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By

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The Economic Effects of Chronic Wasting Disease (CWD) In Wisconsin¹

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Abstract: Wisconsin's 600,000 deer hunters will bear the brunt of the economic losses from chronic wasting disease (CWD) in the Wisconsin deer herd. Though studies have not been done to pinpoint these losses, under plausible assumptions, they could have amounted to between \$58 million and \$83 million in 2002. I would anticipate somewhat smaller losses in 2003, perhaps between \$30 million and \$53 million. CWD can also be expected to cause deer hunters to spend less on their sport than they have in the past. However, the impacts of reduced hunter spending on the Wisconsin economy should not be too large. Losses to the deer hunting economy will be counterbalanced as resident hunters who reduce expenditures spend their money elsewhere in the economy. Some spending by nonresident hunters will be lost, but deer hunting is a very small part of the tourist economy. Nevertheless, businesses that serve hunters are likely to feel the effects and this is especially true in rural areas as fewer urban deer hunters spend money on the services they provide. Additional costs are being borne by public agencies in Wisconsin as they try to cope with the disease. Little is known about impacts on deer and elk farms, on those who feed deer to facilitate viewing, and on feed businesses that cater to deer feeders.

Large numbers of Wisconsin residents first became aware of CWD following its discovery in the south-central part of the state in early 2002. The Wisconsin Department of Natural Resources (DNR) implemented programs to try to eradicate deer in the area where the disease was discovered, drastically reduce the herd in adjacent areas, and test deer harvested throughout the state during the 2002 hunting season. Plans designed to eradicate the disease through increased hunting in the fall and winter of 2003-04 and other strategies are now in place. Regulations affecting Wisconsin's more than 900 deer and elk farms have been strengthened. Feeding deer to facilitate hunting and viewing was banned in 2002 and will be limited in 2003.

Obviously, CWD has an economic side to it. Businesses that cater to Wisconsin's more than 600,000 deer hunters, such as sporting goods stores, will be adversely affected if hunters drop out or reduce their level of activity in response to the disease. Rural businesses that serve resident and nonresident hunters are particularly vulnerable, since hunting trips can transfer dollars from urban to rural areas where economic opportunities are often limited. Adverse publicity about CWD and regulation of deer farms may adversely affect their profitability in a number of ways. Public agencies that regulate

hunting and deer and elk farming have had to absorb substantial costs in order to address CWD. In what follows, I will treat these effects under the heading of *market and agency impacts*.

But accounting for market and agency impacts alone would be far from the whole story. In fact, I will argue that the brunt of the economic losses associated with CWD in Wisconsin will not fall on businesses, but on the deer hunters themselves. Since deer hunting opportunities are supplied by the state rather than through the market, these effects will be termed *nonmarket impacts*.²

The goal of this paper is to consider, within the limitations of current knowledge, the potential economic effects of CWD in Wisconsin in 2002, the first year of hunting after the disease was discovered, and in the upcoming 2003 season. There is much that is not known about CWD. This holds at least as much for economics as for other aspects of the problem. I am aware of no economic studies in Wisconsin or elsewhere that have gathered data that is tailor made for assessing the impacts of CWD. Hence, the analysis to be presented here is more speculative than definitive. Still, using theory, common sense, and available data, I have been able to piece together enough information to predict who in Wisconsin will be affected and to assess the potential magnitudes of the hunting-related impacts in broad terms.

I begin by asking a question that lies at the center of any effort to judge the potential economic effects of CWD: how will hunters react? The more hunters who decide not to hunt or are adversely affected in other ways, the larger are both the market and nonmarket impacts, as discussed in later sections.

Before getting into the issues further it is worth pausing to stress that CWD impacts are shrouded in uncertainty. Right now, public health officials such as the World Health Organization and the Centers for Disease Control have concluded there is no known link between CWD and human illness. The State of Wisconsin is treating CWD as a wildlife health problem, and not one of human health, but officials are quick to point out that they cannot be absolutely certain that it is safe to eat venison from an infected animal. There can be little doubt that public attention to the problem is driven to a large degree by fears of adverse human health effects like those that attended mad cow disease. Nor is there any evidence that CWD affects animals other than deer and elk, but additional economic impacts would occur if the disease “jumps” to cattle or other animals. Bad news relating to human health or the health of domestic animals could greatly increase the adverse economic effects beyond those discussed below.

One source of uncertainty has been much reduced recently. Throughout 2002, many worried that CWD was present elsewhere in Wisconsin. Those with human health concerns feared that they might inadvertently eat venison from an infected animal even though it was taken far from the south central part of the state. Deer from throughout the state were sampled during 2002 hunting season and tested. This showed with considerable statistical rigor that occurrence of CWD in wild deer is limited to all or part of only six contiguous counties in south-central Wisconsin.³ This is likely to be treated

as good news by hunters in other parts of the state and should lessen the economic effects of CWD so long as the disease does not spread over larger parts of Wisconsin.

Judging the Decline In Deer Hunting Participation

So, the analysis that follows must rest on predictions and assumptions about how Wisconsin hunters are reacting to CWD. In particular, how many (if any) will reduce their participation in deer hunting or stop hunting all together? As the news about various aspects of the disease accumulated in 2002, there was much speculation about the effects it would have on participation in the fall hunting season. This was an important question not only because of potential economic impacts, but also because the DNR's strategy of deer eradication and reduction depends on hunting.

In the spring of 2002, the press reported an unpublished St. Norbert College survey of deer hunters across the state. It asked, among other things, "Would you consider not hunting deer in Wisconsin because of CWD?" 36% of those surveyed said yes. The University of Wisconsin Survey Center conducted a poll between June 8 and June 17, 2002. (So far as I know it was never published.) It found that 75% of the hunters surveyed had not changed their hunting plans for fall as a result of CWD. By implication, the other 25% were at least considering a change. Given the way that deer hunting is deeply entrenched in Wisconsin life and traditions, in the late summer of 2002, I guessed that decreased deer hunters and deer-hunting days would be somewhat less, at between 10 and 20 percent.⁴

Some information that has come to light since that time would tend to support my guess. After years of relative stability,⁵ gun deer license sales declined from 688,540 licenses in 2001 to 618,945 in 2002, a decline of 75,767 licenses or 10 percent in one year. Archery license sales fell even more precipitously, with a 19 percent decline between 2001 and 2002. Combining gun and archery licenses, the decline was right at 12 percent.⁶ The annual deer harvest in Wisconsin is less stable than license sales, but there would appear to have been a large decline there as well. The total statewide harvest in 2002 was 372,021 deer.⁷ This is 16 percent less than in 2001, 40 percent less than in 2000 (a record year), and 20 percent less than the average over the five years, 1997-2001.

On the other hand, results from a study by Jordan Petchenik of the Wisconsin Department of Natural Resources following the 2002 hunting season would indicate that the effect might not have been so severe.⁸ In early 2003, Petchenik surveyed gun deer license holders from 2001 about their behavior during the 2002 season and their attitudes and beliefs regarding CWD. About 12 percent of the respondents from outside the CWD counties did not hunt in 2002, but only 32 percent of those who did not hunt gave CWD as the reason. This would imply a decline in participation due to CWD of slightly more than 4 percent (32 percent of 12 percent). Many reasons other than CWD were given for not hunting, including scheduling conflicts, age, and health.

The license sales data and survey data are hard to reconcile, but the license sales data seem more solid. The main question that arises is whether or not the license sales

decline was attributable to CWD. However, given the relative stability of license sales over the previous decade, CWD seems to be the most probable cause of the decline. Hence, in what follows, I will assume a 12 percent decline in deer hunters in 2002 compared to 2001.

What can we expect in 2003? As noted, the testing done after the 2002 season brought the good news that apparently the disease is restricted to parts of only six contiguous counties. I would expect this to moderate the tendency of hunters to drop out, but of course how much is speculative. To explore the possible magnitudes of the impacts, I will assume a 6 to 10 percent decline in hunter numbers in 2003 relative to the 2001 baseline.

Market and Agency Impacts

As a point of departure, let's draw on the *2001 National Survey of Fishing, Hunting, and Wildlife-Related Recreation*, published by the U.S. Fish and Wildlife Service.⁹ This is a nationwide survey that is done roughly every five years with samples large enough to make estimates about participation and expenditures by hunters, anglers, and other wildlife enthusiasts at the state level. The Fish and Wildlife Service estimated based on this survey that about 596,000 people hunted deer in Wisconsin in 2001.¹⁰ They estimated that Wisconsin deer hunting was responsible for 7,052,000 hunter-days, a figure I will use later on.

According to this same source, Wisconsin hunters spent an estimated \$298,919,000 on travel and equipment for big game hunting in 2001. Since 94% of all big game hunting-days were spent hunting deer (bear and turkey are also considered big game in the survey), I will assume that about 94% of the dollars spent or about \$281 million were spent on deer hunting. This covers only equipment and travel and deer hunters spent money on other things as well. Other hunting costs are mostly made up of magazine subscriptions, membership dues and contributions, land leasing and ownership, licenses, stamps, tags, and permits. These costs are only reported for all hunting. Deer hunting is not separated out. For all Wisconsin hunting (including deer, small game, migratory birds, etc.) spending for items other than travel and hunting equipment amounted to an estimated \$373 million in 2001. Since deer-hunting days amounted to 73 per cent of all hunting-days, I will assume that 73 percent of all hunting spending other than for equipment and travel was for deer hunting. That would be about \$272 million. Hence the total spending in 2001 on deer hunting in Wisconsin for travel, hunting equipment, and other hunting costs is estimated to be \$553 million (\$281 million plus \$272 million) or about \$928 per deer hunter.

To estimate the impacts of CWD on deer hunting in 2002, I will assume that in the absence of CWD, hunter expenditures would have been the same in 2002 as they were 2001. I will also assume that the decline in deer hunters of 12 percent, as estimated in the preceding section, would translate to a 12 percent decline in deer hunting expenditures. This would imply a reduction in hunter expenditures in 2002 of 12 percent of \$553 million or about \$66 million. If my assumed decline in hunters of 6 to 10 percent

relative to the 2001 baseline holds, then the 2003 impact on expenditures will decline to between \$33 million to \$55 million.

These figures, of course, constitute a lot of money. Businesses that cater to deer hunters are suffering substantial losses of revenues. As these losses trickle down to the household level, incomes of some Wisconsin households would be expected to decline by several tens of millions of dollars. Furthermore, some rural households depend on businesses like motels, eating and drinking establishments, deer processing facilities, food and beverage stores and gas stations where hunters from urban areas spend money locally. When fewer hunters come, these households will see their incomes fall and many of the affected individuals live in areas where economic opportunities are limited. Unfortunately, data are not available to estimate the share of market losses that will fall on rural areas.

So CWD's effects were felt in the Wisconsin economy last fall and similar, though probably somewhat reduced, impacts will be felt in 2003. At the same time, it is important not to make too big a deal out of these market losses. Consider:

- In the context of Wisconsin's economy taken as a whole, this is not very much money. In both 2002 and 2003, it is less than \$15 per Wisconsin citizen per year.¹¹
- It is true that tourism is a significant part of the Wisconsin economy. It is also likely that nonresident deer hunting was particularly hard hit by news of CWD in Wisconsin. While, as we have seen, deer hunting license sales overall were down 12 percent in 2002, compared to 2001, nonresident deer license sales were down more than 19 percent. But deer hunting is a very small part of the tourist economy. Less than 6 percent of deer hunters are nonresidents. Hence losses from a decline in out-of-state tourism in 2002 would amount to only \$5 million to \$10 million in lost tourism revenues and the impact should be less in 2003.¹² Wisconsin's revenues from tourism are measured in billions of dollars.¹³
- Since nonresident hunting is a small share, most of the lost deer hunter spending will be associated with resident deer hunters. This will certainly hurt some businesses and households, as I have already mentioned, but these dollars will not evaporate. Residents who hunt deer less or not at all will spend the money elsewhere, probably largely within the state. This will benefit businesses and households elsewhere in the Wisconsin economy. Gains and losses are likely to be more or less equal as these dollars flow into other sectors.

Hence, I would conclude that the net loss to Wisconsin's economy as a whole, which is due only to reduced spending by nonresident deer hunters, was likely in the \$5 million to \$10 million range for 2002 and will be less in 2003. Someone will feel these losses, but in the overall Wisconsin economy, this is quite small. Losses from reduced resident deer hunting will likely be counterbalanced by gains elsewhere in Wisconsin's economy.

Of course, reduced license sales mean reduced revenues going into the coffers of the DNR. I have not made separate estimate of these losses since expenditures on licenses are already included in the figures just presented. It is nevertheless well worth mentioning that the State of Wisconsin spent about \$14.7 million in the last fiscal year to combat CWD.¹⁴ About \$12.6 million was spent by the DNR, partly from the license fees and partly from a special appropriation from the Legislature. The rest was spent by other state agencies. Less extensive testing is planned in 2003, so these costs may decline somewhat.

There are two other market aspects that I cannot even begin to quantify at this time. First, deer and elk farming has become a significant form of alternative agriculture in Wisconsin. Meat, hides, velvet from antlers, live animals, and private hunting opportunities enter the market from several hundred deer and elk farms. CWD has affected this industry in several ways. Markets have been hurt as restrictions on international trade in velvet and interstate trade in live animals have been enacted. Costs for record keeping, testing of animals, extra fencing, and other items must be absorbed. Anecdotal evidence indicates that the venison market has been hurt. Profitability has no doubt suffered for all these reasons. Some costs are also being borne by the Wisconsin Department of Agriculture, Trade, and Consumer Protection, which regulates deer and elk farms. Second, feed dealers have historically provided various items used by residents of the state who want to attract deer for viewing or hunting. A ban on feeding wild deer was enacted in 2002 as a CWD prevention measure, hurting the market of these feed dealers. For 2003-04, feeding is banned in 22 “high-risk” Wisconsin counties. Data are not available to quantify the market effects of these bans.

Nonmarket Impacts

To account for the full economic effects of CWD, natural resource economists would argue that we should look beyond losses in hunter expenditures, agency costs, and lost profits of deer and elk farmers and feed dealers. Deer hunting is important to Wisconsin’s citizens and the concern that venison may be tainted reduces the value of the sport to deer hunters. The question is, how much?

To begin to consider the economic value of deer hunting, let’s start with what we might think of as the “price” of the hunt. If you are a resident of Wisconsin, you can buy a gun deer license for \$20. That could be considered the “price” of a season of deer hunting. But deer hunting is worth more than that. In the preceding section, it was estimated in 2001, deer hunters spent more than \$900 each on average to participate in the sport. In a sense, the “price” of a season of deer hunting is about \$900. But \$900 per hunter per year is the *cost* of deer hunting, not its value. Deer hunters on average must place a value of at least \$900 each on a season of deer hunting. Otherwise they would not continue to spend that kind of money to do it. Economists reason that most of them must have a value greater than the \$900 they spend. If they got only \$900 worth of pleasure per year out of deer hunting, they would just break even. Economists call this extra value their “consumer surplus” or simply “surplus value.” Surplus value is the maximum amount they would be willing to pay for the hunting opportunity over and

above what it costs them. This is a long-standing and widely accepted principle of resource economics.

Unfortunately, there is not study of the surplus value for deer hunting in Wisconsin that would be appropriate for this analysis. I propose to use a value of \$40 per hunter per day in order to explore the potential loss to deer hunting from CWD. This is roughly in keeping with a survey of available studies done between 1967 and 1998 on the value of outdoor recreation, including big game hunting, by Rosenberger and Loomis.¹⁵ For big game hunting, Rosenberger and Loomis found 35 studies containing 177 value estimates. The mean value across these studies was \$43.17 per hunting day (standard error of the mean, \$2.21). The median value was \$37.30. \$40 per hunting day is also roughly in keeping with a study valuing a special deer hunt in Wisconsin by Bishop and Heberlein.¹⁶

As noted already, the *2001 National Survey of Fishing, Hunting, and Wildlife-Related Recreation* estimated that in that year Wisconsin's deer hunters recorded about 7 million days of hunting. At \$40 per day, that would make the annual surplus value from deer hunting in the state \$280 million under pre-CWD (2001) conditions.

The onset of the disease and the measures implemented to try to control it are very likely to reduce this figure, imposing economic losses that are borne by Wisconsin deer hunters. We can anticipate two kinds of losses. First, one would expect a decrease in the total number of deer hunting days, as seems to have come to pass in 2002. Second, for those who continue to hunt, the quality of the deer hunting experience seems likely to decline, with negative implications for the value per day. For one thing, despite the lack of a proven link between CWD in deer and human illness, slightly more than a third of Petchenik's respondents were "very" or "somewhat" concerned about the risk of becoming ill from CWD. On another question, 36 percent of those living in CWD counties and 25 percent of those living in other counties reported that they would be concerned about eating venison from a deer that had not been tested for the disease. Only about half found the information they had received from the DNR about human safety "believable."¹⁷ Such widespread concerns seem likely to detract from the enjoyment of the deer hunt and hence its value. The apparent reduction in the deer harvest in 2002 is another sign of reduced quality. Hunters evidently do not feel as free as they did previously to harvest deer. Also, with so many hunters dropping out, social and family relationships surrounding the hunt are likely being disrupted, further reducing quality.

Let us assume that the 12 percent decline in deer hunters for 2002 resulted in a 12 percent decline in deer hunting days in that year.¹⁸ That would be 840,000 days. At \$40 per day, the lost days would be worth \$34 million (rounding to the nearest million dollars). If the value of the remaining 6.2 million hunting days went down 10 percent to 20 percent (to between \$32 and \$36) then the value of the loss in quality of hunting would amount to between \$25 million and \$49 million. Combining these figures would imply that a loss in value to deer hunters of between \$58 million and \$83 million in 2002.

For the same reasons as earlier stated, I would anticipate lower losses in 2003. Assuming that hunting days will be down 6 percent to 10 percent and that the value of remaining days drops by 5 to 10 percent would mean losses between \$30 million and \$53 million in 2003.

Data are not available to even speculate on the potential nonmarket impact on deer viewers. According to the *2001 National Survey*, wildlife watching is very widespread in Wisconsin. Over 2.4 million people participated in 2001. Over 1.8 million fed wildlife. Close to a million reported viewing large mammals and in Wisconsin most of them must be referring to deer. But how will deer viewers fare under CWD? Perhaps the most dramatic impacts during 2002 and 2003 are related to bans on feeding. It is well known that many people feed deer to attract them for viewing, but there is no basis to judge the magnitude of the impacts from feeding bans. Eradication and herd reduction will have additional, difficult-to-judge impacts.

Conclusions

On the market and agency side, the largest costs identified here fall on the public sector as it struggles to deal with the problem. This could easily amount to \$15 million in 2002 (\$12 million for the DNR and maybe \$3 million for other agencies). Agency costs may be less in 2003. In the private sector, some losses, amounting to a few million dollars, are being incurred due to reduced tourist revenues from nonresident deer hunters. To be sure, there will be other losses in the private sector. Some of the businesses that cater to hunters may feel substantial impacts from reduced hunting. Sporting goods dealers as well as rural businesses that would otherwise enjoy a larger influx of new dollars from urban hunters may be especially vulnerable. But there will be counterbalancing “winners” for the most part as state residents who spend less on deer hunting spend more in-state on other things. And this leaves losses to deer and elk farms and to feed dealers unaccounted for.

The nonmarket losses seem likely to be much larger. Under plausible assumptions, they could amount to several tens of millions of dollars in both 2002 and 2003. While recognizing that these losses are important, it is also important to keep them in perspective. On average, they may amount to less than \$140 per deer hunter in 2002, and 2003 will hopefully see the losses subside somewhat. Such losses are significant, but they are not the end of the world. There is still a lot of deer hunting in Wisconsin and it is generating a lot of surplus value for the hunters.

The future is, of course, uncertain. If the disease can be eliminated or contained in a relatively small part of the state or inexpensive, reliable tests for the disease can be devised so that hunters can be confident that the venison they and others in their households eat is not from infected animals, then the damages, both market and nonmarket, will remain at moderate to low levels. If the area where CWD is endemic expands over time as it has in states like Colorado, the losses will grow. If eating venison from CWD-infected deer is linked to positive, substantial risks to human health and the disease spreads out into the state, much larger losses, possibly in the hundreds of millions of dollars per year, could be sustained. Large losses could also be sustained if CWD

from deer begins to affect the health of domesticated animals. Wise, well-thought-out, cost-effective public policies based in the best science available are definitely called for.

Endnotes

¹ The author is grateful for help at several points from Thomas A. Heberlein and from various personnel at the Wisconsin Department of Natural Resource, especially Jordan Petchenik.

² This point can easily lead to confusion, since hunters do spend money in the marketplace for items such as equipment, food and lodging, and even access to land for hunting. The point is that almost all deer hunting is controlled by the state, which determines where, when, how, and under what conditions deer may be taken. This amount of control means that deer hunting is a nonmarket good.

³ There are 72 counties in Wisconsin.

⁴ Richard C. Bishop. *The Economic Effects in 2002 of Chronic Wasting Disease (CWD) in Wisconsin*. Department of Agricultural and Applied Economics, University of Wisconsin-Madison, Staff Paper 450, 2002. <http://www.aae.wisc.edu/www/pub/sps/stpap450.pdf>

⁵ For example, over the 10 years between 1992 and 2001, the number of gun licenses sold ranged from 652,491 to 694,712, with a mean of 676,626 and a standard deviation of 12,890.

⁶ License and deer harvest data are from the Wisconsin Department of Natural Resources website, <http://www.dnr.state.wi.us/>

⁶This figure was passed along to me in personal communication from Jordan Petchenik of the Wisconsin Department of Natural resources. All other harvest data are from the Wisconsin Department of Natural Resources website, <http://www.dnr.state.wi.us/>.

⁷U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, Bureau of the Census. *2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation: Wisconsin*. FHW/01 WI Rev., Revised March 2003.

⁸Jordan Petchenik. *Chronic Wasting Disease in Wisconsin and the 2002 Hunting Season: Gun Hunters' First Response*. Bureau of Integrated Science Services, Wisconsin Department of Natural Resource, Madison, WI, April 2003. http://www.dnr.state.wi.us/org/es/science/publications/PUB_SS_982_2003.pdf

¹⁰ As noted elsewhere, the Wisconsin DNR recorded over 688,000 licenses sold in 2001. The USFW figures are based on reported hunting in the previous year. Not every one who buys a license hunts. Maybe the Fish and Wildlife Service numbers are a little low since they are based on a sample rather than the entire population.

¹¹ As of September 9, 2003, the Wisconsin Department of Health and Family Services estimated the population of Wisconsin to be 5,461,710. <http://www.dhfs.state.wi.us/population/02demog/wisconsin.htm>.

¹² If 6 percent of the hunters are nonresidents and they spend, on a per person basis, the same as resident hunters, then 6 percent of \$553 million would be \$33.18 million in 2001. A decline in nonresident hunting of 19 percent would imply a loss in expenditures of \$6.3 million.

¹³ The Wisconsin Department of Tourism reported that travelers spent nearly \$11.7 billion in Wisconsin in 2002. See http://agency.travelwisconsin.com/Research/EconomicImpact_Active/02highlightsummary.pdf. A substantial share of these travels was no doubt from out of state.

¹⁴ State of Wisconsin, Legislative Audit Bureau, *Chronic Wasting Disease*, Madison, WI, October 2003, <http://www.legis.state.wi.us/lab/>.

¹⁵ Randall S. Rosenberger and John B. Loomis. *Benefit Transfer of Outdoor Recreation Use Values: A Technical Document Supporting the Forest Service Strategic Plan (2000 revision)*. Gen. Tech. Rep. RMRS-GTR-72. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, 2001.

¹⁶ Richard C. Bishop and Thomas A. Heberlein. "The Contingent Valuation Method." *Economic Valuation of Natural Resources*. Rebecca L. Johnson and Gary V. Johnson, eds. Boulder, CO: Westview Press, 1990, pp. 81-104.

¹⁷ Petchenik, *op cit*.

¹⁸ Petchenik, *op cit.*, did not find a clear indication of whether those who did hunt in 2002 increased or decreased their days of hunting. Most said they hunted about the same as always. Slightly more

respondents reported hunting more than in past years compared to those who said they hunted less, but it is not clear from the report whether the difference was statistically significant.