Hunters' Perspectives on Animal Welfare and Meat Demand: An Application of Maximum Difference and Choice Experiment Methods

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INTRODUCTION

Consumers are increasingly concerned about how their food is produced. This concern extends to animal welfare (AW) practices and the social and environmental impacts of livestock production. Previous research has focused on:

- consumer willingness to pay (WTP) for animal welfare related production process attributes of food animal production,
- linking pet ownership to increased concern for livestock welfare, specifically pigs (McKendree, Croney and Widmar, 2014).
- public acceptance of lethal management of wildlife and feral animals.

Relationships with animals, even those not raised for human consumption, can affect consumers' concern for farm animal welfare. We seek to explore how:

- views of animals, both consumptive and non-consumptive, may influence demand for livestock AW attributes.
- outdoor enthusiasts' underlying value systems inform meat purchasing decisions and WTP for AW attributes in pork chops and chicken breasts.
- consumers' outdoor activities and demographic factors (gender, pet ownership, and opinions on hunting) are related to the relative importance of food values for meat purchases and WTP for AW production process attributes.

The population of hunters is substantial and the perceptions of hunters with regard to livestock AW are largely unstudied. It has been found that farmers are less concerned about AW (Te Velde, Aarts, and Wan Woerkum, 2002) and may also have significantly different perceptions of AW and handling than consumers (Tonsor, Wolf, and McKendree, 2014).

- Six percent of US residents 16 and older participated in hunting; in terms of connectedness of people to their food, hunters may be similar to farmers. There are 13.7 million hunters in the US (US Dept. of the Interior et al., 2011), but only 3.2 million farmers operating farms in the US (USDA, 2014).

Thus, the perceptions of hunters with regard to livestock treatment and meat production are the main focus of this analysis. Further, the paper will determine if individual-specific meat attribute preference shares and WTP estimates are positively correlated.

DATA

- An online survey of 872 outdoor enthusiasts (self-reporting as regularly hunting, fishing, or participating in other outdoor activities) was conducted in May 2014 to obtain data regarding their activities, socio-demographic characteristics, opinions about hunting practices, concern for animal welfare and food safety of both domestic and wild animal species and meat purchasing habits.
- Respondents were asked whether they regularly participated in fishing, hunting, or another outdoor activity such as hiking or camping (they were permitted to chose more than one activity).
- In order to participate in the survey, respondents had to indicate they were 18 or older.

Respondent Summary Statistics

Gender: 50% Male
Average Age: 47 years
Mean HH Income: $59,495
Mean HH Size: 2.62
Graduated High School: 99%
Households with either Cat or Dog: 70%

Regular Participation in Outdoor Activities

Regularly Fish: 63%
Regularly Hunt: 27%
Regularly Camp/Hike: 79%

Hunter Status

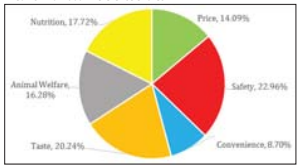
Have Ever Hunted: 52%
Have Hunted in Past 5 years: 30%

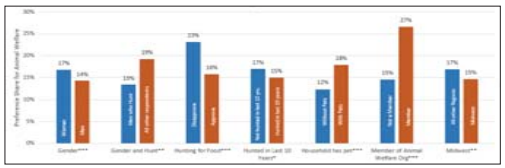
RESULTS AND DISCUSSION

Maximum Difference (Best-Worst) Results

Safety and taste were the most important attributes to outdoor enthusiasts from the best-worst experiment. Women, pet owners, and members of AW organizations were found to have a statistically higher preference share devoted to AW. Those who approved of hunting for food, regardless of their participation in hunting, had a lower preference share for AW as did those who have hunted in the past 10 years.

Mean of Individual Preference Shares





Note: Statistical significance reported to the 1%***, 5%**, and 10%* levels.

Choice Experiment Results

Those who regularly hunt have statistically different WTP for some AW attributes in pork chops and chicken breasts. For example, hunters did not have a WTP statistically different from zero for USDA verified crate-free pork chops, but non-hunters had a mean WTP of $3.13/lb. for USDA verified crate-free pork chops.

Correlations between preference shares from the best-worst analysis and WTP for attributes from the choice experiment were performed for both pork chop and chicken breast. Those respondents who have a higher preference share devoted to AW were generally willing to pay more for AW attributes in the choice experiment.

Pork Chops	Entire Sample		Non-Hunters		Hunters	
	WTP	Confidence	WTP	Confidence	WTP	Confidence
Opting Out	$ (9.01)	[-11.82, -7.40]	$ (8.26)	[-13.16 , -5.48]	$ (11.03)	[-14.25 , -6.22]
Individual Crate_USDA	$ 2.72	[2.08 , 3.45]	$ 3.13	[2.36 , 4.18]	$ 1.60	[-0.18 , 2.76]
Individual Crate_Retailer	$ 0.80	[-0.38 , 1.65]	$ 0.85	[-0.02 , 1.72]	$ 0.66	[-2.65 , 2.73]
Individual Crate_Pork industry	$ 0.34	[-0.42 , 0.95]	$ 0.35	[-0.61, 1.06]	$ 0.32	[-0.86 , 1.31]
AntibioticUse_USDA	$ 4.04	[1.24 , 6.00]	$ 4.74	[0.30 , 7.62]	$ 2.13	[0.51 , 4.63]
AntibioticUse_Retailer	$ 3.78	[2.66 , 4.93]	$ 4.45	[2.77 , 5.74]	$ 1.96	[0.58 , 4.17]
AntibioticUse_Industry	$ 4.16	[3.11 , 5.53]	$ 5.17	[4.03 , 6.61]	$ 1.40	[-0.75 , 5.49]
Local_USDA	$ (1.26)	[-2.40 , 0.44]	$ (1.89)	[-4.41 , 1.71]	$ 0.42	[-4.15 , 3.16]
Local_Retailer	$ (2.44)	[-3.56 , -1.30]	$ (2.57)	[-3.87 , -0.92]	$ (2.08)	[-3.53 , -0.97]
Local_Industry	$ (1.64)	[-2.75 , -0.80]	$ (1.99)	[-3.34 , -1.13]	$ (0.68)	[-2.58 , 0.55]

Chicken Breast	Entire Sample		Non-Hunters		Hunters	
	WTP	Confidence	WTP	Confidence	WTP	Confidence
Opting Out	$ (8.43)	[-59.41 , -57.65]	$ (8.33)	[-59.35 , -57.45]	$ (8.71)	[-$10.20 , -$7.47]
Pasture Access_USDA	$ 2.00	[$1.57 , $2.51]	$ 2.34	[$1.88 , $2.88]	$ 1.07	[$0.39 , $1.79]
Pasture Access _Retailer	$ 1.65	[$1.21 , $2.08]	$ 1.88	[$1.38 , $2.42]	$ 1.04	[$0.38 , $1.76]
Pasture Access _Industry	$ 1.32	[$0.82 , $1.83]	$ 1.80	[$1.26 , $2.42]	$ 0.02	[-$0.77 , $0.81]
AntibioticUse _USDA	$ 1.87	[$1.44 , $2.36]	$ 2.09	[$1.55 , $2.68]	$ 1.29	[$0.52 , $2.04]
AntibioticUse _Retailer	$ 1.65	[$1.17 , $2.25]	$ 1.78	[$1.17 , $2.45]	$ 1.30	[$0.50 , $2.16]
AntibioticUse _Industry	$ 1.94	[$1.35 , $2.55]	$ 1.92	[$1.20 , $2.67]	$ 1.98	[$0.98 , $3.02]
Local_USDA	$ 1.92	[$1.52 , $2.38]	$ 2.06	[$1.60 , $2.60]	$ 1.52	[$0.91 , $2.21]
Local _Retailer	$ 0.68	[$0.27 , $1.10]	$ 0.86	[$0.35 , $1.38]	$ 0.17	[-$0.48 , $0.88]
Local _Industry	$ 0.41	[-$0.04 , $0.90]	$ 0.57	[$0.09 , $1.09]	$ (0.04)	[-$0.74 , $0.66]

Attribute Non-Attendance (ANA) & Validation Question Results

- WTP estimates for either pork chops or chicken breasts were not statistically different when inferred ANA was accounted for.
- Likewise, information on stated ANA was also collected and it was shown that accounting for stated ANA had no statistically significant effect on WTP estimates for either pork chops or chicken breasts.
- Those who passed the validation question had statistically significant and higher WTP for some attributes of pork chops and chicken breasts.
- The WTP estimates were not statistically different when passing the validation question was interacted with either inferred or stated ANA.

Pork Chop	Mean Over Entire Sample		Pass		Fail	
	WTP	Confidence Interval	WTP	Confidence Interval	WTP	Confidence Interval
Opting Out	($4.42)	[-$5.01 , -$3.86]	($4.02)	[-$4.60 , -$3.41]	($6.50)	[-$8.00 , -$5.01]
Individual Crate	$1.23	[$0.80 , $1.70]	$1.28	[$0.87 , $1.80]	$0.93	[$0.13 , $1.79]
Antibiotic Use	$2.99	[$2.36 , $3.82]	$3.38	[$2.68 , $4.28]	$0.93	[-$0.15 , $2.12]
Location	($1.28)	[-$1.77 , -$0.94]	($1.42)	[-$1.98 , -$1.01]	($0.50)	[-$1.23 , $0.14]
USDA Certification	$2.48	[$1.90 , $3.21]	$2.77	[$2.14 , $3.63]	$0.99	[-$0.10 , $2.21]
Industry Certification	($1.06)	[-$1.75 , $3.21]	($1.23)	[-$1.98 , $3.63]	($0.15)	[-$1.32 , $2.21]

Chicken Breast	Mean over Entire Sample		Pass		Fail	
	WTP	Confidence Interval	WTP	Confidence Interval	WTP	Confidence Interval
Opting Out	($3.41)	[-$3.80 , -$3.02]	($3.32)	[-$3.71 , -$2.92]	($3.89)	[-$5.09 , -$2.85]
Location	$0.85	[$0.63 , $1.11]	$0.98	[$0.73 , $1.26]	$0.15	[-$0.31 , $0.60]
Pasture Access	$1.51	[$1.19 , $1.88]	$1.69	[$1.35 , $2.10]	$0.57	[-$0.13 , $1.21]
Antibiotic Use	$1.53	[$1.17 , $1.96]	$1.68	[$1.29 , $2.10]	$0.76	[$0.03 , $1.55]
USDA Certification	$1.40	[$1.02 , $1.79]	$1.49	[$1.11 , $1.96]	$0.92	[$0.24 , $1.65]
Industry Certification	($0.71)	[-$1.07 , $1.79]	$(0.71)	[-$1.07 , $1.96]	$(0.73)	[-$1.62 , $1.64]

CONCLUSIONS

- Safety and Taste were the most important attributes to outdoor enthusiasts when making meat purchasing decisions.
- Those respondents who have a higher preference share devoted to AW were generally willing to pay more for AW attributes in the choice experiment.
- Differences in preferences for AW for hunters versus those who do not hunt were identified through both maximum difference and choice experiment methods. Those who regularly hunt have a statistically lower preference share devoted to animal welfare and statistically different and lower WTP for some animal welfare attributes of both pork chops and chicken breasts.
- Consistent with Widmar and Ortega (2014), accounting for inferred ANA did not change the overall conclusions for WTP. We also find accounting for stated ANA does not have a statistically significant impact on mean WTP estimates for pork chops or chicken breasts.
- Those who passed a simple validation question had statistically higher mean WTP for some attributes of pork chops and chicken breasts.

MAXIMUM DIFFERENCE METHODS

Respondents were presented with a choice experiment using a modified maximum-difference scaling to assess their preferences for six meat value attributes: taste, convenience, safety, AW, price, and nutrition. For each of 15 scenarios respondents were shown a pair of meat attributes and asked to choose the attribute that was most important (best) to them.

From each of the following pairs of attributes, select the attribute that is most important when you purchase meat? For example, for the first pair of attributes, you may select either animal welfare or price as the most important attribute.	
○ Animal Welfare	○ Price
○ Price	○ Taste
○ Animal Welfare	○ Convenience
○ Taste	○ Animal Welfare
○ Nutrition	○ Price

The best-worst scenarios presented included 6 attributes (j); therefore, $J=6$ and there are a total of $J*(J-1)=30$ potential combinations of best-worst rankings that could have been chosen by each respondent. The location of the value attribute on the scale of importance for meat purchasing is represented by λ_i; the level of importance, which is unobservable to researchers, for consumer i is $I_{ij} = \lambda_{ij} + \varepsilon_{ij}$ where ε_{ij} represents a random error term (Lusk and Briggeman, 2009). The probability that i chooses attribute j as the best option and attribute k as the worst option is the probability that the difference between I_{ij} and I_{ik} is greater than all $J*(J-1)-1=29$ potential differences available from the choices shown to each respondent. Maximum likelihood estimation (MLE) is then used to estimate the parameter λ_j which represents how important attribute j is relative to the least important attribute. Individual preference shares can be calculated and used to study the relationships between one's preference shares and demographic and other factors of interest.

CHOICE EXPERIMENT METHODS

Respondents were shown a choice experiment for one of two products, pork chop or chicken breast. For pork chops the model for the deterministic part of utility, v, for individual i, can be expressed as:

$$v_i = \beta_1 Price_i + \beta_2 USDA\_Crate_i + \beta_3 Retailer\_Crate_i + \beta_4 Industry\_Crate_i + \beta_5 USDA\_Loc_i + \beta_6 Retailer\_Loc_i + \beta_7 Industry\_Loc_i + \beta_8 USDA\_Anti_i + \beta_9 Retailer\_Anti_i + \beta_{10} Industry\_Anti_i + \beta_{11} OptOut_i + \beta_{12}(OptOut_i * RegHunt) + \beta_{13}(USDA\_Crate_i * RegHunt) + \beta_{14}(Retailer\_Crate_i * RegHunt) + \beta_{15}(Industry\_Crate_i * RegHunt) + \beta_{16}(USDA\_Loc_i * RegHunt) + \beta_{17}(Retailer\_Loc_i * RegHunt) + \beta_{18}(Industry\_Loc_i * RegHunt) + \beta_{19}(USDA\_Anti_i * RegHunt) + \beta_{20}(Retailer\_Anti_i * RegHunt) + \beta_{21}(Industry\_Anti_i * RegHunt)$$

Where $Price_i$ is the price of the boneless, center-cut pork chop and $OptOut_i$ is a constant representing the negative utility of not having the pork chop in the choice set. The terms, such as $\beta_2 USDA\_Crate_i$ are effects-coded interaction terms between the attributes, in this case individual crates/stalls, and the verification agency. The terms, such as $\beta_2 USDA\_Crate_i * RegHunt$ are effects-coded interaction terms multiplied by a dummy variable for whether the respondent reported regularly hunting where $RegHunt$ is equal to 1 if the respondent reported regularly hunting and zero if the respondent did not. To calculate mean WTP estimates, the standard formula accounting for effects coding is used and modified to account for the addition of the dummy variable $RegHunt$. For example, the WTP equation for USDA verified crate free production is:

Attribute	Option A	Option B	Option C
Price ($/lb.)	$5.29	$5.29	
Individual Crates/Stalls	Permitted	Permitted	I choose not to purchase either product
Location	No Claim	No Claim	
Antibiotic Use	Permitted	Not Permitted	
Certification Entity	Retailer	USDA-PVP	
I Choose:	___	___	___

$$WTP_k = -2\left(\frac{\beta_2 + \beta_{13} * RegHunt}{\beta_1}\right).$$

Confidence intervals were estimated using the Krinsky-Robb (1986) method.

ANA & VALIDATION QUESTION METHODS

The survey instrument also contained a simple validation question, to determine careless survey takers, and a question asking respondents which choice experiment attributed they ignored, or the respondent's stated attribute non-attendance (ANA). To account for inferred ANA, the method proposed by Hess and Hensher (2010) and employed by Widmar and Ortega (2014) utilizing the coefficient of variation (ratio of the standard deviation to the mean) calculated from individual-specific parameter estimates to infer which attributes have not been attended to is employed. Analysis is conducted to determine whether statistically significant differences in mean WTP exist based on passing or failing the validation question, and whether passing/failing the validation question and stated (and inferred) ANA yields statistically significant differences in WTP estimates.

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