Research Article

Effects of Zoonotic Disease Attributes on Public Attitudes Towards Wildlife Management

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Abstract

Society faces a growing challenge in the management of zoonotic wildlife diseases. Unique attributes of zoonotic diseases and the shifting sociocultural contexts within which diseases are experienced create serious challenges for managers. We address 2 critical questions: how do uncertainty and severity associated with a zoonotic disease relate to public management attitudes and preferences, and do immigrant attitudes and preferences differ from those of long-term residents in rural areas of the Intermountain West? We addressed these questions using a personally administered questionnaire in Teton County, Idaho, USA. Based on 2 hypothetical zoonotic wildlife diseases, one less severe and more known (type A) and one more severe and less known (type B), we asked respondents to indicate their agreement with 13 statements regarding their perception of the disease and management preferences. We also asked respondents to indicate their support for different groups controlling management. Our compliance rate was 95% (n = 416, sampling error ± 4.8%). Respondents considered type B a greater risk to human and livestock health, and supported using lethal control methods, except hunting, to control it. Disease type, however, had less impact on public support for management options involving fencing and supplemental feeding. With only 2 exceptions, longer-term residents (LTR) supported lethal management options more than newer residents (NR). Further, NR hunted less than LTR, thereby restricting lethal management options. Respondents indicated some level of support for all management control options except giving authority to local civic leaders. Newer residents showed higher support for wildlife scientists and federal agencies making management decisions, whereas LTR preferred state livestock agencies. Demographic change in rural areas may lead to higher levels of support for federal and scientific control over zoonotic disease management but lower support for lethal management and ability to enact lethal management. Our results suggest 2 critical management needs: solicitation and consideration of public input for type A zoonotic disease management and promotion of hunting or developing a viable lethal management alternative. (JOURNAL OF WILDLIFE MANAGEMENT 70(6):1746–1753; 2006)

Key words

attitudes, disease, Idaho, public opinion, risk, Teton Valley, Wyoming, zoonotic disease.

Society faces a serious and growing challenge in the management of zoonotic wildlife diseases. Outbreaks of severe acute respiratory syndrome (SARS) and avian influenza have made wildlife-related zoonotic disease management a global issue (Liu 2003, World Health Organization 2004). Zoonotic diseases make the social dimension of wildlife-disease management exponentially more complex. Oversimplification of relationships among biological, political, and social factors related to managing zoonotic diseases could lead to both public backlash and failure to reduce disease prevalence. Prion-associated chronic wasting disease (CWD) provides a glance at the complexity of these relationships. Media coverage of the prion-associated bovine spongiform encephalopathy (BSE; mad cow disease) and the uncertainty about CWD itself probably influenced public perceptions of risk, and thus acceptable management strategies, more than anything known about the disease. Although no evidence links human disease and CWD (Raymond et al. 2000, Belay et al. 2001, Williams et al. 2002), the perceived link with BSE may allow wildlife managers to use more draconian measures in addressing CWD than Lyme disease, bovine tuberculosis, or West Nile virus, which actually infected humans.

Research has just begun to address social dimensions of wildlife disease management (Dorn and Mertig 2005). Intuitively, approval of lethal management should differ for a disease with well-known etiology and relatively mild clinical signs and one characterized by uncertainty and severe clinical signs, including death. For instance, one can expect that the public would feel differently about lethal management of host species for controlling ringworm versus CWD. Further, participation in lethal management has a connection with perceptions of risk. More than 50% of Wisconsin gun deer hunters who hunted in 2001, but not in 2002, cited CWD as their reason for not hunting (Vaske et al. 2004).

Perceptions of risk to self, humans, domestic animals, and wildlife should influence public attitudes towards, and willingness to participate in, zoonotic disease management. Risk refers to the possibility that actions or events lead to consequences harming people or things humans value (Klinke and Renn 2002). Risk perception has 2 fundamental dimensions: unknown and dread risk (Slovic 1987, Klinke and Renn 2002). Diseases high on the unknown dimension of risk are non-observable, new, unknown to those exposed,

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delayed in effect, and without scientific risk assessments (Slovic 1987). Diseases high on the dread dimension are uncontrollable, dreaded, catastrophic, fatal, risky to future generations, difficult to reduce, progressively more risky over time, and unavoidable (Slovic 1987). While both dimensions exist on continuums, we can make general distinctions. Type A diseases (e.g., bovine brucellosis, *E. coli,* bovine tuberculosis) have low levels of unknown risk (e.g., observable, old, known to the public and science) and low levels of dread risk (e.g., controllable, typically nonfatal, non-catastrophic, low risk to future generations, and fairly easily reduced). Type B diseases (e.g., prion-associated diseases, SARS) have high levels of unknown risk (e.g., non-observable, new, unknown to the public and science), and dread risk (e.g., noncontrollable, fatal, catastrophic, risk to future generations, difficult to reduce, and increasing). Temporal and cultural contexts define differences between type A and type B zoonotic diseases. West Nile virus was "new" to United States citizens in 2002, but "old" for people in areas where the disease was previously endemic (e.g., the Nile Delta in Egypt).

Because cultural context defines perception of risk, the influx of urbanites into historically rural areas (Fuguitt 1995, Wilkins et al. 2003) complicates zoonotic disease management. Nonmetropolitan America saw a dramatic increase in the rate of population growth during the last 15–20 years (Johnson 2003). Rural areas with high natural amenity value to both tourists and potential residents experienced the greatest increase in population during the 1990s (Shumway and Davis 1996, Smith and Krannich 2000, Johnson 2003). Reasons for migration to rural mountain areas, in particular, include outdoor recreational opportunities, notably skiing (Rothman 1998), and improved quality of life for raising families or similar social factors (Graber 1974, Starrs 1995). Starrs (1995:279) labeled those seeking a better life "urban refugees" who flee negative aspects of the urban experience.

As people with urban temperaments encroach on wildlife habitat, perceived risk associated with disease attributes may change, sympathy for lethal management practices (e.g., hunting, sharpshooting, feeding bans) may decline, and support for nonlethal, although potentially nonpractical, practices (e.g., vaccination, fencing, quarantines) may increase (Dizard 2003, Peterson et al. 2003). Further, as rural communities develop larger proportions of residents with urban backgrounds, traditionally anti-federal sentiments regarding authority for management of public resources such as wildlife may decline (Brunner et al. 2002).

We chose to evaluate the relationships between disease types (i.e., A and B), human demographic change, and public disease management preferences with a case study in Teton County, Idaho, USA. Findings from this case can apply in global zoonotic disease management contexts, but represent rural, natural amenity–rich areas in the Intermountain West. Regarding disease types, we hypothesized that type B diseases would elicit 1) more concern about contracting the disease, 2) more concern about living in or visiting areas where the disease is prevalent, 3) more support for actively managing the disease, and 4) more support for lethal management strategies. Regarding demographic categories (e.g., longer-term residents [LTR] vs. newer residents [NR]), we hypothesized that LTR would be more supportive of 1) actively managing diseases, 2) using lethal management, and 3) local control of management versus federal control. We used a personally administered survey to evaluate how zoonotic disease types related to public management preferences and how the influx of immigrants into this rural area influenced public preferences for managing zoonotic disease.

Study Area

The Teton Valley study area includes the Idaho communities of Driggs, Victor, Tetonia, and Felt; the Wyoming Community of Alta; unincorporated areas throughout Teton County, Idaho; and the portion of Teton County, Wyoming, USA, west of the Teton Mountain range (Fig. 1). Construction of a ski resort in 1965, combined with increasing through traffic to Jackson, Wyoming, Grand Teton National Park, and Yellowstone National Park drove a transition from an ailing farm-based economy to a tourism-based economy. Population had been decreasing steadily since the Great Depression (3,921 in 1920; 2,351 in 1970). Expansion of the ski resort, immigration of service laborers from Jackson seeking affordable housing, and immigration of retirees, second home owners, and telecommuting professionals, made Teton County the fastest growing county in Idaho, the fourth fastest growing state, during the 1990s (U.S. Census). Between 1990 and 2000, Teton Valley followed the global trend of household growth outpacing population growth (Liu et al. 2003; human population 3,439 to 5,999 [74% increase]; household number 1,123 to 2,078 [85% increase]). Population reached approximately 7,200 in 2004 when we conducted our study.

We avoided areas currently managing specific zoonotic disease outbreaks (e.g., areas in Teton County, Wyo., east of the Tetons) because respondent attitudes could reflect the context of the specific outbreak and management approach rather than the metric within our questionnaire. Although scientists found brucellosis in Teton Valley, Idaho, cattle herds in the past, none received media attention during the year of this study. Several interview respondents knew about a brucellosis-related cattle herd liquidation in Wilson, Wyoming, that occurred during our survey period (Fig. 1). We chose this study area because its proximity to Yellowstone National Park, Grand Teton National Park, and the National Elk Refuge would make zoonotic disease a salient, but not necessarily a divisive issue (Fig. 1).

Methods

We developed 2 hypothetical wildlife diseases to evaluate the influence of disease attributes associated with dread risk and unknown risk on public response to zoonotic disease management options. Disease type A had attributes associated with low levels of dread and unknown risk, and disease type B had attributes associated with high dread and

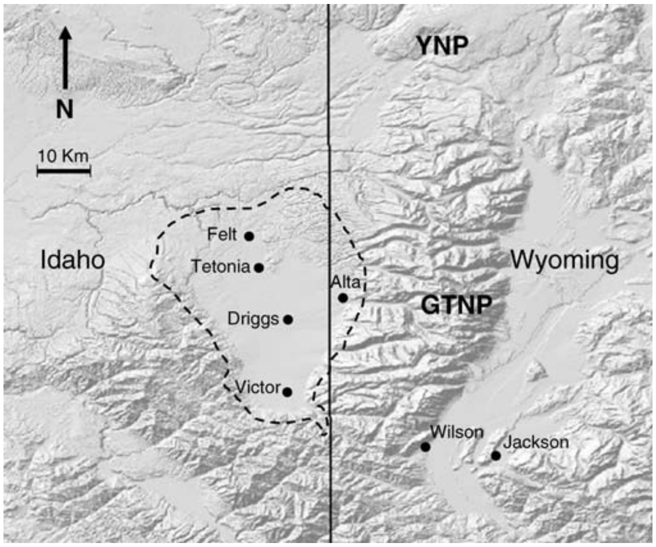

Figure 1. Map of Idaho–Wyoming, USA, border region. Dashed line indicates boundaries of Teton Valley study area, YNP indicates Yellowstone National Park, and GTNP indicates Grand Teton National Park.

unknown risk (Appendix). We used an in-person interview protocol to assess attitudes towards types A and B zoonotic disease management and authority over that management. We chose personal interviews because they promised higher response rates (Dillman 2000), a means to ensure respondents understood the rather complex survey, and qualitative insight regarding the decision-making processes and cultural dynamics of respondents (Peterson et al. 2002). We conducted a pretest of the questionnaire with residents of Lansing, Michigan, USA ($n = 18$), and residents of Victor, Idaho (within the study area; $n = 23$), to clarify terminology and improve instrument validity. The Michigan State University Committee on Research Involving Human Subjects approved all research we conducted (IRB # 04-402).

Interview Protocol

Financial and temporal limitations, as well as acceptable sampling error (5%), dictated a sample size of 550. We purchased a representative sample of public telephone listings of Teton Valley residents from Survey Sampling, Incorporated (Fairfield, Connecticut). We conducted the survey during July–August 2004. With the exception of respondents using Post Office boxes, we attempted to visit every respondent during 4 time intervals, morning and evening on a weekday and on a weekend day, before resorting to telephone contact. We only made initial contact via telephone after the first 4 visits failed or if we could not locate a physical address with the aid of local informants. Three interviewers conducted all English interviews, and we enlisted an interpreter for interviews in Spanish. We ensured comparability between interviewers by training interviewers with a strict interview protocol. Interviewers answered most queries by explaining questionnaire format, reading directly from the questionnaire, or stating, "whatever it means to you" (Groves 1989:451).

Interviewers presented respondents a table comparing disease types A and B (Appendix) and explained table format, saying: "This table compares 2 hypothetical diseases; disease A is described in the first column and disease B is described in the second column." The interviewer then used the table to describe each disease by pointing at the appropriate cell (Appendix) while reading it (e.g., "the cause of disease A is a bacteria, the cause of disease B is a prion, disease A can live in the soil for 24 hours, disease B can live in the soil for more than 25 years, the method for eradicating disease A is maintaining low animal densities, the method for eradicating disease B is unknown," etc.). We allowed interviewers to define the word prion (the definition offered was "a type of protein") when a respondent inquired about its meaning. We made the latter concession because several respondents in the pretest ($n = 41$) had not heard the word and believed it was concocted for the survey. We considered the potential bias associated with some respondents believing we made up the disease agent greater than the bias associated with connotations associated with the word "protein." Finally, interviewers defined "ungulate" by listing common names of wild ungulate species found in the valley.

We asked respondents to indicate their agreement with 13 statements regarding their perception of each disease and its management (Table 1). We instructed interviewers to define acronyms (e.g., USFWS, United States Fish and Wildlife Service; CDC, Centers for Disease Control and Prevention; USDA, United States Department of Agriculture). We measured respondent opinions with Likert-scale response options (i.e., strongly agree = 5, mildly agree = 4, unsure = 3, mildly disagree = 2, and strongly disagree = 1). We asked respondents to indicate their opinion of 12 different groups (Table 2) having management authority over the hypothetical diseases, using the same scale. We also collected information on several demographic variables (e.g., gender, age, income, education, participation in hunting and fishing) for evaluating sample biases.

We used respondents' length of residence in the community to compare LTR and NR. Prior studies comparing LTR to NR in the Intermountain West defined the LTR group using either a 10-year residency requirement (Graber 1974, Fortmann and Kusel 1990) or the approximate year a substantial in-migration to the community began (Graber 1974, Smith and Krannich 2000). We chose the latter approach because it was less arbitrary, and a major in-migration event began in Teton County, Idaho, in the early 1990s (Fig. 2). We used least-squares nonlinear breakpoint regression of annual population data (U.S. decennial census and annual estimates) to estimate the pivot point related to the immigration boom (StatSoft, Inc. 2003). A clear pivot point existed between 1991 and 1992, and the regression model accounted for 99.5% of the observed variance in population (Fig. 2). Based on this analysis, we categorized residents born in the area and

Table 1. Comparison of management preferences for hypothetical zoonotic wildlife disease types A and B (Appendix) in Teton Valley, Idaho, USA, during 2004.

Statement[a]	n	$\bar{x}^b$ Disease type A	Disease type B	Z^c
1. I would be concerned about getting this disease	308	2.47	3.34	−9.3***
2. I would avoid moving to an area where this disease was prevalent	308	2.35	3.00	−8.0***
3. I would move away from an area where this disease was prevalent	309	2.06	2.66	−7.9***
4. I would not vacation in an area where this disease was prevalent	309	2.22	2.82	−8.1***
5. The disease should be allowed to take its natural course	308	2.62	2.09	−7.0***
6. Wild ungulates that test positive for the disease should be penned	305	3.27	3.52	−3.7***
7. Wild ungulates that test positive for the disease should be killed	305	2.76	3.72	−9.7***
8. All wild ungulates in a herd where the disease is found should be killed	307	2.03	2.70	−8.4***
9. In areas where the disease is found, wild ungulates that approach areas inhabited by humans and livestock should be killed	305	2.39	2.90	−7.1***
10. In areas where the disease is found, wild ungulates should be kept out of neighborhoods with fencing	303	3.27	3.61	−6.0***
11. In areas where the disease is found, wild ungulates should be kept out of livestock areas with fencing	303	3.62	3.88	−5.0***
12. In areas where the disease is found, supplemental feeding of wild ungulates should be banned	307	2.89	3.23	−6.6***
13. In areas where the disease is found, hunting harvest of wild ungulates should be increased	307	3.07	2.91	−2.8**

[a] Likert scale ranged from 5 (strongly agree) to 1 (strongly disagree).
[b] Higher mean responses indicate more agreement with the statement.
[c] Wilcoxon signed-ranks test.
** $P \leq 0.01$, *** $P \leq 0.001$.

immigrants moving to the area prior to 1992 as LTR and other residents as NR. To evaluate potential bias associated with pivot point selection, we conducted analyses with the dividing year ranging from 1989 to 1993. Significant findings only changed for 6 of 51 items (Table 3: 2A, 4A, 7B; Table 2: 5, 7, 9), and P-values changed by <0.05 in all cases.

Data Analysis

Because our data were ordinal (i.e., Likert scale), and 8 of the comparisons failed Levene's test for equality of variance, we used Wilcoxon signed-ranks tests to compare median responses to questions regarding management of the type A disease with those for the type B disease (because the same respondents answered both questions). Similarly, we used Mann–Whitney U tests to compare disease management preferences of NR and LTR (because we compared different respondents). We conducted all analyses using SPSS 12.0 (2003; SPSS, Inc., Chicago, Illinois).

Results

Of the 550 household addresses in our sample, we could not use 66 (e.g., wrong address, vacant home, deceased resident). Of the 484 usable addresses, we conducted interviews at 416 households. We could not contact respondents at 48

Table 2. Comparison of longer-term resident (LTR; $n = 194$) and newer resident (NR; $n = 215$) support for zoonotic wildlife disease management authority options in Teton Valley, Idaho, USA, during 2004.

Who should have decision-making authority for managing wildlife diseases that can infect livestock or humans?[a]	n	$\bar{x}^b$	SE	$\bar{x}^b$ LTR	NR	Z^c
1. Wildlife scientists	410	4.08	0.05	3.74	4.33	−5.50***
2. Federal wildlife management agencies (e.g., USFWS)	409	3.57	0.07	3.26	3.81	−4.50***
3. Federal human health regulatory agencies (e.g., CDC)	408	3.52	0.07	3.25	3.72	−3.61***
4. Federal livestock health regulatory agencies (e.g., USDA)	408	3.57	0.07	3.50	3.63	−0.63
5. State wildlife management agencies	411	4.03	0.05	3.95	4.09	−2.10*
6. State human health regulatory agencies	407	3.74	0.06	3.77	3.72	−0.14
7. State livestock health regulatory agencies	406	3.84	0.05	3.99	3.73	−1.92
8. Local civic leaders	409	2.73	0.07	2.96	2.56	−2.76**
9. Citizens of this county	409	3.42	0.07	3.56	3.31	−1.83
10. A coalition of local and state human and livestock health regulatory agencies	409	4.02	0.05	4.02	4.02	−0.26
11. A coalition of local, state, and federal human and livestock regulatory agencies	408	3.83	0.06	3.71	3.93	−1.92
12. A coalition of all impacted groups and agencies	409	3.78	0.07	3.66	3.88	−1.21

[a] Likert scale ranged from 5 (strongly agree) to 1 (strongly disagree).
[b] Higher mean responses indicate more agreement with the statement.
[c] Mann–Whitney U test.
* $P \leq 0.05$, ** $P \leq 0.01$, *** $P \leq 0.001$.

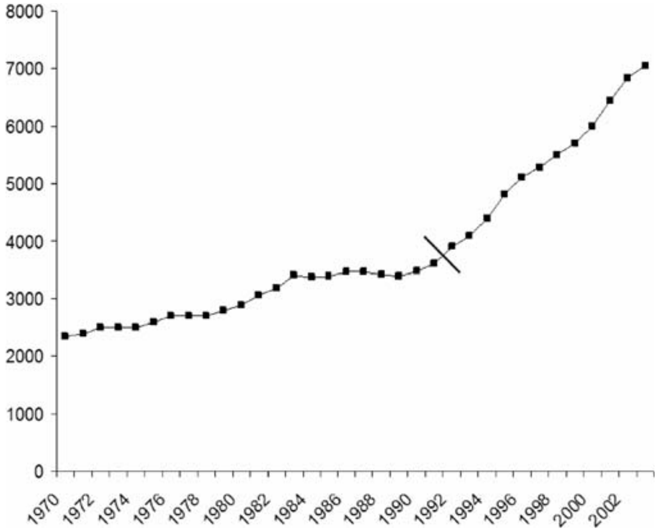

Figure 2. Annual population estimated for Teton County, Idaho, USA, with pivot point between 1991 and 1992.

households, and 20 households refused to provide an interview. The final compliance rate was 95% (sampling error ± 4.8%).

Socio-Demographics

Our sample matched the population in terms of sex and ethnicity: 46.1% female (47.0%; 2000 Census), 89.9% Anglo (91.3%; 2000 Census), 6.1% other (6.7%; 2000 Census). All non-Anglo respondents responded to the query "what is your race or ethnicity" by stating "Mexican". We respect the self-classification and refer to a group of Mexican Nationals and United States citizens of Mexican origin as Mexican. Median annual family income was $35,000–$49,999, 6.5% of respondents had annual family incomes below $15,000, and 90% were below $100,000. Most respondents were high school graduates (94.6%), and 39.3% had graduated from a 4-year college.

The comparison of diseases portion of the interview took 30–45 minutes, causing item nonresponse rates near 25% (item nonresponse includes respondents who agree to take the survey, but leave one or more items incomplete). We compared socio-demographic data (e.g., education level, percent female, percent Anglo, percent with family member raising livestock) for disease question responders to the general sample and found no significant differences from the general sample.

The sample was 47.2% LTR ($n = 194$) and 52.8% NR ($n = 217$). Longer-term residents were older (mean age: LTR = 52.9, NR = 40.1), more likely to have a family member raising livestock (LTR = 51.3%, NR = 26.0%), more likely to hunt (LTR = 53.9%, NR = 42.6%), and more likely to have moved from a nearby state (i.e., Id., Mont., Ut., Wyo.; LTR = 52.6% [106 LTR not born in Teton Valley], NR = 40.6%). Newer residents had higher proportions of

Table 3. Comparison of zoonotic wildlife disease management attitudes between longer-term residents (LTR) and newer residents (NR) in Teton Valley, Idaho, USA, during 2004.

Statement[a]	Disease type[b]	$\bar{x}$[c] LTR	n	$\bar{x}$[c] NR	n	Z[d]
1. I would be concerned about getting this disease	A	2.50	139	2.46	177	−0.01
	B	3.20	132	3.42	175	−1.01
2. I would avoid moving to an area where this disease was prevalent	A	2.58	137	2.21	177	−1.38
	B	3.04	133	2.97	175	−0.34
3. I would move away from an area where this disease was prevalent	A	2.10	138	2.03	177	−0.39
	B	2.62	133	2.69	175	−0.57
4. I would not vacation in an area where this disease was prevalent	A	2.46	138	2.07	177	−1.44
	B	2.93	133	2.75	175	−0.66
5. The disease should be allowed to take its natural course	A	2.46	137	2.73	177	−1.70
	B	2.00	132	2.15	175	−0.60
6. Wild ungulates that test positive for the disease should be penned	A	3.38	135	3.19	177	−1.05
	B	3.51	130	3.52	174	−0.01
7. Wild ungulates that test positive for the disease should be killed	A	3.22	134	2.45	177	−3.89***
	B	3.93	129	3.60	175	−1.55
8. All wild ungulates in a herd where the disease is found should	A	2.18	136	1.91	177	−2.04*
be killed	B	3.03	131	2.50	175	−2.42*
9. In areas where the disease is found, wild ungulates that approach	A	2.78	136	2.15	175	−3.12***
areas inhabited by humans and livestock should be killed	B	3.17	131	2.72	173	−2.20*
10. In areas where the disease is found, wild ungulates should be kept	A	3.46	133	3.18	176	−1.26
out of neighborhoods with fencing	B	3.58	128	3.63	174	−0.85
11. In areas where the disease is found, wild ungulates should be kept	A	3.78	133	3.53	176	−1.22
out of livestock areas with fencing	B	3.91	128	3.86	174	−0.04
12. In areas where the disease is found, supplemental feeding of wild	A	2.90	137	2.88	176	−0.71
ungulates should be banned	B	3.25	132	3.22	174	−0.53
13. In areas where the disease is found, hunting harvest of wild	A	3.40	137	2.87	176	−3.56***
ungulates should be increased	B	3.18	132	2.74	174	−2.59**

[a] Likert scale ranged from 5 (strongly agree) to 1 (strongly disagree).
[b] We divided responses by disease type (i.e., disease types A and B; Appendix).
[c] Higher mean responses indicate more agreement with the statement.
[d] Mann–Whitney U test.
* $P \leq 0.05$, ** $P \leq 0.01$, *** $P \leq 0.001$.

Mexicans (LTR = 2.6%, NR = 9.4%) and college graduates (LTR = 30.4%, NR = 46.0%).

Zoonotic Disease Management Attitudes

Respondents scored statements regarding perceived risk significantly higher for the type B disease (Table 1: statements 1–4). Not surprisingly, they were less supportive of allowing the type B disease to take its "natural course" (Table 1: 5). With the notable exception of increased hunting, respondents supported all lethal and nonlethal management strategies more for the type B disease than for the type A disease (Table 1). The dread and unknown risk associated with disease type B influenced public support for nonlethal management strategies (i.e., fencing, penning, and supplemental feeding) less than for lethal management strategies (Table 1: 6, 10–11, 14). With the exception of banning supplemental feeding and killing ungulates that test positive for type B diseases, LTR supported all lethal management options more than NR (Table 3).

Management Authority Attitudes

Respondents indicated some level of support, on average, for all management authority options except local civic leader control (Table 2). The wildlife scientists, state wildlife management agencies, and coalition of state and local agencies options for management authority elicited the most agreement (Table 2). Several important differences between LTR and NR existed. Newer residents showed higher support for wildlife scientists, federal agencies, and state wildlife management agencies controlling zoonotic disease management (Table 2: 1–3, 5). Although NR made up a majority of respondents and residents, they were less supportive of giving local civic leaders authority than LTR (Table 2: 8).

Discussion

The comparison of type A (less severe and more known) and B (more severe and less known) diseases supports our hypotheses about dread and unknown dimensions of risk. The type B disease elicited more concern about personal safety, more support for management, and more support for lethal management. Hunting presented an anomaly in the attitudes because respondents preferred using this form of lethal management for the type A disease (Table 1: 13). Although no formal questions addressed why less support existed for increasing hunting harvest to manage disease B, some ($n = 9$) respondents expressed concern about the safety of hunters. In addition, one respondent, who operated a guide and outfitting business, opposed increased hunting because high elk densities attracted clients but said he knew hunting was the best option for managing the disease. These results suggest general risk theory and risk management strategy (Slovic 1987, Klinke and Renn 2002) apply to zoonotic disease management.

Our results also indicated significant difference between LTR and NR. Longer-term residents demonstrated greater agreement with lethal management options than NR, with the exception of killing ungulates infected with the type B disease (Table 3). The general support for lethal management among LTR probably relates to greater participation in hunting and raising livestock. In both cases, LTRs use mortality as a means to achieve practical ends (e.g., making a living, putting food on the table, social engagement, or sport [Peterson 2004]), rather than as an abstract concept. Because winter-feeding has occurred in the region for nearly 100 years, cultural context may explain low LTR support for wildlife-feeding bans.

The lack of difference between LTR and NR regarding killing ungulates that test positive for the type B disease probably relates to the lethality of the disease. An animal infected with type B will die, so lethal management does not change the ultimate outcome and may be more humane than allowing the animal to suffer from the disease. Both LTR and NR respondents verbalized this viewpoint. For type A, however, lethal control changes the ultimate outcome from recovery to death. Further, LTR were more likely to raise livestock and be aware of historical herd liquidations related to type A diseases (e.g., brucellosis). Eight respondents, all LTR, specifically mentioned historical herd liquidations in Teton Valley.

High levels of support for scientific management and federal authority among NR bodes well for USFWS involvement and plans utilizing adaptive management. While political trends suggest disillusionment with science, our study suggests the term still carries substantial rhetorical value. Teton Valley residents indicated strong agreement with scientific control of disease management (Table 2). The science in question did not link to any formal entity or organization, so support for this management option likely stemmed from specific connotations of science or personal views of scientists. False claims, however, can quickly eviscerate the rhetorical power of science. For instance, in Europe, doctors diagnosed 130 people with a mad cow disease–related variant of Creutzfeldt–Jakob disease after scientists claimed human infection was impossible; this dealt a severe blow to public trust in science (Heberlein 2004).

Future immigration of NR should improve public support for federal agencies exercising authority over zoonotic disease management. Unfortunately, NR hunt less than LTR and both groups showed less support for using hunting to manage type B diseases than for type A diseases. Accordingly, demographic change in the Intermountain West may provide wildlife management agencies, particularly federal ones, unprecedented support for lethal management of type B disease, coupled with an unprecedented inability to enact the management (i.e., fewer hunters and unwillingness to hunt in areas with endemic type B disease; Heberlein 2004).

Management Implications

Wildlife managers may utilize more draconian management strategies (e.g., local extirpation of host species) to address type B zoonotic diseases (e.g., CWD, SARS, avian influenzas) than to address type A diseases (e.g., brucellosis, tuberculosis, enteropathogenic *E. coli*) without facing high levels of resistance. Cultural context becomes more important, relative to scientific claims, for managing type A diseases (this study, Peterson 1997). In the Intermountain West, managers addressing type A diseases should make special efforts to communicate with LTR because they represent the core constituency supporting currently viable management options (Peterson 1991) but demonstrate the least support for current management agencies. State livestock agencies probably provide the best avenue for communicating with LTR.

To prevent management agencies from facing the dilemma of unprecedented support for lethal management and unprecedented inability to enact such management (Heberlein 2004), managers should promote hunting or develop a viable lethal management alternative. However, education programs claiming CWD poses no risk to hunters should not augment these efforts until researchers can verify that claim. Managers should strive to protect the unusually high public support for wildlife scientist control of zoonotic disease–related decision-making (Table 2) because it represents political capital for critical but unpopular decisions.

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Appendix. Table and answer key used to compare hypothetical zoonotic wildlife disease types A and B, Teton Valley, Idaho, USA, 2004.

	Hypothetical wildlife disease	
Attribute	**A**	**B**
Cause	Bacteria	Prion
Life of disease in the soil	24 hr	More than 25 yr
Method for eradicating the disease	Maintain low animal densities	Unknown
Time required to eradicate the disease after it becomes established	10 yr	More than 50 yr
Symptoms of disease	Temp elevated about 3 degrees	Paralysis
Risk of human infection	1 in 1,000,000	Low if possible
Risk of livestock infection	1 in 1,000,000	Low if possible
Outcome for infected wild ungulates	Full recovery in 6 weeks with proper treatment	Death
Outcome for infected humans	Full recovery in 6 weeks with proper treatment	Death
Outcome for infected livestock	Full recovery in 6 weeks with proper treatment	Death

Answer key	
Response	**Code**
Strongly agree	SA
Mildly agree	MA
Unsure	U
Mildly disagree	MD
Strongly disagree	SD