Modeling the Effect of Attitudes on Usual Cooking and Ordering

Food safety messages—both direct and indirect—can affect consumer behavior by increasing the risk that consumers perceive from eating a rare or medium-rare hamburger. Yet consumers also make decisions based on palatability. We developed a model for the decision to cook or order hamburgers lightly cooked. We then used data on respondents' usual cooking and ordering behavior from the 1996 HPQ to explore the relationship between hamburger cooking behavior and attitudes about risk and palatability attributes. It would also have been desirable to estimate a similar model using hamburgers recorded in the HECD consumption diaries, but the sample of hamburgers in the HECD consumed by respondents who completed the questionnaire on risk perceptions and taste, tenderness, and juiciness perceptions was too small, given the low frequency of red and pink hamburger consumption.

Conceptual Framework for the Role of Risk and Taste

Some consumer behavior researchers have used the Health Belief Model to explain risk-avoiding behaviors, including food safety behavior (Schafer et al., 1993). That model assumes that individuals make rational decisions about health behavior based on awareness of a risk, knowledge of the risk, and judgment about the level of the risk. The Health Belief Model treats behavior as a function of a first set of beliefs that provides motivation for taking action and a second set that includes modifying factors that enhance or impede such action, such as the consumer's general motivation to improve his or her health and the belief that these efforts will be effective (self-efficacy).

McIntosh's (1994) study of hamburger preparation in Texas modified the model to include habits and attitudes that are not necessarily "rational," including hamburger style preferences. The study found that palatability perceptions of Texas consumers—how they ranked the taste, tenderness, and juiciness of hamburgers cooked to different styles—were a major determinant of hamburger preparation behavior.

In the economics literature on consumer demand for health-producing goods such as food safety and nutrition, the theory of household production (Becker, 1965) and the theory of demand for characteristics (Lancaster, 1971) have been adapted to include health as an argument in the utility function, a health production function in the constraints, and the prices of health-producing goods in the budget constraint (Pitt and Rosenzweig, 1985). Information can be conceptualized as affecting both the marginal utility of health and the perceived effect of health-producing goods on health status. The optimal use of health-producing inputs (including time devoted to health-producing activities) is then a function of the prices of these inputs and the parameters of the utility and health production functions, including information. This framework can be easily reconciled with the Health Belief Model (and McIntosh's extensions) by interpreting the utility function as a description of the consumer's desire for better health, and interpreting the health production function as a perceived function incorporating the consumer's level of self-efficacy. The economic framework of utility maximization has the advantage that it can very naturally accommodate some consumers' dislike for well-done hamburgers as a cost of safe cooking behavior. Similarly, the cost could conceptually include any extra preparation steps needed to maintain the desirable qualities of a lightly cooked hamburger or extra fat content accepted to improve the palatability of a well-done hamburger.

For further details on the economic model we used to describe doneness choice, see Appendix A.

Empirical Specification and Estimation

To identify consumers who usually cook hamburgers lightly (rare, medium-rare, or medium with pink in the center) or order hamburgers that way in restaurants, the HPQ asked respondents how they usually cooked hamburgers for themselves to eat (rare, medium-rare, etc.) and how they would describe the interior color of medium hamburgers (table 5). To measure food safety knowledge, the survey asked respondents why the amount of time a hamburger is cooked would affect a person's chances of getting sick from eating the hamburger. We counted answers as correct if they included the concept that heat kills bacteria. To measure perceived risk, the survey asked respondents to rate each hamburger style on the chances of getting sick (1=not at all likely...4=very likely). To measure perceived palatability of different hamburger styles, the survey asked respondents to rank hamburgers at each level of doneness on juici-

Table 5—Variable definitions and means of sample used in model of response to risk motivation, N=530

Variable	Questionnaire wording or variable definition	Means and proportions for model estimation sample
	Behavior	
Cooks hamburgers lightly	(Counted as lightly cooked if rare, medium-rare or medium, where respondent indicated that medium includes red or pink in the center)	24% (mean for whole sample=20%)
Orders hamburgers lightly cooked		18% (mean for whole sample=15%)
	When cooking hamburger patties FOR YOURSELF TO EAT, how do you cook them?	Rare: 6.7% Medium-rare: 5.3% Medium: 20% Medium-well: 22% Well-done: 45%
	When ordering hamburgers in a restaurant, how do you order them?	Rare: 2.6% Medium-rare: 7.5% Medium: 15.7% Medium-well: 17.9% Well-done: 34.3%
	Which of the following colors do YOU think best describes the INSIDE of a hamburger patty that is cooked MEDIUM?	Red: 7.7% Pink: 46.6% Light brown: 37.1% Dark brown: 8.6%
	Knowledge and Attitudes	
Knowledge	To the best of your knowledge, why would the amount of time hamburger patties are cooked affect a person's chances of getting sick from eating the patties? (Answers were counted as correct if they included the concept that heat kills bacteria.)	Correct: 54%
Perceived risk	How likely do YOU think it is that YOU would get sick sometime in the next 12 months from eating a rare, medium-rare, medium, medium-well, or well-done hamburger patty? Ratings for rare, medium-rare hamburgers averaged.	Average score for lightly cooked: 3.3 out of maximum 4 1=Not at all likely 4=Very likely
Perceived palatability	How would YOU rank hamburger patties in terms of the amount of JUICINESS? …TASTE? …TENDERNESS? All three rankings for rare, medium-rare and medium hamburgers averaged into single measure for palatability of lightly cooked hamburgers. (Half of respondents count some pink as medium.)	Average score for lightly cooked: 3.2 out of 5 (5 is highest ranked)
Risk importance	How important is each [of the factors listed] TO YOU in deciding how to cook or order hamburger patties FOR YOURSELF TO EAT? "How likely it is to make me sick"	Average: 3.1 out of 4 1=Not at all important 4=Very important
Risk motivation index	Perceived risk x risk importance	Average: 8.9 out of 16

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Table 5—Variable definitions and means of sample used in model of response to risk motivation, N=530 (continued)

Variable	Questionnaire wording or variable definition	Means and proportions for model estimation sample
	Knowledge and Attitudes (continued)	
Palatability importance	How important…(same as above)? "How juicy the patty is" "How tasty the patty is" "How tender it is" Importance ratings averaged for three attributes.	Average rating: 3.2 out of 4 1=not important 4=very important
Palatability motivation index	Perceived palatability x palatability importance	Average: 10.5 out of 20
Illness experience	Have you ever been sick from eating any of the following foods because they were raw or undercooked? Hamburger patties Other meats or poultry Fish or shellfish	Percent ill from any source: 33
Lower Frequency	Frequency of hamburger consumption (1=once a week or more, 2=two or three times a month, 3=about once a month, 4=less than once a month, 5=never in the past 12 months)	Average: 2.1 out of 5 (About 2-3 times a month)
	Demographic characteristics	
Male		50%
South	DE, MD, DC, VA, WV, NC, SC, GA, KY, TN, AL, MS, AR, LA, OK, TX	28%
Midwest	OH, IN, IL, MI, WI, MN, IA, MO, ND, SD, NE, KS	29%
Northeast	ME, NH, VT, MA, RI, CT, NY, NJ, PA	21%
West	CA, OR, WA, ID, NV, AZ, NM, CO, WY, MT, UT, AK, HI	21%
White	English speaking, European ancestry	90%
Other ethnic groups	Non-European ancestry, or non-English speaking	10%
College	Attended some college	50%
High school	Completed high school	28%
Grammar school	Grades 1-8	22%
Senior homemaker	Homemaker 65 or over	18%
No children	No children in the household	54%
Household size	Total number in household	Average: 2.2
Big city	Metropolitan area with 500,000 or more residents	45%
Per capita annual income	In thousands	Average: 18.5

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Table 5—Variable definitions and means of sample used in model of response to risk motivation, N=530 (continued)

Variable	Questionnaire wording or variable definition	Means and proportions for model estimation sample
	Information Sources	
	Where have you heard or read about how to cook hamburger patties so a person won't get sick from eating the patties? (Yes or No for each)	
Word of mouth	"Family, relatives, friends, colleagues"	60%
Newspaper	"Newspapers"	72%
Magazine	"Magazines"	57%
Cookbook	"Cookbooks"	33%
TV/radio	"Television, radio"	72%
Physician	"Physicians"	26%
Label	"Label or instructions on a package"	54%
Brochure	"Brochures at grocery stores"	33%
Government (such as hotlines)		33%
Other sources		14%

Source: 1996 Hamburger Preparation Quiz

ness, taste, and tenderness (1=lowest ranked...5=highest ranked). We calculated the average ranking for taste, tenderness, and juiciness for each level of doneness to get an overall palatability measure for hamburgers cooked rare, medium-rare, and so on. Then we averaged the overall palatability measures for rare, medium-rare and medium-pink to derive a measure of perceived palatability for lightly cooked hamburgers.

To measure the importance of risk and palatability, the survey asked respondents to assign an importance level to the chances of getting sick, the juiciness, flavor, and tenderness of a hamburger (1=not at all important...4=very important). We multiplied the perceived risk and risk importance ratings to create a "risk motivation index" that increases from 1 to 16 as the respondents' motivation to avoid illness increases. Similarly, we multiplied the palatability measure by the respondents' importance rating for taste factors to create a "palatability motivation index" that increases from 1 to 20 as the respondent's motivation to choose the sensory characteristics of a more lightly cooked hamburger increase.

Respondents also answered questions about the frequency of hamburger consumption, whether they had ever been ill from hamburgers, other meats, poultry, or seafood, and where they obtained information about safe hamburger preparation.

We modeled the probabilities of cooking hamburgers lightly at home and ordering hamburgers lightly cooked (rare, medium-rare, or medium-pink), together with risk motivation, palatability motivation, and food safety knowledge as a system of five equations. The behaviors "cooks hamburgers lightly at home" (L_h) and "orders hamburgers lightly cooked" (L_o) are modeled as functions of the consumer's risk motivation index (R), the consumer's palatability motivation index (P), the consumer's knowledge (K), and a vector of demographic variables ($\boldsymbol{D}$).

Because R, P, and K may be associated with factors influencing L_h and L_o, we modeled these variables as well. We modeled R and K as a function of exposure to food safety information from several sources ($\boldsymbol{I}$), foodborne illness experience (E), frequency of hamburger consumption (F), and demographic variables.

We modeled P as a function of demographic variables and frequency of hamburger consumption. The model is:

$$L_h = L_h (K, R, P, \mathbf{D}) \quad (1)$$

$$L_o = L_o (K, R, P, \mathbf{D}) \quad (2)$$

$$R = R (\mathbf{I}, E, F, \mathbf{D}) \quad (3)$$

$$K = K (\mathbf{I}, E, F, \mathbf{D}) \quad (4)$$

$$P = P (F, \mathbf{D}), \quad (5)$$

where

L_h = Cooks hamburgers lightly at home

K = Knowledge

L_o = Orders hamburgers lightly cooked in restaurants

R = Risk motivation index

P = Palatability motivation index

$\mathbf{D}$ = Demographic variables

$\mathbf{I}$ = Safety information source variables

E = Experienced foodborne illness

F = Lower frequency of hamburger consumption

Variable definitions and sample means are included in table 5, including details on demographic characteristics ($\mathbf{D}$) and information sources ($\mathbf{I}$). For further details on the statistical techniques used in this report, see Appendix B.

The Roles of Palatability Motivation and Risk Motivation

Taste preferences were the most important factors affecting how hamburgers were cooked and ordered (tables 6 and 7). A 10-percent higher palatability motivation index was associated with a 76-percent higher probability of cooking hamburgers rare or medium-rare and a 52-percent higher probability of ordering hamburgers rare or medium-rare.

Table 6—Factors associated with usually preparing hamburgers lightly cooked, N=530

Household and personal characteristics	Coefficient from bivariate Probit estimate[1]	t-statistic	Effect of household and personal characteristics on probability that respondent cooks hamburgers lightly	
			Absolute[2]	*Percent*[3]
Constant	*** -3.335	-6.517		
Male (compared with female)	0.221	1.486	N/S	N/S
South (compared with West)	0.279	1.278	N/S	N/S
Midwest (compared with West)	0.197	0.952	N/S	N/S
Northeast (compared with West)	0.307	1.474	N/S	N/S
Senior homemaker (compared with homemaker < 65)	-0.045	-0.245	N/S	N/S
Per capita annual income (for an additional $5,000)	0.005	0.142	N/S	N/S
Household size (for one additional member)	** -0.168	-1.938	-0.043	-22
White (compared with all other ethnic groups)	0.154	0.534	N/S	N/S
Household head has completed some college (compared with no college)	0.135	0.877	N/S	N/S
No children (compared with households with children)	-0.157	-0.904	N/S	N/S
City larger than 500,000 (compared with rural areas, suburbs, and smaller cities)	0.135	0.871	N/S	N/S
Risk motivation index (for an additional 10%)	** -0.037	-1.930	-0.010	-5
Palatability motivation index (for an additional 10%)	*** 0.488	7.561	0.149	76
Knowledge	0.015	0.105	N/S	N/S
Pseudo R-squared	0.460			
Correlation between errors of equations 1 and 2	0.850			

1) *** indicates $p < 0.01$, ** indicates $p < 0.05$. See Appendix B for estimation details.

2) N/S indicates not significantly different from zero. Calculated as the change in unconditional probability (probability of cooking hamburgers lightly not accounting for whether respondent usually orders hamburgers lightly cooked), and only for significant determinants. For the effects of the risk motivation index, palatability motivation index, and household size, the starting probability is calculated with means for all independent variables and equals 0.197.

3) N/S indicates not significantly different from zero. Percent change in probability is calculated as the absolute change in probability divided by the starting probability.

Source: 1996 Hamburger Preparation Quiz.

Table 7—Factors associated with usually ordering hamburgers lightly cooked, N=530

Household and personal characteristics	Coefficient from bivariate Probit estimate[1]	t-statistic	Effect of household or personal characteristic on probability that respondent orders hamburgers lightly cooked	
			Absolute[2]	*Percent*[3]
Constant	*** -3.098	-5.967		
Male (compared with female)	0.178	1.205	N/S	N/S
South (compared with West)	* 0.370	1.655	0.078	83
Midwest (compared with West)	0.238	1.158	N/S	N/S
Northeast (compared with West)	* 0.380	1.698	0.081	86
Senior homemaker (compared with homemaker < 65)	-0.198	-1.032	N/S	N/S
Per capita annual income (for an additional $5,000)	0.032	0.970	N/S	N/S
Household size (for one additional member)	-0.074	-0.857	N/S	N/S
White (compared with all other ethnic groups)	0.487	1.418	N/S	N/S
Household head has completed some college (compared with no college)	0.031	0.179	N/S	N/S
No children (compared with households with children)	-0.204	-1.118	N/S	N/S
City larger than 500,000 (compared with rural areas, suburbs, and smaller cities)	** 0.362	2.152	0.085	75
Risk motivation index (per 10%)	** -0.059	-2.715	-0.013	-9
Palatability motivation index (per 10%)	*** 0.308	6.261	0.076	52
Knowledge	-0.027	-0.171	N/S	N/S
Pseudo R-squared:	0.46			
Correlation of error terms	0.850			

1) *** indicates $p < 0.01$, ** indicates $p < 0.05$, * indicates $p < 0.10$. See Appendix B for estimation details.

2) N/S indicates not significantly different from zero. Calculated as the change in unconditional probability (probability of ordering hamburgers lightly cooked, not accounting for whether respondent usually cooks hamburgers lightly) and only for significant determinants. For the effects of the risk motivation index and palatability motivation index, the starting probability is estimated with means for all independent variables and equals 0.146. For the effects of South and Northeast, the starting probability is estimated with zero for all regional dummy variables, as if all respondents lived in the West; this starting probability is 0.094. For the effect of being in a large city, the starting probability is estimated with zero for the large city variable and equals 0.112.

3) N/S indicates not significantly different from zero. Percent change in probability is estimated as the absolute change in probability divided by the starting probability. Starting probabilities are not the same for all cases, as discussed in footnote 2.

Source: 1996 Hamburger Preparation Quiz

Respondents with higher motivation to avoid getting sick were less likely to cook hamburgers rare, medium-rare, or medium-pink—5 percent less likely for each 10-percent higher risk motivation index. The response was stronger for hamburgers ordered away from home. With each 10-percent higher risk motivation index, respondents were 9 percent less likely to order hamburgers medium-rare or rare.

These results suggest that while some consumers cook or order hamburgers medium-well or well-done because of fear of illness, taste preferences factor significantly in consumers' choices. The recommendation from FSIS—to cook hamburgers to 160°F using a food thermometer—could improve the sensory characteristics of properly cooked hamburgers because some hamburgers may be safe before turning brown in the center of the patty.

Note that because we did not have data on those who do not eat hamburgers, our results may have underestimated the effects of risk perceptions and preference for rare and medium-rare hamburgers. If some people believe even a well-done hamburger is risky, or they would rather not eat a hamburger than eat it well-done, they may have stopped eating hamburgers altogether. These individuals were not included in our sample, and so our results did not measure the full effect of risk perceptions and preferences for rare or medium-rare hamburgers. Further research is needed to explore the role of risk perceptions and doneness preferences in the decision not to eat hamburgers.

The Role of Information

Several channels appear to be effective for communicating the risks of unsafe hamburger preparation. Respondents who said they get their information from magazines, television, cookbooks, or government hot-

Table 8—Factors associated with the risk motivation index, N=945

Household and personal characteristics	Effect on risk motivation index of a one unit change in household or personal characteristic		t-statistic
	Absolute (coefficient from Ordinary Least Squares estimate[1])	*Percent[2]*	
Constant	* 1.934		1.777
Male (compared with female)	-0.194	-2	-0.472
South (compared with West)	-0.245	-3	-0.436
Midwest (compared with West)	0.750	9	1.278
Northeast (compared with West)	-0.831	-10	-1.370
Senior homemaker (compared with homemaker < 65)	0.067	1	0.134
Per capita annual income (for an additional $5,000)	** 0.213	3	2.545
Household size (for one additional member)	** 0.510	6	2.512
White (compared with all other ethnic groups)	*** 1.711	21	2.888
Household head has completed some college (compared with no college)	-0.032	<0.5	-0.078
No children (compared with households with children)	0.086	1	0.194
City larger than 500,000 (compared with rural areas, suburbs, and smaller cities)	-0.041	-1	-0.096
Gets information about how to cook hamburgers safely from:			
…Word of mouth (compared with those who don't)	0.218	3	0.526
…Newspapers	0.018	<0.5	0.038
…Magazines	*** 1.360	17	3.171
…Cookbooks	*** 1.377	17	3.221
…Television/radio	** 1.163	15	2.500
…Doctor	-0.414	-5	-0.890
…Labels	-0.356	-4	-0.847
…Brochures	** -1.060	-13	-2.333
…Government sources (such as hotlines)	*** 1.169	15	2.624
…Other sources	-0.648	-8	-1.104
Has been ill from hamburger, other meat, or fish (compared with those that haven't)	*** 2.757	34	6.361
Adjusted R-squared	0.103		
Sample's mean risk motivation index	7.99		

1) *** indicates $p < 0.01$, ** indicates $p < 0.05$, * indicates $p < 0.10$. See Appendix B for estimation details.

2) Estimated as the coefficient divided by the sample's mean risk motivation index.

Source: 1996 Hamburger Preparation Quiz.

lines had 15 to 17 percent higher risk motivation than those who did not cite these sources of food safety information (table 8). Because a higher risk motivation index was associated with a lower probability of cooking hamburgers lightly and ordering lightly cooked hamburgers in restaurants, the results imply that respondents citing these information sources had lower probabilities of cooking hamburgers lightly or ordering them lightly cooked in restaurants. The probability of cooking hamburgers lightly was 7.5 (1.5 x 5) to 8.5 (1.7 x 5) percent lower for respondents citing information from magazines, television, cookbooks, or government hotlines, while the probability of ordering lightly cooked hamburgers was 13.5 (1.5 x 9) to 15.3 (1.7 x 9) percent lower for those respondents.

Labels by themselves did not seem to have an independent effect in our study after accounting for other factors that also increase awareness such as illness experience and demographic variables. More research is needed to explore these findings, but it is not surprising that it is difficult to separate the effects of different forms of information. Consumers are exposed to several sources at the same time, and information sources may work together to affect consumer perceptions.

Surprisingly, consumers who cited brochures had lower risk perceptions than respondents who did not, after accounting for demographic factors. If brochures contain more information about how to control pathogens, consumers who read brochures may perceive less risk because the information in the brochures helps them feel they can control the risk of foodborne illness through their behavior. There could also be a confounding relationship between brochure use and demographic variables. If some demographic groups have

lower risk motivation index levels and are also more likely to read brochures, the apparently negative effect of brochures on risk motivation could actually reflect the effect of demographic variables on both brochure use and risk motivation. More research is needed to explore explanations for this result.

While food safety knowledge was not significantly associated with preparing lightly cooked hamburgers or ordering lightly cooked hamburgers, it is useful to compare the effects of information sources on food safety knowledge with their effects on the risk motivation index to show how the two measures differ. The correct answer to the survey question "To the best of your knowledge, why would the amount of time hamburger patties are cooked affect a person's chances of getting sick from eating the patties?" was any answer including the concept that "heat kills bacteria."

Information from newspapers was significantly and positively associated with food safety knowledge, but not the risk motivation index, while information from magazines, cookbooks, and government sources were significant positive determinants of the risk motivation index but not food safety knowledge (table 9). Information from television and radio was a significant determinant of both the risk motivation index and food safety knowledge, as was previous foodborne illness.

Table 9—Factors associated with food safety knowledge, N=1,033

Household and personal characteristics	Coefficient from Probit estimate[1]	t-statistic	Effect of household and personal characteristics on probability that respondent correctly answered that heat kills bacteria	
			Absolute[2]	*Percent*[3]
Constant	*** -1.278	5.852	-0.509	
Male (compared with female)	** 0.206	2.416	** 0.082	17
South (compared with West)	0.138	1.207	0.055	11
Midwest (compared with West)	0.147	1.214	0.059	12
Northeast (compared with West)	* 0.214	1.714	* 0.085	18
Senior homemaker (compared with homemaker < 65)	0.002	0.017	0.001	0
Per capita annual income (for an additional $5,000)	* 0.031	1.778	* 0.012	3
Household size (for one additional member)	0.009	0.206	0.003	1
White (compared with all other ethnic groups)	*** 0.363	3.007	*** 0.145	30
Household head has completed some college (compared with no college)	-0.104	-1.229	-0.042	-9
No children (compared with households with children)	0.023	0.250	0.009	2
City larger than 500,000 (compared with rural areas, suburbs, and smaller cities)	-0.062	-0.700	-0.025	-5
Gets information about how to cook hamburgers safely from:				
…Word of mouth (compared with those who don't)	-0.081	0.954	-0.032	-7
…Newspapers	*** 0.313	3.358	*** 0.125	26
…Magazines	0.129	1.476	0.052	11
…Cookbooks	0.198	2.202	0.079	16
…Television/radio	*** 0.298	3.155	*** 0.119	25
…Doctor	-0.128	-1.333	-0.051	-11
…Labels	0.075	0.871	0.030	6
…Brochures	0.012	0.134	0.005	1
…Government sources (such as hotlines)	0.102	1.121	0.041	8
…Other sources	0.092	0.763	0.037	8
Has been ill from hamburger, other meat, or fish (compared with those that haven't)	** 0.190	2.103	** 0.076	16
Pseudo R-squared:	0.060			
Sample's mean probability of correctly answering that heat kills bacteria	0.479			

1) *** indicates $p < 0.01$, ** indicates $p < 0.05$, * indicates $p < 0.10$. See Appendix B for estimation details.

2) The partial derivative of the unconditional probability with respect to each independent variable.

3) Calculated as the absolute effect divided by the sample's mean probability of correctly answering that heat kills bacteria.

Source: 1996 Hamburger Preparation Quiz.

Further research on the content of newspaper stories and magazine stories would be useful in interpreting these results. For example, if newspapers focus more on outbreak facts while magazines carry stories about the emotions of foodborne illness victims, this could explain why newspapers are associated with higher knowledge and magazines are associated with higher risk motivation. Alternatively, consumers who are more educated about bacteria may be more likely to read newspapers while those who are more concerned about food safety could be more likely to notice magazine articles about victims of foodborne illness.

The Role of Demographic Characteristics

Some household characteristics were important even after accounting for differences in risk perceptions and tastes. Respondents with smaller households were more likely to cook hamburgers lightly while respondents in the South, Northeast, and large cities were more likely to order hamburgers lightly cooked in restaurants (tables 6 and 7). Individuals with these characteristics may require more exposure to safe handling recommendations to change their behavior.

Household and personal characteristics also affect behavior through their effect on attitudes. The risk motivation index (table 8) was significantly higher for respondents with higher per capita income (3 percent for each additional $5,000), respondents in larger households (6 percent for each additional member), and White respondents (21 percent higher than all other ethnic groups combined).

The palatability motivation index, which had a strong effect on cooking and ordering behavior, was 4 percent lower for men and 8 percent lower for respondents from the Midwest (table 10). It was higher for White respondents (14 percent) and for respondents with higher income (1 percent for each additional $5,000 in per capita income).

Our results highlight the need to focus consumer education efforts to encourage ordering thoroughly cooked hamburgers on consumers in the South and Northeast. Consumers in large cities should also be encouraged to order hamburgers thoroughly cooked. Consumer education to encourage thorough cooking of hamburgers at home should be broadly dispersed, however, since household size was the only statistically significant factor influencing this behavior after accounting for risk perceptions and tastes.

Table 10—Factors associated with the palatability motivation index, N=619

Household and personal characteristics	Effect on risk motivation index of a one-unit change in household or personal characteristic		t-statistic
	Absolute (coefficient from Ordinary Least Squares estimate[1])	*Percent[2]*	
Constant	*** 9.209		13.46
Male (compared with female)	* -0.417	-4	-1.829
South (compared with West)	-0.316	-3	-0.978
Midwest (compared with West)	** -0.812	-8	-2.491
Northeast (compared with West)	-0.052	<0.5	-0.148
Senior homemaker (compared with homemaker < 65)	-0.463	-4	-1.608
Per capita annual income (for an additional $5,000)	* 0.084	1	1.868
Household size	0.172	2	1.441
White (compared with all other ethnic groups)	*** 1.447	14	3.734
Household head has completed some college (compared with no college)	0.044	<0.5	0.189
No children (compared with households with children)	-0.264	-3	-1.035
City larger than 500,000 (compared with rural areas, suburbs, and smaller cities)	0.325	3	1.338
Eat hamburgers less frequently (compared with those that eat hamburgers more frequently)	-0.024	<0.5	-0.211
Adjusted R-squared	0.030		
Sample's mean palatability motivation index	10.5		

1) *** indicates $p < 0.01$, ** indicates $p < 0.05$, * indicates $p < 0.10$. See Appendix B for estimation details.

2) Calculated as the coefficient divided by the sample's mean palatability motivation index.

Source: 1996 Hamburger Preparation Quiz.