131,848	160,686
	Percentage of One-Timer in Location	1.0	17.0	82.1	
	Percentage of Locational Group That Are One-Timer	39.1	30.8	36.1	35.1
Churner	Number	839	23,257	95,814	119,910
	Percentage of Churner in Location	0.7	19.4	79.9	
	Percentage of Locational Group That Are Churner	21.0	26.2	26.3	26.2
Avid	Number	1,589	38,115	137,281	176,985
	Percentage of Avid in Location	0.9	21.5	77.6	
	Percentage of Locational Group That Are Avid	39.9	43.0	37.6	38.7
Total	Number	3,986	88,652	364,943	457,581
	Percentage of Total in Location	0.9	19.4	79.8	
χ^2=1176.197 · df=4 · Cramer's V=0.036 · p=0.000					

Gender

The null hypothesis regarding gender proposes that hunter avidity and the hunter's gender are independent of one another. Once again, the Chi-square test is highly significant, indicating a strong relationship between gender and hunter avidity in Indiana. In this situation, the incidence of high avidity is much more prevalent for male hunters (42% versus 16% female).

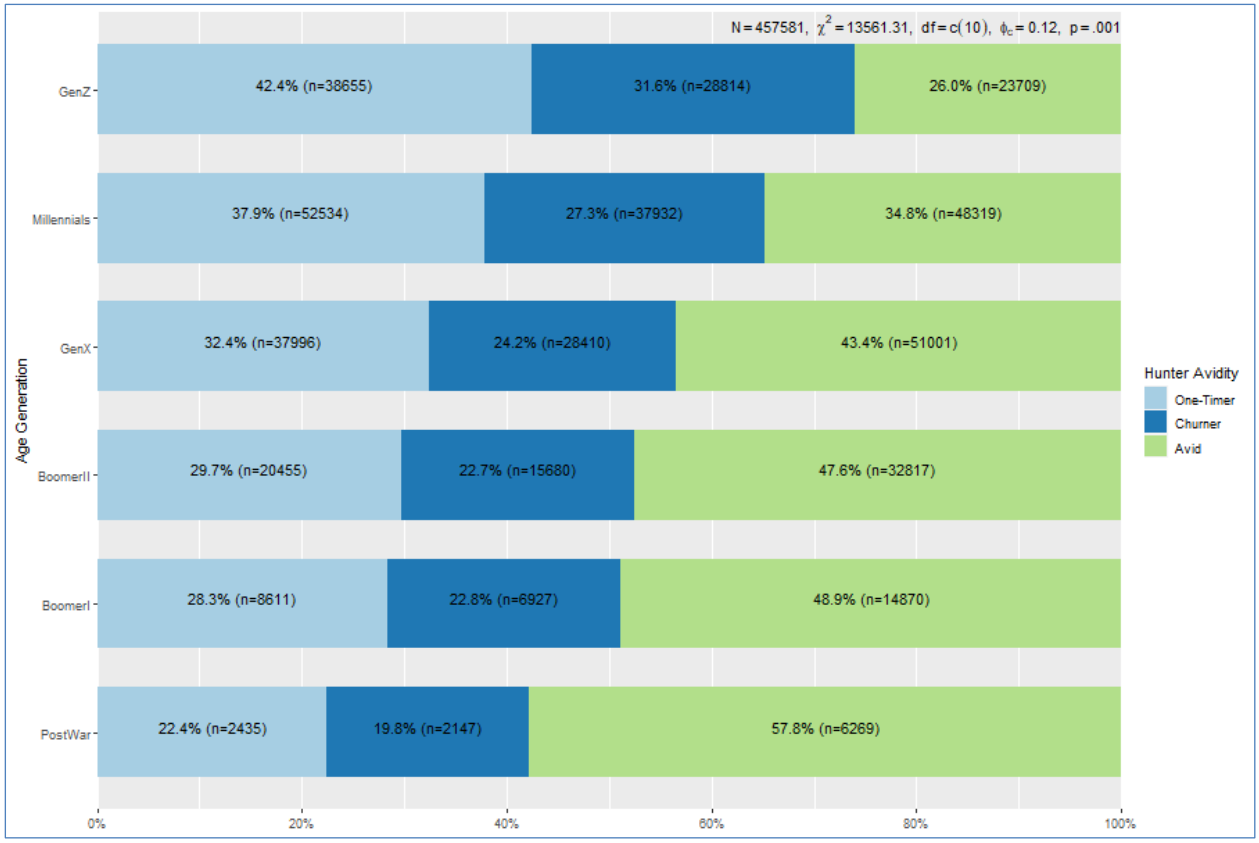
Contingency Table for Gender and Hunter Avidity, Indiana				
Avidity Group		**Female**	**Male**	**Total**
One-Timer	Number	33,387	127,299	160,686
	Percentage of One-Timer in Gender Category	20.8	79.2	
	Percentage of Gender Group That Are One-Timer	56.0	32.0	35.1
Churner	Number	16,843	103,067	119,910
	Percentage of Churner in Gender Category	14.0	86.0	
	Percentage of Gender Group That Are Churner	28.3	25.9	26.2
Avid	Number	9,354	167,631	176,985
	Percentage of Avid in Gender Category	5.3	94.7	
	Percentage of Gender Group That Are Avid	15.7	42.1	38.7
Total	Number	59,584	397,997	457,581
	Percentage of Total in Gender Category	13.0	87.0	
				χ^2=17998.938 · df=2 · Cramer's V=0.198 · p=0.000



Generational Age

Based on widespread consensus as well as new Gen Z analysis by the Pew Research Center, and the one generation defined by the U.S. Census Bureau (Baby Boomers), date of birth can be used to define generation groups. The researchers examined the relationship between hunter avidity and generational age. The generational age of a hunter is also shown to influence hunter avidity based on the significant Chi-square test result. High avidity was most prevalent in the oldest age groups represented by Post War, Boomers I, and Boomers II, where more than 48% of hunters were highly avid. Avidity declined in a linear fashion as hunter age declined to the lowest age generation, Gen Z, where only 1 in 4 Indiana hunters were considered avid.

Contingency Table for Generational Age and Hunter Avidity, Indiana								
Avidity Group		**Post War**	**Boomer I**	**Boomer II**	**Gen X**	**Millennial**	**Gen Z**	**Total**
One-Timer	Number	2,435	8,611	20,455	37,996	52,534	38,655	160,686
	Percentage of One-Timer in Age Group	1.5	5.4	12.7	23.6	32.7	24.1	
	Percentage of Age Group That Are One-Timer	22.4	28.3	29.7	32.4	37.9	42.4	35.1
Churner	Number	2,147	6,927	15,680	28,410	37,932	28,814	119,910
	Percentage of Churner in Age Group	1.8	5.8	13.1	23.7	31.6	24.0	
	Percentage of Age Group That Are Churner	19.8	22.8	22.7	24.2	27.3	31.6	26.2
Avid	Number	6,269	14,870	32,817	51,001	48,319	23,709	176,985
	Percentage of Avid in Age Group	3.5	8.4	18.5	28.8	27.3	13.4	
	Percentage of Age Group That Are Avid	57.8	48.9	47.6	43.4	34.8	26.0	38.7
Total	Number	10,851	30,408	68,952	117,407	138,785	91,178	457,581
	Percentage of Total in Age Group	2.4	6.6	15.1	25.7	30.3	19.9	
χ^2=13561.312 · df=10 · Cramer's V=0.122 · p=0.000								


N = 457581, χ^2 = 13561.31, df = c(10), ϕ_c = 0.12, p = .001
GenZ
Millennials
GenX
BoomerII
BoomerI
PostWar
Age Generation
42.4% (n=38655)
31.6% (n=28814)
26.0% (n=23709)
37.9% (n=52534)
27.3% (n=37932)
34.8% (n=48319)
32.4% (n=37996)
24.2% (n=28410)
43.4% (n=51001)
29.7% (n=20455)
22.7% (n=15680)
47.6% (n=32817)
28.3% (n=8611)
22.8% (n=6927)
48.9% (n=14870)
22.4% (n=2435)
19.8% (n=2147)
57.8% (n=6269)
0%
20%
40%
60%
80%
100%
Hunter Avidity
One-Timer
Churner
Avid

MEASURING HUNTER AVIDITY KANSAS

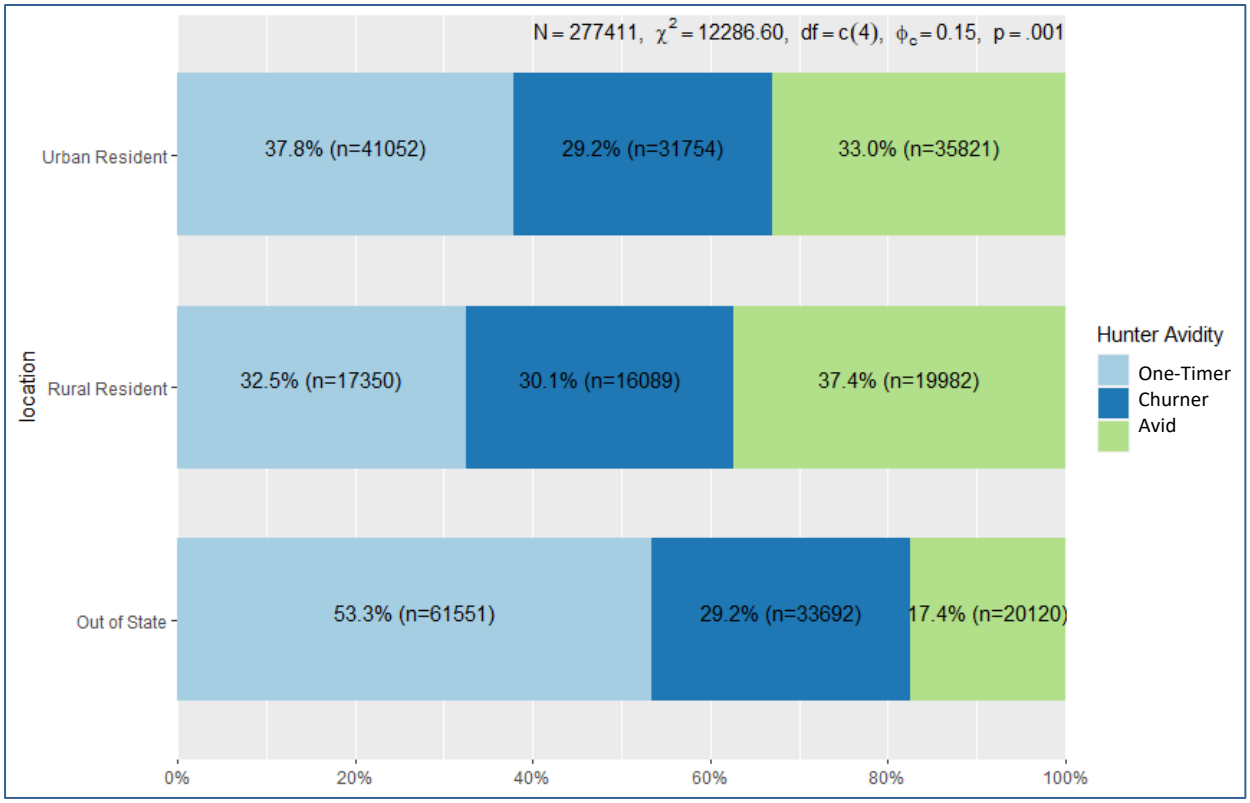
Avidity Group

The table below presents the results of the avidity categorization in Kansas. It shows that 43% are one-timers. The other two groups are fairly even: 29% are in the churner group, and 27% are in the avid group.

Number and Percentage of Hunters in Avidity Categories				
	One-Timer	Churner	Avid	Total
Number	119,953	81,535	75,923	277,411
Percentage	43.2	29.4	27.4	

Location

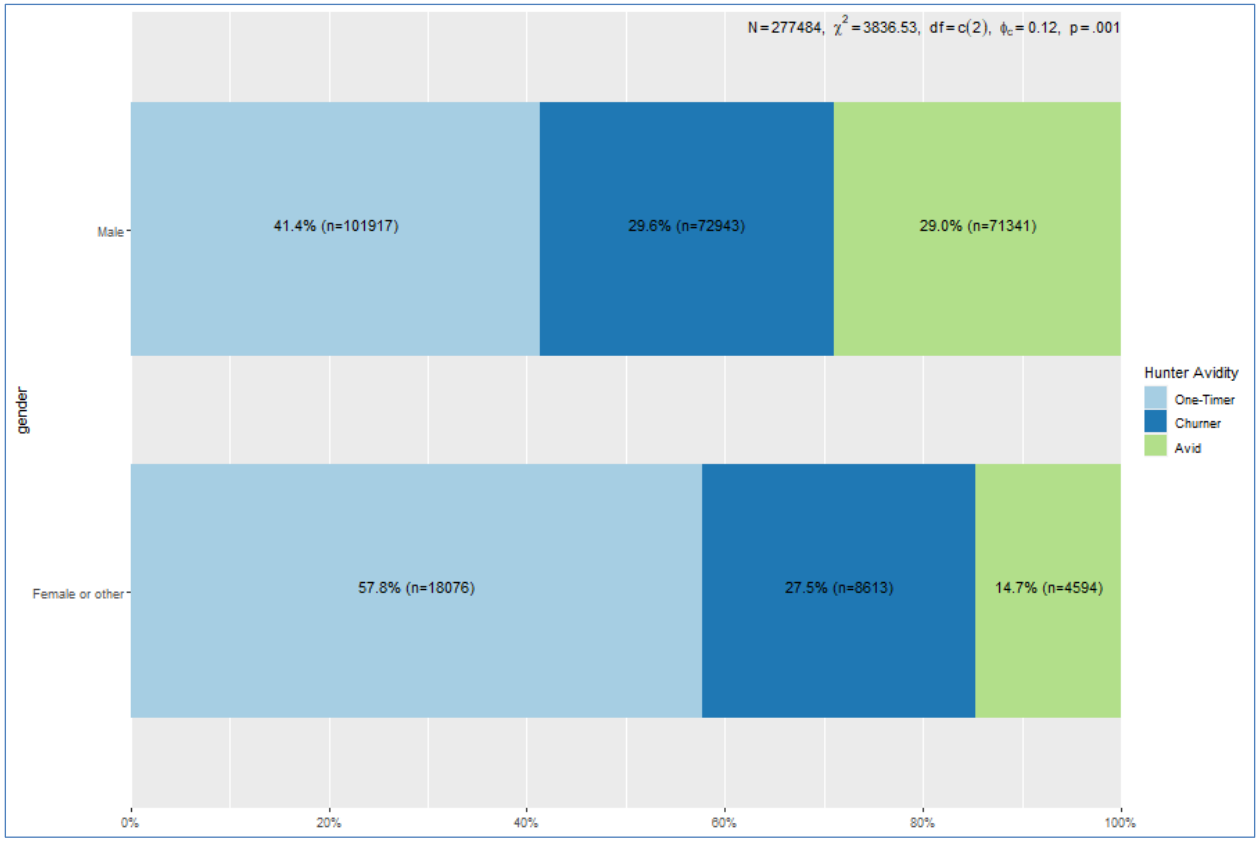
Hunters who resided in rural areas of the state were more likely to be avid than those living in urban areas or those who came from out of state to hunt. A contingency table, also known as a cross-classification table, describes the relationships between two or more categorical variables. The null hypothesis proposes that hunter avidity and location of the hunter's residence are independent of one another. This means the occurrence of one kind of event does not depend on the other kind of event (i.e., they are not associated). As can be seen in the figure below, the p-value of the Chi Square Test is highly significant ($p<0.001$), indicating that the location frequency varies among the three kinds of hunter avidity.



Contingency Table for Location and Hunter Avidity, Kansas					
Avidity Group		**Rural**	**Urban**	**Out of State**	**Total**
One-Timer	Number	17,350	41,052	61,551	119,953
	Percentage of One-Timer in Location	14.5	34.2	51.3	
	Percentage of Locational Group That Are One-Timer	32.5	37.8	53.4	43.2
Churner	Number	16,089	31,754	33,692	81,535
	Percentage of Churner in Location	19.7	38.9	41.3	
	Percentage of Locational Group That Are Churner	30.1	29.2	29.2	29.4
Avid	Number	19,982	35,821	20,120	75,923
	Percentage of Avid in Location	26.3	47.2	26.5	
	Percentage of Locational Group That Are Avid	37.4	33.0	17.4	27.4
Total	Number	53,421	108,627	115,363	277,411
	Percentage of Total in Location	19.3	39.2	41.6	100.0
χ^2=12286.597 · df=4 · Cramer's V=0.149 · p=0.000					

Gender

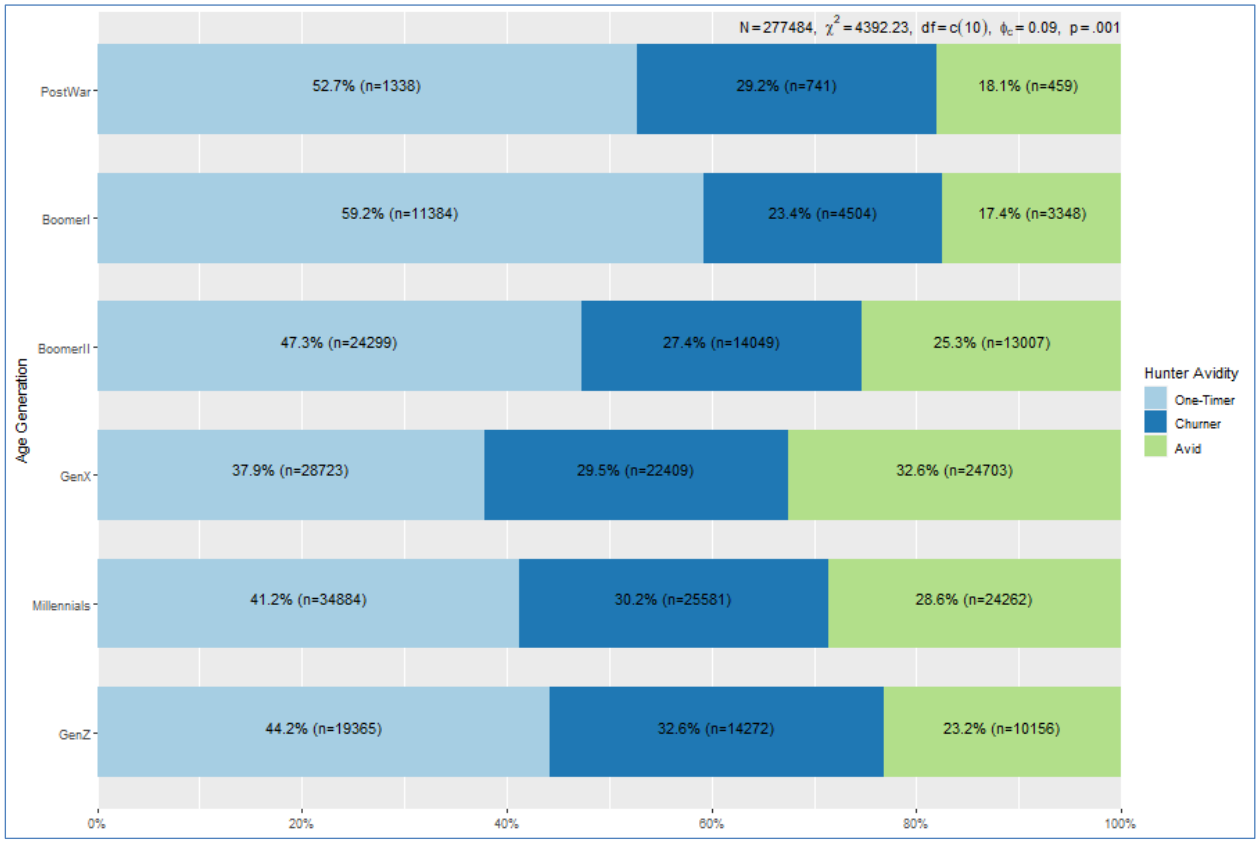
The null hypothesis regarding gender proposes that hunter avidity and the hunter's gender are independent of one another. Once again, the Chi-square test is highly significant, indicating a strong relationship between gender and hunter avidity in Kansas. In this situation, the incidence of high avidity is much more prevalent for male hunters (29% versus 19% female).



Contingency Table for Gender and Hunter Avidity, Kansas				
Avidity Group		**Female or other**	**Male**	**Total**
One-Timer	Number	18,076	101,917	119,993
	Percentage of One-Timer in Gender Category	15.1	84.9	
	Percentage of Gender Group That Are One-Timer	57.8	41.4	43.2
Churner	Number	8,613	72,943	81,556
	Percentage of Churner in Gender Category	10.6	89.4	
	Percentage of Gender Group That Are Churner	27.5	29.6	29.4
Avid	Number	4,594	71,341	75,935
	Percentage of Avid in Gender Category	6.0	94.0	
	Percentage of Gender Group That Are Avid	14.7	29.0	27.4
Total	Number	31,283	246,201	277,484
	Percentage of Total in Gender Category	11.3	88.7	
χ^2=3836.533 · df=2 · Cramer's V=0.118 · p=0.000				

Generational Age

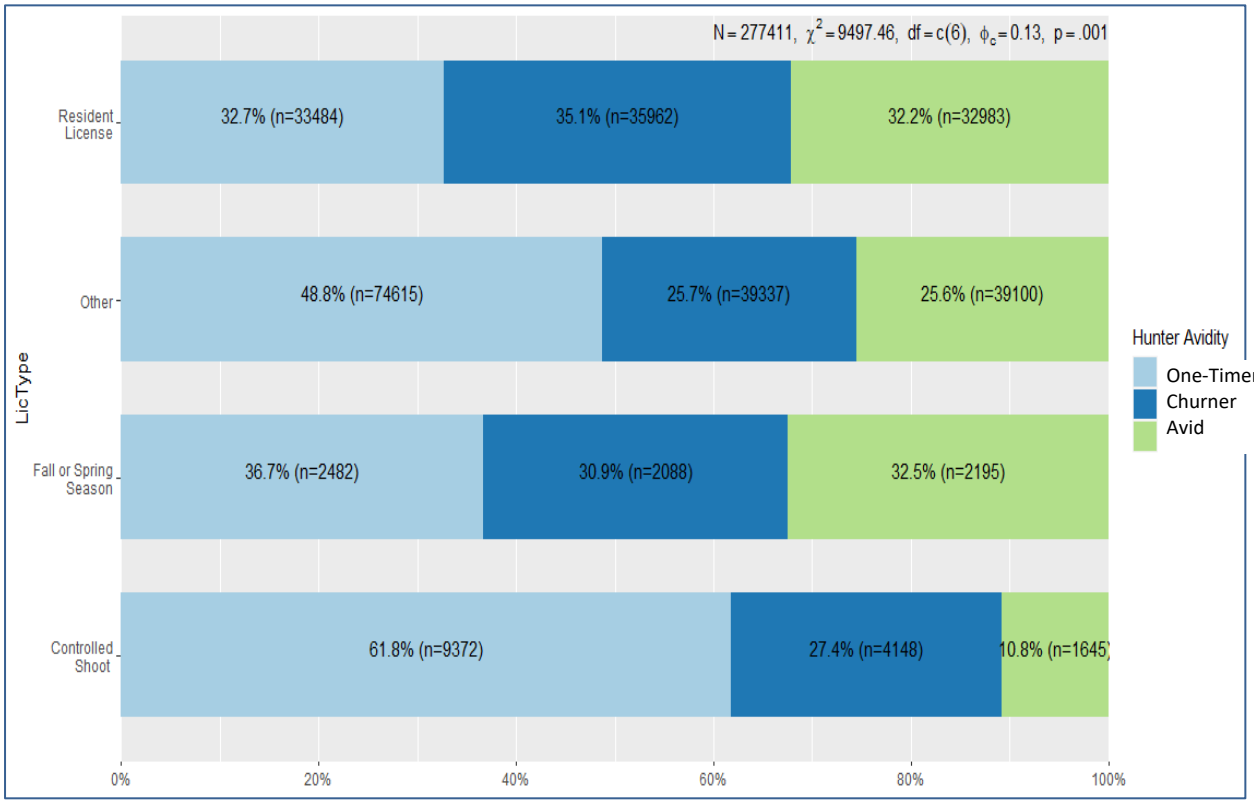
Based on widespread consensus as well as new Gen Z analysis by the Pew Research Center, and the one generation defined by the U.S. Census Bureau (Baby Boomers), date of birth can be used to define generation groups. The researchers examined the relationship between hunter avidity and generational age. The generational age of a hunter is also shown to influence hunter avidity based on the significant Chi-square test result. High avidity was most prevalent in the mid-age groups represented by Gen X, where a third of hunters were highly avid, and Boomer II, where 1 in 4 were avid. Avidity proportions were the lowest for the two oldest age generations in Kansas, Post War and Boomer I.



Contingency Table for Generational Age and Hunter Avidity, Kansas								
Avidity Group		**Post War**	**Boomer I**	**Boomer II**	**Gen X**	**Millennial**	**Gen Z**	**Total**
One-Timer	Number	1,337	11,375	24,290	28,715	34,878	19,358	119,953
	Percentage of One-Timer in Age Group	1.1	9.5	20.2	23.9	29.1	16.1	
	Percentage of Age Group That Are One-Timer	52.7	59.2	47.3	37.9	41.2	44.2	43.2
Churner	Number	741	4,503	14,047	22,408	25,570	14,266	81,535
	Percentage of Churner in Age Group	0.9	5.5	17.2	27.5	31.4	17.5	
	Percentage of Age Group That Are Churner	29.2	23.4	27.4	29.6	30.2	32.6	29.4
Avid	Number	459	3,348	13,005	24,699	24,257	10,155	75,923
	Percentage of Avid in Age Group	0.6	4.4	17.1	32.5	31.9	13.4	
	Percentage of Age Group That Are Avid	18.1	17.4	25.3	32.6	28.6	23.2	27.4
Total	Number	2,537	19,226	51,342	75,822	84,705	43,779	277,411
	Percentage of Total in Age Group	0.9	6.9	18.5	27.3	30.5	15.8	
χ^2=4384.637 · df=10 · Cramer's V=0.089 · p=0.000								

License Type

In Kansas there are several broad category licenses and several specialty licenses that were grouped into “other,” the base category.



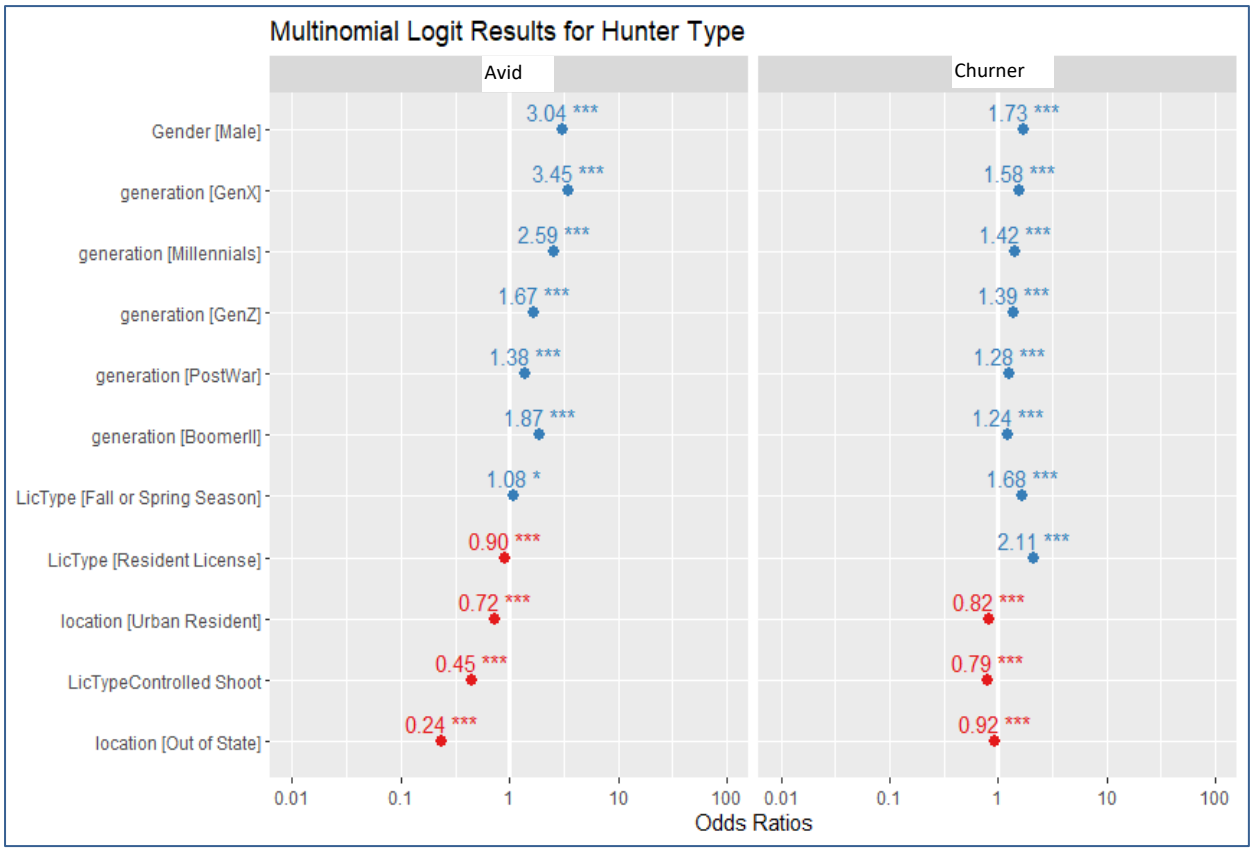
Contingency Table for License Type and Hunter Avidity, Kansas						
Avidity Group		**Controlled Shoot**	**Fall or Spring Season**	**Other**	**Resident License**	**Total**
One-Timer	Number	9,372	2,482	74,615	33,484	119,953
	Percentage of One-Timer in License Type	7.8	2.1	62.2	27.9	
	Percentage of License Group That Are One-Timer	61.8	36.7	48.8	32.7	43.2
Churner	Number	4,148	2,088	39,337	35,962	81,535
	Percentage of Churner in License Type	5.1	2.6	48.2	44.1	
	Percentage of License Group That Are Churner	27.4	30.9	25.7	35.1	29.4
Avid	Number	1,645	2,195	39,100	32,983	75,923
	Percentage of Avid in License Type	2.2	2.9	51.5	43.4	
	Percentage of License Group That Are Avid	10.8	32.4	25.5	32.2	27.4
Total	Number	15,165	6,765	153,052	102,429	277,411
	Percentage of Total in License Type	5.5	2.4	55.2	36.9	
χ^2=9497.463 · df=6 · Cramer's V=0.131 · p=0.000						

Multinomial Logistic Regression

Logistic regression is a statistical technique used when the dependent variable is categorical (or nominal). For binary logistic regression the number of dependent variables is two, whereas the number of dependent variables for multinomial logistic regression is more than two. As with other types of regression, multinomial logistic regression can have nominal and/or continuous independent variables and can have interactions between independent variables to predict the dependent variable. Multinomial logistic regression is often considered an attractive analysis because; it does not assume normality, linearity, or homoscedasticity. This approach does have assumptions, such as the assumption of independence among the dependent variable choices. This assumption states that the choice of or membership in one category is not related to the choice or membership of another category (i.e., the dependent variable). Furthermore, multinomial logistic regression also assumes non-perfect separation. If the groups of the outcome variable are perfectly separated by the predictor(s), then unrealistic coefficients will be estimated, and effect sizes will be greatly exaggerated. The estimation defines the avidity group “One-Timer” as the reference category for the dependent variable. The refence categories for the explanatory variables are identified in the table.

The results of the logistic regression show that hunter gender and age generation were the most important variables that distinguish between avid and one-time hunters. These same variables were found to be important for distinguishing churners from one-timers in addition to license type.

Predictors	Avidity			
	Odds Ratios	CI	p	Response
(Intercept)	0.26	0.24 – 0.27	**<0.001**	Churner
(Intercept)	0.21	0.20 – 0.22	**<0.001**	Avid
GenderMale	1.73	1.67 – 1.79	**<0.001**	Churner
GenderMale	3.04	2.93 – 3.17	**<0.001**	Avid
generationBoomerII	1.24	1.19 – 1.29	**<0.001**	Churner
generationBoomerII	1.87	1.79 – 1.96	**<0.001**	Avid
generationGenX	1.58	1.52 – 1.64	**<0.001**	Churner
generationGenX	3.45	3.30 – 3.61	**<0.001**	Avid
generationGenZ	1.39	1.33 – 1.45	**<0.001**	Churner
generationGenZ	1.67	1.60 – 1.76	**<0.001**	Avid
generationMillennials	1.42	1.37 – 1.48	**<0.001**	Churner
generationMillennials	2.59	2.48 – 2.71	**<0.001**	Avid
generationPostWar	1.28	1.16 – 1.41	**<0.001**	Churner
generationPostWar	1.38	1.23 – 1.56	**<0.001**	Avid
Rural Resident	*Reference*			
Controlled Shoot	0.45	0.43 – 0.48	**<0.001**	Avid
Out of State	0.92	0.89 – 0.95	**<0.001**	Churner
Fall or Spring Season	1.08	1.02 – 1.15	**0.012**	Avid
Urban Resident	0.82	0.79 – 0.84	**<0.001**	Churner
Other	*Reference*			
Resident License	0.90	0.88 – 0.92	**<0.001**	Avid
Controlled Shoot	0.79	0.76 – 0.83	**<0.001**	Churner
Out of State	0.24	0.23 – 0.25	**<0.001**	Avid
Fall or Spring Season	1.68	1.58 – 1.78	**<0.001**	Churner
Resident License	2.11	2.06 – 2.17	**<0.001**	Churner
Urban Resident	0.72	0.70 – 0.74	**<0.001**	Avid
Observations	277411			
R^2 / R^2 adjusted	0.045 / 0.045			


Multinomial Logit Results for Hunter Type
Avid
Churner
Gender [Male]
generation [GenX]
generation [Millennials]
generation [GenZ]
generation [PostWar]
generation [BoomerII]
LicType [Fall or Spring Season]
LicType [Resident License]
location [Urban Resident]
LicTypeControlled Shoot
location [Out of State]
3.04 ***
3.45 ***
2.59 ***
1.67 ***
1.38 ***
1.87 ***
1.08 *
0.90 ***
0.72 ***
0.45 ***
0.24 ***
1.73 ***
1.58 ***
1.42 ***
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1.28 ***
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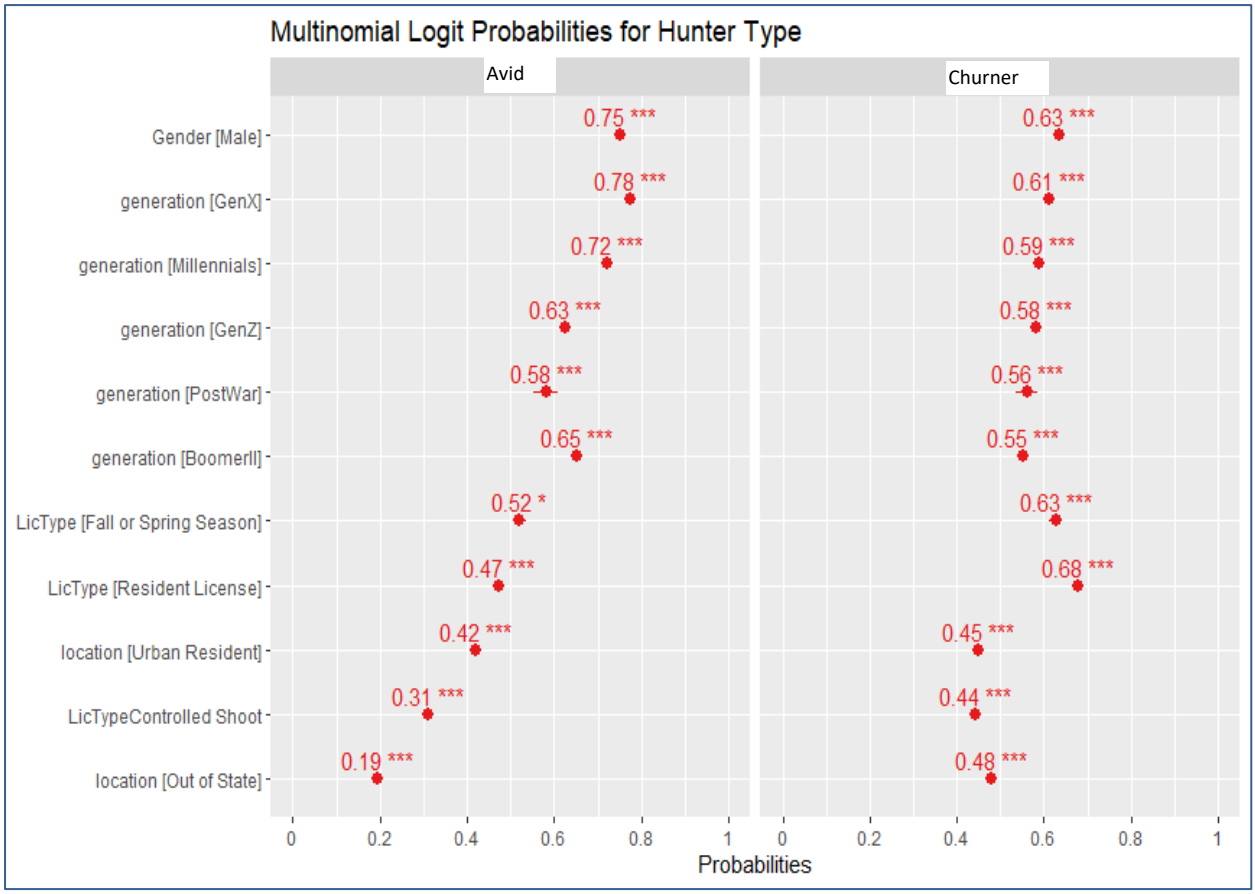
0.79 ***
0.92 ***
0.01
0.1
1
10
100
Odds Ratios


Multinomial Logit Probabilities for Hunter Type
Avid
Churner
Gender [Male]
generation [GenX]
generation [Millennials]
generation [GenZ]
generation [PostWar]
generation [BoomerII]
LicType [Fall or Spring Season]
LicType [Resident License]
location [Urban Resident]
LicTypeControlled Shoot
location [Out of State]
0.75 ***
0.78 ***
0.72 ***
0.63 ***
0.58 ***
0.65 ***
0.52 *
0.47 ***
0.42 ***
0.31 ***
0.19 ***
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0.61 ***
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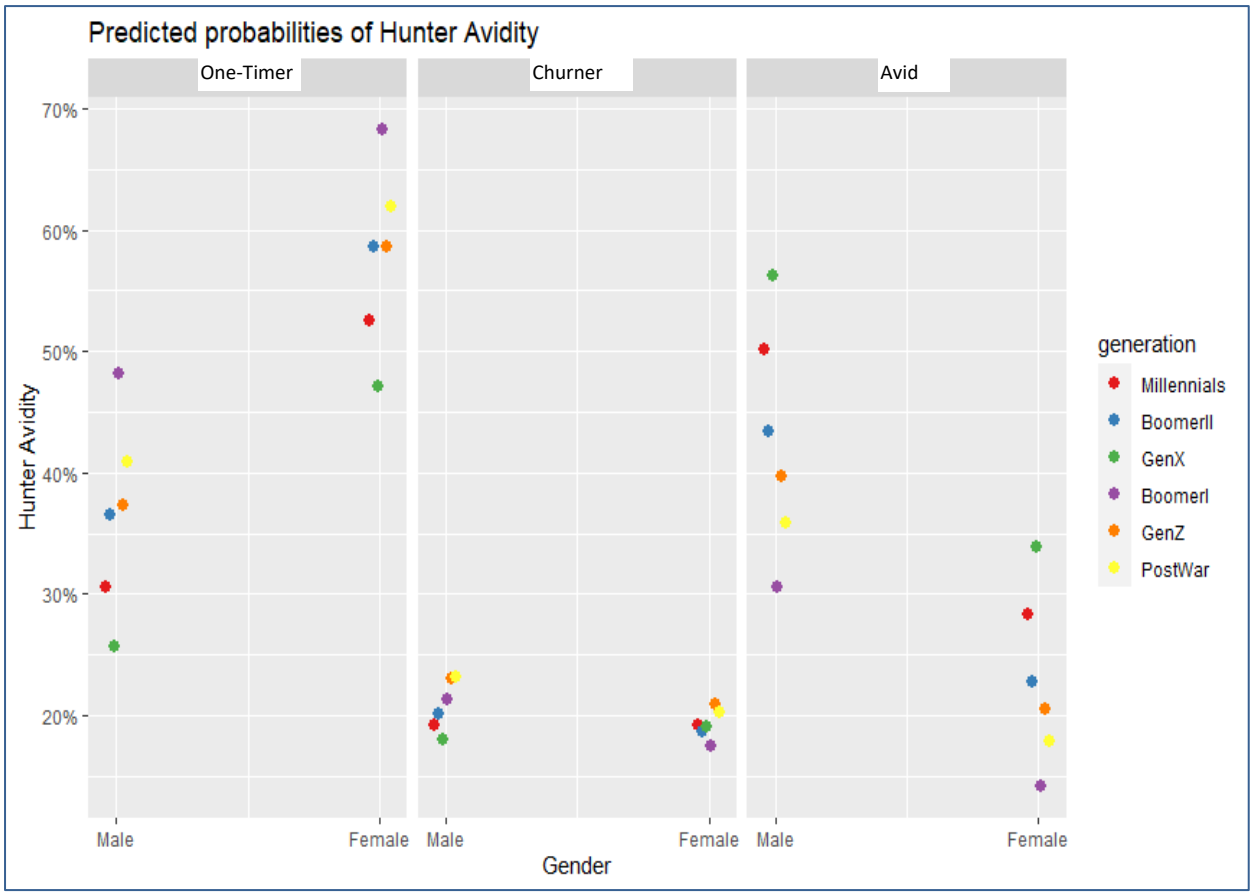
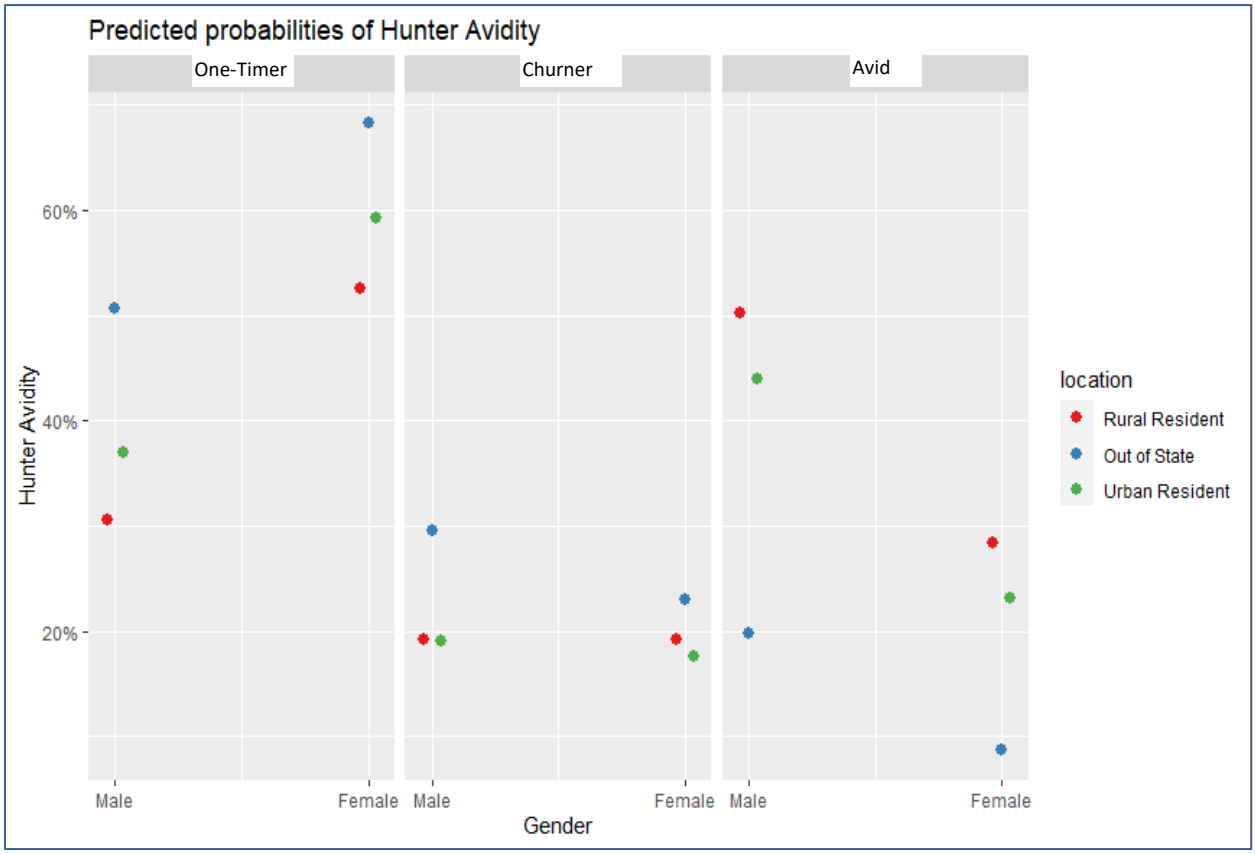
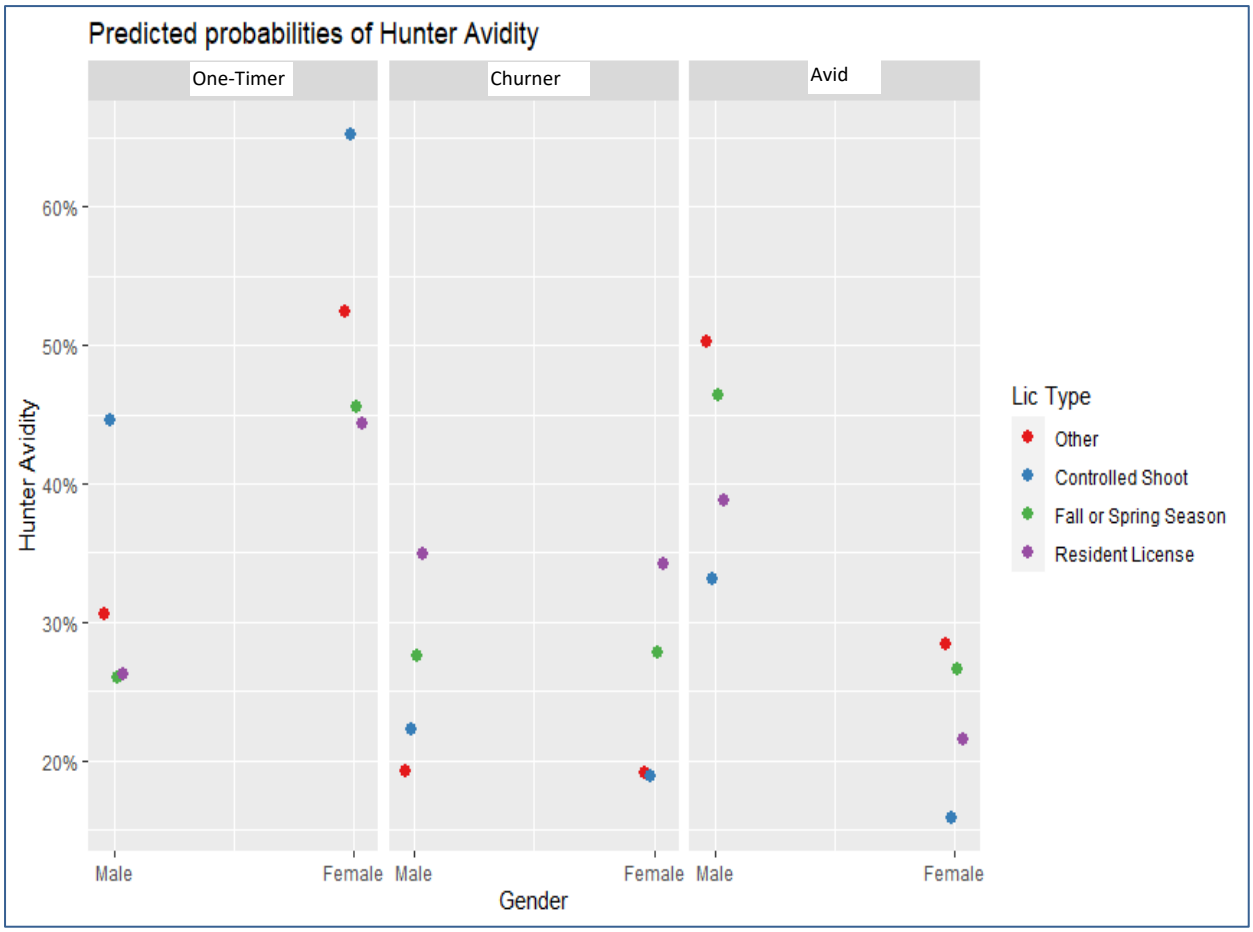
0.56 ***
0.55 ***
0.63 ***
0.68 ***
0.45 ***
0.44 ***
0.48 ***
0
0.2
0.4
0.6
0.8
1
Probabilities


Predicted probabilities of Hunter Avidity
One-Timer
Churner
Avid
70%
60%
50%
40%
30%
20%
Hunter Avidity
Male
Female
Male
Female
Male
Female
Gender
generation
Millennials
BoomerII
GenX
BoomerI
GenZ
PostWar


Predicted probabilities of Hunter Avidity
One-Timer
Churner
Avid
60%
40%
20%
Hunter Avidity
Male
Female
Male
Female
Male
Female
Gender
location
Rural Resident
Out of State
Urban Resident


Predicted probabilities of Hunter Avidity
One-Timer
Churner
Avid
60%
50%
40%
30%
20%
Hunter Avidity
Male
Female
Male
Female
Male
Female
Gender
Lic Type
Other
Controlled Shoot
Fall or Spring Season
Resident License

MEASURING HUNTER AVIDITY MAINE

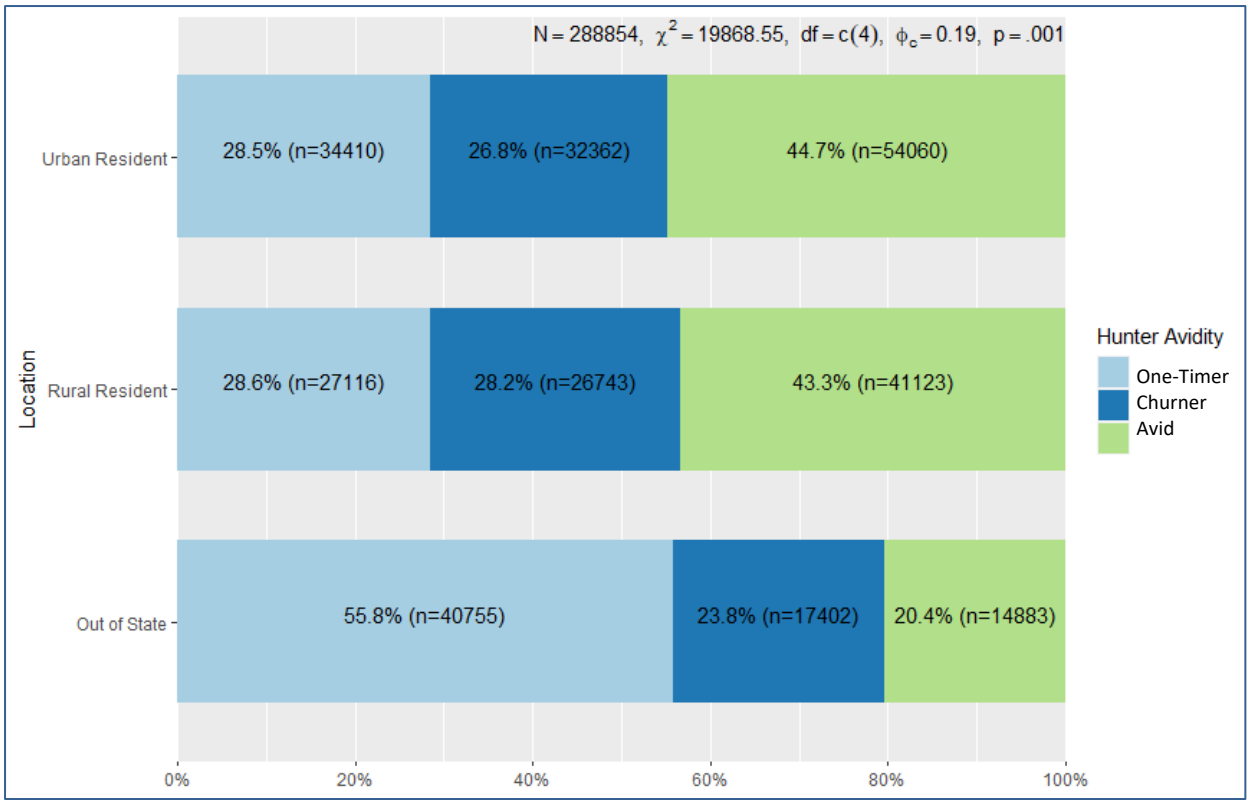
Avidity Group

The avidity groups for Maine are provided in the table below. The research shows that the largest group (38%) are avid hunters in Maine. More than a third of hunters (35%) during the period studied were one-timers. About a fourth of hunters fell somewhere between, having purchased a license in 2-3 years of the 5-year period examined.

Number and Percentage of Hunters in Avidity Categories				
	One-Timer	Churner	Avid	Total
Number	102,281	76,507	110,066	288,854
Percentage	35.4	26.5	38.1	

Location

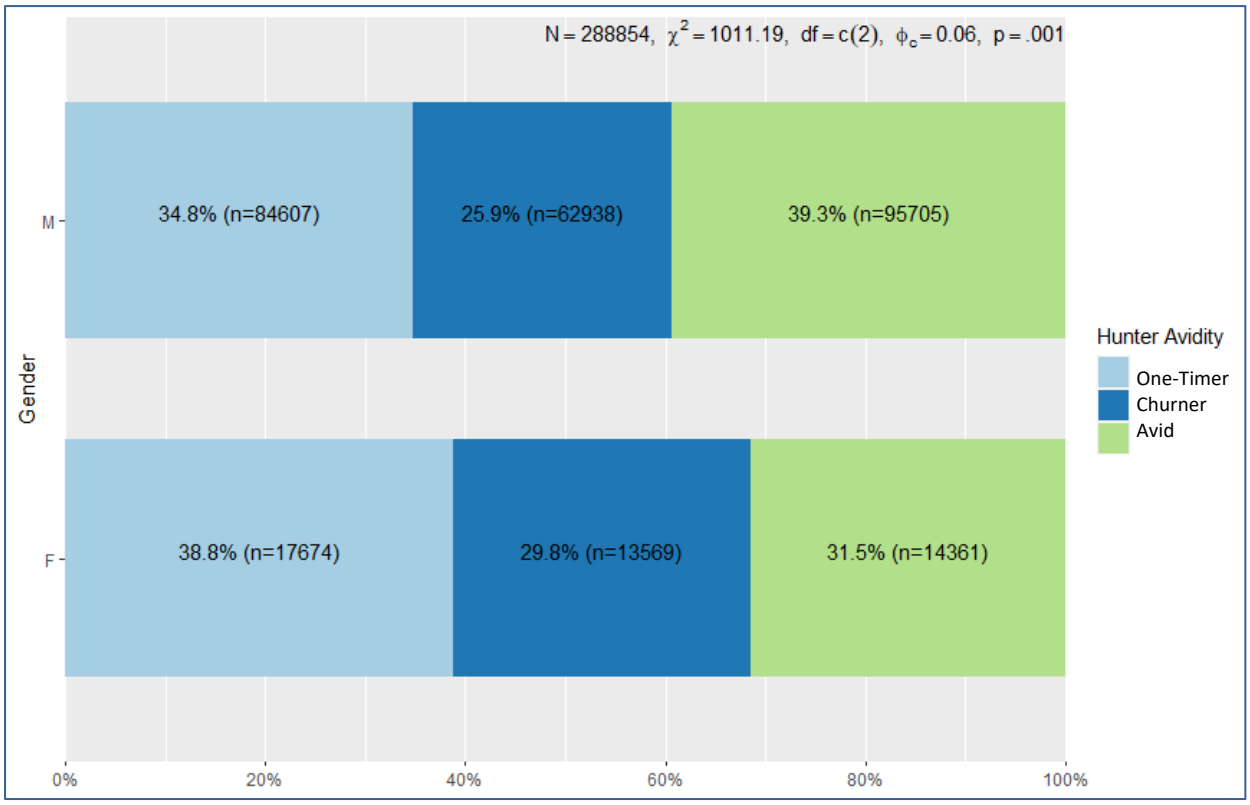
Hunters who resided in-state were twice as likely to be avid as those who came from out of state to hunt. A contingency table, also known as a cross-classification table, describes the relationships between two or more categorical variables. The null hypothesis proposes that hunter avidity and location of the hunter's residence are independent of one another. This means the occurrence of one kind of event does not depend on the other kind of event (i.e., they are not associated). As can be seen in the figure below, the p-value of the Chi Square Test is highly significant ($p<0.001$), indicating that the location frequency varies among the three kinds of hunter avidity.



Contingency Table for Location and Hunter Avidity, Maine					
Avidity Group		**Rural**	**Urban**	**Out of State**	**Total**
One-Timer	Number	27,116	34,410	40,755	102,281
	Percentage of One-Timer in Location	26.5	33.6	39.8	
	Percentage of Locational Group That Are One-Timer	28.5	28.5	55.8	35.4
Churner	Number	26,743	32,362	17,402	76,507
	Percentage of Churner in Location	35.0	42.3	22.7	
	Percentage of Locational Group That Are Churner	28.2	26.8	23.8	26.5
Avid	Number	41,123	54,060	14,883	110,066
	Percentage of Avid in Location	37.4	49.1	13.5	
	Percentage of Locational Group That Are Avid	43.3	44.7	20.4	38.1
Total	Number	94,982	120,832	73,040	288,854
	Percentage of Total in Location	32.9	41.8	25.3	100.0
χ^2=19868.554 · df=4 · Cramer's V=0.185 · p=0.000					

Gender

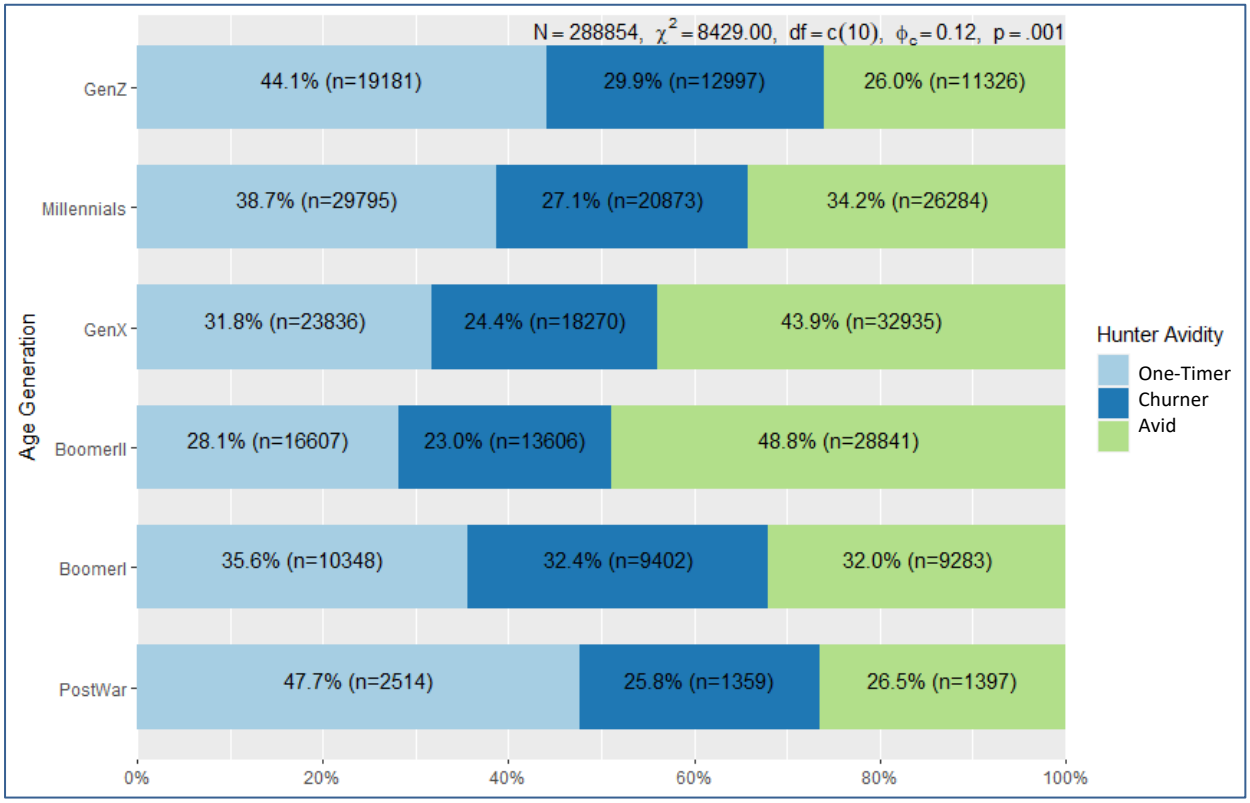
The null hypothesis regarding gender proposes that hunter avidity and the hunter's gender are independent of one another. Once again, the Chi-square test is highly significant, indicating a strong relationship between gender and hunter avidity in Maine. In this situation, the incidence of high avidity is much more prevalent for male hunters (39% versus 32% female).



Contingency Table for Gender and Hunter Avidity, Maine				
Avidity Group		**Female**	**Male**	**Total**
One-Timer	Number	17,674	84,607	102,281
	Percentage of One-Timer in Gender Category	17.3	82.7	
	Percentage of Gender Group That Are One-Timer	38.8	34.8	35.4
Churner	Number	13,569	62,938	76,507
	Percentage of Churner in Gender Category	17.7	82.3	
	Percentage of Gender Group That Are Churner	29.8	25.9	26.5
Avid	Number	14,361	95,705	110,066
	Percentage of Avid in Gender Category	13.0	87.0	
	Percentage of Gender Group That Are Avid	31.5	39.3	38.1
Total	Number	45,604	243,250	288,854
	Percentage of Total in Gender Category	15.8	84.2	100.0
				χ^2=1011.187 · df=2 · Cramer's V=0.059 · p=0.000

Generational Age

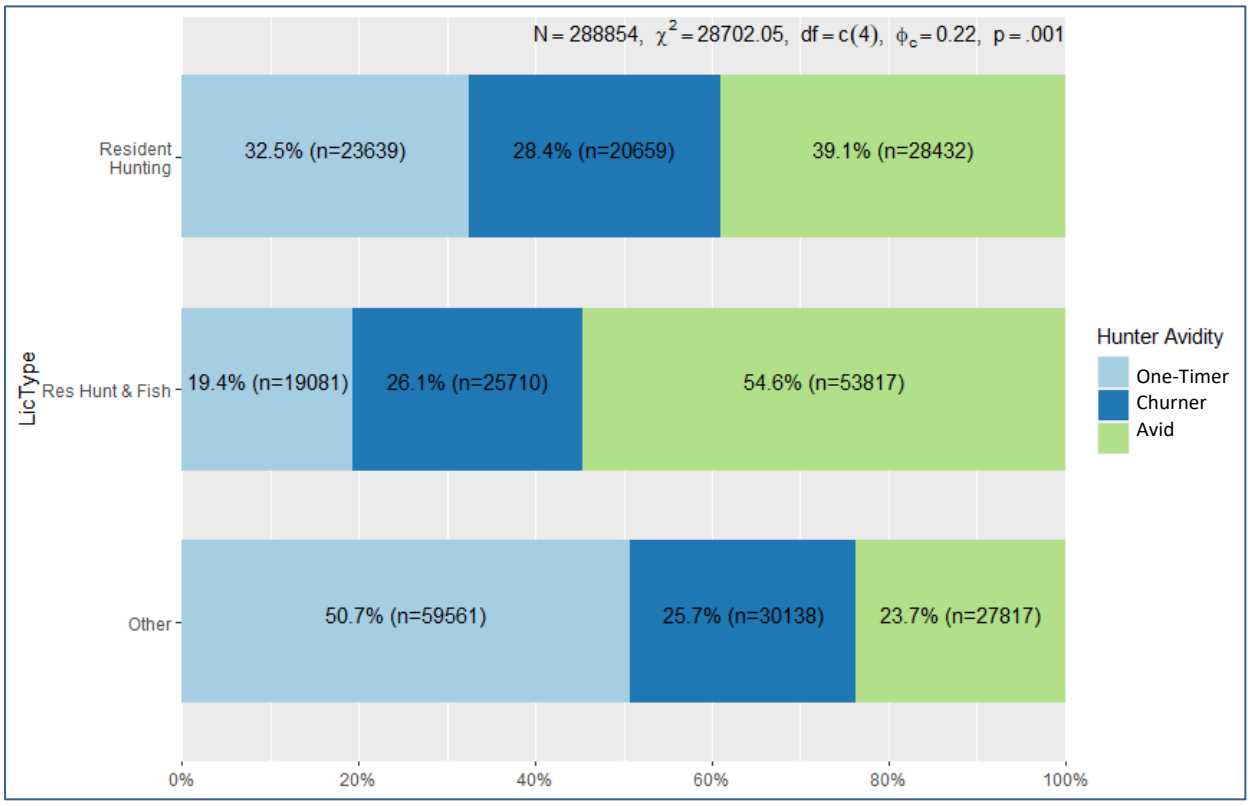
Based on widespread consensus as well as new Gen Z analysis by the Pew Research Center, and the one generation defined by the U.S. Census Bureau (Baby Boomers), date of birth can be used to define generation groups. The researchers examined the relationship between hunter avidity and generational age. The generational age of a hunter is also shown to influence hunter avidity based on the significant Chi-square test result. High avidity was most prevalent in the mid-age groups represented by Boomers II and Gen X, where 49% and 44%, respectively, were highly avid. Avidity proportions drops off to nearly 1 in 4 for both older and younger generations.



Contingency Table for Generational Age and Hunter Avidity, Maine								
Avidity Group		**Post War**	**Boomer I**	**Boomer II**	**Gen X**	**Millennial**	**Gen Z**	**Total**
One-Timer	Number	2,514	10,348	16,607	23,836	29,795	19,181	102,281
	Percentage of One-Timer in Age Group	2.5	10.1	16.2	23.3	29.1	18.8	
	Percentage of Age Group That Are One-Timer	47.7	35.6	28.1	31.8	38.7	44.1	35.4
Churner	Number	1,359	9,402	13,606	18,270	20,873	12,997	76,507
	Percentage of Churner in Age Group	1.8	12.3	17.8	23.9	27.3	17.0	
	Percentage of Age Group That Are Churner	25.8	32.4	23.0	24.3	27.1	29.9	26.5
Avid	Number	1,397	9,283	28,841	32,935	26,284	11,326	110,066
	Percentage of Avid in Age Group	1.3	8.4	26.2	29.9	23.9	10.3	
	Percentage of Age Group That Are Avid	26.5	32.0	48.8	43.9	34.2	26.0	38.1
Total	Number	5,270	29,033	59,054	75,041	76,952	43,504	288,854
	Percentage of Total in Age Group	1.8	10.1	20.4	26.0	26.6	15.1	
χ^2=8428.998 · df=10 · Cramer's V=0.121 · p=0.000								

License Type

In Maine there are type types of resident licenses and several specialty licenses that were grouped into “other,” the base category. A high percentage of avid hunters (55%) were associated with the resident combination hunting and fishing type of license.



Contingency Table for License Type and Hunter Avidity, Maine					
Avidity Group		**Other**	**Resident Hunt and Fish**	**Resident Hunting**	**Total**
One-Timer	Number	59,561	19,081	23,639	102,281
	Percentage of One-Timer in License Type	58.2	18.7	23.1	
	Percentage of License Group That Are One-Timer	50.7	19.4	32.5	35.4
Churner	Number	30,138	25,710	20,659	76,507
	Percentage of Churner in License Type	39.4	33.6	27.0	
	Percentage of License Group That Are Churner	25.6	26.1	28.4	26.5
Avid	Number	27,817	53,817	28,432	110,066
	Percentage of Avid in License Type	25.3	48.9	25.8	
	Percentage of License Group That Are Avid	23.7	54.6	39.1	38.1
Total	Number	117,516	98,608	72,730	288,854
	Percentage of Total in License Type	40.7	34.1	25.2	
χ^2=28702.051 · df=4 · Cramer's V=0.223 · p=0.000					

Multinomial Logistic Regression

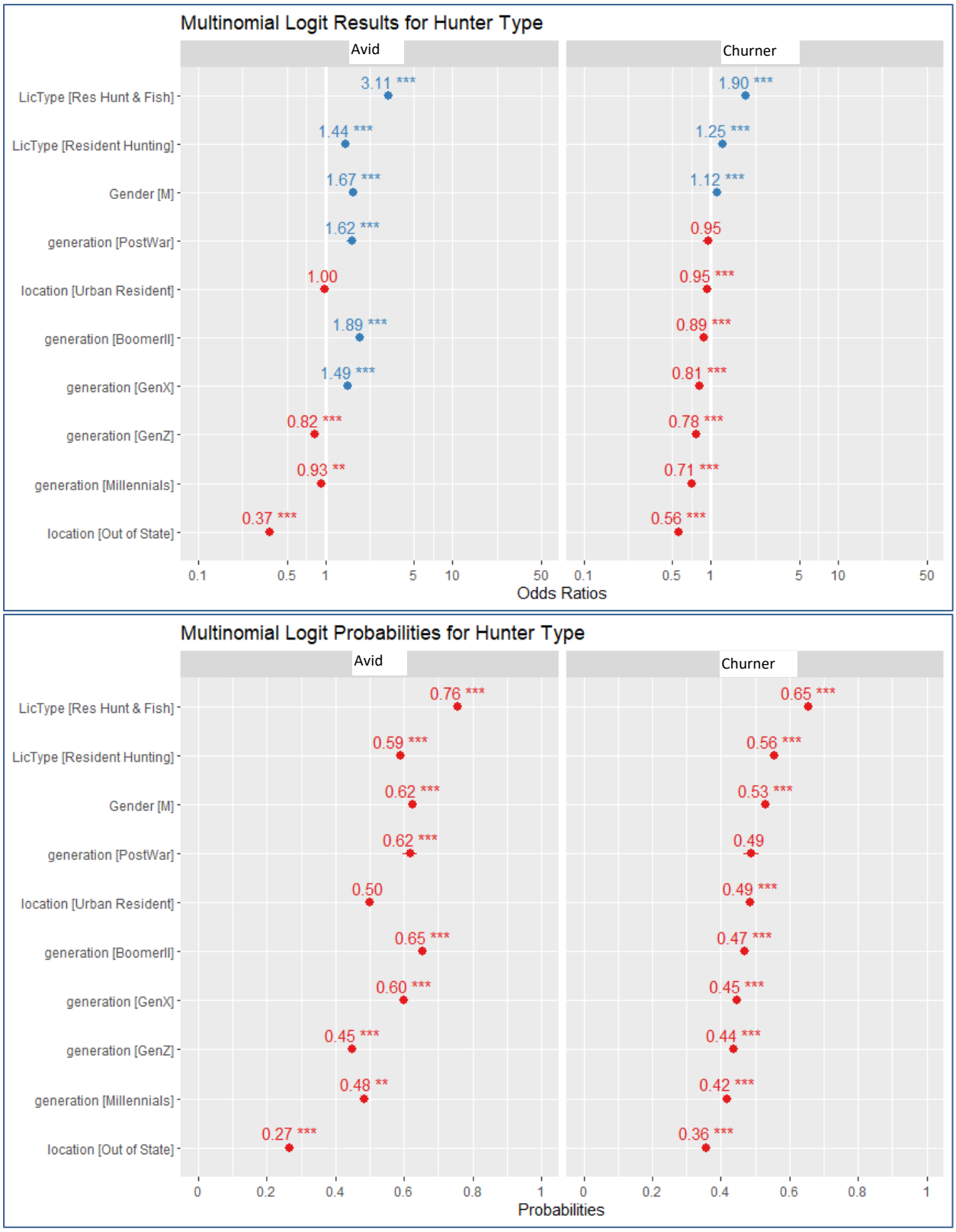
Logistic regression is a statistical technique used when the dependent variable is categorical (or nominal). For binary logistic regression the number of dependent variables is two, whereas the number of dependent variables for multinomial logistic regression is more than two. As with other types of regression, multinomial logistic regression can have nominal and/or continuous independent variables and can have interactions between independent variables to predict the dependent variable. Multinomial logistic regression is often considered an attractive analysis because; it does not assume normality, linearity, or homoscedasticity. This approach does have assumptions, such as the assumption of independence among the dependent variable choices. This assumption states that the choice of or membership in one category is not related to the choice or membership of another category (i.e., the dependent variable). Furthermore, multinomial logistic regression also assumes non-perfect separation. If the groups of the outcome variable are perfectly separated by the predictor(s), then unrealistic coefficients will be estimated, and effect sizes will be greatly exaggerated.

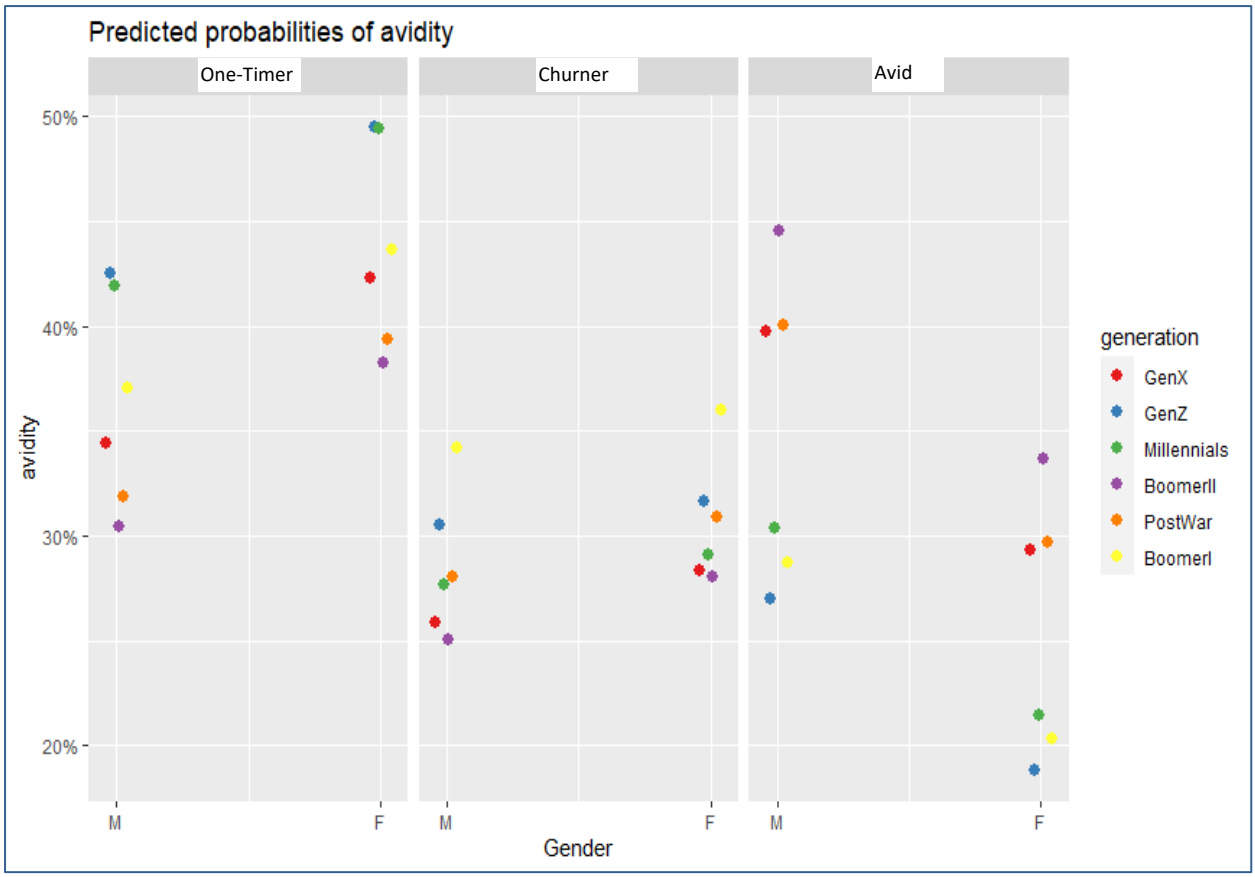
The ratio of the probability of choosing one outcome category over the probability of choosing the baseline category is often referred as relative risk (and it is sometimes referred to as odds, described in the regression parameters above). The relative risk is the right-hand side linear

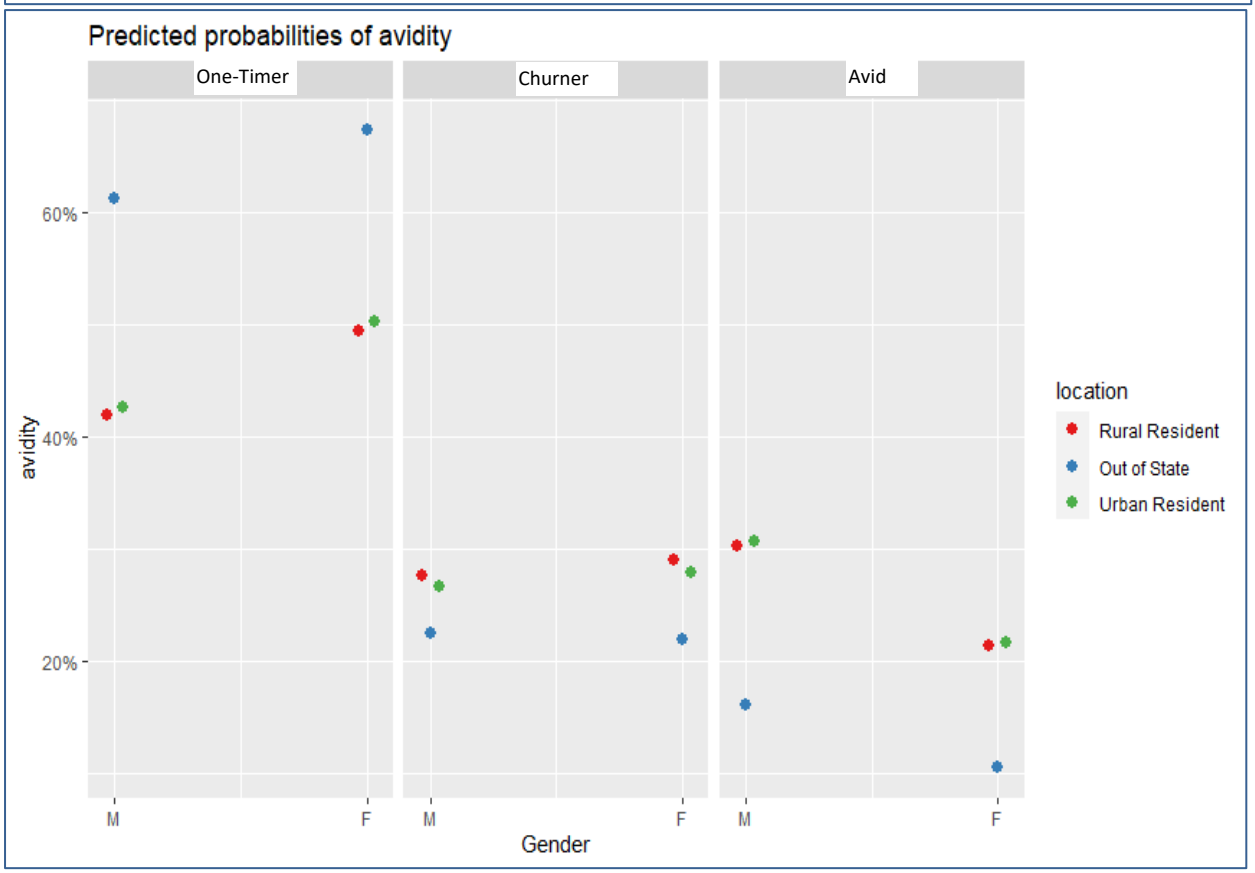
equation exponentiated, leading to the fact that the exponentiated regression coefficients are relative risk ratios for a unit change in the predictor variable. The researchers exponentiated the coefficients from the model to see these risk ratios. Odd ratios greater than 1.0 indicate a positive effect from the variable in question.

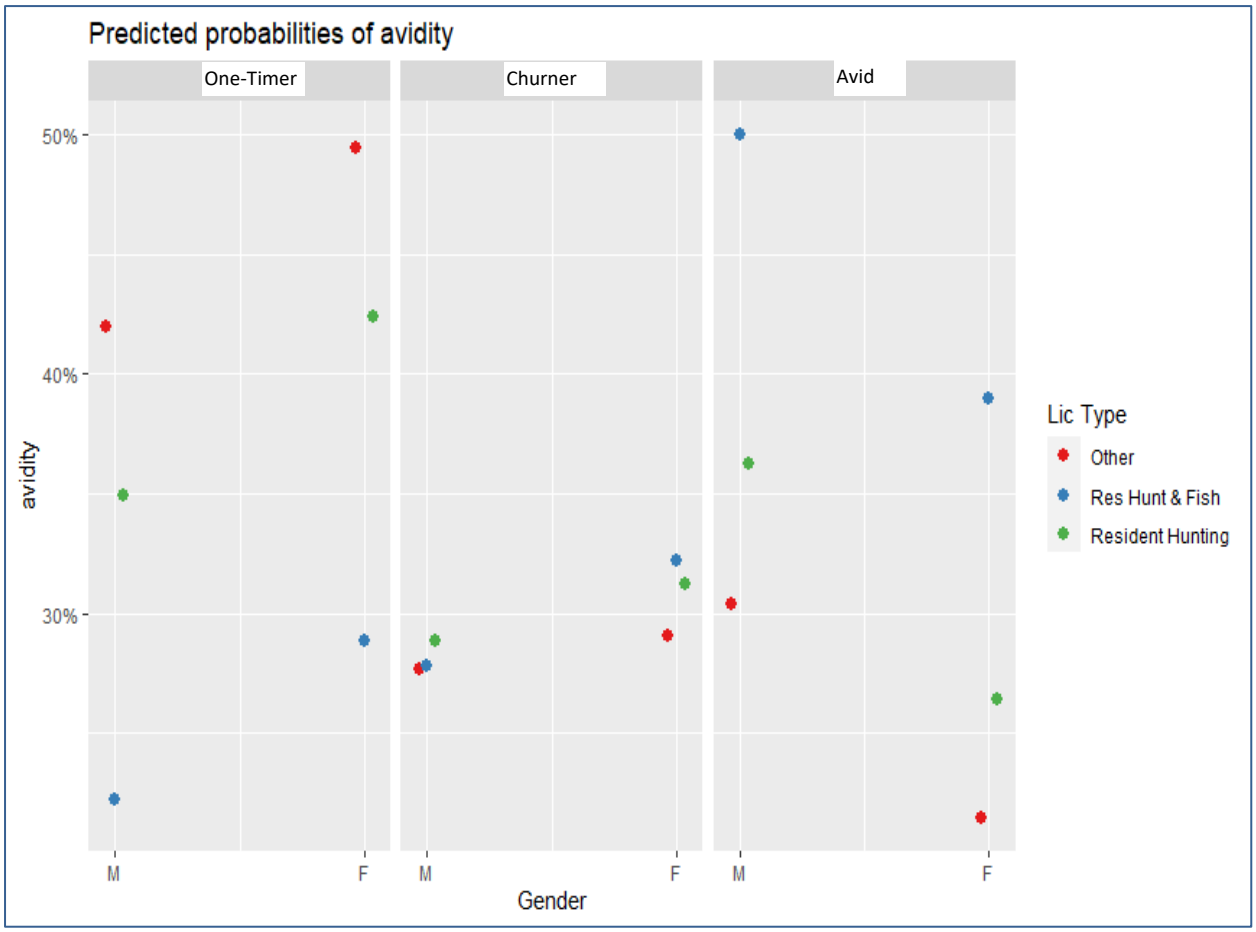
License type, age generation, and hunter gender were all found to be significant determinants of hunter avidity. Those from the Post War, Boomer II, and Gen X age generations were much more likely to be avid hunters. Location and hunter gender were also important in distinguishing avid and one-timers with male hunters having a higher probability of being avid and both rural and urban Maine Residents more likely to be avid than out of state residents.

Predictors	**Avidity**			
	Odds Ratios	**CI**	**p**	**Response**
(Intercept)	0.82	0.78 – 0.87	**<0.001**	Churner
(Intercept)	0.47	0.44 – 0.49	**<0.001**	Avid
GenderM	1.12	1.09 – 1.16	**<0.001**	Churner
GenderM	1.67	1.62 – 1.72	**<0.001**	Avid
generationBoomerII	0.89	0.85 – 0.93	**<0.001**	Churner
generationBoomerII	1.89	1.81 – 1.97	**<0.001**	Avid
generationGenX	0.81	0.78 – 0.85	**<0.001**	Churner
generationGenX	1.49	1.43 – 1.55	**<0.001**	Avid
generationGenZ	0.78	0.74 – 0.81	**<0.001**	Churner
generationGenZ	0.82	0.78 – 0.86	**<0.001**	Avid
generationMillennials	0.71	0.69 – 0.74	**<0.001**	Churner
generationMillennials	0.93	0.89 – 0.97	**0.001**	Avid
generationPostWar	0.95	0.87 – 1.04	0.267	Churner
generationPostWar	1.62	1.48 – 1.77	**<0.001**	Avid
Rural Resident	*Reference*			
Out of State	0.56	0.53 – 0.58	**<0.001**	Churner
Res Hunt & Fish	3.11	3.00 – 3.23	**<0.001**	Avid
Urban Resident	1.00	0.97 – 1.02	0.793	Avid
Resident Hunting	1.44	1.38 – 1.49	**<0.001**	Avid
Other	*Reference*			
Out of State	0.37	0.35 – 0.38	**<0.001**	Avid
Res Hunt & Fish	1.90	1.83 – 1.97	**<0.001**	Churner
Resident Hunting	1.25	1.21 – 1.30	**<0.001**	Churner
Urban Resident	0.95	0.92 – 0.97	**<0.001**	Churner
Observations	202198			
R2 / R2 adjusted	0.062 / 0.062			
McFadden CoxSnell Nagelkerke	0.06239514 0.12686522 0.14313841			


Multinomial Logit Results for Hunter Type
Avid
Churner
LicType [Res Hunt & Fish]
LicType [Resident Hunting]
Gender [M]
generation [PostWar]
location [Urban Resident]
generation [BoomerII]
generation [GenX]
generation [GenZ]
generation [Millennials]
location [Out of State]
3.11 ***
1.44 ***
1.67 ***
1.62 ***
1.00
1.89 ***
1.49 ***
0.82 ***
0.93 **
0.37 ***
1.90 ***
1.25 ***
1.12 ***
0.95
0.95 ***
0.89 ***
0.81 ***
0.78 ***
0.71 ***
0.56 ***
0.1
0.5
1
5
10
50
Odds Ratios
Multinomial Logit Probabilities for Hunter Type
Avid
Churner
LicType [Res Hunt & Fish]
LicType [Resident Hunting]
Gender [M]
generation [PostWar]
location [Urban Resident]
generation [BoomerII]
generation [GenX]
generation [GenZ]
generation [Millennials]
location [Out of State]
0.76 ***
0.59 ***
0.62 ***
0.62 ***
0.50
0.65 ***
0.60 ***
0.45 ***
0.48 **
0.27 ***
0.65 ***
0.56 ***
0.53 ***
0.49
0.49 ***
0.47 ***
0.45 ***
0.44 ***
0.42 ***
0.36 ***
0
0.2
0.4
0.6
0.8
1
Probabilities


Predicted probabilities of avidity
One-Timer
Churner
Avid
50%
40%
30%
20%
avidity
M
F
Gender
generation
GenX
GenZ
Millennials
BoomerII
PostWar
BoomerI


Predicted probabilities of avidity
One-Timer
Churner
Avid
60%
40%
20%
avidity
M
F
Gender
location
Rural Resident
Out of State
Urban Resident


Predicted probabilities of avidity
One-Timer
Churner
Avid
50%
40%
30%
avidity
M
F
M
F
M
F
Gender
Lic Type
Other
Res Hunt & Fish
Resident Hunting

MEASURING HUNTER AVIDITY NEW JERSEY

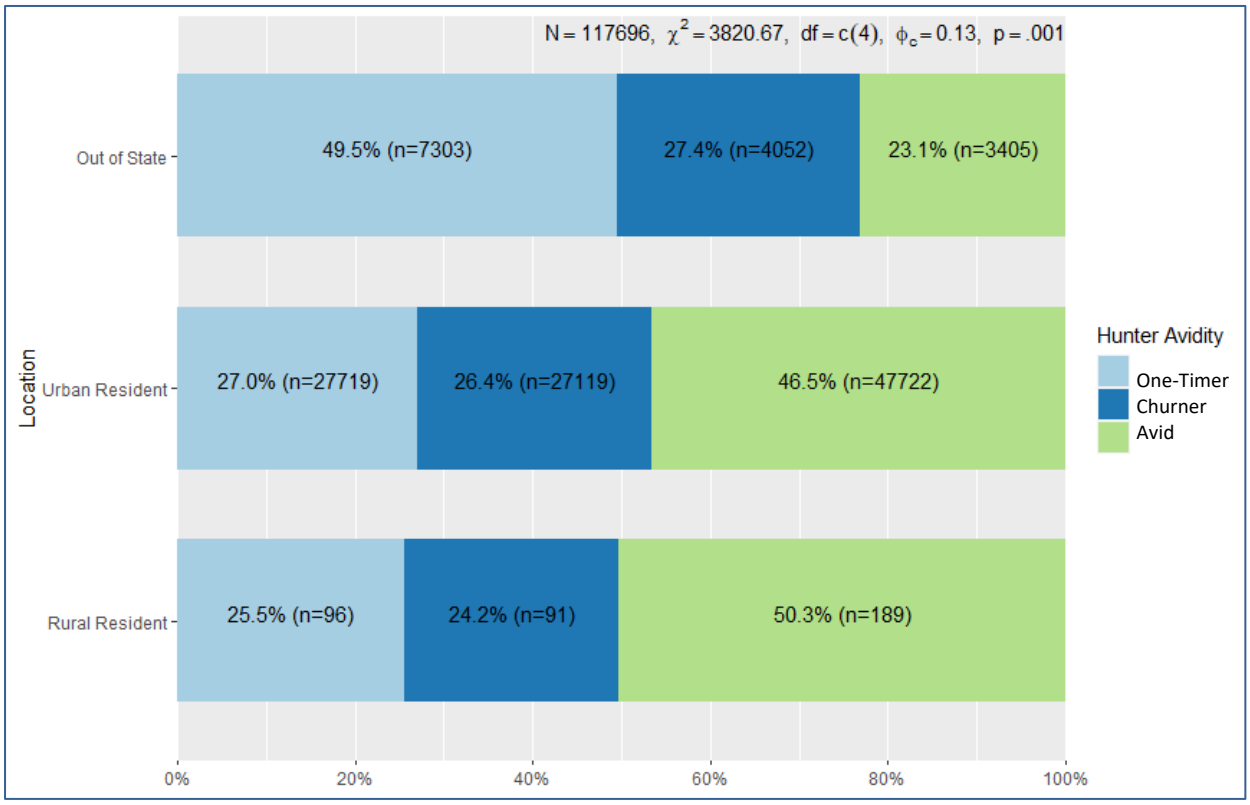
Avidity Group

In New Jersey, the avid group is the largest, at 44%, as shown in the table that follows. Otherwise, 30% are one-timers, and 27% are in the churner group.

Number and Percentage of Hunters in Avidity Categories				
	One-Timer	Churner	Avid	Total
Number	35,118	31,262	51,316	117,696
Percentage	29.8	26.6	43.6	

Location

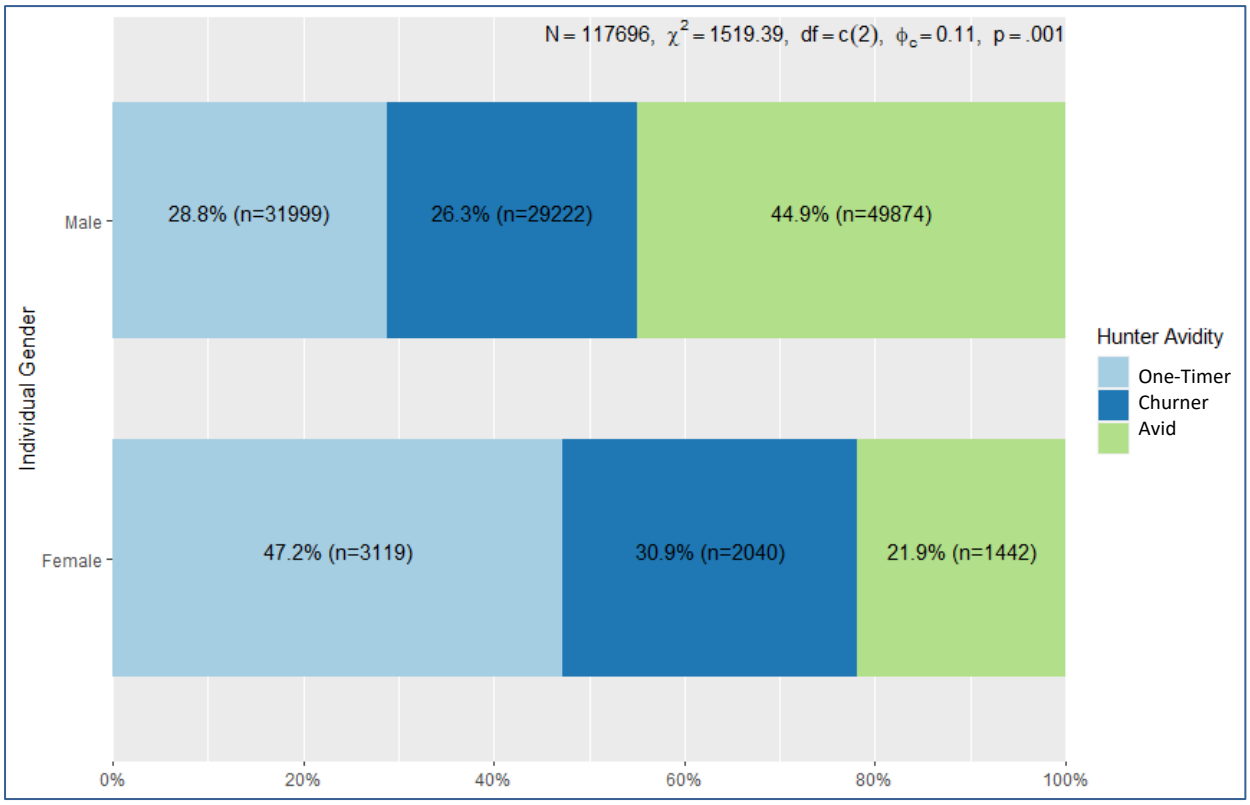
Hunters who resided in rural areas of the state were more likely to be avid than those living in urban areas or those who came from out of state to hunt. A contingency table, also known as a cross-classification table, describes the relationships between two or more categorical variables. The null hypothesis proposes that hunter avidity and location of the hunter's residence are independent of one another. This means the occurrence of one kind of event does not depend on the other kind of event (i.e., they are not associated). As can be seen in the figure below, the p-value of the Chi Square Test is highly significant ($p<0.001$), indicating that the location frequency varies among the three kinds of hunter avidity.



Contingency Table for Location and Hunter Avidity, New Jersey					
Avidity Group		**Rural**	**Urban**	**Out of State**	**Total**
One-Timer	Number	96	27,719	7,303	35,118
	Percentage of One-Timer in Location	0.3	78.9	20.8	
	Percentage of Locational Group That Are One-Timer	25.5	27.0	49.5	29.8
Churner	Number	91	27,119	4,052	31,262
	Percentage of Churner in Location	0.3	86.7	13.0	
	Percentage of Locational Group That Are Churner	24.2	26.4	27.5	26.6
Avid	Number	189	47,722	3,405	51,316
	Percentage of Avid in Location	0.4	93.0	6.6	
	Percentage of Locational Group That Are Avid	50.3	46.5	23.1	43.6
Total	Number	376	102,560	14,760	117,696
	Percentage of Total in Location	0.3	87.1	12.5	100.0
χ^2=3820.672 · df=4 · Cramer's V=0.127 · p=0.000					

Gender

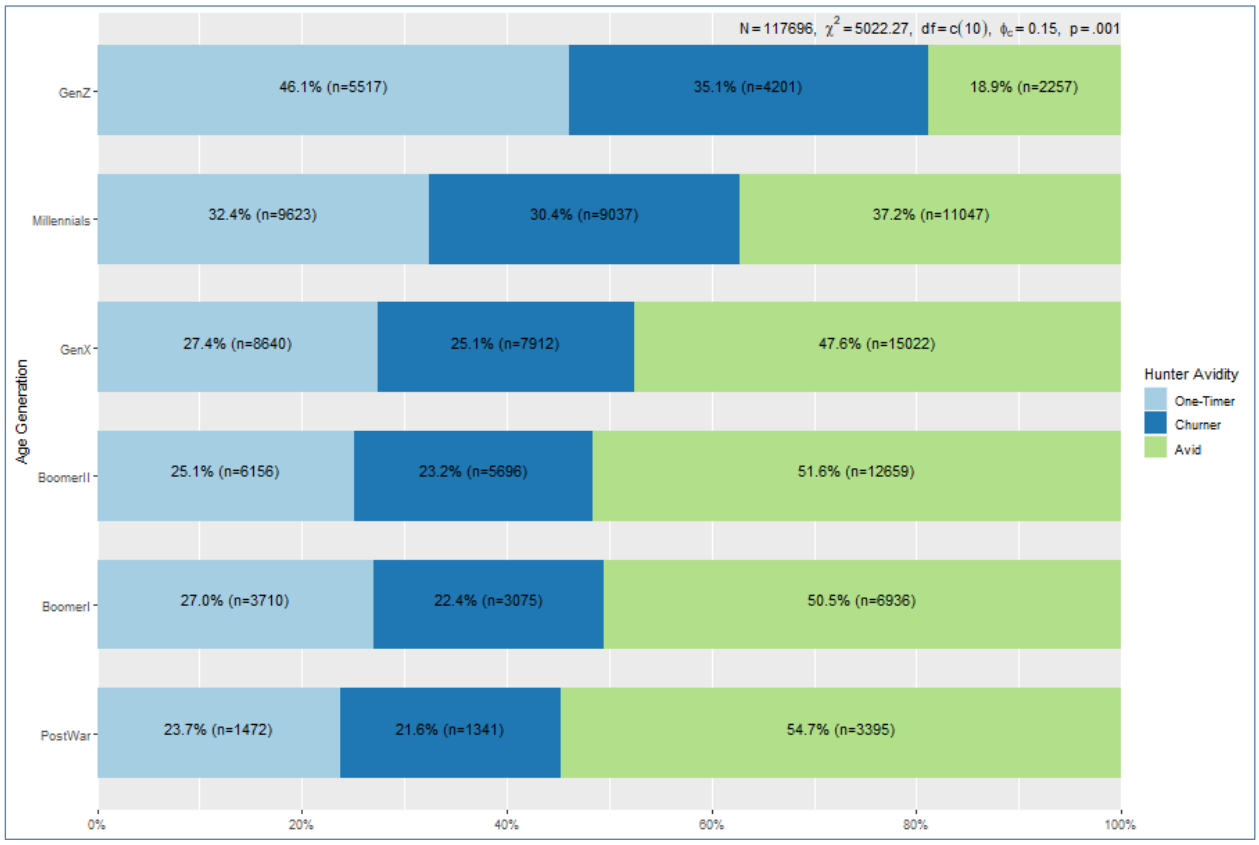
The null hypothesis regarding gender proposes that hunter avidity and the hunter's gender are independent of one another. Once again, the Chi-square test is highly significant, indicating a strong relationship between gender and hunter avidity in New Jersey. In this situation, the incidence of high avidity is much more prevalent for male hunters (45% versus 22% female).



Contingency Table for Gender and Hunter Avidity, New Jersey				
Avidity Group		**Female**	**Male**	**Total**
One-Timer	Number	3,119	31,999	35,118
	Percentage of One-Timer in Gender Category	8.9	91.1	
	Percentage of Gender Group That Are One-Timer	47.3	28.8	29.8
Churner	Number	2,040	29,222	31,262
	Percentage of Churner in Gender Category	6.5	93.5	
	Percentage of Gender Group That Are Churner	30.9	26.3	26.6
Avid	Number	1,442	49,874	51,316
	Percentage of Avid in Gender Category	2.8	97.2	
	Percentage of Gender Group That Are Avid	21.8	44.9	43.6
Total	Number	6,601	111,095	117,696
	Percentage of Total in Gender Category	5.6	94.4	100.0
				χ^2=1519.395 · df=2 · Cramer's V=0.114 · p=0.000

Generational Age

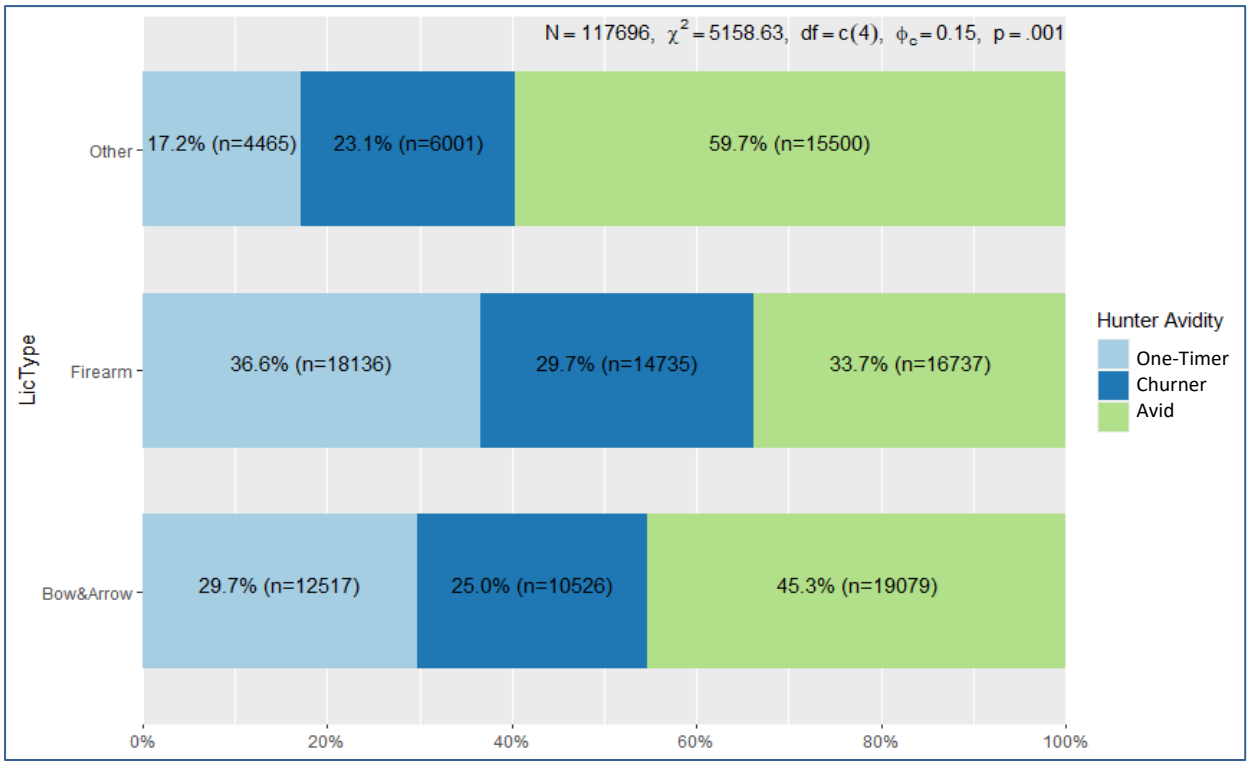
Based on widespread consensus as well as new Gen Z analysis by the Pew Research Center, and the one generation defined by the U.S. Census Bureau (Baby Boomers), date of birth can be used to define generation groups. The researchers examined the relationship between hunter avidity and generational age. The generational age of a hunter is also shown to influence hunter avidity based on the significant Chi-square test result. High avidity was most prevalent in the oldest age groups represented by Post War, Boomers I, and Boomers II, where one half or more of hunters were highly avid. Avidity drops off considerably for the Gen Z generational age.



Contingency Table for Generational Age and Hunter Avidity, New Jersey								
Avidity Group		**Post War**	**Boomer I**	**Boomer II**	**Gen X**	**Millennial**	**Gen Z**	**Total**
One-Timer	Number	1,472	3,710	6,156	8,640	9,623	5,517	35,118
	Percentage of One-Timer in Age Group	4.2	10.6	17.5	24.6	27.4	15.7	
	Percentage of Age Group That Are One-Timer	23.7	27.0	25.1	27.4	32.4	46.1	29.8
Churner	Number	1,341	3,075	5,696	7,912	9,037	4,201	31,262
	Percentage of Churner in Age Group	4.3	9.8	18.2	25.3	28.9	13.4	
	Percentage of Age Group That Are Churner	21.6	22.4	23.2	25.1	30.4	35.1	26.6
Avid	Number	3,395	6,936	12,659	15,022	11,047	2,257	51,316
	Percentage of Avid in Age Group	6.6	13.5	24.7	29.3	21.5	4.4	
	Percentage of Age Group That Are Avid	54.7	50.6	51.6	47.6	37.2	18.8	43.6
Total	Number	6,208	13,721	24,511	31,574	29,707	11,975	117,696
	Percentage of Total in Age Group	5.3	11.7	20.8	26.8	25.2	10.2	
χ^2=5022.270 · df=10 · Cramer's V=0.146 · p=0.000								

License Type

In New Jersey there are two broad categories of licenses pertaining to bow and arrow and firearms. There are also several specialty licenses that were grouped into "other," the base category. A high percentage of avid hunters (60%) were associated with these types of licenses. Bow and arrow hunters were more likely to be avid hunters than firearm hunters.



Contingency Table for License Type and Hunter Avidity, New Jersey					
Avidity Group		**Bow and Arrow**	**Firearm**	**Other**	**Total**
One-Timer	Number	12,517	18,136	4,465	35,118
	Percentage of One-Timer in License Type	35.6	51.6	12.7	
	Percentage of License Group That Are One-Timer	29.7	36.6	17.2	29.8
Churner	Number	10,526	14,735	6,001	31,262
	Percentage of Churner in License Type	33.7	47.1	19.2	
	Percentage of License Group That Are Churner	25.0	29.7	23.1	26.6
Avid	Number	19,079	16,737	15,500	51,316
	Percentage of Avid in License Type	37.2	32.6	30.2	
	Percentage of License Group That Are Avid	45.3	33.7	59.7	43.6
Total	Number	42,122	49,608	25,966	117,696
	Percentage of Total in License Type	35.8	42.1	22.1	
					χ^2=5158.627 · df=4 · Cramer's V=0.148 · p=0.000

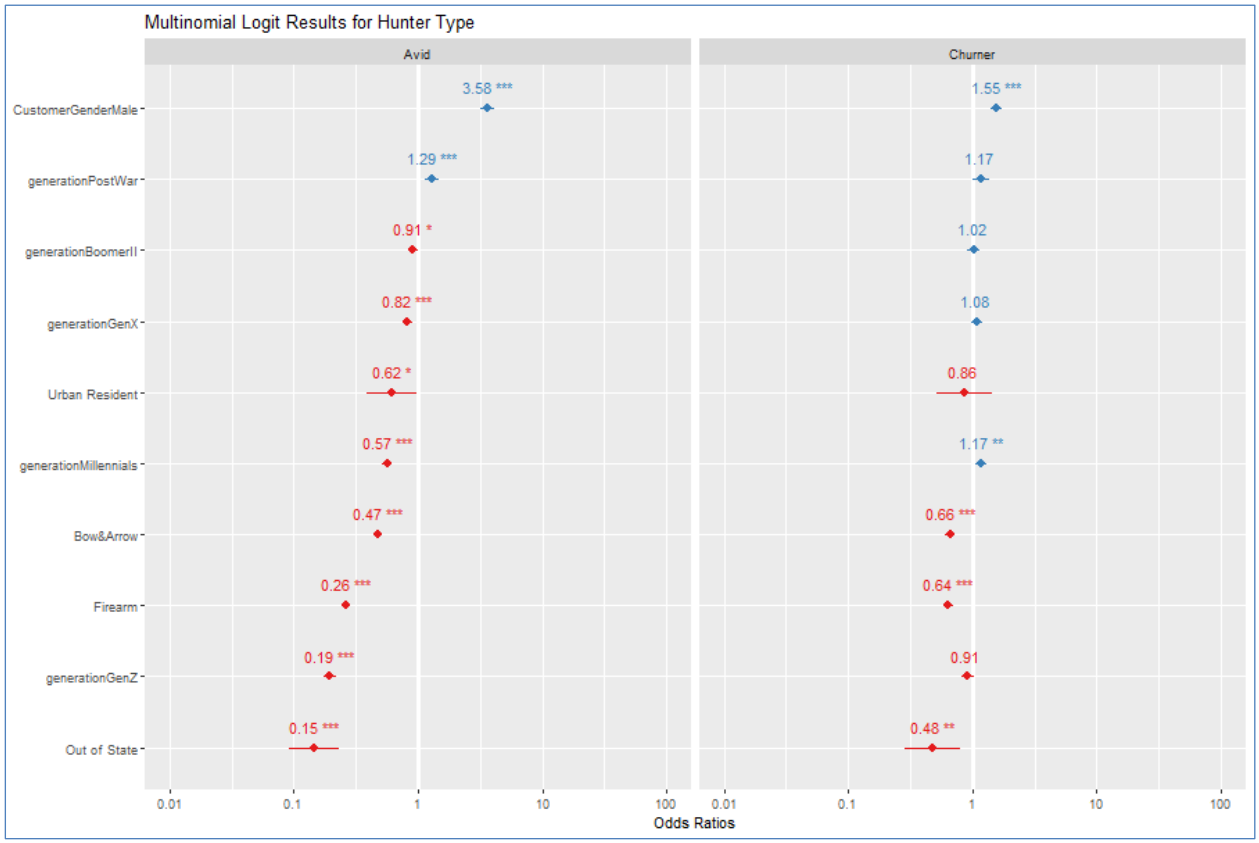
Multinomial Logistic Regression

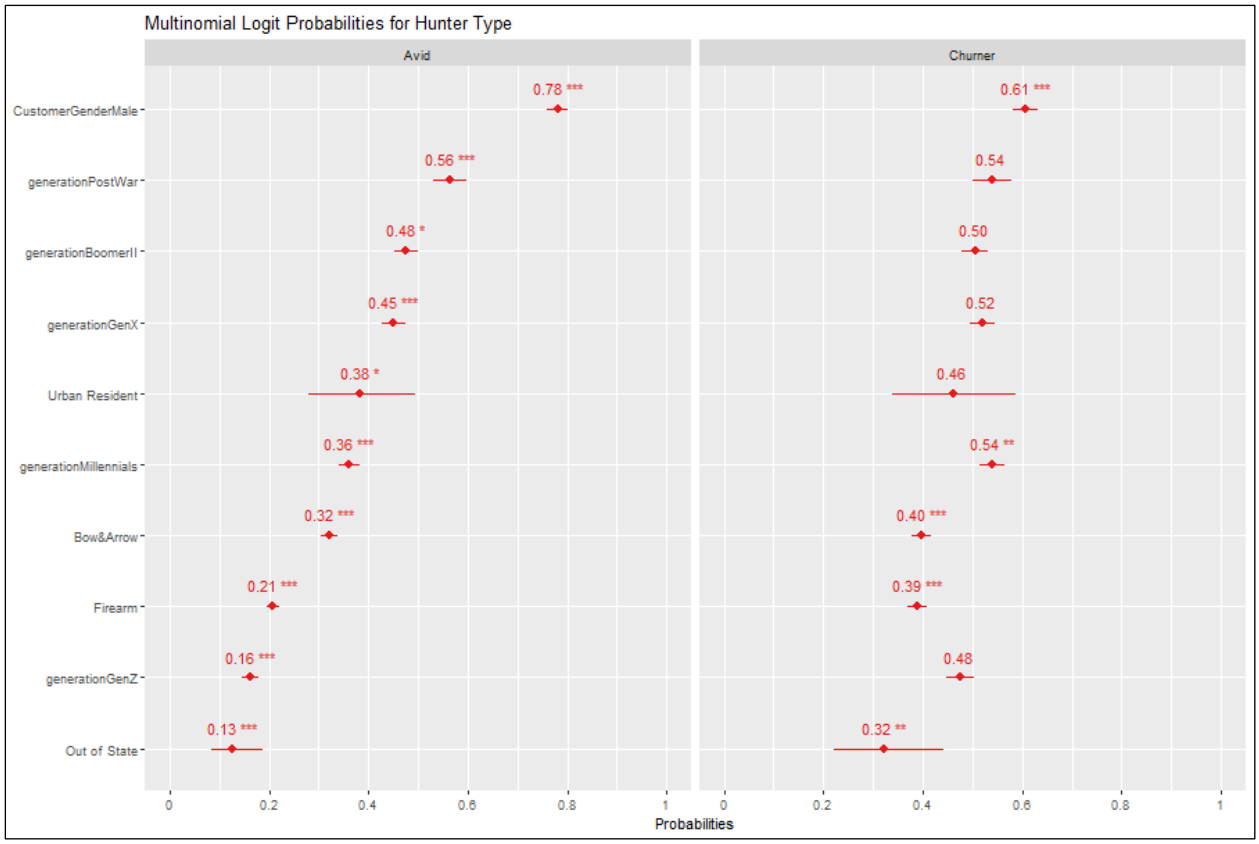
Logistic regression is a statistical technique used when the dependent variable is categorical (or nominal). For binary logistic regression the number of dependent variables is two, whereas the number of dependent variables for multinomial logistic regression is more than two. As with other types of regression, multinomial logistic regression can have nominal and/or continuous independent variables and can have interactions between independent variables to predict the dependent variable. Multinomial logistic regression is often considered an attractive analysis because; it does not assume normality, linearity, or homoscedasticity. This approach does have assumptions, such as the assumption of independence among the dependent variable choices. This assumption states that the choice of or membership in one category is not related to the choice or membership of another category (i.e., the dependent variable). Furthermore, multinomial logistic regression also assumes non-perfect separation. If the groups of the outcome variable are perfectly separated by the predictor(s), then unrealistic coefficients will be estimated, and effect sizes will be greatly exaggerated. The estimation defines the avidity group "One-Timer" as the reference category for the dependent variable. The refence categories for the explanatory variables are identified in the table.

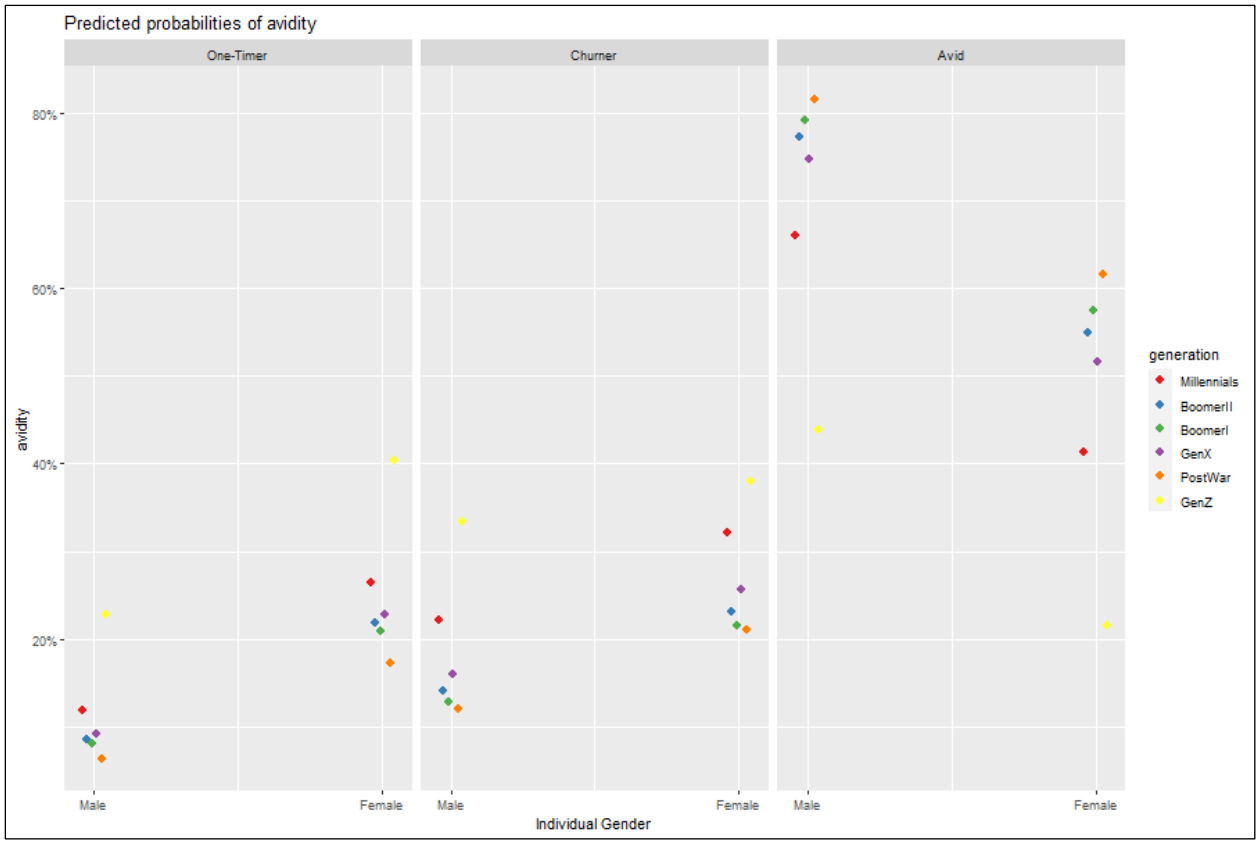
Predictors	**Avidity**			
	Odds Ratios	**CI**	**p**	**Response**
(Intercept)	1.04	0.61 – 1.76	0.892	Churner
(Intercept)	2.76	1.70 – 4.48	<0.001	Avid
Individual Gender	*Reference*			
CustomerGenderMale	1.55	1.39 – 1.72	<0.001	Churner
CustomerGenderMale	3.58	3.16 – 4.06	<0.001	Avid
generationBoomerII	1.02	0.91 – 1.14	0.727	Churner
generationBoomerII	0.91	0.83 – 1.00	0.048	Avid
generationGenX	1.08	0.98 – 1.20	0.126	Churner
generationGenX	0.82	0.75 – 0.90	<0.001	Avid
generationGenZ	0.91	0.81 – 1.02	0.100	Churner
generationGenZ	0.19	0.17 – 0.22	<0.001	Avid
generationMillennials	1.17	1.06 – 1.30	0.002	Churner
generationMillennials	0.57	0.52 – 0.62	<0.001	Avid
generationPostWar	1.17	1.00 – 1.38	0.051	Churner
generationPostWar	1.29	1.12 – 1.48	<0.001	Avid
Rural Resident	*Reference*			
Bow&Arrow	0.47	0.44 – 0.51	<0.001	Avid
Urban Resident	0.86	0.51 – 1.43	0.553	Churner
Firearm	0.26	0.24 – 0.28	<0.001	Avid
Out of State	0.15	0.09 – 0.23	<0.001	Avid
Other	*Reference*			
Out of State	0.48	0.28 – 0.79	0.005	Churner
Bow&Arrow	0.66	0.61 – 0.72	<0.001	Churner
Firearm	0.64	0.59 – 0.69	<0.001	Churner
Urban Resident	0.62	0.39 – 0.98	0.040	Avid
Observations	35,309			
R^2 / R^2	0.065 / 0.065			

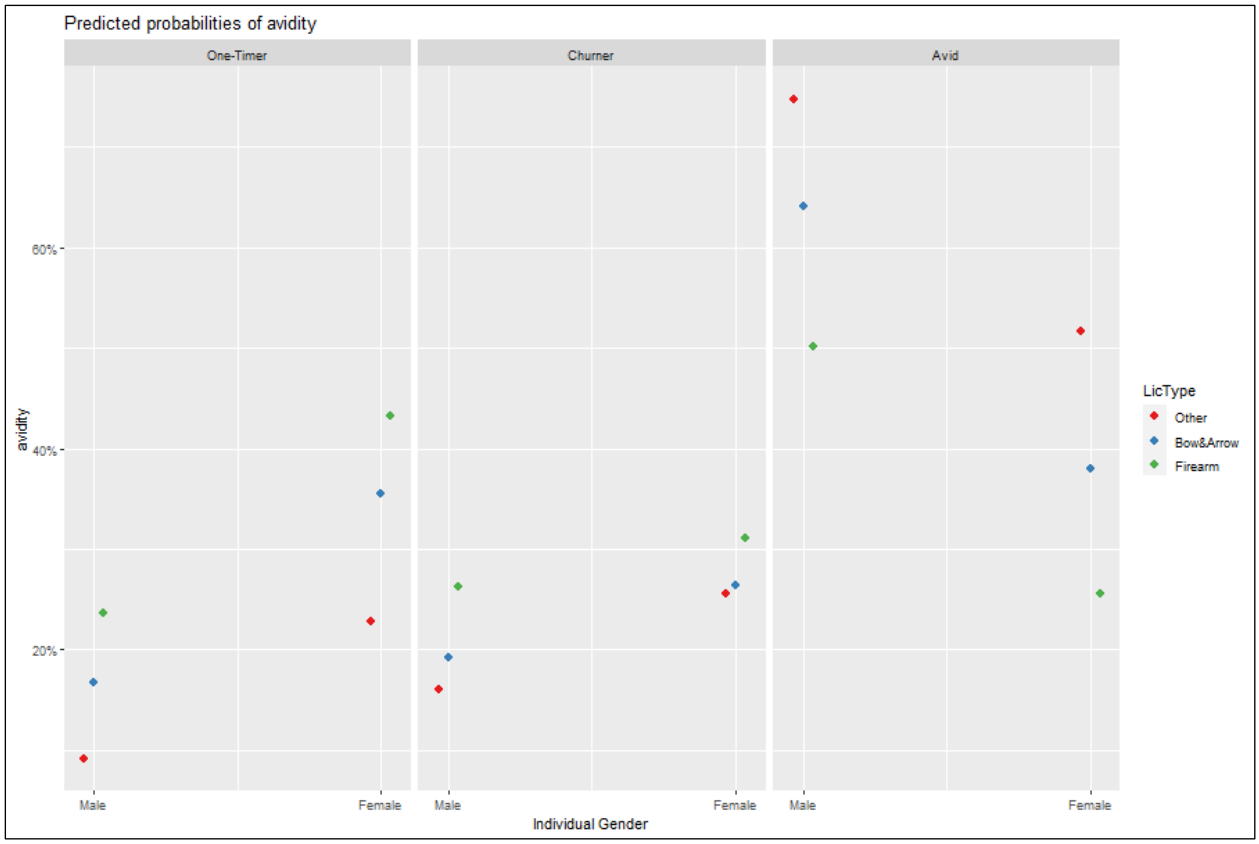
The ratio of the probability of choosing one outcome category over the probability of choosing the baseline category is often referred as relative risk (and it is sometimes referred to as odds, described in the regression parameters above). The relative risk is the right-hand side linear equation exponentiated, leading to the fact that the exponentiated regression coefficients are relative risk ratios for a unit change in the predictor variable. The researchers exponentiated the coefficients from this model to see these risk ratios. Odd ratios greater than 1.0 indicate a positive effect from the variable in question.

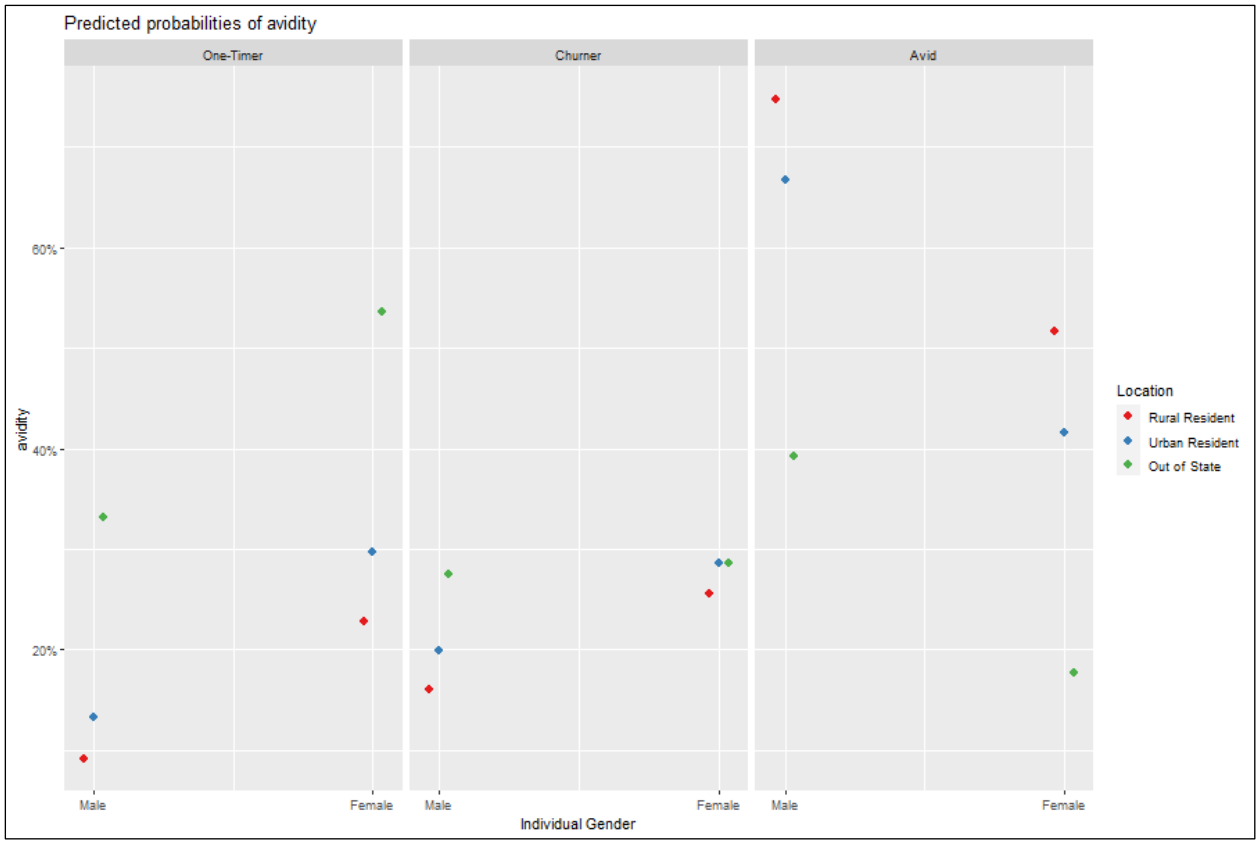
Hunter gender was the most influential variable in distinguishing both avid and churner hunter groups from one-timers. Those from the Post War generational age were much more likely to be avid hunters in New Jersey. Location was important in distinguishing avid and churner hunters, with hunters from urban areas having a higher probability of being in the churner group.




Multinomial Logit Probabilities for Hunter Type
Avid
Churner
CustomerGenderMale
generationPostWar
generationBoomerII
generationGenX
Urban Resident
generationMillennials
Bow&Arrow
Firearm
generationGenZ
Out of State
0.78 ***
0.56 ***
0.48 *
0.45 ***
0.38 *
0.36 ***
0.32 ***
0.21 ***
0.16 ***
0.13 ***
0.61 ***
0.54
0.50
0.52
0.46
0.54 **
0.40 ***
0.39 ***
0.48
0.32 **
0
0.2
0.4
0.6
0.8
1
Probabilities


Predicted probabilities of avidity
One-Timer
Churner
Avid
80%
60%
40%
20%
avidity
Male
Female
Male
Female
Male
Female
Individual Gender
generation
Millennials
BoomerII
BoomerI
GenX
PostWar
GenZ


Predicted probabilities of avidity
One-Timer
Churner
Avid
60%
40%
20%
avidity
Male
Female
Male
Female
Male
Female
Individual Gender
LicType
Other
Bow&Arrow
Firearm


Predicted probabilities of avidity
One-Timer
Churner
Avid
60%
40%
20%
avidity
Male
Female
Male
Female
Male
Female
Individual Gender
Location
Rural Resident
Urban Resident
Out of State

MEASURING HUNTER AVIDITY NORTH CAROLINA

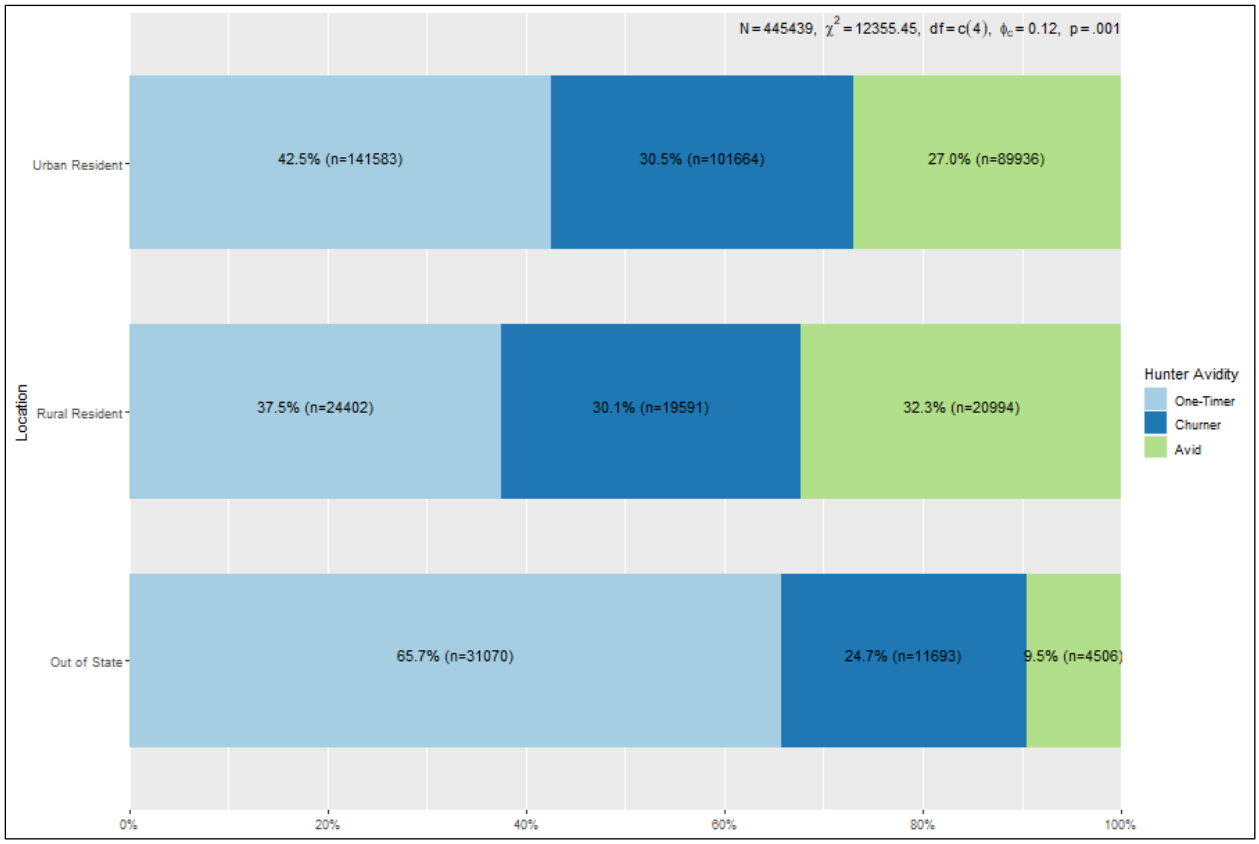
Avidity Group

The avidity groups for North Carolina are provided in the table below. Most hunters during the time period were one-timers (44%), only buying a license in one of the 5 years. The smallest group during the period studied were avid hunters (26%). Almost a third (30%) of North Carolina hunters fell somewhere between, having purchased a license in 2-3 years of the 5-year period examined.

Number and Percentage of Hunters in Avidity Categories				
	One-Timer	**Churner**	**Avid**	**Total**
Number	197,055	132,948	115,436	445,439
Percentage	44.2	29.8	25.9	

Location

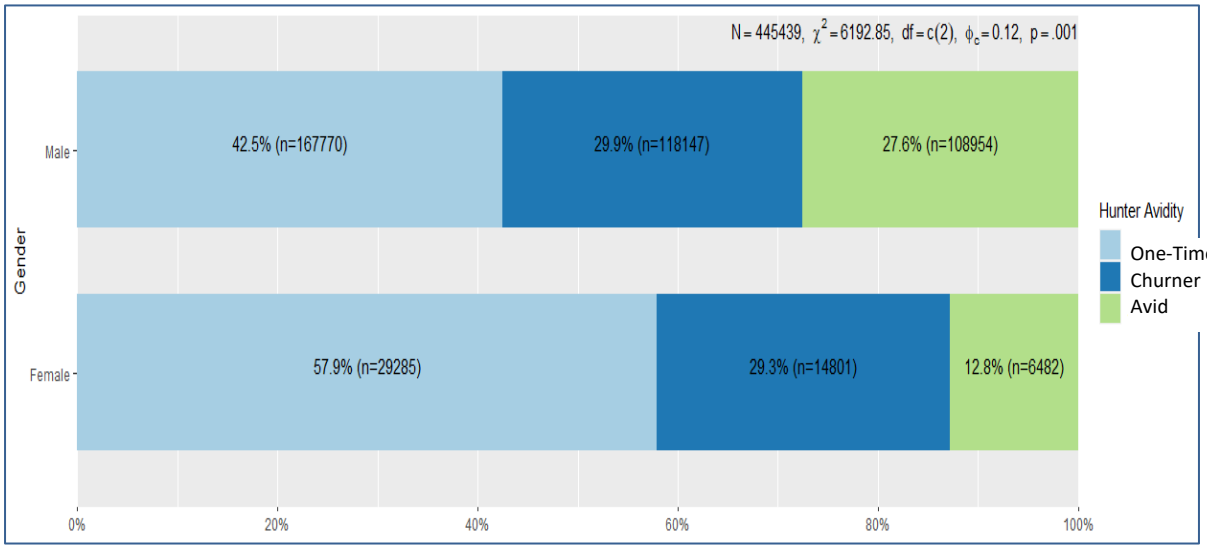
Hunters that resided in rural areas of the state were more likely to be avid than those living in urban areas or that came from out of state to hunt. A contingency table, also known as a cross-classification table, describes the relationships between two or more categorical variables. The null hypothesis proposes that hunter avidity and location of the hunter's residence are independent of one another. This means the occurrence of one kind of event does not depend on the other kind of event (i.e., they are not associated). As can be seen in the figure below, the p-value of the Chi Square Test is highly significant (p=0.001), indicating that the location frequency varies among the three kinds of hunter avidity.



Contingency Table for Location and Hunter Avidity, North Carolina					
Avidity Group		**Rural**	**Urban**	**Out of State**	**Total**
One-Timer	Number	24,404	141,581	31,070	197,055
	Percentage of One-Timer in Location	12.4	71.8	15.8	
	Percentage of Locational Group That Are One-Timer	37.5	42.5	65.7	44.2
Churner	Number	19,592	101,663	11,693	132,948
	Percentage of Churner in Location	14.7	76.5	8.8	
	Percentage of Locational Group That Are Churner	30.1	30.5	24.7	29.8
Avid	Number	20,997	89,933	4,506	115,436
	Percentage of Avid in Location	18.2	77.9	3.9	
	Percentage of Locational Group That Are Avid	32.3	27.0	9.5	25.9
Total	Number	64,993	333,177	47,269	445,439
	Percentage of Total in Location	14.6	74.8	10.6	100.0
					χ^2=12356.058 · df=4 · Cramer's V=0.118 · p=0.000

Gender

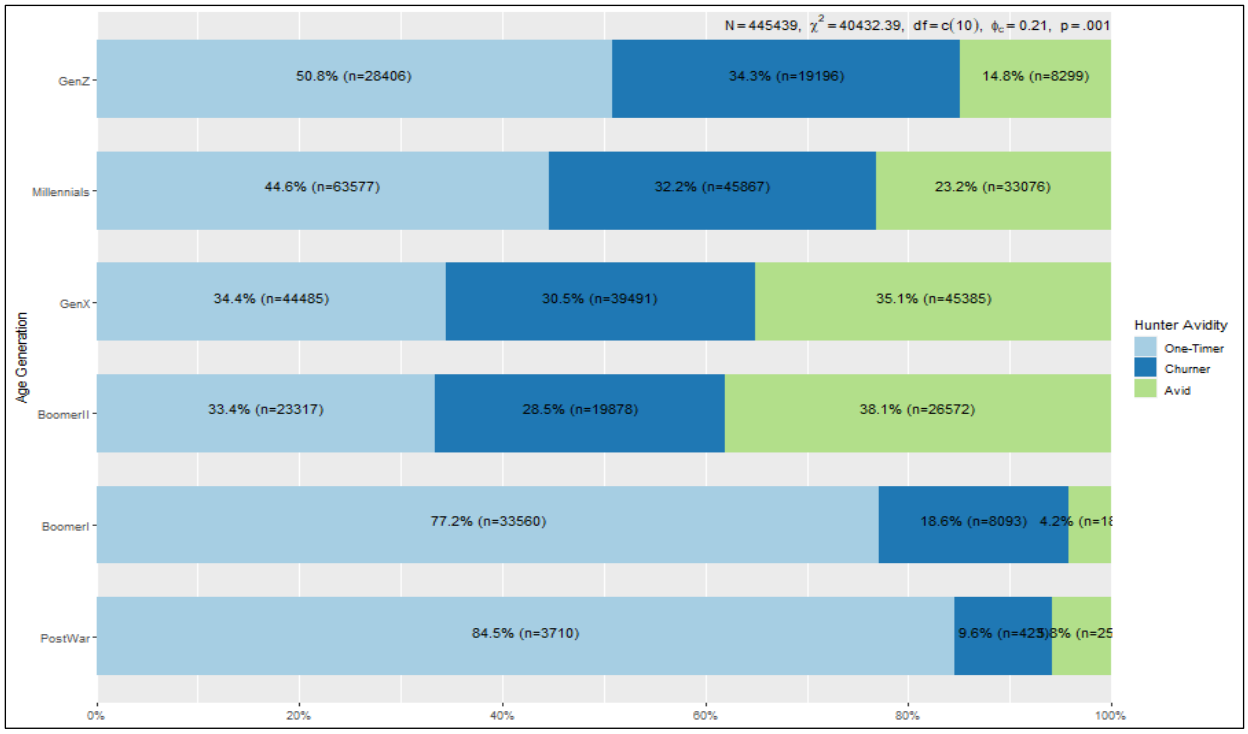
The null hypothesis regarding gender proposes that hunter avidity and the hunter's gender are independent of one another. Once again, the Chi-square test is highly significant, indicating a strong relationship between gender and hunter avidity in Alabama. In this situation, the incidence of high avidity is much more prevalent for male hunters (28% versus 13% female).



Contingency Table for Gender and Hunter Avidity, North Carolina				
Avidity Group		**Female**	**Male**	**Total**
One-Timer	Number	29,285	167,770	197,055
	Percentage of One-Timer in Gender Category	14.9	85.1	
	Percentage of Gender Group That Are One-Timer	57.9	42.5	44.2
Churner	Number	14,801	118,147	132,948
	Percentage of Churner in Gender Category	11.1	88.9	
	Percentage of Gender Group That Are Churner	29.3	29.9	29.8
Avid	Number	6,482	108,954	115,436
	Percentage of Avid in Gender Category	5.6	94.4	
	Percentage of Gender Group That Are Avid	12.8	27.6	25.9
Total	Number	50,568	394,871	445,439
	Percentage of Total in Gender Category	11.4	88.6	100.0
				χ^2=6192.849 · df=2 · Cramer's V=0.118 · p=0.000

Generational Age

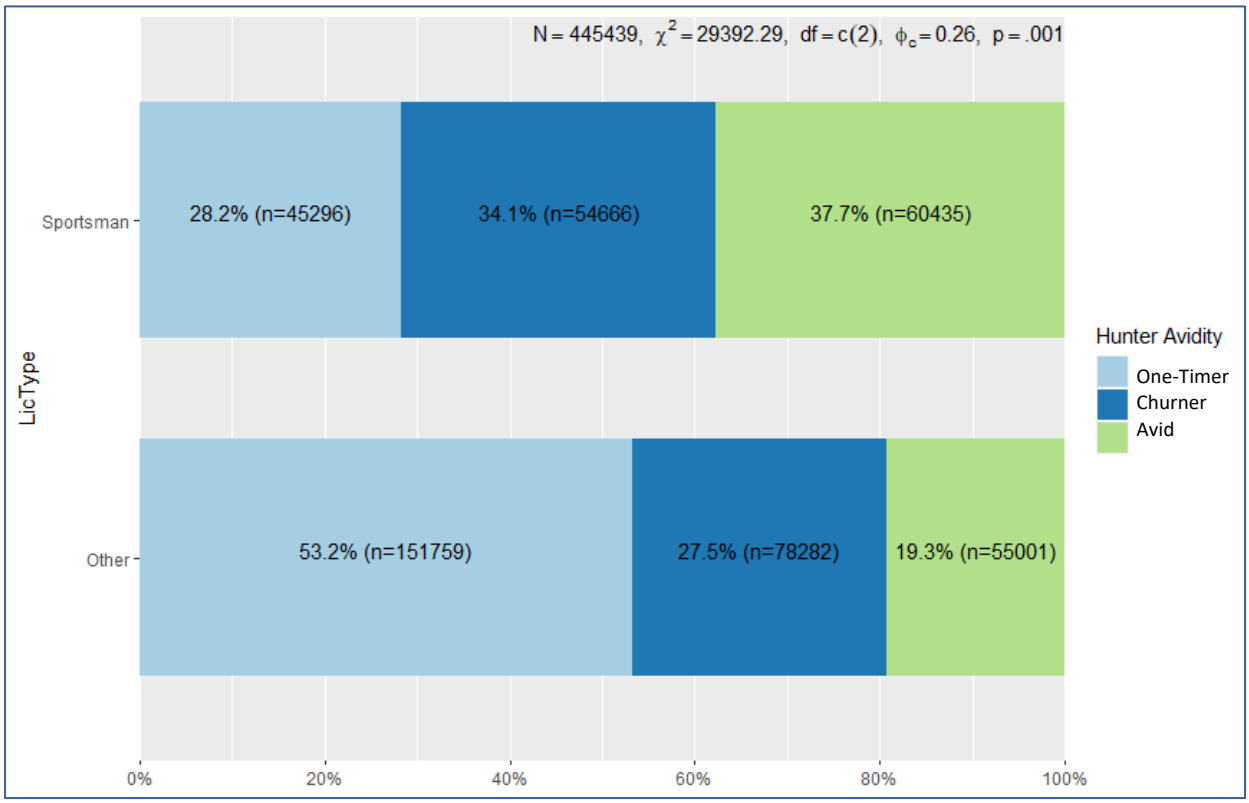
Based on widespread consensus as well as new Gen Z analysis by the Pew Research Center, and the one generation defined by the U.S. Census Bureau (Baby Boomers), date of birth can be used to define generation groups. The researchers examined the relationship between hunter avidity and generational age. The generational age of a hunter is also shown to influence hunter avidity based on the significant Chi-square test result. High avidity was most prevalent in the mid-age groups represented by Boomers II and Gen X, where at least 35% of all hunters were highly avid. Avidity drops off significantly for the oldest generations: Post War and Boomer I.



Contingency Table for Generational Age and Hunter Avidity, North Carolina								
Avidity Group		**Post War**	**Boomer I**	**Boomer II**	**Gen X**	**Millennial**	**Gen Z**	**Total**
One-Timer	Number	3,710	33,560	23,317	44,485	63,577	28,406	197,055
	Percentage of One-Timer in Age Group	1.9	17.0	11.8	22.6	32.3	14.4	
	Percentage of Age Group That Are One-Timer	84.5	77.1	33.4	34.4	44.6	50.8	44.2
Churner	Number	423	8,093	19,878	39,491	45,867	19,196	132,948
	Percentage of Churner in Age Group	0.3	6.1	15.0	29.7	34.5	14.4	
	Percentage of Age Group That Are Churner	9.6	18.6	28.5	30.5	32.2	34.3	29.8
Avid	Number	255	1,849	26,572	45,385	33,076	8,299	115,436
	Percentage of Avid in Age Group	0.2	1.6	23.0	39.3	28.7	7.2	
	Percentage of Age Group That Are Avid	5.8	4.3	38.1	35.1	23.2	14.8	25.9
Total	Number	4,388	43,502	69,767	129,361	142,520	55,901	445,439
	Percentage of Total in Age Group	1.0	9.8	15.7	29.0	32.0	12.5	
								χ^2=40432.389 · df=10 · Cramer's V=0.213 · p=0.000

License Type

In North Carolina there is one broad category of sportsman licenses and several specialty licenses that were grouped into "other," the base category. A high percentage of avid hunters (38%) were associated with the sportsman type of license.



Contingency Table for License Type and Hunter Avidity, North Carolina				
Avidity Group		**Other**	**Sportsman**	**Total**
One-Timer	Number	151,759	45,296	197,055
	Percentage of One-Timer in License Type	77.0	23.0	
	Percentage of License Group That Are One-Timer	53.2	28.2	44.2
Churner	Number	78,282	54,666	132,948
	Percentage of Churner in License Type	58.9	41.1	
	Percentage of License Group That Are Churner	27.5	34.1	29.8
Avid	Number	55,001	60,435	115,436
	Percentage of Avid in License Type	47.6	52.4	
	Percentage of License Group That Are Avid	19.3	37.7	25.9
Total	Number	285,042	160,397	445,439
	Percentage of Total in License Type	64.0	36.0	
				χ^2=29392.285 · df=2 · Cramer's V=0.257 · p=0.000

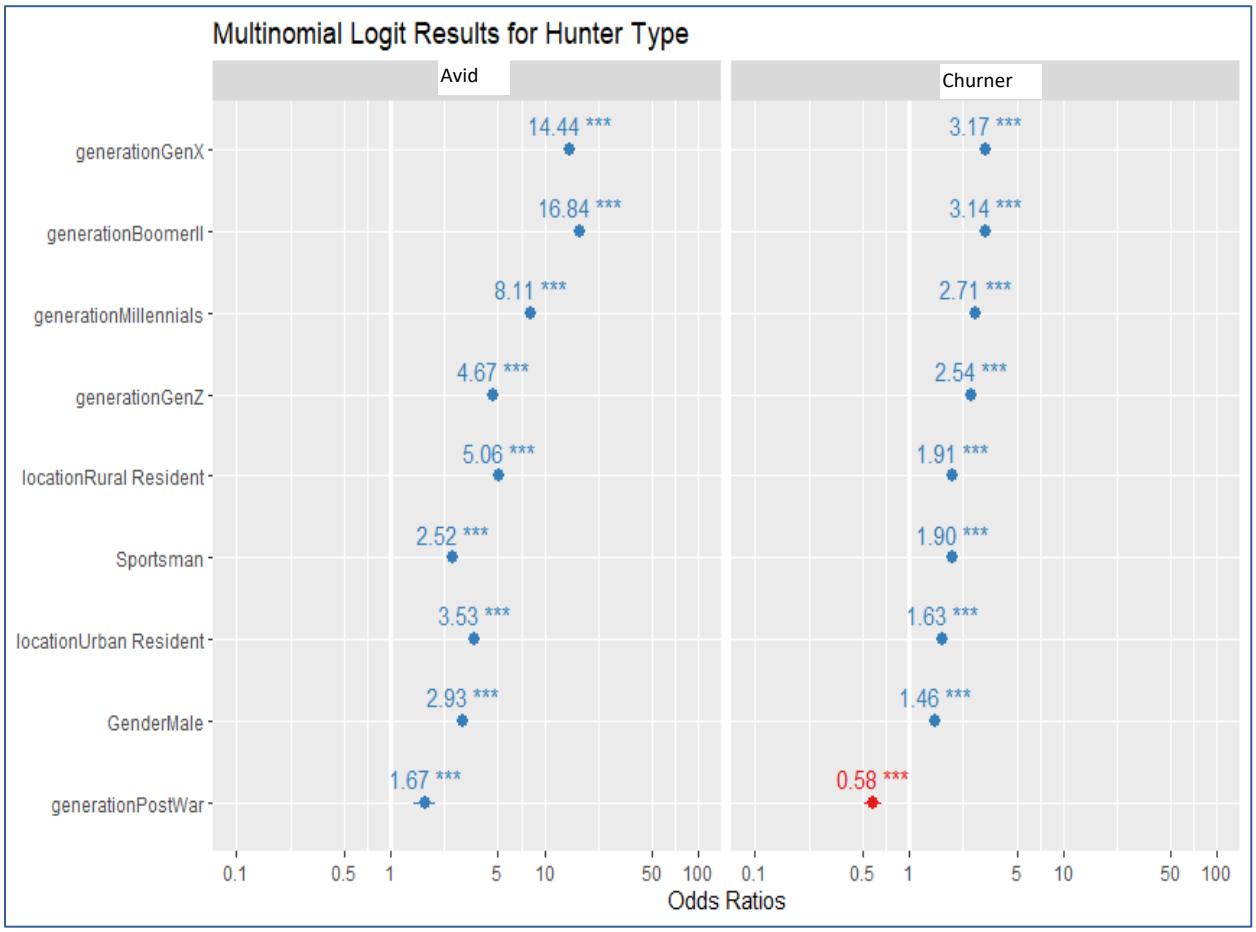
Multinomial Logistic Regression

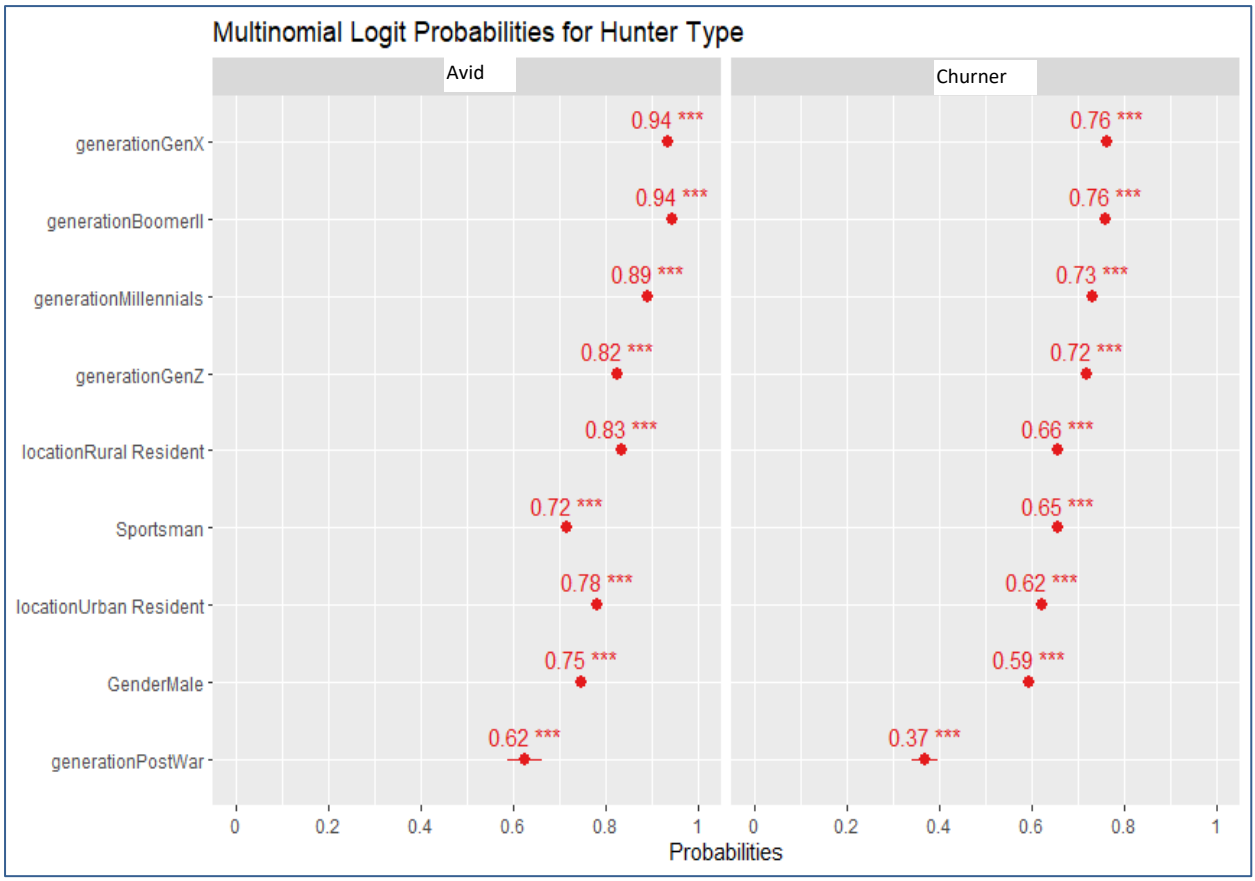
Logistic regression is a statistical technique used when the dependent variable is categorical (or nominal). For binary logistic regression the number of dependent variables is two, whereas the number of dependent variables for multinomial logistic regression is more than two. As with other types of regression, multinomial logistic regression can have nominal and/or continuous independent variables and can have interactions between independent variables to predict the dependent variable. Multinomial logistic regression is often considered an attractive analysis because; it does not assume normality, linearity, or homoscedasticity. This approach does have assumptions, such as the assumption of independence among the dependent variable choices. This assumption states that the choice of or membership in one category is not related to the choice or membership of another category (i.e., the dependent variable). Furthermore, multinomial logistic regression also assumes non-perfect separation. If the groups of the outcome variable are perfectly separated by the predictor(s), then unrealistic coefficients will be estimated, and effect sizes will be greatly exaggerated. Estimation of multinomial logistic regression randomly chooses one target class as the reference class and fits the number of classes-1 regression models that compare each of the remaining classes to the reference class. In this situation, the refence class if one-timers. The coefficients and odds ratios represent how different the avid and churner group are from one-timers with respect to the explanatory variables. The estimation defines the avidity group "One-Timer" as the reference category for the dependent variable. The refence categories for the explanatory variables are identified in the table.

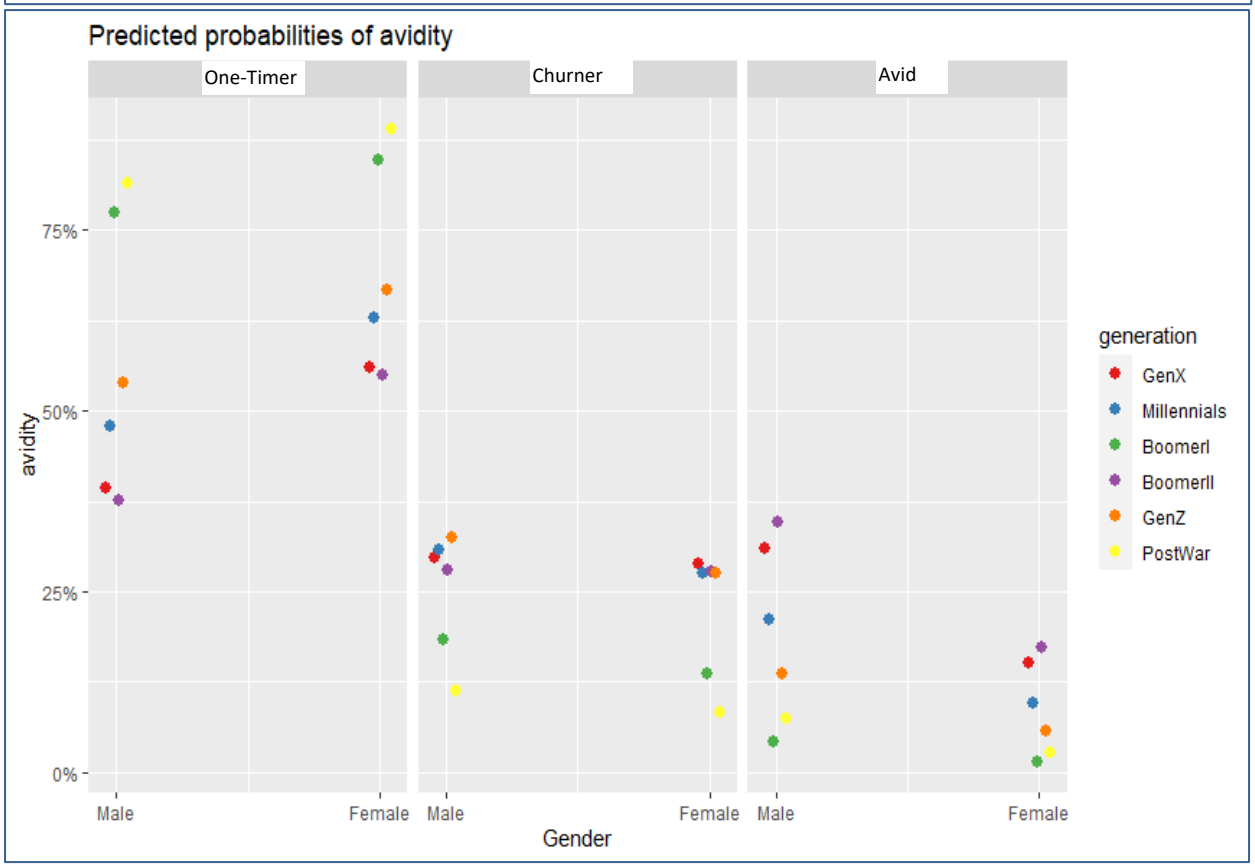
Predictors	**Avidity**			
	Odds Ratios	**CI**	**p**	**Response**
(Intercept)	0.10	0.09 – 0.10	**<0.001**	Churner
(Intercept)	0.01	0.00 – 0.01	**<0.001**	Avid
GenderMale	1.46	1.43 – 1.50	**<0.001**	Churner
GenderMale	2.93	2.83 – 3.03	**<0.001**	Avid
generationBoomerII	3.14	3.02 – 3.26	**<0.001**	Churner
generationBoomerII	16.84	15.85 – 17.89	**<0.001**	Avid
generationGenX	3.17	3.07 – 3.28	**<0.001**	Churner
generationGenX	14.44	13.61 – 15.31	**<0.001**	Avid
generationGenZ	2.54	2.45 – 2.64	**<0.001**	Churner
generationGenZ	4.67	4.38 – 4.98	**<0.001**	Avid
generationMillennials	2.71	2.63 – 2.81	**<0.001**	Churner
generationMillennials	8.11	7.64 – 8.60	**<0.001**	Avid
generationPostWar	0.58	0.51 – 0.66	**<0.001**	Churner
generationPostWar	1.67	1.42 – 1.96	**<0.001**	Avid
Location	*Reference*			
Other	*Reference*			
Sportsman	2.52	2.47 – 2.57	**<0.001**	Avid
Sportsman	1.90	1.86 – 1.93	**<0.001**	Churner
locationRural Resident	1.91	1.84 – 1.98	**<0.001**	Churner
locationRural Resident	5.06	4.83 – 5.29	**<0.001**	Avid
locationUrban Resident	1.63	1.58 – 1.68	**<0.001**	Churner
locationUrban Resident	3.53	3.39 – 3.67	**<0.001**	Avid
Observations	311807			
R^2 Nagelkerke	0.178			

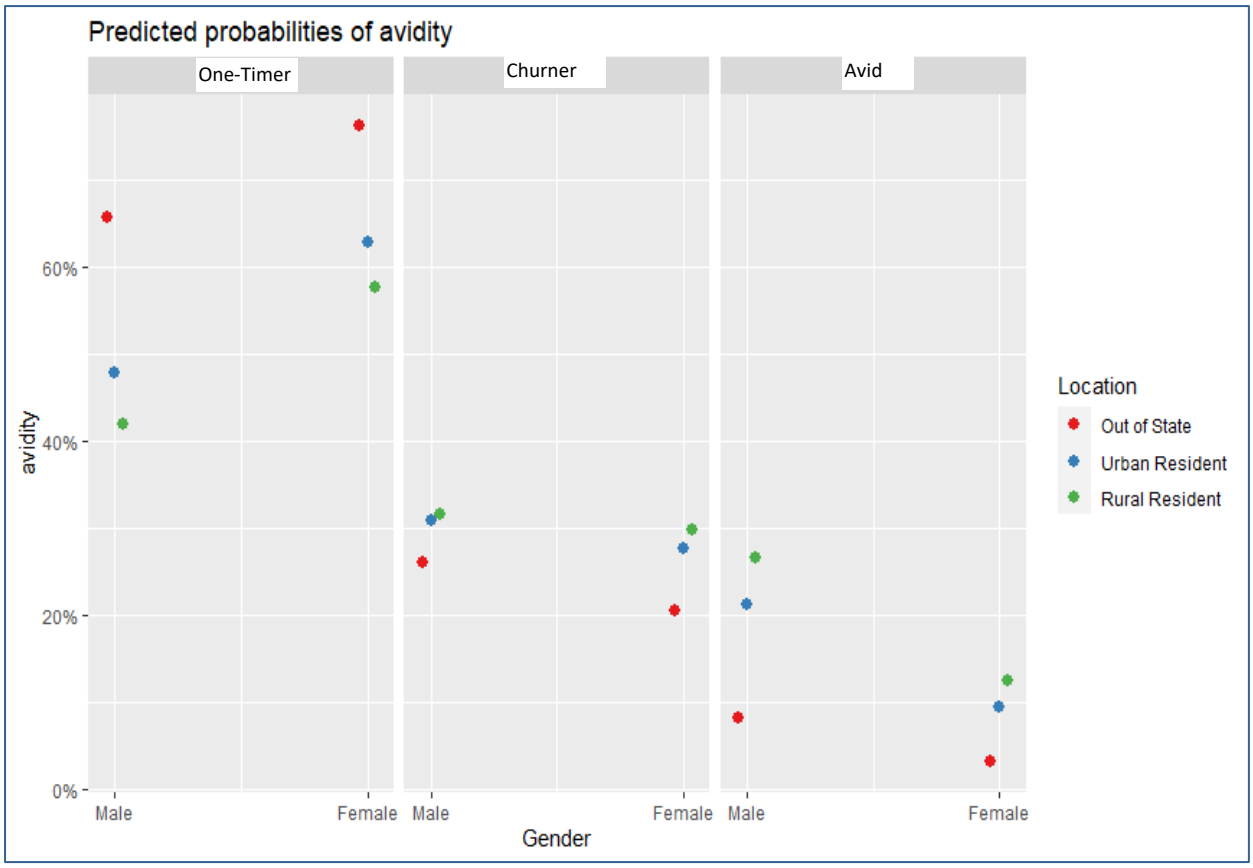
The ratio of the probability of choosing one outcome category over the probability of choosing the baseline category is often referred as relative risk (and it is sometimes referred to as odds, described in the regression parameters above). The relative risk is the right-hand side linear equation exponentiated, leading to the fact that the exponentiated regression coefficients are relative risk ratios for a unit change in the predictor variable. The researchers exponentiated the coefficients from the model to see these risk ratios. Odd ratios greater than 1.0 indicate a positive effect from the variable in question.

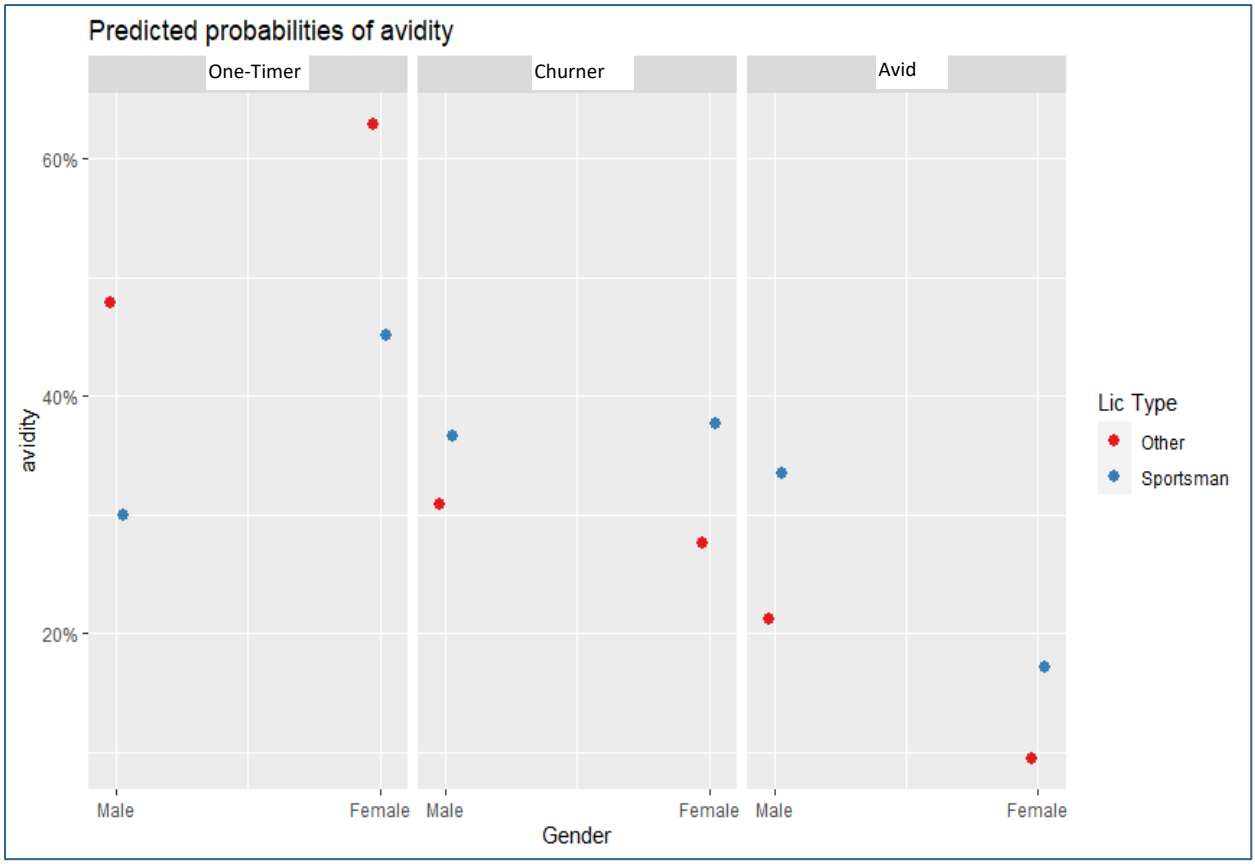
Hunter generation was the most influential variable in distinguishing both avid and churner hunter groups from one-timers. Those from the Gen X and Boomer II generations were much more likely to be avid hunters. Location, license type, and hunter gender were also important in distinguishing avid and one-timers, with male hunters having a higher probability of being avid and both rural and urban North Carolina residents more likely to be avid than out of state residents. Hunters who purchased a sportsman license rather than a specialty license were more likely to be avid. With a p-value less than 0.001, this coefficient is statistically significant at the 5% level.




Multinomial Logit Probabilities for Hunter Type
Avid
Churner
generationGenX
generationBoomerII
generationMillennials
generationGenZ
locationRural Resident
Sportsman
locationUrban Resident
GenderMale
generationPostWar
0.94 ***
0.94 ***
0.89 ***
0.82 ***
0.83 ***
0.72 ***
0.78 ***
0.75 ***
0.62 ***
0.76 ***
0.76 ***
0.73 ***
0.72 ***
0.66 ***
0.65 ***
0.62 ***
0.59 ***
0.37 ***
0
0.2
0.4
0.6
0.8
1
Probabilities


Predicted probabilities of avidity
One-Timer
Churner
Avid
avidity
75%
50%
25%
0%
Male
Female
Gender
generation
GenX
Millennials
BoomerI
BoomerII
GenZ
PostWar


Predicted probabilities of avidity
One-Timer
Churner
Avid
avidity
60%
40%
20%
0%
Male
Female
Gender
Location
Out of State
Urban Resident
Rural Resident


Predicted probabilities of avidity
One-Timer
Churner
Avid
avidity
60%
40%
20%
Male
Female
Gender
Lic Type
Other
Sportsman

MEASURING HUNTER AVIDITY OKLAHOMA

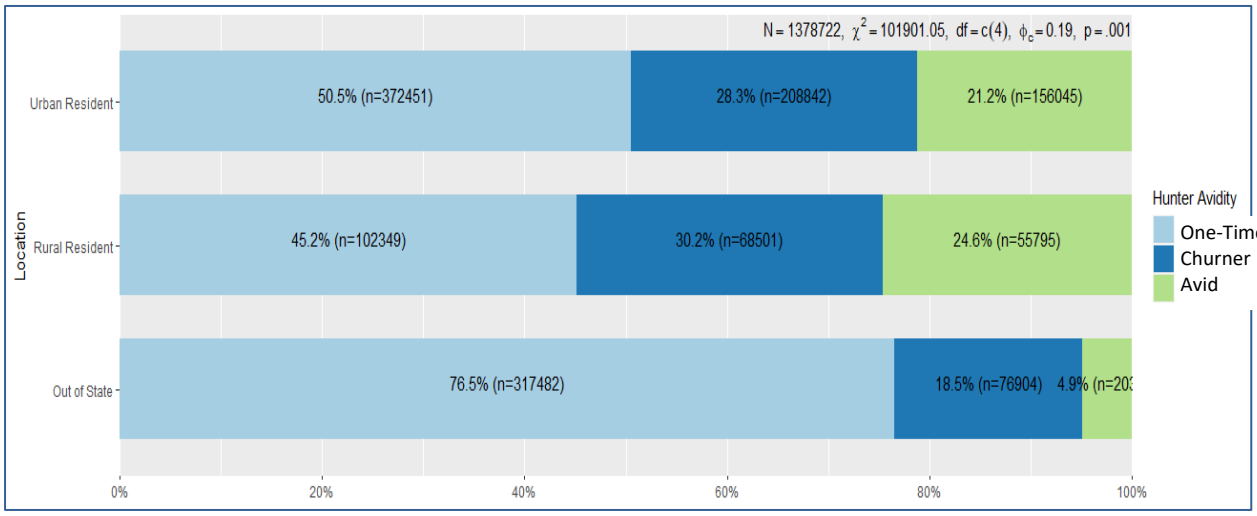
Avidity Group

In Oklahoma, the majority of hunters are in the one-timer group (58%). Otherwise, about a quarter are in the churner group (26%), and the remainder are in the avid group (17%).

Number and Percentage of Hunters in Avidity Categories				
	One-Timer	Churner	Avid	Total
Number	792,282	354,247	232,193	1,378,722
Percentage	57.5	25.7	16.8	

Location

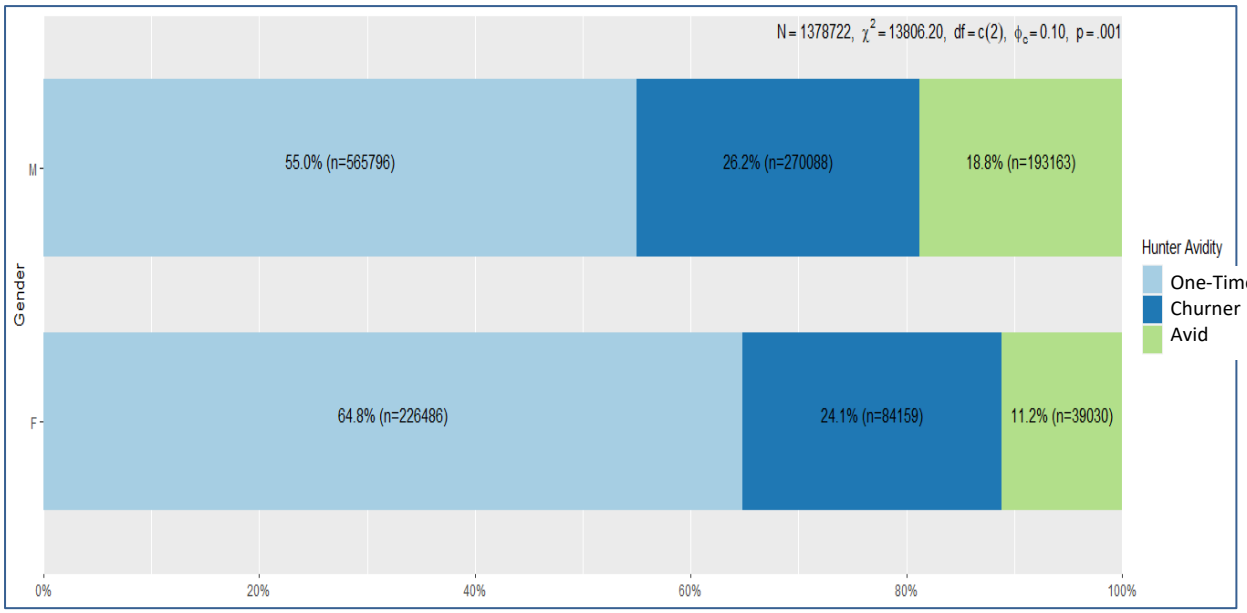
Hunters who resided in rural areas of the state were more likely to be avid than those living in urban areas or those who came from out of state to hunt. A contingency table, also known as a cross-classification table, describes the relationships between two or more categorical variables. The null hypothesis proposes that hunter avidity and location of the hunter's residence are independent of one another. This means the occurrence of one kind of event does not depend on the other kind of event (i.e., they are not associated). As can be seen in the figure below, the p-value of the Chi Square Test is highly significant ($p<0.001$), indicating that the location frequency varies among the three kinds of hunter avidity.



Contingency Table for Location and Hunter Avidity, Oklahoma					
Avidity Group		**Rural**	**Urban**	**Out of State**	**Total**
One-Timer	Number	102,349	372,451	317,482	792,282
	Percentage of One-Timer in Location	12.9	47.0	40.1	
	Percentage of Locational Group That Are One-Timer	45.2	50.5	76.5	57.5
Churner	Number	68,501	208,842	76,904	354,247
	Percentage of Churner in Location	19.3	59.0	21.7	
	Percentage of Locational Group That Are Churner	30.2	28.3	18.5	25.7
Avid	Number	55,795	156,045	20,353	232,193
	Percentage of Avid in Location	24.0	67.2	8.8	
	Percentage of Locational Group That Are Avid	24.6	21.2	4.9	16.8
Total	Number	226,645	737,338	414,739	1,378,722
	Percentage of Total in Location	16.4	53.5	30.1	100.0
χ^2=101901.048 · df=4 · Cramer's V=0.192 · p=0.000					

Gender

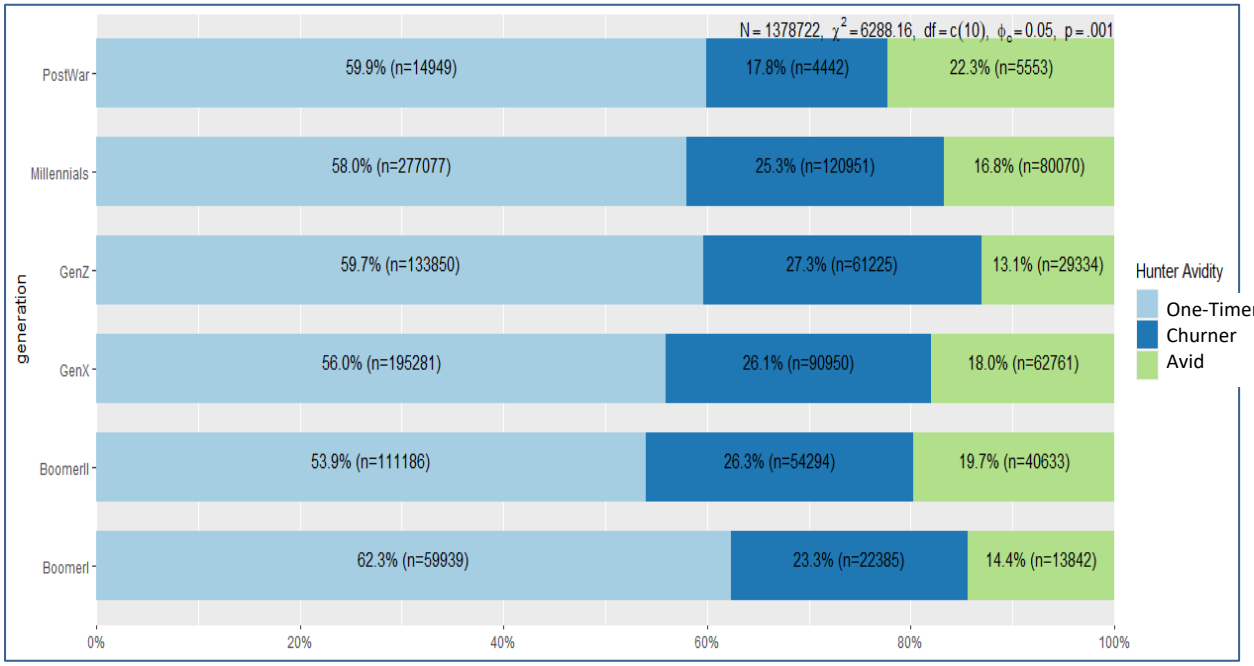
The null hypothesis regarding gender proposes that hunter avidity and the hunter's gender are independent of one another. Once again, the Chi-square test is highly significant, indicating a strong relationship between gender and hunter avidity in Oklahoma. In this situation, the incidence of high avidity is more prevalent for male hunters (19% versus 11% female).



Contingency Table for Gender and Hunter Avidity, Oklahoma				
Avidity Group		**Female**	**Male**	**Total**
One-Timer	Number	226,486	565,796	792,282
	Percentage of One-Timer in Gender Category	28.6	71.4	
	Percentage of Gender Group That Are One-Timer	64.8	55.0	57.5
Churner	Number	84,159	270,088	354,247
	Percentage of Churner in Gender Category	23.8	76.2	
	Percentage of Gender Group That Are Churner	24.1	26.2	25.7
Avid	Number	39,030	193,163	232,193
	Percentage of Avid in Gender Category	16.8	83.2	
	Percentage of Gender Group That Are Avid	11.2	18.8	16.8
Total	Number	349,675	1,029,047	1,378,722
	Percentage of Total in Gender Category	25.4	74.6	100.0
				χ^2=13806.203 · df=2 · Cramer's V=0.100 · p=0.000

Generational Age

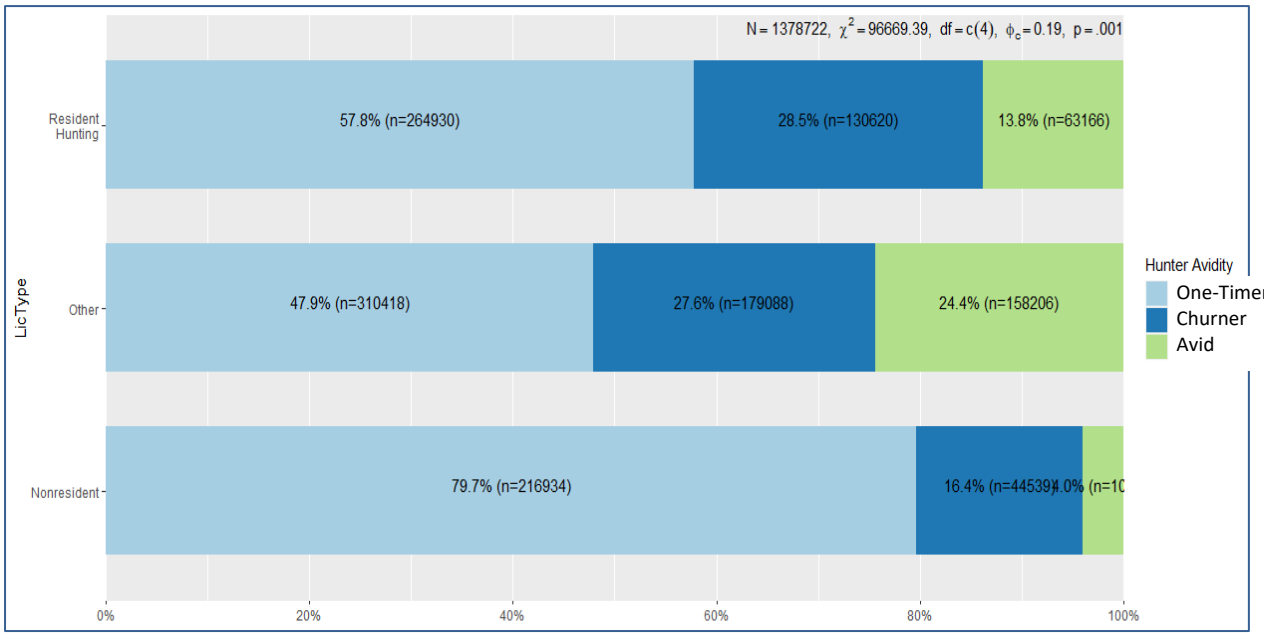
Based on widespread consensus as well as new Gen Z analysis by the Pew Research Center, and the one generation defined by the U.S. Census Bureau (Baby Boomers), date of birth can be used to define generation groups. The researchers examined the relationship between hunter avidity and generational age. The generational age of a hunter is also shown to influence hunter avidity based on the significant Chi-square test result. High avidity was most prevalent in the oldest age generation, Post War, at more than 1 in 5 hunters. Mid-age groups represented by Boomers II and Gen X also had relatively high proportions of avid hunters. Avidity drops off to 13% for those in the youngest generational age.



Contingency Table for Generational Age and Hunter Avidity, Oklahoma								
Avidity Group		**Post War**	**Boomer I**	**Boomer II**	**Gen X**	**Millennial**	**Gen Z**	**Total**
One-Timer	Number	14,949	59,939	111,186	195,281	277,077	133,850	792,282
	Percentage of One-Timer in Age Group	1.9	7.6	14.0	24.6	35.0	16.9	
	Percentage of Age Group That Are One-Timer	59.9	62.3	53.9	56.0	58.0	59.6	57.5
Churner	Number	4,442	22,385	54,294	90,950	120,951	61,225	354,247
	Percentage of Churner in Age Group	1.3	6.3	15.3	25.7	34.1	17.3	
	Percentage of Age Group That Are Churner	17.8	23.3	26.3	26.1	25.3	27.3	25.7
Avid	Number	5,553	13,842	40,633	62,761	80,070	29,334	232,193
	Percentage of Avid in Age Group	2.4	6.0	17.5	27.0	34.5	12.6	
	Percentage of Age Group That Are Avid	22.3	14.4	19.7	18.0	16.7	13.1	16.8
Total	Number	24,944	96,166	206,113	348,992	478,098	224,409	1,378,722
	Percentage of Total in Age Group	1.8	7.0	14.9	25.3	34.7	16.3	
χ^2=6288.155 · df=10 · Cramer's V=0.048 · p=0.000								

License Type

In Oklahoma there are two broad category licenses, resident and nonresident, and several specialty licenses that were grouped into “other,” the base category.

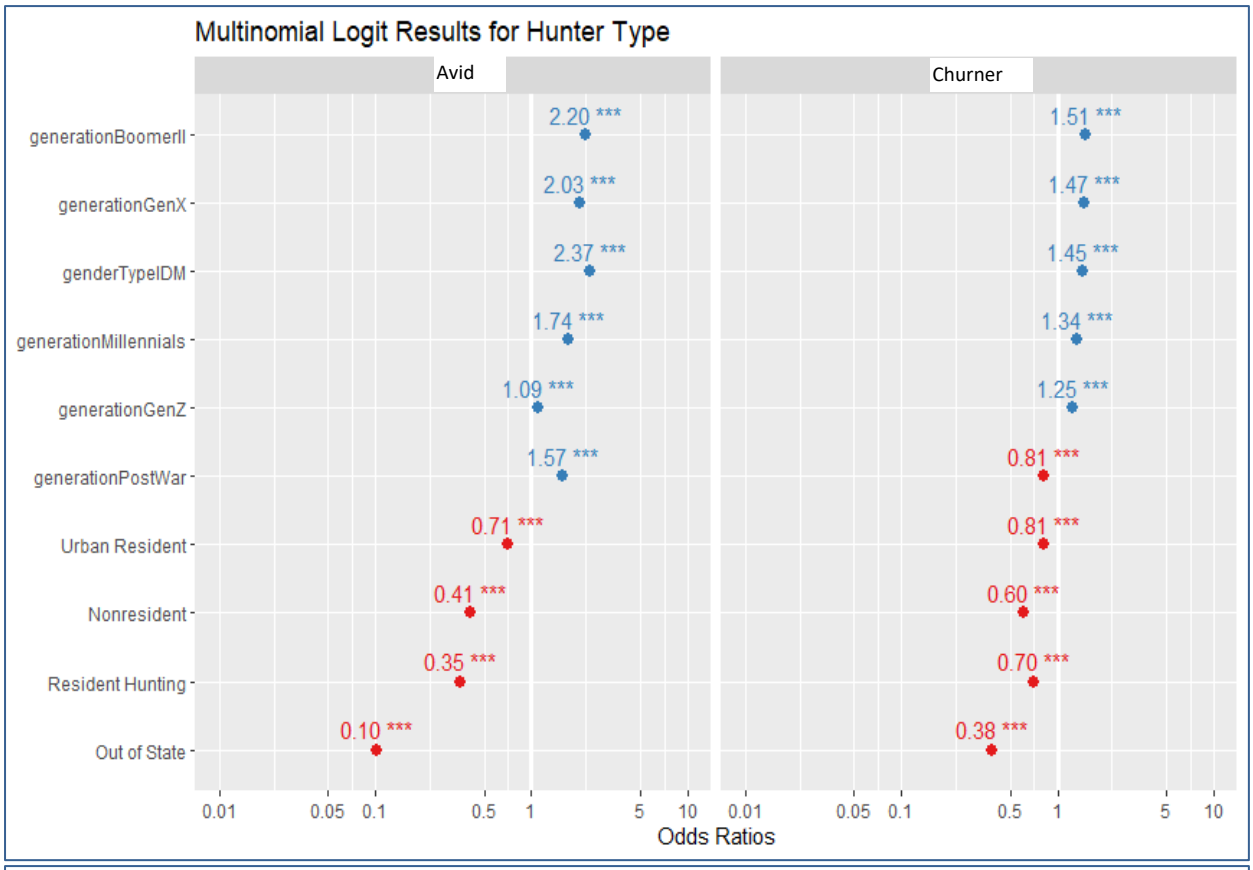


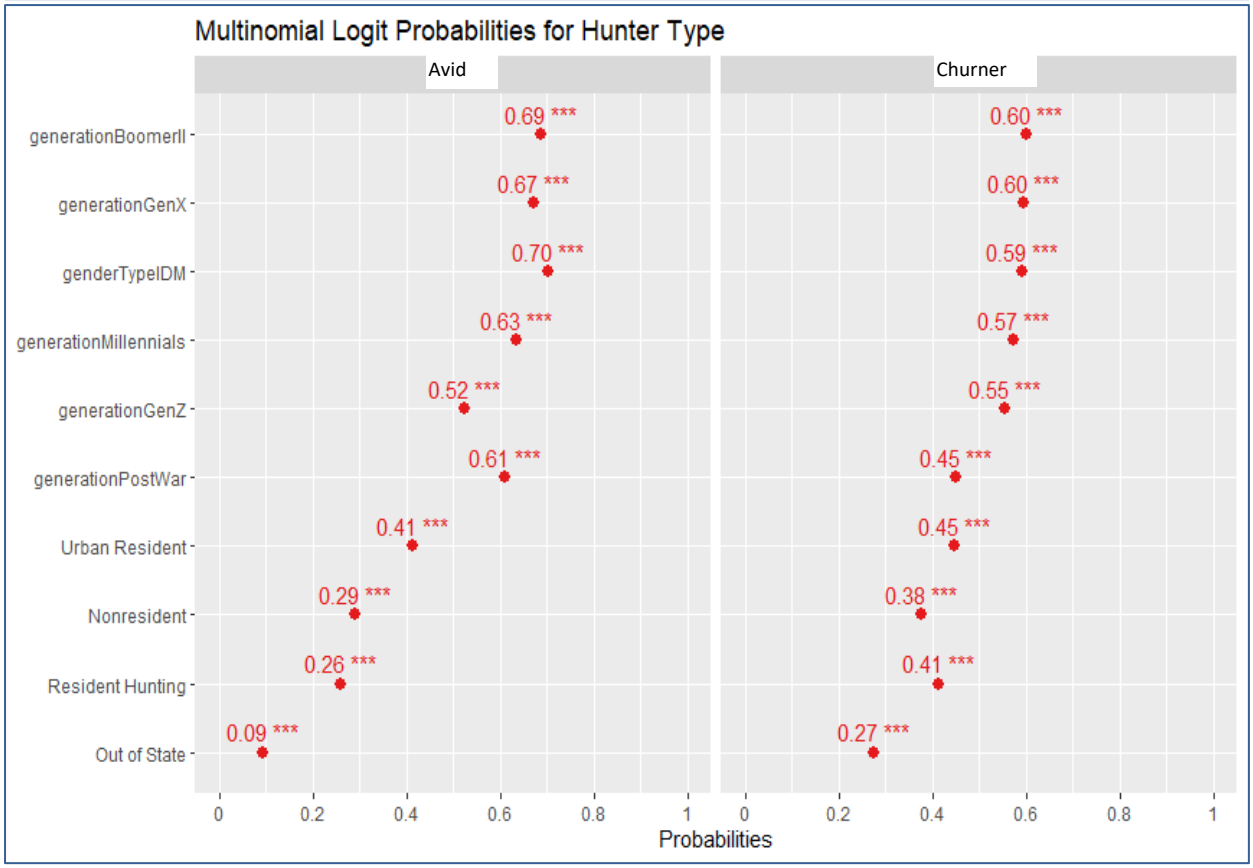
Contingency Table for License Type and Hunter Avidity, Oklahoma					
Avidity Group		**Nonresident**	**Other**	**Resident Hunting**	**Total**
One-Timer	Number	216,934	310,418	264,930	792,282
	Percentage of One-Timer in License Type	27.4	39.2	33.4	
	Percentage of License Group That Are One-Timer	79.7	47.9	57.8	57.5
Churner	Number	44,539	179,088	130,620	354,247
	Percentage of Churner in License Type	12.6	50.6	36.9	
	Percentage of License Group That Are Churner	16.4	27.6	28.5	25.7
Avid	Number	10,821	158,206	63,166	232,193
	Percentage of Avid in License Type	4.7	68.1	27.2	
	Percentage of License Group That Are Avid	4.0	24.4	13.8	16.8
Total	Number	272,294	647,712	458,716	1,378,722
	Percentage of Total in License Type	19.7	47.0	33.3	
					χ^2=96669.387 · df=4 · Cramer's V=0.187 · p=0.000

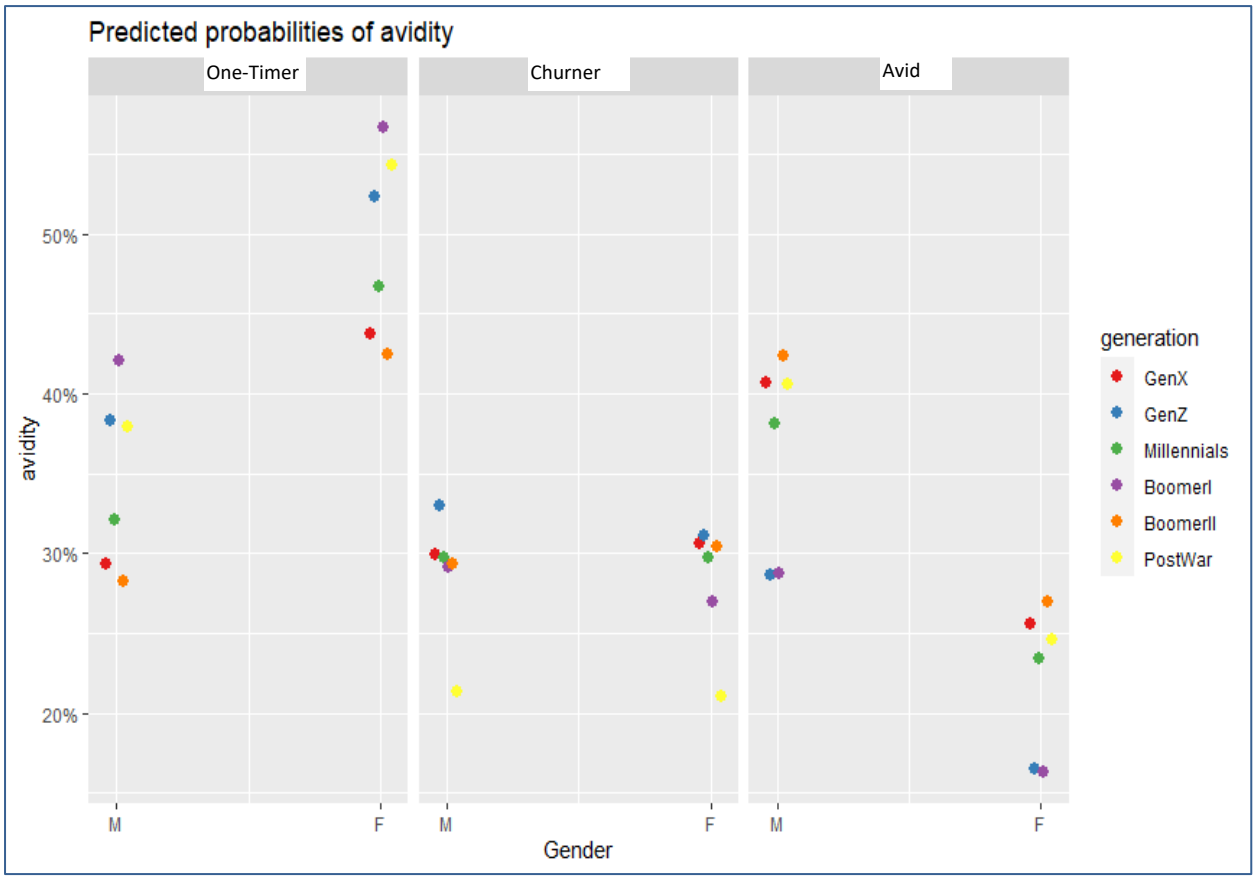
Multinomial Logistic Regression

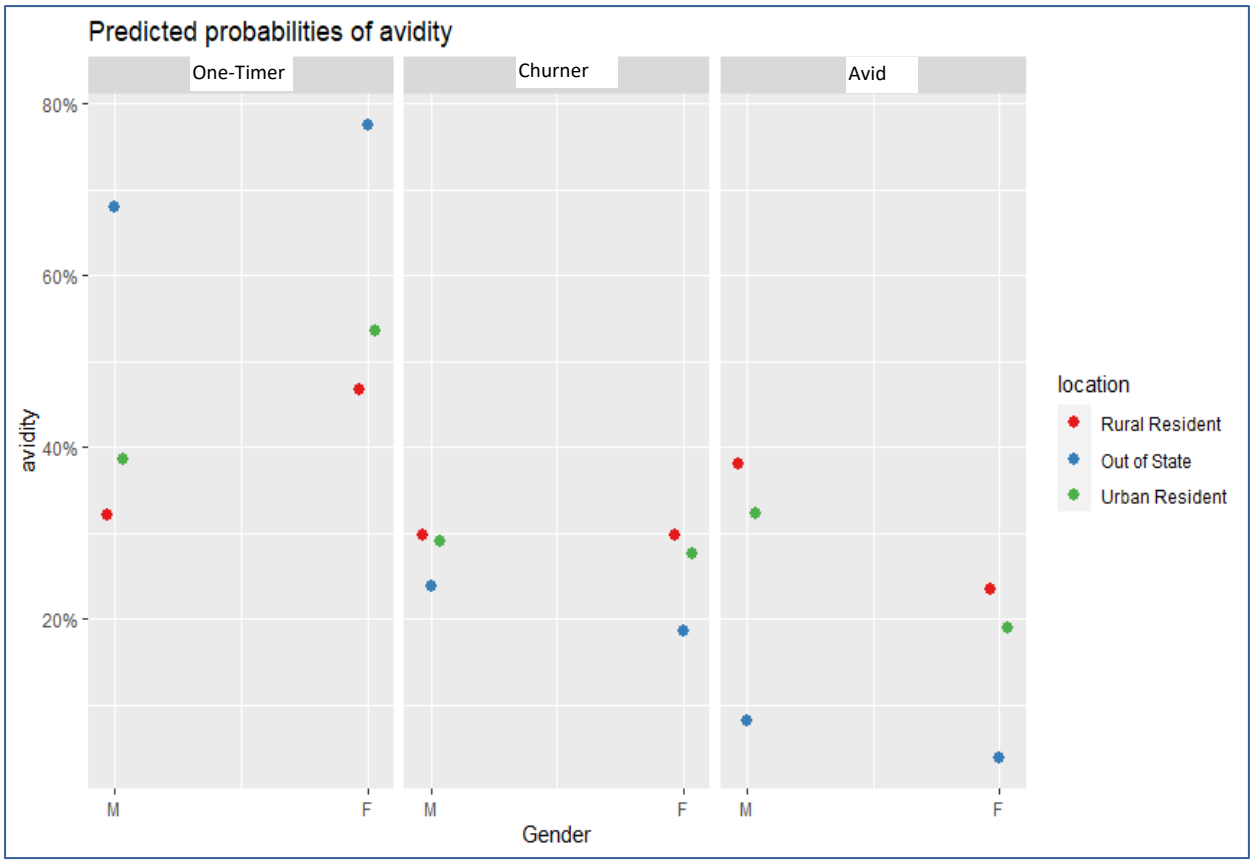
Logistic regression is a statistical technique used when the dependent variable is categorical (or nominal). For binary logistic regression the number of dependent variables is two, whereas the number of dependent variables for multinomial logistic regression is more than two. As with other types of regression, multinomial logistic regression can have nominal and/or continuous independent variables and can have interactions between independent variables to predict the dependent variable. Multinomial logistic regression is often considered an attractive analysis because; it does not assume normality, linearity, or homoscedasticity. This approach does have assumptions, such as the assumption of independence among the dependent variable choices. This assumption states that the choice of or membership in one category is not related to the choice or membership of another category (i.e., the dependent variable). Furthermore, multinomial logistic regression also assumes non-perfect separation. If the groups of the outcome variable are perfectly separated by the predictor(s), then unrealistic coefficients will be estimated, and effect sizes will be greatly exaggerated.

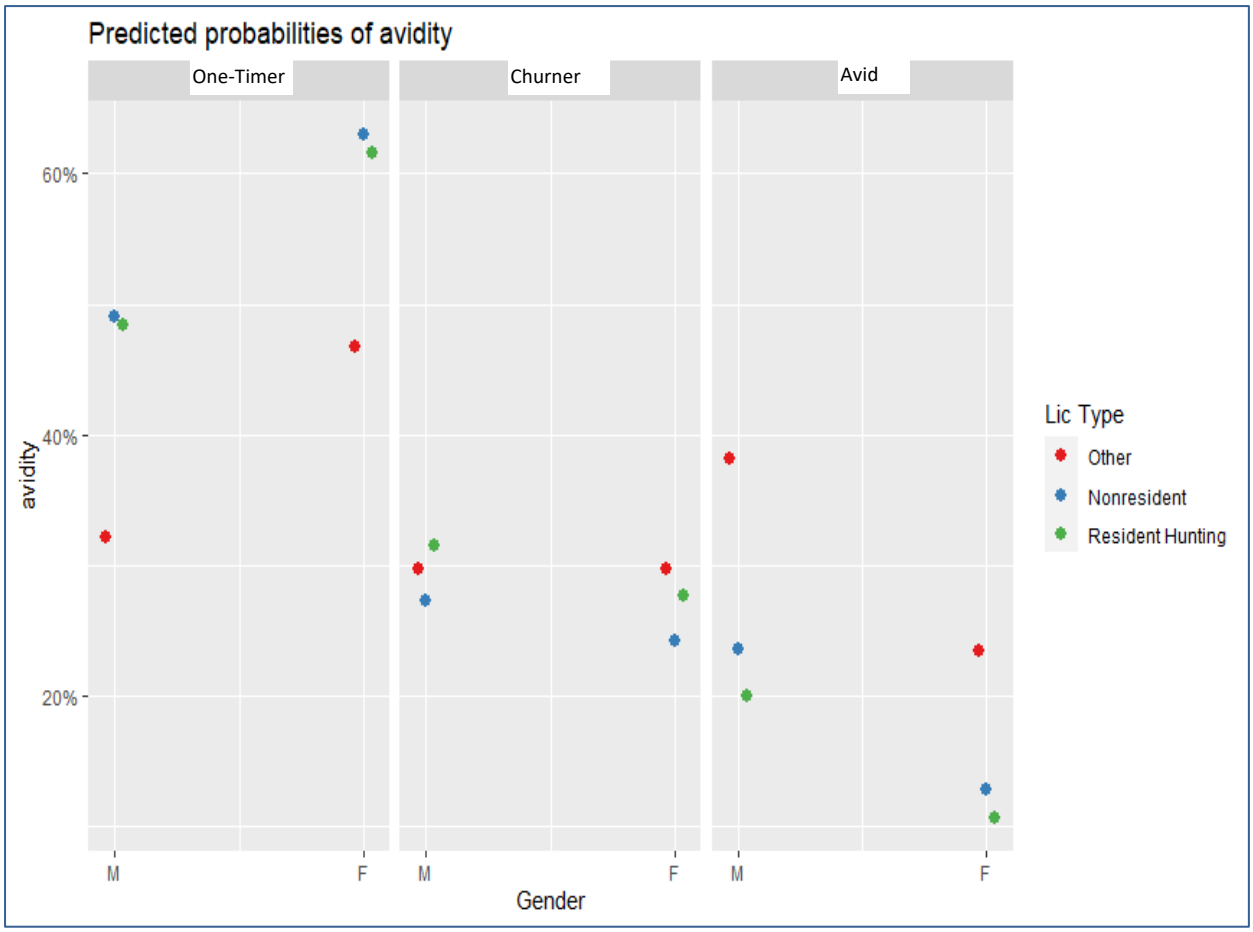
Predictors	Avidity			
	Odds Ratios	CI	p	Response
(Intercept)	0.48	0.47 – 0.49	<0.001	Churner
location: Out of State	0.38	0.37 – 0.38	<0.001	Churner
location: Urban Resident	0.81	0.80 – 0.82	<0.001	Churner
genderTypeIDM	1.45	1.44 – 1.47	<0.001	Churner
generationBoomerII	1.51	1.48 – 1.53	<0.001	Churner
generationGenX	1.47	1.45 – 1.50	<0.001	Churner
generationGenZ	1.25	1.22 – 1.27	<0.001	Churner
generationMillennials	1.34	1.31 – 1.36	<0.001	Churner
generationPostWar	0.81	0.78 – 0.84	<0.001	Churner
Lic Type: Nonresident	0.60	0.59 – 0.61	<0.001	Churner
Lic Type: Resident Hunting	0.70	0.70 – 0.71	<0.001	Churner
(Intercept)	0.29	0.28 – 0.30	<0.001	Avid
location: Out of State	0.10	0.10 – 0.10	<0.001	Avid
location: Urban Resident	0.71	0.70 – 0.71	<0.001	Avid
genderTypeIDM	2.37	2.34 – 2.39	<0.001	Avid
generationBoomerII	2.20	2.15 – 2.25	<0.001	Avid
generationGenX	2.03	1.99 – 2.07	<0.001	Avid
generationGenZ	1.09	1.07 – 1.12	<0.001	Avid
generationMillennials	1.74	1.70 – 1.78	<0.001	Avid
generationPostWar	1.57	1.51 – 1.63	<0.001	Avid
Lic Type: Nonresident	0.41	0.40 – 0.42	<0.001	Avid
Lic Type: Resident Hunting	0.35	0.34 – 0.35	<0.001	Avid
Observations	1378722			
R2 / R2 adjusted	0.072 / 0.072			
McFadden CoxSnell Nagelkerke	0.07204684 0.13013057 0.15209654			


Multinomial Logit Results for Hunter Type
Avid
Churner
generationBoomerII
generationGenX
genderTypeIDM
generationMillennials
generationGenZ
generationPostWar
Urban Resident
Nonresident
Resident Hunting
Out of State
2.20 ***
2.03 ***
2.37 ***
1.74 ***
1.09 ***
1.57 ***
0.71 ***
0.41 ***
0.35 ***
0.10 ***
1.51 ***
1.47 ***
1.45 ***
1.34 ***
1.25 ***
0.81 ***
0.81 ***
0.60 ***
0.70 ***
0.38 ***
0.01
0.05
0.1
0.5
1
5
10
Odds Ratios


Multinomial Logit Probabilities for Hunter Type
Avid
Churner
generationBoomerII
generationGenX
genderTypeIDM
generationMillennials
generationGenZ
generationPostWar
Urban Resident
Nonresident
Resident Hunting
Out of State
0.69 ***
0.67 ***
0.70 ***
0.63 ***
0.52 ***
0.61 ***
0.41 ***
0.29 ***
0.26 ***
0.09 ***
0.60 ***
0.60 ***
0.59 ***
0.57 ***
0.55 ***
0.45 ***
0.45 ***
0.38 ***
0.41 ***
0.27 ***
0
0.2
0.4
0.6
0.8
1
Probabilities


Predicted probabilities of avidity
One-Timer
Churner
Avid
avidity
50%
40%
30%
20%
M
F
Gender
generation
GenX
GenZ
Millennials
BoomerI
BoomerII
PostWar


Predicted probabilities of avidity
One-Timer
Churner
Avid
avidity
80%
60%
40%
20%
M
F
Gender
location
Rural Resident
Out of State
Urban Resident


Predicted probabilities of avidity
One-Timer
Churner
Avid
60%
40%
20%
avidity
M
F
M
F
M
F
Gender
Lic Type
Other
Nonresident
Resident Hunting

MEASURING HUNTER AVIDITY OREGON

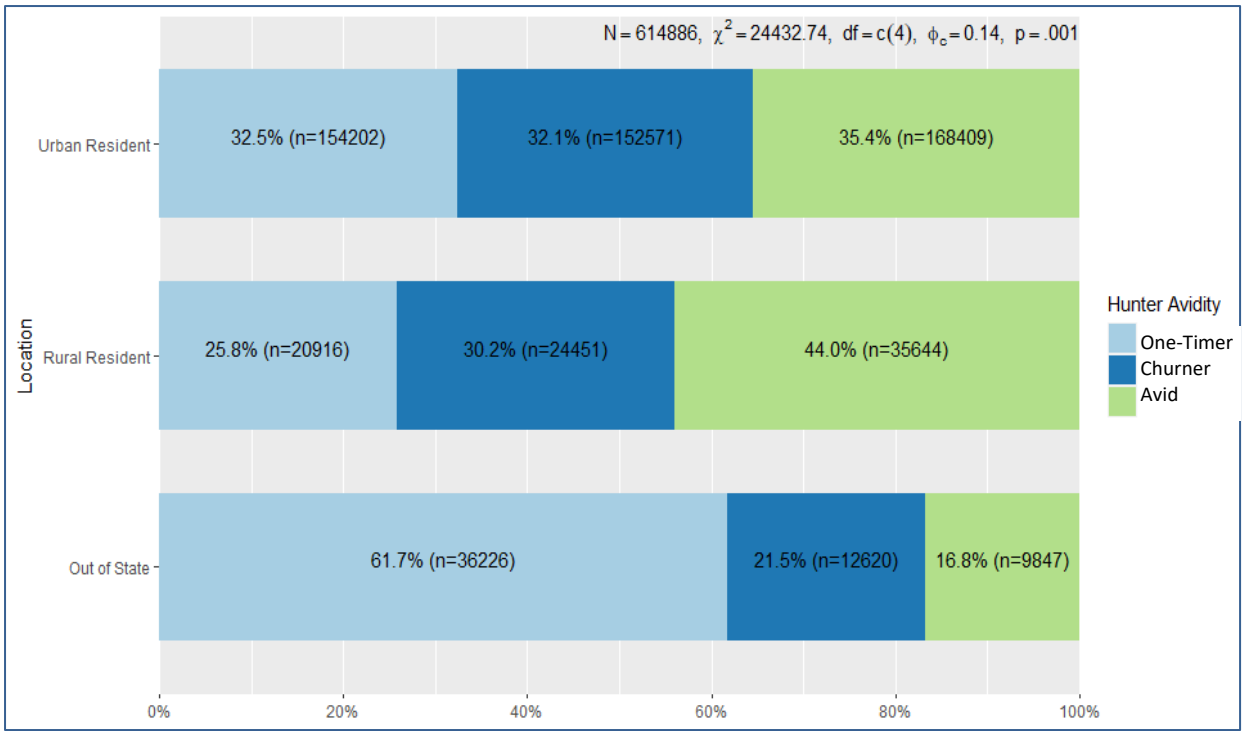
Avidity Group

The avidity groups for Oregon are provided in the table below. A similar percentage of hunters during the 2016-220 period were considered either one-timers (34%) or avid (35%). The smallest share (31%) of Oregon hunters fell somewhere between, having purchased a license in 2-3 years of the 5-year period examined.

Number and Percentage of Hunters in Avidity Categories				
	One-Timer	Churner	Avid	Total
Number	211,344	189,642	213,900	614,886
Percentage	34.4	30.8	34.8	

Location

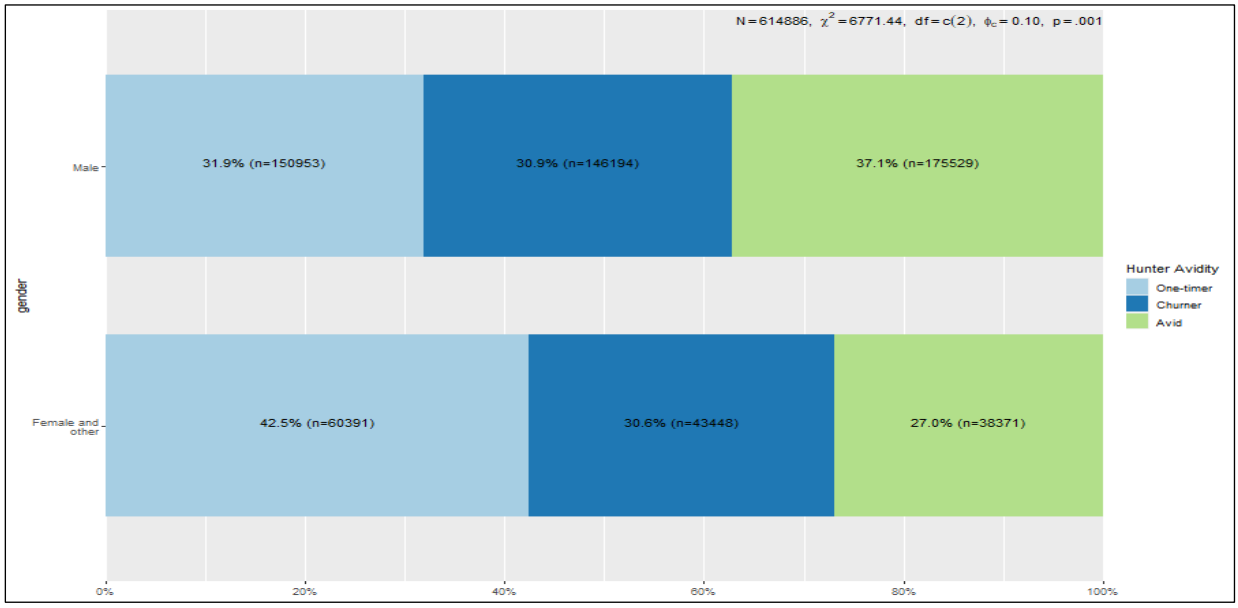
Hunters that resided in rural areas of the state were more likely to be avid than those living in urban areas or that came from out of state to hunt. A contingency table, also known as a cross-classification table, describes the relationships between two or more categorical variables. The null hypothesis proposes that hunter avidity and location of the hunter's residence are independent of one another. This means the occurrence of one kind of event does not depend on the other kind of event (i.e., they are not associated). As can be seen in the figure below, the p-value of the Chi Square Test is highly significant (p=0.001), indicating that the location frequency varies among the three kinds of hunter avidity.



Contingency Table for Location and Hunter Avidity, Oregon					
Avidity Group		**Rural**	**Urban**	**Out of State**	**Total**
One-Timer	Number	20,916	154,202	36,226	211,344
	Percentage of One-Timer in Location	9.9	73.0	17.1	
	Percentage of Locational Group That Are One-Timer	25.8	32.5	61.7	34.4
Churner	Number	24,451	152,571	12,620	189,642
	Percentage of Churner in Location	12.9	80.5	6.7	
	Percentage of Locational Group That Are Churner	30.2	32.1	21.5	30.8
Avid	Number	35,644	168,409	9,847	213,900
	Percentage of Avid in Location	16.7	78.7	4.6	
	Percentage of Locational Group That Are Avid	44.0	35.4	16.8	34.8
Total	Number	81,011	475,182	58,693	614,886
	Percentage of Total in Location	13.2	77.3	9.5	100.0
					χ^2=24432.743 · df=4 · Cramer's V=0.141 · p=0.000

Gender

The null hypothesis regarding gender proposes that hunter avidity and the hunter's gender are independent of one another. Once again, the Chi-square test is highly significant, indicating a strong relationship between gender and hunter avidity in xxx Alabama. In this situation, the incidence of high avidity is much more prevalent for male hunters (37% versus 27% female/other).

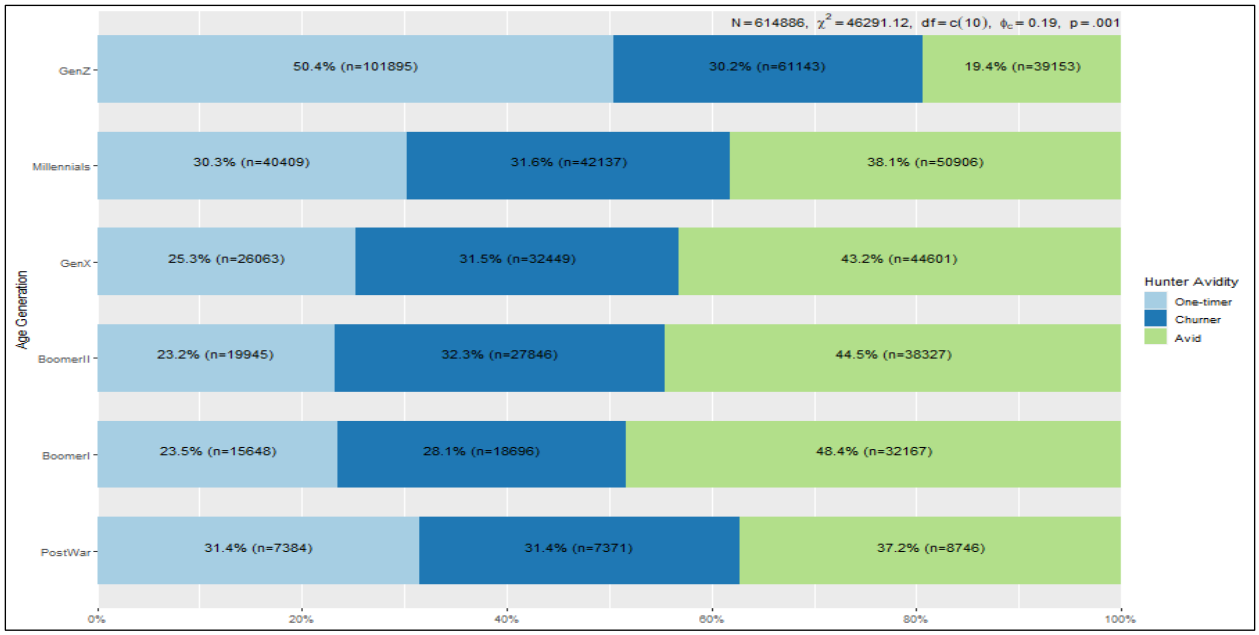


Contingency Table for Gender and Hunter Avidity, Oregon				
Avidity Group		**Female and other**	**Male**	**Total**
One-Timer	Number	60,391	150,953	211,344
	Percentage of One-Timer in Gender Category	28.6	71.4	
	Percentage of Gender Group That Are One-Timer	42.5	31.9	34.4
Churner	Number	43,448	146,194	189,642
	Percentage of Churner in Gender Category	22.9	77.1	
	Percentage of Gender Group That Are Churner	30.6	30.9	30.8
Avid	Number	38,371	175,529	213,900
	Percentage of Avid in Gender Category	17.9	82.1	
	Percentage of Gender Group That Are Avid	27.0	37.1	34.8
Total	Number	142,210	472,676	614,886
	Percentage of Total in Gender Category	23.1	76.9	
				χ^2=6771.438 · df=2 · Cramer's V=0.105 · p=0.000

*Other gender was included in calculations but removed from the table for legibility.

Generational Age

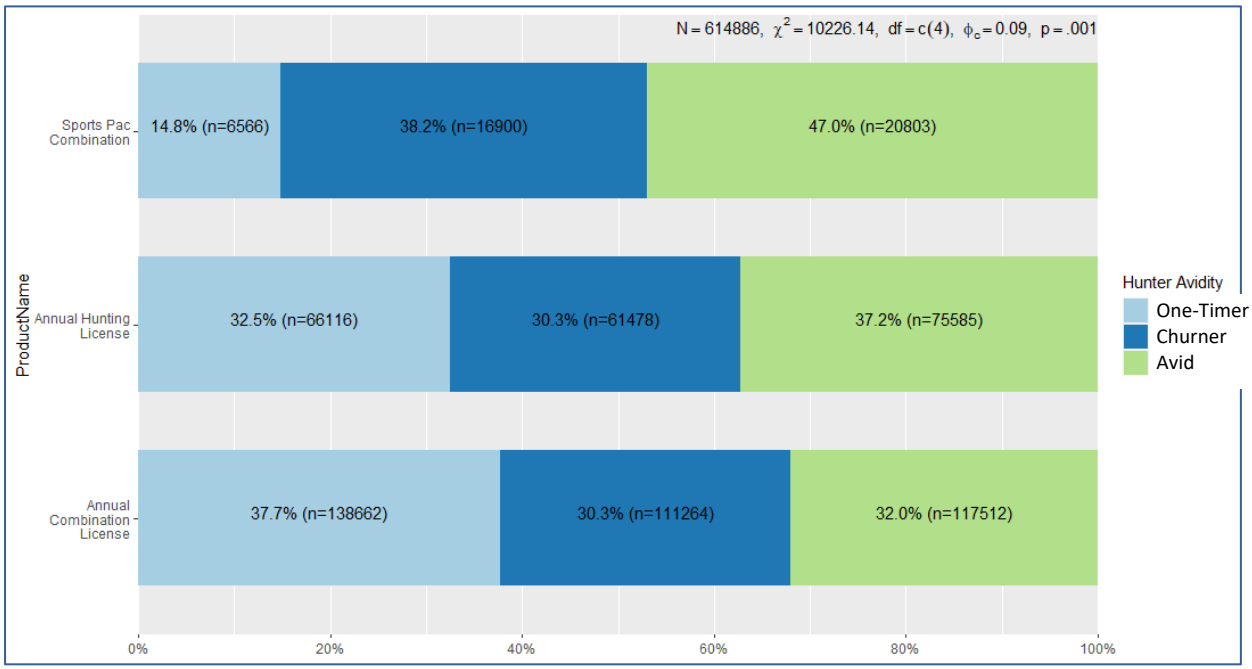
Based on widespread consensus as well as new Gen Z analysis by the Pew Research Center, and the one generation defined by the U.S. Census Bureau (Baby Boomers), date of birth can be used to define generation groups. The researchers examined the relationship between hunter avidity and generational age. The generational age of a hunter is also shown to influence hunter avidity based on the significant Chi-square test result. High avidity was most prevalent in the mid-age groups represented by Boomers II and Gen X, where nearly 45% of all hunters were highly avid. Avidity drops off significantly for the youngest generation, Gen Z, where only 1 in 5 hunters are avid.



Contingency Table for Generational Age and Hunter Avidity, Oregon								
Avidity Group		**Post War**	**Boomer I**	**Boomer II**	**Gen X**	**Millennial**	**Gen Z**	**Total**
One-Timer	Number	7,309	15,429	19,718	25,751	40,074	101,574	209,855
	Percentage of One-Timer in Age Group	3.5	7.4	9.4	12.3	19.1	48.4	
	Percentage of Age Group That Are One-Timer	31.4	23.4	23.0	25.2	30.2	50.4	34.3
Churner	Number	7,296	18,478	27,659	32,187	41,806	60,831	188,257
	Percentage of Churner in Age Group	3.9	9.8	14.7	17.1	22.2	32.3	
	Percentage of Age Group That Are Churner	31.3	28.0	32.3	31.4	31.5	30.2	30.8
Avid	Number	8,699	32,053	38,239	44,443	50,721	38,996	213,151
	Percentage of Avid in Age Group	4.1	15.0	17.9	20.9	23.8	18.3	
	Percentage of Age Group That Are Avid	37.3	48.6	44.7	43.4	38.3	19.4	34.9
Total	Number	23,304	65,960	85,616	102,381	132,601	201,401	611,263
	Percentage of Total in Age Group	3.8	10.8	14.0	16.7	21.7	32.9	
								χ^2=46634.132 · df=10 · Cramer's V=0.195 · p=0.000

License Type

Oregon has three broad categories of licenses: Sports Pac Combination, Annual Hunting License, and Annual Combination License. A high percentage of avid hunters (47%) were associated with the Sports Pac Combination type of license.



Contingency Table for License Type and Hunter Avidity, Oregon					
Avidity Group		**Annual Combination**	**Annual Hunting**	**Sports Pac Combination**	**Total**
One-Timer	Number	138,662	66,116	6,566	211,344
	Percentage of One-Timer in License Type	65.6	31.3	3.1	
	Percentage of License Group That Are One-Timer	37.7	32.5	14.8	34.4
Churner	Number	111,264	61,478	16,900	189,642
	Percentage of Churner in License Type	58.7	32.4	8.9	
	Percentage of License Group That Are Churner	30.3	30.3	38.2	30.8
Avid	Number	117,512	75,585	20,803	213,900
	Percentage of Avid in License Type	54.9	35.3	9.7	
	Percentage of License Group That Are Avid	32.0	37.2	47.0	34.8
Total	Number	367,438	203,179	44,269	614,886
	Percentage of Total in License Type	59.8	33.0	7.2	
χ^2=10226.137 · df=4 · Cramer's V=0.091 · p=0.000					

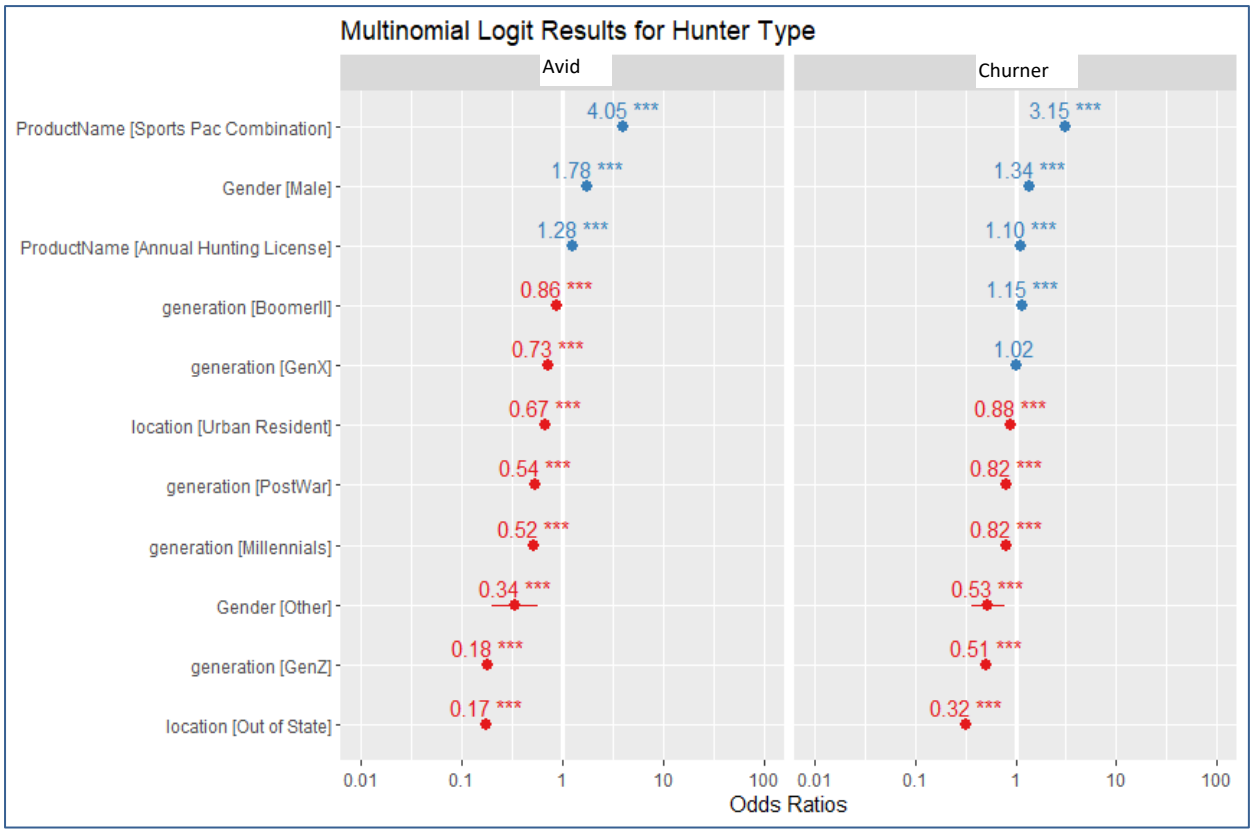
Multinomial Logistic Regression

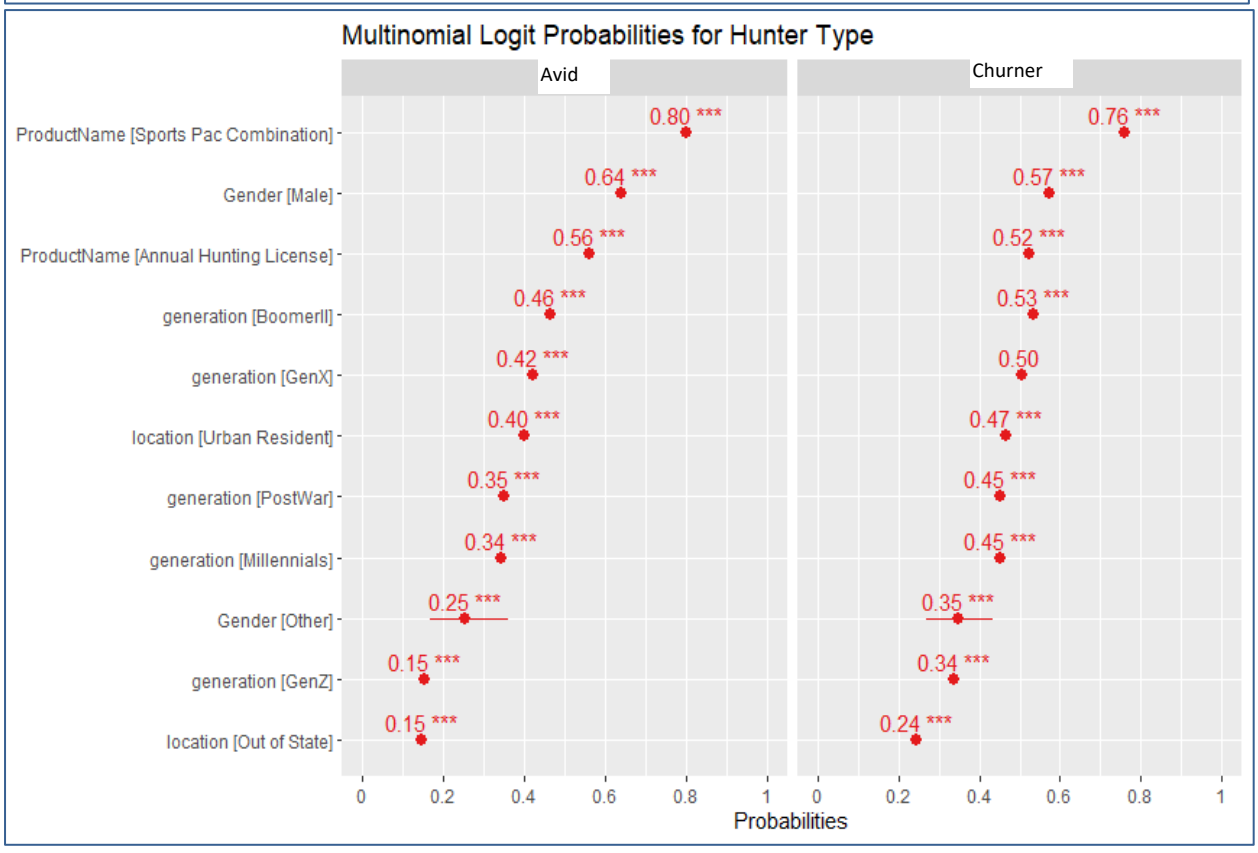
Logistic regression is a statistical technique used when the dependent variable is categorical (or nominal). For binary logistic regression the number of dependent variables is two, whereas the number of dependent variables for multinomial logistic regression is more than two. As with other types of regression, multinomial logistic regression can have nominal and/or continuous independent variables and can have interactions between independent variables to predict the dependent variable. Multinomial logistic regression is often considered an attractive analysis because; it does not assume normality, linearity, or homoscedasticity. This approach does have assumptions, such as the assumption of independence among the dependent variable choices. This assumption states that the choice of or membership in one category is not related to the choice or membership of another category (i.e., the dependent variable). Furthermore, multinomial logistic regression also assumes non-perfect separation. If the groups of the outcome variable are perfectly separated by the predictor(s), then unrealistic coefficients will be estimated, and effect sizes will be greatly exaggerated. Estimation of multinomial logistic regression randomly chooses one target class as the reference class and fits the number of classes-1 regression models that compare each of the remaining classes to the reference class. In this situation, the refence class if one-timers. The coefficients and odds ratios represent how different the avid and churner group are from one-timers with respect to the explanatory variables.

Predictors	Avidity			
	Odds Ratios	CI	p	Response
(Intercept)	1.11	1.07 – 1.15	**<0.001**	Churner
(Intercept)	1.96	1.90 – 2.03	**<0.001**	Avid
GenderMale	1.34	1.32 – 1.37	**<0.001**	Churner
GenderMale	1.78	1.75 – 1.81	**<0.001**	Avid
GenderOther	0.53	0.36 – 0.77	**0.001**	Churner
GenderOther	0.34	0.20 – 0.56	**<0.001**	Avid
generationBoomerII	1.15	1.11 – 1.19	**<0.001**	Churner
generationBoomerII	0.86	0.84 – 0.89	**<0.001**	Avid
generationGenX	1.02	0.98 – 1.05	0.362	Churner
generationGenX	0.73	0.71 – 0.75	**<0.001**	Avid
generationGenZ	0.51	0.50 – 0.53	**<0.001**	Churner
generationGenZ	0.18	0.18 – 0.19	**<0.001**	Avid
generationMillennials	0.82	0.79 – 0.84	**<0.001**	Churner
generationMillennials	0.52	0.50 – 0.53	**<0.001**	Avid
generationPostWar	0.82	0.78 – 0.86	**<0.001**	Churner
generationPostWar	0.54	0.52 – 0.56	**<0.001**	Avid
Rural Resident	*Reference*			
Out of State	0.17	0.17 – 0.18	**<0.001**	Avid
Out of State	0.32	0.31 – 0.33	**<0.001**	Churner
Urban Resident	0.88	0.85 – 0.90	**<0.001**	Churner
Urban Resident	0.67	0.65 – 0.68	**<0.001**	Avid
ProductNameAnnual Hunting License	1.10	1.08 – 1.12	**<0.001**	Churner
ProductNameAnnual Hunting License	1.28	1.25 – 1.30	**<0.001**	Avid
ProductNameSports Pac Combination	3.15	3.04 – 3.27	**<0.001**	Churner
ProductNameSports Pac Combination	4.05	3.90 – 4.20	**<0.001**	Avid
Observations	427,911			
R^2 Nagelkerke	0.155			

The ratio of the probability of choosing one outcome category over the probability of choosing the baseline category is often referred as relative risk (and it is sometimes referred to as odds, described in the regression parameters above). The relative risk is the right-hand side linear equation exponentiated, leading to the fact that the exponentiated regression coefficients are relative risk ratios for a unit change in the predictor variable. The researchers exponentiated the coefficients from the model to see these risk ratios. Odd ratios greater than 1.0 indicate a positive effect from the variable in question.

Hunter license type was the most influential variable in distinguishing both avid and churner hunter groups from one-timers. Gender was also highly influential with males much more likely to be avid hunters.


Multinomial Logit Results for Hunter Type
Avid
Churner
ProductName [Sports Pac Combination]
Gender [Male]
ProductName [Annual Hunting License]
generation [BoomerII]
generation [GenX]
location [Urban Resident]
generation [PostWar]
generation [Millennials]
Gender [Other]
generation [GenZ]
location [Out of State]
4.05 ***
1.78 ***
1.28 ***
0.86 ***
0.73 ***
0.67 ***
0.54 ***
0.52 ***
0.34 ***
0.18 ***
0.17 ***
3.15 ***
1.34 ***
1.10 ***
1.15 ***
1.02
0.88 ***
0.82 ***
0.82 ***
0.53 ***
0.51 ***
0.32 ***
0.01
0.1
1
10
100
Odds Ratios


Multinomial Logit Probabilities for Hunter Type
Avid
Churner
ProductName [Sports Pac Combination]
Gender [Male]
ProductName [Annual Hunting License]
generation [BoomerII]
generation [GenX]
location [Urban Resident]
generation [PostWar]
generation [Millennials]
Gender [Other]
generation [GenZ]
location [Out of State]
0.80 ***
0.64 ***
0.56 ***
0.46 ***
0.42 ***
0.40 ***
0.35 ***
0.34 ***
0.25 ***
0.15 ***
0.15 ***
0.76 ***
0.57 ***
0.52 ***
0.53 ***
0.50
0.47 ***
0.45 ***
0.45 ***
0.35 ***
0.34 ***
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0.4
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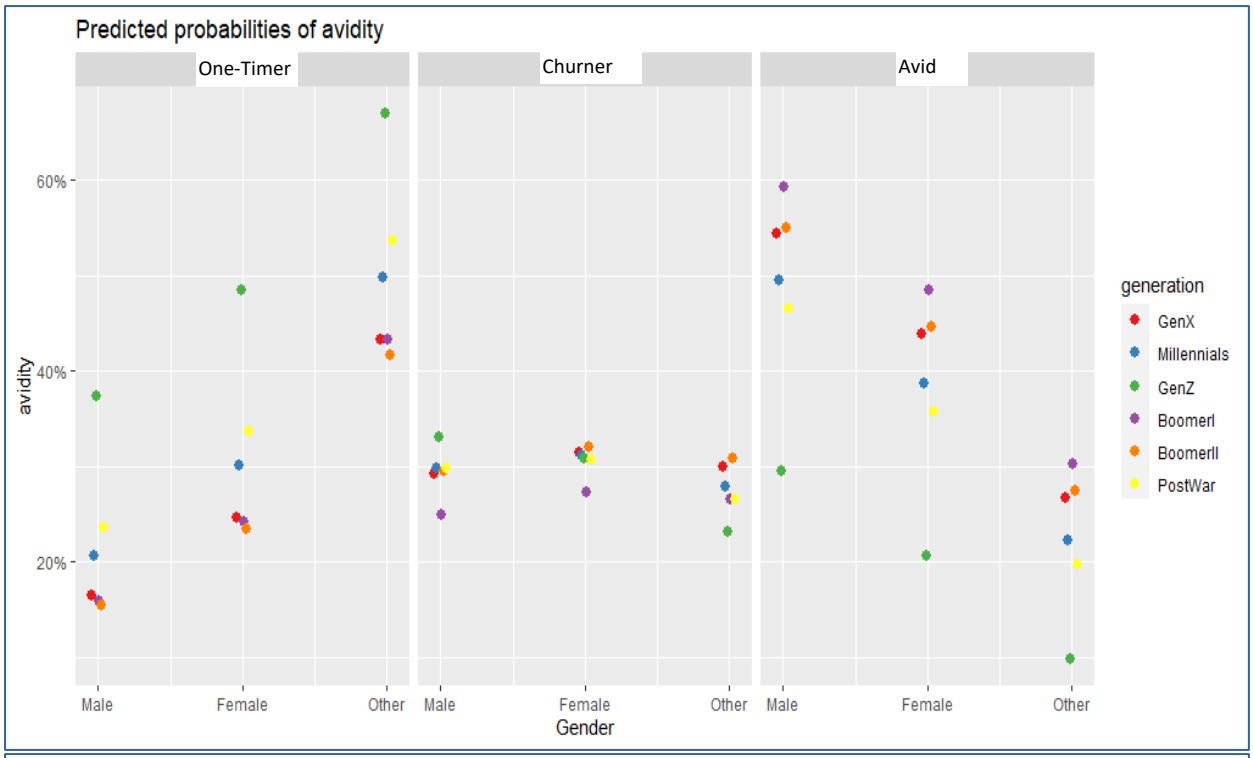
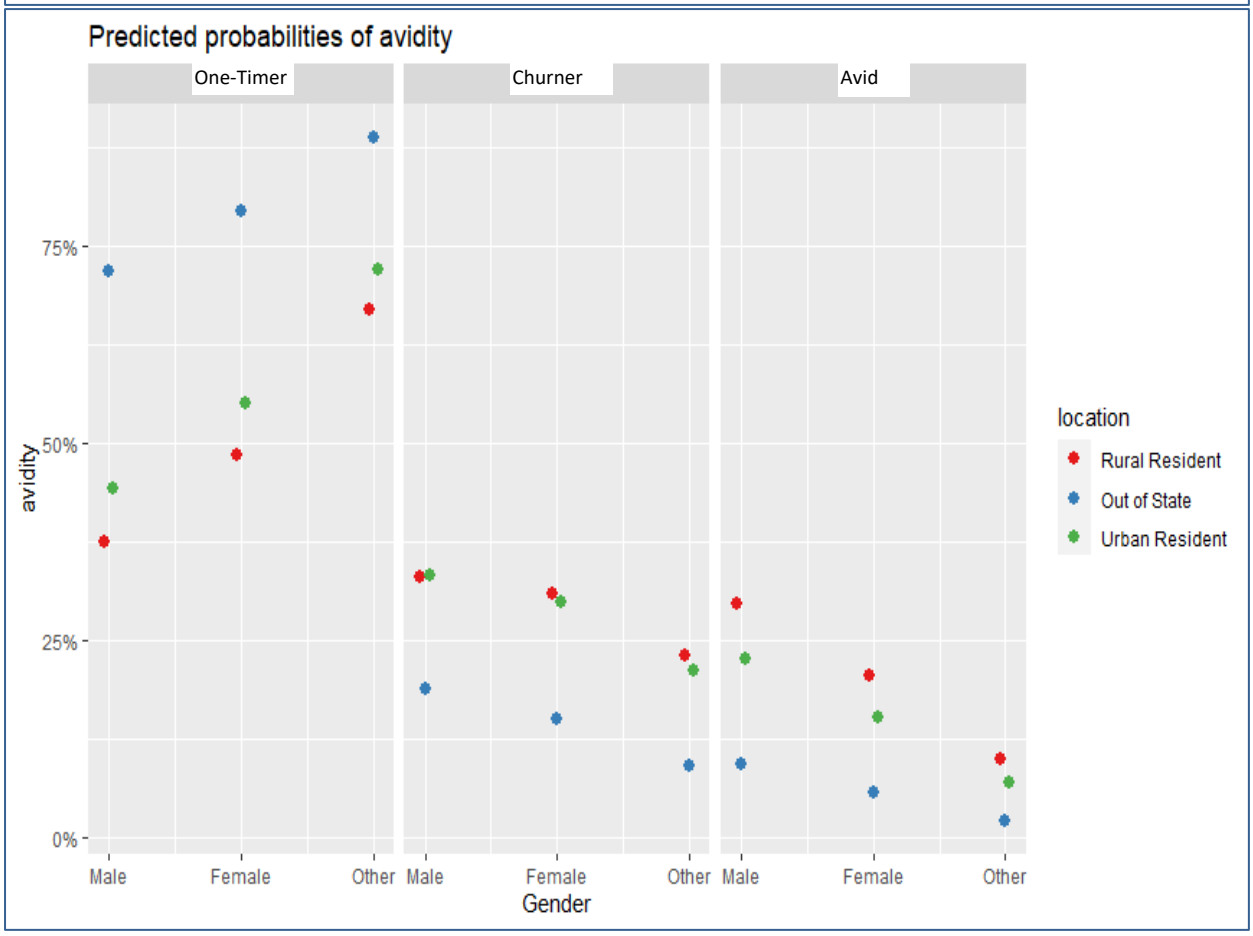
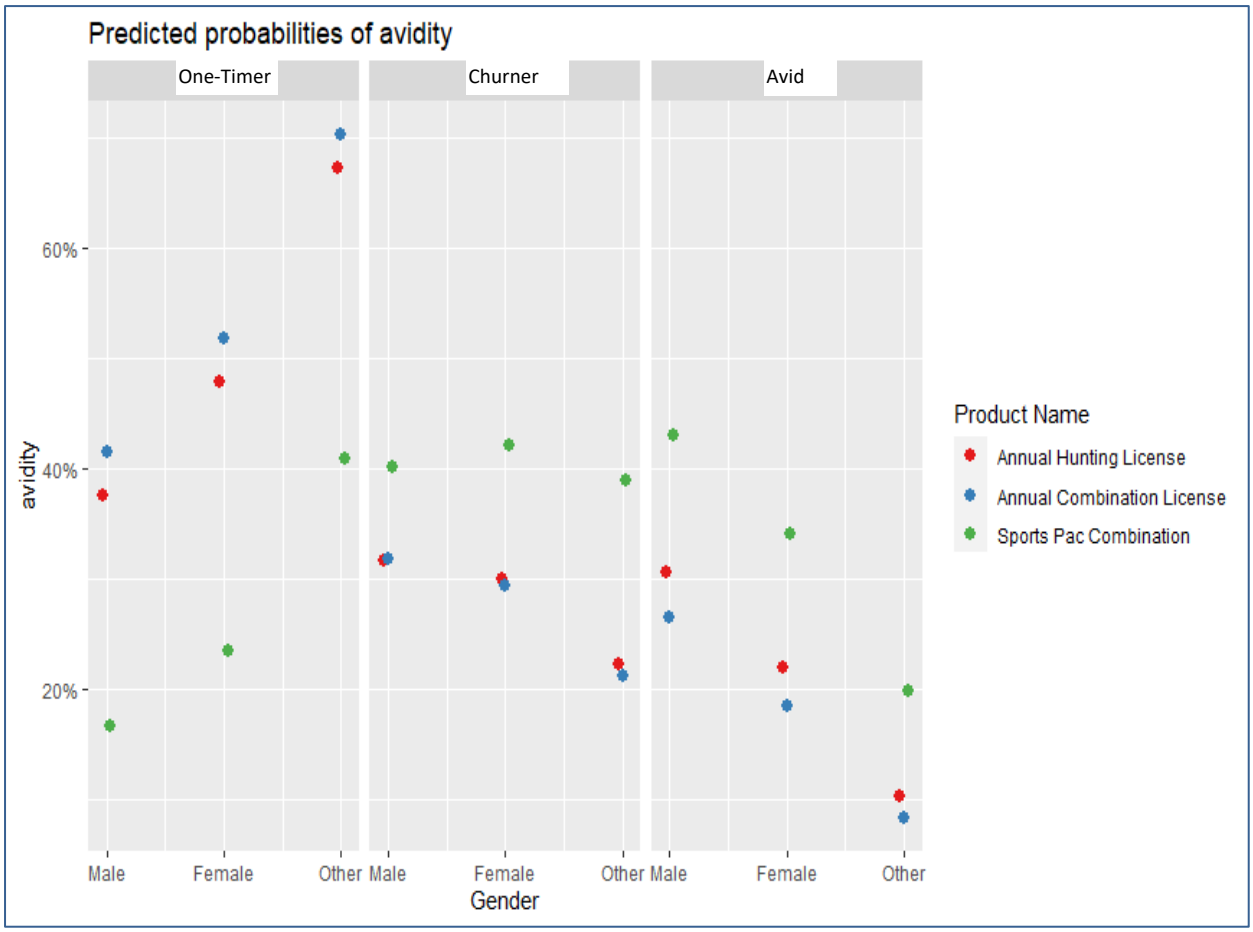
0.8
1
Probabilities


Predicted probabilities of avidity
One-Timer
Churner
Avid
60%
40%
20%
avidity
Male
Female
Other
Gender
generation
GenX
Millennials
GenZ
BoomerI
BoomerII
PostWar


Predicted probabilities of avidity
One-Timer
Churner
Avid
75%
50%
25%
0%
avidity
Male
Female
Other
Gender
location
Rural Resident
Out of State
Urban Resident


Predicted probabilities of avidity
One-Timer
Churner
Avid
60%
40%
20%
avidity
Male
Female
Other
Gender
Product Name
Annual Hunting License
Annual Combination License
Sports Pac Combination

MEASURING HUNTER AVIDITY WEST VIRGINIA

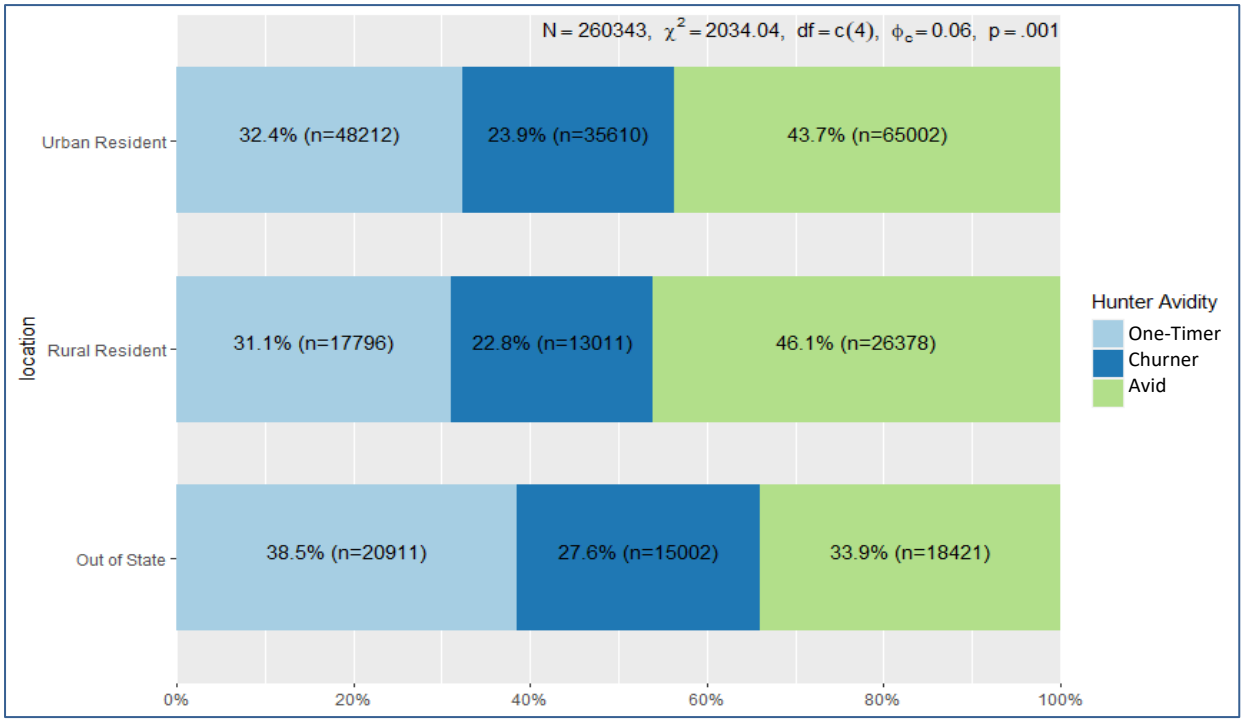
Avidity Group

The avidity groups for West Virginia are provided in the table below. The largest group (42%) are avid hunters in West Virginia. About a third of hunters (33%) during the period studied were one-timers. About a fourth of hunters (24%) fell somewhere between, having purchased a license in 2-3 years of the 5-year period examined.

Number and Percentage of Hunters in Avidity Categories				
	One-Timer	Churner	Avid	Total
Number	86,919	63,623	109,801	260,343
Percentage	33.4	24.4	42.2	

Location

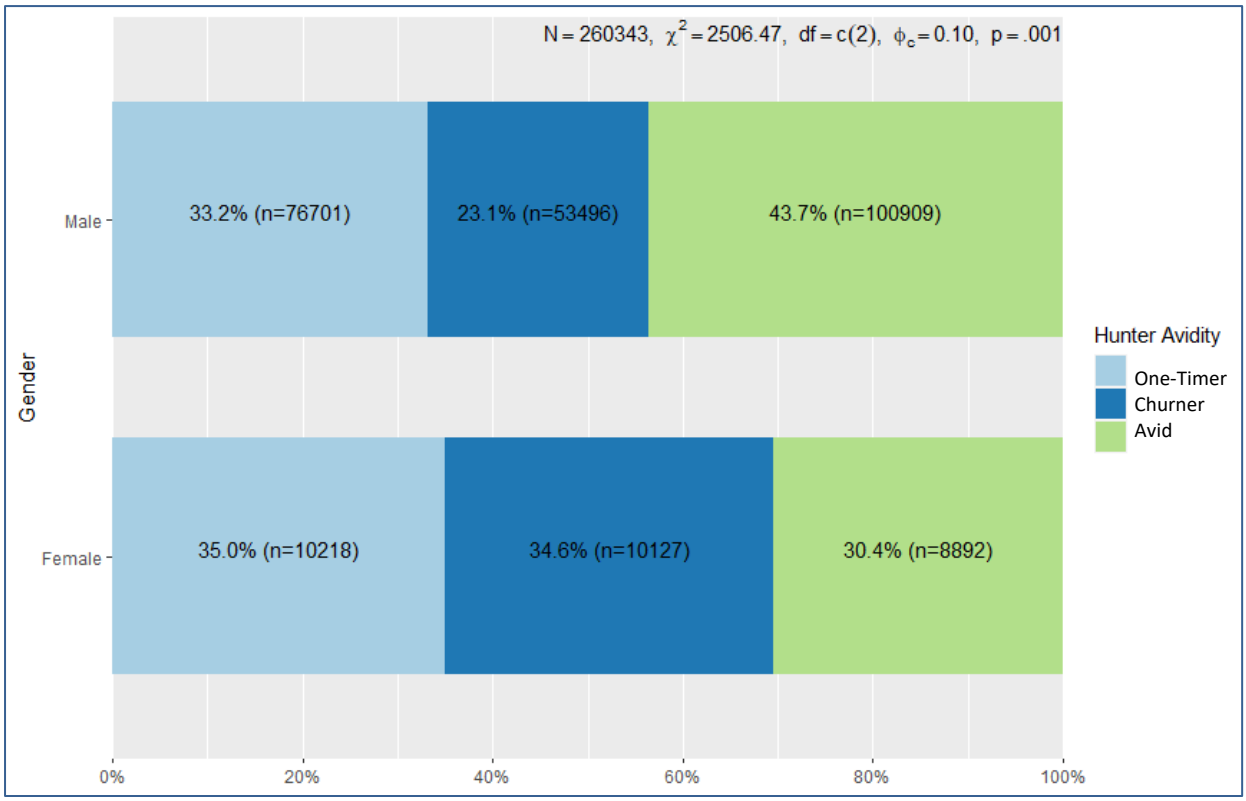
Hunters who resided in rural areas of the state were slightly more likely to be avid than those living in urban areas, and both were much more likely to be avid than those who came from out of state to hunt. A contingency table, also known as a cross-classification table, describes the relationships between two or more categorical variables. The null hypothesis proposes that hunter avidity and location of the hunter's residence are independent of one another. This means the occurrence of one kind of event does not depend on the other kind of event (i.e., they are not associated). As can be seen in the figure below, the p-value of the Chi Square Test is highly significant (p=0.001), indicating that the location frequency varies among the three kinds of hunter avidity.



Contingency Table for Location and Hunter Avidity, West Virginia					
Avidity Group		**Rural**	**Urban**	**Out of State**	**Total**
One-Timer	Number	17,796	48,212	20,911	86,919
	Percentage of One-Timer in Location	20.5	55.5	24.1	
	Percentage of Locational Group That Are One-Timer	31.1	32.4	38.5	33.4
Churner	Number	13,011	35,610	15,002	63,623
	Percentage of Churner in Location	20.5	56.0	23.6	
	Percentage of Locational Group That Are Churner	22.8	23.9	27.6	24.4
Avid	Number	26,378	65,002	18,421	109,801
	Percentage of Avid in Location	24.0	59.2	16.8	
	Percentage of Locational Group That Are Avid	46.1	43.7	33.9	42.2
Total	Number	57,185	148,824	54,334	260,343
	Percentage of Total in Location	22.0	57.2	20.9	100.0
χ^2=2034.040 · df=4 · Cramer's V=0.063 · p=0.000					

Gender

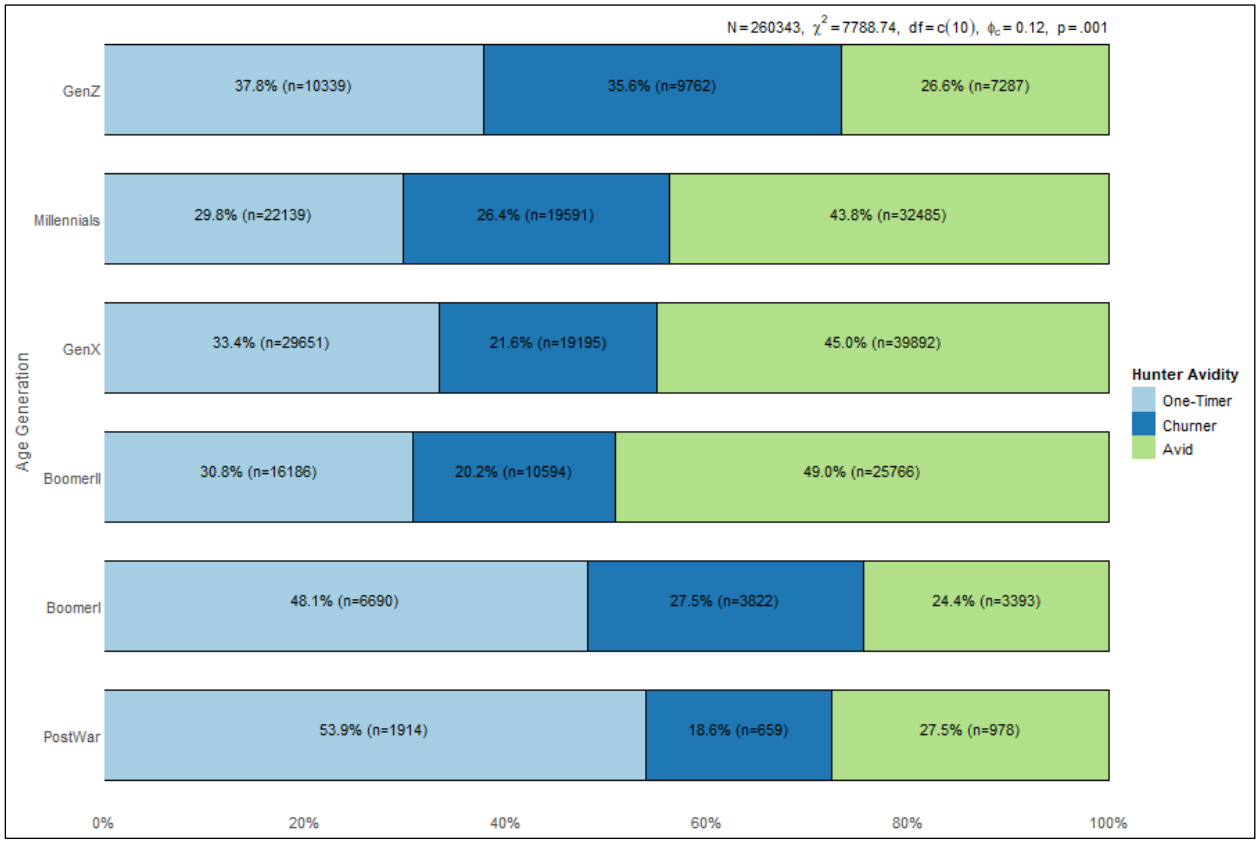
The null hypothesis regarding gender proposes that hunter avidity and the hunter's gender are independent of one another. Once again, the Chi-square test is highly significant, indicating a strong relationship between gender and hunter avidity in West Virginia. In this situation, the incidence of high avidity is much more prevalent for male hunters (44% versus 30% female).



Contingency Table for Gender and Hunter Avidity, West Virginia				
Avidity Group		**Female**	**Male**	**Total**
One-Timer	Number	10,218	76,701	86,919
	Percentage of One-Timer in Gender Category	11.8	88.2	
	Percentage of Gender Group That Are One-Timer	34.9	33.2	33.4
Churner	Number	10,127	53,496	63,623
	Percentage of Churner in Gender Category	15.9	84.1	
	Percentage of Gender Group That Are Churner	34.6	23.1	24.4
Avid	Number	8,892	100,909	109,801
	Percentage of Avid in Gender Category	8.1	91.9	
	Percentage of Gender Group That Are Avid	30.4	43.7	42.2
Total	Number	29,237	231,106	260,343
	Percentage of Total in Gender Category	11.2	88.8	100.0
				χ^2=2506.469 · df=2 · Cramer's V=0.098 · p=0.000

Generational Age

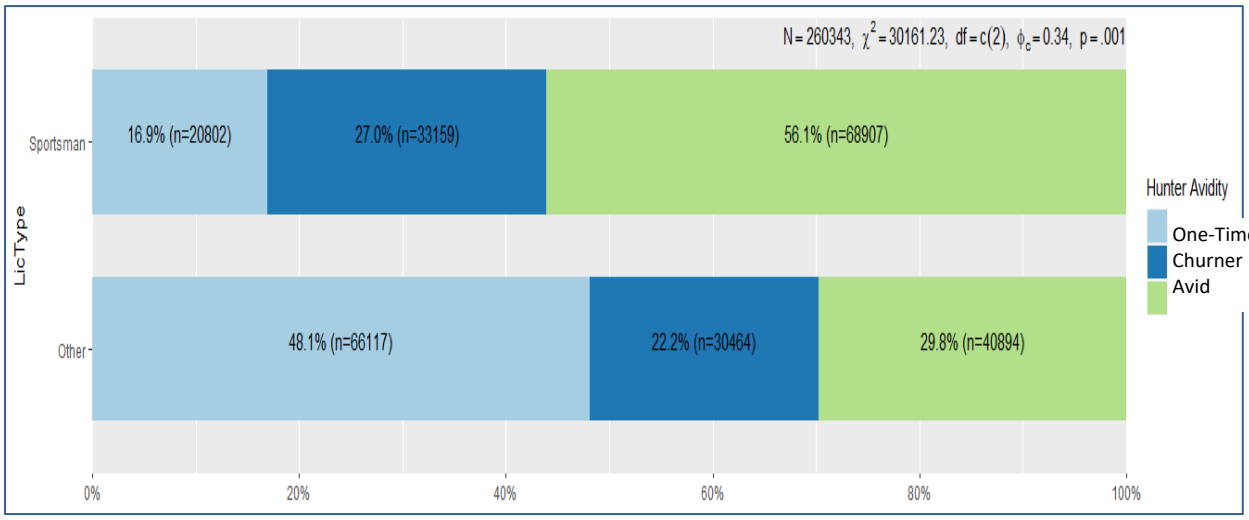
Based on widespread consensus as well as new Gen Z analysis by the Pew Research Center, and the one generation defined by the U.S. Census Bureau (Baby Boomers), date of birth can be used to define generation groups. The researchers examined the relationship between hunter avidity and generational age. The generational age of a hunter is also shown to influence hunter avidity based on the significant Chi-square test result. High avidity was most prevalent in the mid-age groups represented by Boomers II and Gen X, where at least 45% of all hunters were highly avid. Avidity drops off by more than 10% for both the older and younger generational ages.



Contingency Table for Generational Age and Hunter Avidity, West Virginia								
Avidity Group		**Post War**	**Boomer I**	**Boomer II**	**Gen X**	**Millennial**	**Gen Z**	**Total**
One-Timer	Number	1,914	6,690	16,186	29,651	22,139	10,339	86,919
	Percentage of One-Timer in Age Group	2.2	7.7	18.6	34.1	25.5	11.9	
	Percentage of Age Group That Are One-Timer	53.9	48.1	30.8	33.4	29.8	37.8	33.4
Churner	Number	659	3,822	10,594	19,195	19,591	9,762	63,623
	Percentage of Churner in Age Group	1.0	6.0	16.7	30.2	30.8	15.3	
	Percentage of Age Group That Are Churner	18.6	27.5	20.2	21.6	26.4	35.6	24.4
Avid	Number	978	3,393	25,766	39,892	32,485	7,287	109,801
	Percentage of Avid in Age Group	0.9	3.1	23.5	36.3	29.6	6.6	
	Percentage of Age Group That Are Avid	27.5	24.4	49.0	45.0	43.8	26.6	42.2
Total	Number	3,551	13,905	52,546	88,738	74,215	27,388	260,343
	Percentage of Total in Age Group	1.4	5.3	20.2	34.1	28.5	10.5	
χ^2=2034.040 · df=4 · Cramer's V=0.063 · p=0.000								

License Type

In West Virginia there is one broad category of sportsman licenses and several specialty licenses that were grouped into “other,” the base category. A high percentage of avid hunters (56%) were associated with the sportsman type of license.



Contingency Table for License Type and Hunter Avidity, West Virginia				
Avidity Group		**Other**	**Sportsman**	**Total**
One-Timer	Number	66,117	20,802	86,919
	Percentage of One-Timer in License Type	76.1	23.9	
	Percentage of License Group That Are One-Timer	48.1	16.9	33.4
Churner	Number	30,464	33,159	63,623
	Percentage of Churner in License Type	47.9	52.1	
	Percentage of License Group That Are Churner	22.2	27.0	24.4
Avid	Number	40,894	68,907	109,801
	Percentage of Avid in License Type	37.2	62.8	
	Percentage of License Group That Are Avid	29.7	56.1	42.2
Total	Number	137,475	122,868	260,343
	Percentage of Total in License Type	52.8	47.2	
				χ^2=30161.234 · df=2 · Cramer's V=0.340 · p=0.000

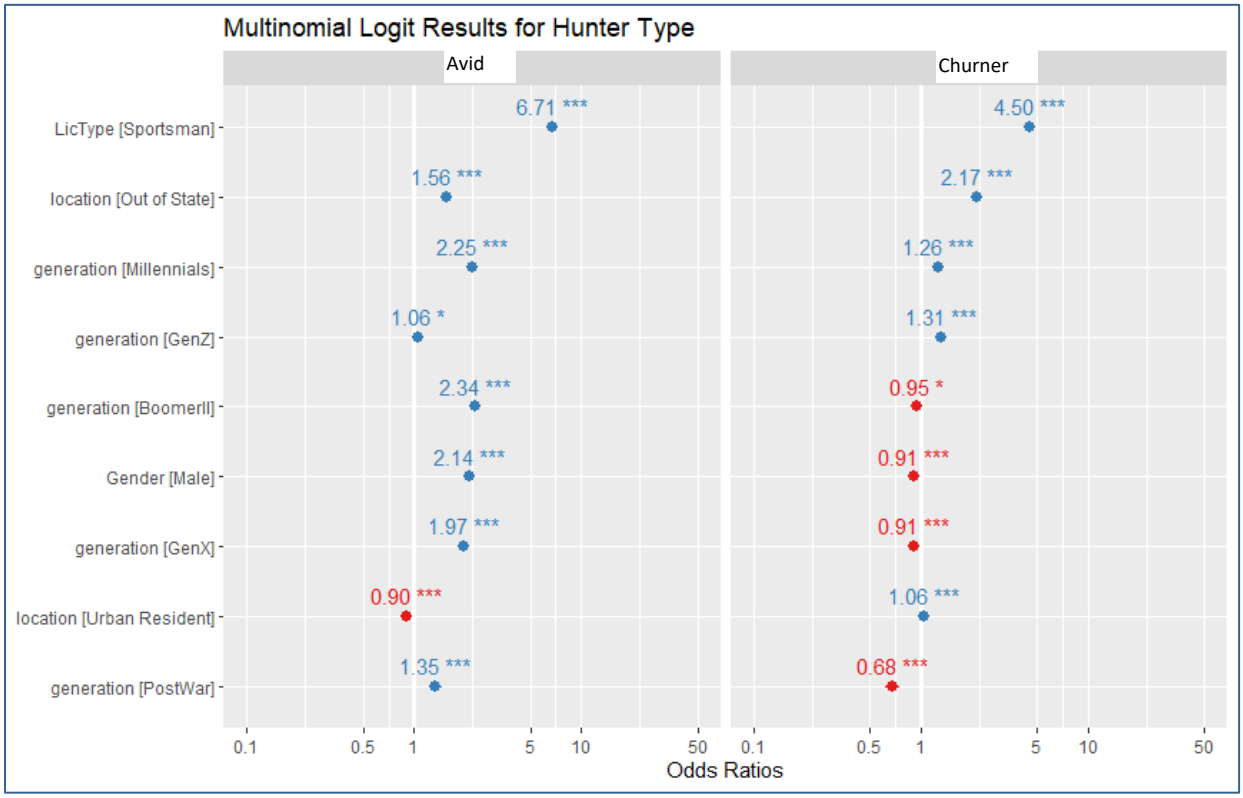
Multinomial Logistic Regression

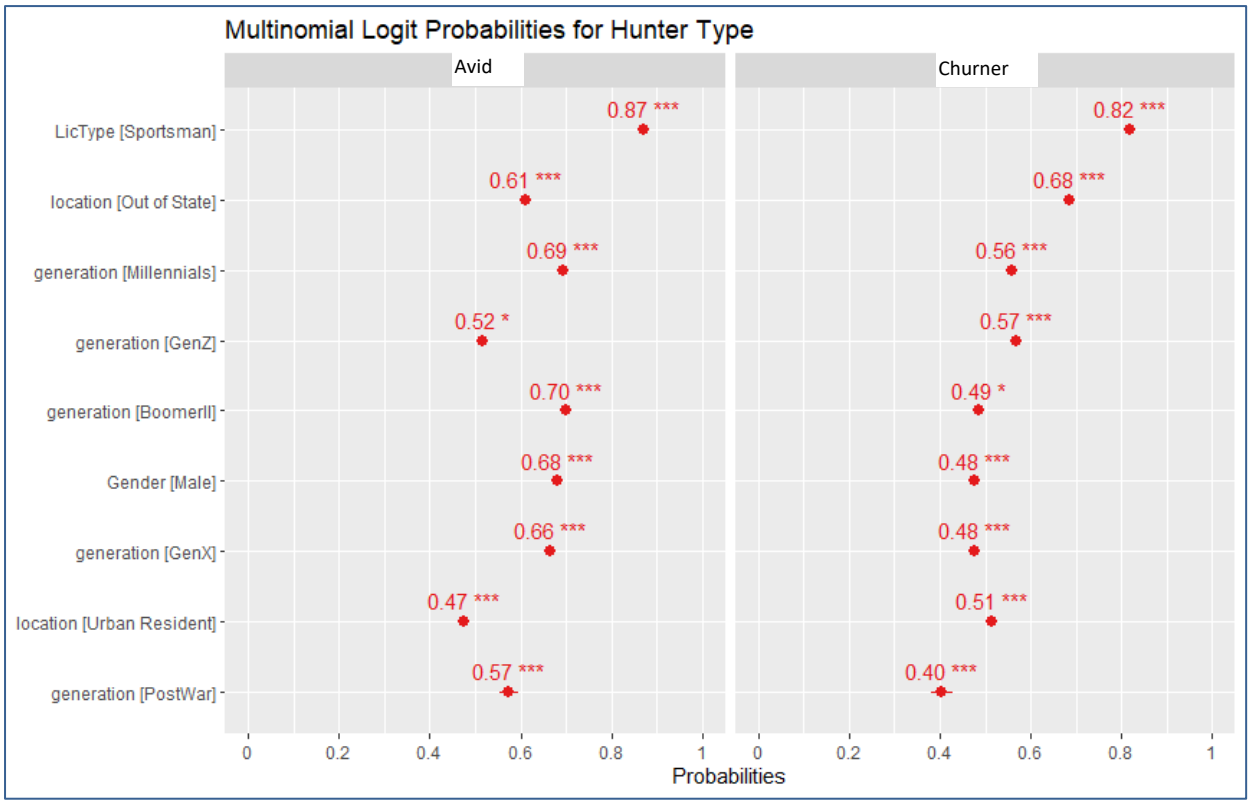
Logistic regression is a statistical technique used when the dependent variable is categorical (or nominal). For binary logistic regression the number of dependent variables is two, whereas the number of dependent variables for multinomial logistic regression is more than two. As with other types of regression, multinomial logistic regression can have nominal and/or continuous independent variables and can have interactions between independent variables to predict the dependent variable. Multinomial logistic regression is often considered an attractive analysis because; it does not assume normality, linearity, or homoscedasticity. This approach does have assumptions, such as the assumption of independence among the dependent variable choices. This assumption states that the choice of or membership in one category is not related to the choice or membership of another category (i.e., the dependent variable). Furthermore, multinomial logistic regression also assumes non-perfect separation. If the groups of the outcome variable are perfectly separated by the predictor(s), then unrealistic coefficients will be estimated, and effect sizes will be greatly exaggerated.

The ratio of the probability of choosing one outcome category over the probability of choosing the baseline category is often referred as relative risk (and it is sometimes referred to as odds, described in the regression parameters above). The relative risk is the right-hand side linear equation exponentiated, leading to the fact that the exponentiated regression coefficients are relative risk ratios for a unit change in the predictor variable. The researchers exponentiated the coefficients from the model to see these risk ratios. Odd ratios greater than 1.0 indicate a positive effect from the variable in question.

Hunter generation was the most influential variable in distinguishing both avid and churner hunter groups from one-timers. Those from the Boomer II and Millennials were much more likely to be avid hunters. Location and hunter gender were also important in distinguishing avid and one-timers with male hunters having a higher probability of being avid and both rural and urban West Virginia Residents more likely to be avid than out of state residents. Being a male hunter (as compared to being a female) is associated with a 65% increase in the odds of being avid. With a p-value less than 0.001, this coefficient is statistically significant at the 5% level.

Predictors	Avidity			
	Odds Ratios	CI	p	Response
(Intercept)	0.34	0.32 – 0.36	**<0.001**	Churner
location [Out of State]	2.17	2.10 – 2.25	**<0.001**	Churner
location [Urban Resident]	1.06	1.03 – 1.09	**<0.001**	Churner
Gender [Male]	0.91	0.89 – 0.94	**<0.001**	Churner
generation [BoomerII]	0.95	0.90 – 0.99	**0.024**	Churner
generation [GenX]	0.91	0.87 – 0.95	**<0.001**	Churner
generation [GenZ]	1.31	1.25 – 1.38	**<0.001**	Churner
generation [Millennials]	1.26	1.21 – 1.32	**<0.001**	Churner
generation [PostWar]	0.68	0.61 – 0.75	**<0.001**	Churner
LicType [Sportsman]	4.50	4.38 – 4.61	**<0.001**	Churner
(Intercept)	0.14	0.13 – 0.15	**<0.001**	Avid
location [Out of State]	1.56	1.52 – 1.61	**<0.001**	Avid
location [Urban Resident]	0.90	0.88 – 0.92	**<0.001**	Avid
Gender [Male]	2.14	2.07 – 2.22	**<0.001**	Avid
generation [BoomerII]	2.34	2.23 – 2.45	**<0.001**	Avid
generation [GenX]	1.97	1.88 – 2.07	**<0.001**	Avid
generation [GenZ]	1.06	1.01 – 1.12	**0.025**	Avid
generation [Millennials]	2.25	2.15 – 2.36	**<0.001**	Avid
generation [PostWar]	1.35	1.23 – 1.47	**<0.001**	Avid
LicType [Sportsman]	6.71	6.56 – 6.87	**<0.001**	Avid
Observations	260343			
R^2 Nagelkerke	0.177			




Multinomial Logit Probabilities for Hunter Type
Avid
Churner
LicType [Sportsman]
location [Out of State]
generation [Millennials]
generation [GenZ]
generation [BoomerII]
Gender [Male]
generation [GenX]
location [Urban Resident]
generation [PostWar]
0.87 ***
0.61 ***
0.69 ***
0.52 *
0.70 ***
0.68 ***
0.66 ***
0.47 ***
0.57 ***
0.82 ***
0.68 ***
0.56 ***
0.57 ***
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0.48 ***
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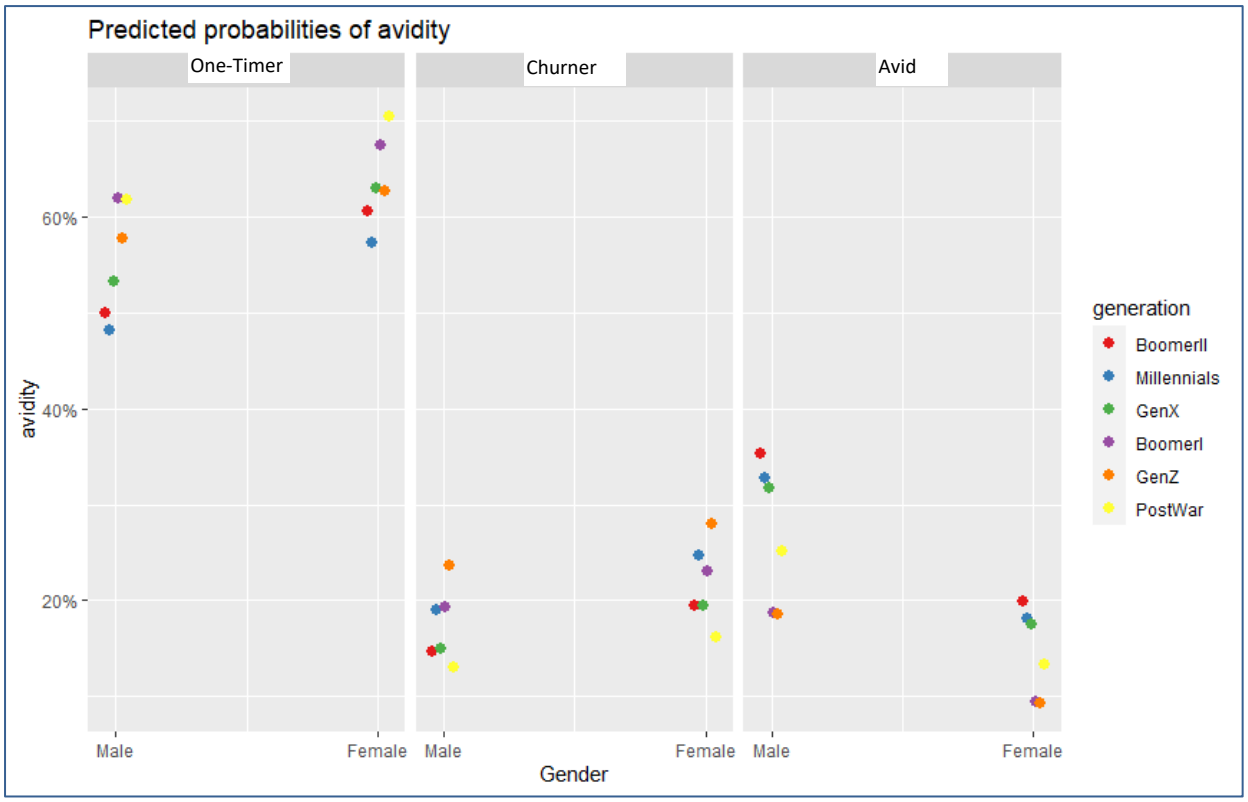
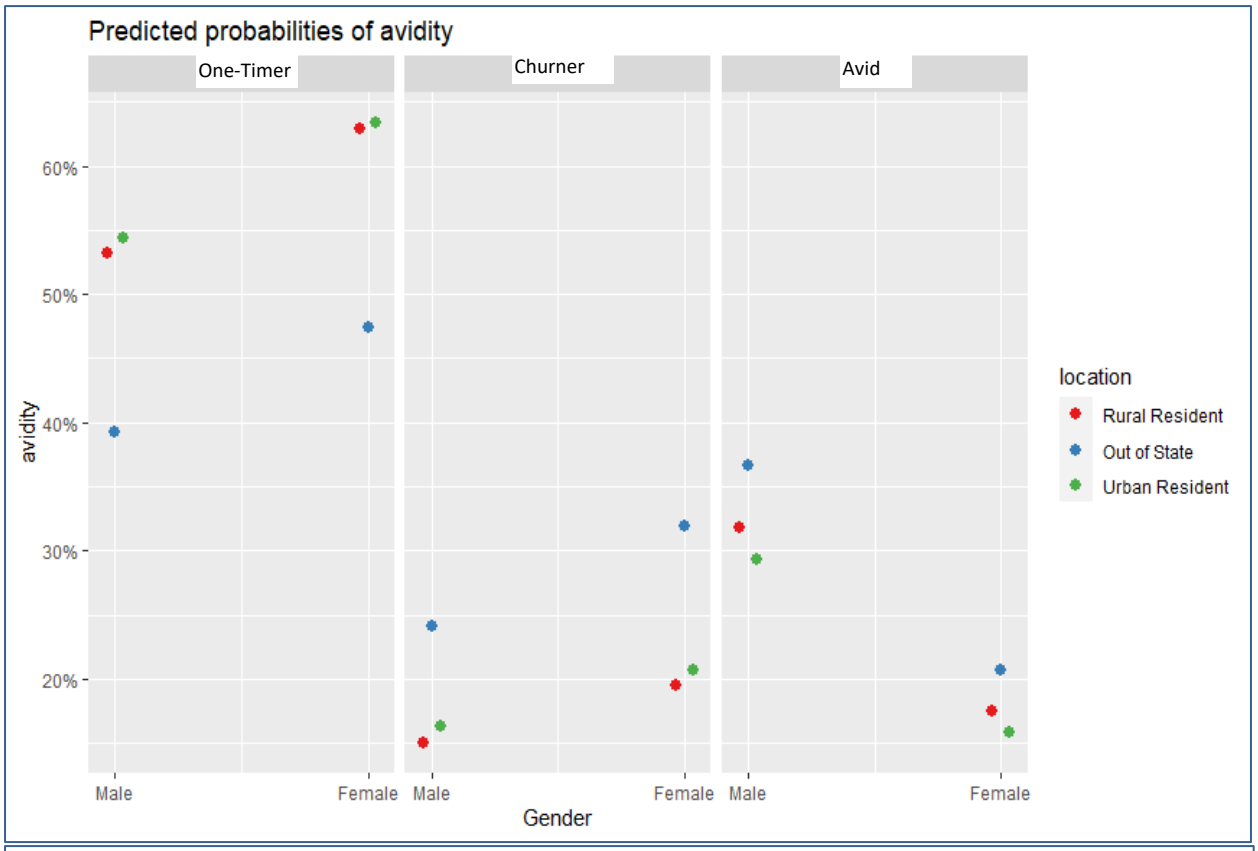
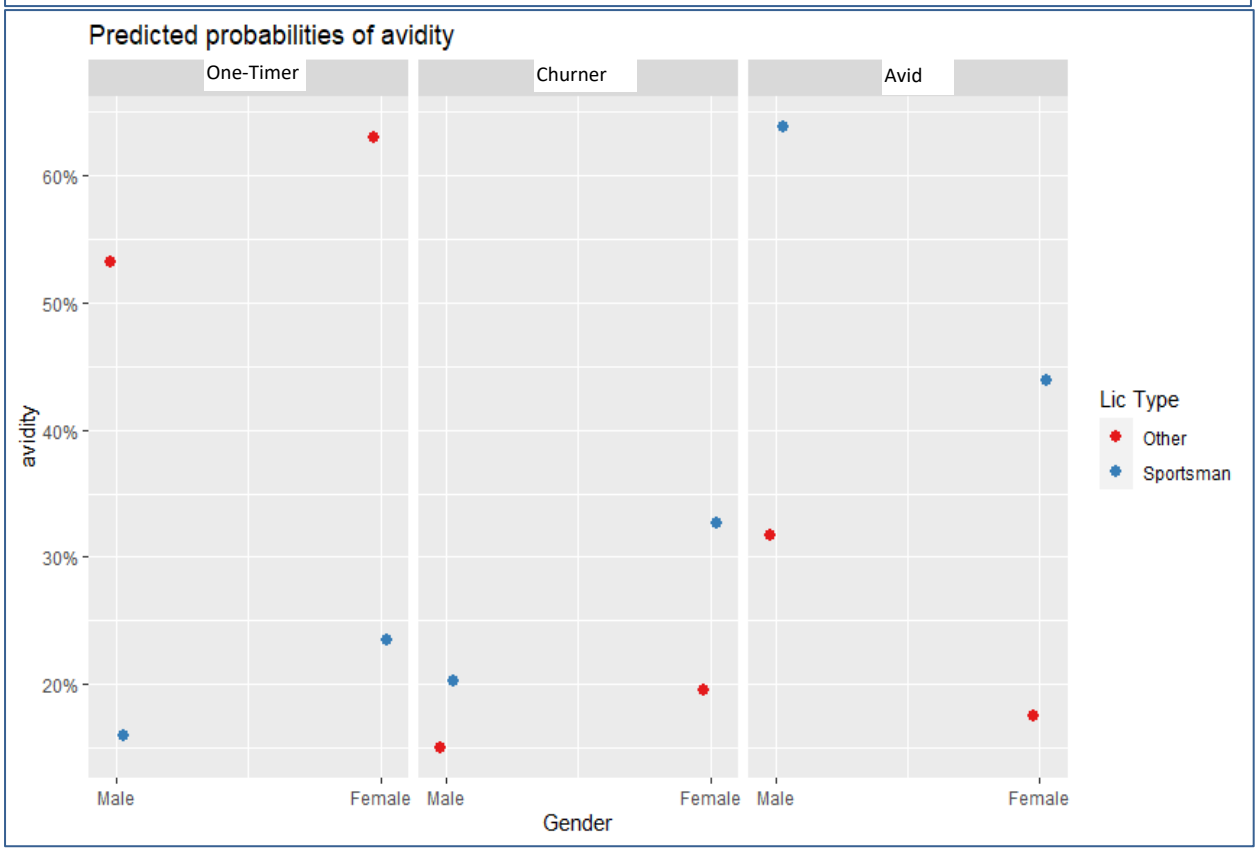
0.40 ***
0
0.2
0.4
0.6
0.8
1
Probabilities


Predicted probabilities of avidity
One-Timer
Churner
Avid
60%
40%
20%
avidity
Male
Female
Gender
generation
BoomerII
Millennials
GenX
BoomerI
GenZ
PostWar


Predicted probabilities of avidity
One-Timer
Churner
Avid
60%
50%
40%
30%
20%
avidity
Male
Female
Male
Female
Male
Female
Gender
location
Rural Resident
Out of State
Urban Resident


Predicted probabilities of avidity
One-Timer
Churner
Avid
60%
50%
40%
30%
20%
avidity
Male
Female
Male
Female
Male
Female
Gender
Lic Type
Other
Sportsman

REFERENCES FOR SECTION

Brant, R. 1990. "Assessing Proportionality in the Proportional Odds Model for Ordinal Logistic Regression." *Biometrics* 46(4): 1171–1178.

Walker S.H.; and D.B. Duncan. 1967. "Estimation of the Probability of an Event as a Function of Several Independent Variables." *Biometrika* 54: 167–79.

McCullagh, P. 1980. "Regression Models for Ordinal Data." *Journal of the Royal Statistical Society. Series B: Statistical Methodology* 42: 109–27.

3.2. NEW DATA COLLECTION: SURVEY OF HUNTERS

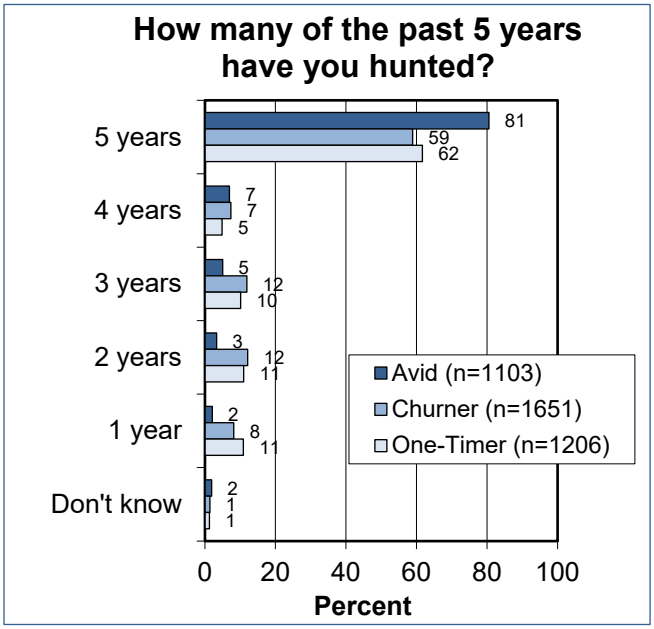
This section is organized thematically rather than in the order of survey questions. The basic analyses of the survey data, which include tabulations and graphing of data as well as select crosstabulations, are presented first. This is followed by a discussion of more intensive statistical analyses.

In the analyses, the three avidity groups—avids, churners, and one-timers—were kept separate. For this breakdown, hunters' level of avidity was assigned based on licenses purchased as shown in the databases. The survey asked about the number of years hunted within the past 5 years, but this was not used to define avidity because the most important measure of avidity to wildlife agencies is licenses sold. As a reminder, the definitions are as follows:

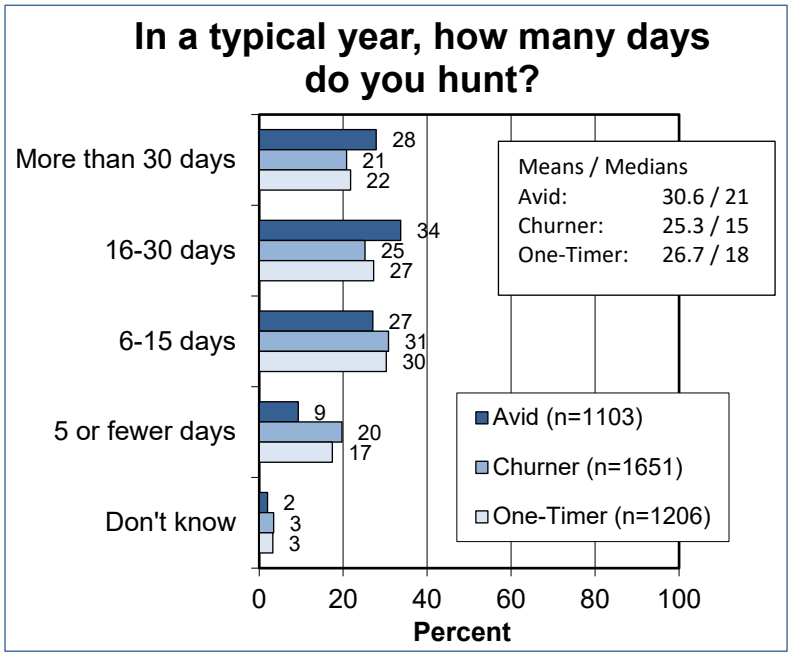
- Avid: Purchased at least 4 of the past 5 years or purchased a lifetime license in the 5-year time period.
- Churner: Purchased a license in 2 or 3 of the 5 years (and none of the licenses were a lifetime license).
- One-Timer: Purchased a license in only 1 of the 5 years (and the license was not a lifetime license).

BASIC AVIDITY MEASURES: YEARS HUNTED, DAYS HUNTED, MENTORING

One finding was that many hunters went hunting in years in which they were not in the database as license purchasers. It may be that some were hunting legally (some hunting is allowed without a license), but others may have been hunting illegally. Additionally, it may be that there are inaccuracies in the databases wherein some hunters who had purchased a license are not shown in the database—this can happen when slightly different names are used (e.g., the hunter purchases a license using his full name one year including a middle name but then purchases another year without the middle name, although the analysts for this project completed checks on the databases for these occurrences to correct them). Also, respondent memory may be slightly off wherein a hunter "remembers" that he went hunting more years than he actually did. Finally, the avidity was measured by purchases within one state, while the hunting question was not restricted to a single state, and a hunter may have purchased licenses in multiple states.

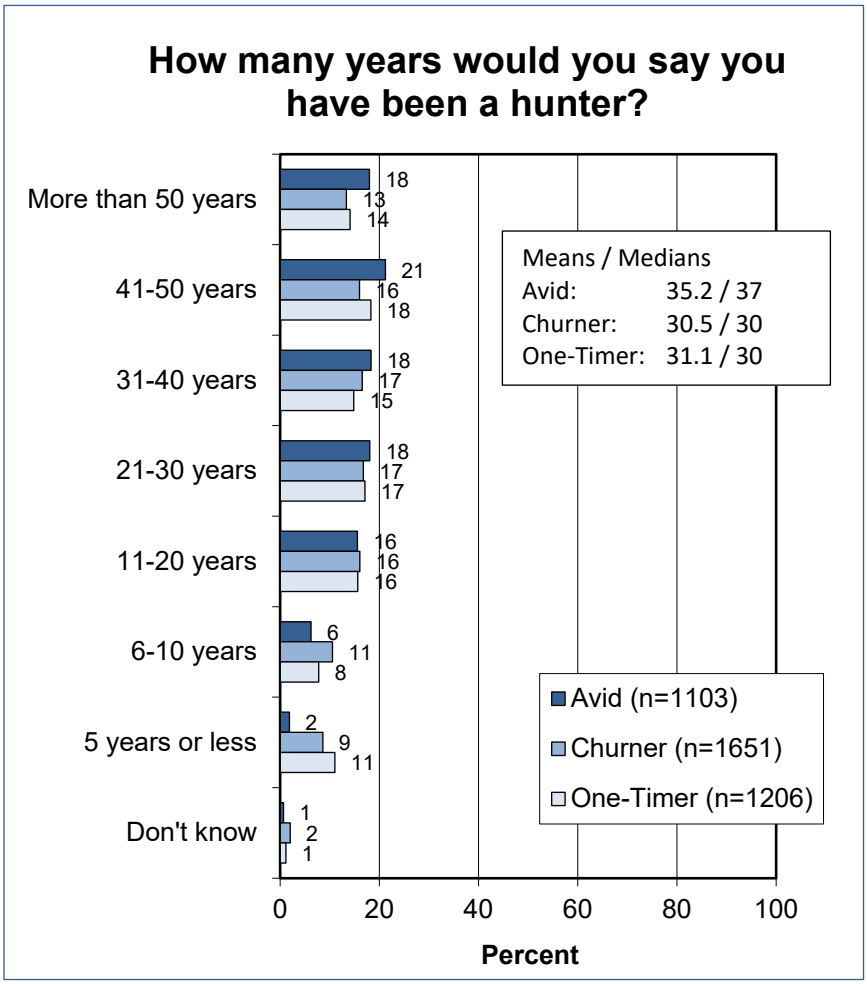


As shown in the graph, there were some hunters who had only purchased a license in the particular state once in the 5-year span yet indicated that they went hunting all 5 years (those labeled one-timers in the graph). Likewise, the churner group also has a relatively large percentage who indicated hunting all 5 years.

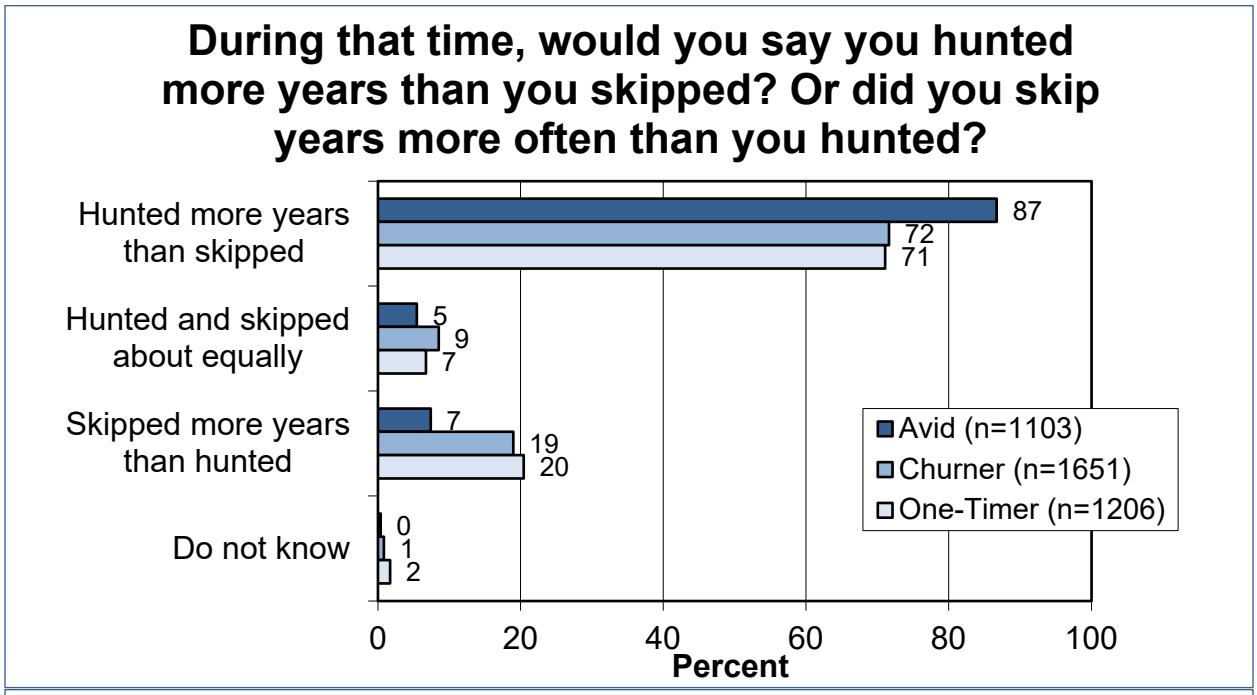


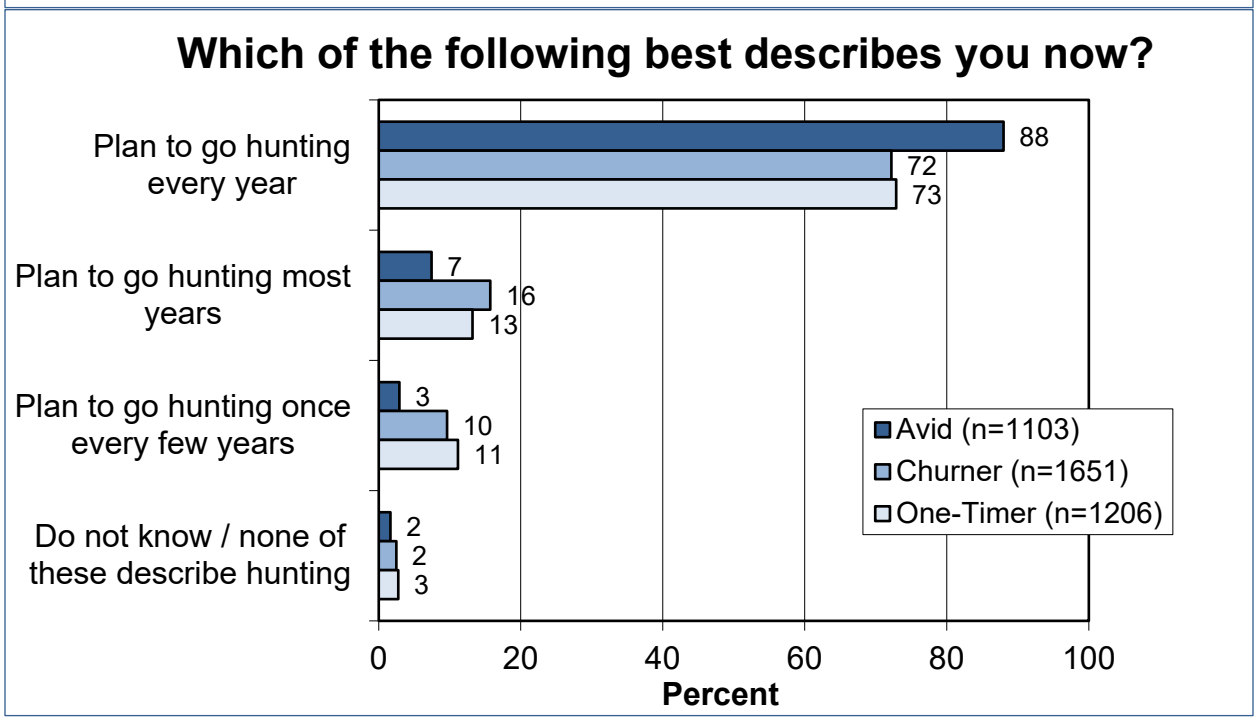
The days hunted in a typical year are shown in the accompanying graph, which suggests that churners and one-timers are quite similar. Avids are more active, with a higher mean and median, compared to the other groups. The higher percentages among avids in the top two categories (more than 30 days and 16-30 days) are statistically significant. The markedly lower percentage among avids in the 5 days or fewer category is statistically significant.

The accompanying graph shows the number of years that hunters had been hunting and their avidity level. For all ranges above 20 years, the percentage of avids is higher than the percentages of the other groups, and it is particularly pronounced in the upper two ranges of 41-50 years (21% among avids; no higher than 18% among the other groups) and more than 50 years (18% among avids; no higher than 14% among the other groups). The higher number of years among avids is statistically significant.

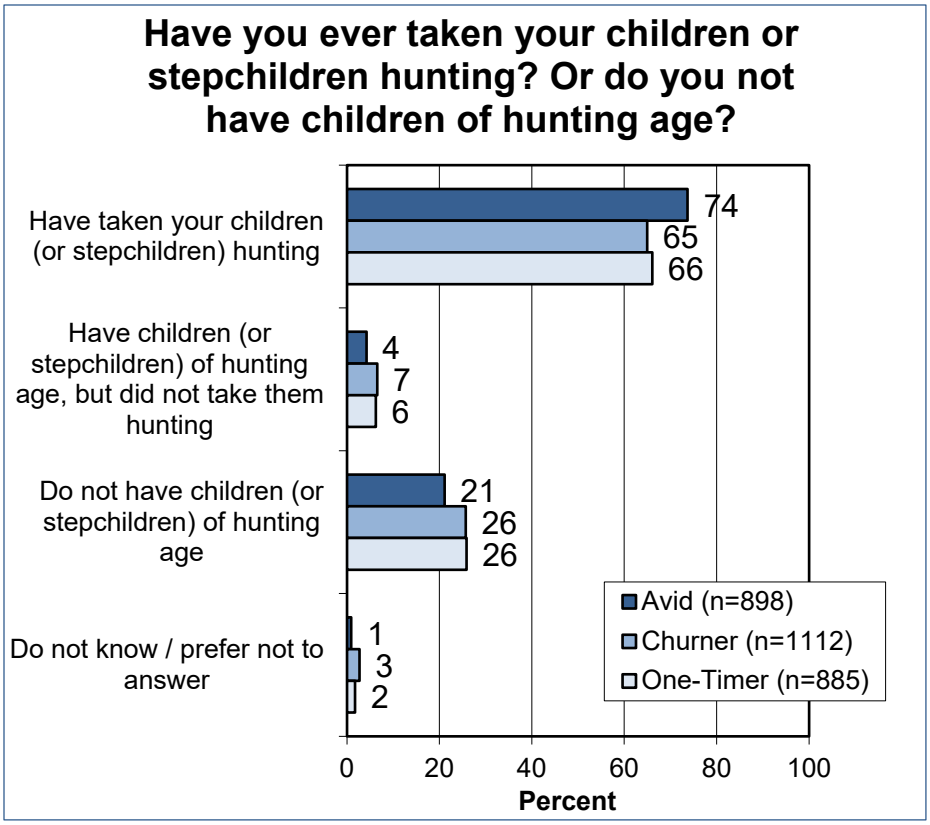


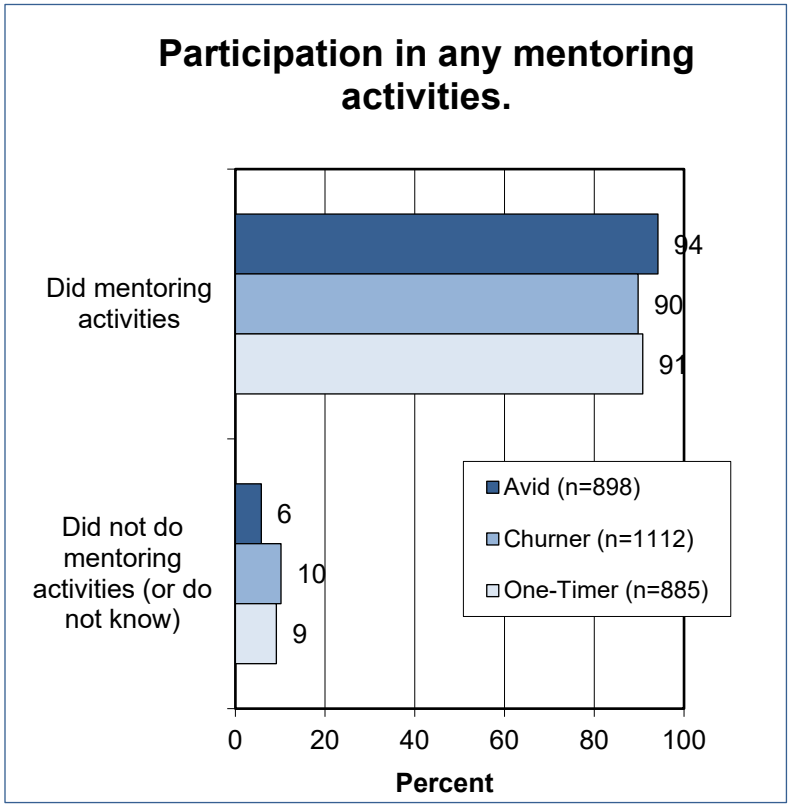
While it is intuitive that the avids have a higher percentage who have hunted more years than skipped (statistically significant), it is of interest that the churner and one-timers are almost identical in this regard (shown to be not statistically different). Nonetheless, all three groups have large majorities who hunted more years than skipped throughout the years of their hunting. The results to the question about planned hunting now show quite similar results. Avids have a higher percentage who plan to hunt every year (statistically significant), while the churners and one-timers are quite similar to one another (shown to be not statistically different).





Three questions about mentoring were included in the survey. The first is shown in the accompanying graph, showing that avids more often take their children hunting, compared to the other groups. However, of interest is that majorities of the other two groups also took their children hunting. (Statistical tests were run on the next graph, which shows the results of all three questions.)

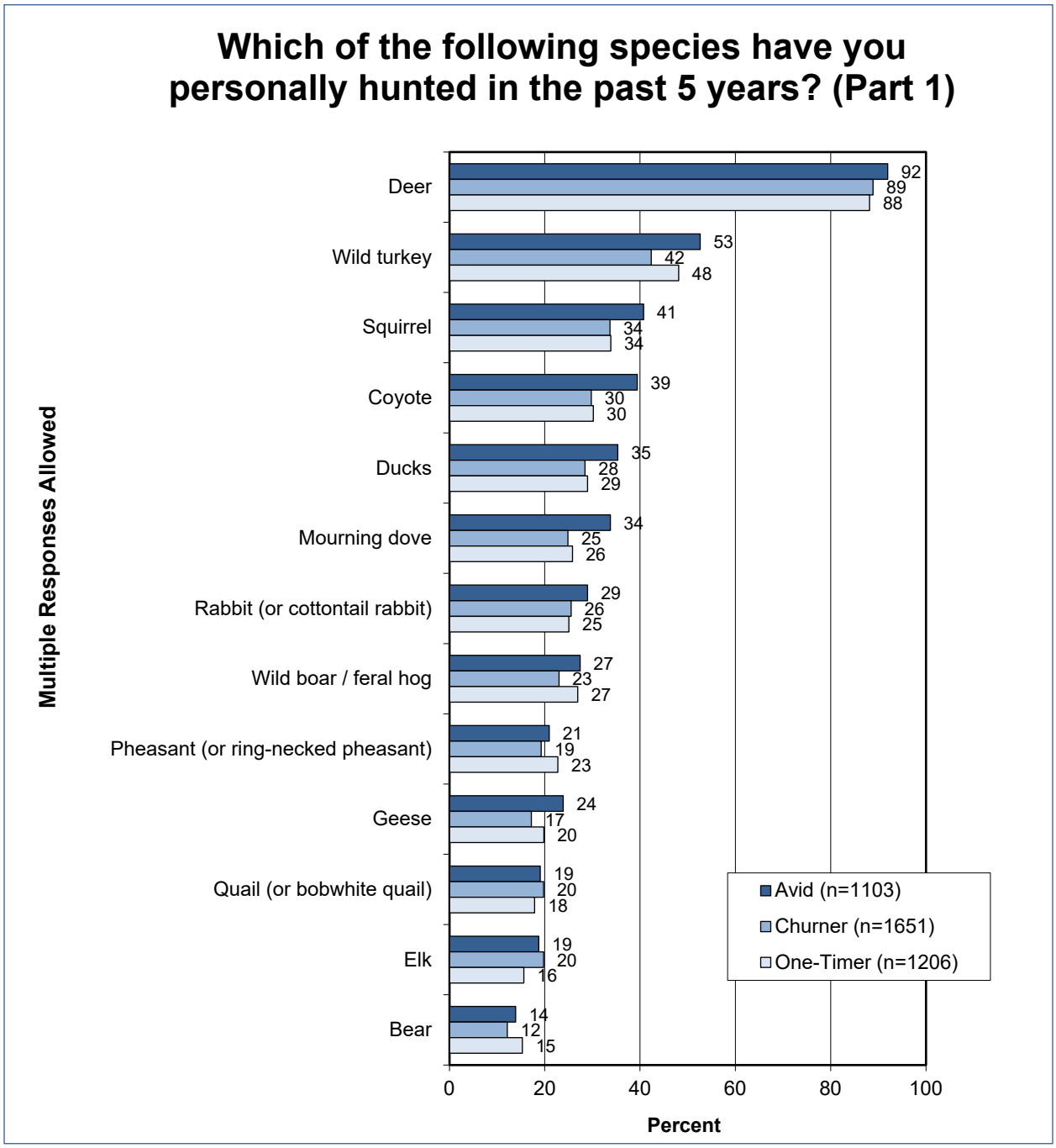


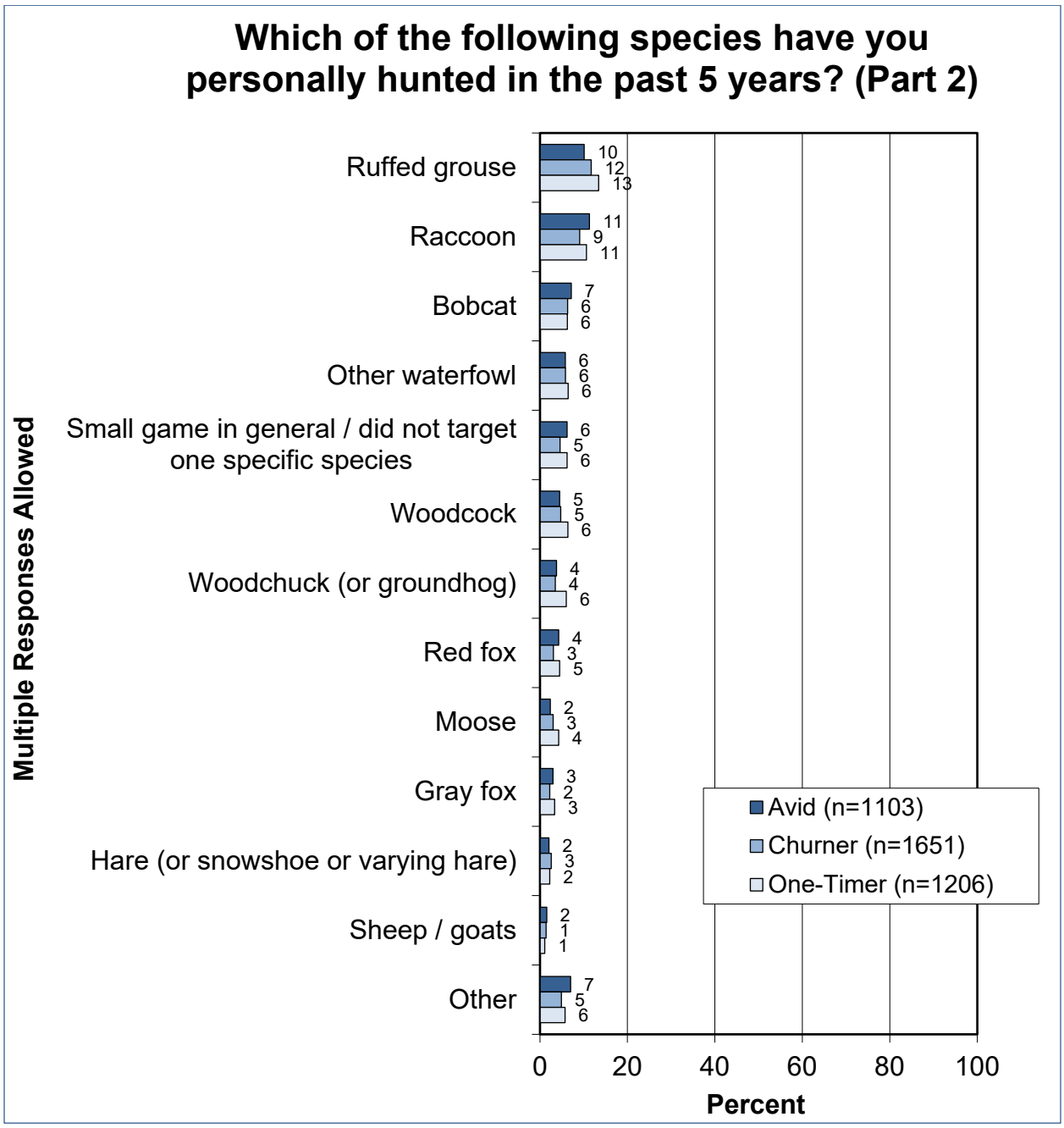


Two additional mentoring questions along with the first question were then used to produce the second of the mentoring graphs: those who had not taken their children hunting were asked if they had taken anybody else hunting who was new to the sport, and those who had not taken their children or anybody else hunting were asked if they had helped a beginner even if they had not gone hunting with them. Although similar percentages had done any mentoring activities, ranging from 91% to 94%, the slightly greater percentage among avids is statistically significant.

SPECIES HUNTED AND HARVEST

The primary purpose of the species hunted question was to obtain data on harvest to test whether harvest success has any correlation with avidity level. A lead-in question asked about species hunted, and then harvest questions obtained data on the harvest success rate. For nearly every one of the species asked about, avid hunters hunted it at a greater percent, but only slightly more (a discussion of statistically significant differences on select species follows the graphs for this question). For instance, the deer hunting rate ranges from 92% among avids to 88% among one-timers. The difference is particularly pronounced in the hunting rate of wild turkey, squirrel, coyote, duck, mourning dove, and geese.





Statistically significant differences for select species are as follows:

- Deer: Avids have a statistically significant higher rate.
- Wild turkey: All groups are statistically different from one another.
- Squirrel: Avids have a statistically significant higher rate.
- Coyote: Avids have a statistically significant higher rate.
- Ducks: Avids have a statistically significant higher rate.
- Geese and ducks combined: Avids have a statistically significant higher rate.
- Mourning dove: Avids have a statistically significant higher rate.

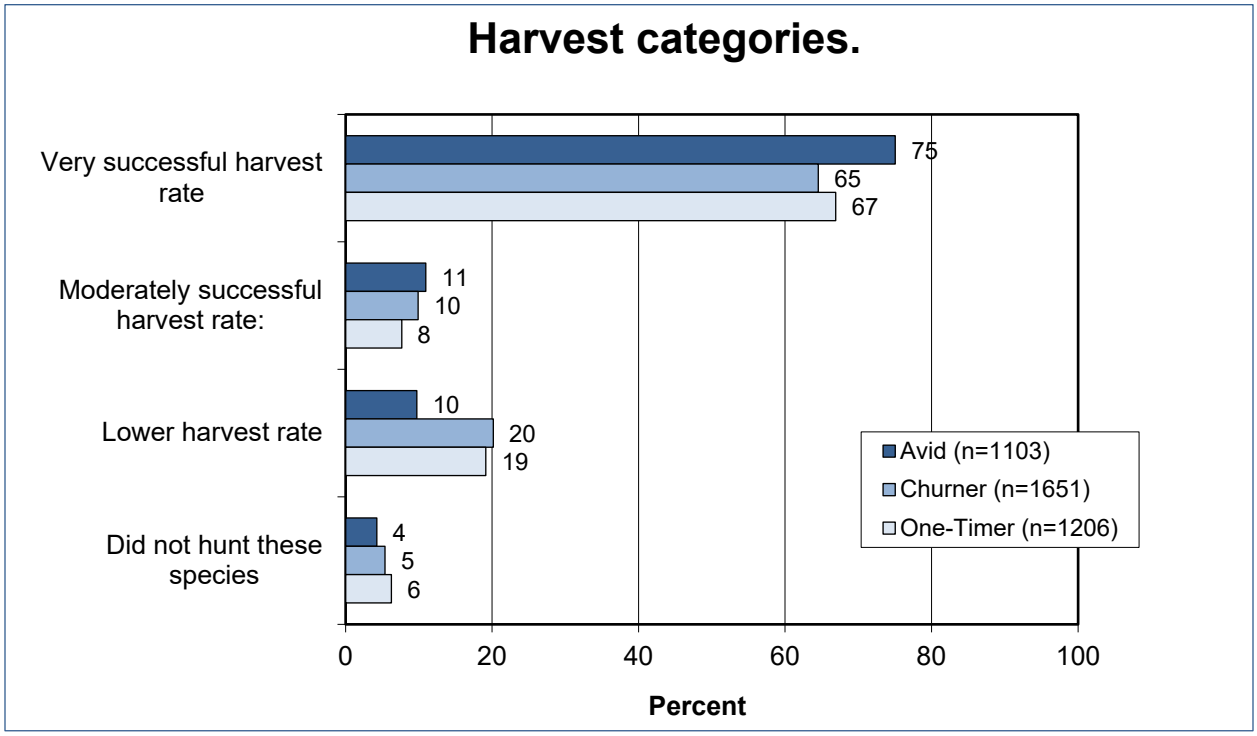
The follow-up harvest questions allowed harvest success categories to be analyzed with regard to avidity. For the analysis, a hunter who met any of the conditions within the category were put into that category. These categories were as follows:

Very successful harvest rate. Did any of the following:
- Hunted deer, had 50% or greater success rate.
- OR
- Hunted bear, had 50% or greater success rate.
- OR
- Hunted turkey, had 50% or greater success rate.
- OR
- Hunted waterfowl, had 75% or greater success rate.
- OR
- Hunted elk or moose, had any harvest.

Moderately successful harvest rate. Did none of the above, but:
- Hunted deer, had harvest.
- OR
- Hunted bear, had harvest.
- OR
- Hunted turkey, had harvest.
- OR
- Hunted waterfowl, had 50% or greater success rate.

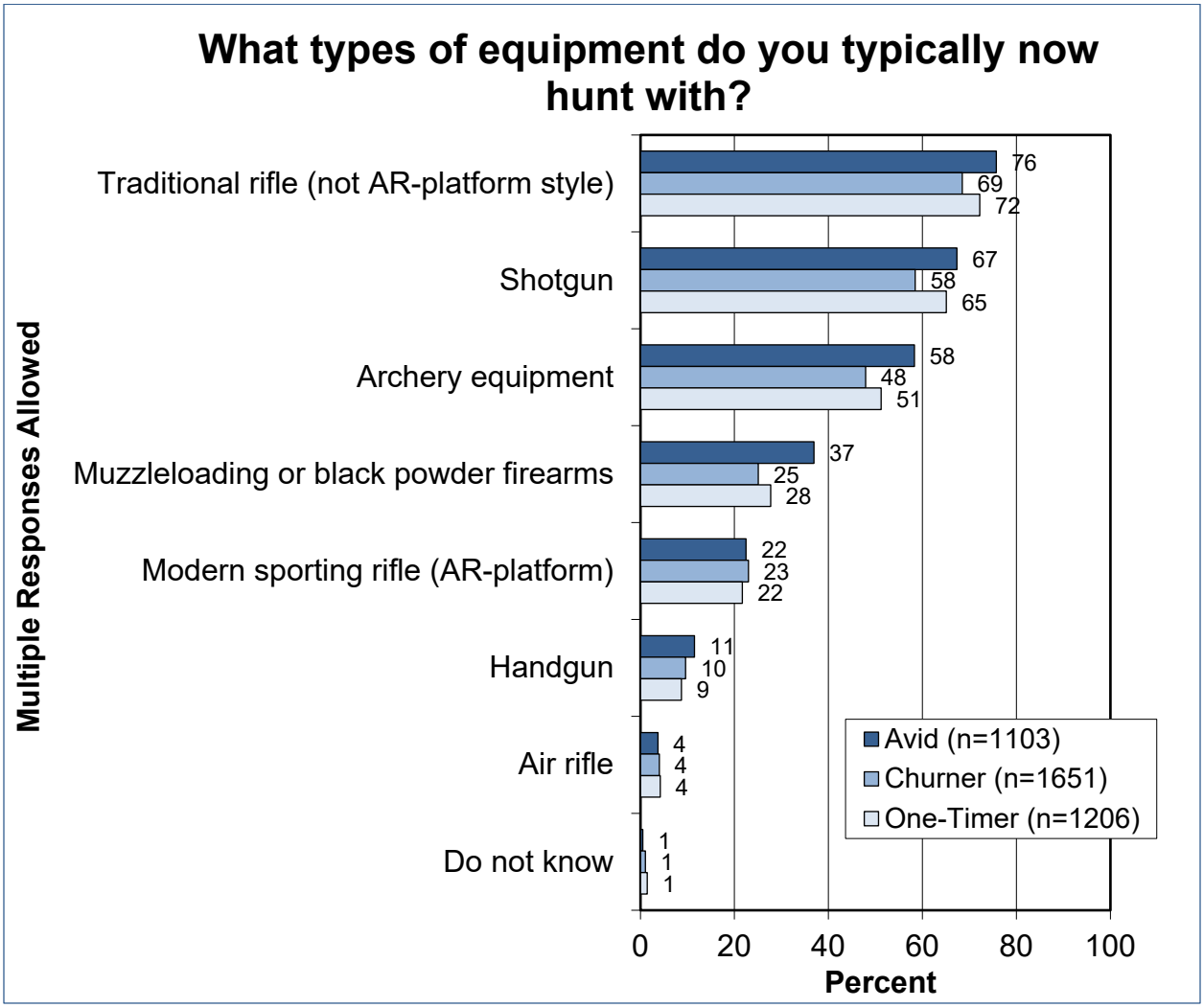
Lower harvest rate: All the rest go into this category.

As can be seen, avids have a higher rate of harvest success, a statistically significant difference.

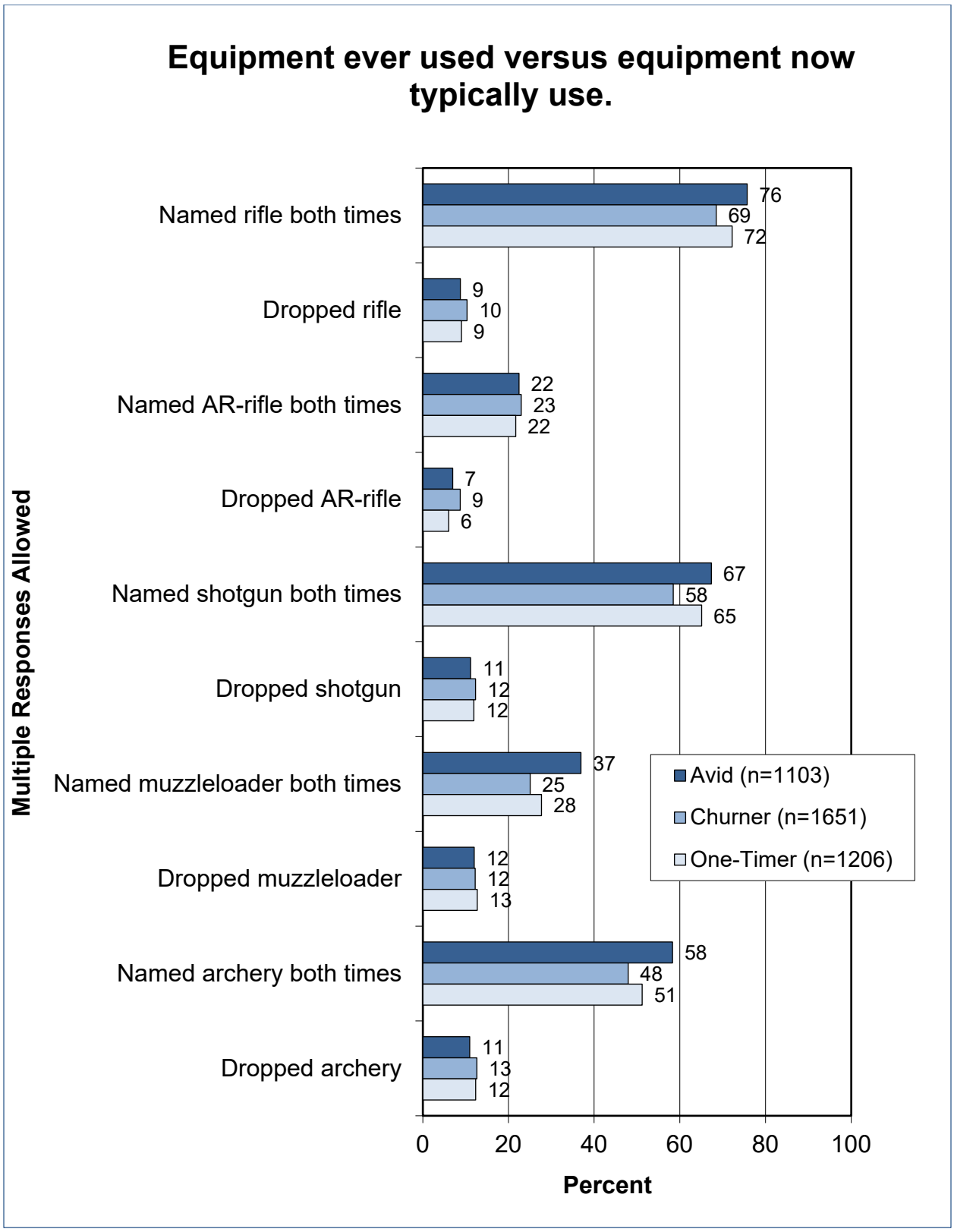


HUNTING EQUIPMENT

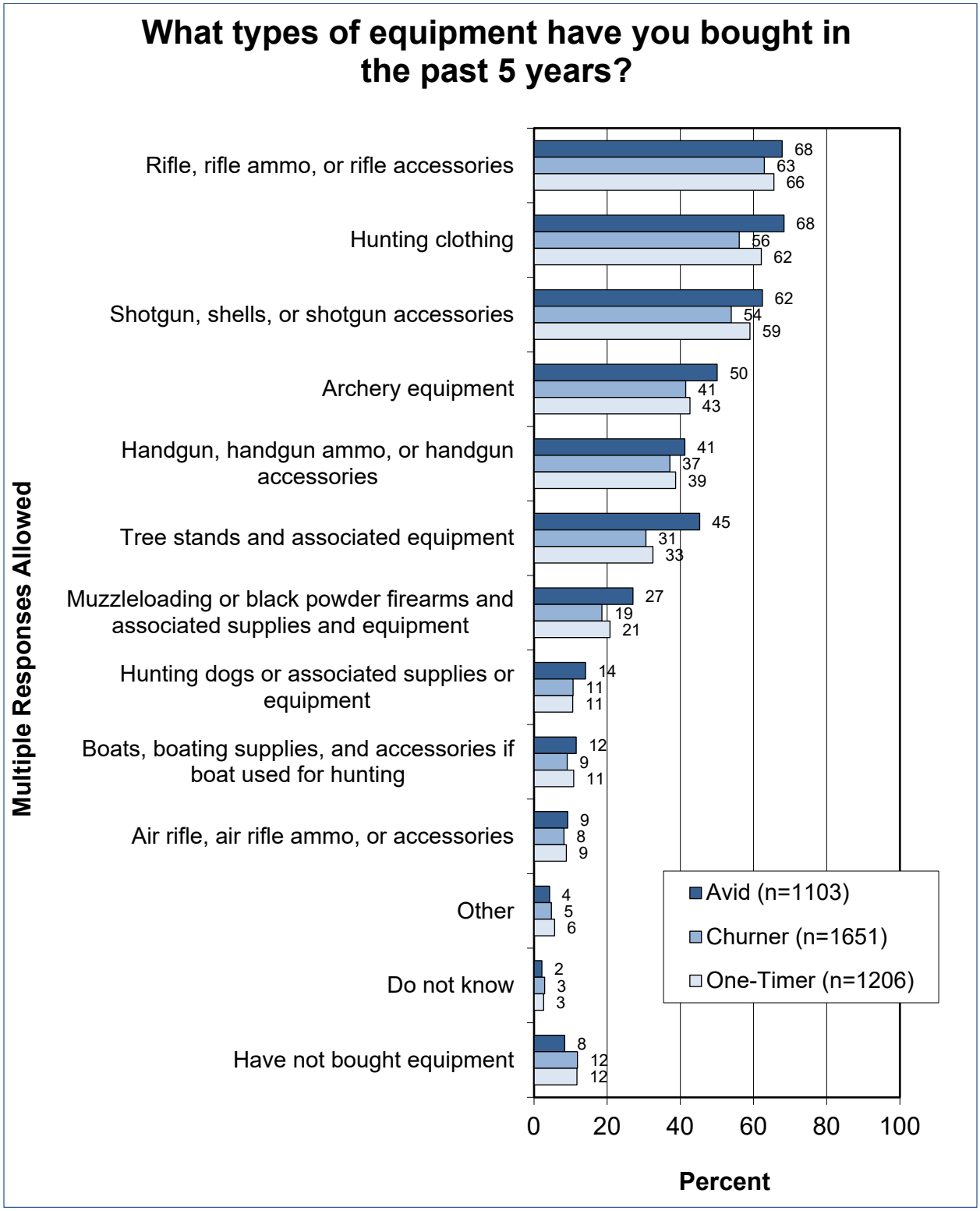
Two questions asked about equipment use: equipment that was *ever used* and equipment *typically used now* by hunters. There are some differences in use now: avids use archery and muzzleloaders at substantially higher rates than do the other groups (these are statistically significant differences).



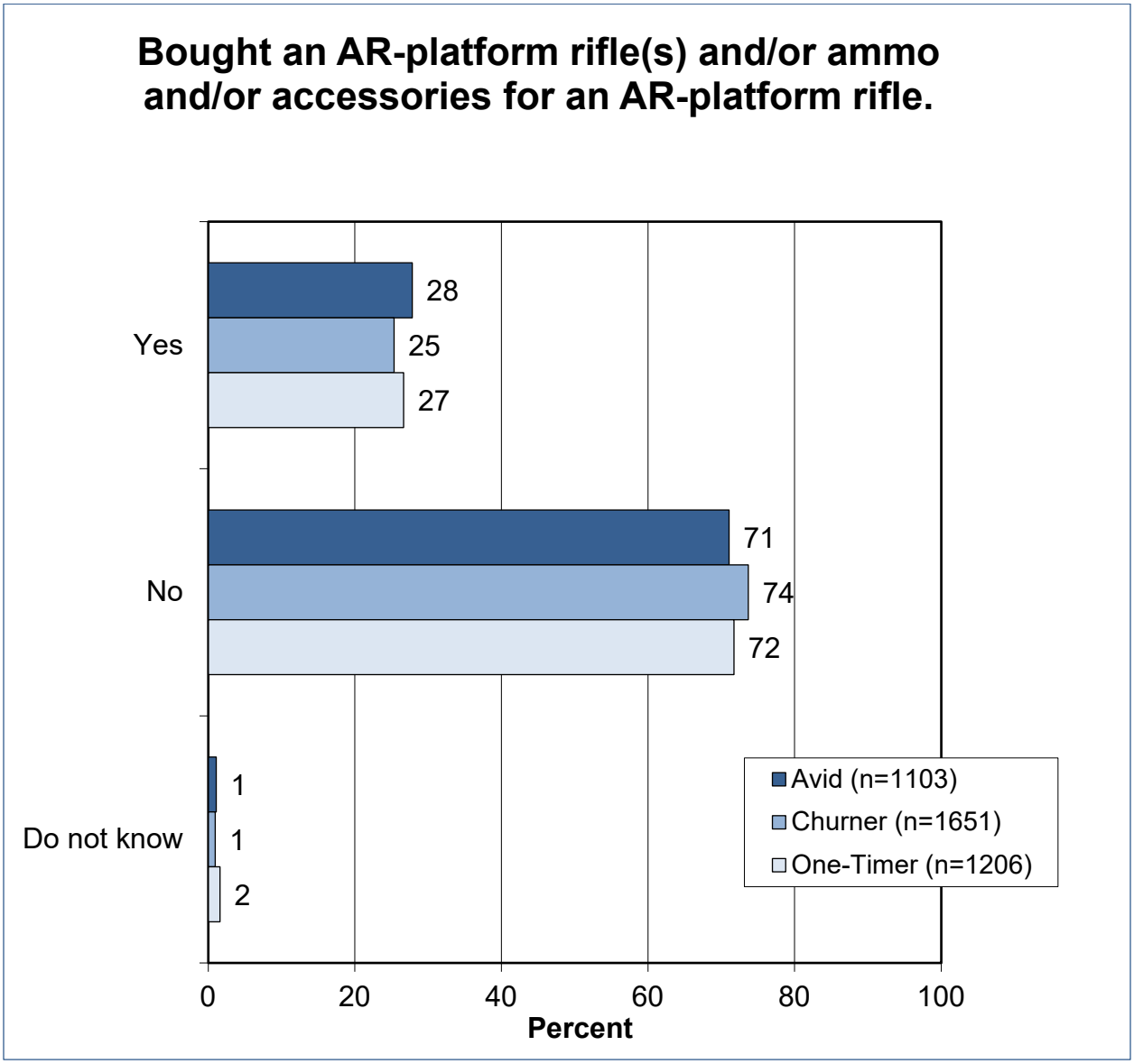
The graph on the following page looks at both questions together. Those who indicated ever using one type of equipment but not typically using that equipment now are shown as having "dropped" the equipment. However, avids are not more likely to have stopped using any particular type of equipment than the other groups. For instance, 9% of avids stopped using rifles, which is nearly the same as among churners (10%) and the same as one-timers (9%).


Equipment ever used versus equipment now typically use.
Multiple Responses Allowed
Named rifle both times
76
69
72
Dropped rifle
9
10
9
Named AR-rifle both times
22
23
22
Dropped AR-rifle
7
9
6
Named shotgun both times
67
58
65
Dropped shotgun
11
12
12
Named muzzleloader both times
37
25
28
Dropped muzzleloader
12
12
13
Named archery both times
58
48
51
Dropped archery
11
13
12
Avid (n=1103)
Churner (n=1651)
One-Timer (n=1206)
0
20
40
60
80
100
Percent

The survey also examined equipment purchases. The groups are quite similar in their purchases. Avids are slightly more likely to purchase hunting clothing, archery equipment, tree stands, muzzleloaders or muzzleloading equipment, and hunting dogs and/or associated supplies. That avids are less likely to have *not* bought equipment (at the bottom of the graph) is statistically significant.

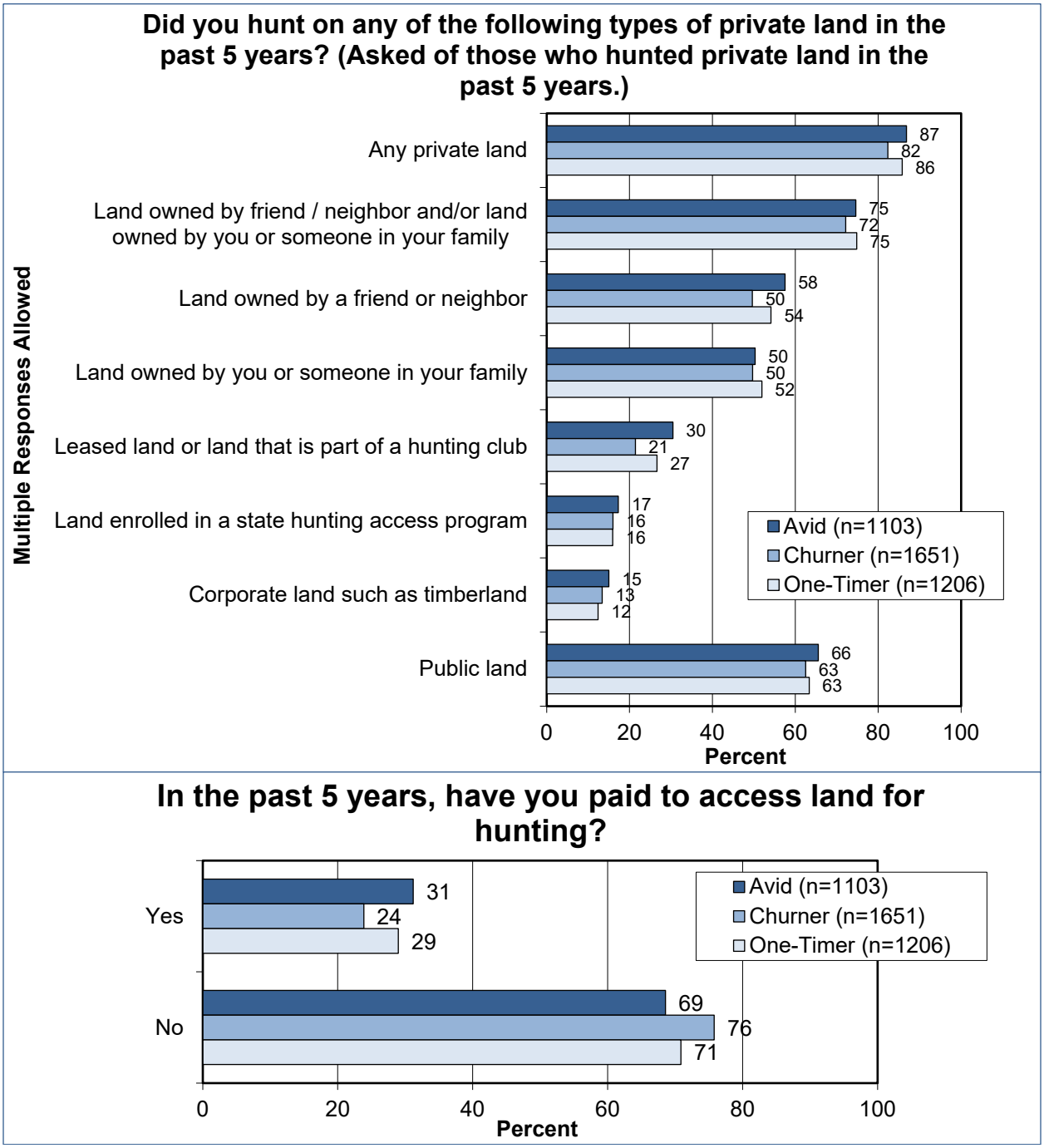


Those who purchased rifles, rifle ammo, or rifle accessories were asked about AR-platform rifles and components. However, the three groups are nearly identical when it comes to having purchased AR-platform rifles or ammo/components for such rifles.

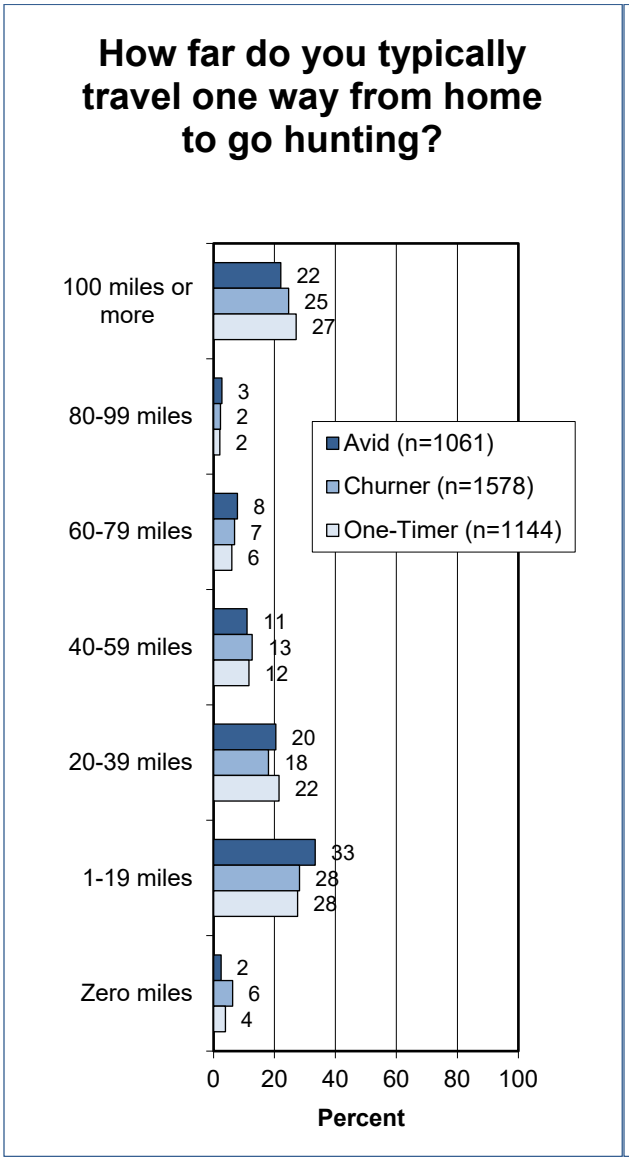


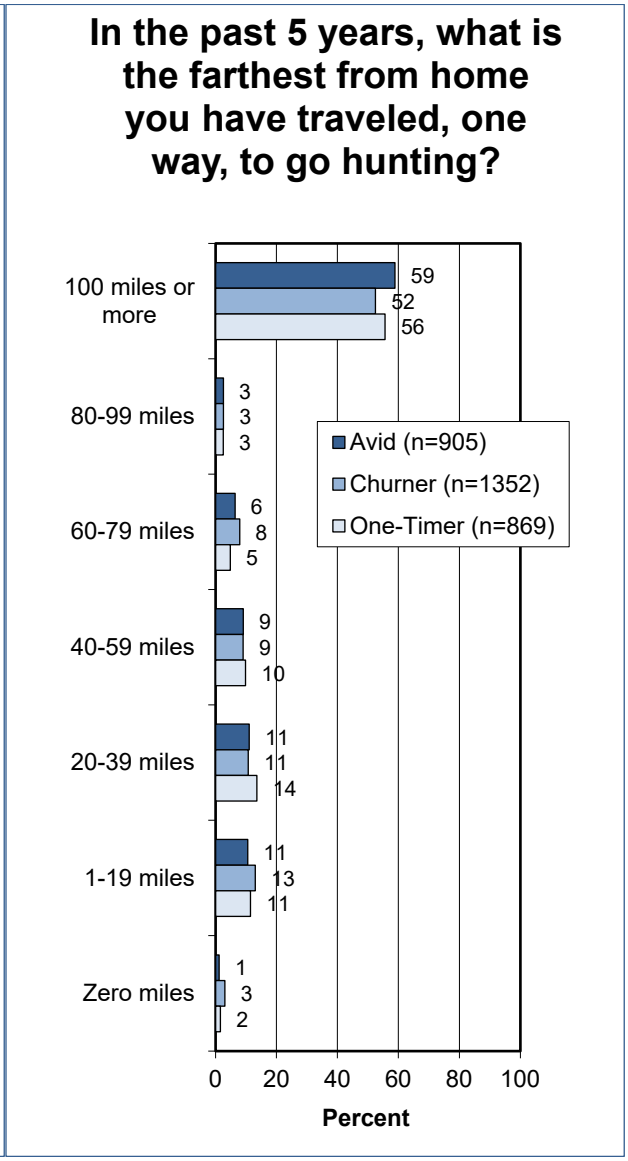
HUNTING LOCATIONS

Land used by hunters does not greatly vary among the three groups. A second graph shows use of land for which an access fee is paid. Avids have the highest rate of paying for access, but only slightly more than one-timers. Of interest is that there were no statistically significant differences among avidity groups in hunting on friend's/neighbor's land or hunting on own/family land. Furthermore, avids and one-timers are not statistically different on hunting public land. (The graph includes a combination of friend's/neighbor's and own/family land, with no marked differences. Also note that all categories are subsets of private land, with the exception of public land.)



The survey explored travel distance, both the typical distance as well as the farthest hunters have travelled in the past 5 years. Typical mean travel distance is slightly shorter for avids (mean of 77.7 miles) than for churners (90.0 miles) and one-timers (87.1 miles), although the median distances are the same for the three groups (30 miles). Regarding the farthest hunters have travelled, one-timers have the longest mean distance.

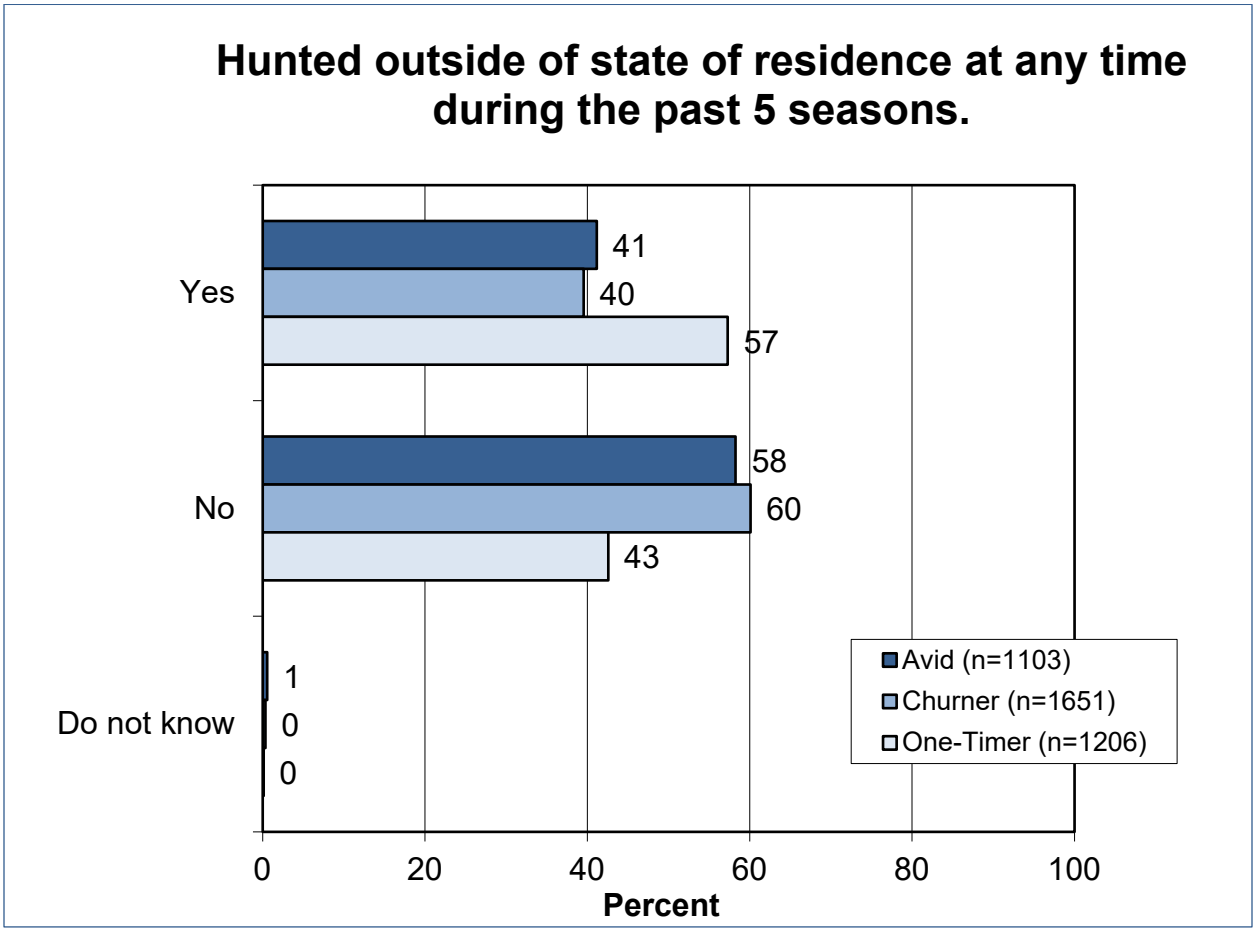




Means / Medians Typical	
Avid:	77.7 / 30
Churner:	90.0 / 30
One-Timer:	87.1 / 30

Means / Medians Farthest	
Avid:	411.1 / 180
Churner:	414.3 / 150
One-Timer:	556.8 / 200

The final locational question determined if hunters had hunted out of state. These results are based on several questions to account for those who had moved in the 5-year time period asked about in the survey. As the graph shows, one-timers are much more likely to have hunted out of state, compared to the other two groups. This difference is statistically significant.



MOTIVATIONS AND SATISFACTIONS FOR HUNTING

The survey presented seven possible motivations for going hunting. For each of them, the survey had hunters rate how important it was as a reason they first went hunting, and then how important it is now as a reason they go hunting. The questions used a 0 to 10 scale where 0 is not at all important and 10 is extremely important. The first table shows the mean ratings for the two times (when first hunted and now). Overall, three motivations become more important in general from first hunting experiences to the latest: connecting with nature (mean ratings for all three avidity groups increases considerably), for the challenge or sport (mean ratings for all three avidity groups increases somewhat), and for exercise (a considerable increase among all three avidity groups).

Note that ratings for hunting to get meat also rises, but this could be a product of the time in which the survey was given. At that moment in time, the Covid-19 pandemic had been ongoing for more than 2 years, and there was some evidence that hunting for meat became more important during the pandemic. Additionally, inflation was quite high at the time of the survey, and it could be that this would drive up the desire for getting meat from hunting (no evidence was found to back this up; it is merely conjecture).

Motivation	Avidity Group	Mean Rating of Importance When First Went Hunting	Mean Rating of Importance Now
To connect with nature	Avid	6.9	8.4
	Churner	7.1	8.2
	One-Timer	7.0	8.3
To be with family	Avid	7.7	7.8
	Churner	7.7	7.5
	One-Timer	7.5	7.3
For the challenge or sport	Avid	7.0	7.5
	Churner	6.9	7.3
	One-Timer	6.8	7.3
To get meat	Avid	6.7	7.2
	Churner	6.9	7.2
	One-Timer	6.8	7.2
To be with friends	Avid	6.9	7.2
	Churner	6.7	6.9
	One-Timer	6.5	6.8
For exercise	Avid	3.3	5.0
	Churner	3.5	4.8
	One-Timer	3.3	4.6
To get a trophy	Avid	4.2	4.4
	Churner	3.9	3.7
	One-Timer	4.1	3.9

The only difference that is statistically significant in the means in the column for *first hunted* is that avids have a higher mean in the "to be with friends" reason.

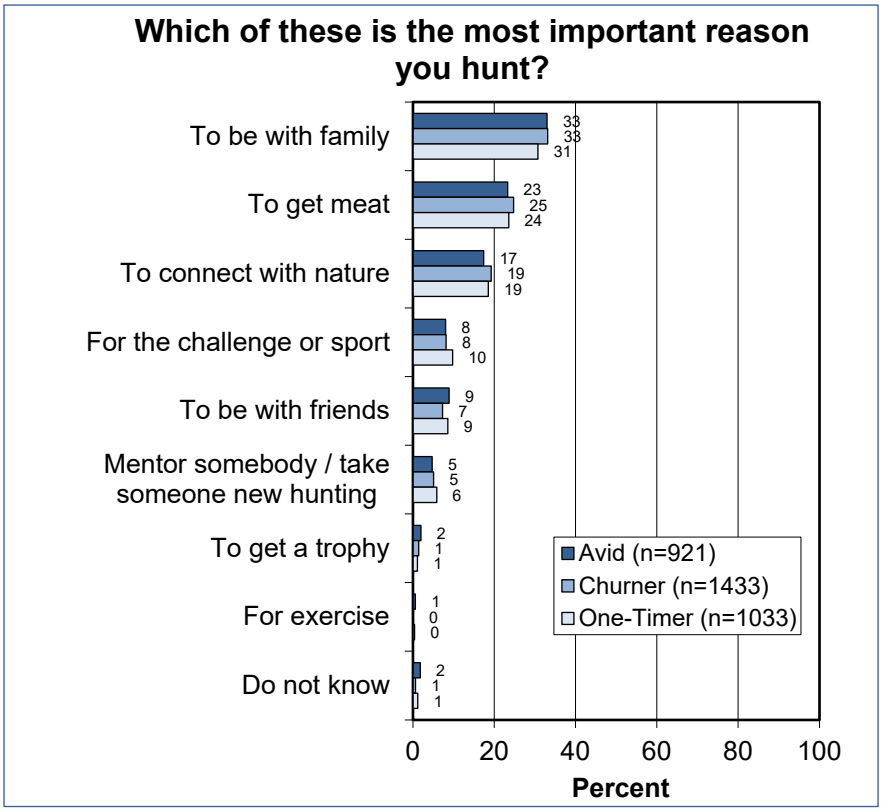
Statistically significant differences in the column for *hunting now* are that avids have a higher mean than one-timers for the reasons "to be with family" and "for exercise"; avids have a higher mean than both other groups for the reasons "to be with friends" and "to get a trophy."

These cells are shaded light green.

Further analyses were conducted on these questions. Because both questions were asked of respondents, each respondent could be categorized as follows for each motivation: the motivation could have gone down in importance, it could have stayed the same in importance, or it could have gone up in importance. This analysis suggests that only two motivations have show a rise in importance among avids more so than churners and one-timers: for exercise and

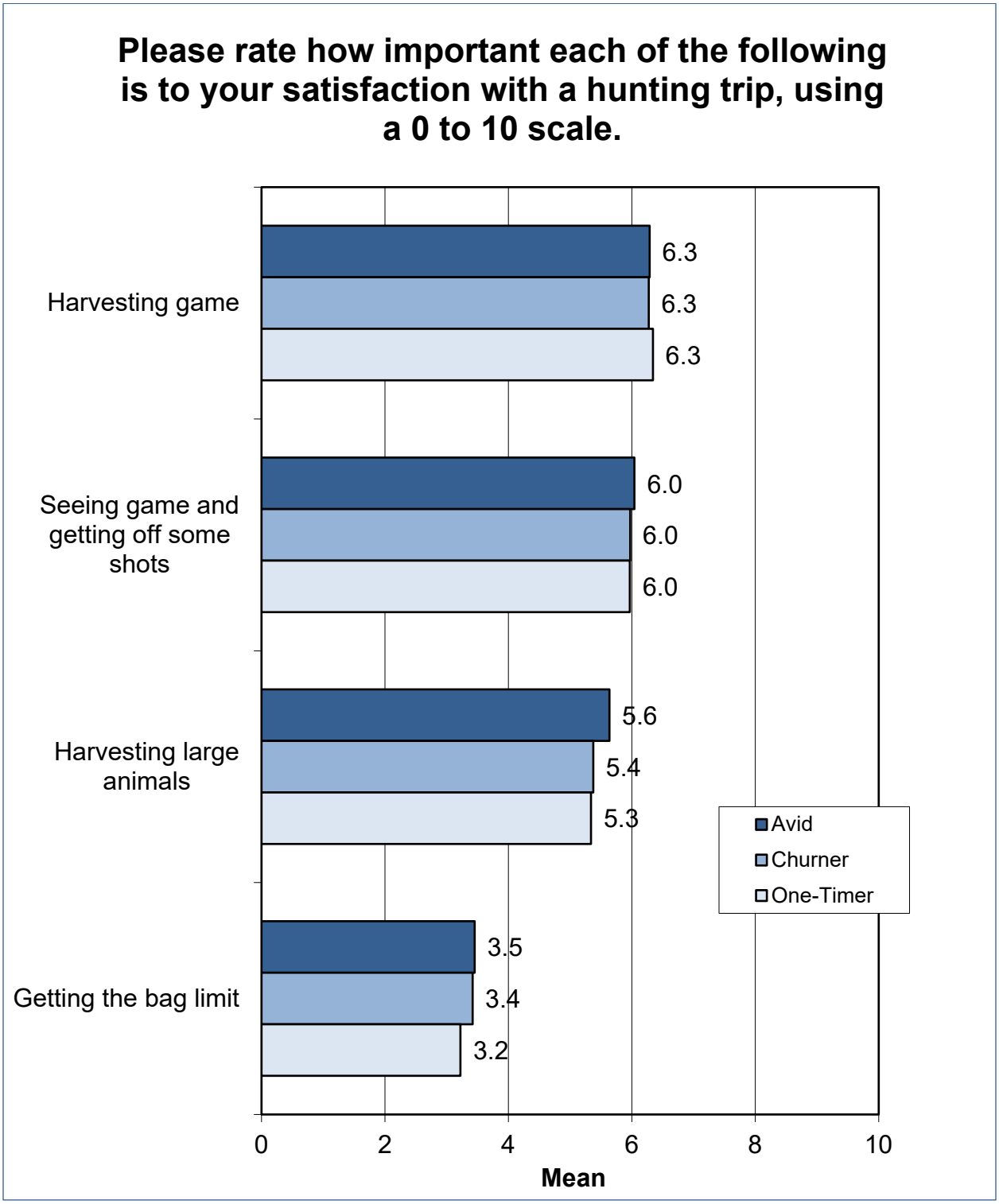
to get a trophy. However, both of those are the least important overall. Otherwise, the three groups are similar in the percentages whose importance rating went up or down.

Motivation	Avidity Group	Percent Whose Rating Went Down	Percent Whose Rating Stayed the Same	Percent Whose Rating Went Up
To connect with nature	Avid	1	64	35
	Churner	2	68	30
	One-Timer	2	64	34
To be with family	Avid	19	62	19
	Churner	20	64	15
	One-Timer	22	59	19
For the challenge or sport	Avid	9	68	23
	Churner	10	70	21
	One-Timer	9	68	23
To get meat	Avid	14	61	25
	Churner	16	64	21
	One-Timer	14	64	22
To be with friends	Avid	15	62	24
	Churner	14	67	19
	One-Timer	14	64	23
For exercise	Avid	3	62	35
	Churner	4	66	30
	One-Timer	3	66	31
To get a trophy	Avid	19	57	24
	Churner	21	63	16
	One-Timer	21	60	19



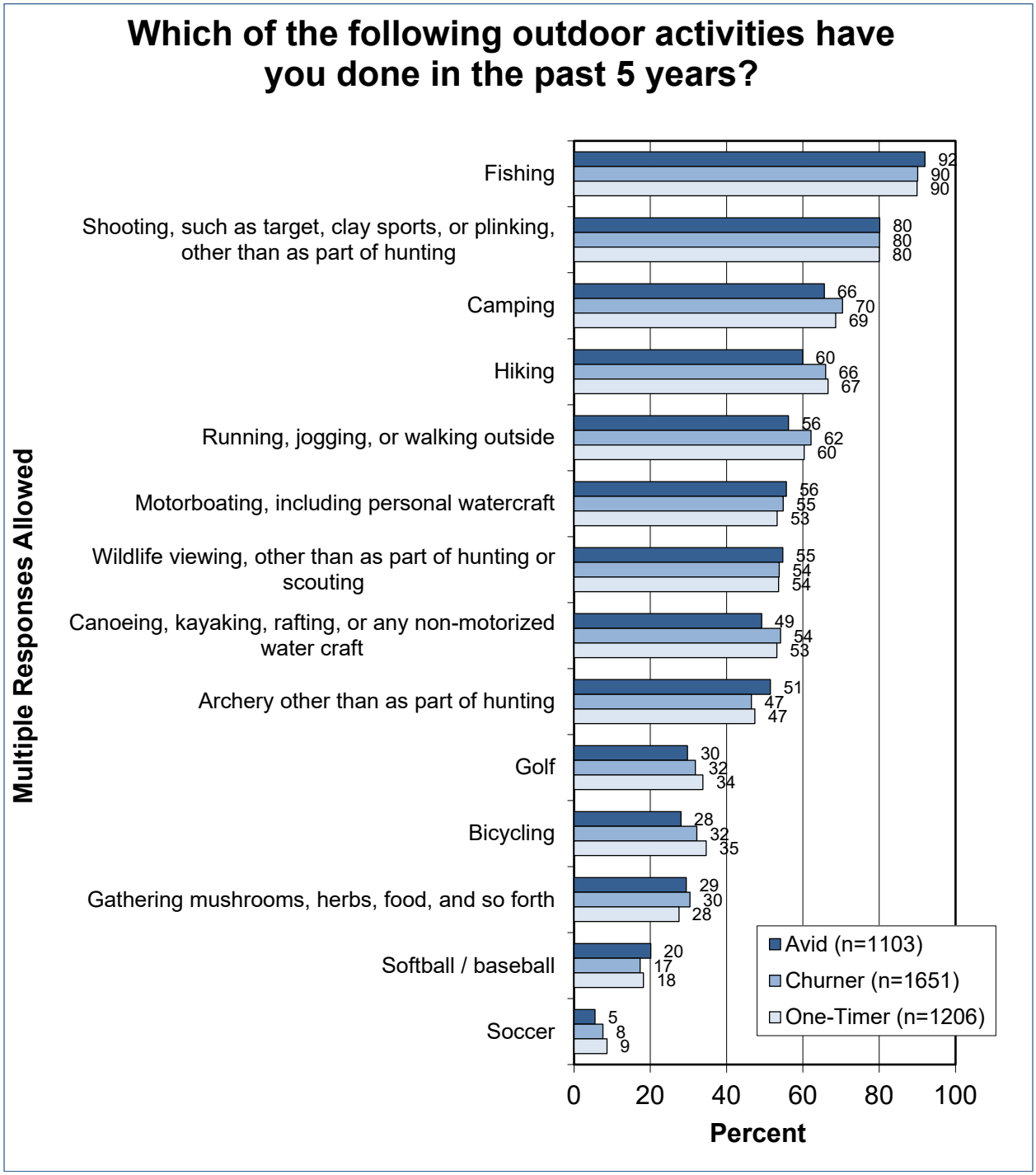
After these questions where each motivation was rated in importance, the survey asked hunters to choose their single most important reason for hunting. On this question, the groups are remarkably similar—there were no statistically significant differences. (Mentoring was added in this list; it is a motivation low on the list for all groups.)

The survey examined the importance of various satisfactions, asking hunters to rate them on a 0 to 10 scale, where 0 is not at all important and 10 is extremely important. There are no marked differences by avidity group.



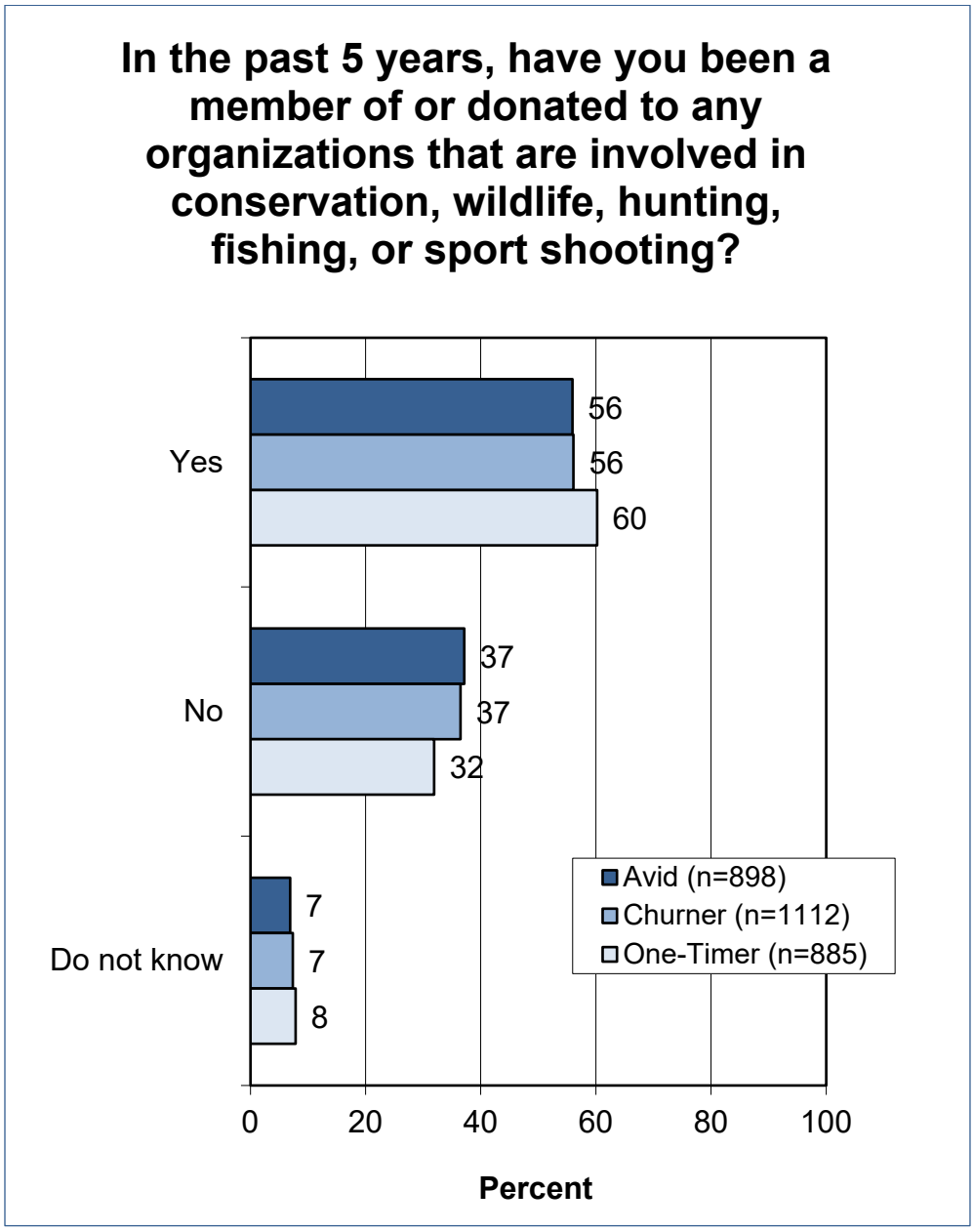
CROSSOVER ACTIVITIES

The three groups are similar in their other outdoor activities, with only slight differences. Avids have a lower percentage who have camped (statistically different from churners on this), hiked (statistically different from both other groups), ran/jogged/walked (statistically different from churners), gone canoeing/kayaking/non-motorized boating (statistically different from churners), bicycled (statistically different from both other groups), and soccer (statistically different from one-timers).



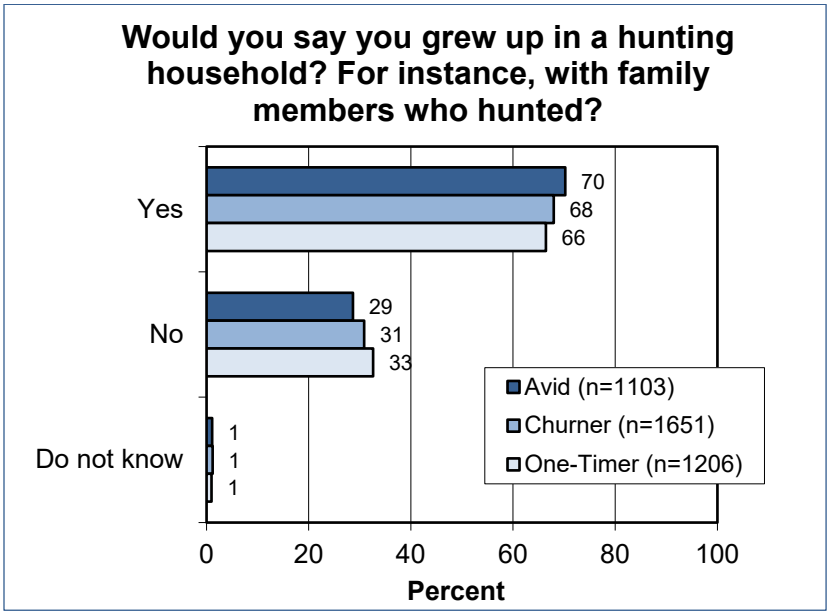
INVOLVEMENT IN ORGANIZATIONS

A little more than half of avids and churners, and well more than half of one-timers, have been members of or donated to an organization devoted to conservation, wildlife, and related outdoor activities. There is no statistically significant difference in the yes response on this.



INTRODUCTION TO HUNTING

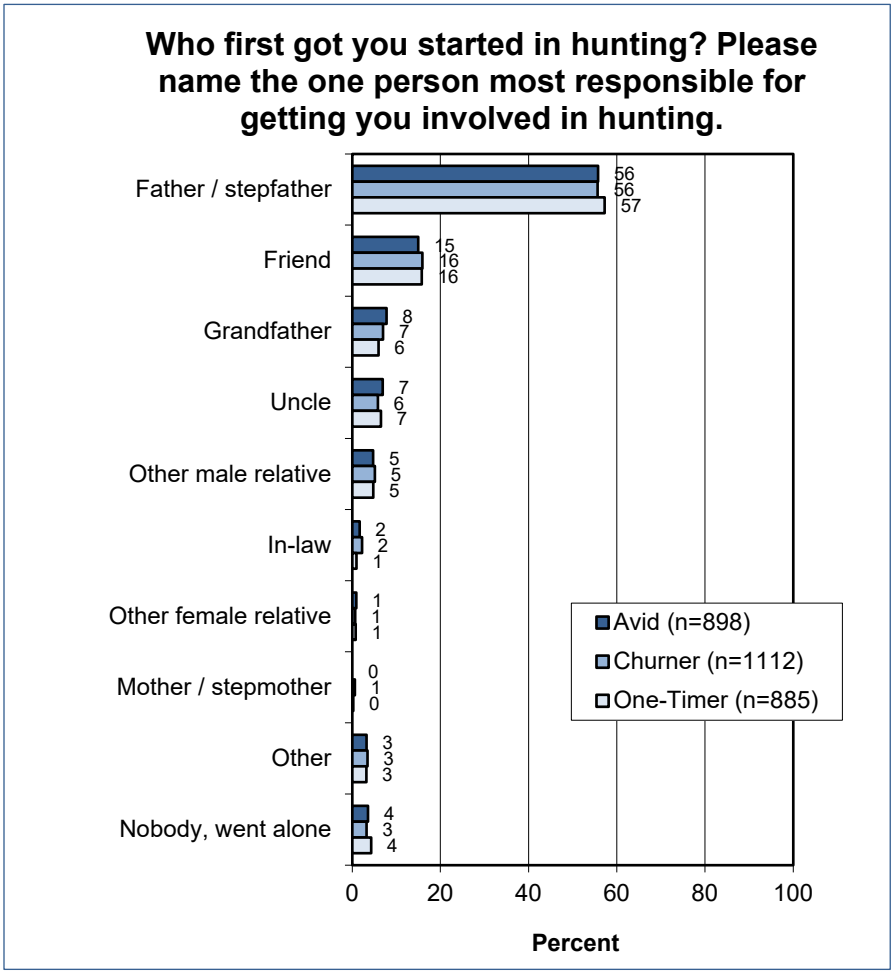
One of the questions in this line asked about growing up in a hunting household. Although avids had just a slightly higher rate, the differences are not statistically significant.



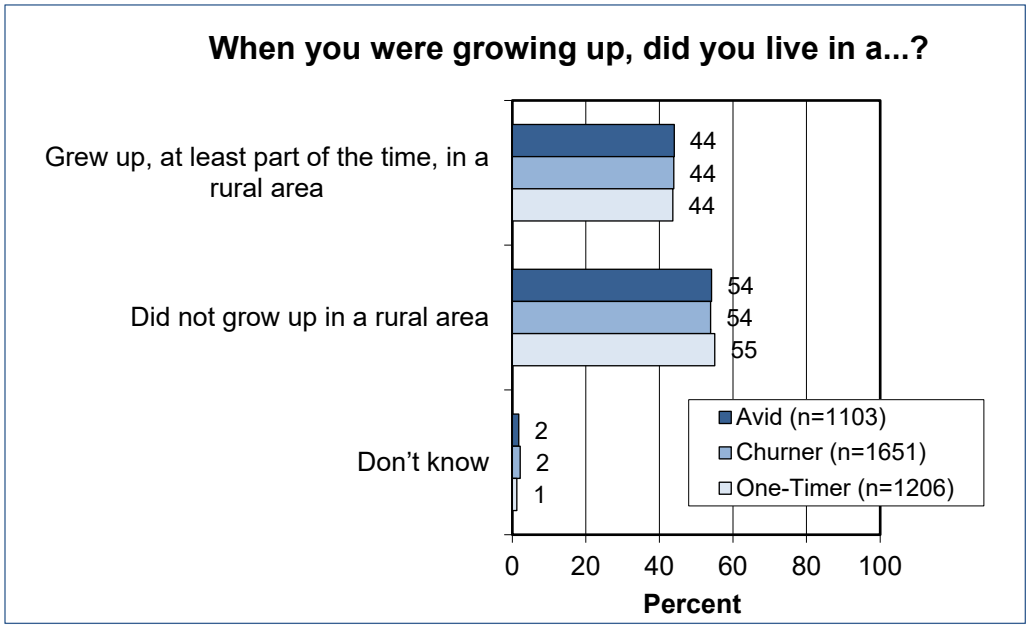
The analyses examined the demographic makeup of the groups identified in this graph. For instance, it was of interest to see the demographic characteristics of those avids who did not have the traditional route into hunting of being introduced through a hunting family—the 29% of avids who answered "no" above. Therefore, the age and gender breakdown of the groups identified above were tabulated. Each of the bars in the above graph (ignoring the do not know responses) were examined separately; for instance, the 70% of avids who grew up in a hunting household (the top bar in the above graph) have the age and gender breakdown as shown in the first column of data). The data suggest that each group (avid, churner, one-timer) has similar characteristics when broken down by growing up in a hunting household—in other words, marked differences just did not appear based on this characteristic.

	Grew Up in Hunting Household, Avid	Did Not Grow Up in Hunting Household, Avid	Grew Up in Hunting Household, Churner	Did Not Grow Up in Hunting Household, Churner	Grew Up in Hunting Household, One-Timer	Did Not Grow Up in Hunting Household, One-Timer
65 years old or older	18	19	17	15	18	18
55-64 years old	24	23	21	18	19	15
45-54 years old	20	23	18	20	20	15
35-44 years old	17	15	18	20	16	27
25-34 years old	15	15	16	17	15	18
18-24 years old	4	2	7	6	9	4
	100	100	100	100	100	100
Male	94	94	91	90	92	90
Not male	6	6	10	10	8	10
	100	100	100	100	100	100

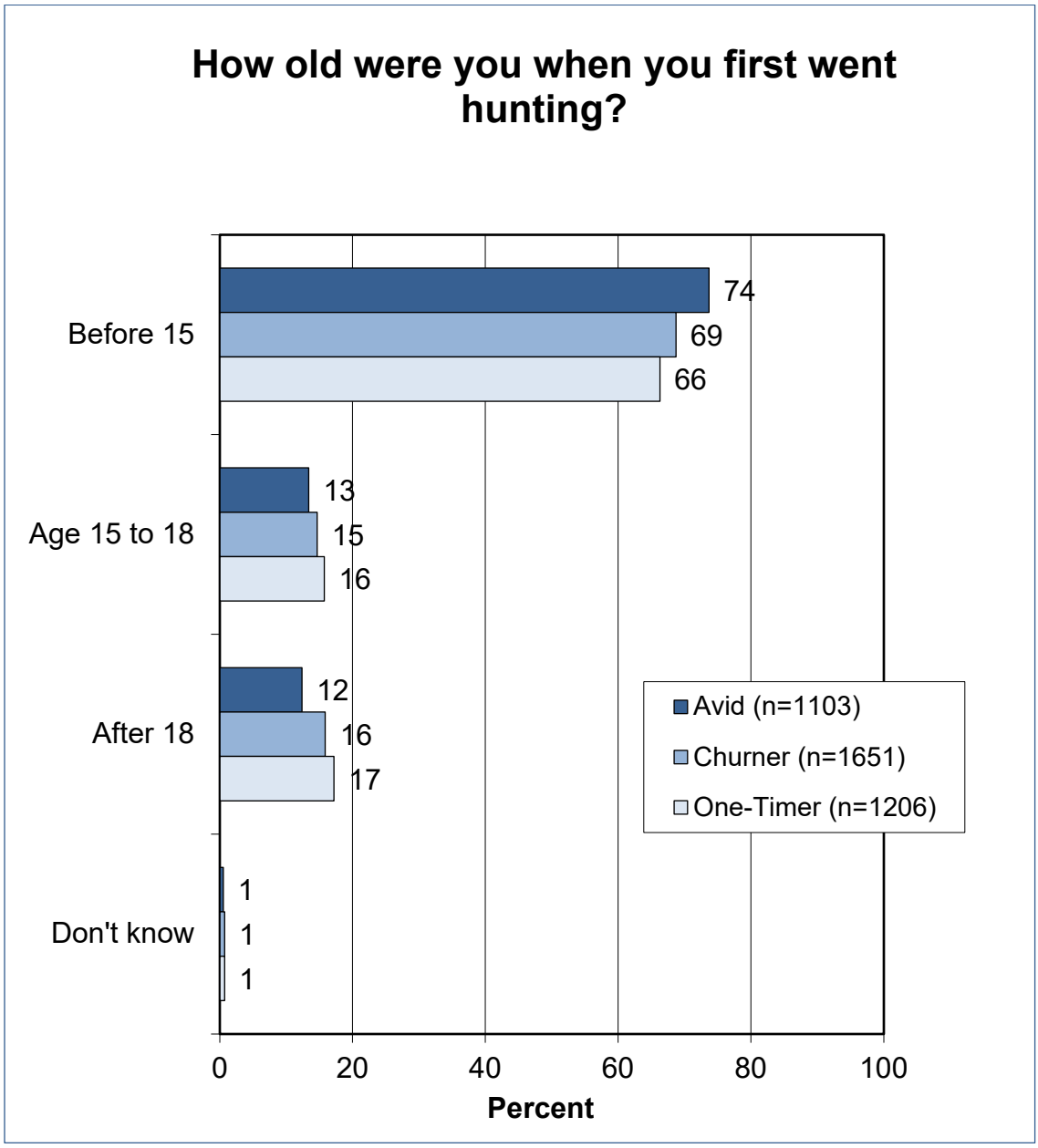
Avids, churners, and one-timers are remarkably similar regarding by whom introduced them into hunting—there are no statistically significant differences. Conventional wisdom is that avid hunters came from a hunting household and were introduced into hunting by their father or other male family member. However, the same can be said for churners and one-timers, as well.



Hunting is rural sport—it takes place in rural areas—but most hunters in the survey had not grown up in a rural area. Interestingly, the three groups are the same on this.



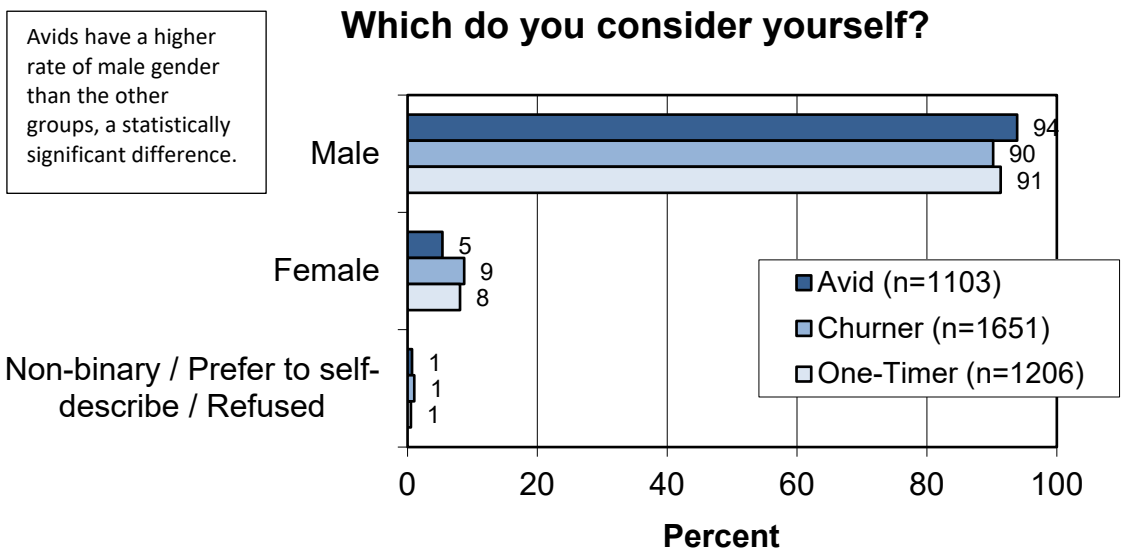
Another question in this section asked hunters to indicate their age when they first went hunting. In this question, the survey obtained the specific age; post-survey analyses put them into the categories shown. Avids more often started very early in life, compared to the other groups, a statistically significant difference.



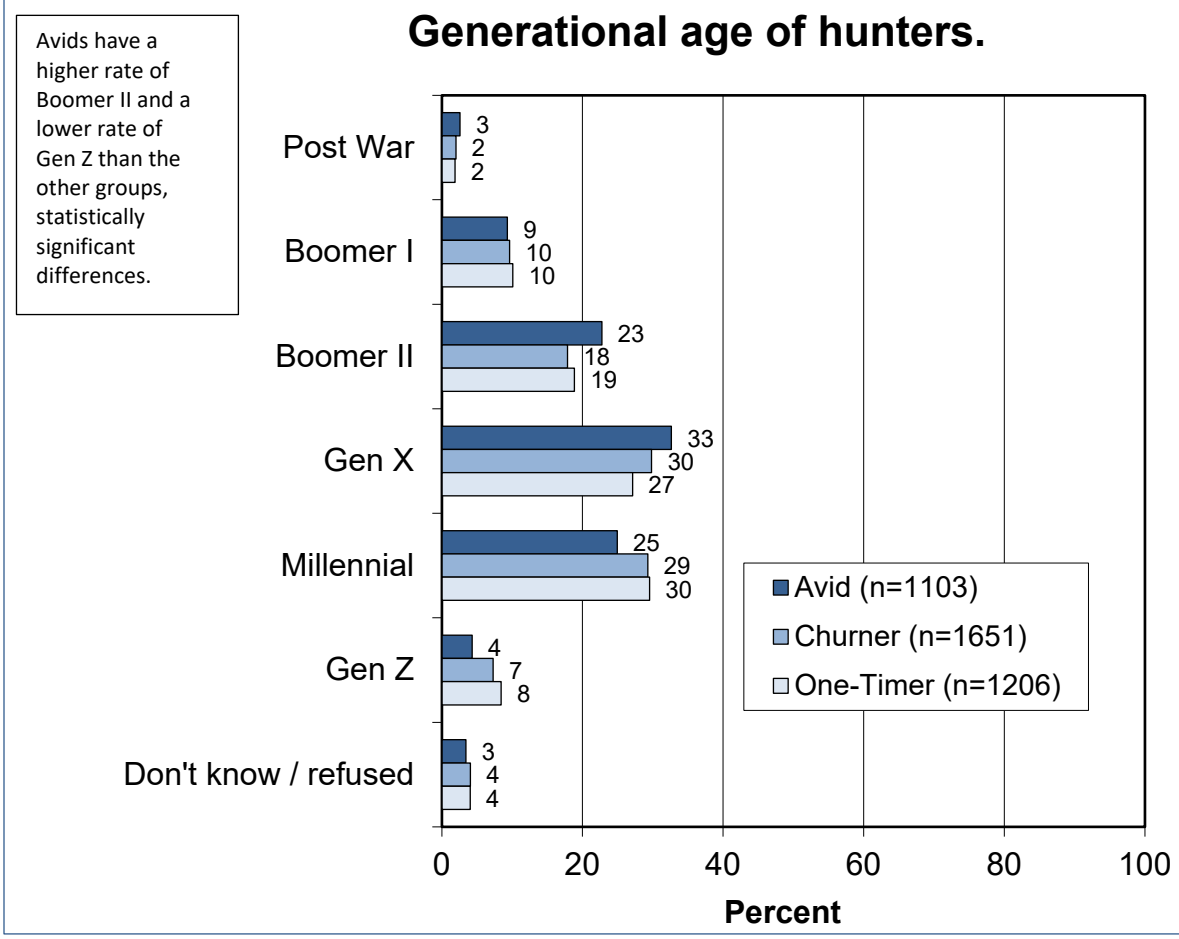
DEMOGRAPHIC INFORMATION AND OTHER PERSONAL CHARACTERISTICS

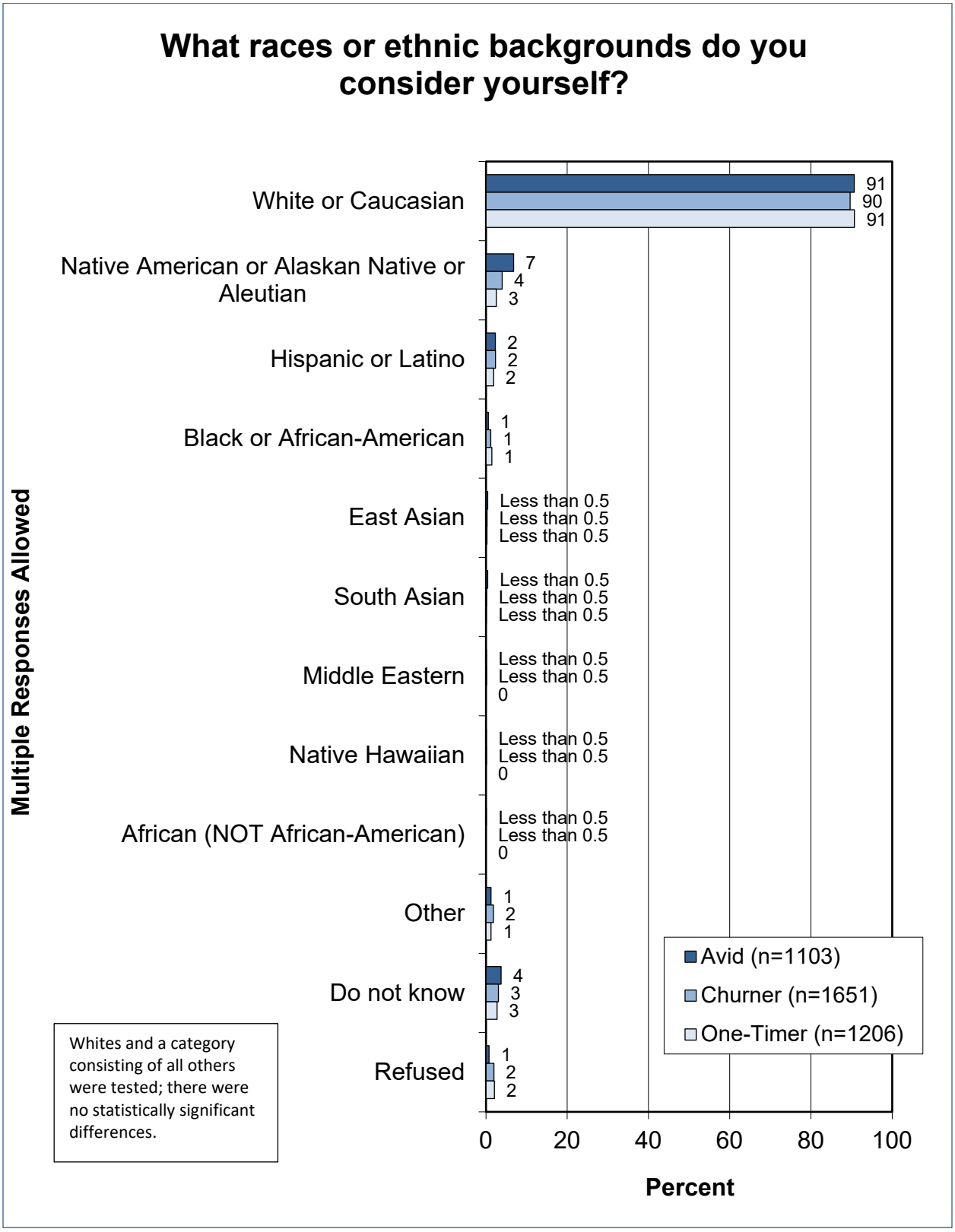
Demographic information was gathered for crosstabulations and further analyses: gender, age, ethnicity, residential area, education, occupation, and income. Other information gathered were the hunter's comfort level talking about hunting and political affiliation. Results of significance tests are shown on those questions that were analyzed.

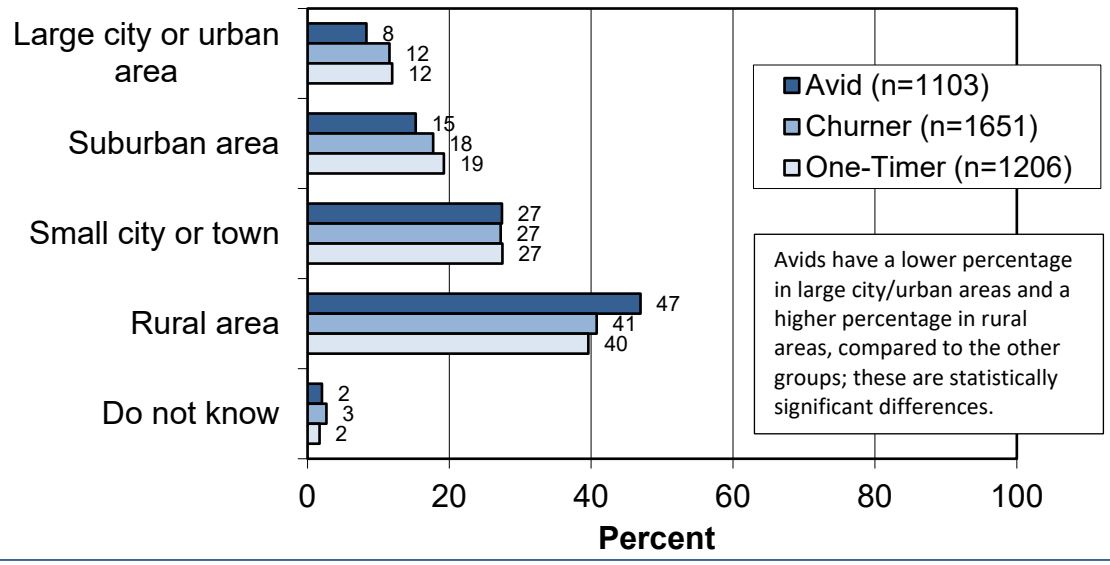
Avids have a higher rate of male gender than the other groups, a statistically significant difference.

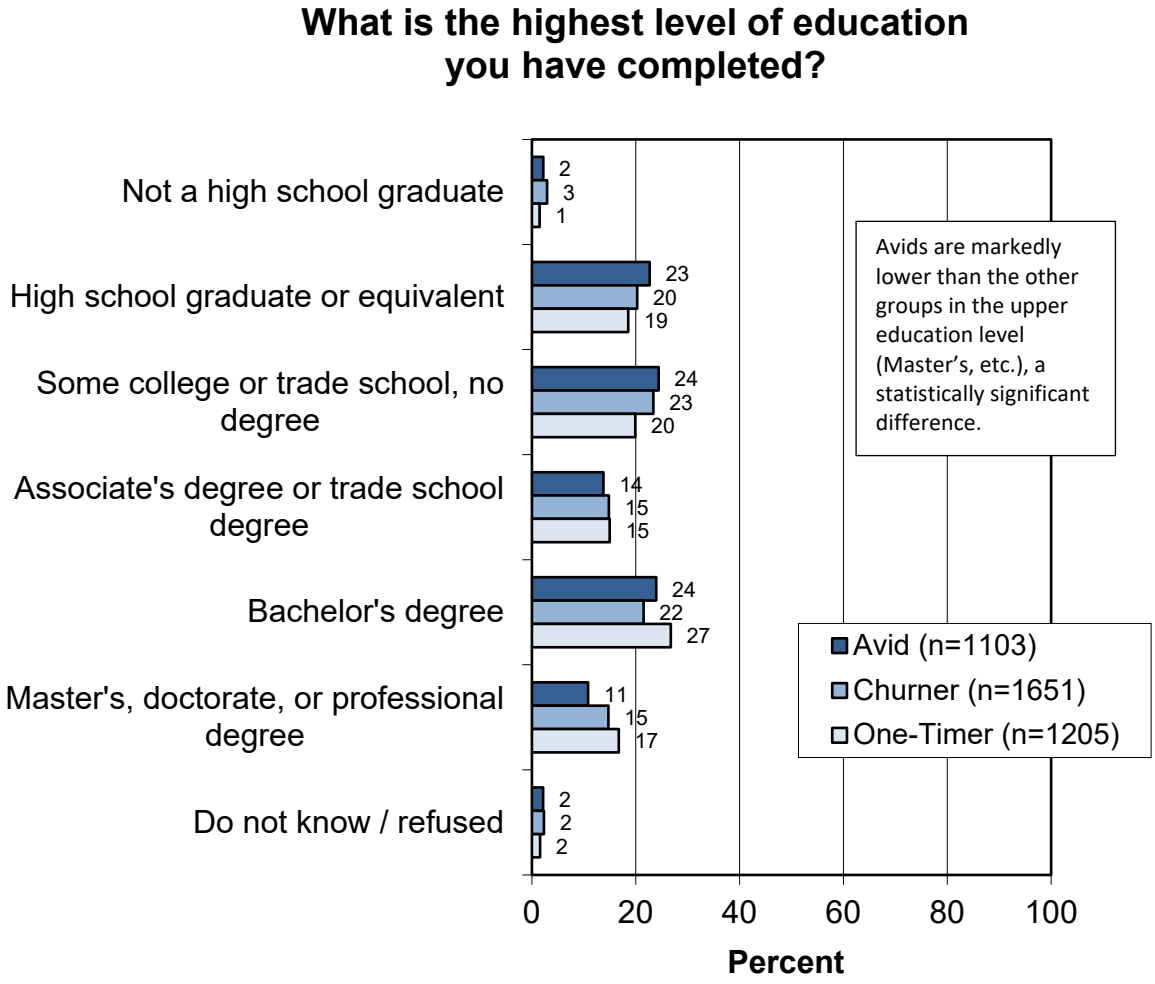


Avids have a higher rate of Boomer II and a lower rate of Gen Z than the other groups, statistically significant differences.

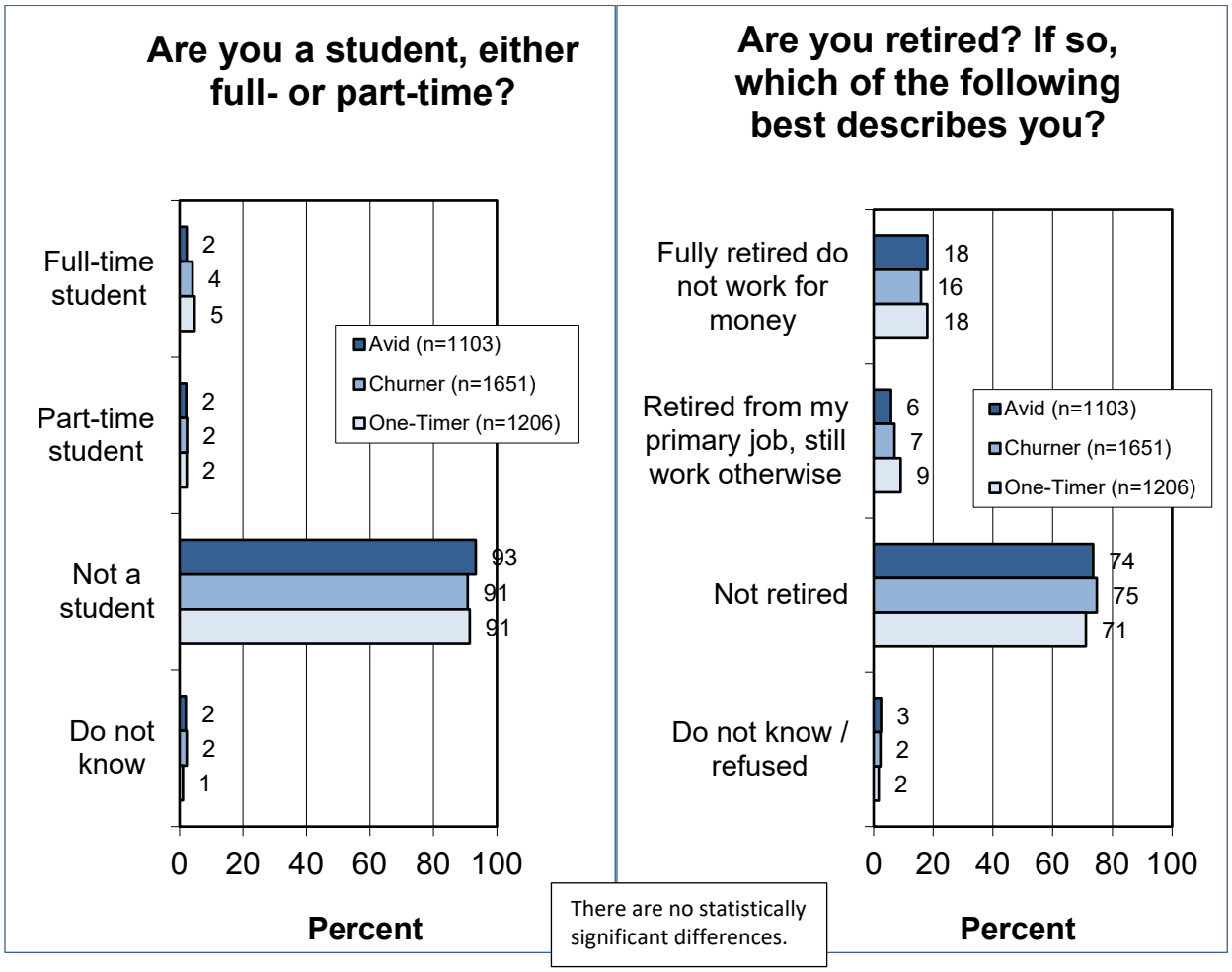


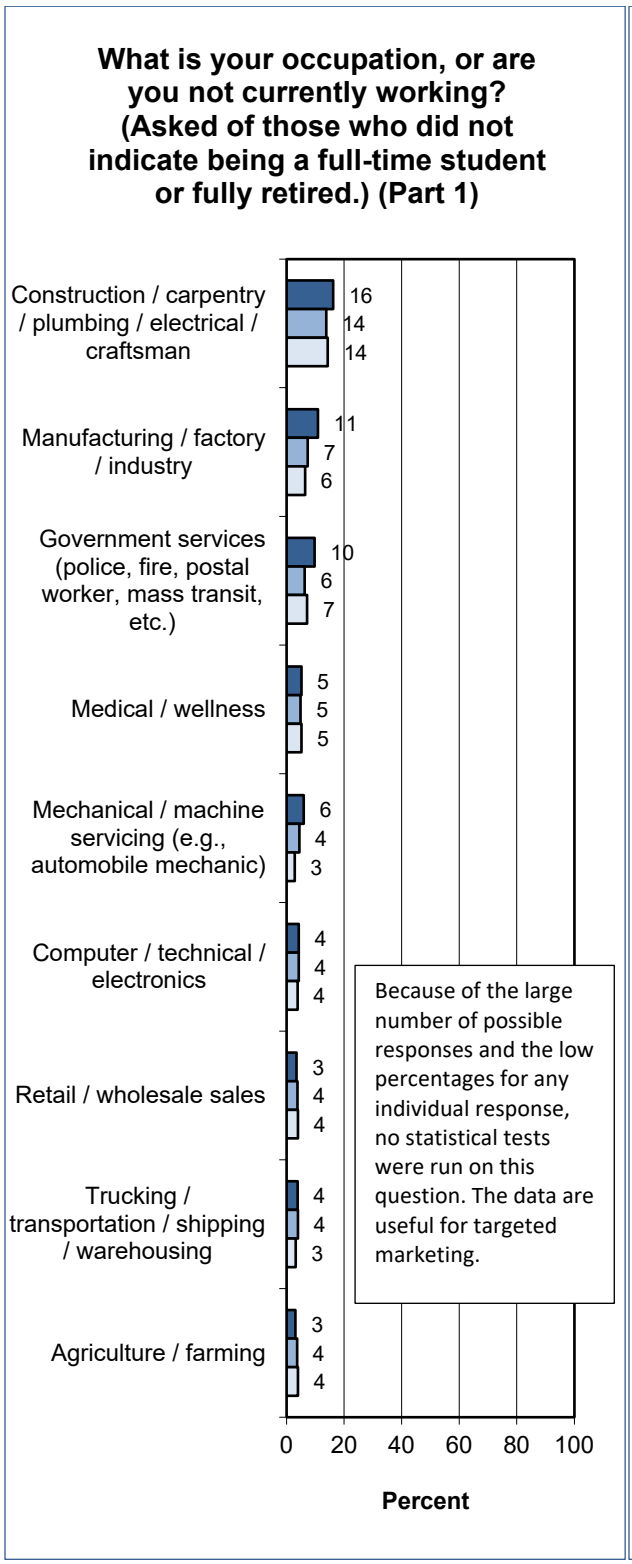

What races or ethnic backgrounds do you consider yourself?
Multiple Responses Allowed
White or Caucasian
91
90
91
Native American or Alaskan Native or Aleutian
7
4
3
Hispanic or Latino
2
2
2
Black or African-American
1
1
1
East Asian
Less than 0.5
Less than 0.5
Less than 0.5
South Asian
Less than 0.5
Less than 0.5
Less than 0.5
Middle Eastern
Less than 0.5
Less than 0.5
0
Native Hawaiian
Less than 0.5
Less than 0.5
0
African (NOT African-American)
Less than 0.5
Less than 0.5
0
Other
1
2
1
Do not know
4
3
3
Refused
1
2
2
Avid (n=1103)
Churner (n=1651)
One-Timer (n=1206)
0
20
40
60
80
100
Percent
Whites and a category consisting of all others were tested; there were no statistically significant differences.

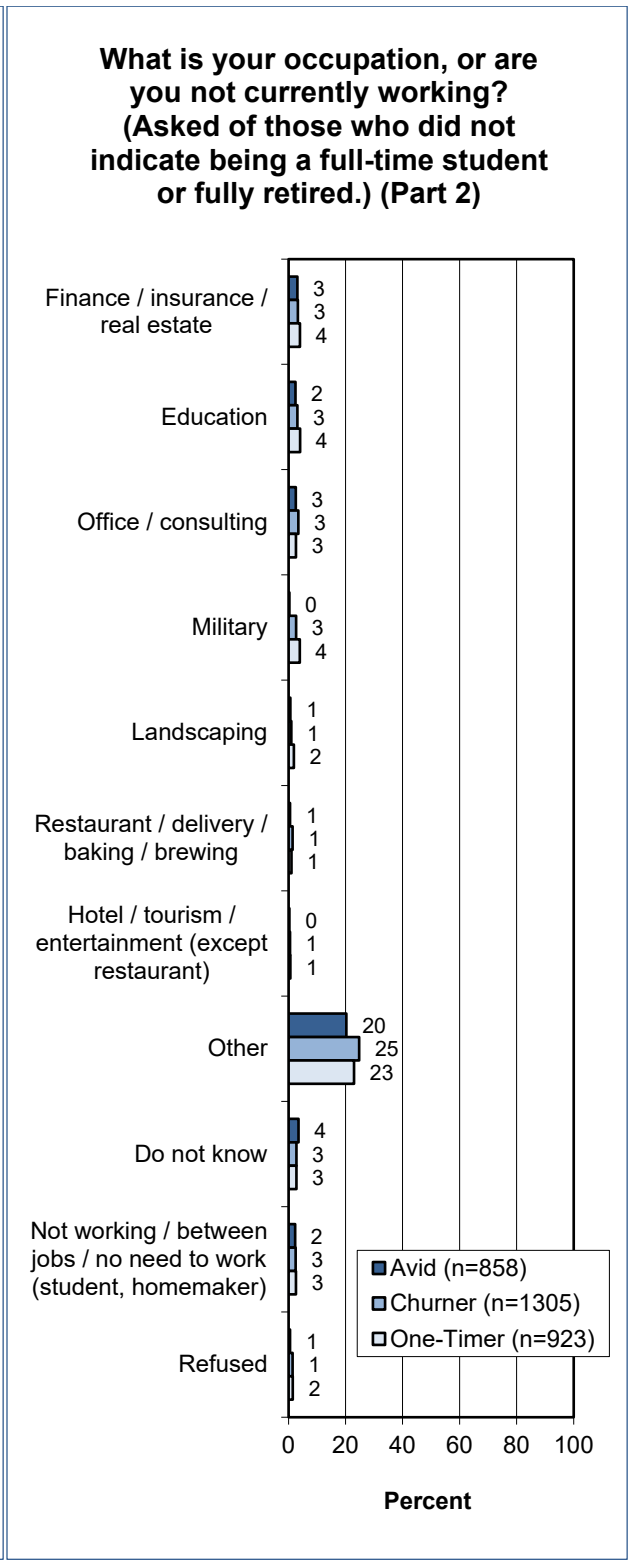

Do you consider your current place of residence to be a...?
Large city or urban area
Suburban area
Small city or town
Rural area
Do not know
8
12
12
15
18
19
27
27
27
47
41
40
2
3
2
Avid (n=1103)
Churner (n=1651)
One-Timer (n=1206)
Avids have a lower percentage in large city/urban areas and a higher percentage in rural areas, compared to the other groups; these are statistically significant differences.
0
20
40
60
80
100
Percent


What is the highest level of education you have completed?
Not a high school graduate
High school graduate or equivalent
Some college or trade school, no degree
Associate's degree or trade school degree
Bachelor's degree
Master's, doctorate, or professional degree
Do not know / refused
2
3
1
23
20
19
24
23
20
14
15
15
24
22
27
11
15
17
2
2
2
Avids are markedly lower than the other groups in the upper education level (Master's, etc.), a statistically significant difference.
Avid (n=1103)
Churner (n=1651)
One-Timer (n=1205)
0
20
40
60
80
100
Percent

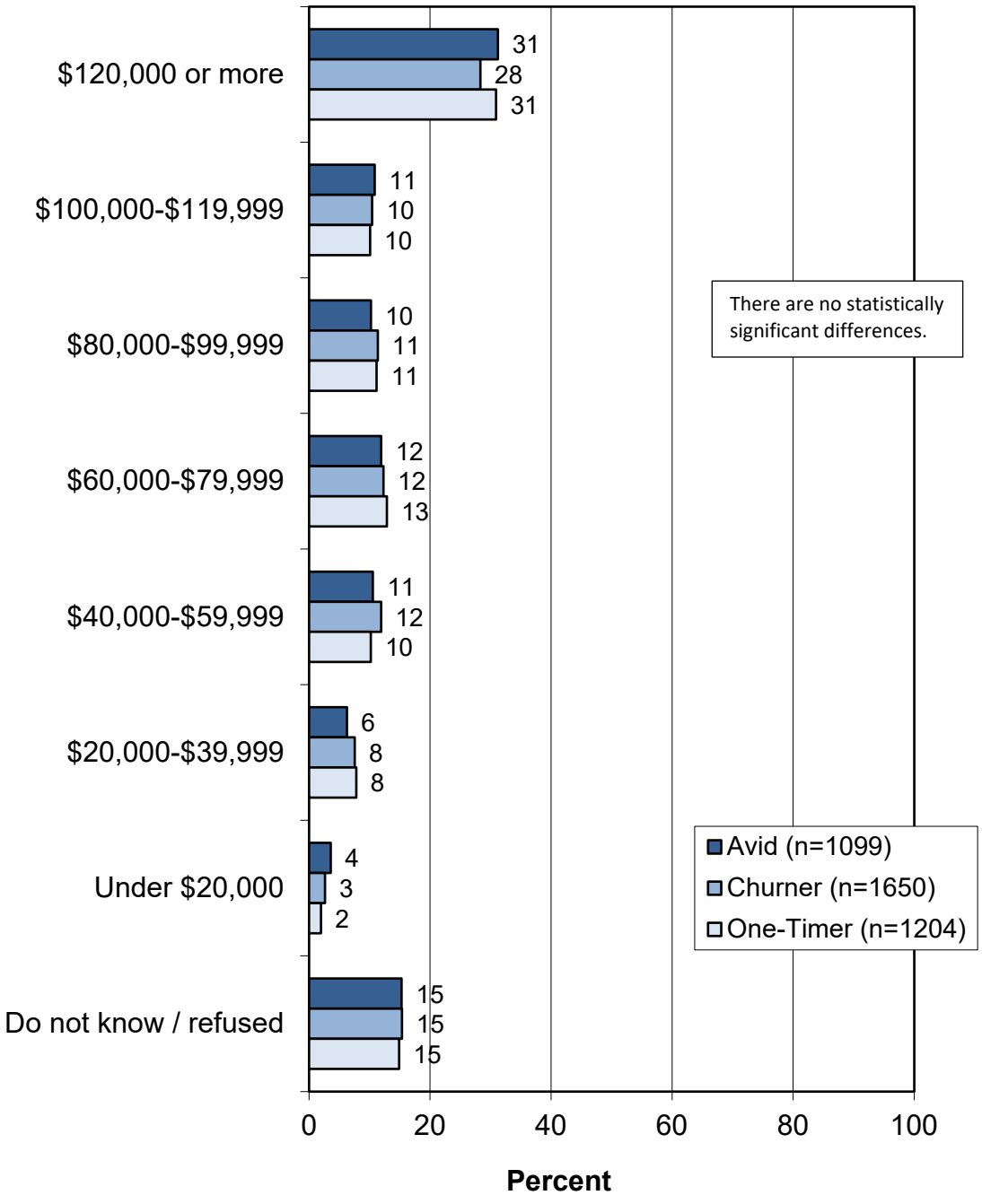
The question on occupation was asked only of those who, in the lead-in questions, did not indicate being a full-time student or fully retired. Of interest is that avids and one-timers are the same when it comes to being fully retired—one could have conjectured that avids might have more time, but the rate of being fully retired does not suggest this.

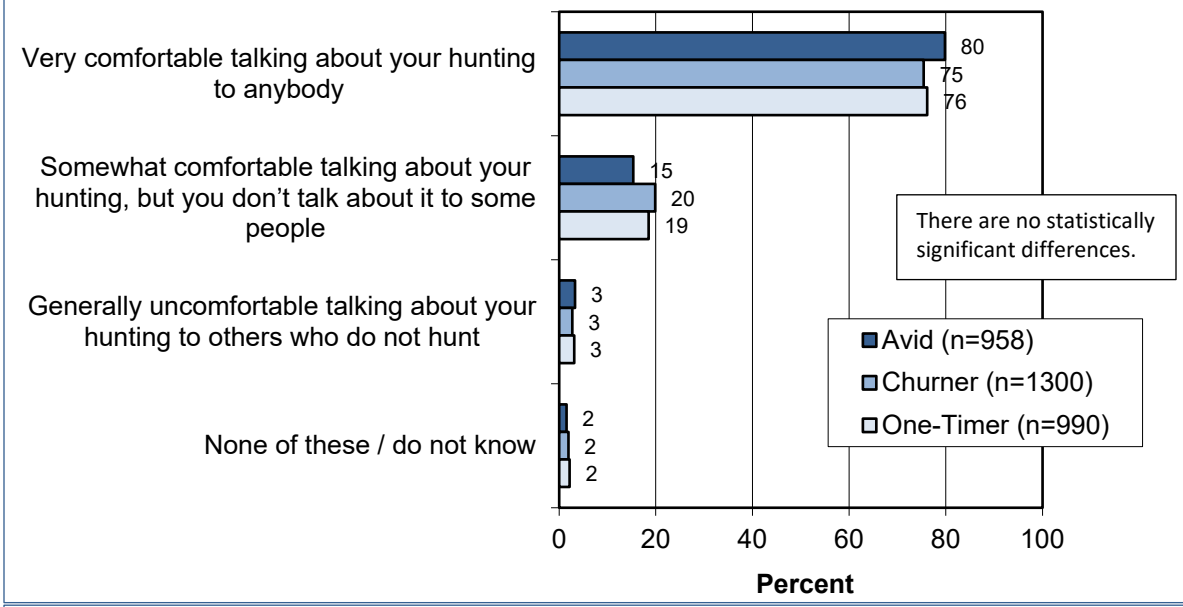


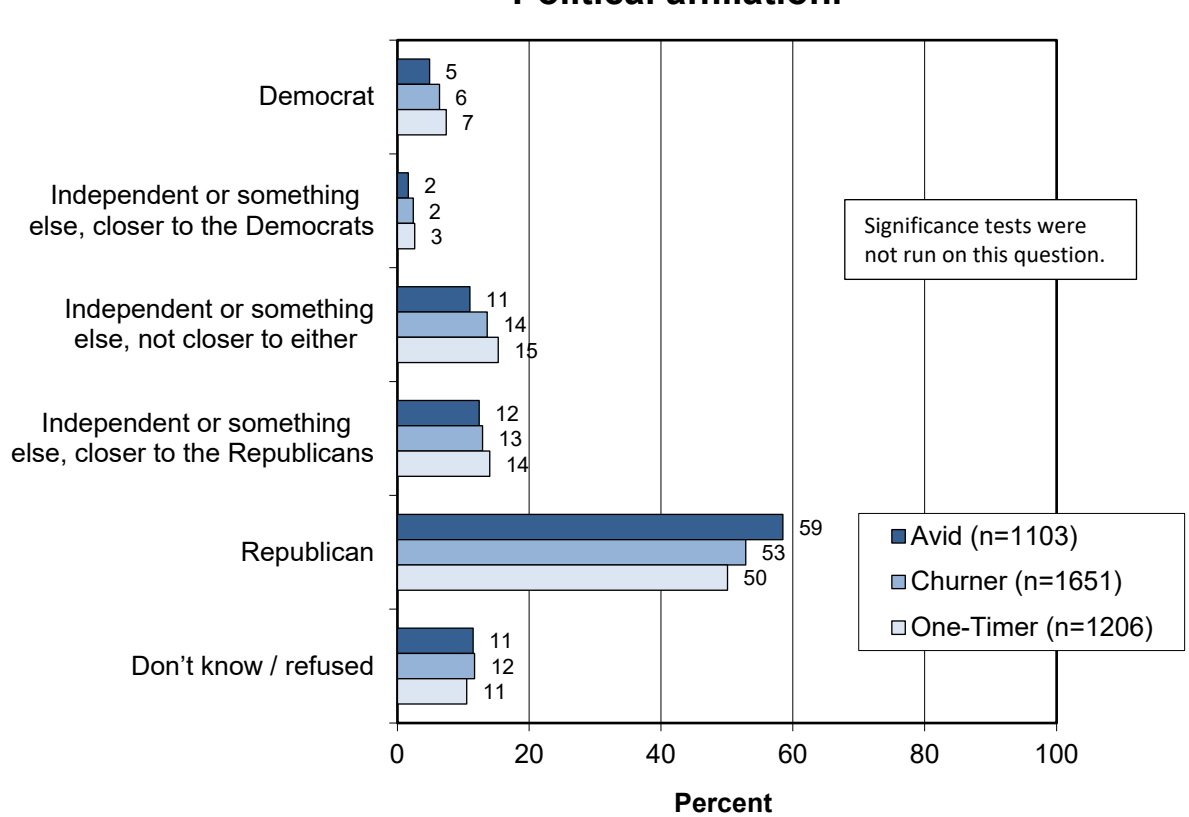

What is your occupation, or are you not currently working? (Asked of those who did not indicate being a full-time student or fully retired.) (Part 1)
Construction / carpentry / plumbing / electrical / craftsman
16
14
14
Manufacturing / factory / industry
11
7
6
Government services (police, fire, postal worker, mass transit, etc.)
10
6
7
Medical / wellness
5
5
5
Mechanical / machine servicing (e.g., automobile mechanic)
6
4
3
Computer / technical / electronics
4
4
4
Retail / wholesale sales
3
4
4
Trucking / transportation / shipping / warehousing
4
4
3
Agriculture / farming
3
4
4
Because of the large number of possible responses and the low percentages for any individual response, no statistical tests were run on this question. The data are useful for targeted marketing.
0 20 40 60 80 100
Percent


What is your occupation, or are you not currently working? (Asked of those who did not indicate being a full-time student or fully retired.) (Part 2)
Finance / insurance / real estate
3
3
4
Education
2
3
4
Office / consulting
3
3
3
Military
0
3
4
Landscaping
1
1
2
Restaurant / delivery / baking / brewing
1
1
1
Hotel / tourism / entertainment (except restaurant)
0
1
1
Other
20
25
23
Do not know
4
3
3
Not working / between jobs / no need to work (student, homemaker)
2
3
3
Refused
1
1
2
Avid (n=858)
Churner (n=1305)
One-Timer (n=923)
0 20 40 60 80 100
Percent

Which of these categories best describes your total household income before taxes last year?







First question asked hunters to select Democrat, Republican, or Independent/other. Those latter hunters were then asked if they leaned more to the Democratic side or the Replublican side (or neither).

SUMMARY OF SURVEY FINDINGS

This summary has the same thematic sections as the survey findings. It is based on the survey findings and the statistical analyses conducted on those results.

Basic Avidity Measures: Years Hunted, Days Hunted, Mentoring

- Avids have higher numbers of days hunting, as was expected, compared to the other groups. Of somewhat more interest is that churners and one-timers are quite similar regarding the number of days that they go hunting in a particular year.

- Avids have higher numbers of years of hunting experience, compared to the other groups. Like with days, an important finding is that churners and one-timers again are quite similar to each other.

- The desire to hunt is somewhat strong in churners and one-timers in that nearly three quarters of each group say that they "plan to go hunting every year" (the specific wording used in the question), while the rest plan to go at lesser frequencies or do not know, and churners and one-timers are not statistically different on this. Avids, as was expected, have a statistically significant higher percentage who plan to go hunting every year.

- Nearly all hunters do some mentoring activities: either taking their own kids, taking friends or acquaintances hunting, or otherwise helping hunters if not actually going with them. Avids do this mentoring at a slightly greater rate than churners and one-timers—the latter groups are statistically the same.

Species Hunted and Harvest

- In species hunted, avids have a greater rate, compared to the other avidity groups, of hunting deer, wild turkey, squirrel, coyote, waterfowl, and mourning dove. And except for wild turkey, churners and one-timers are similar to one another on species sought. Regarding wild turkey, one-timers have a greater rate of hunting it than do churners.

- Harvest may have an effect on avidity, or vice-versa, as the analyses do not determine directionality of cause. Some hunters may become more avid because they start to have more harvest success, while other hunters who are avid already may then, through experience, become more efficient hunters. Nonetheless, avids had a statistically significant higher percentage in the top harvest success category, compared to the other groups.

Hunting Equipment

- Avid hunters use archery and muzzleloaders at statistically higher rates than the other groups. However, there is not a linear relationship in use of equipment because churners in the survey had slightly lower rates of use compared to one-timers. In other words, one-timers were closer to avids than were churners.

- While avids had higher rates of use of any type of shooting equipment (other than air rifles), which means that they also had a higher rate of people using multiple types of equipment, there was not any marked differences in percentages who had stopped using a particular type of equipment. There was interest in learning if avids might be more inclined to drop the use of particular equipment to specialize in a single type—those who stop firearm hunting to hunt with archery equipment would epitomize this. However, rates of dropping any type of equipment show no meaningful relationships to avidity level.

- Specialization in hunting as an effect on equipment may play a role in purchases. Avids are more likely to purchase hunting clothing, archery equipment, tree stands, muzzleloaders or muzzleloading equipment, and hunting dogs/associated supplies. The only statistically significant difference between churners and one-timers occurred in the purchase of hunting clothing; the groups are the same on the other items mentioned above.

- There was interest in seeing if AR-platform rifles were more popular among avids than others, but there were no marked differences in the avidity groups regarding purchases in this category.

Hunting Locations

- The types of land used had no marked differences among avidity groups—they all are using the same types of land at about the same rates. This includes land owned by the hunters or the hunters' families or land owned by friends or neighbors. Furthermore, while avids had a slightly higher rate of paying for access, compared to the other groups, avids were closer to one-timers than they were to churners. In other words, the relationship was *not* linear in the sense that avids were the most likely to pay for access and then that rate moved down as avidity went down, because that was not the case. In fact, one-timers had a higher percentage who paid for access than did churners—the opposite of a linear relationship.

- In typical travel distance, the most important finding is that all three avidity groups have the same median distance—there just are not important differences. There is no linear relationship in mean distance, as churners have the highest mean, followed by one-timers and then avids.

- One-timers are the most likely to have hunted out of state in the previous 5 years. Meanwhile, avids and churners are about the same on this.

Motivations and Satisfactions For Hunting

- Motivations were explored in two ways. The first way asked hunters to rate the importance of various motivations when they started hunting and then again now. As shown in the results, three motivations become more important in general from first hunting experiences to the latest (connecting with nature, for the challenge or sport, and for exercise), but they rise for all three avidity groups—so the groups are the same as far as that goes. In looking at the individual questions, starting with motivations for

first hunting, avids have a slightly higher mean rating of going hunting to be with friends, compared to the other groups—this is the only statistically significant difference in that question. In motivations now, avids have a higher mean rating to be with family and to be with friends (as well as for exercise and to get a trophy, although those motivations are low down in the next question discussed below).

- In the second way to look at motivations, the survey asked hunters to choose their most important reason for hunting now. However, there are no statistically significant differences in the three avidity groups on this.

- An additional analysis was made based on the two ratings questions. Hunters were categorized for each possible motivation as having had that motivation decrease in importance, stay the same, or increase. Between first hunting and now, to be with family had the highest percentages who said that this motivation went down in importance, followed by to be with friends and to get meat. However, the percentages whose ratings of importance went down on these is about the same among the three avidity groups.

- The reasons that had the highest percentages whose ratings went up are for connecting with nature and for exercise, with avids more likely than the other groups to give a higher rating now compared to when they first hunted for these reasons. Avids have a markedly higher percentage whose rating went up for getting meat and for getting a trophy, as well.

- The survey examined four possible satisfactions, as well: harvesting game, seeing game, harvesting large animals, and getting the bag limit. On these, the importance ratings are not statistically different. (However, as noted elsewhere, harvest success does have a correlation to avidity.)

Crossover Activities

- In looking at other outdoor activities, the analyses had some important findings. First of all, the rates of fishing and sport shooting among the avidity groups are not statistically different. Secondly, avids are less likely than the other groups to do several of what are termed non-consumptive outdoor activities: camping, hiking, and canoeing/kayaking/non-motorized boating. Avids are also less likely to do some very active activities: running/jogging, bicycling, and soccer. Motorboating is statistically the same among the three groups.

Involvement in Organizations

- Among all three groups of hunters, there are no statistically significant differences in saying that they have donated to or been members of an organization devoted to conservation, wildlife, and related outdoor activities.

Introduction to Hunting

- While growing up in a hunting family has been shown to be associated with becoming a hunter, the three avidity groups are not statistically different on this. Avids do have a

higher rate, but just slightly. (For targeted marketing, the age and gender breakdown of the groups defined by this question were presented in that section of the report.)

- In examining the person who first took hunters hunting, avids, churners, and one-timers are similar—there are no statistically significant differences in first hunting companion. While avid hunters generally come from a hunting household and were introduced into hunting by their father or other male family member, it is the same with churners and one-timers, too.

- Avids more often started hunting early in life—before the age of 15—compared to the other groups. Churners and one-timers are statistically the same on this.

Demographic Characteristics

- Avids have a higher rate of male gender than the other groups, a statistically significant difference.

- Avids have a higher rate of Boomer II and a lower rate of Gen Z than the other groups, statistically significant differences.

- Whites and a category consisting of all others were tested; there were no statistically significant differences.

- Avids have a lower percentage in large city/urban area and a higher percentage in rural area, compared to the other groups; these are statistically significant differences.

- Avids are markedly lower than the other groups in the upper education level (Master's, etc.), a statistically significant difference.

- Income had no statistically significant differences.

- Regarding comfort level talking about hunting, there was interest to see if avids were greatly different from churners and one-timers; however, there are no statistically significant differences in being very comfortable talking about hunting to others. All three groups have overwhelming percentages being comfortable talking about their hunting, with low percentages being uncomfortable—only 3% of each avidity group indicated being generally uncomfortable talking about their hunting.

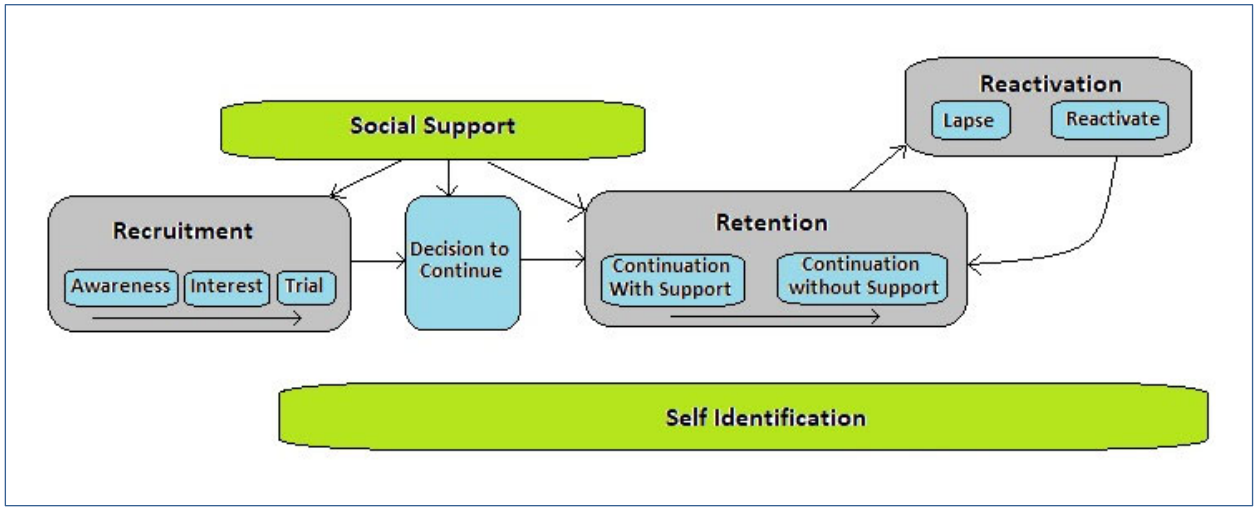
3.3. HUNTER AVIDITY MODEL

The Hunter Avidity Model starts with the Outdoor Recreation Adoption Model (ORAM), which is described first, followed by a discussion of ORAM as it relates to avidity levels. Then each part of the model is examined in the context of the above results.

ORAM AND ITS RELATIONSHIP TO RECRUITMENT, RETENTION, AND REACTIVATION

People go through stages when they become recreation participants. The first three stages of ORAM (awareness, interest, and trial activity) are addressed by recruitment efforts. These initial stages lead to the next stages: the decision to continue, continuing participation with social support, and then continuing participation without social support. These continuation stages are addressed by retention efforts. Individuals who do not continue to participate are referred to as lapsed participants—the remaining stages of ORAM. Lapsing may be further divided into individuals who are short-term lapsed and those who are long-term lapsed. These lapsed stages are addressed by reactivation efforts. (ORAM was previously shown but is reproduced here for the reader's convenience.)

Outdoor Recreation Adoption Model (ORAM)



Note that not all participants go through all the stages—the model is not meant to be strictly linear from beginning to end but contains loops—as some people move through the continuation stages into the lapsed stages and then back into the continuation stages (if they become reactivated), and some (ideally) stop at the continuation without support stage. ORAM is reproduced below. The model was recreated based on the figure in Appendix A of *AFWA President's Task Force on Angler R3* published in 2018.

ORAM AND AVIDITY LEVELS

In broad terms, avids are in the "continuation without support" stage of ORAM. They self-identify as hunters, and they show robust participation.

Churners can be in almost any stage, but they most fit into either the "continuation with support" stage or the "reactivate" stage.

One-timers also can be in any stage, but they most fit into the "trial" stage leading into the "decision to continue" node, although they also fit into the "lapse" stage leading into (the hunting community would hope) the "reactivate" stage.

RECRUITMENT

Beginning hunters in general, although there are exceptions, go for only a few days in a given year to start. Based solely on days, however, there are not major differences between churners (who would be further along on ORAM leading up to continuation without support) and one-timers.

At this stage, harvest may still be elusive.

Avid hunters put slightly greater importance on hunting with friends when they started hunting, compared to the other groups. This may mean that avids started with robust support groups. This suggests the importance of friends at the early stages.

There is evidence that early recruitment is positively associated with avidity. Avid hunters started earlier than did churners and one-timers.

DECISION TO CONTINUE

Although many hunters say that harvest is not their favorite aspect of hunting, there is evidence that harvest success is associated with avidity. This, in turn, suggests that some harvest success is a factor in the decision to continue.

In general, three motivations become more important as hunters gain experience: connecting with nature, for the challenge or sport, and for exercise. These motivations for hunting should be tapped into and encouraged to develop avid hunters, but there is not a great difference between avidity groups on this—these rise in importance for all groups. On the other hand, the motivations of being with family and being with friends fall for many hunters.

RETENTION: CONTINUATION WITH SUPPORT

Hunters start to approach a high number of days hunting. However, as was noted, the differences between churners and one-timers were negligible on days hunted, so there may be little apparent difference vis-à-vis days hunted and where a hunter falls in ORAM.

Harvest levels at this stage are in the middle and starting to approach the high harvest success of avids. However, note that there was not a great difference between churners and one-timers on harvest success—only the avids were different on this.

At this stage, hunters may or may not be specializing in shooting equipment. The analyses found that avids use archery and muzzleloading equipment more than do the other groups, but one-timers did not have the lowest use—churners did. So equipment use does not define this stage of ORAM, as lower use rates could be among hunters in many of the stages.

As hunters move through this stage, there is some evidence that the importance of friends and family as hunting partners may diminish a little. They diminish for all three groups. However,

avids still rated these reasons higher than the other groups—so this is a mixed result. Connecting with nature becomes more important.

Although crossover activities have some association with hunting participation—other surveys by Responsive Management have shown that hunting initiation is more effective among people who already do outdoor activities—the most avid hunters had a lower rate of camping, hiking, and canoeing/kayaking than did churners and one-timers. While interest in hunting can be piqued through contact with outdoor recreationists, at some point the most avid hunters may do these other activities at lower rates than churners or one-timers.

RETENTION: CONTINUATION WITHOUT SUPPORT

At this stage, hunters are hunting many days.

Hunters plan to go hunting every year when in this stage.

The overwhelming majority of avid hunters do mentoring activities. However, with the exception of those in the recruitment part of the model (i.e., before the decision to continue node), all hunters do mentoring activities: the survey found high percentages of churners and one-timers who also had done mentoring.

Avid hunters have a greater rate of hunting most important species (important in terms of the number who hunt them) compared to churners and one-timers. Related to the species hunted is harvest success—the analyses found a correlation between harvest success and being an avid hunter.

At this stage, avids show signs of specialization—they use archery and muzzleloaders more than do the other groups. They buy hunting clothing, tree stands, and hunting dogs at a higher rate than the other avidity groups.

There is some evidence that avid hunters may concentrate more on hunting than on camping, hiking, and canoeing/kayaking at this stage (although substantial portions still, nonetheless, do those activities—just not at the rate that less avid hunters do).

REACTIVATION

It was apparent that hunters in this stage had or continue to mentor other hunters—an obvious conduit to reactivating themselves. While avids are the most likely to mentor, very large percentages of all groups do so, and churners and one-timers are not different (only the avids showed a statistically significant difference).

SOME NOTABLE CHARACTERISTICS THAT DID NOT HAVE DIFFERENCES

The use of AR-platform rifles does not seem to have a correlation to hunting avidity—purchases of AR-platform rifles and associated equipment and supplies has no statistically significant relationship to avidity.

There was interest in testing whether the dropping of use of certain equipment had any relationship with avidity—in other words, were avid hunters stopping the use of some types of

firearms or equipment in favor of using other equipment? Were they dropping rifles to hunt with archery or muzzleloaders? The survey did not find marked differences in the rates of dropping the use of any types of equipment among the avidity groups. Therefore, it appears that all avidity groups are dropping the use of some types of equipment in favor of others.

Only one type of land showed any correlation with avidity—paying for access. Avids had done this more than churners or one-timers. But churners had done it less than one-timers, so the correlation to avidity is not consistent. Other types of land, including using one's own land/family land or a friend's/neighbor's land shows no statistical correlation.

Travel distance does not show any marked correlation to avidity.

Avids and churners were about the same on hunting out of state. (The highest rate of hunting out of state was among one-timers.)

Motivations were explored both through a series of ratings importance (reported above) as well as through a question that asked hunters to choose their single most important motivation. In this regard, there are no statistically significant differences in the avidity groups on this.

In the ratings of four possible satisfactions with hunting that were asked about in the survey, there were no statistically significant differences. Those satisfactions were harvesting game, seeing game, harvesting large animals, and getting the bag limit. This is perceived rating of importance; note that elsewhere harvest success was correlated to a higher level of avidity.

There was no statistically significant difference in avidity groups and whether they have donated to or been members of an organization devoted to conservation, wildlife, and related outdoor activities.

Growing up in a hunting family has been shown to be associated with becoming a hunter, but the three avidity groups are not statistically different on this.

Regarding who first took hunters hunting, there are no statistically significant differences in first hunting companions among avids, churners, and one-timers. They all most commonly were first taken by their father.

4. RESEARCH METHODS

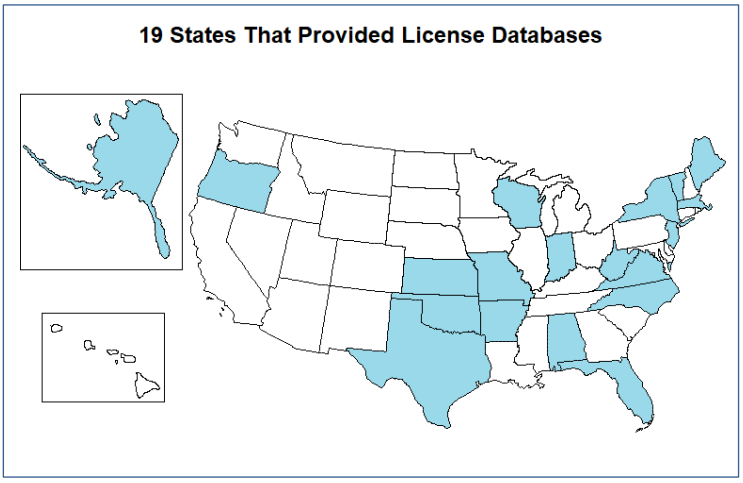
This section discusses four components of the research:

- The acquisition of databases.
- The initial analyses of those databases.
- The acquisition of new data: survey of hunters.
- The final analyses of data and development of the Hunter Avidity Model.

4.1. OBTAINING DATABASES FOR ANALYSES AND SURVEY SAMPLING

The initial component of the study was the acquisition of state license databases, used in the analyses that identified potential variables to use in the creation of the model and used as well for the survey research. Note that the databases were used only for research and were deleted from Responsive Management's database system upon the completion of research; Responsive Management does not maintain samples of licensed hunters.

Responsive Management contacted every state fish and wildlife agency to try to obtain a licensed hunter sample. In the end, 19 states were willing to participate, and confidentiality agreements were made between Responsive Management and each participating state that required one. The participating states' fish and wildlife agencies then provided samples of licensed hunters for use in this project. These 19 states are shown in the accompanying map.

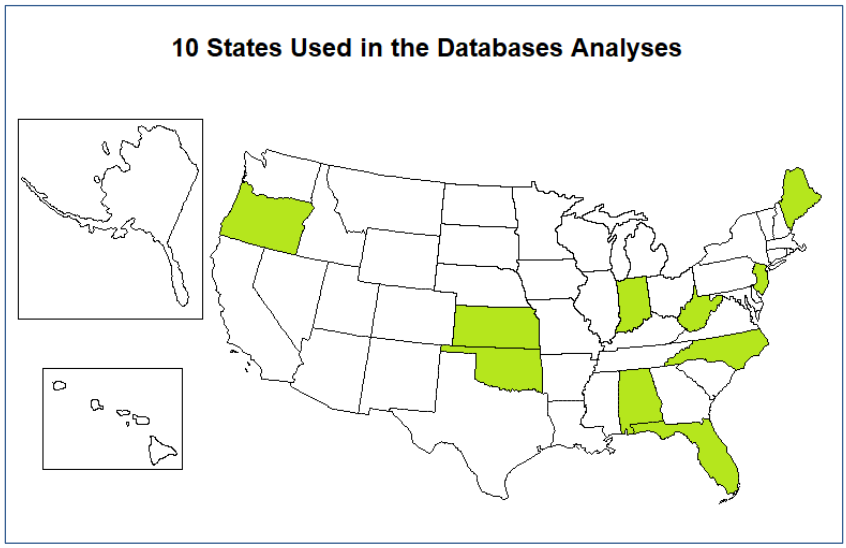


Each database was examined to determine which ones could be used in the analyses and subsequent surveying. The most important criterion was that there be 5 years of license records because a measure of avidity that was envisioned was the number of years out of 5 that the hunter had bought a license. Also essential was an identifier attached to the license holder (not attached to the particular license or the single license buying transaction but to the license holder across all license purchases) so that multiple licenses bought by a single person all have the same identifier attached; otherwise, the years of license records could not be used.

The multi-modal survey had to be conducted in the same states as these analyses of the databases. Therefore, another essential criterion was the inclusion of contact information. Specifically, the database needed to have at least some records with email addresses and/or telephone numbers. Additionally, the databases were examined to inventory other variables that might be useful in analyses: address (i.e., location of residence), gender, and age.

Of the 19 states that provided databases, 10 included the necessary information to be used in this project. The following table shows the information available in those 10 states that provided license databases.

Variables Available in the State Databases								
State	**Years of Records (need 5 years)**	**Customer ID**	**Tracks All Licenses Bought**	**Email Address (for use in the survey)**	**Phone Number (for use in the survey)**	**Address**	**Gender**	**Age**
AL	5	Yes	Yes	Yes	Yes	Yes	No	Yes
FL	5	Yes	Yes	No	Yes	Yes	No	Yes
IN	5	Yes	Yes	Yes	Yes	Yes	Yes	Yes
KS	5	Yes	Yes	Yes	No	Yes	Yes	Yes
ME	5	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NC	5	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NJ	5	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OK	5	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OR	5	Yes	Yes	No	Yes	Yes	Yes	Yes
WV	5	Yes	Yes	Yes	Yes	Yes	Yes	Yes



4.2. INITIAL ANALYSES OF DATABASES

The initial analyses of the databases looked at the variables available. Statistical analyses were then performed on those variables.

IDENTIFICATION OF VARIABLES AVAILABLE IN THE DATABASES

Several variables were available in the databases: avidity level, location, age, gender, and license type.

Avidity

Having 5 years of records available allowed the determination of the number of the years in the database that the license holder had purchased a license, with the maximum being all 5 years. Because lifetime license purchases typically do not entail any further license purchases, lifetime license holders were considered in a different way in the definitions, as explained below.

The levels of avidity based on this measure were labeled and defined as follows:

- Avid: Purchased at least 4 of the past 5 years or purchased a lifetime license in the 5-year time period.
- Churner: Purchased a license in 2 or 3 of the 5 years (and none of the licenses were a lifetime license).
- One-Timer: Purchased a license in only 1 of the 5 years (and the license was not a lifetime license).

The analyses explored how this avidity variable was affected by other variables: location, generation, gender, and license type(s). These are explained below.

Location

Having zip codes available allowed for a categorization of the hunters in the database on a rural-urban continuum with out-of-state residency added in as a locationally defined group. Rural and urban designations of in-state hunters were based on the Economic Research Service Rural-Urban Continuum Codes, a classification scheme that distinguishes metropolitan counties by the population size of their metro area and nonmetropolitan counties by degree of urbanization and adjacency to a metro area. These codes are available by zip code, which allowed for integration into the databases. In addition, any zip codes out of the state of the licensing state or any nonresident licenses triggered the categorization as an out-of-state hunter.

Based on the information above, a location variable was created that reflected three different groups:

- Rural residents.
- Urban residents.
- Out-of-state residents.

Generational Age

Included with the databases was an indication of age, either the age itself or the birthdate of the license holder. For the age variable, the generations were defined as being born in the years indicated:

- Post War: 1928-1945
- Boomer I: 1946-1954
- Boomer II: 1955-1964
- Gen X: 1965-1980
- Millennials: 1981-1996
- Gen Z: 1997 or later

There is a generation before "Post War" called "WWII," which refers to those who would have been old enough to legally enlist in the military during World War II; there were not enough respondents in that category to be included in the analyses. The Post War label refers to the fact that people born in that time were not legally able to enlist in the military during that war (even though some did so), making them "Post War."

Gender

This variable was included in most of the databases, as recorded by the state fish and wildlife agencies. In Alabama and Florida, the gender variable was not available in the databases. For those states, a software package maintained by the R Foundation as part of the Comprehensive R Archive Network (CRAN) called "Predict Gender from Names Using Historical Data" was used to impute gender name. This package considers the name and spelling as well as historical data on male/female ratios in the state on people who had that name at the time of the person's birth (i.e., also considering the time period that the name was given). More information can be found at the website, "The R Project for Statistical Computing" (r-project.org).

License Type

Each states has its own suite of license types. For the analyses, each state's licenses were categorized into logical groupings. This categorization was not exactly the same in each state simply because license types varied in each state.

ANALYSES OF VARIABLES' EFFECTS ON AVIDITY

For each state included in the analyses, license holders were first categorized into groups based on the avidity variable. Subsequently, the other variables were tested to see how they affected the avidity variable.

4.3. SURVEY OF HUNTERS

This section explains the sampling, questionnaire design, and survey administration.

SAMPLING

Responsive Management developed the samples of hunters who were surveyed from the license databases provided by the states.

QUESTIONNAIRE DESIGN

The survey instrument was developed by Responsive Management with input from reviewers from hunting- and shooting-related organizations. The development of the instrument was also based on the initial analyses of the databases and identification of possible variables that might correlate to avidity. The questionnaire was computer coded for both telephone surveying and online surveying. The telephone questionnaire was coded using Responsive Management's computer-assisted telephone interviewing (CATI) system. An important aspect of this CATI system is that the computer controls which questions are asked, but each telephone survey is administered by a live interviewer.

The online questionnaire was coded in an online survey platform. Note that the online survey was closed, meaning that it was available only to anglers who were specifically selected for the survey and who were sent a survey link. Hunters could complete the survey only once. The survey could not be accessed through a general internet search.

For both the online and telephone versions of the questionnaire, the survey was programmed to automatically skip questions that did not apply and to substitute phrases in the questionnaire based on previous responses, as necessary, for logic and flow. There were slight differences between the telephone and online versions of the questionnaire to accommodate each survey mode, but otherwise the telephone and online versions were identical. Responsive Management conducted pretests of the survey questionnaire in both modes to ensure proper wording, flow, and logic. Both the online and telephone versions produced data that could be exported directly into Responsive Management's data analyses programs.

MULTI-MODAL SURVEY ADMINISTRATION

Once the samples were pulled, the contact method was determined. For hunters selected for the survey, those with an email address were contacted using that mode, and the remaining hunters were contacted by telephone (both landlines and cell phones were called). The emails were sent on behalf of the Sportsmen's Alliance and the U.S. Fish and Wildlife Service, assuring potential respondents of the legitimacy of the survey. Those contact attempts with email addresses that were determined to be to invalid were put back into the telephone sample so that attempts could be made to reach them by telephone.

Regarding the email contact, the first invitations to participate in the survey were sent to hunters in June 2022, with reminder email messages sent 4 days after the initial email (for those who had not responded to the initial email). A copy of the initial email is shown on the following page. The initial and reminder emails included a link to the survey for each

respondent, as well as a contact at Responsive Management for technical concerns about taking the survey.

Hello [contact("first name")] [contact("last name")] [contact("role")],

As a valued member of the hunting community, we would like to invite you to participate in a study on hunting participation. This study is being conducted under a grant from the U.S. Fish and Wildlife Service (FWS) and the Association of Fish and Wildlife Agencies (AFWA), in partnership with a group of state fish and wildlife agencies, including the [invite("custom 3")]. **As a licensed hunter, your feedback is very important to this study and to future management decisions.**

Click Here to Start the Survey
Please consider responding to this survey by July 16.

This study is being conducted to assess licensed hunters' participation, preferences, and experiences regarding hunting across the U.S., including hunting both in and outside your current state of residence. Our records for this study show that you have purchased a [contact("region")] hunting license (this includes both resident and nonresident licensed hunters of the state) in the past 5 years.

Responsive Management, an independent research firm that specializes in natural resource and fish and wildlife issues, has partnered with the [invite("custom 3")] and other state fish and wildlife agencies to conduct this study. If you need technical assistance with the survey, please contact Responsive Management via email at research@responsivemanagement.com.

You are one of only a small number of licensed hunters in your state randomly chosen to participate in this study. To ensure that results truly represent hunters, it is important that we hear from you. Your answers will be kept completely confidential and will not be associated with your name in any way.

Thank you for your time and willingness to participate and share your opinions:
[invite(survey_link)]

Sincerely,
Mark Damian Duda
Executive Director
Responsive Management

For the telephone phase of the survey, telephone interviews were conducted Monday through Friday from noon to 9:00 p.m. and Saturday from noon to 7:00 p.m., local time, using interviewers with experience conducting computer-assisted surveys about hunting and natural resources. A five-callback design was used to maintain the representativeness of the telephone

sample, to avoid bias toward people easy to reach by telephone, and to provide an equal opportunity for all to participate. When an hunter could not be reached on the first call, subsequent calls were placed on different days of the week and at different times of the day.

For quality control, the Survey Center Managers monitored the telephone interviews in real time and provided feedback to the interviewers. To further ensure the integrity of the telephone survey data, Responsive Management has interviewers who have been trained according to the standards established by the Council of American Survey Research Organizations. Methods of instruction included lecture and role-playing. The Survey Center Managers and other professional staff conducted briefings with the interviewers prior to the administration of the survey. Interviewers were instructed on type of study, study goals and objectives, handling of survey questions, interview length, termination points and qualifiers for participation, interviewer instructions within the survey questionnaires, reading of the survey questions, skip patterns, and probing and clarifying techniques necessary for specific questions in the survey questionnaire.

After obtaining the completed questionnaires (both the telephone and online versions), the Survey Center Managers and/or statisticians checked each completed survey to ensure clarity and completeness. In addition, the survey included proprietary quality control code to further ensure the quality of the data. Responsive Management obtained 3,960 completed surveys from the ten states included in the project, as shown in the accompanying table. The project goals included full regional representation, so there were both statewide goals and regional goals that were met.

Region	State	Goal		Completed Surveys	
		by State	by Region	by State	by Region
Northeast	Maine	250	500	482	969
	New Jersey	250		487	
Southeast	Alabama	200	800	405	1,367
	Florida	200		248	
	North Carolina	200		335	
	West Virginia	200		379	
Midwest	Indiana	250	700	275	1,124
	Kansas	250		597	
	Oklahoma	200		252	
West	Oregon	500	500	500	500
Total		2,500		3,960	

4.4. FINAL DATA ANALYSES

The databases and survey data were analyzed using IBM SPSS Statistics as well as proprietary software developed by Responsive Management. Additional statistical analyses were conducted, which are described and presented in the applicable report sections.

ABOUT RESPONSIVE MANAGEMENT

Responsive Management is an internationally recognized survey research firm specializing in natural resource and outdoor recreation issues. Our mission is to help natural resource and outdoor recreation agencies, businesses, and organizations better understand and work with their constituents, customers, and the public. Focusing only on natural resource and outdoor recreation issues, Responsive Management has conducted telephone, mail, and online surveys, as well as multi-modal surveys, on-site intercepts, focus groups, public meetings, personal interviews, needs assessments, program evaluations, marketing and communication plans, and other forms of human dimensions research measuring how people relate to the natural world for more than 30 years. Utilizing our in-house, full-service survey facilities with 75 professional interviewers, we have conducted studies in all 50 states and 15 countries worldwide, totaling more than 1,000 human dimensions projects *only* on natural resource and outdoor recreation issues.

Responsive Management has conducted research for every state fish and wildlife agency and every federal natural resource agency, including the U.S. Fish and Wildlife Service, the National Park Service, the U.S. Forest Service, Bureau of Land Management, U.S. Coast Guard, and the National Marine Fisheries Service. Additionally, we have also provided research for all the major conservation NGOs including the Archery Trade Association, the American Sportfishing Association, the Association of Fish and Wildlife Agencies, Dallas Safari Club, Ducks Unlimited, Environmental Defense Fund, the Izaak Walton League of America, the National Rifle Association, the National Shooting Sports Foundation, the National Wildlife Federation, the Recreational Boating and Fishing Foundation, the Rocky Mountain Elk Foundation, Safari Club International, the Sierra Club, Trout Unlimited, and the Wildlife Management Institute.

Other nonprofit and NGO clients include the American Museum of Natural History, the BoatUS Foundation, the National Association of Conservation Law Enforcement Chiefs, the National Association of State Boating Law Administrators, and the Ocean Conservancy. As well, Responsive Management conducts market research and product testing for numerous outdoor recreation manufacturers and industry leaders, such as Winchester Ammunition, Vista Outdoor (whose brands include Federal Premium, CamelBak, Bushnell, Primos, and more), Trijicon, Yamaha, and others. Responsive Management also provides data collection for the nation's top universities, including Auburn University, Clemson University, Colorado State University, Duke University, George Mason University, Michigan State University, Mississippi State University, North Carolina State University, Oregon State University, Penn State University, Rutgers University, Stanford University, Texas Tech, University of California-Davis, University of Florida, University of Montana, University of New Hampshire, University of Southern California, Virginia Tech, West Virginia University, Yale University, and many more.

Our research has been upheld in U.S. Courts, used in peer-reviewed journals, and presented at major wildlife and natural resource conferences around the world. Responsive Management's research has also been featured in many of the nation's top media, including *Newsweek*, *The Wall Street Journal*, *The New York Times*, CNN, National Public Radio, and on the front pages of *The Washington Post* and *USA Today*.

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