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Of course I know what I'm talking about: Assessment of Risk Communication about Undercooked Hamburgers by Restaurant Servers

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ABSTRACT

According to the U.S. Food and Drug Administration 2013 Model Food Code, it is the duty of a food establishment to disclose and remind consumers of risk when ordering undercooked food such as ground beef. The purpose of this study was to explore actual risk communication activities of food establishment servers. Secret shoppers visited restaurants (n=265) in seven geographic locations across the U.S., ordered medium rare burgers, and collected and coded risk information from chain and independent restaurant menus and from server responses. The majority of servers reported an unreliable method of doneness (77%) or other incorrect information (66%) related to burger doneness and safety. These results indicate major gaps in server knowledge and risk communication, and the current risk communication language in the Model Food Code does not sufficiently fill these gaps. Furthermore, should servers even be acting as risk communicators? There are numerous challenges associated with this practice including high turnover rates, limited education, and the high stress environment based on pleasing a customer. If it is determined that servers should be risk communicators, food establishment staff should be adequately equipped with consumer advisory messages that are accurate, audience-appropriate, and delivered in a professional manner so as to help their customers make more informed food safety decisions.

Introduction

Ground beef is a vehicle for human pathogens and its consumption has been identified as a risk factor for foodborne illness *(7*). Various pathogenic bacteria may be found in the gut of cattle (and on hides) and can contaminate meat during slaughtering and processing (*5, 10*). One of the pathogens commonly associated with ground beef is *Escherichia coli* O157:H7. Other serotypes of *E. coli* have also resulted in foodborne illness associated with ground beef (*1*). If ground beef is contaminated, two risk-reduction steps have been shown to be achieve a 5-log reduction: cooking to 155°F for 15 seconds or 160°F for <1 second, and avoiding cross-contamination (the transfer of pathogens from one surface to another post-processing). Sensory qualities such as color or texture, and/or cook time, are not reliable indicators of pathogen risk reduction on a hamburger, but are often cited by culinary professionals as indicators of doneness (*8*).

The U.S. FDA 2013 Model Food Code stipulates that when a food of animal origin (such as beef, eggs, fish, lamb, milk, poultry, or shellfish) is served raw, undercooked, or has been insufficiently processed to eliminate pathogens, the restaurant shall disclose and remind consumers of risk (*6*). Disclosure is defined as including a description of the animal-derived food (such as, “hamburger can be cooked to order”) and stating that the food is served undercooked, which is typically identified by an asterisk.

The reminder is to asterisk the food with a footnote stating that "consuming raw or undercooked meat, poultry, seafood, shellfish, or eggs may increase your risk of foodborne illness." The consumer advisory may also include the distinction that this risk is especially increased if an individual has a particular medical condition, and that additional safety information is available upon request (*6*). However, there is little research to illustrate whether disclosure and reminder of risk is actually occurring, and what the role of restaurant servers is in the process.

The goal of this project was to investigate the process of risk disclosure and reminder in restaurants, on both the menu and by the server. It was hypothesized that there would be numerous gaps and inconsistencies in how risk is communicated in restaurants.

MATERIALS AND METHODS

Recruitment. Forty-four secret shoppers were recruited and trained to collect data in seven locations: Raleigh, NC; Blacksburg, VA; College Station, TX; Manhattan, KS; Lincoln, NE; Davis, CA; and Philadelphia, PA. Geographic locations were selected for convenience based on where project collaborators were located nationally, and to represent multiple regions of the United States. Restaurants were selected by using an online restaurant directory for each geographic location. Locations were classified according to the U.S. Census Bureau standards, which include urbanized areas (UA), which are defined as a densely developed territory (at least 1,000 people per square mile) of 50,000 people or more, or urbanized clusters (UC), which are defined as a densely developed territory between 2,500 and 50,000 people (*12*).

Secret shopper training was standardized and consisted of an in-person meeting between trainer and trainee at the sampling location. The secret shoppers were presented a brief background of the rationale for the project, followed by a walk-through of the script, which included an explanation of Likert scale coding, designed to rank degree of agreement or disagreement with certain statements. Likert scales were used to rank the level of correctness or incorrectness of server responses about undercooked hamburgers.

Data collection was primarily conducted during lunchtime on a weekday, and for convenience, the restaurant sample was limited to a radius of approximately 10 miles from the secret shopper's work location. Exceptions included Virginia and Kansas, where secret shoppers visited other cities in the state to reach the restaurant quota. A sample list was generated by randomly selecting from online regulatory catalogs of permitted food premises. A chain restaurant was defined as a franchised restaurant that included 10 or

more locations; less than 10 locations was classified as an independent restaurant. Each secret shopper was assigned a random number, restaurants generated from the sample list were assigned a number, and restaurants were randomly assigned to the secret shoppers.

Data Collection. Two secret shoppers visited each restaurant. First, secret shoppers captured pictures of the consumer advisory messages on the restaurant menu(s). Secret shoppers then ordered lunch to eat at the restaurant site, specifically not a hamburger. During the meal, secret shoppers ordered two hamburgers to go: one was ordered cooked medium rare, and the other, well done. The secret shopper ordering the medium rare hamburger ordered first. When ordering the medium rare burger, if the server did not proactively provide any risk information, the secret shopper ordering the well-done burger interjected to ask:

- Is that safe to eat?
- How do you determine doneness (whether it is safely cooked or not?)?

Secret shoppers occasionally went off script based on server responses and how the conversation progressed. Server responses to the questions were documented by the secret shoppers, in most cases as text on a cell phone.

Coding. Data were segmented by server response to secret shopper questions for each restaurant, and a codebook was developed to analyze these responses. Five categories were used to examine the different aspects of server communication. Specifically, server responses were coded for (1) availability of medium rare ordering; (2) method of determining doneness; (3) whether safety information was mentioned; (4) whether incorrect information was mentioned; and (5) appearance of server confidence.

The question of availability of medium rare burgers was addressed by coding for whether servers allowed medium rare to be ordered.

- **Yes** was coded when servers allowed burgers to be ordered
- **No** was coded when servers cited restaurant policy that did not allow medium rare to be ordered.

One of the primary goals of this research was to capture the method of doneness cited by the server; more specifically, how many restaurant servers communicate an unreliable indicator of doneness to consumers. After review of the data, six codes emerged to describe types of "doneness" as described by servers. Some data units were double-coded or even triple-coded in cases when servers mentioned more than one method of determining doneness.

- **Temperature** was coded when a thermometer use was referenced, or when a specific temperature was mentioned. Temperature was sometimes double-coded with color.
- **Color** was coded when mentioned by the server. Color was often double-coded with touch, and sometimes double-coded with temperature.
- **Touch** was coded when a textural quality was mentioned, or when words such as "warm" or "cold" were used. Touch was often double-coded with color.
- **Time** was coded when any unit of time was mentioned or implied.
- **Cooks know** was coded when cook experience was used as the criteria for judging degree of doneness.
- **I don't know** was coded when the server stated that he or she did not know or was not sure.

The third category addressed the question: Is safety information provided by the server? Because servers frequently referred to factors that were more directly related to quality, but believed them to be safety related, such statements were also coded as safety information.

- **Yes** was coded when the risk for foodborne illness was stated; when the consumer was told directly whether it was safe or not to consume medium rare burgers; when the health department or Food Code was mentioned; or when a quality factor was mentioned as an answer to a safety question, implying that the two are related.
- **No** was coded when the above information was not provided. Some servers provided a method of doneness, but made no statements about safety. These instances were also coded under this category.

The fourth category further addressed the question of risk information by coding for whether incorrect information was provided.

- **Yes** was coded when any incorrect information was stated. Incorrect information included any method to determine doneness other than temperature; statements about quality that implied a correlation with safety; and/or a direct statement of safety if the temperature was stated to be below 160°F.
- **No** was coded when all information provided was correct.

The fifth category was the appearance of confidence of the server: positive or negative.

- **Positive** was coded with the use of "to be" verbs, indicative mood, no hedging, and overall apparent confidence of the server as noted by direct observation by the secret shopper.
- **Negative** was coded with the use of conditional language or hedging, and overall appearance of little confidence as observed by the secret shopper.

Code reliability was confirmed by determining simple reliability and Cohen's kappa using a second coder for the initial 40 restaurants visited. Both values for each code are listed in Table 1. Because Cohen's kappa values were all within the range of acceptability, refinement of codes was not necessary.

Likert scales were also developed to score the risk messages found on the menus and to provide a comprehensive score for server responses. This was done because there were varying degrees of correct or incorrect information provided, as well as depth of information, and the need to characterize such variations quantitatively. There were a total of four scales used: a menu scale; an initial server response scale (assigned to each server response that dictated whether it was subsequently scored as correct or incorrect information; a correct server response scale (used when the response contained correct information); and an incorrect server response scale (used when the response contained incorrect information). Each site visited was assigned a score from three of the four scales. Scores ranged from a low of 1 to a high of 7. For the menu and initial server scales, incorrect information received scores between 1 and 3, and correct information received scores between 4 and 7. The correct and incorrect scales were used to further quantify the type of information that was shared by the server. Secret shoppers and an additional coder scored the data based on these scales.

The three most recent inspection reports were collected from those restaurants for which they were available. Inspection frequencies varied, but inspection typically occurred once per year. The information from inspection reports about posted consumer advisory messaging [in compliance (I), out of compliance (O), or N/A] were collected from each report.

Data Analysis. Data were analyzed using SAS 9.4 software (SAS Institute, Cary, NC). Analysis consisted of running a GLIMMIX procedure to determine a p value for each comparison and compare differences in code frequencies and Likert scores between states, restaurant type, and restaurant location. A Spearman correlation was performed on secret shopper Likert scores for menu and server response scores to test the consistency of training and ensure validity.

RESULTS

Coding. A total of 265 restaurants were visited (132 chain, 133 independent); 87.6% of them were in urbanized areas, while 12.4% were in urban clusters. Based on the coding explained above, six subcodes were used to describe servers' reporting of method used to determine doneness: temperature, color, touch, time, cooks know, or server stated that they did not know. In some instances, servers did not mention a method of doneness; some servers listed more than one method of doneness in a conversation. A total of 296 responses were obtained, exclusive of 66 instances in which the server did not mention a method of doneness and inclusive of server responses in which more than one subcode was cited. Response rate to this question was 74.0% (n = 199) and Figure 1 illustrates the overall percentage of each method of doneness mentioned by a server. The majority of server respondents cited a single subcode, but 23.6% (n = 47), 4.0% (n = 8), and 0.5% (n = 1) provided double coding, triple coding, or quadruple coding. The most frequent instances for which multiple methods of doneness were mentioned were for temperature and color, color and touch, or all three.

Overall, 74.1% of restaurants (n = 196) allowed medium rare burgers to be ordered. There was not a significant difference between states or population area, but significantly more independently owned restaurants allowed secret shoppers to order medium rare burgers than did chain restaurants ($p = 0.0007$).

In 50.7% of the conversations (n = 134), servers mentioned safety information (both correct and incorrect information). There was a difference between states, with California having the highest rate of safety information sharing, and significantly differing from Kansas, Nebraska, and Pennsylvania ($p = 0.0095$, 0.0316, 0.0014,

respectively). There was not a difference between type of restaurant ($p = 0.6183$) or population area ($p = 0.1952$) relative to servers discussing safety.

For those instances in which servers shared information, that information was incorrect in 66.7% of the interactions ($n = 177$). There were significant state-to-state differences; Pennsylvania had the highest rate of incorrect information shared ($p = 0.0051$). There was no difference when comparing information sharing by type of restaurant or population area. Approximately 70% of servers appeared confident ($n = 189$). There was not a significant difference in appearance of confidence by state ($p = 0.5776$), restaurant type (0.6321), or population area ($p = 0.9737$).

Likert Scoring. A Spearman's correlation was run on secret shopper and control Likert scores to ensure that they were a consistent standard, and that the secret shopper training was valid. The scores that were generated confirmed validity (menu $= 0.741$, initial server $= 0.612$, correct server $= 0.354$, incorrect server $= 0.388$).

The Likert scale data are summarized in Tables 3, 4, and 5. Virginia had the highest menu scores, while California scored the lowest. Similar results were observed for the initial server scores, although Pennsylvania and Texas also scored low. Chain restaurant menu and initial server scores were significantly higher than independent restaurant scores ($p < 0.001$). Urbanized clusters scored significantly higher than urbanized areas for menu scores ($p < 0.001$) but not for initial server scores.

Thirty-five percent of server interactions ($n = 93$) qualified to be scored on the correct server response Likert scale, while 67% of server interactions qualified to be scored on the incorrect server response Likert scale. There was wide variability in these scores when comparing states. There was not a significant difference for restaurant type

for either types of server response (correct p = 0.6705, incorrect p = 0.7950). However, urbanized areas scored higher than urbanized clusters for the correct server response scoring (p = 0.0080), but not for incorrect server response (p = 0.0752).

Inspection Reports. Not all of the inspection reports were available to access for each restaurant (0% missing for Nebraska; 46% missing for Pennsylvania). Based on those available, the majority of restaurants were reported to be in compliance with consumer advisory messaging in inspection reports (Table 6). North Carolina had the highest rate of noncompliance. For all of the other states, there was at least one round of inspections in which noncompliances related to written consumer advisories were absent.

Server Responses. Posing questions to servers yielded a wide array of responses related to safety of the product, determining doneness, and servers' personal opinions. Particularly notable responses included stating that undercooked burgers were safe even for pregnant women, just the outside of burgers are where the bad bacteria lives, and the cook just knows if the burger is done by feeling it. These types of responses highlight the major gaps and inconsistencies in the information that servers provide to consumers.

DISCUSSION

Beef hamburgers are a favorite of Americans, and despite their association with some high profile foodborne illness outbreaks and the scientific consensus that temperature is the only reliable indicator of doneness, consumers continue to eat burgers that are not thoroughly cooked as a result of personal and cultural preferences. Consumer messaging can take many forms, both written and oral. The purpose of this study was to determine whether restaurant servers discuss risks of consuming undercooked hamburgers with consumers, and if so, what information they share. Identifying current practices helps determine inconsistencies in the risk information that is being communicated, and to make recommendations as to what information would most effectively communicate risk so that consumers can make an informed decision. A secret shopper study design was chosen, in which data collectors posed as restaurant patrons and collected information from servers while actually ordering medium rare hamburgers. While more expensive than a national survey of servers in which they self-report their behaviors, this design allowed for direct communication with the servers and the opportunity to present the data in both qualitative and quantitative manners. A previous secret shopper study conducted in 13 supermarkets in Ontario revealed that store employees appeared confident in the advice they offered, but it was incorrect; poor food handling practices were also observed (*9*). Points of particular interest were the methods used to determine hamburger doneness; whether ordering undercooked hamburgers was allowed; and whether the information shared by servers was correct. Information on written menu messages and inspection reports were provided as a framework for comparison.

While inspection reports for the restaurants visited showed a high rate of compliance with Food Code-recommended consumer advisory messaging, the Likert scores for menu messaging and server response were not always consistent, and servers frequently provided contradictory information. For example, servers used a wide array of unreliable factors when discussing burger doneness, particularly color. In some cases, this was simply because the server did not know the temperature ranges used to cook hamburgers. This lack of knowledge suggests poor communication between the kitchen staff and serving staff, as well as the possibility that thermometers are not being used by kitchen staff. This is consistent with the literature (*2*). When servers did mention temperature, it was often in conjunction with another qualitative factor, such as color or time.

Similarly, the majority of restaurants were in compliance relative to consumer advisory messaging on inspection reports. Nonetheless, servers frequently contradicted the risk information found on the menu by citing qualitative indicators of doneness (as described above); assuring consumers that undercooked hamburgers were safe to consume; or by listing temperatures that are not sufficient to kill pathogens. For the servers that did share correct information, the average Likert scores show that prompting by the secret shopper was still required to get any risk information, which was part of the secret shopper ordering protocol if servers did not volunteer risk information. The inconsistency between inspection reports and server risk messaging illustrates a major drawback of the former, in that formal inspections can miss the impact of personal communication in risk management. Stressing the importance of consumer advisory in the process of inspections would be one step towards a more positive risk communication

culture in restaurants. Adding this component not only fills the gap in investigating how a restaurant communicates risk, but also serves to emphasize its importance to those administering and receiving the inspection.

The Likert scoring revealed some differences between states and restaurant type with respect to the quality of risk information that was shared by servers. For example, California scored the lowest for menu and initial server score. North Carolina, which adopted the 2009 FDA Food Code shortly before the secret shopper study began, had high scores. Chain restaurant servers consistently scored higher than independent restaurant servers. This is to be expected, as chain restaurants typically have standardized food safety programs that include employee training and appropriate messaging.

The data presented here demonstrate a gap in server knowledge about food safety risks and the communication of that risk to consumers. But should servers be risk communicators? Placing them in this role presents challenges: (i) high turnover and low pay; (ii) limited education; (iii) high stress and fast-paced environment; and (iv) pressure to "please" the consumer and provide a pleasurable dining experience. If we were to rely on servers for food safety communication, the data presented here suggests the need for a more formal food safety curriculum specifically aimed towards servers, with the ultimate goal of improving risk messaging to consumers. Risk communication literature demonstrates that consumers need to understand the context of a risk in order to identify and remember it (*4*). Familiarity also plays a strong role in consumer perception of a risk, as does trust (*11*). Behavior and risk communication are more likely to be impacted when targeting both knowledge and individual intention. Food servers may be in the unique position of providing accurate food safety information to consumers. Identifying

additional roadblocks and determining server receptivity to training interventions focused on risk communication is the next step moving forward from this study.

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FIGURE LEGENDS

Figure 1. Overall percentages of method of doneness mentioned by server (n = 296).

Table 1. Simple reliability and Cohen's kappa for secret shopper codes.

Code	**Simple reliability**	**Cohen's kappa**
Medium rare allowed	100%	1
Method of doneness	72%	0.65
Safety information provided	89%	0.75
Incorrect information	85%	0.68
Appearance of server confidence	93%	0.82

Table 2. Likert scores for menu, initial server, correct server, and incorrect server by state. An asterisk designates when there was a significant difference between state scores. The highest and lowest score for each category is in bold.

State	Menu* (n = 276)	Std. dev.	Initial Score* (n = 269)	Std. dev.	Correct score* (n = 105)	Std. dev.	Incorrect score* (n = 191)	Std. dev.
California	**3.19**	0.83	2.89	1.25	4.25	-	4.84	1.95
Kansas	3.84	0.85	3.44	1.39	2.60	1.22	**5.24**	1.71
Nebraska	3.83	0.88	3.31	1.37	3.53	1.48	4.77	1.74
North Carolina	3.99	0.59	3.24	1.46	2.95	1.16	4.81	1.54
Pennsylvania	3.86	0.88	2.86	0.99	**2.14**	0	4.50	2.06
Texas	3.64	0.84	**2.82**	1.57	**4.33**	1.83	4.23	1.99
Virginia	**4.08**	0.91	**3.84**	1.63	3.46	0.94	**2.88**	1.78
Total	3.79	0.88	3.22	1.42	3.19	1.34	4.60	1.90

Table 3. Likert scores for menu, initial server, correct server, and incorrect server by restaurant type. An asterisk designates when there was a significant difference between chain and independent scores.

Restaurant Type	Menu* (n = 276)	Std. dev.	Initial Score* (n = 269)	Std. dev.	Correct score (n = 105)	Std. dev.	Incorrect score (n = 191)	Std dev.
Chain	4.09	0.94	3.40	1.45	3.21	1.78	4.68	1.92
Independent	3.52	0.66	3.03	1.38	3.17	1.78	4.52	1.89

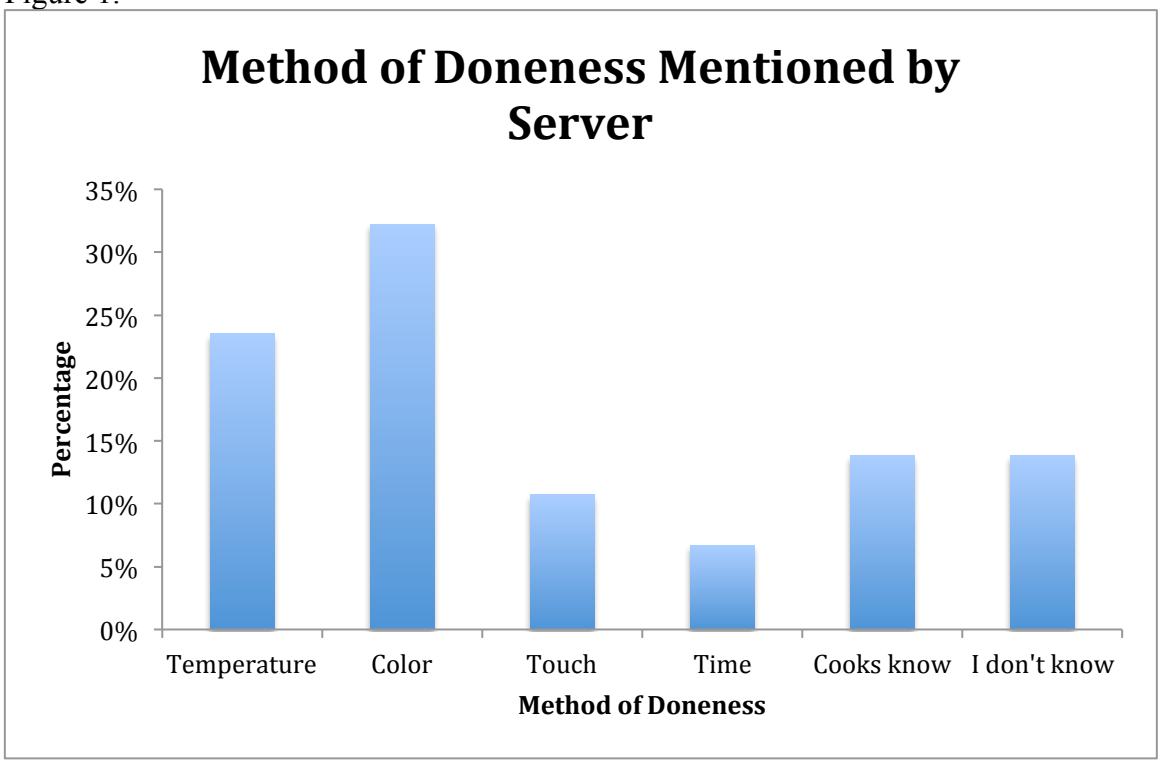
Table 4. Likert scores for menu, initial server, correct server, and incorrect server by population area. An asterisk designates when there was a significant difference between urbanized area and urbanized cluster scores.

Population Area	Menu* (n = 276)	Std. dev.	Initial Score (n = 269)	Std. dev.	Correct score (n = 105)	Std. dev.	Incorrect score* (n = 191)	Std. dev.
Urbanized Area	3.76	0.83	3.18	1.42	3.22	1.85	4.76	1.83
Urbanized Cluster	4.09	0.98	3.56	1.40	3.05	1.43	2.67	1.63

Table 5. Average rate of compliance with consumer advisory messaging in restaurants visited for past 3 inspections.

Compliance category	Percentage
In compliance	68%
Out of compliance	9%
N/A	23%

Figure 1.


Method of Doneness Mentioned by Server
35%
30%
25%
20%
15%
10%
5%
0%
Percentage
Temperature
Color
Touch
Time
Cooks know
I don't know
Method of Doneness