

Exploring demand for attributes of processed turkey products: turkey bacon and lunchmeat

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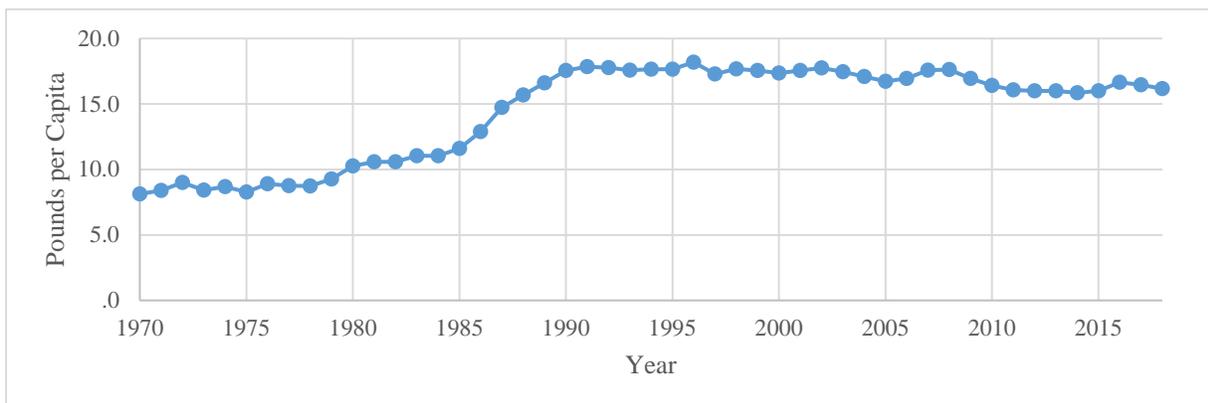
Abstract

Health consciousness and changing tastes/preferences have driven consumers' interests in poultry-based meat products, such as turkey bacon. Simultaneously, turkey producers and processors are facing changing consumer preferences for credence attributes of turkey rearing, including whether turkeys were raised free range or on a vegetarian diet. Consumption of turkey bacon and turkey lunchmeat, were studied using a national sample of 1,130 U.S. respondents. Ninety-five percent of respondents consumed poultry; 40% indicated they consumed it 2 – 3 times per week. Forty-eight percent of respondents indicated that they ate lunch outside the home once or twice a week. Respondents were randomly assigned to participate in the choice experiment for either turkey bacon or turkey lunchmeat. Consumer WTP for attributes of turkey bacon (n=559) and turkey lunchmeat (n=571) were assessed using discrete choice experiments. The mean estimated willingness to pay was positive for all verified attributes of turkey bacon, for all but retailer-certified free range and retailer-certified fed a vegetarian diet for turkey lunchmeat. There were some statistical differences in willingness to pay for verified attributes between the two processed turkey products, suggesting demand for production attributes varies between processed turkey products. Turkey producers and processors should consider the particular products consumers are interested in and/or buying, as there is at least some evidence that demand for attributes of production systems varied between the products studied. Further analysis is necessary to determine if tastes and preferences of consumers vary across other key turkey or poultry products.

Introduction

Given the reported rise of interest in lean protein among millennials (Daniels, 2016), it may not be surprising that poultry has been a focus in recent years with regard to development of unique and varied products. According to Jones, Haley, and Melton (2018), "Rising meat demand in the U.S. has been supported by sustained economic growth since the 2009 Great Recession and stable to declining retail prices brought about by low animal feed costs." Increasingly, turkey has undergone growth in total pounds per capita of commercial disappearance, in particular during the 1980s when it climbed to its currently sustained increased levels (Figure 1, developed using USDA ERS, 2019 data download). Popular press has focused on turkey products, mentioning the popularity of turkey sausage and bacon, specifically, and citing turkey bacon as experiencing particularly strong retail growth per reporting by Jennie-O via Hormel (Daniels, 2016).

Figure 1. Per capita disappearance (pounds) using retail weight as reported by WASDE



Lunchmeat is a rather unique meat product in the sense that it is bought cooked and cold, and generally consumed without further preparation or reheating. McKendree and Widmar (2013) sought to measure volume of consumption by households in their national sample of 798 respondents, finding that 88% of respondents were in lunchmeat consuming households. Of the households found to consume lunchmeat, 37% consumed less than ½ a pound per week, 40% consumed 8 oz to 16 oz per week, 14% consumed 1.1 to 2 lbs per week, and 7% (47 households) consumed over 2 lbs per week. Turkey has been identified as the most commonly purchased or consumed lunchmeat variety amongst lunchmeat consuming households (Mintel, 2012; McKendree & Widmar, 2013).

Consumers' affinity for bacon has been widely recognized with headlines like "Why bacon is suddenly everywhere" in Fortune (Hackett, 2015) and "Record bacon prices driving retail pork prices" on National Hog Farmer (Plain, 2017) fueling the public conversations around bacon broadly. While there has been work done to study demand for bacon attributes (Bir et al., 2018), there is a relative dearth of information related to consumer demand for and perceptions of turkey bacon. Turkey bacon undergoes a different process to form bacon prepared from chopped, formed, cured, and smoked turkey, which differs from the traditional bacon made with fattier pork bellies. "Based on how it's made, turkey bacon is more like sausage than pork bacon," according to Jeffrey Sindelar, a meat specialist at the University of Wisconsin–Madison's Meat Laboratory. There are two main styles: one that's made from finely ground meat and one that's made from meat chopped into larger chunks." (Shannon, 2018). Turkey bacon is often marketed as a lower fat/calorie bacon alternative, although many of the same concerns about preservatives, nitrates, and other processing techniques/ingredients remain (Julson, 2018).

This analysis seeks to investigate consumer preferences surrounding two popular processed turkey products, specifically turkey lunchmeat and turkey bacon. Turkey lunchmeat and turkey bacon were selected for their similarities (i.e., both processed products made from turkey) and differences (i.e., eating occasion, when and how they are generally consumed). Turkey lunchmeat is generally consumed cold, in the same form in which it was purchased. Oftentimes lunchmeat, as per its name, is consumed as an on-the-go meal or brown-bag lunch item. In contrast, turkey bacon is generally consumed hot/warm, often as part of breakfast, although increasingly at other meals as a salad topping, sandwich enhancement, or even a snack. The objective of this analysis was to determine consumer WTP for turkey bacon and turkey lunchmeat production process attributes. Specifically, this analysis sought to 1) evaluate consumer shopping behavior and preferences especially regarding lunchmeat 2) compare consumer WTP between production attributes and verifiers within the products turkey bacon and turkey lunchmeat, and 3) compare consumer WTP for production attributes between turkey lunchmeat and turkey bacon. The production attributes of interest are free range, fed a vegetarian diet, hormone use, and antibiotic use. Because all of these production attributes are credence attributes that cannot be confirmed by the consumer, even after consumption, these attributes were stated to be certified by either the USDA Process Verified Program (PVP), the turkey industry, or a retailer. It was hypothesized that the consumers' WTP would vary across turkey products for the same verified attributes, as well as across verified production process attributes within each turkey product.

Materials and Methods

A survey was developed by an interdisciplinary team of researchers familiar with consumer behavior, meat science, and turkey production to elicit consumer demand for turkey lunchmeat and turkey bacon. The survey instrument was administered November 12-19, 2018 using the online survey tool Qualtrics to accumulate demographic information, food purchasing and consumption behavior, and WTP for turkey bacon and turkey lunchmeat. Online surveys have become increasingly popular and favored due to their

low costs and relatively fast completion times (Louviere et al., 2008; Tonsor & Wolf, 2010; Olynk & Ortega, 2013). Due to the rapid adoption of online surveys for data collection, in particular with respect to consumer surveys, a field of research on the survey administration mechanism has swarmed to study online surveys relative to traditional methods. Hudson et al. (2004) documented that internet surveys did not exhibit nonresponse bias and Fleming and Bowden (2009) and Marta-Pedroso, Freitas and Domingos (2007) found no significant differences when comparing results of web-based surveys, conventional mail and in-person interview surveys.

The company, Lightspeed GMI, hosts a large opt-in panel database which was used to obtain survey respondents. Respondents were required to be 18 years of age or older to participate. The sample was targeted to be representative of the U.S. population in terms of gender, income, education, and geographical region of residence (U.S. Census Bureau, 2016) using quotas in Qualtrics. Regions of residence were defined as in the Census Bureau Regions and Divisions (U.S. Census Bureau, 2016). The survey instrument was designed to collect information regarding shopping behavior, food consumption and dining preferences, with a special highlight on lunchmeat consumption as well as turkey bacon and turkey lunchmeat WTP. The statistical representativeness of the survey respondents was evaluated using the test of proportions to compare the percentages of demographic groups from the sample with the targeted population, the U.S. Census.

Respondents were asked shopping behavior questions such as: if they were the primary shopper, online shopping behavior, and total money spent on food consumption. To gauge meat consumption, respondents were asked about meat consumption within their households, with a special emphasis on poultry and lunchmeat consumption. Since WTP for turkey bacon was specifically considered in the survey instrument, respondents were also asked about their preferences for nitrite and nitrate in foods, given its use in processed meats and significant controversy in popular press. Respondents were asked about the number of meals eaten out for breakfast, lunch and dinner as well as the number of times they consumed snacks and drinks outside the home.

WTP model for turkey bacon and turkey lunchmeat

Five-hundred and fifty-nine random respondents participated in a WTP choice experiment focusing on turkey bacon, and 571 random respondents participated in a WTP choice experiment focusing on turkey lunchmeat for a total of 1,130 respondents in the studied sample.¹ Respondents participated in either a WTP experiment where they were asked to choose between two turkey bacon purchasing scenarios or two turkey lunchmeat purchasing scenarios or the option “I do not choose to purchase either option A or B”. For both products studied, respondents were informed that they could face this decision in a retail store where they typically shop. Additionally, respondents were informed that the two turkey bacon products or two turkey lunchmeat products presented in each scenario had the same characteristics in terms of color, brand, and flavor, with the exception of the varying attributes presented. Information explaining each of the five attributes in the choice experiment (available in Appendix A) was shown to respondents prior to presenting any choice questions. Attributes included were the same for both products with the exception of price: free range (yes, no), fed a vegetarian diet (yes, no), hormone use (not permitted, permitted), antibiotic use (not permitted, permitted), and certifier (USDA, industry, retailer). There were three price levels for both products, \$1.69, \$3.65, and \$5.61 per 12 oz package of turkey bacon, and \$2.99, \$5.99, and \$8.99 per 16 oz package of turkey lunch

¹ The respondents randomly selected to answer these questions were part of a larger data collection that resulted in 1,695 responses.

meat. To minimize hypothetical bias, respondents were also shown the cheap talk script as proposed by Lusk (2003).

The specific combination of attribute levels seen by respondents in the choice experiment was determined using the SAS OPTEX program, which resulted in a main effect plus two-way interaction experimental design (Lusk & Norwood 2005). Maximizing D-efficiency was used as the measure for design choice. The D-efficiency for the chosen model for both turkey bacon and lunchmeat was 75.3486 and included 33 choice scenarios (questions) for each product. To avoid survey fatigue, which has been shown to decrease the quality of responses (Galesic & Bosnjak, 2009), the 33 choice scenarios for each product were randomly assigned to 3 blocks of 8 choice scenarios, and 1 block of 9 choice scenarios, for a total of 4 blocks for each product. Respondents were then randomly assigned to participate in one of the four WTP blocks for each product, for a total of eight WTP blocks in total when considering both products.

Random utility theory is the basis for choice experiments. The probability that alternative i was chosen by respondent n , which represents maximizing utility (U) with deterministic component V_{nit} , if $U_{nit} > U_{njt} \forall j \neq i$ is represented by (Train, 2009):

$$P_{nit} = \text{Prob}(V_{nit} + \varepsilon_{nit} > V_{njt} + \varepsilon_{njt}; \forall j \in C, \forall j \neq i). \quad (1)$$

Equation (1) can be condensed through algebraic manipulation given the underlying distribution of the error term to:

$$P_{nit} = \frac{\exp(V_{nit})}{\sum_j \exp(V_{njt})}. \quad (2)$$

The random utility of a selection for either product is defined as:

$$V_{it} = \beta_1 \text{Price}_{it} + \beta_2 \text{USDA_VegDiet}_{it} + \beta_3 \text{Retailer_VegDiet}_{it} + \beta_4 \text{Industry_VegDiet}_{it} + \beta_5 \text{USDA_HormoneUse}_{it} + \beta_6 \text{Retailer_HormoneUse}_{it} + \beta_7 \text{Industry_HormoneUse}_{it} + \beta_8 \text{USDA_FreeRange}_{it} + \beta_9 \text{Retailer_FreeRange}_{it} + \beta_{10} \text{Industry_FreeRange}_{it} + \beta_{11} \text{USDA_AntibioticUse}_{it} + \beta_{12} \text{Retailer_AntibioticUse}_{it} + \beta_{13} \text{Industry_AntibioticUse}_{it} + \beta_{14} \text{Optout}_{it} + \beta_{15} \text{Optout_Buysturkey}_{it} + \beta_{16} \text{Optout_Age}_{it} \quad (3)$$

where $Price$ is the price a consumer is willing to pay for turkey bacon and turkey lunchmeat, and $Optout$ is a constant which represents the respondent's disutility from having to walk away from the purchase of turkey bacon or turkey lunchmeat, $Optout_Buysturkey$ and $Optout_Age$ are the interaction between the disutility of having to walk away from a turkey bacon or turkey lunchmeat purchase, whether the respondent had purchased turkey products in the past, and the age of the respondent, $USDA_VegDiet$, $Retailer_VegDiet$, and $Industry_VegDiet$ are the effects coded interaction terms between the certification entities and $VegDiet$ (where $VegDiet$ indicates the animal was fed a vegetarian diet), $USDA_HormoneUse$, $Retailer_HormoneUse$, and $Industry_HormoneUse$ are the effects coded interaction terms between the certification entities and $HormoneUse$ (where $HormoneUse$ indicates hormone use was not permitted), $USDA_FreeRange$, $Retailer_FreeRange$, and $Industry_FreeRange$ are the effects coded interaction terms between the certification entities and $FreeRange$ (where $FreeRange$ indicates the animal was free range), and $USDA_AntibioticUse$, $Retailer_AntibioticUse$, and $Industry_AntibioticUse$ are the effects coded interaction terms between the certification entities and $AntibioticUse$ (where $AntibioticUse$ indicates antibiotic use was not permitted). WTP is calculated by dividing the marginal utility of an attribute by the marginal utility of the cost, for example the WTP for USDA verified animals fed a vegetarian diet turkey bacon or turkey lunchmeat can be calculated as:

$$WTP = -2 \frac{\beta_2}{\beta_1}. \quad (4)$$

The -2 in Equation 4 accounts for the effects coding of the various levels of the attributes. The disutility in terms of dollars of walking away from the purchase of turkey bacon or turkey lunchmeat (*OptOut*) for a person aged 18-24 who purchased turkey products in the past is calculated as:

$$WTP = - \frac{\beta_{14} + \beta_{15} + \beta_{16} * 1}{\beta_1}. \quad (5)$$

Ninety-five percent confidence intervals were calculated to account for the variability in the estimations using the Krinsky and Robb method of parametric bootstrapping (Krinsky & Robb 1986; Olynk & Ortega 2013). Overlapping confidence intervals were compared to determine statistically significant differences between respondent willingness to pay for the different attributes within each model, either turkey lunchmeat or turkey bacon (Schenker and Gentleman, 2001). The complete combinatorial method as outlined by Poe, Giraud, and Loomis (2005) was used to statistically compare WTP estimates between the turkey bacon and turkey lunchmeat models.

Results

Statistical differences between the full sample, those who participated in the turkey bacon WTP experiment, those who participated in the turkey lunchmeat WTP experiment and the U.S. Census were analyzed (Table 1). There were statistical differences between the U.S. Census and the full sample at the <0.001 level, the turkey bacon WTP respondents, and the turkey lunchmeat WTP respondents. For the turkey bacon and turkey lunchmeat respondents, there were lower percentages of those aged 18-24, those with an income higher than \$100,000, those that did not graduate from high school, and those from the Midwest when compared to the U.S. Census. Higher percentages of respondents did not graduate from high school and were from the South for the two sub-samples when compared to the U.S. Census. There were higher percentages of respondents in the full sample and WTP for turkey bacon sample when compared to the U.S. census who attended college Associates or Bachelor's degree earned. There was also a lower percentage of respondents in the full sample who graduated from high school, did not attend college and a higher percentage of respondents who attended college no degree earned when compared to the U.S. Census.

Table 1. Demographics

Demographic Variable	Total Percentage of Respondents n=1130	WTP turkey bacon experiment n=559	WTP turkey lunchmeat experiment n=571	U.S. Census
<i>Gender</i>				
Male	45 [†]	46	45	49
<i>Age</i>				
18-24	8 ^{††}	7 ^{††}	8 ^{††}	13
25-34	17	19	16	18
35-44	18 [†]	18	18	16
45-54	18	17	19	17
55-65	18	17	19	17
65 +	21	22	20	19
<i>Income</i>				
\$0-\$24,999	25 [†]	25 [†]	25 [†]	22
\$25,000-\$49,999	24	23	25	23
\$50,000-\$74,999	19	19	19	17
\$75,000-\$99,999	13	15 [†]	12	12
\$100,000 and higher	19 ^{††}	18 ^{††}	19 ^{††}	26
<i>Education</i>				
Did not graduate from high school	4 ^{††}	3 ^{††}	3 ^{††}	13
Graduated from high school, Did not attend college	23 ^{††}	23 [†]	24 [†]	28
Attended College, No Degree earned	25 ^{††}	24	26 [†]	21
Attended College, Associates or Bachelor's Degree earned	34 ^{††}	36 ^{††}	32 [†]	27
Attended College, Graduate or Professional Degree earned	14 [†]	14	15 [†]	12
<i>Region</i>				
Northeast	19	19	19	18
South	35 ^{††}	35 ^{††}	36 ^{††}	21
Midwest	22 ^{††}	22 ^{††}	22 ^{††}	38
West	23	24	23	24

[†]Percentage of respondents is statistically different than the percentage of the US census at the <.05 level; ^{††}Percentage of respondents is statistically different than the percentage of the US census at the <.001 level

Eighty seven percent of respondents were the primary shopper for their household. Eighty percent of respondents indicated they food shopped at least weekly. Twenty-four percent of respondents reported that they shopped online, which was defined as either/or online with delivery, online with curbside pick-up, and online with in-store pick up. Of the respondents that shopped online with delivery (n=187), 77% had used Amazon (including Amazon Prime), 41% had used Amazon Prime Pantry, and 39% had used a different online grocery provider. On average respondents spent \$127 dollars per week on total food consumption including at home, on groceries, in restaurants, take-outs etc.

Respondents were also posed questions regarding their particular food consumption habits. Between 60% and 71% of respondents indicated they at least sometimes purchased organic fruit, vegetables, chicken and beef. Between 47% and 55% of respondents indicated they at least sometimes purchased organic turkey, dry-goods and cereals, dairy products, and non-dairy beverages (Table 2). Ninety-five percent of respondents consumed meat, 2% did not consume meat but someone in their household did, and 3% of respondents did not consume meat and no one in their household did. Regarding poultry specifically, 95% of respondents consumed poultry, with 40% of respondents indicating they consumed poultry 2-3 times a week. Thirteen percent of respondents raised or hunted for a portion of the meat they consumed, while 7% of respondents raised or hunted for turkey specifically. Thirty-four percent of respondents indicated they actively avoided products with nitrite or nitrate added, 37% indicted they do not, and 29% indicated they don't know (Table 2). In general, higher percentages of respondents consumed lunchmeat in the fall (Table 2).

Respondents selected the frequency of meals (breakfast, lunch, dinner) eaten out, for example either take out, restaurant, or cafeteria settings, from the options: zero meals, 1-2 meals, 3-4 meals, 5-6 meals, and all 7 meals (Table 2). High percentages of respondents (58%) indicated that they did not eat breakfast out. Thirty-two percent of respondents ate 1-2 breakfast meals out. A high percentage of respondents (48%) eat 1-2 lunch meals outside the home, while 32% eat zero lunch meals out in a given week. Fifty-four percent of respondents eat 1-2 dinners out, and 28% of respondents eat zero dinner meals out. Less than 3% of respondents eat all 7 meals out for breakfast, lunch or dinner.

Table 2. Respondent food shopping and consumption behavior

Respondent organic food purchasing behavior, percentage of respondents n=1130					
	Yes, regularly	Yes, Sometimes	No	I don't know	
Fruits	34	36	28	2	
Vegetables	35	36	27	2	
Chicken	35	36	27	2	
Beef	30	30	38	2	
Turkey	23	32	42	3	
Dry-goods and cereals	14	33	49	3	
Dairy products, including fluid milk	25	30	42	2	
Non-dairy beverages	21	26	50	3	
Consumer preferences for nitrate and nitrate added products, percentage of respondents n=1130					
	Yes	No	I don't know		
Actively avoids products with nitrite or nitrate added	34	37	29		
Respondent lunchmeat consumption, percentage of respondents n=1099					
	Spring	Summer	Fall	Winter	Never
Ham	56	57	61	60	18
Turkey	48	52	70	59	15
Roast Beef	48	53	54	52	27
Chicken	67	72	64	62	20
Number of meals eaten out (either take out, restaurant, or cafeteria setting), percentage of respondents n=1130					
	Zero meals eaten out	1-2 meals	3-4 meals	5-6 meals	All 7 meals
Of the 7 breakfasts in a given week	58	32	5	3	2
Of the 7 lunches in a given week	32	48	13	5	2
Of the 7 dinners in a given week	28	54	12	4	3
Number of times in a typical week respondents purchase the following items outside the home, percentage of respondents n=1130					
	Never	1-2 times	3-4 times	5-6 times	7 or more
Coffee or tea	35	41	13	5	7
Juice/smoothies	62	29	6	2	2
Dairy beverages	53	36	6	3	2
Snack	29	49	13	6	3

WTP for turkey bacon and turkey lunchmeat

Respondents were willing to pay a positive amount for all verifiers and attributes examined for turkey bacon (Table 3-4). Respondents were willing to pay a higher amount for USDA certified free range turkey bacon (\$3.47) when compared to USDA certified fed a vegetarian diet (\$2.08) and USDA certified antibiotic use not permitted (\$2.24) turkey bacon. For retailer certified hormone use not permitted turkey bacon, respondents were willing to pay a higher amount (\$3.55) when compared to all other retailer certified attributes. Respondents were willing to pay a lower amount for retailer certified fed a vegetarian diet turkey bacon (\$1.49) when compared to retailer certified hormone use not permitted (\$3.55) and retailer certified antibiotic use not permitted (\$2.47). For industry certified hormone use not permitted, respondents were willing to pay a higher amount (\$2.65) when compared to industry certified free range turkey bacon (\$1.20). Respondents had a higher WTP for USDA certified free range turkey bacon when compared to all other certifiers. For the attributes fed a vegetarian diet, hormone use not permitted and antibiotic use not permitted there were no statistically significant differences between the certifiers.

Respondents were willing to pay a statistically significant positive amount for all attributes and verifiers included for turkey lunchmeat with the exception of retailer certified free range and retailer certified fed a vegetarian diet (Table 3-4). The confidence intervals for respondent WTP for retailer certified free range and retailer certified fed a vegetarian diet both included zero, which indicates the WTP for both attributes were not statistically significant. Respondents were willing to pay a statistically significant higher amount (\$4.47) for USDA certified free range turkey lunchmeat when compared to USDA certified fed a vegetarian diet (\$2.61) and USDA certified antibiotic use not permitted (\$2.50). WTP for retailer certified hormone use not permitted (\$6.01) was statistically higher than retailer certified antibiotic use not permitted (\$4.48). Respondents were willing to pay a higher amount for industry certified fed a vegetarian diet turkey lunchmeat (\$4.17) when compared to industry certified free range (\$1.35) and industry certified antibiotic use not permitted (\$2.05) turkey lunchmeat. When comparing between the verifiers, respondents were willing to pay a higher amount for USDA certified free range turkey lunchmeat when compared to industry certified free range turkey lunchmeat. Respondents were willing to pay a higher amount for industry certified fed a vegetarian diet turkey lunchmeat when compared to USDA certified fed a vegetarian diet. Recall WTP for retailer certified free range and retailer certified fed a vegetarian diet turkey lunchmeat were not statistically significant. Respondents were willing to pay more for retailer certified hormone use not permitted and retailer certified antibiotic use not permitted when compared to both USDA and industry certification.

Respondents experienced negative utility from walking away from both turkey bacon and turkey lunchmeat purchasing opportunities. Those who purchased turkey experienced higher disutility for each age category and both products when compared to those who did not buy turkey. Additionally, as age increased, the disutility from walking away from a turkey bacon or turkey lunchmeat buying experience decreased for both those who did and did not purchase turkey. Normalizing for the average price presented to respondents for each product (\$3.65 for turkey bacon and \$5.99 for turkey lunchmeat) the disutility experienced by respondents from walking away from a turkey bacon or lunchmeat purchasing opportunity was statistically compared. The disutility experienced by those who buy turkey and were aged 18-24 and 25-34 was greater for turkey bacon when compared to turkey lunchmeat. Additionally, for all age categories for those who do not buy turkey the disutility of walking away from a turkey bacon buying opportunity was greater than walking away from a turkey lunchmeat buying opportunity.

In addition to differences in disutility (negative WTP) for the two turkey products studied and walking away from a purchasing opportunity, there were statistical differences in WTP between the certifiers

and attributes studied. Respondents had a higher WTP (normalized by average price) for retailer certified free range turkey bacon and retailer certified fed a vegetarian diet turkey bacon. This finding is not surprising as both of these certifier attribute combinations spanned zero for turkey lunchmeat. Respondents were willing to pay a higher amount, normalized by average price, for industry certified fed a vegetarian diet turkey lunchmeat when compared to turkey bacon.

Table 3. Random Parameters Logit model results. Estimated coefficients for attributes of turkey bacon and lunchmeat. (***, **, * indicates significance at <.001%, 5%, and 1% levels.)

Attributes	Turkey Bacon n=559		Turkey Lunchmeat n=571	
	Coefficient (SE)	Standard Deviation (SE)	Coefficient (SE)	Standard Deviation (SE)
USDA certified free range	0.692 ^{***} (0.090)	0.332 ^{***} (0.109)	0.576 ^{***} (0.081)	0.932 ^{***} (0.107)
USDA certified fed a vegetarian diet	0.415 ^{***} (0.075)	0.088 (0.085)	0.336 ^{***} (0.063)	0.060 (0.087)
USDA certified hormone use not permitted	0.591 ^{***} (0.083)	0.567 ^{***} (0.117)	0.521 ^{***} (0.073)	0.039 (0.095)
USDA certified antibiotic use not permitted	0.447 ^{***} (0.079)	0.186 (0.115)	0.322 ^{***} (0.077)	0.967 ^{***} (0.093)
Retailer certified free range	0.388 ^{***} (0.086)	0.279 ^{***} (0.101)	0.079 (0.076)	0.002 (0.105)
Retailer certified fed a vegetarian diet	0.297 ^{***} (0.081)	0.012 (0.114)	0.029 (0.080)	0.358 ^{***} (0.084)
Retailer certified hormone use not permitted	0.707 ^{***} (0.086)	0.069 (0.083)	0.775 ^{***} (0.084)	0.175 ^{**} (0.077)
Retailer certified antibiotic use not permitted	0.493 ^{***} (0.079)	0.399 ^{***} (0.078)	0.578 ^{***} (0.076)	0.084 (0.083)
Industry certified free range	0.238 ^{**} (0.101)	0.249 [*] (0.136)	0.175 ^{**} (0.076)	0.108 (0.100)
Industry certified fed a vegetarian diet	0.396 ^{***} (0.092)	0.116 (0.098)	0.537 ^{***} (0.081)	0.011 (0.086)
Industry certified hormone use not permitted	0.529 ^{***} (0.090)	0.085 (0.094)	0.403 ^{***} (0.084)	0.118 (0.095)
Industry certified antibiotic use not permitted	0.430 ^{***} (0.086)	0.145 [*] (0.076)	0.264 ^{***} (0.077)	0.196 [*] (0.077)
Opt Out	-6.097 ^{***} (0.489)	1.052 [*] (0.213)	-4.384 ^{***} (0.376)	3.648 ^{***} (0.467)
Price	-0.399 ^{***} (0.030)		-0.258 ^{***} (0.017)	
Buys turkey, age 18-24	-6.623 ^{***}		-6.150 ^{***}	
Buys turkey, age 25-34	-6.112 ^{***}		-5.827 ^{***}	
Buys turkey, age 35-44	-5.601 ^{***}		-5.503 ^{***}	
Buys turkey, age 45-54	-5.090 ^{***}		-5.179 ^{***}	
Buys turkey, age 55-64	-4.579 ^{***}		-4.855 ^{***}	
Buys turkey, age 65+	-4.067 ^{***}		-4.532 ^{***}	
Doesn't buy turkey, age 18-24	-5.585 ^{***}		-4.061 ^{***}	

Doesn't buy turkey, age 25-34	-5.074***		-3.737***	
Doesn't buy turkey, age 35-44	-4.563***		-3.413***	
Doesn't buy turkey, age 45-54	-4.052***		-3.090***	
Doesn't buy turkey, age 55-64	-3.541***		-2.766***	
Doesn't buy turkey, age 65+	-3.029***		-2.442	

Table 4. Random Parameters Logit model results. Willingness to pay for attributes of turkey bacon and lunchmeat.

Attributes	<u>Turkey Bacon n=559</u>		<u>Turkey Lunchmeat n=571</u>		P value comparing WTP between Bacon and Lunchmeat
	Mean WTP	WTP 95% confidence interval	Mean WTP	WTP 95% confidence interval	
USDA certified free range	\$3.47	[\$2.98, \$4.01]	\$4.47	[\$3.76, \$5.23]	0.9831
USDA certified fed a vegetarian diet	\$2.08	[\$1.65, \$2.58]	\$2.61	[\$1.98, \$3.24]	0.9558
USDA certified hormone use not permitted	\$2.96	[\$2.48, \$3.51]	\$4.04	[\$3.34, \$4.75]	0.9373
USDA certified antibiotic use not permitted	\$2.24	[\$1.81, \$2.71]	\$2.50	[\$1.85, \$3.14]	0.9945
Retailer certified free range	\$1.94	[\$1.48, \$2.42]	\$0.61	[-\$0.04, \$1.25]	<0.0000
Retailer certified fed a vegetarian diet	\$1.49	[\$1.08, \$1.91]	\$0.23	[-\$0.38, \$0.82]	<0.0000
Retailer certified hormone use not permitted	\$3.55	[\$3.07, \$4.09]	\$6.01	[\$5.23, \$6.80]	0.4028
Retailer certified antibiotic use not permitted	\$2.47	[\$2.06, \$2.91]	\$4.48	[\$3.86, \$5.17]	0.2048
Industry certified free range	\$1.20	[\$0.71, \$1.61]	\$1.35	[\$0.75, \$1.98]	0.8967
Industry certified fed a vegetarian diet	\$1.99	[\$1.54, \$2.47]	\$4.17	[\$3.52, \$4.92]	0.0419
Industry certified hormone use not permitted	\$2.65	[\$2.21, \$3.14]	\$3.13	[\$2.50, \$3.75]	0.9937
Industry certified antibiotic use not permitted	\$2.16	[\$1.73, \$2.65]	2.05	[\$1.41, \$2.72]	0.9982
Buys turkey, age 18-24	-\$16.61	[-\$17.99, -\$15.34]	-\$23.87	[-\$25.76, -\$22.06]	0.0077
Buys turkey, age 25-34	-\$15.33	[-\$16.60, -\$14.14]	-\$22.61	[-\$24.43, -\$20.95]	0.0241
Buys turkey, age 35-44	-\$14.05	[-\$15.19, -\$13.00]	-\$21.36	[-\$23.09, -\$19.82]	0.0742
Buys turkey, age 45-54	-\$12.77	[-\$13.83, -\$11.81]	-\$20.10	[-\$21.66, -\$18.65]	0.2099
Buys turkey, age 55-64	-\$11.48	[-\$12.45, -\$10.61]	-\$18.84	[-\$20.31, -\$17.51]	0.5241
Buys turkey, age 65+	-\$10.20	[-\$11.12, -\$9.37]	-\$17.59	[-\$18.98, -\$16.33]	0.7861
Doesn't buy turkey, age 18-24	-\$14.01	[-\$15.22, -\$12.95]	-\$15.76	[-\$17.09, -\$14.40]	<0.0000
Doesn't buy turkey, age 25-34	-\$12.73	[-\$13.84, -\$11.78]	-\$14.50	[-\$15.70, -\$13.25]	<0.0000
Doesn't buy turkey, age 35-44	-\$11.45	[-\$12.45, -\$10.59]	-\$13.25	[-\$14.33, -\$12.12]	<0.0000
Doesn't buy turkey, age 45-54	-\$10.16	[-\$11.06, -\$9.41]	-\$11.99	[-\$13.02, -\$10.94]	<0.0000
Doesn't buy turkey, age 55-64	-\$8.88	[-\$9.69, -\$8.17]	-\$10.73	[-\$11.70, -\$9.77]	<0.0000
Doesn't buy turkey, age 65+	-\$7.60	[-\$8.31, -\$6.94]	-\$9.48	[-\$10.40, -\$8.53]	<0.0000

Notes: 95% confidence intervals were found using the Krinsky Robb method. A complete combinatorial test was performed on the attribute WTP/average price of each product (\$3.65 for turkey bacon and \$5.99

for turkey lunchmeat). Interpretation is such that a p-value of less than 0.05 would indicate statistical significance at the 5%.

Discussion

Eighty-seven percent of respondents indicated they were the primary shopper for their household which is consistent with previous research that has found 88% (Bir et al., 2019) and 86% (Ochs et al., 2019) of respondents in national-scale samples. In an online survey of U.S. respondents, Lee and Yun (2015) found that 51% of respondents indicated they did all of the shopping in the household, while 41% of respondents indicated they did most of it. Higher percentages of respondents purchased organic fruits, vegetables, chicken and beef which ranged from 30-35%. Lee and Yun (2015) similarly found that over 40% of respondents purchased a wide category of organic foods. While not yet entirely mainstream as a grocery shopping statistic, increased attention has been devoted to spending and use of online food shopping in recent years. Even 20 years ago, Morganosky and Crude (2000) identified reasons for online food shopping and found that 19% of their sample of 243 US consumers who participated in online grocery shopping bought all of their groceries online. Participation in Amazon Prime was collected as a statistic potentially indicative of propensity to shop online. Particularly interesting, given the focus of this study on food items was the approximately 40% of respondents who had used Amazon Prime Pantry and approximately the same proportion who had employed other online grocery shopping providers. On average, respondents spent \$127 per week on total food, which was similar to the finding by McKendree et al. (2013) of an average weekly expenditure of \$132.77.

Many of the livestock rearing or production related claims are credence attributes of livestock-derived food products, including claims about housing, management practices, and even dietary restrictions for the animals. Because consumers cannot discern claims about credence attributes even after the product is purchased and consumed (Caswell & Mojduszka, 1996), such as housing types for turkeys while they were alive, the consumer must rely on labeling or certification entities to convince them the claims are indeed true. A multitude of studies have been completed in agricultural economics literature studying credence attributes of meat products. Norwood and Lusk (2011) offered an economist-framed approach to navigating questions to inform livestock producer (as well as policy maker) decision making via a number of summarized and interpreted consumer demand experiments. Cicia and Colantuoni (2010) documented 23 studies that report 88 WTP valuations for traceable meat attributes. Many studies employ national-scale samples to understand consumer WTP for livestock product attributes such as country-of-origin labeling (Lim et al., 2013) and rearing practices (McKendree et al., 2013; Lusk, 2018). Byrd, Widmar, & Gramig (2018b) studied the relative ranking of six meat attributes and found differences in rank order depending on the experimental design studied; but, the top three attributes were robust across designs with safety ranking first, taste ranking second, animal welfare ranking third, and price ranking third or fourth. While the relative ranking is informative on the whole, the implications are for meat defined broadly. Certainly food safety should be a main point of concern for consumers cooking raw meats, and especially poultry products. But, are processed products, and in particular those products that are not generally cooked before consumption – like lunchmeats – fundamentally different?

While studies continue to attempt to identify effective ways to improve consumer home food safety/handling (Maughan, Chambers, and Godwin, 2016), lunchmeat remains an outlier from the common meat handling and preparation guidelines. Consider lunchmeat in contrast to other poultry products for which marketing campaigns have been developed to educate consumers about safe handling and cooking to a specified temperature before consuming. Admittedly, there are segments of

the population for whom heating of lunchmeats until steaming hot is recommended. *Listeria* from lunchmeat is most likely to sicken pregnant women and their newborns, adults aged 65 or older, and people with weakened immune systems (CDC, 2019); thus the United States Food and Drug Administration recommends pregnant women reheat lunchmeats to steaming hot before consumption (FDA, 2018). Still, the United States Center for Disease Control and Prevention outlines lunchmeats as one of the potential sources of *Listeria* infections, although notably since the 1990s outbreaks linked to dairy and produce have also occurred (CDC, 2019).

McKendree and Widmar (2013) identified lunchmeat eating occasions which mirrored common perceptions associated with the nomenclature, 'lunch' meat. In total 76% of households studied consumed lunchmeat on a sandwich, whereas far fewer respondents indicated occasions such as eaten alone (10%), on a salad (6%) or as a snack (7%) (McKendree & Widmar, 2013). This analysis made advancements in understanding when, as in the time of the year, lunchmeat purchases were made. Turkey lunchmeat had a notable spike in the Fall season, hypothesized to correspond with back-to-school season and associated packed lunches. It has been repeatedly found that turkey is either the most, or among the most, popular lunchmeat options for U.S. consumers as a whole (Mintel, 2012; McKendree & Widmar, 2013). Mintel (2012) documented that turkey was consumed in 94% of lunchmeat-purchasing households, with ham coming in a very close second in 92% of households. McKendree and Widmar (2013) documented turkey as the first 'most often purchased lunchmeat' as well as the second 'second most often purchased lunchmeat', again with ham lunchmeat at the corresponding second most popular. One of the more interesting findings perhaps is the stated popularity of chicken lunchmeat. Mintel (2012) documented chicken as being consumed in 83% of lunchmeat-consuming households. McKendree and Widmar (2013) only asked about first and second most often purchased variety, but still identified chicken for 8% of households as first most often and 13% of households as second most often. Chicken lunchmeat offers an interesting point of comparison given the focus in this analysis on turkey products, as they are both processed poultry products.

A higher estimated disutility associated with opting out of purchasing turkey lunchmeat for younger respondents was identified in this study, which aligns with the general notion that younger consumers more often purchase/consume lunchmeat. McKendree and Widmar (2013) identified that households that consumed lunchmeat were more often larger, more often had children as household members, and had higher mean household food expenditures than households that did not consume lunchmeat. Furthermore, households purchasing greater than 1.1 lbs of lunchmeat weekly were even younger and larger in terms of number of household members (including children).

Relatively few consumer demand studies have been dedicated specifically to poultry products. Recent additions to the literature focusing on poultry products include Van Loo et al. (2011) which sought to estimate consumer WTP for organic chicken breasts and Byrd, Widmar and Wilcox (2018a) who found positive WTP for local, antibiotic-free and pasture based production of chicken breasts. Bett et al. (2013) investigated consumer WTP for indigenous chicken products in three regions of Kenya, while Mulder and Zomer (2017) specifically studied Dutch consumers' willingness to pay for broiler welfare attributes. Notably, Saitone, Sexton, and Sumner (2015) state that the overall economic benefits of implementing restrictions on livestock production industries (specifically referencing pork) strongly depend on the demand response by consumers. Seeking to understand consumer demand for broiler rearing attributes, Mulder and Zomer (2017) found that outdoor access and anesthesia before slaughter were particularly valued. Specific to turkey, Widmar et al. (2016) measured consumer preferences for six holiday turkey attributes, including weight, price, antibiotic free, local, pasture access, and brand.

Olynk, Tonsor, and Wolf (2010) found evidence of varying WTP for verified production process attributes depending on the product (milk versus pork chops), and thus species, involved. In addition, they found that the valuation of specific production process attributes varied, as did the value placed on verification of those attributes (Olynk et al., 2010). Building on the finding which suggested differences in preferences for attributes across products from varying livestock species, additional studies sought to investigate evidence of variation in WTP across different products from the same livestock species. Olynk and Ortega (2013) identified differences in consumer valuation (relative to the product price levels) for verified production process attributes for dairy cows depending on whether consumers were buying yogurt or ice cream with the same production attributes. In contrast, Mckendree et al. (2013) found no differences, relative to product price levels, when comparing verified attributes across smoked ham and ham lunchmeat products. Multiple potential explanations may be proposed, including whether the differentiation in species, pig versus dairy cow, or in product type, meat versus dairy, are responsible for the difference in findings. Alternatively, the individual products themselves may be responsible for the deviation, with the pork products being both processed similarly and more closely related than yogurt and lunchmeat.

In the case of turkey bacon versus turkey lunchmeat, both are processed products, although they are potentially differentiated in their use or consumption occasions. The consumption occasion differences as well as preparation time may contribute to the differences in WTP for some attributes in this study, as well as the differences in disutility experienced from walking away from a buying opportunity. Respondents experienced greater disutility from walking away from a turkey bacon buying experience, which may be influenced by the overall popularity and enthusiasm people have for bacon.

Conclusions and Implications

Consumer WTP for turkey bacon was assessed using a sub-sample of 559 randomly assigned respondents, while the remaining 571 respondents participated in a choice experiment employed to estimate WTP for turkey lunchmeat attributes. In total, 95% of respondents consumed poultry, and 40% indicated they consumed it 2 – 3 times per week. Given the focus on processed turkey products, nitrite and nitrate were actively focused on within the survey. Thirty-four percent of respondents indicated that they actively avoided products with nitrite and nitrates. Forty-eight percent of respondents indicated that they eat lunch outside the home once or twice a week.

The mean estimated WTP was positive for all verified attributes of turkey bacon. Respondents were willing to pay a statistically significant positive amount for all attributes and verifiers included for turkey lunchmeat with the exception of retailer certified free range and retailer certified fed a vegetarian diet. For all age categories, the disutility of walking away from a turkey bacon buying opportunity was greater than walking away from a turkey lunchmeat buying opportunity. There were statistical differences in WTP between the certifiers and attributes studied between the two processed turkey products. Namely, respondents had a higher WTP (normalized by average price) for retailer certified free range turkey bacon and retailer certified fed a vegetarian diet turkey bacon than lunch meat with either of these attributes. Respondents were WTP a higher amount for industry certified fed a vegetarian diet turkey lunchmeat when compared to turkey bacon. Given the interest in processed poultry products, and popularity of turkey products overall, these findings suggest that demand for these attributes varies across turkey products, even when both products are processed and seemingly similar in their consumption occasions.

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Appendix A.

Information seen by those participating in the turkey bacon WTP

The next portion of this survey presents you with hypothetical Turkey Bacon purchasing scenarios that you could face in a retail store where you typically shop. The two products that will be presented in each scenario possess the same characteristics (e.g., similar color, brand, flavor, etc.) except for varying levels of the attributes presented below. Prices vary for each product. For each scenario, please select the 12 oz package of Turkey Bacon that you would purchase, or neither, if you would not purchase either package of Turkey Bacon. For your information in interpreting alternative 12 oz package of Turkey Bacon:

Price refers to the cost per 12 oz package of Turkey Bacon:

\$1.69 per package

\$3.65 per package

\$5.61 per package

Free Range refers to the ability of turkeys to access the outside:

- **Yes** means the animal was raised on an operation certified to provide animals with Free Range
- **No** indicates that no claims regarding Free Range are being made

Fed a Vegetarian Diet refers to the turkey being fed a diet free from animal protein:

- **Yes** means the animal was raised on an operation claiming to always feed a vegetarian diet
- **No** indicates that no claims regarding use of vegetarian diets are being made

No Hormones Administered refers to the use of hormones on turkeys where:

- **No** means the animal was raised on an operation claiming to *never* (under any circumstances), administer hormones to animals
- **Yes** indicates that no claims regarding use of hormones are being made

Antibiotic Use refers to the use of antibiotics on turkeys where:

- **No** means the animal was raised on an operation claiming to *never* (under any circumstances), administer antibiotics to animals
- **Yes** indicates that no claims regarding use of antibiotics are being made

Certification Entity refers to the process used in verifying animal welfare and handling claims made on the product label where:

- **USDA** means the label is backed by a producer's participation in a certification and process verification program (PVP) managed by the United States Department of Agriculture (USDA)
- **Industry** means the label is backed by a producer's participation in a certification and verification program managed by the turkey industry itself
- **Retailer** means the label is backed by a producer's participation in a certification and verification program managed by a private, third party retailer that is neither associated with the livestock industry nor any consumer groups

The experience from previous similar surveys is that people often state a higher willingness to pay than what one actually is willing to pay for the good. It is important that you make your selections like you would if you were actually facing these choices in your retail purchase decisions, noting that allocation of funds to these products means you will have less money available for other purchases.

Information seen by those participating in the turkey lunch meat WTP

The next portion of this survey presents you with hypothetical Turkey Lunch Meat purchasing scenarios that you could face in a retail store where you typically shop. The two products that will be presented in each scenario possess the same characteristics (e.g., similar color, brand, flavor, etc.) except for varying levels of the attributes presented below. Prices vary for each product. For each scenario, please select the 16 oz package of Turkey Lunch Meat that you would purchase, or neither, if you would not purchase either package of Turkey Lunch Meat. For your information in interpreting alternative 16 oz package of Turkey Lunch Meat:

Price refers to the cost per 16 oz package of **Turkey Lunch Meat**:

\$2.99 per package

\$5.99 per package

\$8.99 per package

Free Range refers to the ability of turkeys to access the outside:

- **Yes** means the animal was raised on an operation certified to provide animals with Free Range
- **No** indicates that no claims regarding Free Range are being made

Fed a Vegetarian Diet refers to the turkey being fed a diet free from animal protein:

- **Yes** means the animal was raised on an operation claiming to always feed a vegetarian diet
- **No** indicates that no claims regarding use of vegetarian diets are being made

No Hormones Administered refers to the use of hormones on turkeys where:

- **No** means the animal was raised on an operation claiming to *never* (under any circumstances), administer hormones to animals
- **Yes** indicates that no claims regarding use of hormones are being made

Antibiotic Use refers to the use of antibiotics on turkeys where:

- **No** means the animal was raised on an operation claiming to *never* (under any circumstances), administer antibiotics to animals
- **Yes** indicates that no claims regarding use of antibiotics are being made

Certification Entity refers to the process used in verifying animal welfare and handling claims made on the product label where:

- **USDA** means the label is backed by a producer's participation in a certification and process verification program (PVP) managed by the United States Department of Agriculture (USDA)
- **Industry** means the label is backed by a producer's participation in a certification and verification program managed by the turkey industry itself
- **Retailer** means the label is backed by a producer's participation in a certification and verification program managed by a private, third party retailer that is neither associated with the livestock industry nor any consumer groups

The experience from previous similar surveys is that people often state a higher willingness to pay than what one actually is willing to pay for the good. It is important that you make your selections like you would if you were actually facing these choices in your retail purchase decisions, noting that allocation of funds to these products means you will have less money available for other purchases.