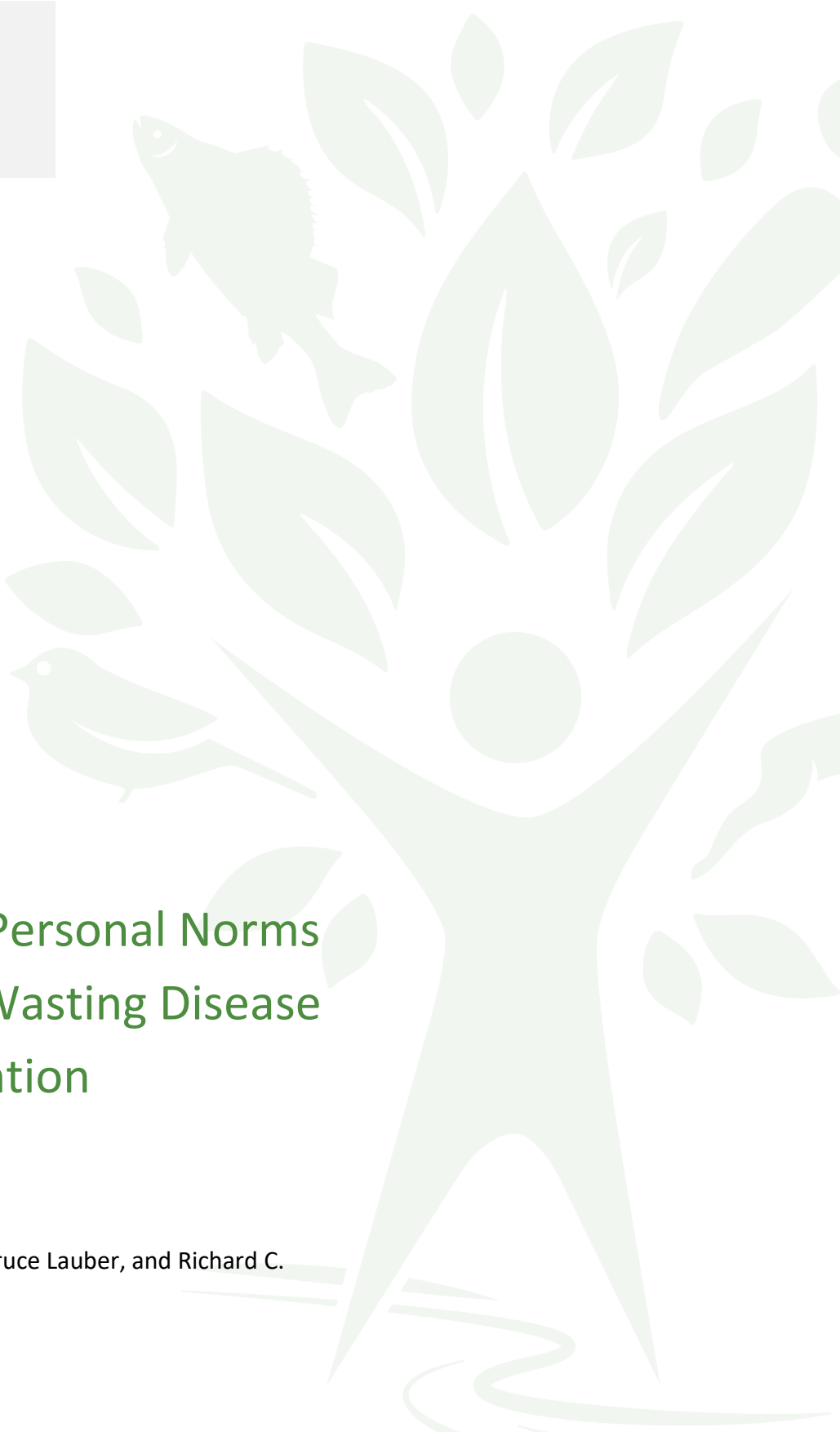


RESEARCH REPORT

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Deer Hunter Personal Norms and Chronic Wasting Disease (CWD) Prevention

REPAIRED BY:

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EXECUTIVE SUMMARY

The many benefits provided by white-tailed deer are threatened by chronic wasting disease (CWD), a fatal prion disease affecting members of the cervid family. Preventing the introduction of CWD to New York will require help from New York's deer hunters. The New York State Interagency Risk Minimization Plan (2018) identifies two risk-minimizing behaviors deer hunters can take to help keep CWD out of New York: bring only deboned meats or cleaned parts back to New York after hunting outside of New York (i.e., comply with the carcass import ban) and hunt deer without using natural (deer urine-based) scent lures. New York residents who hunt outside of New York are of particular interest in efforts to prevent the spread of CWD to New York because these hunters are at a higher risk of interacting with potentially infectious materials if they hunt in CWD-positive areas.

Past research has indicated New York deer hunters vary in their performance of these behaviors. What drives this variation, and how might DEC encourage hunters to behave in such a way so as to reduce CWD risk? The purpose of this publication is to report findings from a study exploring the influence of deer hunters' personal norms on their behavioral intentions to engage in these behaviors. Our study includes two sample populations of New York residents: deer hunters licensed to hunt in New York (NY hunters) and deer hunters licensed to hunt in Pennsylvania (PA hunters), where CWD was recently detected in counties bordering New York.

We used norm-activation theory (NAT) to assess the relationship between hunters' personal norms, or feelings of obligation to perform certain behaviors, and their behavioral intentions. NAT predicts personal norms will be activated when an individual becomes aware of a problem that involves something of value to them (problem awareness and value relevance), leading to self-involvement based on feelings of being personally able to and responsible for reducing the problem (personal responsibility).

STUDY OBJECTIVES

1. Compare the CWD-related beliefs and behaviors of NY hunters and PA hunters.
2. Assess the influence of deer hunters' personal norms to perform CWD risk-minimizing behaviors and their intentions to perform the respective behaviors.
3. Explore the factors and mechanisms influencing activation of deer hunters' personal norms.

METHODS

We randomly sampled 2,000 deer hunters from two populations of interest: New York residents licensed to hunt in New York (NY sample) and New York residents licensed to hunt in Pennsylvania (PA sample). We collected data in October and November of 2021 using a self-administered questionnaire. The survey instrument was disseminated via email for hunters in the NY sample who provided email addresses and by mail for the rest of the NY sample and the entire PA sample, which we could not contact by email. Our response rate was 22% for the NY sample and 35% for the PA sample.

KEY FINDINGS

Performance of Risk-Minimizing Behaviors Hunters varied in their performance of CWD risk-minimizing behaviors. Over the past five years, over half of respondents (53% of NY hunters, 58% of PA hunters) reported never using natural scent lures (NSLs) to hunt deer. Of PA hunters who had harvested a deer or elk in Pennsylvania one year or more (n=437), almost half had taken the harvested animal to a processor or taxidermist (48%) or had processed the animal themselves before returning to New York (59%) at least one year.

Behavioral Intentions Hunters varied in their intentions to perform the CWD risk-minimizing behaviors, but PA and NY hunters reported similar intentions. Roughly half of hunters agreed that they planned to never use NSLs to hunt deer (50% of NY hunters, 45% of PA hunters). Most PA respondents (85%) agreed that they planned to bring only deboned meat or cleaned parts back to New York after hunting in Pennsylvania.

Personal Norm Activation We classified personal norms as "activated" if the respondent agreed that they felt a moral obligation to perform the behavior. Of NY and PA respondents, 43% and 35%, respectively, felt obligated to hunt deer without using NSLs. About three-quarters of PA hunters had an activated personal norm to comply with the carcass import ban.

Problem Awareness Most hunters thought CWD would be a problem to a moderate-great extent for different outcomes presumably of value to hunters, including the health of New York deer (NY hunters=92%, PA hunters=88%) and their deer hunting satisfaction in New York (NY hunters=86%, 78%). However, PA hunters generally had lower problem awareness than NY hunters, especially in the extent to which they perceived specific behaviors posed a risk of introducing CWD to New York. The percent of PA hunters (33%) who thought bringing a whole deer carcass back to New York (after hunting outside of New York) posed no-slight risk was nearly double the percent of NY hunters (17%) who said the same.

Personal Responsibility Survey respondents generally felt some degree of personal responsibility for CWD prevention. However, hunters differentiated between the effectiveness of the two risk-minimizing behaviors in helping to prevent CWD. About half of hunters (NY hunters=47%, PA hunters=50%) strongly agreed that complying with the carcass import ban would help, but only 16% of NY hunters and 15% of PA hunters said the same for hunting without using NSLs.

Predicting Behavioral Intentions and Personal Norm Activation Hunters' personal norms to perform risk-minimizing behaviors increased their respective behavioral intentions. We were able to explain 46% of the variance in PA hunters' intentions to comply with the carcass import ban and 60% and 64% in intentions to hunt deer without NSLs amongst NY and PA hunters, respectively. We were able to predict activation of hunters' personal norms to comply with the carcass import ban with 90% overall accuracy, the personal norm to hunt without using NSLs in the NY sample with 74% overall accuracy and in the PA sample with 83% overall accuracy. The only significant variable across all three models was perceived effectiveness of the risk-minimizing behavior which increased the likelihood personal norms would be activated by over two times. Using mediation analysis, we found that the effect of CWD problem awareness and CWD prevention personal responsibility were indirect and conveyed by changes to perceived effectiveness of the behaviors.

Conclusions and Recommendations

Across the board, deer hunters' personal norms positively affected their intentions to perform risk-minimizing behaviors. We identified hunter beliefs about the effectiveness of risk-minimizing behaviors (in helping to keep CWD out of New York) as a key factor positively affecting activation of personal norms. Not only did efficacy beliefs have a direct effect on personal norms, but they also conveyed the influence of other variables. A substantial part of the impact CWD problem awareness or CWD risk perceptions have on personal norms is because risk perceptions increase feelings of personal responsibility to help prevent CWD (e.g., feelings of being able to and responsible for helping) and these feelings of self-involvement increase perceptions that specific risk-minimizing behaviors will be effective which in turn increase personal norms.

To encourage performance of risk-minimizing behaviors, we suggest it is important that deer hunters are able to assess the behaviors as effective in achieving the desired outcome (CWD prevention). We suggest there is a need to 1) reduce underlying scientific uncertainty around risk-minimizing behaviors and 2) inform CWD risk communication with these findings to help hunters assess the effectiveness of recommended behaviors.

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A huge thank you to our collaborators at the Pennsylvania Game Commission (and a special thank you to Chris Rosenberry) for helping us to implement a survey of New York residents licensed to hunt in Pennsylvania. Our survey instrument and request to conduct survey research were reviewed and granted approval by the Cornell University Office of Research Integrity and Assurance (Institutional Review Board for Human Participants Protocol ID#: 1004001374). This work was supported by New York Federal Aid in Wildlife Restoration Grant WE-173-G.

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INTRODUCTION

Chronic wasting disease (CWD) is a fatal prion disease affecting white-tailed deer and other members of the cervid family (e.g., elk, moose). CWD has been detected in wild cervid populations in 29 states in the US and three provinces in Canada (Richards, 2021). In the late stages of CWD, animals may present a vivid image of suffering with symptoms like dramatic weight loss (giving the appearance of the animal “wasting away”), listlessness, and drooling (Rivera et al., 2019). There are no known preventatives or treatments for CWD, and at high prevalence levels, CWD poses a risk to the wellbeing and sustainability of cervid populations (Almberg et al., 2011; Rivera et al., 2019).

There is scientific uncertainty about whether CWD could potentially infect humans. There have been no cases of a human being infected with CWD, but research exploring transmission in macaques has produced mixed findings as to whether macaques can be infected with CWD (Adamowicz et al., 2021; Race et al., 2018). Perceptions of risk associated with CWD could diminish the benefits the public derives from cervid species (e.g., wildlife viewing and hunting opportunities) (Decker et al., 2016; Heberlein & Stedman, 2009).

Once CWD has been introduced to an area, it is nearly impossible to eliminate because of the unique characteristics of the misfolded proteins (prions) that cause CWD (Gillin & Mawdsley, 2018). CWD can be transmitted directly through contact with infected animals or materials (e.g., saliva, urine, excreta) and indirectly through contamination in the environment (Almberg et al., 2011; Rivera et al., 2019). Miller et al. (2004) demonstrated indirect environmental transmission in a study where unexposed deer became infected with CWD after living in a paddock with a CWD-infected deer carcass left to decompose two years prior. Indirect transmission is possible because CWD prions can bind to soil and plant leaves (where they remain infectious) and can transmit CWD to CWD-susceptible species upon ingestion (Johnson et al., 2006; Pritzkow et al., 2015; Wyckoff et al., 2016).

The only case where CWD was eliminated from a free-ranging herd occurred in New York state in 2005 (Evans et al., 2012). After CWD was discovered in two captive deer herds, two CWD-positive wild deer were identified through the intensive sampling of wild deer in a containment area established with a 10-mile radius around the infected herds (Brown et al., 2006; New York State Department of Environmental Conservation [NYSDEC], 2018). Emergency regulations were immediately adopted which required testing of hunter-harvested deer and disposal of carcasses in the trash or at a landfill. Over the next five years, 7,000 wild deer were tested within the containment area, and no subsequent cases of CWD were discovered (NYDEC, 2018). Despite this success story, it is generally accepted that preventing a CWD introduction and establishment is more effective than trying to eliminate it after an outbreak (Wobeser, 2002).

As a threat to the many benefits provided by white-tailed deer, CWD is an important issue for wildlife and disease management programs. In 2018, NYSDEC in collaboration with the New York State Department of Agriculture and Markets and the Cornell University Vet School published the New York State Interagency Risk-Minimization Plan (NYSDEC, 2018). The plan outlines strategies for preventing the reintroduction and establishment of CWD in New York. These strategies include two hunter behaviors that help minimize the risk of introducing CWD to New York: complying with the carcass import ban by bringing only deboned deer meat or cleaned parts back to New York after hunting cervids elsewhere and hunting deer without using natural scent lures (NSLs) which contain deer urine collected from high-risk captive facilities.

Siemer et al. (2020) found New York deer hunter performance of these CWD risk-minimizing behaviors varied, although the perceived effectiveness of the behaviors (in keeping CWD out of New York) positively affected intentions. However, between a quarter and a third of hunters were unsure about the efficacy of each risk-minimizing behavior, and ultimately perceived efficacy explained relatively little variance in intentions. Subsequent focus groups with New York deer hunters suggested hunters' norms and values influence their CWD-related behaviors (Siemer et al., 2021). Participants mentioned motivations such as minimizing animal suffering, treating animals with respect, feelings of obligation to reduce the waste they produce and preserving opportunities for future deer hunters (Siemer et al., 2021). Although some hunters questioned the effectiveness of recommended CWD risk-minimizing behaviors, many maintained a desire to learn what the "right thing" to do was (Siemer et al., 2021).

Research Questions

In the current study, we surveyed New York residents who hunt deer in New York (NY hunters) and New York residents who hunt cervids in the neighboring CWD-positive state of Pennsylvania (PA hunters; Figure 1). PA hunters are at a higher risk of interacting with potentially infectious materials and may differ in their CWD-related beliefs and behaviors if they hunt in CWD-positive areas.

RQ1: Do NY hunters and PA hunters differ in their CWD-related beliefs and behaviors?

We used norm-activation theory (NAT) as a conceptual framework for exploring the influence of deer hunters' "inner voices," or personal norms, on their intentions to perform CWD risk-minimizing behaviors (Harland et al., 2007; Schwartz, 1977). We also explore the factors and mechanisms influencing the activation of deer hunters' personal norms.

RQ2: Do deer hunters' personal norms influence their intentions to perform CWD risk-minimizing behaviors?

RQ3: What factors lead to the activation of deer hunters' personal norms?

Home Counties of NY Residents Who Hunt in Pennsylvania

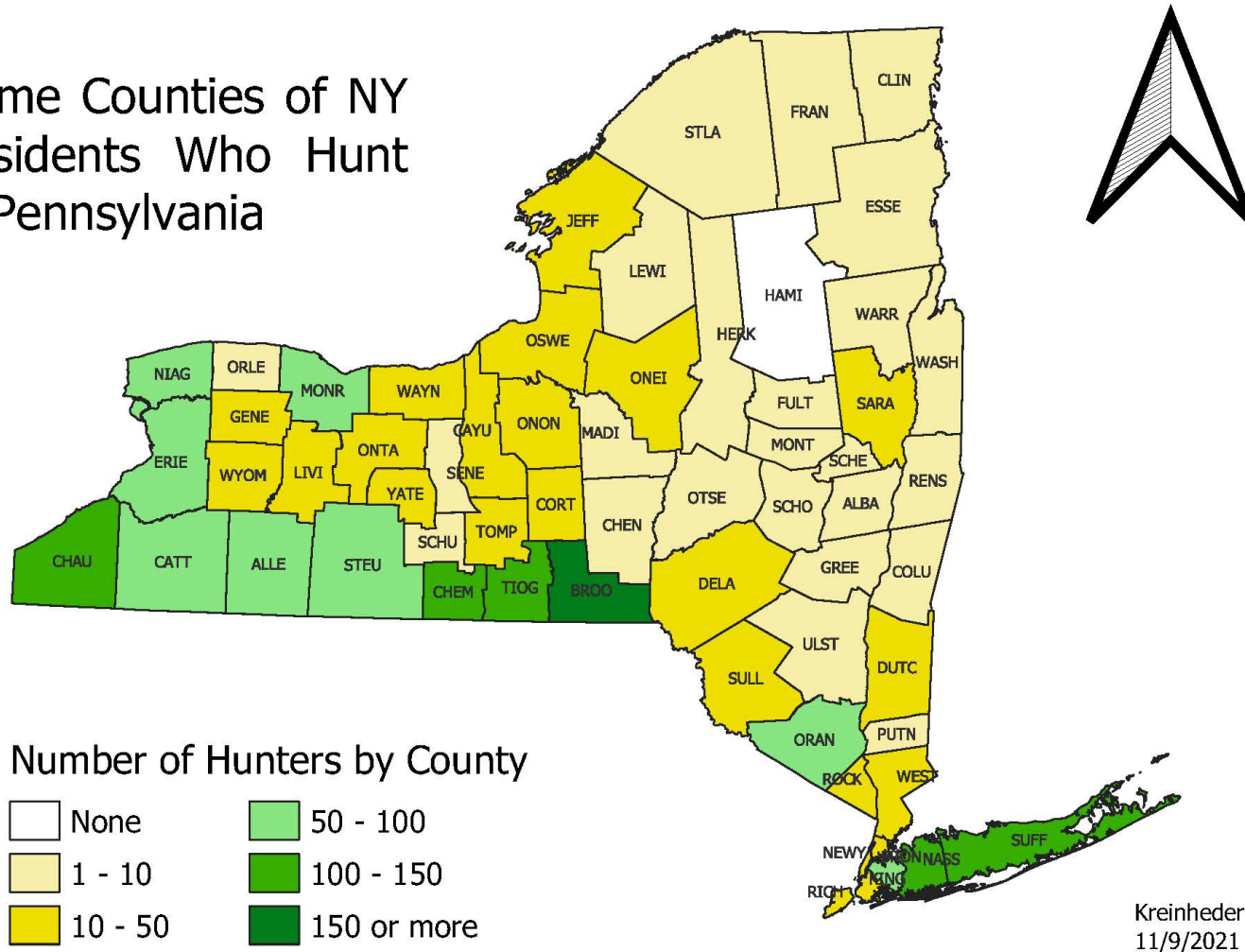


Figure 1. Home counties of hunters from the random sample of Pennsylvania (PA) licensees with New York (NY) zip codes.

Conceptual Foundation

Personal norms, or internalized standards of behavior, may be experienced as an “inner voice” when activated (Harland et al., 2007; Schwartz, 1977). Norm-activation theory (NAT) predicts that activation of personal norms will influence behavioral intentions because acting in accordance with one’s norms satisfies one’s self-expectations and is accompanied by positive feelings about oneself (Schwartz, 1977; Schwartz & Howard, 1984). Past research has documented the influence of personal norms on pro-environmental behaviors, including acceptance of energy policies (de Groot & Steg, 2009; Steg & de Groot, 2010), reduction of personal car usage (Harland et al., 2007; Klöckner & Matthies, 2004; Nordlund & Garvill, 2003), and engagement in recycling behaviors (Janmaimool, 2017; Minton & Rose, 1997; Vining & Ebreo, 1992).

NAT posits that activated personal norms, or “feelings of moral obligation to engage in a certain behavior,” occur when a problem involves an individual’s values (value relevance), and the individual becomes aware of the problem (problem awareness) leading to self-involvement in problem reduction based on feeling able to and responsible for helping (personal responsibility) (de Groot & Steg, 2009; Schwartz, 1977) (Figure 2). In the current study, we explore the influence of deer hunters’ personal norms on their intentions to perform CWD risk-minimizing behaviors. We consider problem awareness and personal responsibility at a broad level (Do hunters view CWD as a problem? Do hunters feel able to and responsible for helping to prevent CWD?) and at a behavior-specific level (Do hunters view specific hunting behaviors as a problem because they may introduce CWD to New York? Do hunters believe performing specific risk-minimizing behaviors will help to prevent CWD?)

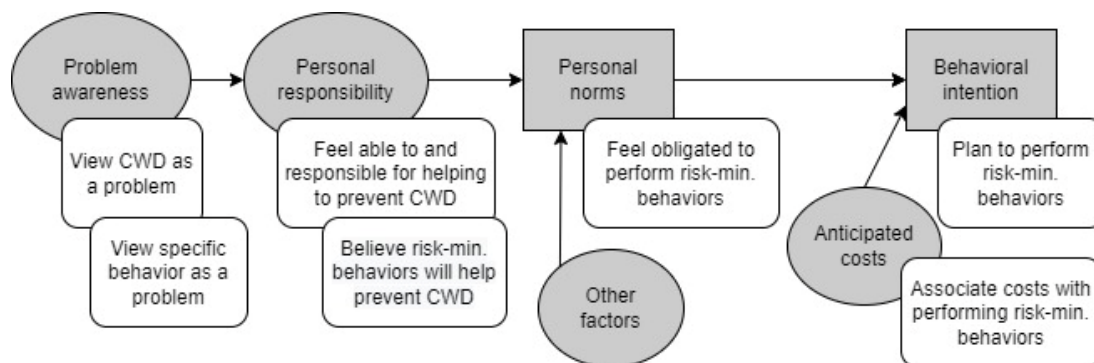


Figure 2. Interpretation of norm-activation theory (NAT) in the context of CWD prevention.

Once personal norms have been activated, Schwartz (1977) suggests anticipating costs to performing the behavior may neutralize the personal norm or weaken the relationship between personal norms and intentions. Anticipated costs may be physical, moral, or social in nature (Schwartz, 1977). For example, a deer hunter may anticipate hunting deer without using natural scent lures would negatively impact their deer harvest success (physical cost), conflict with a personal norm to use natural products (moral cost), or incite mockery from hunting partners (social costs). Other factors are expected to influence personal norms, including individual tendencies to become aware of the external effects of one's behavior (awareness of consequences) and to accept or reject rationales that lower one's personal responsibility (denial of responsibility) (Schwartz, 1977; Schwartz & Howard, 1981). These factors are included in this study but are not a major focus.

Schwartz (1977) originally presented NAT as a sequential process where a variable directly influences the immediately subsequent variable, and any influence on following variables should be indirect or mediated through another variable. For example, problem awareness should not directly influence personal norms, but it should influence personal responsibility which should influence personal norms. We adopt a mediation model interpretation of NAT here because it has received more support than other interpretations of NAT (including as a moderation model) (de Groot & Steg, 2009; de Ruyter & Wetzels, 2000; Steg & de Groot, 2010).

METHODS

Survey Implementation

We collected data through a mail and online survey of two populations: New York residents who hunt deer in New York (NY sample) and New York residents who hunt deer in Pennsylvania (PA sample). The NY sample was comprised of 2,000 New York residents randomly drawn from DEC's licensing database for the 2020-2021 license year. Hunters who listed an email address were surveyed by email while hunters without email addresses were surveyed by mail. We maintained the proportion of hunters who listed email addresses in the database (38%) in our sample to preserve an equal likelihood of these hunters being surveyed.

The PA sample included 2,000 New York residents randomly selected from the Pennsylvania Game Commission's licensing database for the 2021-2022 license year based on their home zip code. A limitation of using the current license year (when the survey was implemented) was that some hunters had not yet bought their licenses for the season and, therefore, were not included in our sample. However, about 66% of the total projected licenses had been sold at

the time when the sample was drawn. All hunters in the PA sample were surveyed by mail because they could not be contacted via email.

All potential study participants were contacted up to four times between October and November 2021 following a modified version of the process outlined by Dillman et al. (2014). The first and third communication for the mail survey included a personalized cover letter and a questionnaire with postage pre-paid. The mail survey instrument was comprised of two letter-sized sheets inside a cover and folded in half into a booklet (a total of four pages printed front and back with 5-½ x 8-½ dimensions). The second and fourth waves of the mail survey only included a personalized cover letter which encouraged hunters to respond to the survey. Hunters surveyed by email received invitation emails to complete the online questionnaire using Qualtrics, an online software platform used to conduct surveys. All four waves of the online survey included a personalized email encouraging hunters to complete the questionnaire and a personalized, one-time-use link to complete the questionnaire online.

CCSS staff completed follow-up phone interviews with nonrespondents to determine whether differences existed between survey respondents and nonrespondents. The nonrespondent interviews contained a subset of questions from the full questionnaire that were modified to be administered over the phone. We drew a random sample of 200 nonrespondents from the NY sample and 200 from the PA sample and attempted to contact each person up to three times. We completed 51 interviews with the NY sample and 49 responses with the PA sample.

Measurement

The online and mail survey instrument for the NY sample had identical questions. We created two versions of the survey instrument for dissemination to the NY sample (NY version) and the PA sample (PA version) (Appendix B). There was considerable overlap in the questions asked on both versions of the questionnaire. Wording differed in places where the NY version broadly referred to out-of-state hunting activities and the PA version referred to hunting activities specifically in Pennsylvania. We rearranged some questions and omitted others in the PA version to accommodate questions about Pennsylvania hunting seasons. When we refer to specific questionnaire items below, we refer to numbering from the NY version of the survey instrument (unless otherwise noted).

Hunting Behavior and Socio-demographic Characteristics

We measured basic demographic variables (Items 21 – 24), including education level, age, gender, and political views.

Hunting Season Participation We asked participants how many days per year they had typically hunted deer in the New York archery, regular firearms, and muzzleloader seasons over the past five years (Items 3a -3c). In the PA version, we also asked about participation in Pennsylvania deer hunting seasons (archery, muzzleloader, regular and special firearms) and the special elk season over the past five years (Items 8a – 8d). All questions were based on items from Siemer et al. (2020), and response options included no days (1), 1-2 days (2), 3-7 days (3), and 8 or more days (4).

Past CWD-Related Hunting Behaviors Using items from Siemer et al. (2020), we asked participants how many different years in the past five years they had performed the following behaviors in New York: used natural (deer urine-based) scent lures, harvested a deer, taken their deer to a processor, processed their deer themselves, and disposed of the deer carcass on the land or in the trash/at a landfill (Items 5a – 5f). We also asked hunters how many different years they had performed the following behaviors outside of New York (NY version, Items 9a - 9d) or specifically in Pennsylvania (PA version, Items 8a – 8d): harvested a cervid species, taken the animal to a processor or taxidermist before returning to New York, processed the animal themselves before returning to New York, brought the animal back to New York to process it.

Norm-Activation Theory (NAT) Variables

We used a series of items on the survey instrument to measure complex concepts (problem awareness and personal responsibility) from norm-activation theory (NAT). In these cases, we used exploratory factor analysis to identify underlying constructs accounting for the associations between items used to measure the same concepts (Appendix A, Table 23-25). We used a combination of statistical results and theoretical considerations to create scales where applicable and used Cronbach's alpha to assess the reliability or internal consistency of the scales. Scores were created by calculating the mean of the items used in the scale.

Behavioral Intentions Hunters' behavioral intentions were measured by asking to what extent they agreed that they planned to take specific actions in the next three years on a scale from strongly disagree (1) to strongly agree (5) (Items 20a – 20e). Behaviors of interest include: never use natural scent lures to hunt deer, dispose of deer carcasses by putting them in the trash or landfill, hunt cervid species outside of New York (NY version) or specifically in Pennsylvania (PA version), and comply with the carcass import ban (by bringing back only the deboned meat or cleaned parts of a cervid harvested outside of New York).

Personal Norms We measured hunters' personal norms by asking to what extent they agreed they felt a strong moral obligation to perform a behavior on a scale from strongly disagree (1) to strongly agree (5) (Items 19a – 19d). We asked about broad behaviors, including helping to

prevent a CWD introduction and ensuring they do not personally introduce CWD and the two more specific CWD risk-minimizing behaviors.

Value Relevance Value relevance assessed the extent to which CWD and its management could affect outcomes hunters value. We used three items to create a scale reflecting value relevance (Cronbach's alpha: NY sample=0.83, PA sample=0.75) (Table 1).

Problem Awareness Problem awareness measured awareness of negative consequences (presumably for something an individual values) associated with CWD. At a broad level, we operationalized problem awareness as hunters' CWD risk perceptions or the perceived severity and likelihood of consequences from CWD. Based on a factor analysis, we created a CWD problem awareness scale using five items that measured perceptions of the extent to which CWD would be a problem (Cronbach's alpha: NY sample=0.90, PA sample=0.89) (Table 1). The measure of perceived likelihood of a CWD introduction did not load onto the same factor and was included independently.

Measures of behavior-specific problem awareness were operationalized as beliefs that specific hunting behaviors (like using natural scent lures) contribute to the problem by posing some risk of introducing CWD to New York. These measures did not load onto the same factor as CWD risk perceptions and although several loaded onto a second factor, we included them independently in the remaining analyses.

Personal Responsibility Personal responsibility described hunters' sense of self-involvement in CWD prevention based on feeling personally able to help and responsible for helping. We created a prevention personal responsibility scale from four items (Cronbach's alpha: NY sample=0.82, PA sample=0.88) assessing personal responsibility for prevention in general (i.e., beliefs that there are actions hunters can take to help control the spread of CWD, assigning some responsibility to oneself for helping to prevent CWD) (Table 1).

At a specific level, we measured hunter perceptions of the effectiveness of the risk-minimizing behaviors in reducing the problem or helping to keep CWD out of New York (behavior-specific efficacy) and perceptions that performing the respective behaviors would be difficult (ability). The efficacy measures loaded onto the same factor as the broad personal responsibility items, but we chose to keep the efficacy items independent to maintain our ability to differentiate between hunter beliefs at a broad and behavior-specific level. The measures of perceived ability had weak factor loadings indicating these items were dissimilar from each other which prompted us to interpret the items as measures of anticipated costs not ability.

Table 1. Measures of norm-activation theory (NAT) concepts and item numbers from the NY version of the survey instrument.

Concept and Measures	Item #
Value relevance scale (Cronbach's alpha: NY sample=0.83, PA sample=0.75):	
• Being an ethical deer hunter is important	4a
• The health of the NY deer herd is an important issue	4b
• Helping to prevent CWD is part of being an ethical hunter	4d
CWD problem awareness scale (Cronbach's alpha: NY=0.90, PA=0.89):	
• CWD would be a problem for the health of deer in areas where I hunt in NY	12a
• CWD would be a problem for the health of deer throughout NY	12b
• CWD would be a problem for NY deer population levels	12c
• CWD would be a problem for my deer hunting satisfaction in NY	12d
• CWD would be a problem for my willingness to consume venison	12e
Independent measures of problem awareness:	
• Perceived likelihood of CWD spreading to NY	13
• Behavior-specific problem awareness	
○ Using natural scent lures (NSLs) poses some risk of introducing CWD	15a
○ Bringing whole carcasses back to NY poses some risk of introducing CWD	15d
Prevention personal responsibility scale (Cronbach's alpha: NY=0.82, PA=0.88):	
• Hunters can take action to help control the spread of CWD	16a
• Feel partially responsible for preventing CWD	18a
• Personal participation in CWD prevention helps	18b
• Feel like endangering the NY deer hunting experience by not putting effort into keeping CWD out	18c
Independent measures of personal responsibility:	
• Behavior-specific efficacy	
○ Hunting deer without using NSLs helps to keep CWD out	16b
○ Complying with the carcass import ban helps to keep CWD out	16c
Independent measures of anticipated costs:	
• Difficulty of performing behaviors	
○ Hunting deer without using NSLs	6
○ Complying with the carcass import ban	10
• Perceived effect of hunting without NSLs on deer harvest (NY version only)	7
• Social norms to perform behaviors	
○ Hunt deer without using NSLs	17a
○ Comply with the carcass import ban	17c

Anticipated Costs We assessed potential social costs by asking about perceived social expectations, or to what extent hunters agreed that other people thought they should perform risk-minimizing behaviors (Table 1). The NY version of the survey included a question asking hunters to what extent they believed avoiding NSLs would affect their deer harvest success, a physical cost mentioned by some focus group participants (Siemer et al., 2021). The item measuring ability to hunt without natural scent lures was highly correlated with this measure of a perceived cost and further supported our interpretation of the item as a measure of anticipated cost, not ability.

Other Factors We included measures of awareness of consequences (Item 3c) and denial of responsibility (Item 18d). However, this report engages with these factors only to a limited extent.

Data Analysis

Data were analyzed using SPSS Version 28. We calculated descriptive statistics (e.g., frequencies, means) to summarize the results for each variable. We used *t*-tests or chi-square tests to compare groups. Reported probabilities of *t*-tests are two-sided, and we used Cohen's *d* to measure effect size. We used linear regression to assess relationships between personal norms and behavioral intentions and logistic regression to predict the likelihood of activating personal norms. We used the PROCESS macro in SPSS to perform mediation analyses where we calculated the indirect effects of independent variables on dependent variables (Hayes & Rockwood, 2017; Steg & de Groot, 2010). Statistically significant relationships were determined at the .05 level.

RESULTS

Survey Response

The response rate for the combined NY sample was 22% (n=407) and 35% for the PA sample (n=688) (Table 2). Survey questions only applied to members of the sample who hunt deer or other cervids, so our analyses included only respondents who said they had typically hunted at least one day of one of the seasons over the past five years (leaving us with 381 “active hunters” in the NY sample and 677 “active hunters” in the PA sample).

Table 2. Response rate for the NY and PA samples for the 2021 survey of deer hunter personal norms related to chronic wasting disease (CWD) prevention.

	NY Sample			PA Sample
	Combined	Mail	Email	
Response rate ¹	22.0%	23.7%	19.1%	35.0%
Completed questionnaires	407	272	135	688
Refusals (returned a blank questionnaire)	10	1	9	2
Noncontact (undeliverable questionnaires)	148	93	55	37
Other nonrespondents	1435	874	561	1273
Total	2000	1240	760	2000

¹Response rate calculation: Completed questionnaires / (total number of units in the sample – undeliverable units).

Respondent-Nonrespondent Comparisons

NY Respondent - NY Nonrespondent Comparisons

NY nonrespondents were younger (\bar{x} =47.5 years) than NY respondents (\bar{x} =57.2 years) and had typically hunted fewer days in the New York regular deer season (\bar{x} =3.16) compared to respondents (\bar{x} =3.47) (Appendix A, Table 22). In the past five years, nonrespondents had harvested deer in New York for more years (\bar{x} =3.45) than respondents (\bar{x} =2.76) and had used natural scent lures (NSLs) in more years (\bar{x} =2.29) than respondents (\bar{x} =1.50). Nonrespondents also believed using NSLs posed less of a risk of introducing CWD to New York (\bar{x} =1.57) compared to respondents (\bar{x} =2.05). Finally, NY nonrespondents agreed less (\bar{x} =3.39) than NY respondents (\bar{x} =3.94) with the statement, “I am partially responsible for preventing a CWD introduction to NY.”

NY nonrespondents and NY respondents did not significantly differ in their participation in New York deer archery seasons, frequency of hunting cervids outside of New York, personal importance of deer hunting, or perceptions of the likelihood of CWD spreading to New York.

PA Respondent – PA Nonrespondent Comparisons

PA nonrespondents were also significantly younger (\bar{x} =43.6 years) than PA respondents (\bar{x} =57.3 years) (Appendix A, Table 22). PA nonrespondents had typically hunted fewer days in the regular New York deer season (\bar{x} =2.69) than PA respondents (\bar{x} =3.21). In the past five years, PA

nonrespondents had harvested deer or elk in Pennsylvania in more years (\bar{x} =3.02) than respondents (\bar{x} =2.06) and had used NSLs in more years (\bar{x} =2.10) than respondents (\bar{x} =1.44). PA nonrespondents believed bringing whole carcasses back to New York posed less of a risk of introducing CWD to New York (\bar{x} =2.27) compared to respondents (\bar{x} =2.95).

PA nonrespondents and PA respondents did not significantly differ in the rate at which they had hunted the Pennsylvania firearms or archery season for deer. They also agreed to a similar extent that they were partially responsible for preventing a CWD introduction, and they assessed the likelihood of CWD spreading to New York similarly.

Data Weighting

Despite observing differences between nonrespondents and respondents, we decided against weighting the data based on nonrespondent interviews. Weighting data involves giving greater weight to responses that most resemble nonrespondents “to compensate for errors in survey coverage” (Dey, 1997). Interviewing nonrespondents allowed us to surmise some ways in which survey respondents were different from nonrespondents. However, in this study, we do not have estimates for nonresponse population parameters and could not determine which survey respondents most resemble nonrespondents. Instead, we discuss the representativeness of our data and the implications of nonresponse bias for our findings in the discussion section (Stedman et al., 2019).

Hunting Behaviors

Participation in Hunting Seasons

On average, hunters from both samples had been hunting deer for over 30 years, although PA hunters had hunted for longer (\bar{x} =38.7 years) than NY hunters (\bar{x} =33.9 years). Most PA hunters (88%) typically hunted at least one day of the New York regular deer season (Table 3). A larger portion of PA hunters (70%) had typically hunted at least one day of the New York archery season than NY hunters (55%) ($\chi^2=25.53$, $p<.001$). Most PA hunters (86%) typically hunted at least one day of the Pennsylvania firearms season for deer, a smaller proportion (52%) had hunted at least one day of the archery season for deer, and only four hunters had hunted the special elk season (Table 3).

Table 3. Percent of NY and PA hunters who typically hunted at least one day of the following deer seasons (or elk where noted) over the past five years.

Hunting season	NY Hunters		PA Hunters		Chi-square Test	
	n	%	n	%	χ^2	<i>p</i>
NY regular firearms	381	98.7	675	87.6	39.11	<.001
NY archery season	379	54.9	675	70.4	25.53	<.001
NY muzzleloader	380	52.6	674	57.4	2.26	.133
PA firearms			639	85.8		
PA archery			640	51.9		
PA muzzleloader			638	32.4		
PA elk (special season)			637	0.6		

Note: Blank responses coded as no days hunted if the participant answered another item in the table and the immediately previous and following questions.

Past Performance of CWD Risk-Minimizing Behaviors

Over the past five years, similar proportions of NY and PA hunters had participated in risk-minimizing behaviors at least once in New York. Over half of NY hunters (54%) and PA hunters (58%) had never used NSLs to hunt deer in the last five years (Table 4). Of NY hunters (n=288) and PA hunters (n=500) who had successfully harvested a deer in New York, 42% of NY hunters and 45% of PA hunters had disposed of deer carcasses in the trash or by taking them to a landfill at least once. However, about a third of hunters in both samples had disposed of carcasses by leaving them on the land.

In the past five years, 69% of PA hunters had harvested a deer or elk in Pennsylvania in at least one year (n=437) (Table 4). Of these hunters, almost half (48%) had taken the animal to a processor or taxidermist before returning to New York, and 59% had processed the animal themselves before returning in at least one year. Only 10% said they brought the animal back to New York to process at least once. However, bringing a whole carcass back to New York became illegal in the last five years which may have reduced hunters' willingness to report taking this action.

Table 4. Percent of NY and PA hunters who performed CWD-related hunting behaviors at least once in the past five years.

Actions taken one year or more in NY	NY Hunters		PA Hunters		Chi-square Test	
	n	%	n	%	χ^2	<i>p</i>
Used a natural scent lure	347	46.4	636	42.0	1.78	.182
Harvested a deer	343	84.0	632	79.1	3.38	.066
Disposed of the deer carcass on the land ¹	287	32.8	495	32.3	0.02	.902
Disposed of the deer carcass in the trash or at a landfill ¹	283	42.0	490	44.5	0.43	.510
Actions taken one year or more in PA			n	%		
Harvested a deer or elk			638	68.5		
Taken the animal to a processor or taxidermist before returning to NY ²			431	48.0		
Processed the animal themselves before returning to NY ²			434	58.8		
Brought the animal back to NY to process ²			431	9.5		

¹Includes only hunters who had harvested deer in New York in at least one of the last five years (NY sample n=288, PA sample n=500).

²Includes only PA hunters who had harvested deer or elk in Pennsylvania in at least one of the last five years (n=437).

Behavioral Intentions and Personal Norm Activation

Behavioral Intentions

Hunters varied in their intentions to perform the two CWD risk-minimizing behaviors, but PA and NY hunters reported similar intentions (Appendix A, Table 26). Roughly a third of hunters (NY hunters=34%, PA hunters=32%) strongly agreed that they intended to never use natural scent lures (NSLs) to hunt deer, but 29% of NY hunters and 32% of PA hunters were neutral (Table 5). Of NY hunters who said they were neutral or planned to hunt outside of New York in the future (n=191) and PA hunters, 78% and 85%, respectively, intended to comply with the carcass import ban by bringing only deboned deer meat or cleaned parts back. Finally, about half of hunters (NY hunters=50%, PA hunters=49%) agreed that they planned to dispose of deer carcasses in the trash or at a landfill, while 28% of NY hunters and 29% of PA hunters disagreed.

Table 5. Hunter intentions to perform risk-minimizing behaviors in the next three years.

Within the next three years, I plan to...	Sample	n	\bar{x}	Disagreement/agreement rating (%)				
				Strongly disagree (1)	Slightly disagree (2)	Neutral (3)	Slightly agree (4)	Strongly agree (5)
Hunt deer without using NSLs	NY	344	3.48	14.8	6.1	29.4	15.7	34.0
	PA	642	3.38	15.0	8.9	31.6	12.6	31.9
Comply with the carcass import ban	NY ¹	191	4.36	2.6	1.6	17.8	13.1	64.9
	PA	642	4.50	3.3	2.8	8.7	11.5	73.7
Dispose of deer carcasses in the trash/landfill	NY	345	3.37	23.8	4.3	21.7	11.6	38.6
	PA	635	3.32	23.8	4.7	22.8	13.4	35.3

¹Includes only NY respondents who were neutral or agreed that they planned to hunt outside of NY in the next five years (n=191).

Personal Norms

We measured hunters' personal norms or feelings of obligation to engage in CWD prevention at a broad level and by performing specific CWD risk-minimizing behaviors. We considered personal norms to be activated if the participant agreed that they felt obligated to perform the behavior. Personal norms to help prevent an introduction of CWD to New York were activated in most hunters (NY hunters=85%, PA hunters=84%), as were personal norms to ensure one does not personally introduce CWD to New York (NY hunters=90%, PA hunters=89%) (Table 6).

Activation of hunters' personal norms to perform the two risk-minimizing behaviors differed between behaviors and between samples. Personal norms to hunt deer without using NSLs were activated in more NY hunters (43%) compared to PA hunters (35%) ($\chi^2=5.86$, $p=.016$). Among PA hunters (n=642) and NY hunters who agreed or were neutral that they planned to hunt cervids outside of New York in the future (n=191), roughly three-quarters of hunters felt a moral obligation to comply with the carcass import ban (NY hunters=76%, PA hunters=75%).

Table 6. Hunters’ personal norms related to CWD prevention and risk-minimizing behaviors.

I feel a strong moral obligation to...	Sample	n	% Activated	Chi-square Test	
				χ^2	<i>p</i>
Help prevent an introduction of CWD to NY	NY	349	84.8	0.09	.764
	PA	641	84.1		
Hunt deer <u>without</u> using NSLs	NY	347	42.9	5.86	.016
	PA	638	35.1		
Comply with the carcass import ban	NY ¹	191	75.9	0.02	.882
	PA	642	75.4		
Ensure that <u>I do not personally</u> introduce CWD to NY	NY	348	90.2	0.72	.397
	PA	642	88.5		

¹Includes only NY hunters who were neutral or agreed they planned to hunt outside of New York in the next five years (n=191).

Value Relevance

Survey respondents indicated that CWD had high value relevance and NY hunters (\bar{x} =4.80, SD=0.56) and PA hunters (\bar{x} =4.81, SD=0.50) reported similar scores on the value relevance scale (t =-0.48, p =.629) (Table 26). In response to one of the three items included in the scale, 88% of NY hunters and 89% of PA hunters strongly agreed that the health of the New York deer herd is an important issue (Table 7). Given the lack of variation in value relevance, the concept did not help us differentiate between hunters, and we did not include it in the remaining analyses.

Problem Awareness

We asked hunters to assess CWD as a problem, which roughly reflected their CWD risk perceptions. NY and PA respondents similarly assessed the likelihood of CWD spreading to NY in the next five years; the most frequent response was “slightly likely” (41%) (Table 8).

Table 7. Relevance of CWD and related behaviors to things hunters presumably value.

Statements	Sample	n	\bar{x}	Disagreement/agreement rating (%)				
				Strongly disagree (1)	Slightly disagree (2)	Neutral (3)	Slightly agree (4)	Strongly agree (5)
Being an ethical deer hunter is important	NY	375	4.84	1.6	0.3	1.9	5.1	91.2
	PA	672	4.90	1.2	0.1	1.0	2.8	94.8
The health of the NY deer herd is an important issue	NY	377	4.81	1.3	0.3	2.9	7.4	88.1
	PA	672	4.84	1.0	0.0	2.1	7.7	89.1
Helping to prevent CWD is part of being an ethical hunter	NY	378	4.75	1.9	0.0	4.0	10.1	84.1
	PA	673	4.70	1.5	0.9	5.2	11.1	81.3

Table 8. Perceived likelihood of CWD spreading to New York in the next five years.

Sample	n	\bar{x}	Perceived likelihood (%)				
			Very unlikely (1)	Slightly unlikely (2)	Neither likely nor unlikely (3)	Slightly likely (4)	Very likely (5)
NY	365	3.67	5.2	9.9	21.1	40.8	23.0
PA	660	3.71	4.7	8.8	21.1	41.4	24.1

We created a CWD problem awareness scale measuring the perceived severity of consequences associated with CWD. On average, hunters believed CWD would be a problem to at least a moderate extent, but NY hunters perceived CWD to be a problem to a greater extent (\bar{x} =3.43, SD=0.72) compared to PA hunters (\bar{x} =3.26, SD=0.77) (t =3.50, p <.001, Cohen's d =0.22, Table 26). Very few hunters (2% of NY hunters and 3% of PA hunters) said CWD would not at all be a problem for the health of New York deer (Table 9). On the other hand, 13% of NY hunters and 19% of PA hunters said CWD would not at all be a problem for their willingness to consume venison.

Table 9. Hunters’ problem awareness regarding the consequences of CWD.

To what extent would CWD be a problem for...	Sample	n	\bar{x}	Extent of the problem ¹ (%)			
				Not	Slight	Mod.	Great
The health of deer in areas where I hunt in NY	NY	369	3.50	3.5	7.9	23.3	65.3
	PA	647	3.40	4.9	10.8	23.8	60.4
The health of deer throughout NY	NY	370	3.57	1.6	6.2	25.7	66.5
	PA	653	3.46	2.6	10.0	26.2	61.3
NY deer population levels	NY	367	3.48	2.5	7.9	28.9	60.8
	PA	652	3.35	3.5	13.5	27.6	55.4
My deer hunting satisfaction in NY	NY	369	3.40	6.5	7.6	25.2	60.7
	PA	651	3.22	8.3	13.5	26.3	51.9
My willingness to consume venison	NY	368	3.22	13.0	11.1	16.8	59.0
	PA	658	2.84	18.7	19.5	21.3	40.6

¹Not at all (1), slight (2), moderate (3), a great extent (4).

While hunters generally agreed that CWD would be a problem, they varied in their identification of specific behaviors as a problem (i.e., behavior-specific problem awareness). A similar proportion of NY hunters (9%) and PA hunters (10%) perceived using natural scent lures (NSLs) to pose a great deal of risk of introducing CWD to New York (Table 10). On the other hand, 54% of NY hunters thought bringing a whole carcass back to New York posed a great deal of risk compared to 40% of PA hunters. The proportion of PA hunters who thought hunting outside New York posed no risk was twice that of NY hunters, and the proportion of PA hunters who thought it posed a great deal of risk was one-quarter the proportion of NY hunters.

Personal Responsibility

We measured hunters’ perceived personal responsibility or self-involvement in CWD prevention based on feeling able to and responsible for helping to prevent CWD, using the prevention personal responsibility scale. Scale scores indicated NY hunters (\bar{x} =4.11, SD=0.81) and PA hunters (\bar{x} =4.17, SD=0.93) similarly felt some degree of personal responsibility for helping to prevent CWD (Table 26). One of the scale items asked if respondents thought there were actions hunters can take to help prevent CWD, and most hunters agreed (NY hunters=83%, PA hunters=86%) (Table 11). Another item asked if hunters believed their participation helps to keep CWD out of New York, and 78% and 81% of NY and PA hunters, respectively, agreed.

Table 10. Perceived risk of introducing CWD to New York associated with various behaviors.

Behavior-specific problem awareness	Sample	n	\bar{x}	Perceived risk of introducing CWD ¹ (%)			
				No	Slight	Mod.	Great
Using natural scent lures	NY	347	2.05	34.9	33.7	22.8	8.6
	PA	648	2.06	35.2	34.0	20.8	10.0
Bringing whole carcass back to NY	NY	359	3.31	5.8	11.4	28.4	54.3
	PA	657	2.95	12.3	21.0	26.5	40.2
Hunting outside NY	NY	354	2.54	17.2	31.9	30.5	20.3
	PA	655	1.90	38.0	39.5	17.3	5.2

¹No risk (1), slight risk (2), moderate risk (3), a great deal of risk (4).

Table 11. Hunter's perceptions of personal responsibility to broadly engage in CWD prevention.

Statements	Sample	n	\bar{x}	Disagreement/agreement rating (%)				
				Strongly disagree (1)	Slightly disagree (2)	Neutral (3)	Slightly agree (4)	Strongly agree (5)
Hunters can take action to help control the spread of CWD	NY	366	4.30	2.5	1.9	13.1	28.7	53.8
	PA	659	4.40	2.1	2.4	9.7	25.2	60.5
Feel partially responsible for preventing CWD	NY	352	3.94	7.1	1.7	18.2	36.4	36.6
	PA	639	4.06	7.4	4.4	10.3	31.0	46.9
Personal participation in CWD prevention helps	NY	353	4.16	1.4	1.7	19.0	34.8	43.1
	PA	640	4.21	4.1	4.1	11.3	28.3	52.3
Feel like endangering the NY deer hunting experience by <u>not</u> putting effort into keeping CWD out	NY	352	4.09	3.7	2.8	19.0	30.1	44.3
	PA	639	4.03	6.6	5.5	13.8	26.6	47.6

In addition to asking hunters about the responsibility they ascribe to themselves, we asked to what extent they thought other entities were responsible for helping to prevent CWD. On average, participants thought hunters, captive deer owners, and DEC managers were all at least somewhat responsible for helping to prevent CWD (Table 12). While almost half of NY hunters (47%) and PA hunters (48%) believed hunters were very responsible, 65% of NY hunters and 73% of PA hunters thought captive deer owners were very responsible.

Table 12. Responsibility attributed to groups for helping to prevent a CWD introduction.

Groups of people	Sample	n	\bar{x}	Degree of responsibility ¹ (%)			
				Not	Slightly	Somewhat	Very
Hunters	NY	367	3.19	6.8	13.9	32.4	46.9
	PA	661	3.17	7.3	16.8	28.0	48.0
Captive deer owners	NY	364	3.45	6.0	7.1	22.3	64.6
	PA	659	3.58	4.1	6.8	15.9	73.1
DEC wildlife managers	NY	366	3.32	7.9	9.8	24.3	57.9
	PA	661	3.25	8.2	13.2	23.8	54.9

¹Not at all responsible (1), slightly responsible (2), somewhat responsible (3), very responsible (4).

At a behavior-specific level, NY and PA hunters similarly believed that complying with the carcass import ban (by bringing only deboned deer meat or cleaned parts back to New York) was more effective at helping to keep CWD out of New York compared to hunting deer without using NSLs (Table 13). About half of hunters (NY hunters=47%, PA hunters=50%) strongly agreed that complying with the carcass import ban would help, while only 16% of NY hunters and 15% of PA hunters said the same for hunting without using NSLs.

Table 13. Perceived effectiveness of the suggested CWD risk-minimizing behaviors in helping to keep CWD out of New York.

Behavior-specific efficacy	Sample	n	\bar{x}	Disagreement/agreement rating (%)				
				Strongly disagree (1)	Slightly disagree (2)	Neutral (3)	Slightly agree (4)	Strongly agree (5)
Hunting deer <u>without</u> using NSLs helps to keep CWD out	NY	359	3.12	14.5	9.2	42.3	18.1	15.9
	PA	655	3.03	15.0	13.6	39.7	16.8	15.0
Complying with the carcass import ban helps keep CWD out	NY	364	4.07	5.2	4.4	15.4	28.3	46.7
	PA	658	3.97	7.9	7.9	14.0	20.2	50.0

Anticipated Costs

We measured hunters’ perceptions that performing risk-minimizing behaviors would be associated with physical and social costs. We asked NY hunters to what extent they thought hunting without NSLs would affect their deer hunting success and 43% said not at all (Table 14). Due to space limitations, we did not ask this question on the PA version of the questionnaire.

Table 14. Perceived effect of hunting deer without natural scent lures on deer harvest success.

n	\bar{x}	Perceived effect on harvest success (%)			
		Not at all (1)	Slight (2)	Moderate (3)	A great extent (4)
159 ¹	1.89	43.4	30.8	18.9	6.9

¹Includes NY respondents who had used NSLs at least once in the past five years (n=161).

Of hunters who had used natural scent lures (NSLs) at least once in the past five years (NY sample n=161, PA sample n=267), slightly over a third of NY hunters (35%) and PA hunters (34%) thought hunting deer without NSLs would be very easy and only 4% of NY hunters and 6% of PA hunters thought it would be very difficult (Table 15). Of PA hunters who had either brought a harvested animal to a processor or taxidermist or processed the animal themselves before returning to New York (n=435), 46% thought complying with the carcass import ban would be very easy, and 11% said it would be very difficult.

Table 15. Perceived difficulty of performing risk-minimizing behaviors.

Behavior	Sample	n	\bar{x}	Perceived difficulty of behavior (%)				
				Very easy (1)	Some-what easy (2)	Neither easy nor difficult (3)	Some-what difficult (4)	Very difficult (5)
Hunting deer <u>without</u> using NSLs ¹	NY	161	2.37	35.4	11.2	39.1	9.9	4.3
	PA	265	2.51	34.0	6.8	39.2	14.3	5.7
Complying with the carcass import ban ²	PA	433	2.33	46.4	12.5	13.4	16.6	11.1

¹Includes only respondents who had used natural scent lures (NSLs) at least once in the past five years (NY sample n=161, PA sample n=267).

²Includes only PA respondents who brought a harvested animal to a processor or taxidermist or processed the animal themselves before returning to New York at least once (n=435).

Hunters perceived a stronger social norm to comply with the carcass import ban than to hunt without using NSLs. Only 13% of hunters (in both the NY and PA sample) strongly agreed that there were social expectations to hunt deer without NSLs, while 43% of NY hunters and 45% of PA hunters said the same for complying with the carcass import ban (Table 16).

Table 16. Perceived social norms to perform risk-minimizing behaviors.

The people who matter most to me think I should...	Sample	n	\bar{x}	Disagreement/agreement rating (%)				
				Strongly disagree (1)	Slightly disagree (2)	Neutral (3)	Slightly agree (4)	Strongly agree (5)
Hunt deer <u>without</u> using NSLs	NY	352	3.07	10.8	8.2	57.1	10.8	13.1
	PA	638	2.97	16.5	8.3	50.6	11.3	13.3
Comply with the carcass import ban	NY	352	3.91	4.5	3.1	32.4	16.8	43.2
	PA	640	3.86	8.8	6.6	20.0	19.7	45.0

Hunter Intentions and Personal Norms

Factors That Influence Intentions to Perform Risk-Minimizing Behaviors

We used multivariate analyses to assess the relationship between personal norms and hunters' behavioral intentions to perform risk-minimizing behaviors.

Intentions to Comply with the Carcass Import Ban The carcass import ban only applies to hunters returning to New York after harvesting a cervid outside of New York. This scenario applied to relatively few of the NY respondents (n=55), so we focused our analyses for this behavior on PA hunters. We were able to explain 46% of the variance in PA hunters' intentions to comply with the carcass import ban and the personal norm to comply was the strongest predictor (Table 17). Hunters intended to comply with the ban to a greater extent when they felt a personal obligation to do so, had brought whole carcasses back to New York in fewer years, perceived complying with the ban to be less difficult, and perceived greater social expectations to comply with the ban.

Intentions to Hunt Deer Without Using Natural Scent Lures (NSLs) DEC recommends hunting deer without using natural (deer urine-based) scent lures (NSLs). We were able to explain 60% of the variance in NY hunters' intention to follow this recommendation and 64% of the variance in PA hunters (Table 17). Again, the personal norm to perform the respective behavior was the strongest predictor of intentions. In both samples, intentions increased with feelings of obligation to hunt without NSLs and perceived efficacy of hunting without NSLs (in keeping CWD out of New York) and decreased with past years using NSLs. Among PA hunters, intentions increased with perceived social expectations to perform the behavior and decreased with perceived difficulty. In the NY sample, neither social norms nor perceived difficulty influenced intentions. However, beliefs that hunting without NSLs would affect deer harvest success negatively influenced intentions amongst NY hunters. (Due to space limitations, this item was only included on the NY version of the questionnaire.)

Table 17. Predicting intentions to perform risk-minimizing behaviors using personal norms, anticipated costs, and previously significant variables.

Independent Variables	Intentions		
	Comply with Ban (PA Sample) <i>b</i> (SE)	Hunt Deer Without Using NSLs (NY Sample) <i>b</i> (SE)	Hunt Deer Without Using NSLs (PA Sample) <i>b</i> (SE)
(Constant)	2.89 (0.16)***	1.75 (0.25)***	1.17 (0.16)***
Personal norms to perform risk-minimizing behavior	0.35 (0.04)***	0.47 (0.06)***	0.42 (0.05)***
Years performing “risky” form of the behavior	-0.19 (0.04)***	-0.16 (0.03)***	-0.12 (0.02)***
Behavior-specific efficacy	0.01 (0.04)	0.18 (0.06)**	0.22 (0.04)***
Difficulty of performing behaviors	-0.10 (0.02)***	-0.09 (0.06)	-0.12 (0.04)***
Social norms to perform behaviors	0.10 (0.04)*	0.08 (0.06)	0.20 (0.04)***
Perceived effect of hunting without NSLs on deer harvest (NY version)		-0.17 (0.08)*	
	<i>R</i> ²	0.458	0.604
	Adj. <i>R</i> ²	0.453	0.596
	<i>df</i> (residual)	576	298
	<i>F</i>	97.242	75.640
	Sig.	<.001	<.001

****p*<.001; ***p*<.01; **p*<.05

Factors Predicting Activation of Personal Norms to Perform Risk-Minimizing Behaviors

Having demonstrated the use of personal norms in understanding hunters’ intentions to perform risk-minimizing behaviors, our next objective was to explore the variables and mechanisms influencing activation of deer hunters’ personal norms. First, we used binary logistic regression to identify factors affecting the odds of personal norms being activated. (Personal norms were considered activated if the respondent agreed that they felt obligated to perform the risk-minimizing behavior.)

Personal Norms to Comply with the Carcass Import Ban We predicted activation of PA hunters’ personal norms to comply with the carcass import ban with 90% overall accuracy (Table 18). Personal norms were over twice as likely to be activated with one-unit increases to behavior-specific problem awareness (beliefs that bringing a whole carcass back to NY poses some degree of risk of introducing CWD), prevention personal responsibility, and behavior-specific efficacy (perceptions that complying with the ban helps to keep CWD out of New York) (Table 19). CWD problem awareness (CWD risk perceptions) did not influence the odds of personal norm activation.

Personal Norms to Hunt Without Using Natural Scent Lures (NSLs) We were able to predict activation of NY hunters’ personal norms to hunt without NSLs with 74% overall accuracy and in PA hunters with 83% overall accuracy (Table 18). In both samples, the odds of activating personal norms increased over 2.5 times with beliefs that hunting deer without NSLs would be effective and decreased with past use of NSLs (Table 19). Among PA hunters only, odds of activation increased when hunters perceived using NSLs to pose a greater risk of introducing CWD to NY, and amongst NY hunters only, odds of activation decreased with increasing responsibility denial (feelings of being less responsible if other hunters are not participating in prevention). Measures of CWD problem awareness and prevention personal responsibility did not predict activation in either sample.

Table 18. Classification table for logistic regression models predicting activation of personal norms to perform risk-minimizing behaviors.

Activation Observed?	Activation of Personal Norms Predicted?								
	Comply with Ban			Hunt Deer Without Using NSLs					
	(PA Sample)			(NY Sample)			(PA Sample)		
	No	Yes	% Correct	No	Yes	% Correct	No	Yes	% Correct
No (Not activated)	105	33	76.1	131	36	78.4	334	31	91.5
Yes (Activated)	23	399	94.5	40	85	68.0	62	124	66.7
Overall %			90.0			74.0			83.1

Table 19. Variables in logistic regression models to predict the likelihood of activating personal norms to perform risk-minimizing behaviors.

Independent Variables	Personal Norms					
	Comply with Ban (PA Sample)		Hunt Deer Without Using NSLs			
	OR	Wald	(NY Sample)		(PA Sample)	
	OR	Wald	OR	Wald	OR	Wald
CWD problem awareness scale	0.68	3.13	0.89	0.24	1.05	0.08
Perceived likelihood of CWD spreading to NY	1.11	0.48	1.01	<0.01	1.06	0.22
Awareness of consequences	0.96	0.05	0.88	0.71	1.15	0.63
Behavior-specific problem awareness	2.30	17.54***	1.20	0.87	1.57	7.36**
Prevention personal responsibility scale	2.76	21.50***	1.09	0.17	1.40	2.63
Responsibility denial	0.89	0.80	0.76	4.72*	0.99	0.01
Behavior-specific efficacy	2.53	38.15***	2.61	23.81***	3.26	51.42***
Years performing “risky” form of the behavior	0.75	2.58	0.69	17.72***	0.75	15.18***
Constant	<0.01	28.55***	0.11	3.67	<0.01	37.7***
Nagelkerke R^2	0.660		0.444		0.532	

*** $p < .001$; ** $p < .01$; * $p < .05$

Indirect Effects on Deer Hunters’ Personal Norms

After identifying variables that predicted activation of personal norms, we used mediation analysis to explore *how* variables influence personal norms. The relationship between an independent variable (X) and a dependent variable (Y) is considered mediated when a significant indirect effect of X on Y is identified (Hayes & Rockwood, 2017). Mediation analysis estimates this indirect effect as a product of 1) X’s effect on a mediating variable (M) and 2) M’s more proximate influence on Y (Figure 3). For example, a mediation interpretation of norm-activation theory (NAT) predicts problem awareness will not directly influence personal norms but will increase personal responsibility, which will increase personal norms (Figure 2).

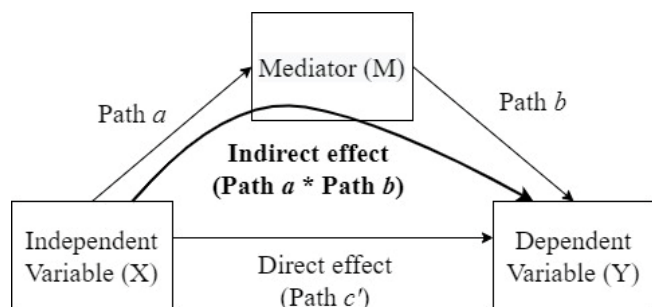


Figure 3. Path diagram of a simple mediation model.

As anticipated, we found that CWD problem awareness did not generally influence activation outcomes (Table 19). Using mediation analysis, we discovered that CWD problem awareness had an indirect effect on personal norms (via intermediate changes to prevention personal responsibility) in all three cases (Table 20). Furthermore, while controlling for the influence of prevention personal responsibility on personal norms, we confirmed that CWD problem awareness had no direct effect on personal norms to comply with the carcass import ban or to avoid natural scent lures amongst NY hunters. However, there was still a significant direct effect for PA hunters. The presence of this direct effect does not negate the discovery of indirect effects but suggests the relationship is only partially mediated.

Table 20. Estimating CWD problem awareness’ direct effect on personal norms and indirect effect as mediated by prevention personal responsibility.

	Personal Norms		
	Comply with Ban (PA Sample) <i>b</i> [95% CI]	Hunt Deer Without Using NSLs (NY Sample) <i>b</i> [95% CI]	Hunt Deer Without Using NSLs (PA Sample) <i>b</i> [95% CI]
Indirect Effect	0.44* [0.35, 0.53]	0.22* [0.13, 0.33]	0.24* [0.18, 0.31]
Direct Effect	0.09 [-0.01, 0.18]	<-0.01 [-0.18, 0.17]	0.17* [0.05, 0.29]

*Significant at .05 level.

We expected prevention personal responsibility to increase the odds of personal norm activation but found it only predicted personal norms to comply with the import ban (Table 19). We found that prevention personal responsibility indirectly affects personal norms because prevention personal responsibility increases beliefs about the effectiveness of specific risk-minimizing behaviors, and this is what positively influences personal norms (Table 21).

Table 21. Estimating prevention personal responsibility’s direct effect on personal norms and indirect effect as mediated by behavior-specific efficacy.

	Personal Norms		
	Comply with Ban (PA Sample) <i>b</i> [95% CI]	Hunt Deer Without Using NSLs	
		(PA Sample) <i>b</i> [95% CI]	(PA Sample) <i>b</i> [95% CI]
Indirect Effect	0.60* [0.48, 0.72]	0.48* [0.35, 0.61]	0.40* [0.33, 0.48]
Direct Effect	0.38* [0.29, 0.47]	0.12 [-0.04, 0.28]	0.20* [0.10, 0.29]

*Significant at .05 level.

DISCUSSION AND CONCLUSION

Overall, NY hunters (New York residents who hunt in New York where CWD is not known to occur) and PA hunters (New York residents who hunt in Pennsylvania where CWD has been found) reported similar personal norms and behavioral intentions to perform CWD risk-minimizing behaviors. However, differences between the two CWD risk-minimizing behaviors were apparent. Among PA hunters (n=642) and NY hunters (n=191) who agreed or were neutral that they planned to hunt cervids outside of New York in the future, roughly three-quarters had an activated personal norm, and more agreed they planned to comply with the carcass import ban. On the other hand, personal norms to hunt deer without using natural scent lures (NSLs) were activated in only about one third of hunters, and about half agreed that they planned to never use NSLs to hunt deer (but about a third said they were neutral).

Deer hunters’ personal norms positively affected their intentions to perform both CWD risk-minimizing behaviors. Using personal norms, past performance of the “risky” alternate behavior (e.g., bringing a whole cervid carcass back to New York, using natural scent lures), and anticipated costs of performing the risk-minimizing behaviors, we explained 46% of the variance in PA hunters’ intentions to bring only deboned deer meat or cleaned parts back to

New York (i.e., comply with the carcass import ban), 60% of the variance in NY hunters' intentions to hunt without using natural scent lures (NSLs) and 64% of the variance in PA hunters' intentions to hunt without NSLs.

Deer hunters generally agreed that CWD would have negative consequences for outcomes of value to them, creating a foundation for personal norms to influence their intentions. For example, most hunters strongly agreed that NY deer health was an important issue to them (88-89%) and that CWD would be a problem to a moderate-great extent for the health of deer in New York (88-92%). That said, we found that PA hunters had lower CWD problem awareness, or risk perceptions, compared to NY hunters. This finding aligns with other studies suggesting CWD risk perceptions may decrease with experience with CWD (Needham et al., 2006; Vaske & Miller, 2018).

PA hunters perceived hunting outside of New York to pose less risk of introducing CWD to New York compared to NY hunters. It is possible that PA hunters who are licensed to hunt in CWD-positive Pennsylvania are less concerned because they have experience performing this potentially risky behavior, are more familiar with protocols in Pennsylvania to reduce disease spread (e.g., additional restrictions within disease management areas), and consider the continued absence of CWD in New York as a testament to the low risk posed by the behavior. Ultimately, despite PA hunters assessing specific behaviors as less problematic, they did not differ from NY hunters in their beliefs about the efficacy of risk-minimizing behaviors. About half of both NY and PA hunters strongly agreed that complying with the carcass import ban would be effective, while less than one-fifth said the same for forgoing natural scent lures (NSLs) for deer hunting.

As we discovered, perceived efficacy, or beliefs that practicing risk-minimizing behaviors would have the desired outcome of helping to prevent CWD, consistently increased the odds that hunters would feel obligated to perform the respective behaviors (i.e., activation of personal norms). For every unit increase in perceived efficacy, activation of personal norms became 2.5-3.3 times more likely in all cases. A positive relationship between perceived efficacy and hunter engagement in and support for CWD management has been documented in other studies (Cooney & Holsman, 2010; Holsman et al., 2010; Schroeder et al., 2021; Siemer et al., 2020; Vaske & Miller, 2018). However, our study not only identified efficacy as having a positive effect, but it added to our understanding of *why* efficacy has such a strong influence.

It makes logical sense that assessments of CWD as a problem should influence feelings of obligation to perform risk-minimizing behaviors. And yet, CWD problem awareness did not predict activation of personal norms. Using mediation analysis, we found that the perceived effectiveness of the risk-minimizing behaviors conveys the influence of variables earlier in the

norm-activation process, including CWD problem awareness. CWD risk perceptions do influence personal norms because they increase feelings of personal responsibility to help prevent CWD, and these feelings of self-involvement (e.g., believing there are actions available to hunters to help and that participating in CWD prevention is helpful) increase perceptions of the effectiveness of specific risk-minimizing behaviors (the most proximate influence on personal norms). We saw that despite PA hunters having lower risk perceptions compared to NY hunters, they ultimately had similar intentions to perform risk-minimizing behaviors. This is because PA and NY hunters did not differ in the more proximate variable in the chain of influence; they felt similar levels of personal responsibility and assessed the effectiveness of behaviors similarly.

To encourage the performance of risk-minimizing behaviors, it is important that deer hunters are able to assess the behaviors as effective in achieving the desired outcome (CWD prevention). This is easier said than done, as hunters have expressed uncertainty about the efficacy of CWD management actions, including risk-minimizing behaviors they have been asked to adopt (Holsman et al., 2010; Siemer et al., 2020). We suggest there is a need to 1) reduce underlying scientific uncertainty around risk-minimizing behaviors and 2) inform CWD risk communication with these findings to help hunters assess the effectiveness of recommended behaviors.

In situations where reducing scientific uncertainty is not possible, there may be other ways to help hunters assess the effectiveness of recommended risk-minimizing behaviors. For example, it may be difficult to assess how effective hunting without using natural (deer urine-based) scent lures (NSLs) may be because it is unclear if a bottle contains CWD prions and if spreading lures in the environment will transmit CWD. However, a comparison can be drawn between the effectiveness of avoiding NSLs and other options based on scientific evidence. This approach was exemplified in a bulletin on CWD management on private lands, which identified not dispersing deer urine on the land as a “Best Practice,” followed by a ranking of behaviors from “Low Risk” (only apply deer urine to materials that can be removed from the land to avoid further transmission) to “High Risk” (apply deer urine of unknown origin directly on the land) (Hewitt et al., 2021; Wisconsin Department of Natural Resources, 2019).

Limitations and Future Studies

From nonresponse interviews, we gleaned that nonrespondents may be less invested in deer hunting and overall, less worried about their behaviors introducing CWD to New York compared to respondents. If true, this suggests survey response could have been biased by the content of the survey which causes some concern about the representativeness of our findings (Stedman et al., 2019). As a novel application of norm-activation theory (NAT), we do not know how the

observed differences are related to other variables or relationships between variables in nonrespondents (hence our decision not to weight the data).

NAT suggests the relationship between personal norms and intentions is predicated on the identification of a problem that involves something of personal value (e.g., CWD is value relevant if individuals value deer hunting and think CWD threatens deer hunting). In the current study, value relevance was high amongst survey respondents (which provided a data point in itself), but the lack of variation limited our ability to explore the relationship between personal norms and intentions across different levels of value relevance. It is not clear how the influence of personal norms on behavioral intentions would change in hunters with low value relevance, for example, in casual hunters who may not value deer hunting and health as much as our survey respondents. Future research could make deliberate efforts to studying the influence of personal norms amongst hunters demonstrating varied value relevance.

An assumption of this study (and all studies that measure personal norms using a questionnaire) was that personal norms could be activated simply by asking participants questions about their personal norms on the survey instrument. Personal norms are predicted to be constructed in a specific situation, so any measure outside of the intended situation is limited by an individual's ability to anticipate how they would feel in that situation (Schwartz, 1977). While we believe we were able to activate personal norms using the survey instrument (and activated personal norms increased behavioral intentions), it was outside of the scope of this study to test whether personal norms could be activated (and therefore increase behavior intentions) through other forms of communication (e.g., social media posts, magazine articles).

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APPENDIX A: SUPPLEMENTARY ANALYSES

Table 22. Comparing survey respondents and nonrespondents on key variables.

NY Comparisons	Nonrespondents	Respondents	Independent Samples Test		
	\bar{x} (SD)	\bar{x} (SD)	<i>t</i>	<i>p</i>	Cohen's <i>d</i>
Age	47.5 (17.0)	57.2 (15.7)	-4.08	<.001	-0.61
Typical days hunting in NY regular season ¹	3.16 (1.01)	3.47 (0.73)	-2.16	.035	-0.41
Years harvesting deer in NY	3.45 (1.94)	2.76 (1.83)	2.52	.012	0.38
Years using natural scent lures (NSLs)	2.29 (2.04)	1.50 (1.94)	2.70	.007	0.40
Using NSLs pose some risk of introducing CWD ²	1.57 (0.93)	2.05 (0.96)	-2.92	.004	-0.51
Feel partially responsible for preventing CWD ³	3.39 (1.27)	3.94 (1.12)	-3.16	.002	-0.48
PA Comparisons	\bar{x} (SD)	\bar{x} (SD)	<i>t</i>	<i>p</i>	Cohen's <i>d</i>
Age	43.6 (15.0)	57.3 (15.0)	-6.18	<.001	-0.91
Typical days hunting in NY regular season ¹	2.69 (1.18)	3.21 (1.02)	-3.02	.004	-0.51
Years harvesting deer in PA	3.02 (2.13)	2.06 (1.85)	3.04	.004	0.51
Years using NSLs	2.10 (1.65)	1.44 (1.98)	2.64	.011	0.34
Bringing whole carcasses back to NY poses some risk of introducing CWD ²	2.27 (1.15)	2.95 (1.05)	-4.09	<.001	-0.64

¹Measured on a scale from no days (1), 1-2 days (2), 3-7 days (3), to 8+ days (4).

²Measured on a scale from no risk (1) to a great deal of risk (4).

³Measured on a scale from strongly disagree (1) to strongly agree (5).

Table 23. Factor loadings for items measuring value relevance.

	Factor Loadings	
	NY Sample	PA Sample
Personal importance of deer hunting	0.14	0.10
Being an ethical deer hunter is important	0.75	0.76
The health of the NY deer herd is an important issue	0.86	0.82
Helping to prevent CWD is part of being an ethical hunter	0.80	0.64

Table 24. Rotated factor loadings for items measuring problem awareness.

	Factor Loadings			
	NY Sample		PA Sample	
	Factor 1	Factor 2	Factor 1	Factor 2
CWD would be a problem for the health of deer in areas where I hunt in NY	0.88	0.01	0.86	-0.03
CWD would be a problem for the health of deer throughout NY	0.85	0.07	0.92	-0.02
CWD would be a problem for NY deer population levels	0.82	0.00	0.89	-0.04
CWD would be a problem for my deer hunting satisfaction in NY	0.94	-0.17	0.82	-0.01
CWD would be a problem for my willingness to consume venison	0.60	0.05	0.52	0.14
Perceived likelihood of CWD spreading to NY	0.37	0.16	0.19	0.16
Using NSLs poses some risk of introducing CWD	0.07	0.43	0.20	0.33
Hunting outside of NY poses some risk of introducing CWD	-0.06	0.74	-0.09	0.82
Hunting in an area where CWD has been found poses some risk of introducing CWD	0.02	0.73	0.00	0.59
Bringing whole carcasses back to NY poses some risk of introducing CWD	0.18	0.55	0.29	0.40
Importing finished taxidermy mounts poses some risk of introducing CWD	-0.08	0.41	0.00	0.28

Table 25. Factor loadings for items measuring personal responsibility.

	Factor Loading	
	NY Sample	PA Sample
Attribute responsibility to hunters for helping to prevent CWD	0.46	0.59
Hunters can take action to help control the spread of CWD	0.74	0.72
Feel partially responsible for preventing CWD	0.77	0.74
Personal participation in CWD prevention helps	0.88	0.87
Feel like endangering the NY deer hunting experience by <u>not</u> putting effort into keeping CWD out	0.74	0.82
Hunting deer <u>without</u> using NSLs helps to keep CWD out	0.60	0.45
Complying with the carcass import ban helps to keep CWD out	0.61	0.73
Ability to hunt deer <u>without</u> using NSLs (reverse coded)	0.17	0.18
Ability to comply with the carcass import ban (reverse coded)	0.03	0.41

Table 26. Comparing NY and PA hunter CWD-related behavioral intentions and beliefs.

	NY Hunters	PA Hunters	Independent Samples Test		
	\bar{x} (SD)	\bar{x} (SD)	<i>t</i>	<i>p</i>	Cohen's <i>d</i>
Intentions¹:					
Hunt deer <u>without</u> using NSLs	3.48 (1.40)	3.38 (1.40)	1.10	.271	0.07
Comply with carcass import ban ²	4.36 (1.00)	4.50 (0.99)	-1.64	.102	-0.14
Dispose of deer carcasses in the trash or at a landfill	3.37 (1.59)	3.32 (1.56)	0.49	.624	0.03
Value relevance scale ¹	4.80 (0.56)	4.81 (0.50)	-0.48	.629	-0.03
CWD problem awareness scale ³	3.43 (0.72)	3.26 (0.77)	3.50	<.001	0.22
Perceived likelihood of CWD spreading to NY ⁴	3.67 (1.09)	3.71 (1.07)	-0.68	.496	-0.04
Behavior-specific problem awareness⁵:					
Using NSLs	2.05 (0.96)	2.06 (0.98)	-0.08	.936	-0.01
Hunting outside NY	2.54 (1.00)	1.90 (0.87)	10.20	<.001	0.70
Bringing whole carcass back to NY	3.31 (0.89)	2.95 (1.05)	5.88	<.001	0.37
Prevention personal responsibility scale ¹	4.11 (0.81)	4.17 (0.93)	-1.01	.313	-0.06
Behavior-specific efficacy¹:					
Hunting deer <u>without</u> using NSLs	3.12 (1.22)	3.03 (1.23)	1.06	.290	0.07
Complying with the carcass import ban	4.07 (1.12)	3.97 (1.29)	1.34	.182	0.08

¹Measured on a scale from strongly disagree (1) to strongly agree (5).

²Includes only hunters from NY sample who were neutral or agreed that they planned to hunt outside of New York in the future (n=191).

³Measured on a scale from not at all (1) to a great extent (4).

⁴Measured on a scale from very unlikely (1) to very likely (5).

⁵Measured on a scale from no risk (1) to a great deal of risk (4).

APPENDIX B: SURVEY INSTRUMENTS

NY Version

Deer Hunters and Chronic Wasting Disease (CWD) Prevention

Research conducted for the
NYS Department of Environmental Conservation (DEC)
Division of Fish and Wildlife
by the
Center for Conservation Social Sciences
Department of Natural Resources and the Environment
Cornell University

Chronic wasting disease (CWD) is a fatal disease of the cervid (deer, elk, moose, caribou) family. It is caused by an abnormal protein called a prion. In 2005, CWD was discovered in captive deer facilities in New York (NY) and then in two wild white-tailed deer nearby. However, over the last 15 years, it has not been found again in the state. As such, NY is considered free of CWD.

Keeping CWD out of NY is a priority for DEC. DEC has asked hunters to help prevent the introduction and spread of CWD by adopting risk-minimizing behaviors.

The goal of this survey is to understand hunters' views and behaviors related to CWD in NY to improve DEC communication with hunters. Input from **everyone** who receives this questionnaire is valuable, not just those who have strong opinions about deer hunting or CWD. We want the results of the survey to reflect the perspectives of all deer hunters in NY.

Your identity will be kept confidential and the information you give us will never be associated with your name.

Please complete this questionnaire as soon as you can, seal it with the white re-sealable label provided, and drop it in any mailbox; ***return postage has been pre-paid.***

Part I: General Deer Hunting Questions

1) About how many total years have you hunted deer? (Fill in the number.) _____

2) How important is deer hunting to you personally? (Circle one number.)

Not at all important	Slightly important	Moderately important	Very important
1	2	3	4

3) Over the last 5 years, about how many days per year did you typically hunt during the following seasons in NY? (Check one box per line.)

Number of days hunted:	None	1-2	3-7	8+
Archery seasons	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regular firearms seasons	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Muzzleloader seasons	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4) Hunters have different opinions about how they should act as deer hunters. Please indicate your level of agreement with the following statements. (Circle one number per line.)

	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
It is important to me to be an ethical deer hunter.	1	2	3	4	5
The health of the NY deer herd is an important issue to me.	1	2	3	4	5
I think my current deer hunting behaviors impact future deer hunters.	1	2	3	4	5
I think putting effort into keeping CWD out of NY is part of being an ethical hunter.	1	2	3	4	5

Part 2: Specific Deer Hunting Behaviors

5) Over the past 5 years, how many different years have you done the following in NY?
(Circle one number per line.)

	Number of years:					
Used a natural (deer urine-based) scent lure	0	1	2	3	4	5
Harvested a deer	0	1	2	3	4	5
Processed (butchered) the deer myself	0	1	2	3	4	5
Disposed of my deer carcass by leaving it on the land	0	1	2	3	4	5
Disposed of my deer carcass by putting it in the trash or taking it to a landfill	0	1	2	3	4	5
Taken the deer to a processor	0	1	2	3	4	5

6) How difficult would it be for you to hunt deer without using natural scent lures? (Circle one number.)

Very easy	Somewhat easy	Neither easy nor difficult	Somewhat difficult	Very difficult
1	2	3	4	5

7) How much do you think hunting deer without using natural scent lures would affect your deer harvest success? (Circle one number.)

Not at all	Slightly	Moderately	A great deal
1	2	3	4

8) Over the past 5 years, how often did you hunt deer, elk, moose, or caribou outside of NY?
(Circle one number.)

- 1 Never >>>>>> Skip to Question # 11
- 2 At least once
- 3 Multiple times

9) Over the past 5 years, how many different years have you done the following outside of NY? (Circle one number per line.)

	Number of years:					
Harvested a deer, elk, moose, or caribou <u>outside of NY</u>	0	1	2	3	4	5
Taken the harvested animal to a processor or taxidermist before returning to NY	0	1	2	3	4	5
Processed (butchered) the harvested animal myself before returning to NY	0	1	2	3	4	5
Brought the harvested animal back to NY to process	0	1	2	3	4	5

10) How difficult would it be for you to bring only deboned meat or cleaned parts back to NY after hunting outside of NY? Note: "Cleaned parts" includes skull caps, antlers with no flesh, raw or processed capes/hides, teeth/lower jaws, and finished taxidermy products. (Circle one number.)

Very easy	Somewhat easy	Neither easy nor difficult	Somewhat difficult	Very difficult
1	2	3	4	5

11) To what degree does your concern about CWD influence the following? (Circle one number per line.)

	Not at all	Slightly	Moderately	A great deal
Your carcass processing and disposal methods	1	2	3	4
Your decision about whether to use natural (deer urine-based) scent lures	1	2	3	4
Your decision about whether to hunt <u>outside of NY</u>	1	2	3	4
If you hunt outside of NY, your handling of deer, elk, moose, or caribou harvested <u>outside of NY</u>	1	2	3	4

Part 3: Your Beliefs About CWD

These questions will help DEC understand your beliefs about CWD and factors that influence the risk of a CWD introduction.

12) Please indicate to what extent you think that CWD would be a problem if it were to be introduced to NY. (Circle one number per line.)

To what extent would CWD be a problem for...	Not at all	Slight	Moderate	A great extent
The health of deer in areas where I hunt in NY	1	2	3	4
The health of deer throughout NY	1	2	3	4
NY deer population levels	1	2	3	4
My deer hunting satisfaction in NY	1	2	3	4
My willingness to consume venison	1	2	3	4

13) How unlikely or likely do you think it is that CWD will spread to NY in the next 5 years? (Circle one number.)

Very unlikely	Slightly unlikely	Neither likely nor unlikely	Slightly likely	Very likely
1	2	3	4	5

14) To what degree do you believe the following people are responsible for helping to prevent a CWD introduction to NY? (Circle one number per line.)

	Not at all responsible	Slightly responsible	Somewhat responsible	Very responsible
Hunters	1	2	3	4
Captive deer owners	1	2	3	4
DEC wildlife managers	1	2	3	4

15) To what degree do you believe the following actions pose a risk of introducing CWD to NY? (Circle one number per line.)

	No risk	Slight risk	Moderate risk	A great deal of risk
Using natural scent lures	1	2	3	4
Hunting <u>outside of NY</u>	1	2	3	4
Hunting in an area where CWD has been found	1	2	3	4
Bringing whole carcasses back to NY after hunting <u>outside of NY</u>	1	2	3	4
Importing finished taxidermy mounts	1	2	3	4

16) DEC believes hunters can help reduce the risk of introducing CWD to NY. Please indicate your level of agreement with these statements about hunter actions.

(Circle one number per line.)	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
There are actions hunters can take to help control the spread of CWD.	1	2	3	4	5
Hunting deer <u>without</u> using natural scent lures helps to keep CWD out of NY.	1	2	3	4	5
Bringing only deboned meat or cleaned parts back to NY after hunting <u>outside of NY</u> helps to keep CWD out of NY.	1	2	3	4	5
Hunters I know have changed their behavior to help keep CWD out of NY.	1	2	3	4	5
I have changed my behavior to help keep CWD out of NY.	1	2	3	4	5

Part 4: Your Role in CWD Prevention

These questions will help DEC understand how you view your personal role in helping to keep CWD out of NY.

17) Consider the people whose opinions matter the most to you. To what extent do you agree that they think you should do the following? (Circle one number per line.)

The people who matter most to me think I should...	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
Hunt deer <u>without</u> using natural scent lures	1	2	3	4	5
<u>Not</u> hunt in an area where CWD has been found	1	2	3	4	5
Bring only deboned meat or cleaned parts back to NY after hunting <u>outside of NY</u>	1	2	3	4	5

18) Hunters perceive their role in helping to prevent a CWD introduction differently. Please indicate your level of agreement with the following statements.

(Circle one number per line.)	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
I am partially responsible for preventing a CWD introduction to NY.	1	2	3	4	5
My participation in CWD prevention helps keep CWD out of NY.	1	2	3	4	5
If I did <u>not</u> put effort into keeping CWD out of NY, I would feel like I was endangering the NY deer hunting experience.	1	2	3	4	5
If other hunters do <u>not</u> participate in CWD prevention, I will feel less responsible to do so.	1	2	3	4	5

19) Hunters have different opinions about their personal duty to perform certain behaviors. Please indicate your level of agreement with the following statements.

<i>(Circle one number per line.)</i>	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
I feel a strong moral obligation to help prevent an introduction of CWD to NY.	1	2	3	4	5
I feel a strong moral obligation to hunt deer <u>without</u> using natural scent lures.	1	2	3	4	5
If I hunt outside NY, I feel a strong moral obligation to bring only deboned meat or cleaned parts back to NY.	1	2	3	4	5
I feel a strong moral obligation to ensure that <u>I do not personally</u> introduce CWD to NY.	1	2	3	4	5

20) Hunters differ in their behaviors. To what extent do you agree that you plan to take the following actions within the next 3 years? (Circle one number per line.)

Within the next 3 years, I plan to...	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
<u>Never</u> use natural scent lures to hunt deer	1	2	3	4	5
Take deer I harvest to a processor	1	2	3	4	5
Dispose of my deer carcasses by putting them in the trash or taking them to a landfill	1	2	3	4	5
Hunt deer, elk, moose, or caribou <u>outside of NY</u>	1	2	3	4	5
If I hunt outside NY, bring only deboned meat or cleaned parts back to NY	1	2	3	4	5

Part 5: Your Background Information

By providing a little more information about yourself, you will help DEC to understand the concerns of all types of hunters.

21) What is the highest degree or level of school you have completed? *(Circle one number.)*

- 1 Less than high school diploma or equivalent
- 2 High school diploma or equivalent
- 3 Some college, no degree
- 4 Associate degree
- 5 Bachelor's degree
- 6 Masters, professional, or PhD degree

22) In what year were you born? *(Fill in the year.)* _____

23) What is your gender? *(Circle one number.)*

- 1 Female
- 2 Male
- 3 Prefer not to say
- 4 Prefer to self-describe: _____

24) How would you describe your political views? *(Circle one number.)*

Very conservative	Slightly conservative	Moderate	Slightly liberal	Very liberal
1	2	3	4	5

PA Version

Deer Hunters and Chronic Wasting Disease (CWD) Prevention

Research conducted for the
NYS Department of Environmental Conservation (DEC)
Division of Fish and Wildlife
by the
Center for Conservation Social Sciences
Department of Natural Resources and the Environment
Cornell University

Chronic wasting disease (CWD) is a fatal disease of the cervid (deer, elk, moose, caribou) family. It is caused by an abnormal protein called a prion. In 2005, CWD was discovered in captive deer facilities in New York (NY) and then in two wild white-tailed deer nearby. However, over the last 15 years, it has not been found again in the state. As such, NY is considered free of CWD.

Keeping CWD out of NY is a priority for DEC. DEC has asked hunters to help prevent the introduction and spread of CWD by adopting risk-minimizing behaviors when they hunt in states, such as Pennsylvania, where CWD has been found.

You have been selected to participate in this survey because you are a NY resident who has hunted in Pennsylvania. **We will ask you about both your hunting in NY and your hunting in PA.**

The goal of this survey is to understand hunters' views and behaviors related to CWD to improve DEC communication with hunters. Input from **everyone** who receives this questionnaire is valuable, not just those who have strong opinions about deer hunting or CWD.

Your identity will be kept confidential and the information you give us will never be associated with your name.

Please complete this questionnaire as soon as you can, seal it with the white re-sealable label provided, and drop it in any mailbox; ***return postage has been pre-paid.***

Part I: General Deer Hunting Questions

1) About how many total years have you hunted deer? (Fill in the number.) _____

2) How important is deer hunting to you personally? (Circle one number.)

Not at all important	Slightly important	Moderately important	Very important
1	2	3	4

3) Hunters have different opinions about how they should act as deer hunters. Please indicate your level of agreement with the following statements. (Circle one number per line.)

	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
It is important to me to be an ethical deer hunter.	1	2	3	4	5
The health of the NY deer herd is an important issue to me.	1	2	3	4	5
I think my current deer hunting behaviors impact future deer hunters.	1	2	3	4	5
I think putting effort into keeping CWD out of NY is part of being an ethical hunter.	1	2	3	4	5

4) Over the last 5 years, about how many days per year did you typically hunt during the following seasons in NY? (Check one box per line.)

Number of days hunted in NY:	None	1-2	3-7	8+
Archery seasons	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regular firearms seasons	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Muzzleloader seasons	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5) Over the last 5 years, about how many days per year did you typically hunt during the following seasons in PA? (Check one box per line.)

Number of days hunted <u>in PA</u> :	None	1-2	3-7	8+
Archery deer seasons	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regular and special firearms deer seasons	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Muzzleloader (including flintlock) deer seasons	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Elk seasons	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Part 2: Specific Deer Hunting Behaviors

6) Over the past 5 years, how many different years have you done the following in NY? (Circle one number per line.)

	Number of years:					
Used a natural (deer urine-based) scent lure	0	1	2	3	4	5
Harvested a deer	0	1	2	3	4	5
Processed (butchered) the deer myself	0	1	2	3	4	5
Disposed of my deer carcass by leaving it on the land	0	1	2	3	4	5
Disposed of my deer carcass by putting it in the trash or taking it to a landfill	0	1	2	3	4	5
Taken the deer to a processor	0	1	2	3	4	5

7) How difficult would it be for you to hunt deer without using natural scent lures? (Circle one number.)

Very easy	Somewhat easy	Neither easy nor difficult	Somewhat difficult	Very difficult
1	2	3	4	5

8) Over the past 5 years, how many different years have you done the following in PA? (Circle one number per line.)

	Number of years:					
	0	1	2	3	4	5
Harvested a deer or elk <u>in PA</u>	0	1	2	3	4	5
Taken the deer or elk to a processor or taxidermist before returning to NY	0	1	2	3	4	5
Processed (butchered) the deer or elk myself before returning to NY	0	1	2	3	4	5
Brought the deer or elk back to NY to process	0	1	2	3	4	5

9) How difficult would it be for you to bring only deboned meat or cleaned parts back to NY after hunting in PA? Note: "Cleaned parts" includes skull caps, antlers with no flesh, raw or processed capes/hides, teeth/lower jaws, and finished taxidermy products. (Circle one number.)

Very easy	Somewhat easy	Neither easy nor difficult	Somewhat difficult	Very difficult
1	2	3	4	5

10) To what degree does your concern about CWD influence the following? (Circle one number per line.)

	Not at all	Slightly	Moderately	A great deal
Your carcass processing and disposal methods	1	2	3	4
Your decision about whether to use natural (deer urine-based) scent lures	1	2	3	4
Your decision about whether to hunt <u>in PA</u>	1	2	3	4
Your handling of deer or elk harvested <u>in PA</u>	1	2	3	4

Part 3: Your Beliefs About CWD

These questions will help DEC understand your beliefs about CWD and factors that influence the risk of a CWD introduction.

11) Please indicate to what extent you think that CWD would be a problem if it were to be introduced to NY. (Circle one number per line.)

To what extent would CWD be a problem for...	Not at all	Slight	Moderate	A great extent
The health of deer in areas where I hunt in NY	1	2	3	4
The health of deer throughout NY	1	2	3	4
NY deer population levels	1	2	3	4
My deer hunting satisfaction in NY	1	2	3	4
My willingness to consume venison	1	2	3	4

12) How unlikely or likely do you think it is that CWD will spread to NY in the next 5 years? (Circle one number.)

Very unlikely	Slightly unlikely	Neither likely nor unlikely	Slightly likely	Very likely
1	2	3	4	5

13) To what degree do you believe the following people are responsible for helping to prevent a CWD introduction to NY? (Circle one number per line.)

	Not at all responsible	Slightly responsible	Somewhat responsible	Very responsible
Hunters	1	2	3	4
Captive deer owners	1	2	3	4
DEC wildlife managers	1	2	3	4

14) To what degree do you believe the following actions pose a risk of introducing CWD to NY? (Circle one number per line.)

	No risk	Slight risk	Moderate risk	A great deal of risk
Using natural scent lures	1	2	3	4
Hunting <u>outside of NY</u>	1	2	3	4
Hunting in an area where CWD has been found	1	2	3	4
Bringing whole carcasses back to NY after hunting <u>in PA</u>	1	2	3	4
Importing finished taxidermy mounts	1	2	3	4

15) DEC believes hunters can help reduce the risk of introducing CWD to NY. Please indicate your level of agreement with these statements about hunter actions.

(Circle one number per line.)	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
There are actions hunters can take to help control the spread of CWD.	1	2	3	4	5
Hunting deer <u>without</u> using natural scent lures helps to keep CWD out of NY.	1	2	3	4	5
Bringing only deboned meat or cleaned parts back to NY after hunting <u>in PA</u> helps to keep CWD out of NY.	1	2	3	4	5
Hunters I know have changed their behavior to help keep CWD out of NY.	1	2	3	4	5
I have changed my behavior to help keep CWD out of NY.	1	2	3	4	5

Part 4: Your Role in CWD Prevention

These questions will help DEC understand how you view your personal role in helping to keep CWD out of NY.

16) Consider the people whose opinions matter the most to you. To what extent do you agree that they think you should do the following? (Circle one number per line.)

The people who matter most to me think I should...	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
Hunt deer <u>without</u> using natural scent lures	1	2	3	4	5
<u>Not</u> hunt in an area where CWD has been found	1	2	3	4	5
Bring only deboned meat or cleaned parts back to NY after hunting <u>in PA</u>	1	2	3	4	5

17) Hunters perceive their role in helping to prevent a CWD introduction differently. Please indicate your level of agreement with the following statements.

(Circle one number per line.)	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
I am partially responsible for preventing a CWD introduction to NY.	1	2	3	4	5
My participation in CWD prevention helps keep CWD out of NY.	1	2	3	4	5
If I did <u>not</u> put effort into keeping CWD out of NY, I would feel like I was endangering the NY deer hunting experience.	1	2	3	4	5
If other hunters do <u>not</u> participate in CWD prevention, I will feel less responsible to do so.	1	2	3	4	5

18) Hunters have different opinions about their personal duty to perform certain behaviors. Please indicate your level of agreement with the following statements.

<i>(Circle one number per line.)</i>	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
I feel a strong moral obligation to help prevent an introduction of CWD to NY.	1	2	3	4	5
I feel a strong moral obligation to hunt deer <u>without</u> using natural scent lures.	1	2	3	4	5
I feel a strong moral obligation to bring only deboned meat or cleaned parts back to NY after hunting <u>in PA</u> .	1	2	3	4	5
I feel a strong moral obligation to ensure that <u>I do not personally</u> introduce CWD to NY.	1	2	3	4	5

19) Hunters differ in their behaviors. To what extent do you agree that you plan to take the following actions within the next 3 years? (Circle one number per line.)

Within the next 3 years, I plan to...	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
<u>Never</u> use natural scent lures to hunt deer	1	2	3	4	5
Take deer I harvest to a processor	1	2	3	4	5
Dispose of my deer carcasses by putting them in the trash or taking them to a landfill	1	2	3	4	5
Hunt deer or elk <u>in PA</u>	1	2	3	4	5
Bring only deboned meat or cleaned parts back to NY after hunting <u>in PA</u>	1	2	3	4	5

Part 5: Your Background Information

By providing a little more information about yourself, you will help DEC to understand the concerns of all types of hunters.

20) What is the highest degree or level of school you have completed? *(Circle one number.)*

- 1 Less than high school diploma or equivalent
- 2 High school diploma or equivalent
- 3 Some college, no degree
- 4 Associate degree
- 5 Bachelor’s degree
- 6 Masters, professional, or PhD degree

21) In what year were you born? *(Fill in the year.)* _____

22) What is your gender? *(Circle one number.)*

- 1 Female
- 2 Male
- 3 Prefer not to say
- 4 Prefer to self-describe: _____

23) How would you describe your political views? *(Circle one number.)*

Very conservative	Slightly conservative	Moderate	Slightly liberal	Very liberal
1	2	3	4	5