



## Television Celebrity Chefs as Role Models for Consumers' Safe Food Handling in the Home

### ABSTRACT

Research has documented that television chefs frequently fail to follow recommended food-handling behaviors. This study investigated the food-handling practices of four celebrity chefs, and consumers' and culinary students' attitudes toward mishandling. A scale based on the four core practices: Cook, Clean, Chill, Separate was developed, validated, and used to evaluate 59 cooking shows. Video clips of each chef were shown to culinary students to assess their attitudes toward chefs as role models and to consumers in focus groups and via an online survey to measure attitudes toward chef practices and the influence of these attitudes on personal behavior. Television chefs continue to practice potentially dangerous food-handling behaviors. Culinary students believed chefs should serve as positive role models for consumers. Results of the focus groups and online survey confirmed that some consumers were unaware of breaches of safety protocol and admitted they used similar practices. When consumers were

aware of mishandling, they reported thinking less of the chef's expertise. Our findings indicate that consumers viewed celebrity chefs as role models, utilized information transmitted during cooking shows, and often practiced the behaviors they observed. Celebrity chefs' poor food-handling practices could increase the risk of foodborne illness associated with food prepared at home.

### INTRODUCTION

Foodborne illness continues to be a significant health concern in the U.S. The Centers for Disease Control and Prevention (CDC) estimates that each year in the U.S., 9.4 million episodes of foodborne illness, resulting in 55,961 hospitalizations, 1,351 deaths and an economic burden of approximately \$77.7 billion annually (22, 23), occur. More deaths were attributed to poultry and more illnesses were attributed to leafy vegetables than to any other commodities (17).

Foodborne illness has been traced to ready-to-eat food purchased in supermarkets, prepared in restaurants, and

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prepared by consumers in the home (11). However, consumers continue to believe that they have a greater risk of getting sick from food processed in a plant or in a restaurant than from food prepared at home (10, 14, 26). In The Center for Science in the Public Interest's 2014 Outbreak Alert, 24.3% of the foodborne illness outbreaks from 2002 to 2011 were attributed to food prepared in private homes and 15% from food in the workplace, school, or camping/picnics settings. These foods may have been prepared in the home (7).

Proper food-handling practices at home are an important factor in reducing the incidence of foodborne illness. Observational studies and self-reporting studies are both used to determine consumers' food-handling behaviors; however, observational studies are a more accurate assessment of actual practices. Common consumer behaviors associated with foodborne illness are inadequate heating, cooking and cooling; obtaining food from unsafe sources; insufficient hand washing; cross-contamination; and improper storage of food (6, 16, 19, 24). Failure to wash hands is one of the top offenses, with people aware of the value of washing and good intentions to wash, yet not washing their hands when appropriate (8). An FDA-FSIS study indicated that consumers select a variety of foods that are known to be high risk, such as raw oysters, sushi, and raw alfalfa sprouts (14). Other frequently reported behaviors included not refrigerating cooked food within the recommended time period; carrying cooked food from the grill on the same plate that was used to bring the raw food to the grill without washing the plate first, and not washing produce before preparation (5, 14). An often overlooked source of foodborne contamination is the kitchen dishcloth (12, 25). Dishcloths and sponges can harbor unsafe bacteria and are a good vehicle for transfer of the bacteria to food preparation surfaces such as counters, cutting boards and utensils (12). Research from Fein and others shows that consumers have a tendency to do things by habit and that they often don't follow safe food-handling recommendations (1, 10). In fact, they are less likely to follow general food-safety practices today than in the past (26). The prevalence of these behaviors and incidences of foodborne illness indicate that it is appropriate to encourage additional innovations to increase safe food-handling practices.

Imitating positive behavior of a role model may impact the adoption of safe-handling practices. A role model is someone whose behavior is imitated by others (2). While role modeling has been shown to be an effective mode for behavior change in the nursing and medical arena, the concept has not been applied to food-safety education (9). Simply exposing an observer to modeled behaviors will not establish that the modeled behavior will "stick." Effective role modeling involves exposure, reinforcement, accountability, and repeating (3, 4).

Consumers use television as both a source of entertainment and information. Because of their popularity, uniqueness and availability, television cooking shows could be

appropriate vehicles for food safety messaging, yet many shows do not demonstrate recommended food-handling practices (13, 15). Mathiason et al. documented 916 poor food-handling incidents associated with foodborne illness in 60 hours of programming in their 2002–03 study of television celebrity chefs' food-handling behaviors (15). Five years later, Irlbeck, Akers, and Brashear documented 460 negative and only 118 positive behaviors in a content analysis of 49 Food Network cooking shows (13). The television celebrity chefs practiced the same common food-handling errors reported in consumer studies (13, 15).

Television celebrity chefs have the potential to serve as positive role models for safe food-handling because of their popularity and potential reach. The aim of this study was to document positive and negative food-handling behaviors of four popular television celebrity chefs to determine if chefs continue to model behavior that is not recommended, and then to document how the chefs' behaviors affect consumers' attitudes and self-reported practices. Additionally, the attitudes of culinary students, as chefs-in-training, were assessed to determine their views of chefs as role models for safe food handling.

## MATERIALS & METHODS

### Chef practices

Food Network cooking shows on DVDs (Table 1) were purchased from Amazon.com. The chef-hosts Guy Fieri, Rachael Ray, Bobby Flay and Paula Deen were chosen because of their popularity and the ease of acquisition of DVDs of their shows. We chose not to analyze shows recorded from live TV to avoid legal copyright issues. A total of 59 episodes, which included handling meat, poultry or fish, were screened and analyzed for their food-safety behaviors: 19 episodes from Rachael Ray, 9 from Bobby Flay, 13 from Paula Deen, and 18 from Guy Fieri. Each program was approximately 20-minutes long, for a total of about 20 hours of viewing time. The content analysis of these television-cooking shows was performed on the basis of the behaviors of Cook, Clean, Chill, and Separate established by the Partnership for Food Safety Education (PFSE, [fightbac.org](http://fightbac.org)) and consistent with the F.D.A. Food Code (18, 27). Behaviors were organized into 21 different categories based upon a grid developed and validated by three food-safety professionals. The categories consisted of 5 positive and 16 negative food-handling themes (Table 2) (25).

One clip from each chef that showed the chef violating a recommended food-safety behavior (cook, clean, chill, separate) was prepared to show to consumers and chefs in training to assess their awareness of the violation and their response to it.

The first clip showed Guy Fieri preparing stuffed hamburgers. This clip addressed how the chef determined when the meat had reached the recommended end point temperature. Rachael Ray was shown preparing Greek tapas made from

**Table 1. Videos reviewed: Paula Deen, Bobby Flay, Guy Fieri, and Rachael Ray**

Chef/Host	Show Title	Episode Title	
Paula Deen	Paula's Home Cooking	Tugboat Catering-Michael's	The Boss is Coming to
		Smokehouse	Dinner
		Grilling BBQ	Weekend House Guest
		Southern BBQ	Holiday Show
		Cooking for a Crowd	Country Breakfast
		Cooking for the Troops	Southern Brunch
		Meet the Parents	Southern Comfort
		Drum Split BBQ	
Bobby Flay	Boy Meets Grill	Mediterranean Style	Grilling Tandoori Style
		Firehouse Grill	Caribbean Heat
		It's Greek to Me	No Ordinary Vegetable
		Boy Meets Texas Girl	A Fiery Fiesta
		Viva Argentina	
Guy Fieri	Guy's Big Bite	Mexicajitalian Fusion	Tangerine Beef
		Kickin' Cajun Alfredo	Tater Tot Halibut
		Bloody Mary Steaks	Mojito Chicken
		Family-style Fiesta	Cuban Pork
		Two for One Stuffed Meatloaf	Sangria Shrimp
		Far Out Far East Finger Food	Taqitos
		Early Bird Supper	Burgers
		Pepperoni Lasagna	Fish Tacos
Rachael Ray	30 Minute Meals	Linger at the Table, Not at the Stove	Home at 7:30, Cocktail Party at 8!
		Sandwich Night	Wine & Dine
		Classic Cravings	Compliments to the Chef
		Greek Tapas	Knock 'Em Out in 30
		Cooking for 10 in 30	Easy Weekend Entertaining
		"Big Game" House Party	Certified Crowd-Pleasers
		Punched-Up Brunch	30 Minute Great Gatherings
		Southern Hospitality Party	Munch on Lunch
		Southwest Brunch Fiesta	Soul Soothing Formula
		Glamour in 30	

a combination of ground lamb, ground veal and spices. This clip addressed cross-contamination, adequate cooking, and serving time and temperature. The Paula Deen clip showed her serving “beer can chicken” that she had cooked on the grill. This clip addressed adequate cooking and serving hygiene. The Bobby Flay video showed him outside preparing grilled squid. This clip addressed contamination of raw with

ready-to-eat food. See [Table 3](#) for a complete description of the clips.

**Qualitative responses of chefs in training to chef practices**

Students recruited from a culinary school were shown the video clips and asked about their attitudes towards the celebrity chefs and their food-handling practices.

**Table 2. Food-handling practices of celebrity chefs**

Number of shows	Rachael Ray (19)	Paula Deen (13)	Bobby Flay (9)	Guy Fieri (18)	Total Sample (59)
<b>CLEAN</b>	% (n)	% (n)	% (n)	% (n)	% (n)
Handwashing before cooking not shown	100 (19)	100 (13)	100 (9)	94 (17)	98 (58)
Licked fingers	0 (0)	8 (1)	22 (2)	0 (0)	5 (3)
Touched head/hair/face	11 (2)	0 (0)	22 (2)	0 (0)	7 (4)
Washed hands or mentioned handwashing <sup>a</sup>	58 (11)	23 (3)	22 (2)	61 (11)	46 (27)
Washed produce <sup>a</sup>	0 (0)	8 (1)	11 (1)	6 (1)	5 (3)
<b>SEPARATE</b>					
Handled food after raw meat, no washing in between	32 (6)	38 (5)	44 (4)	6 (1)	27 (16)
Used unwashed cutting board, no mention of washing	79 (15)	62 (8)	56 (5)	72 (13)	69 (41)
Wiped hands with cloth towel/clothing during preparation	32 (6)	23 (3)	33 (3)	50 (9)	35 (21)
Sampled food with fingers	5 (1)	15 (2)	44 (4)	0 (0)	11 (7)
Added ingredients with unwashed hands	68 (13)	38 (5)	44 (4)	50 (9)	52 (31)
Handling finished product with hands instead of utensil	26 (5)	15 (2)	56 (5)	17 (3)	25 (15)
Use of utensils between raw & cooked foods	5 (1)	23 (3)	11 (1)	0 (0)	8 (5)
Ate while cooking	0 (0)	15 (2)	44 (4)	0 (0)	10 (6)
Washed or mentioned washing of meat/poultry <sup>a</sup>	0 (0)	0 (0)	0 (0)	11 (2)	3 (2)
Separated raw & ready-to-eat foods <sup>a</sup>	32 (6)	54 (7)	22 (2)	50 (9)	40 (24)
<b>COOK</b>					
Tested for doneness without using a meat thermometer	42 (8)	38 (5)	44 (4)	56 (10)	45 (27)
Cooking temperature mentioned was incorrect	5 (1)	15 (2)	22 (2)	0 (0)	8 (5)
Temperature abuse or mention of incorrect serving temperature	5 (1)	8 (1)	22 (2)	6 (1)	8 (5)
Mentioned CORRECT cooking temperature <sup>a</sup>	5 (1)	38 (5)	0 (0)	6 (1)	12 (7)
<b>CHILL</b>					
Time-temperature abuse	11 (2)	0 (0)	0 (0)	0 (0)	3 (2)
Appropriate storage of potentially hazardous foods <sup>a</sup>	53 (10)	15 (2)	22 (2)	94 (17)	52 (31)
Total Errors	80	52	51	74	257
Avg # errors/show	4.2	4.0	5.7	4.1	4.4

<sup>a</sup>Denotes recommended food-handling practice

Additionally, they were asked for their thoughts about being potential role models for consumers. The students' oral responses were recorded and the students were asked to complete a brief questionnaire during the last 10 minutes of the class.

**Qualitative consumer response to chef practices**

Using a flyer distributed via E-mail, consumers were recruited for 60-minute focus groups. To participate, the volunteers must state that they enjoy watching television

cooking shows, be at least 18 years old, be the main preparer of food for their household, and not have any specialized food knowledge gained through coursework or career training. Participants received a \$10 gift card for participation. Prior to viewing the video clips, the consumers were asked questions regarding why they watched cooking shows, if they ever prepared anything they saw on the shows, and how useful they found the shows for getting ideas or learning cooking skills. Next, they were shown a photo of each chef, one at a time, and asked about their initial impression of the chef,

**Table 3. Video clips of chefs' handling practices shown to consumers and culinary students**

Description of food preparation practices	Food safety considerations
<p>Guy Fieri stuffed burgers with sautéed onions, bacon, chorizo sausage, and cheese. Fieri gathered ingredients from the refrigerator, then sautéed onions, bacon, and chorizo. Next he shaped and stuffed the burgers with the onion, bacon, chorizo mixture and slices of Swiss cheese, and began cooking the burgers in a pan on the stovetop. The next clip showed Fieri removing the burgers from the oven, where he had finished cooking them, and serving them.</p>	<p>No information was provided as to how to determine when the meat was adequately cooked.</p> <p>Cutting board used for meat could contaminate board used for uncooked items.</p> <p>Lettuce was stored below ground beef in the refrigerator.</p>
<p>Rachael Ray chopped fresh herbs, then mixed the raw meat mixture with grated onion, the chopped herbs, salt &amp; pepper. She mixed the ingredients with her hands, then formed the meatballs, grabbed a bottle of olive oil with unwashed hands, drizzled olive oil into the pan and dropped the meatballs into the pan one at a time. Next the clip cut to Ray finishing the cooking and pouring the meatballs from the fry pan onto a platter. One meatball missed the platter and rolled out of sight. Ray stated that the dish was great for parties because the meatballs could be left out all evening. She said, "They are perfectly fine to eat at room temperature, don't worry about it."</p>	<p>Failed to indicate how to tell if meatballs were adequately cooked. Since meatballs were added one at a time, some would reach the recommended cooking temperature while others were barely cooked.</p> <p>Oil container was contaminated when grabbed without washing hands.</p> <p>Time and temperature recommendations were ignored.</p>
<p>Paula Deen determined her chicken was adequately cooked by wiggling the leg joint with her fingers. She removed the chickens from the grill with her hands, licking her fingers between each of three chickens. Deen asked one of the friends to remove the beer can from the bottom of the chicken, which he did with a handkerchief that he pulled from his pocket.</p>	<p>Failed to use a thermometer to determine if the chicken had reached the recommended end point temperature.</p> <p>Used poor personal hygiene in serving.</p>
<p>Bobby Flay cut fresh mint for an uncooked sauce on the unwashed cutting board that had previously held raw squid. The raw squid on a platter was brushed with oil, sprinkled with salt and pepper, and carried to the barbeque, where it was placed on an open grill to cook. The clip then cuts to Flay removing the cooked squid and placing it on the same plate that previously held the raw squid.</p>	<p>Cross-contaminated equipment by placing cooked squid on the same plate that held the raw squid.</p> <p>Contaminated the sauce by chopping the mint on the unwashed cutting board and then placing the parsley in the sauce, which was served without cooking.</p>

whether or not they watch the chef's show, and how often they prepared or were likely to prepare a recipe by the chef. They were then shown a video clip of the chef and asked questions pertaining to their observations and the impact of what they saw on their own food-preparation practices.

**Quantitative assessment of consumer responses**

The attitudes revealed in the focus groups were used to create an online survey to quantify consumer response to celebrity chef practices. A consumer research firm (Tragon Corporation, Redwood City, CA) recruited participants and administered the online survey. The criteria for participation

were the same as for the focus groups. Participants were asked about cooking shows in general and how much they agree or disagree with statements about the chefs. They were shown the same video clips as the focus group participants and asked about their observations and cooking practices, including use of a thermometer.

**RESULTS**

**Content analysis of chefs' food-handling behavior**

Analysis of fifty-nine 20-minute episodes revealed that the most common food-handling error was failure to wash hands prior to beginning food preparation (98%) (Table 2). Almost

half of the time, (46%), handwashing was either mentioned or shown during the episode, but never handwashing for the recommended 20 seconds. Hosts were shown licking their fingers 5% of the time and touching their head, face, or hair 7% of the time. With respect to cross-contamination, ready-to-eat food or kitchen items were touched after handling raw meat without reference to or actual washing of hands prior to touching the items in 16 episodes (27%). Cutting boards were used without washing or mention of washing in 69% of the episodes. The host wiped his/her hands with a cloth towel or clothing in about one-third of the shows, (35%). In 52% of the shows, chefs added ingredients to their dish with unwashed hands, and in 11% of the episodes the host was shown sampling food with their hands rather than utensils. In a quarter of the episodes, the chefs handled the finished dish with their hands instead of utensils, and in 8% of the shows utensils were not washed between being used for raw and ready-to-eat foods. Chefs ate while cooking and while washing or mentioning washing meat or poultry in 10% and 3% of the episodes, respectively. In 45% of the shows, chefs tested meat for doneness without using a thermometer, and 8% mentioned an incorrect cooking temperature. Eight percent also exhibited temperature abuse or recommended serving food at an incorrect temperature.

The chefs varied in the frequency of their food-handling errors. Flay's *Boy Meets Grill* averaged the most errors per show, at 5.7, while Paula's *Home Cooking* averaged the fewest errors, at 4.0 errors/show. Fieri's *Big Bite* and Ray's *30 Minute Meals* averaged of 4.1 and 4.2 errors per episode, respectively (Table 2).

The most frequently observed positive food-handling behavior observed was hand washing or mention of hand washing during the course of the program (46%). Produce was washed in only 5% of the episodes. Raw and ready-to-eat foods were kept separate in 40% of the shows. The correct cooking temperature was mentioned in 12% of the episodes, while appropriate storage of potentially hazardous foods was viewed in over half of the shows (53%) (Table 2). Overall, 257 negative behaviors and 83 positive behaviors were documented (Table 4).

#### Attitudes and expectations of chefs in training: culinary students

Two 90-minute focus groups (group sizes 19 and 35, for a total n = 54) with culinary students (chefs-in-training) were used to gather information about their attitudes and beliefs about television celebrity chefs as role models for consumers. The culinary student focus groups were held at The Culinary Institute of America at Greystone, in St. Helena, CA. The students were in their first year of the program and the groups were held during the second week of their food safety class. The students ranged from 18 to 59 years old, with 78% of them 18–29 years old. Most (61%) were female, and 44% reported some college background. The majority, 72%, were Caucasian. Some chefs had members in their household who were at increased risk for foodborne illness because of age: 13% reported that a member of their household was under 13-years old and 39% reported a member over 55 years old.

Culinary students believed that people watch celebrity chefs primarily for entertainment. They noted that unlike Julia Child, with her comprehensive approach to selection and preparation, some celebrity chefs don't provide the details needed to actually prepare a recipe at home. Nevertheless, culinary students believed people enjoy watching celebrity chefs prepare items and look for new ideas that they might prepare or vicariously enjoy.

Culinary students thought that Guy Fieri was a great TV personality but not a good role model, because he did not practice safe food handling. They valued his support for local restaurants and found him a positive role model for getting men and children into the kitchen. They described Rachael Ray as a role model for time-pressed women and considered Paula Deen a grandmother figure. The culinary students' noted that Bobby Flay was the only television chef they would consider a qualified chef. Some remarked that he should know what he's doing since he had professional education at Cordon Bleu, while others mentioned at Cordon Bleu didn't have a food safety class in their curriculum. After seeing the clip, culinary students reported observing all the food-handling errors described in Table 4 and stated that they were appalled that Deen licked her fingers multiple times. Addi-

**Table 4. Positive and negative behaviors of celebrity chefs (n = 340)**

Television Show	Negative Behaviors % (n)	Positive Behaviors % (n)
Rachael Ray (30 Minute Meals with Rachael Ray)	24 (80)	8 (28)
Paula Deen (Paula's Home Cooking)	15 (52)	5 (18)
Bobby Flay (Boy Meets Grill)	15 (51)	2(7)
Guy Fieri (Guy's Big Bite)	21 (74)	9 (30)
Total	76 (257)	24 (83)

tionally, they mentioned that Flay used the same towel on everything with the assumption that he was cleaning.

Culinary students believed that consumers imitate what they see on TV, so the shows and chefs should be held to high standards. Some believed that the shows should be more

concerned with the ethics of what they are presenting. On the questionnaire completed after viewing the video clips, all culinary students responded that they wanted to be a good example to others (100%). A strong majority, 91%, believed that chefs should set a good example whether on TV or not;

**Table 5. Culinary student attitudes toward professional chefs' food-safety practices (n = 54)**

Question	Agree % (n)	Disagree % (n)	Not Sure % (n)
If I'm doing a demo for TV, I believe it is important to exhibit safe food-handling behaviors.	98 (53)	2 (1)	0 (0)
I think that chefs are role models for consumers.	78 (42)	20 (11)	2 (1)
All chefs should set a good example, whether they are on TV or not.	91 (49)	7 (4)	0 (0)
Celebrity chefs are good role models.	2 (1)	74 (40)	24 (13)
I want to set a good example for others.	100 (54)	0 (0)	0 (0)
If I'm not a television chef, I don't think I need to worry about setting a good example.	2 (1)	98 (53)	0 (0)
Chefs can help reduce the incidence of foodborne illness.	96 (52)	0 (0)	4 (2)
Consumers watch chefs for recipe ideas and entertainment, but not much else.	65 (35)	22 (12)	11 (6)
Television chefs sometimes fail to give consumers the information they need so that they can safely prepare the dish they are demonstrating.	96 (52)	2 (1)	2 (1)
Television chefs don't have time to wash hands and utensils, cutting boards, when they cook on TV.	24 (13)	69 (37)	7 (4)
The celebrity chefs just cook this way for TV. They would do it differently at home and/or in their restaurant.	39 (21)	26 (14)	35 (19)
<b>I think less of a television chef when they...</b>			
... don't wash their hands	80 (43)	17 (9)	4 (2)
... use their fingers when they could use a utensil	76 (41)	20 (11)	4 (2)
... use the same cutting board for raw and ready-to-eat food	94 (51)	6 (3)	0 (0)
... taste a dish with a used spoon (double-dip)	80 (43)	17 (9)	4 (2)
... taste a dish with their finger	63 (34)	28 (15)	9 (5)
I don't expect celebrity chefs to follow food safety recommendations when they cook on TV.	24 (13)	70 (38)	6 (3)
After graduation, I will continue to use a thermometer to check doneness of meat/poultry.	74 (40)	15 (8)	11 (6)
Chefs who fail to use a thermometer to check doneness of meat/poultry on television are not responsible/not skilled.	30 (16)	59 (32)	11 (6)
Chefs who cross-contaminate on television are not responsible/not skilled.	56 (30)	37 (20)	7 (4)
Chefs who condone consuming food left out for more than 2 hours on television are not responsible/not skilled.	46 (25)	41 (22)	13 (7)
Chefs who do not wash (or mention washing) their hands on television are not responsible/not skilled.	59 (32)	35 (19)	6 (3)

The number for each question differs because some respondents did not answer all questions.

however, only 74% thought that celebrity chefs actually were good role models (Table 5). They acknowledged that celebrity chefs sometimes failed to give consumers the information they need. The students were uncertain as to whether the behavior errors observed on TV carried over to the chefs' restaurant preparation. Only 24% excused failure to wash hands and kitchen surfaces on the basis of lack of time. The same percentage indicated that they didn't expect celebrity chefs to follow food safety recommendations when they cooked on TV. Culinary students thought less of celebrity chefs when they tasted a dish with their finger (63%), used their fingers when they could have used a utensil (76%), didn't wash their hands (80%), tasted a dish with a used spoon (double-dip) (80%), and used the same cutting board for raw and ready-to-eat food (94%) (Table 5).

### Consumer qualitative responses (focus groups)

Three 60-minute consumer focus groups were completed with California residents (group sizes 5, 5, and 7, for a total of  $n = 17$ ). Consumers were recruited from the U.S. Department of Agriculture-Agricultural Research Service (Albany, CA), a local crafting group (El Cerrito, CA) and a business office (Davis, CA). The majority of the participants were female (82%), Caucasian (88%), and aged 30–49 (56%). All had at least some college. A total of 30% of the households included someone at increased risk for foodborne illness because of age, with 6 percent having children under the age of 13 and 24% someone over the age of 55 living at home. Most (82%) indicated that they had no prior food-safety training.

Consumers noted that they watched cooking shows on television mostly for entertainment, but also to get ideas and learn cooking techniques. Overall, they enjoyed watching the instructional shows more than the competition ones because of the frenzied, cutthroat feeling portrayed in the latter, as well as consumers' inability to follow or replicate dishes that they saw being prepared. Most said that they tried some of the things that they saw the chefs do on the shows.

As hypothesized, participants were familiar with and liked each chef. The discussions indicated that participants were observing the chef's techniques and some were learning new procedures. After seeing Guy Fieri's clip on burger preparation, one person admitted that he didn't know about over-handling the meat, while another questioned whether the sausage stuffed inside the burger need to be cooked to the same internal temperature as the ground beef itself. When asked how Fieri knew that the burgers were adequately cooked, several people announced that he didn't check the temperature. While no one said what the temperature should be, many knew that this was the recommended way to tell when meat is properly cooked. Most also said that they don't take the temperature of their meat when cooking burgers and that they can tell when their burgers are cooked either by touch or by cutting it open. One mentioned pressing on the meat and looking at the juices, and one participant even

claimed, "the rawer, the better" in response to how to tell when the burger is adequately cooked.

Upon viewing the clip of Paula Deen, the participants thought that it was unprofessional and unsafe that Deen was wearing a long-sleeved jacket while grilling and unanimously gasped when they saw her licking her fingers and then touching the chicken with her hands to serve it. Participants were further disgusted when Deen's friend pulled a handkerchief out of his pocket to assist with handling the chicken. When asked how Deen knew when the chickens were adequately cooked, nearly everyone replied that she didn't and that she should have used a thermometer, though some mentioned that you could tell by touch or by cutting into the meat. Most also noted that they didn't use a thermometer when they cooked chicken at home.

The participants gasped when they watched Ray touch the olive oil bottle after handling raw ground meat without washing her hands first, and some questioned her recommendation to let the meatballs sit out at room temperature. Additionally, they were repulsed by the meatball spill and thought that Ray should have been more clear about not serving it.

Everyone noticed that Flay placed the cooked squid back onto the plate that had previously held the raw squid. They also thought that placing the mint next to the raw squid on the cutting board was an unsafe practice. One participant thought that it was safe to consume raw squid and didn't see a problem prepping them and serving them on the same cutting board.

When asked if they believe that celebrity chefs follow safe food-handling recommendations when cooking for television, the response was an overwhelming "no." Even though most participants said that they watch cooking shows for entertainment, many agreed that if food safety information could be incorporated while keeping the show entertaining, they would continue to watch or even be more inclined to watch. They agreed that they enjoy knowing how and why to do things so that they learn in the process. Most people thought that they personally avoided foodborne illness, but that other people may need extra information.

### Consumer quantitative response: online survey

Almost 200 consumers (197) participated in the online survey. The majority of respondents were female, 66%, and Caucasian, 73%. The consumers surveyed ranged from 18 to 69 years old, with most, 59.4%, being 40 to 69 years old. Responses to attitude and behavior questions did not differ significantly by age or gender.

When asked their overall opinion of the chefs, respondents were generally positive, with Fieri and Ray receiving the highest ratings; 60% or more considered preparing a recipe they saw at least once a month, and 40% or more said they had actually prepared a recipe from a show (Table 6).

When asked about thermometer use in their own kitchens, most (76%) of the consumers said that they would use a meat thermometer when cooking whole chicken and 60% claimed



**Table 6. Consumers' degree of liking for television celebrity chefs (n = 197)**

	Guy Fieri % (n)	Paula Deen % (n)	Rachael Ray % (n)	Bobby Flay % (n)
<b>Degree of liking chef</b>				
Mean Liking <sup>d</sup>	7.6 <sup>a</sup>	6.3 <sup>c</sup>	7.3 <sup>ab</sup>	7.2 <sup>b</sup>
<b>Frequency of watching show</b>				
At least once a week	43 (85)	21 (41)	34 (67)	32 (63)
Every 2–3 weeks	26 (51)	17 (33)	20 (39)	23 (45)
Once a month	15 (30)	16 (32)	18 (35)	16 (32)
Every few months	13 (26)	24 (47)	18 (35)	18 (35)
Never	4 (8)	22 (43)	10 (20)	11 (22)
<b>How often do you consider preparing a recipe seen on the show</b>				
At least once a week	16 (32)	10 (20)	22 (43)	14 (28)
Every 2–3 weeks	24 (47)	19 (37)	22 (43)	22 (43)
Once a month	22 (43)	19 (37)	20 (39)	26 (51)
Every few months	27 (53)	24 (47)	23 (45)	23 (45)
Never	10 (20)	27 (53)	12 (24)	15 (30)
<b>How often to you actually prepare one of the recipes</b>				
At least once a week	9 (18)	7 (14)	12 (24)	9 (18)
Every 2–3 weeks	18 (35)	14 (28)	18 (35)	15 (30)
Once a month	29 (57)	20 (39)	23 (45)	25 (49)
Every few months	28 (55)	24 (47)	31 (61)	28 (55)
Never	17 (33)	35 (69)	16 (32)	22 (43)

<sup>d</sup>Based upon a 9 point scale when 9 = like extremely and 1 = dislike extremely. Calculated using LSD ANOVA. Homogenous groups are represented by the same letter and are significantly different from other groups at the 95% level.

that they would use one when cooking roasts (*Table 7*). Upon viewing the video clip of Guy Fieri preparing burgers, the majority of the participants (89%) said that they would like to know how Fieri knew the burgers were cooked. Over two-thirds agreed that if Guy Fieri used a thermometer, they would consider using one, too. Conversely, half of the respondents agreed that if Fieri did not use a thermometer and only used the recipe cooking time, they would do the same. When they cooked burgers at home, 22% indicated they sometimes used a thermometer, but the method they used most often was to cut the burger open and look at the color of the meat (*Table 8*).

When asked if they would wiggle the joint as Paula Deen to check if chicken was done, responses were almost equally divided, with 49% saying “yes” and 51% saying “no” (*Table 7*). Thirty-eight percent of consumers responded that the method they use most often to check when whole chicken is cooked is to cut it open and look at the color of the meat. Only 31%

said they used a thermometer when cooking whole birds. Additionally, when asked what method they use to tell when chicken parts are cooked, the most frequent response, 52%, was to cut it open and look at the color of the meat (*Table 8*).

Role modeling for food-handling and cleaning was assessed by chef hygienic practices (*Table 9*). Paula Deen was shown licking her fingers and then using her hands, without washing them, to serve the chicken. Participants indicated that they primarily use utensils like forks and spatulas or tongs to place prepared food onto plates, but 20% said that they used hands and utensils together. Further, 61% admitted that they at least sometimes used their finger to taste test a dish. Survey participants acknowledged that, like Rachael Ray, they sometimes touched other items after touching raw meat without first washing their hands. Similarly, like Bobby Flay, they prepared ready-to-eat foods on the same cutting board as raw foods without washing in between.

**Table 7. Consumers' food-handling behaviors and attitudes (n = 197)**

Attitude or behavior	% (n)
<b>For which of the following foods would you use a food thermometer?</b>	
When cooking steaks	33 (65)
When cooking roasts	60 (118)
When cooking burgers	15 (60)
When cooking whole chicken or turkey	76 (150)
When cooking chicken pieces	9 (18)
<b>Thinking back to the Guy Fieri video clip you saw, are you interested in knowing how he knew the burgers were done?</b>	
Yes	89 (175)
No	11 (24)
<b>If Guy Fieri used a thermometer to tell when burgers were done for a recipe that I was preparing, I would consider using one, too.</b>	
Definitely agree	26 (51)
Agree	37 (73)
Neither agree nor disagree	20 (39)
Disagree	9 (17)
Definitely disagree	8 (16)
<b>If Guy Fieri did not use a thermometer, and only used the recipe cooking time, I would do the same. Using a thermometer is not necessary.</b>	
Definitely agree	20 (39)
Agree	32 (63)
Neither agree nor disagree	27 (53)
Disagree	15 (30)
Definitely disagree	6 (12)
<b>Thinking back to the Paula Deen video clip, you may have noticed Paula Deen checked that the chicken was done by wiggling the joint. Would you use this technique at home?</b>	
Yes	49 (97)
No	51 (100)

**Table 8. Techniques used by consumers to tell when meat or poultry is adequately cooked (n = 197)**

Method of assessing adequacy of cooking	Frequency of use	
	Sometimes <sup>a</sup>	Most often <sup>b</sup>
<b>When you are cooking a burger, what methods do you use to tell if it is done cooking?</b>		
Cut it open and look at the color of the meat	67 (132)	41 (81)
Press on the burger	64 (126)	30 (60)

*Table 8 Continued on next page.*

**Table 8. Techniques used by consumers to tell when meat or poultry is adequately cooked (n = 197) (cont.)**

Method assessing adequacy of cooking	Frequency of use	
	Sometimes <sup>a</sup>	Most often <sup>b</sup>
<b>When you are cooking a burger, what methods do you use to tell if it is done cooking?</b>		
Use another method or do not cook burgers	2 (4)	2 (4)
<b>When you are cooking a whole chicken, what method do you use to tell if it is done cooking?</b>		
Cut it open and look at the color of the meat	64 (126)	36 (73)
Use a thermometer to check the temperature	64 (126)	30 (60)
Look for clear juices	50 (99)	15 (30)
Use the time specified in the recipe	43 (85)	5 (10)
Wiggle the joints	23 (45)	7 (14)
Use another method or do not cook whole chicken	5 (10)	5 (10)
<b>When cooking chicken parts, such as drumsticks, breasts, or thighs, what method do you use to tell if it is done cooking?</b>		
Cut it open and look at the color of the meat	68 (134)	50 (100)
Use the time specified in the recipe	48 (95)	12 (24)
Look for clear juices	43 (85)	15 (30)
Use a thermometer to check the temperature	39 (77)	18 (35)
Use another method or do not cook chicken parts	5 (10)	4 (8)
<sup>a</sup> Multiple answers accepted		
<sup>b</sup> Only one answer accepted		

**Table 9. Consumers' response to chefs' cooking practices (n = 197)**

Practice	% (n)
<b>Paula Deen used her hands to remove the chicken from the grill and served it to her guests.</b>	
<b>When placing prepared food onto plates, which of the following methods to you use most often?</b>	
Utensils like forks, spatulas, or tongs	63 (124)
Hands and utensils together	20 (39)
I let people serve themselves (family style)	9 (18)
My hands	6 (12)
Pour food directly from pan onto plate	2 (4)
Frequently	24 (47)
Sometimes	29 (57)
Rarely	26 (51)
Never	13 (26)

*Table 9 Continued on next page.*

**Table 9. Consumers' response to chefs' cooking practices (n = 197) (cont.)**

Practice	% (n)
<b>Thinking back to the Rachael Ray video clip, you may have noticed Rachael Ray grabbed her olive oil bottle after handling raw ground beef. How often would you say you touch/handle items after touching raw meat or chicken without washing your hands?</b>	
Always	4 (8)
Frequently	10 (20)
Sometimes	19 (37)
Rarely	32 (63)
Never	36 (71)
<b>Thinking of the Bobby Flay video clip, you may have noticed he prepared raw squid and fresh mint on the same cutting board. How often would you say you prepare your meal using the same cutting board for ready-to-cook and ready-to-eat ingredients?</b>	
Always	3 (6)
Frequently	7 (14)
Sometimes	19 (37)
Rarely	27 (53)
Never	43 (85)
<b>Rachael Ray mentioned it was OK to leave meatballs out at room temperature and snack on them throughout the night. Which of the following statements best describes your opinion on serving meatballs? (Select one answer.)</b>	
It would be best to only leave them out for about 2 hours	46 (91)
It would be best to serve meatballs in a chafing dish or crock pot	28 (55)
If they are thoroughly cooked leaving them out doesn't matter	14 (28)
Meatballs will still taste good even if they're not hot	12 (24)
Temperature is not important with meatballs	1 (2)

Ray also mentioned that it was ok to leave the meatballs out at room temperature and let her guests snack on them throughout the evening. When asked their opinion about this recommendation, most, 74%, thought it would be best to leave the meatballs out for only about 2 hours or serve meatballs in a chafing dish or crockpot. However, 14% thought that this was not a problem if the meat was thoroughly cooked (Table 9).

Most respondents were tolerant of celebrity chefs' food-handling practices. The consumers believed that the chefs cook differently for television than they would in their own home or restaurant (Table 10). Almost three-quarters of respondents indicated they expected chefs to follow food-safety recommendations when they cook on television. Only 25% believed that chefs don't have time to wash hands, utensils and cutting boards. Further, 44% reported that chefs sometimes fail to give viewers information they need to safely prepare the dish being demonstrated. However, consumers

believed that a food thermometer was useful even though the chefs didn't always use one.

Consumers were impressed when chefs washed their hands or used a food thermometer (Table 11). Respondents indicated they thought less of chefs when the chef licked their fingers instead of washing them (74%), used the same cutting board for raw and ready-to-eat food (68%), tasted a dish with a used utensil (58%), tasted with their fingers (47%), and used fingers instead of utensils (39%).

## DISCUSSION

Keeping hands and surfaces clean is an important measure to avoid cross-contamination and thus reduce the risk of foodborne illness. Behaviors commonly seen in television cooking shows, such as failure to wash hands and drying hands on a reusable cloth towel, have a high potential to lead to foodborne illness. In this sampling of cooking show episodes, 98% of the episodes did not show the chefs washing

**Table 10. Consumer expectations regarding chefs' handling behaviors (n = 197)**

Behavior	Agree %	Neither agree nor disagree %	Disagree %
The chefs cook this way for television. They would do it differently at home or in their restaurant.	61	17	21
I don't expect chefs to follow food safety recommendations when they cook on television.	15	11	74
Chefs don't have time to wash hands, utensils, and cutting boards when they cook on television.	25	11	64
Chefs sometimes fail to give me the information I need so that I can safely prepare the dish they are demonstrating.	44	31	25
Chefs don't use a food thermometer, so it must not be necessary.	10	19	71
If the chef doesn't need a thermometer, I don't either.	16	19	64

**Table 11. Consumer attitudes toward chefs' handling practices (n = 197)**

Indicate your opinion of television chefs when they do each of the following while preparing a meal ...	I think more of them %	Does not change my opinion %	I think less of them %
When they wash their hands	82	13	5
When they use a thermometer to test the doneness of meat and chicken	61	36	3
When they lick their fingers instead of washing them	6	20	74
When they use the same cutting board for raw and ready-to-eat food without washing in between	8	24	68
When they taste a dish with a used utensil (double dipping)	10	32	58
When they taste a dish using their fingers instead of a utensil	14	39	47
When they use their fingers rather than utensils to serve an item	16	45	39

their hands before beginning to cook. In addition, chefs used a cutting board without washing or mentioning washing it. This is consistent with the behavior observed in earlier work suggesting that in general chefs have not modified their behavior to demonstrate hygienic practices (5, 20). Survey participants acknowledge that they, at least sometimes, follow the same unsafe practices modeled by chefs, such as touch/handle items after touching raw meat or chicken without washing their hands. While the audience is seeking entertaining and inspiring culinary creations, a comment as to washing could be incorporated into the program without distracting from its artistic and creative nature. Exhibiting this behavior, using visuals, and verbally mentioning washing,

are ways in which television celebrity chefs could emphasize food safety and reinforce safe handling by consumers.

Harmful bacteria can spread and potentially cause illness through cross-contamination. The Partnership for Food Safety Education (PFSE) (18) advises using separate cutting boards for fresh produce and for meat, poultry and seafood, as well as not placing cooked food on a plate that previously held raw meat, poultry, eggs or seafood. Consistent with previous findings (15), both of these food safety violations were witnessed in this sampling of television cooking shows. Demonstrating proper separation of potentially hazardous and ready-to-eat foods is an important step toward preventing foodborne illness and could easily be

incorporated into television cooking programs in order to emphasize to the consumer the importance of this behavior.

The PFSE (18) recommends cooking foods to specific temperatures to kill pathogens and reduce the risk of foodborne illness. The only accurate way to ensure cooking foods to a safe internal temperature is by using a thermometer. However, in nearly half of the episodes, the host did not use or mention using a thermometer to test for doneness. Past research has shown that consumers do not cook foods to the appropriate temperature and are therefore at increased risk of transmitting foodborne illness (5, 20, 21). Some programs, such as America's Test Kitchen and Good Eats, do include temperature monitoring to ensure a safe end point temperature has been reached without overcooking. It seems feasible and would be useful for the celebrity chefs to demonstrate how to use a thermometer properly and to note appropriate end point temperatures. The majority of the survey participants indicated that they think more of the chefs when they use a thermometer to test the doneness of meat. Since consumers tend to mimic television celebrity chefs and periodically prepare the dishes they see demonstrated, if the chefs used a thermometer and gave information on proper temperatures, consumers could be more likely to adopt this practice.

Keeping foods at appropriate storage temperatures slows down bacterial growth and reduces the risk of foodborne illness. Time and temperature abuse observed in this sample of shows is consistent with prior analysis of cooking show practices (13, 15). The fact that survey participants responded that they were not concerned about leaving meatballs at room temperature all evening indicates that consumers can be misled by inappropriate handling recommendations from celebrity chefs.

Since most of the consumers said that they tried some of the dishes they saw chefs prepare, there is both a likelihood of consumers adopting unsafe food-handling behaviors, and a high potential for the chefs to be positive role models. In both the focus group and the online survey, consumers

agreed that television chefs sometimes failed to give them the information they need to safely prepare the recipes demonstrated. This suggests that the television audience would value additional information.

The purpose of this study was to document the positive and negative food safety messages in a subset of television cooking shows and to evaluate consumers' and culinary students' attitudes toward the chefs' food-handling practices. Based on this sampling of episodes, television celebrity chefs still don't follow recommended food-handling behaviors. The culinary students expressed the belief that chefs have an ethical and professional obligation to practice proper food handling. They consider failure to follow proper food handling unprofessional, and they don't want to be guilty of this practice in their careers. This implies that failure to follow safe food-handling behavior is viewed as incompetence by their professional colleagues in training.

Television celebrity chefs are ideal role models for food safety messaging because of their popularity; therefore, they could serve as important resources for consumer food-safety education. This study documented that consumers were aware of and repelled by some mishandling behaviors, didn't recognize other behaviors as inappropriate, and wished for additional information when critical guidelines were omitted. Consumers reported that they prepared at least some of the recipes they saw demonstrated, and they expected chefs to practice safe behavior. These findings will be communicated to the chefs and their program producers to urge greater adherence to safe-handling recommendations. Increasingly, food companies are being held legally liable for foodborne illnesses. In the future, will cooking programs also be held responsible if they fail to model safe-handling practices?

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