Journal of Agricultural and Applied Economics, 44,2(May 2012):191–202

Willingness-to-Pay for Calf Health Programs and Certification Agents

Tucker Schumacher, Ted C. Schroeder, and Glynn T. Tonsor

Cattle feeders want feeder cattle that have been weaned and preconditioned with a certified health program. Preconditioned calves perform more efficiently in the feedlot with lower morbidity and mortality. Health program claims, however, range from no claim to being USDA-certified. The value of health protocol certification may vary with certifying entity. Results from a choice experiment and survey of cattle feeders indicate preconditioning programs that include weaning, vaccinating against respiratory and clostridial/blackleg, and treating for parasites are worth on average $7.28/cwt to feedlots. Furthermore, a health program certified by USDA carries an additional value of $2.37/cwt on average.

Key Words: calf health programs, calf preconditioning, value of certification

JEL Classifications: Q13, L15, D82

Inadequate flow of information across beef industry sectors has long been recognized as a problem. Poor information flow and verifiability of information from cow-calf producers to backgrounders and feedlots result in considerable inefficiency in cattle and beef production and marketing (Schroeder and Kovanda, 2003). There is growing interest in the cattle production sector for better vertical coordination and certification of cattle health program history (Hodur et al., 2007). Cow-calf producers, selling calves represented as being produced using a specified health preconditioning program, possess asymmetric information. As such, buyers must rely heavily on animal health program claims by cow-calf producers or their agents.[1] The result of this asymmetric information is that cattle routinely end up being revaccinated, retreated, and/or reimplanted assuming nothing has been done before arrival at the feedlot (Chymis et al., 2007). This represents the classic "lemons" problem in which no market premium for health program preconditioned calves should even exist (Akerlof, 1970; Allen, 1993).

However, a market does exist for certified health program calves because some sellers have garnered superior reputations (Turner, McKissick, and Dykes, 1993) and third-party certifications of calf health programs have become more prominent (Zimmerman et al., 2012). The ultimate value of calf preconditioning health programs is likely to depend on both the value of the protocol to downstream producers together with the credibility of the production claim.

Tucker Schumacher is a former Masters of Agribusiness student, currently marketing manager, Global Animal Management, Inc., St. Louis Park, MN. Ted C. Schroeder is a university distinguished professor and Glynn T. Tonsor is assistant professor, Agricultural Economics, Kansas State University, Manhattan, KS.

We acknowledge the feedlot managers who took the time to complete and return our survey. We also appreciate the constructive comments of two anonymous journal reviewers and of Darrell Bosch.

[1] The term health programs as used in this article refer generically to production calf protocols including vaccinations, deworming, parasite controls, weaning, etc., that cow-calf producers may use regardless of whether they are certified by a third party.

When purchased cattle arrive at a feedlot, they routinely undergo a common processing protocol that may include viral, bacterial, and clostridial vaccinations; treating for internal and external parasites; and implanting with synthetic growth promotants (Irsik, 2005). Optimally, feedlots prefer to modify their animal processing protocol depending on the preconditioning program calves may have already received. However, information about specific animal preconditioning health programs is essential before feedlots can appropriately modify their cattle processing procedures. Furthermore, the entity that provides assurances for previous health programs of purchased animals is important to feedlots because they determine the value they are willing to pay for specific preconditioning protocols. Health program verification can include no assurance, seller claims, or certification by a third party or a federal agency such as the USDA. Although existing research suggests consumers place a notably higher value on claims certified by USDA than other parties, there is no known comparable assessment from a feedlot manager perspective (Olynk, Tonsor, and Wolf, 2010a, 2010b). As cow-calf producers decide on preconditioning programs to use, having information on both the expected value of the program as well as the value of the certifying entity is important for management decisions.

In addition to health program assurances and differences in the entity certifying associated claims, there is growing interest by the US cattle industry in a related trait of age and source verification (ASV) of calves. Source verification provides an increased accountability of the cow-calf producer because the animal can be traced directly to the producer. This may improve buyers' perceptions of the cow-calf producers' reputation. In addition, ASV claims are core to many of the most popular process-verified programs facilitated by the USDA. Moreover, being able to document that beef is derived from animals under a certain age is an increasingly common requirement of market access in global beef trade (Schroeder and Tonsor, 2012).

When calves are sold at auction, commonly a brief statement is made by the auctioneer about any health program administered with only the seller's verification. The buyer has no ability to assess the authenticity of this claim other than visible signs of health of the calves in the sale ring. Because of this asymmetric information, several calf health programs have been developed in recent years by animal health companies that provide third-party private certifications such as SUREHEALTH® or SelectVac®. Motivations behind such programs include having designated protocols and an assurance of the program that may have more credibility and thus market value than just a seller's claim. The USDA is also involved in cattle certification systems in which the USDA either directly through their own staff or through private vendors licensed by the USDA provides specific animal production verification. Certification by a public agency such as the USDA may or may not have greater market value than private third-party certifications. However, USDA certification includes costly audit procedures for the producer. Does it matter to the cattle buyer what agency certifies the health program? Our study is designed to answer this question.

The purpose of this study is to determine how preconditioning health programs, and the certifying entity that verifies the programs, affect feedlot willingness to pay for calves having specific preconditioned health program claims. We particularly estimate how specific health program protocols with varying weaning durations and age and source verification are valued by feedlots. We further estimate the difference in willingness to pay associated with the entity that verifies the health program administered by the cow-calf producer.

The information gleaned from this study is important for several reasons. Cow-calf producers deciding on the type of preconditioning and health program to use must weigh the costs of the program against the expected value they will receive when they sell their calves. However, not only do producers need to understand the expected value of the health program they administer, if that value is conditional on the certifying entity, this is also information producers need to consider relative to the certification cost. Seller reputation, measured by sales volume, can affect feeder cattle prices (Turner, McKissick, and Dykes, 1993). Certifying calf health programs is one way cow-calf operations

without an established reputation may be able to secure premiums for production assurances.

Previous Literature

Several studies have investigated values associated with calf preconditioning, health programs, and other value-added practices. Cow-calf producers having a comparative advantage in production skills more often add value to calves through backgrounding as opposed to selling calves at weaning (Pope et al., 2011). Backgrounding calves is an essential part of a calf preconditioning health program. Blank, Forero, and Nader (2009) analyzed data from the Western Video Market for calves and yearlings sold over an 11-year period (1997–2007). Preconditioned calves received an average premium of $1.37/cwt and preconditioned yearlings received a premium of $1.03/cwt. Calves that were not weaned were discounted $3.59/cwt, and age- and-source-verified calves (yearlings) received a premium of $5.31/cwt ($1.96/cwt). Dhuyvetter, Bryant, and Blasi (2005), using Kansas auction market data for specific sales during 1999–2004, found that a premium for a certified vaccination program that included a 45-day weaning requirement was as much as $5.70/cwt for steers.

Zimmerman et al. (2012) analyzed Superior Livestock Auction sales across 10 years (2001–2010) in a comprehensive assessment of the value of individual calf vaccination programs. Steer calf vaccination programs had premiums ranging from $0.63/cwt for a single respiratory vaccination to $5.73/cwt for a vaccination program that included two sets of respiratory and clostridial vaccinations. They also estimated the values of weaning with and without bundled vaccination programs. King et al. (2006) also evaluated Superior Livestock Auction sales from 1995–2005 with similar results to Zimmerman et al. (2012). The largest health program premium in King et al. (2006) using 2005 data was $6.64/cwt for a specific vaccination program having a 45-day minimum weaning verification.

Bulut and Lawrence (2006) evaluated different forms of health program certifications using auction market data from Iowa. Similar to Zimmerman et al. (2012), Bulut and Lawrence controlled for weaning in estimating the value of the animal health program. Certified health programs often include weaning for a minimum number of days as a part of the bundled set of requirements. Thus, separating the value of weaning from the rest of the animal health program can be difficult, if not impossible. Bulut and Lawrence determined the health program premium for calves certified by a third party and weaned at least 30 days was $6.12/cwt relative to calves not weaned and not vaccinated. Calves that were not certified as vaccinated by the third party (although were claimed to be vaccinated) and weaned at least 30 days received a premium of $3.35/cwt, or $2.77/cwt less than the third-party certification.

Schulz and Tonsor (2010) estimated a hedonic pricing model using transaction-level feeder cattle market data from auctions held in late 2008 and early 2009. Breed, color, muscling, frame size, condition, and existence of horns each affected transacted prices. Buyers also discounted unhealthy calves by $6.31/cwt. Avent, Ward, and Lalman (2004), using data from three sales in 2000 at the Joplin Regional Stockyards, found a discount of $23.68/cwt for unhealthy calves.

Past studies find consistently statistically significant premiums present in auction markets for feeder cattle having certified health programs. The magnitudes of premiums being paid, however, vary considerably over time and across specific health programs. Careful attention to details of the health program is obviously important because details likely affect premiums received. Health programs being used by cow-calf producers, although asymmetric in their information content, are garnering premiums in auction markets. There is initial evidence (e.g., Bulut and Lawrence, 2006) that the health program certifying agent may matter. Our study takes this question further by examining in greater detail specifically how much the certifying entity (e.g., the seller, third party, or USDA) affects the value of the health program.

Modeling Health Program and Certification Value

The classic work by Ladd and Martin (1976) provides the foundation theoretical model for

determining the marginal value of inputs with varying characteristics for a firm producing output. The producer chooses inputs varying in quality to maximize profit. The standard hedonic model is a way to examine how input characteristics affect individual product (or lots of feeder cattle) prices (Ladd and Martin, 1976):

$$(1) \qquad r_i = \sum_j T_j X_{ji}$$

where r_i is individual price for transaction i, T_j is the marginal implicit value of individual product characteristic j used in production, and X_{ji} are the characteristics j for transaction i. In most studies estimating the marginal implicit values of feeder cattle input characteristics, transaction data from auctions are collected on individual lots of cattle sold with each characteristic of the pen recorded. Then the typical hedonic model is applied to the data estimating the marginal values of the individual characteristics. This approach works well for estimating implicit prices of product characteristics when markets for products possessing these characteristics are well established.

In our case, markets for the specific feeder cattle traits that we are estimating marginal values for are not well established. That is, obtaining data on pens of cattle being sold possessing different sets of health preconditioning programs and having different parties certifying the programs is difficult. For example, we do not know of any study using data spanning the myriad of health verifications that include sellers, private third parties, and USDA certifiers as alternative signals of the credibility of the claim. Thus, our study evaluates novel health programs and varying potential program certifying parties. We specifically estimate the value of different certification entities including the producer, third-party private, and government agencies, which has not been examined in previous auction market studies.

We elected to use a choice experiment to elicit cattle feedlot producer willingness to pay for feeder cattle health programs and associated program-certifying agencies. The choice experiment approach we use is similar to that used by Ruto, Garrod, and Scarpa (2008) to determine the value of animal genetics to producers in Kenya. Our approach follows several existing analyses, which used stated preference survey approaches to identify agricultural producer preferences for contract attributes (Roe, Sporleder, and Belleville, 2004), voluntary checkoff program contributions (Norwood et al., 2006), valuation for autonomy (Davis and Gillespie, 2007), and traceability systems (Schulz and Tonsor, 2010).

In designing our choice experiment, we were particularly sensitive to the pragmatic issue that managers of cattle feeding operations are busy and not interested in completing lengthy surveys. This is consistent with a host of work regarding choice experiment complexity and impacts on respondent participation and subsequent research conclusions (Louviere et al., 2008). As such, we designed a choice experiment that included characteristics of the calf health program, health program certifier, age- and source-verified, and price. The attributes used in the choice experiment are provided in Table 1.

To manage the number of choice scenarios an individual feedlot manager would need to complete, and to keep the choices as straightforward as possible, we designed the experiment so the respondent would select a pen of calves to buy based on a health program stated with three possible options (Program A, B, or C; plus a no-purchase option). With each health program choice, we varied the certifier, the presence of age and source verification claims, and price premiums. Each choice set included a base pen of calves that had no health program indicated, no certification of health program, no age and source verification, and a price premium of zero (Table 2 provides a sample choice set). A total of 13,824 unique choices are possible with these combinations ([three health program certifiers $\times$ two age and source verifications $\times$ four price premiums]). To reduce the numbers of choices a respondent had to answer, we generated an orthogonal fractional factorial design that resulted in 19 choice sets (Kuhfeld, Tobias, and Garratt, 1994). One choice set was redundant and was deleted. Following Tonsor et al. (2005), the scenarios were randomly ordered and divided into three blocks of six scenarios to reduce chances of respondent fatigue.

Table 1. Choice Set Attributes Evaluated by Feedlot Survey Respondents

Attribute	Alternatives
Health programs	None
	Program A: vaccinated against respiratory (viral and bacterial) and clostridial/blackleg; treated for internal and external parasites; no weaning claim
	Program B: vaccinated against respiratory (viral and bacterial) and clostridial/blackleg; treated for internal and external parasites; weaned for at least 30 days
	Program C: vaccinated against respiratory (viral and bacterial) and clostridial/blackleg; treated for internal and external parasites; weaned for at least 45 days
Health program certification	None
	Seller Claim with no USDA certification
	Third party (e.g., veterinarian, pharmaceutical company) without USDA certification
	USDA certification program
Age- and source-verified	No
	Yes
Price premium (relative to no health program indicated, no certifying agent, and no age and source verification)	\$0.00 per cwt
	\$3.00 per cwt
	\$6.00 per cwt
	\$9.00 per cwt

Consistent with many conjoint applications (Schulz and Tonsor, 2010), we follow random utility theory and define producers' utility function to include a deterministic component (V_{ijt}) and a stochastic component (ε_{ijt}):

$$U_{ijt} = V_{ijt} + \varepsilon_{ijt}, \quad (2)$$

where U_{ijt} is the utility of option j for producer i in choice situation t. The probability of producer i selecting option j in situation t is given by: $\text{Prob}\{V_{ijt} + \varepsilon_{ijt} \geq V_{ikt} + \varepsilon_{ijt}; \forall k \in S_i\}$, where S_i is the choice set faced by producer i (S_i = [Option A, Option B, Option C, None]).

Assuming the systematic component of a producer i's utility function is linear in parameters, it may be written as:

$$V_{ijt} = \beta_1 X_{ijt,1} + \beta_2 X_{ijt,2} + \ \ldots \ + \beta_n X_{ijt,n}, \quad (3)$$

where β_n and $X_{ijt,n}$ are the n^{th} coefficient to be estimated and n^{th} attribute presented in choice situation t for option j, respectively. Alfnes (2004) points out that this describes a panel data model in which the cross-sectional element is individual i and the time-series component is the t choice situation.[2] Given this specification, marginal willingness to pay for a particular attribute is simply the ratio of the attribute coefficient and the price coefficient (Hanemann, 1984).

In this application, we estimate both standard multinomial logit (MNL) and random parameters logit (RPL) models because both are frequently used in analyzing choice experiment response data. In the MNL, preference homogeneity and the independence of irrelevant alternatives are assumed (Revelt and Train, 1998; Train, 2003; Hensher, Rose, and Greene, 2006). The RPL is free of these restrictive assumptions. The particular RPL applied here assumes preferences for all attributes besides price vary

[2] Conventional fed cattle in this context refers to cattle that are not fed and marketed under a specific US Department of Agriculture Agricultural Marketing Service marketing program such as age- and source-verified, naturally raised, nonhormone-treated, or organic.

Table 2. Sample Choice Set used in Feedlot Survey

	Health Program			
	None Indicated	Program A (no wean)	Program B (wean 30 days)	Program C (wean 45 days)
Health program-certified	No	USDA	Seller claim	Third party
Age- and source-verified	No	Yes	No	Yes
Price premium ($/cwt)	$0.00	$9.00	$3.00	$6.00
You would buy? (select one)				

normally across responding producers. This approach is attractive as it assures subsequent willingness-to-pay estimates are normally distributed over the respondent population (Lusk, Roosen, and Fox, 2003). More broadly, the RPL provides two coefficient estimates (mean and standard deviation) that combined describe the distribution of preferences and facilitate an evaluation beyond the typical sole focus on the representative respondent (Tonsor and Shupp, 2011). On estimation, the mean and standard deviation estimates from the RPL can be used to identify the portion of producers positively valuing an attribute and the estimated value of a particular subset of producers (i.e., the 10% most valuing a feeder cattle trait).

Data

A mail survey instrument was used to collect information on cattle feeder preferences for feeder cattle health programs and associated certifications. The survey was mailed to 591 cattle feedlots across the United States in February 2011 using the population of feedlots contained in 2011 BeefSpotter with indicated capacities of 100 head or more (Spotterpublications, 2011). A total of 171 responses was received (28.9% response rate). After sorting out respondents who were no longer feeding cattle and surveys that were incomplete, 159 useable responses remained. Summary statistics of the respondents are provided in Table 3.

The average age of the respondents was 54 years, which is comparable to Census data for 2007 in which the average age of US producers was 57. The locations and sizes of the feedlot respondents are summarized in Table 4. The bulk of our respondents are from the High Plains (51%) followed by the Cornbelt (37%) and the West (12%). Comparing the distributions of annual marketings of respondents to USDA National Agricultural Statistics Service (NASS) data illustrates that our respondents represent predominantly large feedyards. For example, NASS data indicate that in January 2011, approximately 95% of feedlots had less than 1,000 head one-time capacity (corresponding to roughly 2,000 head annual marketings). In contrast, NASS data indicate approximately 0.25% of feedlots had inventory greater than 24,000 head. This would roughly correspond to our largest category of 50,000 head marketed category, which represents 23% of our sample. Feedlots having 1,000 head and greater capacity (5% of feedlots) represented 85% of cattle marketed in 2010 (United States Department of Agriculture, National Agricultural Statistics Service, 2011). Hence, our sample and conclusions reflect the majority of cattle purchased into feedlots nationally rather than the majority of feedlot operations.

Feedlot respondents custom fed 30% of their cattle marketed in 2010, purchased feeder cattle from local auctions (simple average of 29% of purchases), and direct from sellers (23%) (Table 3). The most common method of marketing fed cattle was conventional[3] with 79% of cattle marketed that way, and 16% were marketed as age- and source-verified. Liveweight negotiated pricing of fed cattle was most common representing 39% of sales on average with grid and dressed-weight negotiated next representing 24% and 22%, respectively.

[3] Using the program's panel data specification, all models are estimated in NLOGIT (Greene, 2008) to account for this panel data characterization.

Table 3. Summary Statistics of Feedlot Survey Respondents

	N	Avg.	Standard Deviation	Minimum	Maximum
Operator age (years)	153	53.8	13.1	19	86
Years of experience[a]	159	4.5	1.3	1	6
Education[b]	159	2.6	0.9	1	4
Feeder cattle purchased with identified health program in 2010 (%)	159	22.6	26.7	0	100
Feeder cattle purchase methods					
Custom fed, not purchased (%)	159	30.0	34.0	0	100
Local auctions (%)	159	28.9	30.2	0	100
Video auctions (%)	159	10.0	18.9	0	100
Direct from seller (%)	159	23.4	28.9	0	100
Home raised (%)	159	2.9	7.5	0	50
Other (%)	159	4.7	15.2	0	90
Fed cattle marketing programs					
Conventional fed cattle (%)	159	78.7	28.4	0	100
Age- and source-verified (%)	159	16.4	23.6	0	100
Nonhormone-treated (%)	159	1.0	5.0	0	50
Naturally raised (%)	159	3.2	13.0	0	100
Organically raised (%)	159	0.0	0.0	0	0
Other (%)	159	1.2	10.9	0	100
Fed cattle marketing methods					
Live weight negotiated (%)	159	39.3	41.7	0	100
Live weight formula (%)	159	3.4	11.7	0	100
Dressed weight negotiated (%)	159	21.9	36.8	0	100
Dressed weight formula (%)	159	10.8	27.2	0	100
Grid (%)	159	23.8	36.5	0	100
Other (%)	159	0.9	8.0	0	97

[a] Years experience are coded 1 ≤ 5 years, 2 = 5–9 years, 3 = 10–19 years, 4 = 20–29 years, 5 = 30–39 years, 6 = 40 or more years.
[b] Education is coded as 1 = not attended college, 2 = attended college, no bachelor's degree, 3 = Bachelor's degree, 4 = graduate or professional degree.

Results

The survey asked cattle feeders to provide their perceptions of how feeder cattle raised with specific identified health programs were likely to perform in the feedlot. Table 5 provides responses to the perceptions feedlot managers have regarding cattle performance of calves raised with identified health programs. Respondents tended to expect lower morbidity,

Table 4. Size and Location of Feedlots Responding to Survey

	Annual Marketings (head)			
	<1,000	1,000–9,999	10,000–49,999	50,000+
Percentage of respondents	5	32	40	23
	Feedyard Location[a]			
	Cornbelt	High Plains	West	
Percentage of respondents	37	51	12	

[a] Cornbelt includes states of Iowa, Illinois, Indiana, Minnesota, North Dakota, Nebraska, South Dakota; High Plains includes states of Colorado, Kansas, Oklahoma, Texas; West includes states of Arizona, California, Idaho, Montana, Nevada, Oregon, Utah, Washington, Wyoming.

Table 5. Responses to "Compared with feeder cattle raised without a specific identified health program, how likely are feeders that have had a verified health program to have?"

1 = Very Unlikely, 2 = Unlikely, 3 = Neutral, 4 = Likely, 5 = Very Likely[a]				
Attribute	Responses	Most Common Response	Average Response	Standard Deviation
Lower morbidity	158	4	4.13[a]	0.85
Lower death loss	158	4	4.20[b]	0.84
Better feed efficiency	158	4	3.96[c]	0.73
Better daily gain	159	4	3.94[c]	0.73
Better dressing percentage	158	3	3.35[d]	0.81
Better yield grade	158	3	3.31[d]	0.78
Better quality grade	159	3 and 4	3.67	0.80
Higher cost when purchased	159	4	4.18[ab]	0.82
Higher price when finished	159	3	2.86	0.97

[a] Averages sharing the same superscript are not statistically different from each other $p \leq 0.05$.

lower death loss, better feed efficiency, and better daily gain if feeder cattle were raised with specific health programs before entering the feedlot. Feeder cattle health is positively correlated with finished cattle quality grade (Gardner et al., 1999; Reinhardt, Busby, and Corah, 2009). Many cattle feeder survey respondents recognized this positive correlation. Respondents also expect to pay more for calves raised with health programs when purchased to place in the feedyard. Respondents were less certain about whether feeder cattle raised under such programs would have better yield grade or dressing percentage when harvested. Feedlot managers indicated the selling price of calves when ultimately finished because fed cattle would not differ depending on whether the cattle were raised with a verified health program.

Table 6 presents the RPL model results because the multinomial logit was rejected (per likelihood ratio tests) in favor of the RPL. Stated differently, likelihood ratio tests reject the hypothesis that producer preferences are jointly homogenous for the evaluated feeder cattle traits. Overall, the model fit (pseudo R^2 value of 0.44) is strong and consistent with related applications in the literature. The estimated price coefficient is negative and statistically significant providing the expected result of feedlot operators having a downward sloping demand curve for health preconditioning programs. Besides a general characterization of directional preferences and individual statistical significance, evaluation and interpretation of individual coefficients is cautioned and generally discouraged in random utility models (Scarpa and DelGiudice, 2004). Thus, we turn our attention to economically meaningful ratios of coefficients, namely willingness-to-pay (WTP) estimates.

In addition to WTP point estimates, Table 7 presents 95% confidence intervals derived to determine if estimated mean WTP values are statistically different from zero. The confidence intervals indicate cattle feeders statistically significantly ($p \leq 0.05$) value cattle from health Programs B and C, but not Program A, relative to a pen of calves having no health program claim. Cattle in Programs B and C are estimated to be worth on average \$7.28/cwt and \$12.15/cwt, respectively, to feedlot operators compared with calves having no health program claim. Bulut and Lawrence (2006) estimated premiums of \$6.12/cwt for calves certified by a third party and weaned at least 30 days based on analysis of auction data in Iowa, which compares to our \$7.28/cwt estimate for Program B (which includes vaccination, parasite treatment, and at least 30 days weaning claims; see Table 1). Comparing Programs A and B, the average feedlot manager is willing to pay approximately \$5.35/cwt (\$7.28–1.93) more for calves weaned for 30 days that have otherwise identical health preconditioning programs. This is consistent with estimated

Table 6. Random Parameters Logit Model Estimates of Choice Experiment Responses by Surveyed Feedlots[a]

Variable	Mean	Standard Deviation
Program A (vs. none)	0.667	1.980*
	(0.394)	(0.393)
Program B (vs. none)	2.510*	1.155*
	(0.289)	(0.247)
Program C (vs. none)	4.188*	1.603*
	(0.315)	(0.258)
Age- and source-verified (yes vs. no.)	1.007*	0.811*
	(0.136)	(0.122)
Thirtd party-certified (vs. seller claim)	0.146	0.588*
	(0.109)	(0.175)
USDA-certified (vs. seller claim)	0.409*	0.416
	(0.124)	(0.330)
Price premium ($/cwt)	−0.345*	
	(0.030)	

[a] Model was estimated with NLOGIT 4.0 using Halton draws and 250 replications. Number of observations: 3,816 (159 respondents × six scenarios × four choices). Age- and source-verified and certification variables are effects coded (Lusk, Roosen, and Fox, 2003). All attributes besides price are specified to vary normally. One asterisk indicates statistical significance at the $p \leq 0.05$. Numbers in parentheses are standard errors. Log likelihood: –738.151; Pseduo R^2 : 0.439.

premiums for weaning by Zimmerman et al. (2012) in analysis of Superior Livestock Association auction data for 2008–2010 of $3.47/cwt to $5.42/cwt. The similarity of our estimates to auction market data is reassuring given the hypothetical nature of our estimates. The $5.35/cwt premium (Program A vs. B) feedlot operators place on weaning and $4.87/cwt marginal value feedlot operators place on 15 additional days postweaning (Program B vs. C) should be of interest to cow-calf and stocker operators who know their added production costs of weaning and selling timetables. The animal science literature reveals reduced cattle morbidity if calves have been weaned at least 30–45 days with associated health programs administered before being shipped to a feedlot (Step et al., 2008). Feedlot managers reveal economically important preferences for the upper side of 45 days weaning relative to 30 days.

The typical feedlot manager is estimated to place $5.84/cwt marginal value on feeder cattle carrying age and source verification. This estimate is consistent with auction market analysis by Blank, Forero, and Nader (2009) who estimated age- and source-verified calves receive premiums of $5.31/cwt but greater than Zimmerman et al. (2012) who estimated premiums of $1.67/cwt during 2010. This supports the notion respondents took our survey and choice experiment seriously as estimates, although perhaps upward biased, are not far out of line with those derived from traditional hedonic modeling analyses of transaction data.

Table 7. Willingness-to-Pay (WTP) Estimates ($/cwt) of Feedlot Survey Respondents[a]

Attribute	Lower 95% Confidence Interval	Point Estimate	Upper 95% Confidence Interval
Health Program A (vs. none)	−0.33	1.93	4.18
Health Program B (vs. none)	5.69	7.28	9.25
Health Program C (vs. none)	10.58	12.15	14.20
Age- and source-verified (yes vs. no.)	4.36	5.84	7.36
Third party-certified (vs. seller claim)	−0.38	0.85	2.19
USDA-certified (vs. seller claim)	0.94	2.37	3.70

[a] Confidence intervals obtained using 1,000 simulated WTP estimates using the Krinsky and Robb (1986) bootstrapping method.

Also presented in Table 7 are feedlot manager preferences for the entity that verified the health program. Confidence intervals indicate the representative feedlot manager is indifferent ($p \leq 0.05$) to calf health programs certified by sellers themselves or by private third parties not associated with a USDA certification program (e.g., veterinarian or pharmaceutical company). This is somewhat surprising because third-party certification programs often include an audit procedure to ensure compliance. In contrast, the typical feedlot manager is willing to pay $2.37/cwt more for feeder cattle carrying USDA-certified claims than equivalent claims certified solely by the seller. USDA certification has specific audit procedures and is an independent third party that does not do business with the seller. In contrast, many private third-party certifiers have as customers cattle producers for whom they are providing verification of health programs. As a result, perhaps USDA certification is more trusted as unbiased by buyers. We are unaware of existing studies evaluating the cost of cow-calf producers or stockers enrolling in USDA process-verified programs, but future work could compare the costs with our estimate of $2.37/cwt in expected marginal return relative to self-certification.

Although mean WTP estimates are useful for understanding preferences of typical feedlot operators, analysis of preferences across the distribution of evaluated feedlot managers is also valuable (Tonsor and Shupp, 2011). Using the mean and standard deviations of WTP presented in Table 7, we estimate 63%, 99%, and 100% of feedlot managers are willing to pay some premium for Program A, B, and C, respectively, relative to no health program claim. Similarly, 89%, 60%, and 84% are willing to pay a premium for ASV, third-party certification (vs. seller), and USDA certification (vs. seller). This adds to our understanding by quantifying the maximum market size for a given attribute. For example, our model indicates the top 10% of feedlots in terms of valuing ASV are willing to pay at least $11.87/cwt.

Conclusions

Cow-calf producers have an opportunity to increase returns by adding value to their calves through certified health programs they use. Feedlots prefer feeder cattle that have been weaned for at least 30 days and had a comprehensive health program because the animals are expected to realize improved feeding performance and lower morbidity and mortality. Calves raised with a health program that have been weaned for 30 days are worth approximately $5.35/cwt more to the typical large commercial cattle feeder than calves having the same health program that have not been weaned. Furthermore, calves having the same health program that have been weaned 45 days are worth $4.87/cwt more relative to those weaned for 30 days. Nearly two-thirds of cattle feeders responding to our survey value an animal health program and essentially all cattle feeders value weaning combined with the health program when they buy calves.

The agency that certifies the calf health program is also an important value determinant. Seller and third-party certification have about the same average values, although approximately 60% of feedlots would pay more for third-party than for seller-certified health programs. USDA certification of a calf health program is worth approximately $2.87/cwt to the typical feedlot respondent in our survey relative to calves having only seller health protocol certification. Furthermore, an estimated 84% of feedlot respondents place some value on USDA certification. Feedlots also are willing to pay $5.84/cwt on average more for calves that are age- and source-verified.

The estimated WTP premiums reported for the various calf value-added activities are likely conditional on cattle market prices. As such, estimated premiums may need adjustment during periods with markedly different prices relative to the time period when the data used here were collected (February–March 2011). Costs associated with adopting health program certification and keeping calves postweaning need to be considered as cow-calf producers decide their preferred production option. In addition, the entity that certifies the health program is an important consideration, especially relative to the costs of complying with certified calf health programs.

[Received August 2011; Accepted November 2011.]

References

Akerlof, G.A. "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism." *Quarterly Journal of Economics* 84,3(August 1970): 488–500.

Alfnes, F. "Stated Preferences for Imported and Hormone-Treated Beef: Application of a Mixed Logit Model." *European Review of Agricultural Economics* 31(2004):19–37.

Allen, D.W. "Pot-Bellies, Cattle Breeds and Revealing Signals." *Economic Inquiry* 31,3(July 1993):481–87.

Avent, R.K., C.E. Ward, and D.L. Lalman. "Market Valuation of Preconditioning Feeder Calves." *Journal of Agricultural and Applied Economics* 36,1(August 2004):173–83.

Blank, S.C., L.C. Forero, and G.A. Nader. "Video Market Data for Calves and Yearlings Confirms Discounts for Western Cattle." *California Agriculture* 63,4(October–November 2009): 225–31.

Bulut, H., and J.D. Lawrence. "The Value of Third-Party Certification of Preconditioning Claims at Iowa Feeder Cattle Auctions." *Journal of Agricultural and Applied Economics* 39,3(December 2006):625–40.

Chymis, A.G., H.S. James Jr., S. Konduru, V.L Pierce, and R.L. Larson. "Asymmetric Information in Cattle Auctions: The Problem of Revaccinations." *Agricultural Economics* 36(2007):79–88.

Davis, C.G., and J.M. Gillespie. "Factors Affecting the Selection of Business Arrangements by U.S. Hog Farmers." *Review of Agricultural Economics* 29(2007):331–48.

Dhuyvetter, K.C., A.M. Bryant, D.A. Blasi. "Case Study: Preconditioning Beef Calves: Are Expected Premiums Sufficient to Justify the Practice?" *Professional Animal Scientist* 21(2005): 502–14.

Gardner, B.A., H.G. Dolezal, L.K. Bryant, F.N. Owens, and R.A. Smith. "Health of Finishing Steers: Effects on Performance, Carcass Traits, and Meat Tenderness." *Journal of Animal Science* 77(1999):3168–75.

Greene, W. *NLOGIT Version 4.0 Reference Guide*. Econometric Software, Inc., 2008.

Hanemann, W.M. "Welfare Evaluations in Contingent Valuation Experiments with Discrete Responses." *American Journal of Agricultural Economics* 66(1984):332–41.

Hensher, D.A., J.M. Rose, and W.H. Greene. *Applied Choice Analysis*. Cambridge, UK: Cambridge University Press, 2006.

Hodur, N.M., F.L. Leistritz, D.J. Nudell, C. Clark, D. Griffith, and T. Jensen. "Northern Great Plains Beef Production: Production and Marketing Practices of Cow-Calf Producers." Department of Agribusiness and Applied Economics Report No. 609, North Dakota State University. August 2007.

Irsik, M. "Receiving and Treating Feedlot Cattle." University of Florida Extension, 2005. Available at: http://www.animal.ufl.edu/ANS4245C/documents/FeedlotHealth.pdf (Accessed July 15, 2011).

King, M.E., M.D. Salman, T.E. Wittum, K.G. Odde, J.T. Seeger, D.M. Grotelueschen, G.M. Rogers, and G.A. Quakenbush. "Effect of Certified Health Programs on the Sale Price of Beef Calves Marketed Through a Livestock Videotape Auction Service from 1995 through 2005." Journal of the American Veterinary Medical Association 229(2006):1389–400.

Krinsky, I., and Robb, A. "On Approximating the Statistical Properties of Elasticities." *Review of Economics and Statistics* 64(1986):715–19.

Kuhfeld, W.F., R.D. Tobias, and M. Garratt. "Efficient Experimental Design with Marketing Research Applications." *Journal of Marketing Research* 31(1994):545–57.

Ladd, G.W., and M.B. Martin. "Prices and Demand for Input Characteristics." *American Journal of Agricultural Economics* 58,1(February 1976):21–30.

Louviere, J.J., T. Islam, N. Wasi, D. Street, and L. Burgess. "Designing Discrete Choice Experiments: Do Optimal Designs Come at a Price?" *Journal of Consumer Research* 35(2008):360–75.

Lusk, J., J. Roosen, and J. Fox. "Demand for Beef from Cattle Administered Growth Hormones or Fed Genetically Modified Corn: A Comparison of Consumers in France, Germany, the United Kingdom, and the United States." *American Journal of Agricultural Economics* 85(2003): 16–29.

Norwood, F.B., C. Winn, C. Chung, and C.E. Ward. "Designing a Voluntary Beef Checkoff." *Journal of Agricultural and Resource Economics* 31(2006):74–92.

Olynk, N.J., G.T. Tonsor, and C.A. Wolf. "Consumer Willingness to Pay for Livestock Credence Attribute Claim Verification." *Journal of Agricultural and Resource Economics* 35(2010a): 261–80.

———. "Verifying Credence Attributes in Livestock Production." *Journal of Agricultural and Applied Economics* 42(2010b):439–52.

Pope, K.F., T.C. Schroeder, M.R. Langemeier, and K.L. Herbel. "Cow-Calf Producer Risk Preference Impacts on Retained Ownership Strategies." *Journal of Agricultural and Applied Economics* 43,4(November 2011):497–513.

Reinhardt, C.D., W.D. Busby, and L.R. Corah. "Relationship of Various Incoming Cattle Traits with Feedlot Performance and Carcass Traits." *Journal of Animal Science* 87(2009): 3030–42.

Revelt, D., and K. Train. "Mixed Logit with Repeated Choices: Households' Choices of Appliance Efficiency Level." *Review of Economics and Statistics* 80(1998):647–57.

Roe, B., T.L. Sporleder, and B. Belleville. "Hog Producer Preferences for Marketing Contract Attributes." *American Journal of Agricultural Economics* 86(2004):115–23.

Ruto, E., G. Garrod, and R. Scarpa. "Valuing Animal Genetic Resources: A Choice Modeling Application to Indigenous Cattle in Kenya." *Agricultural Economics* 38(2008):89–98.

Scarpa, R., and T. DelGiudice. "Market Segmentation via Mixed Logit: Extra Virgin Olive Oil in Urban Italy." *Journal of Agricultural and Food Industrial Organization* 2,7(2004):1–18.

Schroeder, T.C., and J. Kovanda. "Beef Alliances: Motivations, Extent, and Future Prospects." *The Veterinary Clinics of North America Food Animal Practice* 19(2003):397–417.

Schroeder, T.C., and G.T. Tonsor. "International Cattle ID and Traceability: Competitive Implications for the United States." *Food Policy* 37,1(February 2012):31–40.

Schulz, L., and G.T. Tonsor. "Cow-Calf Producer Perceptions Regarding Individual Animal Traceability." *Journal of Agricultural and Applied Economics* 42(2010):659–77.

Spotterpublications. 2011. *BeefSpotter 2011*. Available at: www.spotterpublications.com/bs.htm (Accessed October 10, 2011).

Step, D.L., C.R. Krehbiel, H.A. DePra, J.J. Cranston, R.W. Fulton, J.G. Kirkpatrick, D.R. Gill, M.E. Payton, M.A. Montelongo, and A.W. Confer. "Effects of Commingling Beef Calves from Different Sources and Weaning Protocols during a Forty-Two-Day Receiving Period on Performance and Bovine Respiratory Disease." *Journal of Animal Science* 86(2008):3146–58.

Tonsor, G.T., T.C. Schroeder, J.A. Fox, and A. Biere. "European Preferences for Beef Steak Attributes." *Journal of Agricultural and Resource Economics* 30(2005):367–80.

Tonsor, G.T., and R. Shupp. "Cheap Talk Scripts: Effectiveness in Online Choice Experiments and Private Good, Niche Market Assessments." *American Journal of Agricultural Economics* 93(2011):1015–31.

Train, K.E. *Discrete Choice Methods with Simulation*. Cambridge, MA: Cambridge University Press, 2003.

Turner, S.C., J. McKissick, and N.S. Dykes. "Reputations Selling in Feeder Cattle Teleauctions." *Review of Agricultural Economics* 15,1(January 1993):9–19.

United States Department of Agriculture, National Agricultural Statistics Service. *Livestock Operations Final Estimates 2003–2007*. Statistical Bulletin Number 1021. March 2009.

Zimmerman, L.C., T.C. Schroeder, K.C. Dhuyvetter, K.C. Olson, G.L. Stokka, J.T. Seeger, and D.M. Grotelueschen. "The Effect of Value-Added Management on Calf Prices at Superior Livestock Auction Video Markets." *Journal of Agricultural and Resource Economics* 2012, in press.