

ABSTRACT

RAYMOND, BENJAMIN ELIJAH. Food Safety Communication in Social Media. (Under the direction of Dr. Benjamin Chapman.)

Foodborne illness affects millions annually in the US. There is an absence of research on food safety and communication through social media and how these relatively new systems may affect food safety knowledge and action. A content analysis presented within examines the role of YouTube how to recipes on beef hamburgers and the potential food safety consequences of the new media format. A survey of mom bloggers around norovirus knowledge and attitudes provides data with which to aid in design of food safety outreach, both through both social and traditional media. Finally a model blog post for a novel method of sharing and engaging around food safety in social media is presented.

Chapter one introduces the current knowledge around norovirus and Shiga toxin producing *E. coli*; social media and the unique opportunity and challenges presented; and why the research is important in light of learning theories. Chapter two will cover content analysis of hamburger how-to videos to generate data that may be used to better understand the current state of food safety behavior demonstrated within. A survey of mom bloggers in chapter three provides insight into the state of knowledge of mom bloggers on norovirus and why some media sources are considered more trustworthy than other for health information. Finally chapter four presents a blog post on the topic of cooking inside the dishwasher as a model for engagement and communication on a food safety topic that appears in social media outlets.

It was found that YouTube how to videos on hamburger cooking are likely to teach and promote methods of preparing hamburgers that might produce risky finished food. Mom

bloggers are generally aware of norovirus and its symptoms, but have a poor understanding of the role food plays in transmission. Further, specific attributes of both online and other media forms contribute to trust building within the audience and may allow for higher impact risk communication. Engaging with your audience contributes to learning and behavior change, and in this light the model blog post is presented to contribute to food safety communication through social media outlets.

© Copyright 2014 by Benjamin E. Raymond

All Rights Reserved

Food Safety Communication in Social Media

by
Benjamin E. Raymond

A thesis submitted to the Graduate Faculty of
North Carolina State University
in partial fulfillment of the
requirements for the degree of
Master of Science.

Food Science

Raleigh, North Carolina

2014

APPROVED BY:

Dr. Benjamin Chapman
Committee Chair

Dr. Andrew Binder

Dr. Anne McLaughlin

Dr. LeeAnn Jaykus

DEDICATION

Dedicated to my wonderfully beautiful, incredibly patient, and always understanding fiancé,
Rachel.

BIOGRAPHY

Just a food safety nerd from Vermont, its nearly South Canada.

ACKNOWLEDGMENTS

I would like to thank Dr. Chapman for his patient support during my pursuit of food safety science and the entire group that has helped with idea generation and implementation along the way.

Dr. Anne McLaughlin, Dr. Andrew Binder, and Dr. Lee-Ann Jaykus for their invaluable guidance as committee members.

Katrina Levine for her assistance in distributing survey incentives to participants.

Thanks to Meaghan Kowalcyk and Lily Yang for help identifying mom bloggers to include in the recruitment phase of chapter 4.

Lily Yang for her assistance in coding YouTube behaviors for hours on end, and then doing it all over again the next day.

Dr. David Marx for statistical consulting and aide.

TABLE OF CONTENTS

LIST OF TABLES.....	vii
LIST OF FIGURES	viii
CHAPTER 1. INTRODUCTION.....	1
CHAPTER 2. LITERATURE REVIEW	7
SCOPE OF PROBLEM:.....	7
NOROVIRUS	7
GENETIC VARIANTS	10
MITIGATION AND PREVENTION	11
COHORTING	12
SANITATION	12
SHIGA TOXIN PRODUCING <i>ESCHERICHIA COLI</i> :	15
<i>ESCHERICHIA. COLI</i> O157:H7	16
NON-O157: H7 STECS.....	17
IMPACT AND DISEASE OUTCOME.....	18
SOURCES:	19
<i>Host Animals</i>	19
<i>Contaminated Foods</i>	20
TRANSMISSION:	20
PROCESSING AND PREVALENCE.....	22
MITIGATION	22
CONSUMER PERCEPTION OF BEEF SAFETY.....	23
CONSUMER HANDLING OF BEEF.....	24
TARGET AUDIENCE:	25
SOCIAL MEDIA VERSUS TRADITIONAL MEDIA AND CHANGES IN WEB.....	26
<i>Web 1.0 vs. 2.0</i>	26
<i>Traditional and Social Media in Risk Communication</i>	27
<i>Social Media</i>	27
NECESSITY OF FOOD SAFETY RISK COMMUNICATION PRESENCE ON SOCIAL MEDIA NETWORKS	28
POTENTIAL PITFALLS OF SOCIAL MEDIA PRESENCE:	29
SOCIAL MEDIA APPLICATIONS OR PLATFORMS:	30
<i>Twitter</i> :.....	30
<i>The Users of Twitter</i> :.....	32
<i>YouTube</i> :.....	32
<i>Blogs</i> :.....	33
BEHAVIOR CHANGE AND LEARNING THEORY:	34
<i>Social Cognitive Theory (Social Learning Theory) and Self Efficacy</i>	34
<i>Self-Regulation and Self-Efficacy</i>	35
<i>Past Application to Health Behavior Learning</i>	35
<i>Theory of Reasoned Action (TRA)</i>	36
<i>Theory of Planned Behavior</i>	37
<i>Behavior Change Model for Internet Interventions</i> :	39

CHAPTER 3. YOUTUBE AND HAMBURGER: A CONTENT ANALYSIS.....	41
ABSTRACT:	41
YOUTUBE, STECS, AND BURGER HOW-TO VIDEOS.....	42
MATERIALS AND METHODS:	45
<i>Video Selection</i>	45
<i>Coding Content</i>	46
<i>Content Analysis</i>	47
RESULTS:	47
DISCUSSION:.....	48
<i>Limitations:</i>	51
TABLE 3.1 CODING SCHEDULE DEFINITIONS.....	52
CHAPTER 4. MOM BLOGGERS AND NOROVIRUS.....	57
ABSTRACT:	57
INTRODUCTION:.....	57
MATERIALS AND METHODS:	59
<i>Survey</i>	59
<i>Instrument development</i>	59
<i>Recruitment</i>	60
RESULTS:	62
<i>Trust</i>	62
<i>Awareness</i>	62
<i>Previous Experiences</i>	63
<i>General Norovirus Knowledge</i>	63
DISCUSSION:.....	64
LIMITATIONS.....	66
MOM BLOGGER TABLES.....	74
Table 1. Questions 4 and 5. Difference in Attributes that Build Trust and Reliability; Online vs. Traditional Media.....	74
Table 2. Questions 6 and 7. Perception of the most common cause of and symptoms of norovirus.....	74
Table 3. Questions 12 and 13. General Knowledge of Norovirus.....	75
Table 4. Question 14. Return to Social Activities.....	76
Table 5. Question 19. Mitigating the Transmission of Norovirus.....	76
Table 6. Question 21. Public Restroom Hygiene Habits.....	76
Table 7. Question 22. Bathroom Hygiene.....	77
CHAPTER 5. CONCLUSION WITH DISHWASHER BLOG POST.....	78
PROJECT OVERVIEW	78
MOM BLOGGERS AND NOROVIRUS.....	78
YOUTUBE HOW TO VIDEOS: LEARN TO COOK HAMBURGERS ONLINE	79
FINAL CONCLUSIONS	80
BLOG POST	81
APPENDIX.....	97
APPENDIX A	98
APPENDIX B	109

LIST OF TABLES

Table	Title	Page
Table 2.1	Cost of STEC Illness.....	21
Table 2.2	Common food vectors.....	21
Table 3.1	Coding schedule definition	52
Table 3.2	Comparison of positive and negative behaviors by location	54
Table 3.3	Chi square testing behaviors by location	54
Table 3.4	Significance of positive to negative behavior ratios	55
Table 4.1	Difference in attributes that build trust in online vs. traditional media	73
Table 4.2	Perception of the most common cause of and symptoms of norovirus	73
Table 4.3	General knowledge of norovirus.....	75
Table 4.4	Return to social activities.....	75
Table 4.5	Mitigating transmission of norovirus.....	75
Table 4.6	Public restroom hygiene habits.....	75
Table 4.7	Bathroom hygiene.....	76

LIST OF FIGURES

Figure	Title	Page
Figure 4.1	Trusted sources of online health information.....	67
Figure 4.2	Attributes of online and traditional media that build trust	68
Figure 4.3	Return to social activities	69
Figure 4.4	Preferred sanitizing products.....	69
Figure 4.5	Perception of likelihood of norovirus related outcomes.....	70
Figure 4.6	Performing behaviors to prevent norovirus transmission.....	70
Figure 4.6	Public restroom diaper changing	71
Figure 4.7	Perceived importance of helping to stop norovirus transmission.....	71
Figure 4.8	Perceived important behaviors to stop or slow spread of norovirus	72

CHAPTER 1. INTRODUCTION

Learning new skills and knowledge by watching YouTube videos is the new normal. Checking mom blogs for advice, money savings tips, and interesting content is now part of motherhood for millions of women and men(114). Cooking methods are promoted online with seemingly little or no regard for the safety ramifications they may carry, facilitated by widespread Internet access that reaches the majority of Americans (according to the 2012 census, 74.8% of American homes have Internet access(29, 145)). The current state of knowledge regarding food safety and risk communication practices in the above described mediums is either entirely unknown or research is currently thin. Without data on the food safety risk communication and the audiences within these social mediums, outreach and education is without valuable insight and guidance that may result from better understanding of the target audience and methods that will be most effective.

YouTube is a video hosting service that allows for users to upload video content and view content uploaded by others. The amount of available content is growing at a rate of 100 hours of content uploaded per minute of each day. Users spend an incredible amount of time viewing monthly; looking for a variety of content. This is important because people are learning how to cook this way, are looking for guidance, go to the Internet for information and to confirm beliefs and are influenced by the media they consume.

From a microbiological risk standpoint, Shigatoxin producing *E. coli* (STEC) are important pathogens in public health, resulting in 265,232 infections annually. An estimated 175,905 of these infections are foodborne and beef has been identified as an important and prevalent source of these illnesses despite the industry's attention to pathogen control.

In addition to the suffering from illness, E. coli infection costs approximately 289 million dollars in lost wages, medical care, and lost quality of life(17, 124). Beef is the implicated food in 41% of the outbreaks, with ground beef responsible for 68% of the beef related outbreaks (49,042 illnesses). It is understood that consumers are watching YouTube videos about how to prepare hamburgers and that hamburgers are potentially risky to prepare and consume, but it is not known what consumer may be learning. One of the most important ways people learn new behaviors is through modeling the behavior of others(12, 13).

Researchers utilize various learning and behavior theories to predict why one will behave in a given way, or how one may learn new information or skills. Predicting the impact on knowledge or skills of a given media may aide in the understanding the importance of that medias effect on consumer behavior. The Social Cognitive Theory (SCT) predicts that people learn new skills and behaviors by observing and then modeling others. Other important aspects are outcome expectations, self-efficacy, self-regulation and goal setting. YouTube how-to videos on cooking hamburgers may affect some or all of these aspects of learning new behavior. Users may observe and emulate the behavior of the video's host, increase sense of self-efficacy or the sense that one is capable of performing a given behavior, as it is shown or described that the cooking process is simple and straightforward, and they may even help set the outcome expectation that modeling the behavior will lead to a delicious hamburger.

While beef safety can be improved at every step in the process from raising cattle until a burger lands on a plate, consumers can ensure safety of their meal by cooking the burger to an internal temperature of 160°F(61, 147).

It is thus likely that virus may learn new skills that will effect the safety of the food (hamburgers) they prepare after viewing how to videos on the topic of hamburgers. Working on the premise that viewers may learn new skills or reinforce old behaviors, positive or negative, it is important to identify and survey the behaviors that are most likely to be learned.

Content analysis was performed to produce quantifiable data that may be statistically analyzed to allow for the aforementioned comparison by the creation of objective, replicable data from media such as print, video, or audio media. A coding schedule was developed to allow two researchers (raters) to view and record behaviors shown in videos selected for the study. These answers could then be compared for inter-rater reliability and the resulting data analyzed to test the three hypotheses. Content analysis is key to this study as it creates a comprehensive data set describing behavior frequency that would not otherwise be possible to compare.

Consumers are likely to be exposed to greater ratio of shown negative behaviors to possible negative behaviors versus shown positive behaviors to total possible positive behaviors. In light of the SCT, it is expected that the increased amount ratio of negative to positive behaviors may lead to risky food preparation practices and ultimately foodborne illness in some cases.

Another unexamined Internet group that is influential online and in direct care of a group vulnerable to food borne illness, is Mom Bloggers. Often targeted by marketers and marketing researchers, mom bloggers are diverse group with an estimated 3,900,000 active bloggers in the US alone(114). Little is known about the food safety knowledge or attitudes held in general and specific to norovirus. The current state of knowledge regarding this group is predominantly aimed at market research and little is known about knowledge or attitudes around norovirus(107, 114, 151). Norovirus is the most common cause of foodborne illness. Some illuminating statistics about norovirus; It causes illness in 19 to 21 million per year in the US alone with approximately 400,000 seeking medical treatment, 56 to 71 thousand hospitalizations and 570-800 deaths(73). The typical symptoms include nausea, vomiting, diarrhea, and abdominal cramps and less often fever. Incubation time is between 24 and 48 hours with acute onset of symptoms. Norovirus is easily transmitted and highly infectious, as few as 100 viral particles may lead to infection, asymptomatic shedding can occur for greater than two weeks, immunity is not permanent, large strain diversity, and they are highly stable to environmental conditions such as heat, cold, and disinfectants such as alcohol or chlorine(94, 98, 111, 113, 141). Lastly, Norovirus is the most common cause of acute gastroenteritis among children under 5 years of age, a group that mom bloggers are or have cared for. Without knowing how to build trust and influence risk communication dialogue, it is unlikely to make a meaningful impact in reducing norovirus with engagement and outreach to this group. Further knowing the current state of knowledge and attitudes of mom bloggers as compared to the general population may allow for better risk communication in

different mediums and with more tailored messages with the aim of reducing the spread of norovirus infections in the US. Results from this study will be compared with results from another similar survey of the general US population.

Cooking in the dishwasher is not a new idea. Recently, however it has been promoted in a variety of online media outlets as a way to cook everything from fish, to beef, poultry, vegetables, and desserts(6, 22, 50, 109, 132). It is assumed by the authors and interviewees in the articles that the dishwasher will be hot enough to cook the food in it. It is touted as a foolproof method to cook fish, and an energy saving cooking method. Safety is not mentioned, or is glossed over as not a problem if you use high heat settings.

Currently there is no data to support the safety of dishwasher cooking. After calling some of the major dishwasher manufacturers and some odd conversations, it was established that dishwasher's design and potential maximum temperatures varied based on manufacturer, model, and home hot water. In the goal of gaining understanding of the process and its potential safety or lack of, an experiment was designed to test the hypothesis that a dishwasher would not safely cook poultry. To test this temperature data loggers were inserted into various containers containing chicken breast, and in the dishwasher outside of any containers. This data will be presented using current risk communication and marketing methods in blog format.

Hamburgers how to videos, mom bloggers and norovirus, and a dishwasher simmered chicken breast have a much in common. Food safety on the Internet is a relatively new topic with sparse research around the topic. YouTube videos around hamburger recipes are

lacking in positive food safety behaviors, and show a great number of negative behaviors. It is likely that this will lead to increased learning of negative food safety behaviors. Mom bloggers are knowledgeable about some aspects of norovirus, and concerned or care to know more to limit the spread of norovirus. Risk communication tailored to this audience may be developed to increase knowledge and help slow the spread of norovirus. Dishwasher cooking is fraught with potential pitfalls to prepare unsafe food. These three chapters cover important, but previously neglected topics that can change the way consumers view and handle food, either increasing the likelihood of foodborne illness, or reducing it through positive risk communication.

CHAPTER 2. LITERATURE REVIEW

Scope of Problem:

In the United States, Foodborne illness strikes 48 million people, with over 55,000 hospitalizations and 1351 deaths annually (125). Norovirus is the leading cause of foodborne illness, accounting for 58% of disease (125). Norovirus costs approximately 2.002 billion dollars per year due to over 5.4 million illnesses(17). Shiga toxin producing *Escherichia coli* (STEC) causes 175,905 illnesses per year and costs 298 million dollars(17). While norovirus infection exhibits very low mortality rates, the high number of infections and ease with which it spreads make it one of the most damaging foodborne infections in the United States. STEC infection severity and outcomes are considered of greater significance and because of severe sequelae in addition to significant treatment expense.

Norovirus

Norovirus, a non-enveloped RNA virus that infects the gut and intestines of humans, and is the most common cause of foodborne illness (FBI) with approximately five million cases in the United States annually accounting for nearly 58% of all foodborne illnesses with known etiology (125). The U. S. Centers for Disease Control and Prevention (CDC) estimate approximately twenty million cases of norovirus each year when all transmission routes are included. As it is difficult to determine whether a norovirus outbreak is a result of person-to-person transmission, or contaminated food (or some combination), estimates of foodborne norovirus are lower than the total number of reported cases each year. (124) This is exacerbated by the fact that the disease is under diagnosed and under reported to public

health authorities. While infection is generally not life threatening, and damaging complications are rare, it can be dangerous in susceptible populations. The young, old, pregnant and, immunocompromised (YOPI) may experience more serious effects with an estimated 149 deaths per year due to foodborne transmission (110). YOPI individuals may experience greater duration of symptoms as well as increased shedding of viral particles(137). In a past study of three chronic shedders, all with previous underlying health issues resulting in impaired immune response, shedding of viral particles was prolonged and at a increased number of particles. Multiple nosocomial infections may have resulted from infection by chronic shedders.

Norovirus is one of five genera within the family *Caliciviridae*. The genus is further divided into five genogroups over 34 genotypes based on nucleic acid sequence analysis. Of the five genogroups I, II, and IV infect humans, while III and V effect animals (7)

GII.4 is the causative agent behind most norovirus pandemics worldwide with a new variant appearing every two to three years that replaces the previous variant as the dominant strain(36, 74, 112, 130) While the new variant if often the causative agent behind increased outbreaks, it is also possible that it does not increase outbreak activity(153). A new strain, Sydney, emerged in 2012, and spread across the globe, including the United States. Sydney caused over 50% of the 266 confirmed foodborne outbreaks between September and December of 2012(16). Ten other GI and GII variants caused the remainder of the outbreaks(16). The GII.4 variant undergoes rapid mutation, even as compared to other norovirus variants and other RNA viruses (27). Further, the GII.4 variant appears to be more

virulent than other strains with an increased number of hospitalizations and deaths during outbreaks (47).

Among children ages five and under, norovirus is the leading cause of acute gastroenteritis, causing over one million pediatric visits annually. By this age one in six children will have received medical care for the disease; one in fourteen will have visited an emergency room; and about one in three hundred will have been treated for norovirus either outpatient or at a hospital(113) .

A 2012 review of transmission routes gathered from analysis of 565 incidents indicates that norovirus outbreaks are most commonly attributed to foodborne transmission (54%) and 10% are attributed to school or daycare settings (98). de Wit, Koopmans, & van Duynhoven, reported that the greatest risk factor for norovirus infection is contact with persons with gastroenteritis. In addition, food-handling hygiene was strongly associated with risk for norovirus infection(46). The most likely source of norovirus infection within a household with children was found to be daycare or preschool settings. The association of norovirus and attendance at a daycare or preschool and subsequent household transmission suggests that ill children may bring the virus into the home and it is then transmit it to other family members. In this study, the incidence of norovirus attributed to contaminated food was estimated at 12-16% versus the estimate of Scallan et al. of 26% (124).In either case, illness may be prevented with better food handling practices such as excluding ill individuals from food handling and good hand hygiene practices. In most cases of foodborne norovirus

infections, an infected food handler is implicated at some point in the food handling chain(24, 44, 60, 140)

The large number of affected individuals makes norovirus one of the most economically damaging foodborne pathogens in the US and around the world (17). It is currently estimated that norovirus creates in excess of two billion dollars in medical costs, and productivity losses due to morbidity, and pain, suffering, and premature mortality (17). In the Batz et al study, quality adjusted life years were used to estimate cost of disease burden, as well as monetary cost of illness. A QALY is a measure of health related quality of life based on large population based surveys to represent societal views on pain, suffering, and quality of life associated with varying health conditions. Measured on a scale of 1 to 0 with 1 representing perfect health and 0 representing death, Loss of QALYs due to foodborne illness can be calculated to aid in determining burden of a given pathogen. Norovirus causes a QALY loss of 5023 annually and is the fifth worst foodborne pathogen ranked by QALY loss (17).

Genetic Variants

There are multiple norovirus genotypes, with varying prevalence and virulence. Genotype II.4 is the most prevalent genotype in the United States. This genotype has an increased rate of mutation and has been identified as the leading cause of norovirus pandemics (27, 28). This genotype exhibits an increased mutation rate versus less infectious variants.

Food Settings Commonly Implicated in Norovirus Outbreaks

Produce is linked to more norovirus outbreaks than any other simple food. Produce may be contaminated in the field, by water at a processing facility, or by a food handler during harvest or before serving. As produce is often eaten raw, there is no heat treatment that may inactivate the virus before consumption. Other foods commonly associated with norovirus are shellfish, especially raw or quick steamed bivalves such as raw oysters. In addition to foodborne, outbreaks frequently occur in elder care facilities, schools and cruise ships (31). In the aforementioned settings there is close contact amongst a relatively confined population, which allows the virus to spread quickly once introduced. Complex and especially Ready to eat foods (RTE) have been implicated in previous outbreaks and are the leading vehicle for foodborne norovirus transmission. As the food is often not heated or not heated to a temperature that will inactivate the virus, it may be ingested by consumers. These outbreaks typically involve an ill food handler coupled with poor hygiene that allows for contamination of the food being handled. An outbreak in 2014 sickened over 1000 people due to ill food handlers at a bread production facility highlights the risk due to ill workers contaminating RTE foods(90, 154). Another outbreak in Japan was linked to contaminated prepared bento lunches, with 25 confirmed cases of norovirus and over 300 reported ill.

Mitigation and Prevention

The only treatment available to individuals with norovirus infection is supportive care, primarily oral or intravenous fluids. According to the CDC current best practice to mitigate the spread of norovirus is comprised of five directives. 1) Wash hands often. 2) Wash

fruits and vegetables. 3) Cook shellfish thoroughly. 4) Clean surfaces and wash laundry. 5) When ill, do not prepare food or care for others(36).

Cohorting

A best practice for mitigating illnesses includes excluding ill, or recently ill individuals from contact with others until they have recovered and are not exhibiting symptoms for 48 hours. Individuals exhibiting symptoms including nausea, diarrhea and vomiting should not go to work or send ill children to school. Current CDC guidelines recommend excluding food handlers from work for 72 hours following the abatement of symptoms.(8, 33, 36, 93). Some infected individuals will continue to shed viral particle for up to one month after symptoms begin, however the viral load decreases progressively following abatement of symptoms. Atmar and colleagues exposed 16 healthy individuals aged 18-50 to norovirus and measured shedding of virus particles of the 11 individuals that developed typical norovirus symptoms. Using reverse transcriptase PCR (RT-PCR) it was found that initial shedding began at 18 hours post challenge and lasted for a median of 28 days. With a range of 13-56 days (7, 8)

Sanitation

Duizer et al show that inactivation of virus surrogates can be achieved with a strong chlorine solution of greater than 3000ppb and exposure of at least 10 minutes. (54). In this study, the norovirus surrogates enteric canine calicivirus 48 (CaCV) and feline calicivirus F9 (FeCV) were exposed to sodium hypochlorite solutions varying from 0 to 6000ppm as well as UVB, heat, and 70% ethanol treatments. The ethanol solution showed a 3-log reduction

after 30 minutes exposure, indicating an inefficient and impractical method for consumer sanitation. Heat treatment showed a 3 log inactivation at 71.3° C or 160° F for one minute. While FeCV and CaCV are similar to norovirus, they are not perfect surrogates and human norovirus may prove to be more difficult to inactivate. In another study of heat inactivation of FeCV F9 and norovirus GII.4, researchers exposed the two virus strains to varying temperatures to determine if the viral capsids provided similar protection for the respective virus types. The calicivirus RNA was exposed maximally at 63.3° C to destroy the capsid and provide a 4.5 log reduction in infectious particles versus 76.6° C for human norovirus GII.4 capsid destruction indicating that human norovirus GII.4 is hardier and responds differently to heat treatment than FeCV (141).

The CDC recommends that soft goods be washed with the hottest available water, bleach, and on the longest cycle available. Hard goods should be cleaned first with soap and water, and then sanitized with a strong bleach solution.(33)

This provides a challenge to avoiding norovirus infection and preventing the spread of norovirus to others. Cleaning and sanitizing hard surfaces is straightforward and requires soap, water, chlorine bleach, and paper towels. However, soft surfaces and goods such as clothing are much more difficult to clean and sanitize, especially if hot water, hot drying cycles, and or bleach will ruin the item. Other soft goods such as furniture also prove to be problematic, as they cannot be sanitized with chlorine bleach nor run through a washer and dryer. For such items steam cleaning is effective only with relatively long contact time of 5 minutes at 158° F and 1 minute at 212° F (51, 54) The very high concentration of chlorine

necessary to inactivate the virus may be due in part to the high chlorine demand that fomites present as well as aggregation of virus particles(54). In a 2008 study it was found that purified norovirus stock was susceptible to free chlorine at concentrations commonly used to sanitize drinking water in the United States. This study utilized strain 8FIIa, which is a GI genogroups virus, extracted from stool samples obtained during a human infection study. Contrary to previous study by Duizer et al. that indicated great resistance to chlorine inactivation with norovirus particles present after 10 minutes contact time with a 300ppm solution of free chlorine in water(54), Shin and Sobsey also found norovirus to be susceptible to free chlorine concentrations that would be found in municipal water purification systems (1ml/L) (129). However in this study low concentration of virus were used (10^4 - 10^5 PCRU/mL) and were dispersed in purified water rather than aggregated as would be common of norovirus. The study suggests chlorine in water treatment systems could effectively reduce active norovirus particles when the water is properly filtered first and norovirus aggregates are broken apart mechanically. This suggests norovirus is unlikely to be transmitted in municipal water systems, but may be transmitted in untreated water.

Commonly called the 24-hour bug or flu, stomach bug, or food poisoning, norovirus is not well recognized by consumers. There is a dearth of knowledge regarding consumer knowledge and attitudes toward norovirus. It is unlikely that the average mom, food service workers, office employee, or line operator know the CDC recommended mitigation practices regarding norovirus.

Shiga Toxin Producing *Escherichia coli*:

Introduction to Shiga Toxin Producing *Escherichia coli*

Shiga Toxin Producing *Escherichia coli* (STECs) also called verocytotoxin producing *Escherichia coli* (VTECs) or enterohemorrhagic *Escherichia coli* (EHECs) include the most prevalent strain O157:H7 as well as any other serogroup capable of producing Shiga-like toxin. Shiga-like toxin is a protein toxin that binds to intestinal mucosal cells and upon entry inhibits protein synthesis and damages or destroys the cell. Two groups, Stx-1 and Stx-2 are produced by STECs. Like non-pathogenic *E. coli* strains, *E. coli* O157:H7 is Gram negative, non-spore forming, rod shaped and motile (104). Most *E. coli* strains are not pathogenic and carry no risk when consumed. However, *E. coli* O157:H7 alone causes over 60,000-foodborne illnesses each year in the US and is the fifth leading cause of hospitalization due to FBI with an estimated cost of illness to be in excess of quarter billion dollars annually(17, 124). Six other STECs are now estimated to account for approximately 30% of food borne outbreaks. These are *E. coli* O26:H11, *E. coli* O45:H2, *E. coli* O103:H11, *E. coli* O111, *E. coli* O121:H19, and *E. coli* O145. While there are differences among these STEC serotypes, they all share the commonality of Shiga-toxin production and potential for severe disease outcomes. Typical symptoms of STEC infection include fever, vomiting, abdominal cramping, and diarrhea that may progress to ulcerative colitis. Infections are typically more severe and longer lasting in young children and the elderly but occur in all age groups. Symptoms of an infection range from mild to severe with life threatening complications. The typical incubation period is three to four days but may

vary between one and ten days. Duration of illness is typically five to seven days after onset of symptoms but can last longer. Hemolytic Uremic Syndrome may result from STEC infection, causing kidney damage and potentially death in some patients(104)

STEC's are unlike generic *E. coli* in their robust acid resistance. In order to cause gastrointestinal illness any pathogen must be able to survive the acidic environment found in the human stomach. STEC's are able to effectively handle low pH environments through a variety of mechanisms that allow for acid resistance (92). Accordingly, STEC numbers are not effectively reduced by acid washes in processing(25) and may survive in fermented, acidic meat products for long periods(52). Brackett, Had and Doyle inoculated raw beef sirloin tips with a 5 strain mixture of *e. coli* O157:H7 to obtain populations of 10^3 to 10^6 for acid wash testing. The beef samples were then treated with atomized acetic, citric, and lactic acid sprays at 20°C and 55°C. There was no significant reduction in *E. coli* at any concentration or acid combination. *Escherichia coli* that have induced acid resistance also have increased their tolerance to heat, radiation, and antimicrobials. STECs including O157:H7 and the big six shiga toxin producing serotypes do not show unusual resistance to heat treatment. These strains are killed by heat used to kill salmonella; which serves as the basis of recommended time and temperatures combinations for safety by the USDA(147).

***Escherichia. coli* O157:H7**

Of the STECs, only O157:H7 has been extensively studied and is well understood. According to the CDC other serogroups are commonly undiagnosed or unreported and most

clinical laboratories lack the capability to test for non O157 STECs. The non-O157 STECs are commonly less virulent with less severe disease outcomes, but some non-O157 serogroups such as O104:H4 cause severe illness and may be more virulent causing Hemolytic Uremic Syndrome (HUS) more often and in adult patients (55, 149).

Characteristics of O157:H7 that set it apart from most *E. coli* are poor or lack of growth or in *E. coli* broth at or above 44.5° C; inability to ferment sorbitol within 24 hours; and inability to hydrolyze 4-methylumbelliferyl-D-glucuronide (MUG); and presence of a pathogenicity island known as LEE and a 60 MDa plasmid(104).

Non-O157: H7 STECs

Non O157:H7 serotypes commonly implicated in STEC outbreaks include O26, O111, O103, O121, O45, and O145(26). These strains do not share O157:H7's abnormal characteristics outlined above, with the exception of LEE and the large plasmid(104).

As early as 1996 there were concerns that there likely existed other serotypes of Shiga toxin producing *E. coli* that could cause serious illness (83). Increased attention to non-O157: H7 STEC is likely due in part to recent, high profile, wide spread outbreaks such as the spread of *e. coli* O104:H4 in Germany in 2011(149). O104:H4 is a newly identified, highly virulent serogroup. In 2011 the strain caused a very large outbreak in Germany sickening over 4000, causing over 850 cases of HUS and ultimately killing 50 people (149) The strain O104:H4 was eventually identified on fenugreek seeds from Egypt that were used in a commercial sprouting facility (55). Another STEC strain was identified in Norway from a 2006 outbreak that is closely related to the strain involved in the German outbreak. In this

outbreak *E. coli* O103:H25 had an HUS attack rate of over 60% (10 of 17 confirmed cases), showing possible increasing virulence in some STEC strains (91)

Impact and Disease Outcome

HUS is a disorder characterized by hemolytic anemia, thrombocytopenia and acute renal failure. HUS is possible in all STEC infections from any sero-group of STEC, however certain populations are more susceptible to severe disease outcome. Young children and the elderly are more likely to develop HUS with 6.1 cases per 100,000 in children under age 5 and the least likely group to be affected is the 50-59 age group at 0.5 cases per 100,000 (123). 5 to 10% of STEC patients will develop HUS. STEC patients that develop HUS face a mortality rate of 3 to 5% (100) Most HUS cases will recover fully, however results of a recent meta analysis of 49 studies that followed the long term prognosis of STEC HUS patients indicate that up to 50% of HUS patients experience chronic renal sequelae, while 30% may experience neurologic symptoms including irritability, lowered consciousness, and in extreme cases seizures and coma(108, 138). HUS typically develops as diarrheal symptoms are improving. Common signs of HUS include decreased frequency of urination with less volume, blood in urine, extreme fatigue, loss of color in cheeks and inner eyelids(108, 123). Infected individuals with these symptoms should be hospitalized as HUS can progress to life threatening very quickly. Treatment for HUS is supportive care along with treatment for complications resulting from HUS. There is no specific treatment to directly mitigate the effects of the Shiga toxin once released.

STEC infections are commonly undiagnosed or misdiagnosed. In the absence of bloody diarrhea or other severe symptoms, many patients do not seek medical attention, and if medical attention is sought, physicians do not order laboratory testing. Testing may be done to confirm STEC infection by testing for the presence of Shiga toxin, but to determine serogroup specimens need to be sent to state public health laboratories(34).

When a STEC infection requires medical treatment, supportive therapy is the only option. The use of antibiotics has not been shown to be effective in treating STEC infection, and can even increase risk of HUS.

Sources:

Host Animals

STECs are commonly found in ruminants but do not cause illness to these hosts. These animals, especially cattle, serve as a reservoir of pathogenic *E. coli* and are the chief source of STECs that cause human illness(71). Cattle serve as a reservoir of STECs as they lack the receptor globotriosylceramide (Gb3) within their endothelial cells, and so are normally asymptomatic carriers (82). While the prevalence of STECs in cattle herds varies, it is commonly found in both cattle for meat production and dairy herds. There appears to be a seasonality effect, with higher prevalence rates in the warmer summer months(57, 118). Some cattle are super shedders, defined as excreting greater than 10^5 CFU per swab. These cattle contribute approximately 90% of the total bacteria load in a herd and raise the prevalence of infected cattle (82).

There has been debate as to the effect of the diet of the cattle and the prevalence of STECs. One study from 1999 indicated that grain feeding of cattle produced increases of the amount of *E. coli* shed and increased acid resistance(49), while a more recent study indicates hay fed cattle may shed O157:H7 longer than grain fed cattle, and acid resistance was not effected(76).

Contaminated Foods

The primary mode of STEC infection is unprocessed contaminated food. Beef products are responsible for approximately 52.9% of O157:H7 outbreaks and 40% of non-O157:H7 STEC outbreaks. Produce accounts for 18.1% and 13.3 % of O157:H7 and non O157:H7 infections, with the remaining outbreaks due to other food sources such as complex foods or dairy products(17).

Transmission:

Transmission of all STECs is via the fecal-oral route. The pathogen may contaminate beef products during processing and subsequently cause illness due to poor handling or undercooking. Contamination of produce may also occur due to runoff from cattle feed lots, contaminated dust, and insects carrying the bacteria into fields containing produce destined for raw consumption. Infections involving produce are common, being the second most commonly implicated food item in *E. coli* O157:H7 outbreaks (110).

Transmission and infection with STEC can occur when an individual ingests less than 100 cells, a very low mean infectious dose. STECs are acid tolerant which reduces the efficacy of common acid washes.

Table 1. The Cost of STEC Illness**(QALY0 quality adjusted life years, measure of quality of life after illness)**

STEC	QALY	Cost (\$ mil.)	Illnesses	Hospitalizations	Deaths
O157:H7	1565	272	63,153	2138	20
Non- O157:H7	327	26	112,752	271	0
Combined	1,892	298	175,905	2409	20

Table 2. Common Food Vectors

Food	Percentage O157:H7 Infections	Percentage of non- O157:H7 Infections
Beef	52.91	40
Ground Beef	41 (Hamburgers- 68%)	Unknown
Produce	18.1	13.3
Complex Foods	14.8	6.7
Dairy Product	6.5	20
Beverages	1.9	13.3
Deli Meats	3.9	0
Total Outbreaks	258	39
Attributable Outbreaks	155	15

Adapted from (17, 86, 118)

Processing and Prevalence

A variety of interventions are used to reduce the probability of contamination of beef before, during, and after processing. Hussein and Bollinger summarized three decades of reports to determine prevalence rates of *E. coli* O157:H7 in cattle in feedlots, irrigated pasture, and grazing rangeland. The prevalence rates were estimated at 0.3 to 19.7%, 0.7 to 27.3%, and 0.9 to 6.9% respectively. Within beef packing plants, grocery stores, and fast food restaurants, prevalence rates of *E. coli* O157:H7 on beef products were 0.01 to 43.4%, 0.1 to 54.2%, and average of 2.4%, respectively. *E. coli* O157:H7 within ground beef occurred at a rate of 0.1 to 54.2% and in retail cuts 1.1 to 36%. Non O157:H7 STECS were detected in 2.4 to 30% of ground beef, and 8.6 to 49.6% of retail cuts. In Grocery stores and packing plants non O157H:7 STEC prevalence varied from 3.0 to 62.5% and 1.7 to 58% respectively(80). These varied and potentially high prevalence rates indicate that all beef products should be treated as potentially contaminated.

Mitigation

For consumer food safety, cooking non-intact beef products to 160° F or intact beef products to 145° F as measured by a tip sensitive food thermometer is the only way to ensure destruction of any potential STECs present. Lower temperatures with longer cook times are effective if the requisite knowledge and equipment is available to use time and temperature combinations as outlined in USDA FSIS Appendix A. Lower cooking temperatures maintained for longer periods may also be effective in destroying STECs, however this

requires greater food safety and processing knowledge than simply using endpoint temperature (84, 147). Change in color, texture, or clear juices do not reliably indicate a non-intact beef product that is safe to eat (72, 79). Studies demonstrate that beef patties may brown at temperatures as low as 131° F, an unsafe endpoint for typical preparation methods.

Consumer Perception of Beef Safety

In an investigation of consumer attitudes and risk perception, Schroeder et al. focused on beef food safety in different countries specifically the United States, Japan, Mexico and Canada, and quantified how these perceptions have changed beef consumption over time. Using a survey of over 4005 respondents, with approximately 1000 respondents in each country, risk perception of potential hazards such as Bovine Spongiform Encephalopathy (BSE), *E. coli* 157:H7, *Salmonella*, and others varied by country. Of beef consumers in the U.S., 20% had reduced beef consumption in the last four years due to safety concerns. It is notable that the average risk score using a scale of 1-10, 1 being “Strongly Agree, and 10 “Strongly Disagree”, U.S. consumers rated the statement “I Rarely think about food safety when eating beef” at an average of 4.98. When asked about risk exposure due to eating beef, U.S. consumers averaged a response of 3.72 for the statement “Eating beef is risky”. The survey results indicate that risk perception drives declines in consumption to a greater degree than risk attitudes, or the tolerance consumers have for risk(127).

Overall perception of beef safety is varied and dependent on a multitude of factors. Perceptions of food safety matters are important as it may effect the rigor with which consumers handle food safely or even wish to learn about safe food handling.

Consumer Handling of Beef

To avoid inaccuracies common to self reported behavior, researchers used video observation of consumers in their own homes to determine food-handling behaviors. Consumers were recruited believing that they were participating in market research to avoid bias. Using a coding schedule to track safety related behaviors, researchers coded the videos and measured inter-rater reliability to ensure accurate measurement of subject behavior. There were 401 cross contamination events while observing 99 subjects. Only two subjects did not cross contaminate at all. Specific to beef, 44% of the subjects did not know the recommended internal temperature for doneness and only 5% used a food thermometer to check for proper safe endpoint temperature. Food thermometers were owned by 30% of subjects and half of these felt confident in their ability to use it properly(5). In a survey of 19,356 adults in 8 U.S. states, 19% reported not routinely washing their hands with soap and water, 19% did not wash cutting boards with soap and water, and 20% ate “pink” hamburger in the last 12 months(4). This indicates that consumers often do not follow best practices for safe preparation and storage of food. It should be noted that color is not a reliable indicator of safety for cooking raw meat(72).

In a review of consumer food safety studies including surveys, observation, and focus group research, Redmond and Griffith determined that substantial numbers of consumers perform unsafe food handling behaviors. In the North American surveys used for the study, 30% of consumers had heard of *E. coli* and 88% thought a rare hamburger was a high-risk food. 86% reported hand washing to be important before preparing food, while only 45%

knew improper hand washing could increase risk of food borne illness. With regard to cross contamination, 55% could answer questions correctly. Overall 80-93% of the population was lacking knowledge regarding correct cooking endpoint temperatures and 14-21%, 20-22% and 40-56% lacked knowledge regarding hand washing and drying, separation of raw and RTE foods, and proper refrigeration temperatures respectively (119). There are large gaps in knowledge of proper safe food handling within consumer populations in general, and around beef specifically.

Target Audience:

YouTube receives more than one billion unique visitors each month that watch over 4 billions hours of video. After 5 years YouTube viewers have watched over one trillion videos, and there are 72 hours of video uploaded every minute. Users view videos on a wide variety of topics and of video types. How to videos encompassing how to prepare or cook potentially risky foods are available and little is known about these videos. In addition, over 80% of American adults use the Internet to seek out health related information(66). In this study, the target audience is YouTube users learning to make hamburger recipes via YouTube video content.

Mom bloggers is a term used to describe a group of mother bloggers that wield considerable influence. This online community shares information regarding a variety of topics and may encompass food evangelists and advocates. Past campaigns by mom

bloggers have influenced corporations to change product formulations and influence others within the community and outside of it.

Social Media versus Traditional Media and Changes in Web

Web 1.0 vs. 2.0

Web 1.0 refers to an era of time in which the Internet was chiefly used in a top down approach. Characteristic of this top down approach, content creators made websites and provided material for consumers to read, watch, or use without soliciting input or interaction from the user. So, the flow of information is essentially only in one direction and chiefly from companies or organizations with time and resources to create content. Web pages were generally static and did not include user-generated content(42, 64, 68). Web 2.0 is different from web 1.0 in few important ways. Web 2.0 websites allow for and encourage user interaction and input, with some such as YouTube hosting only user-generated content. The flow of information within this framework is multidirectional and complicated. Users now can share, collaborate, and interact in an ever-growing number of ways. Blogs, social networking sites, wikis, video sharing, and a variety of web based applications are common examples of Web 2.0(42, 64, 68). Cormode and Krishnamurthy describe “the essential difference between Web 1.0 and Web 2.0 is that content creators were few in Web 1.0 with the vast majority of users simply acting as consumers of content, while *any* participant can be a content creator in Web 2.0 ,and numerous technological aids have been created to maximize the potential for content creation. The democratic nature of Web 2.0 is exemplified

by creation of a large “number of niche groups (collections of friends) who can exchange content of any kind (text, audio, video) and tag, comment, and link to both intra–group and extra–group pages.” Technologically Web 2.0 is different in the scripting and presentation technologies used, as well as the structure and purpose of a website or application(42). It is however the sociological changes that are most concerning for food safety risk communication.

Traditional and Social Media in Risk Communication

Traditional media including print, visual, and audio media or any combination thereof has traditionally been used to communicate in a top down approach for marketing and health communication purposes. This approach has been used with varying levels of success for organizations promoting health improving programs, lifestyle changes, and awareness. Top down marketing of ideas, goods, or health interventions, requires significant investment of resources that may not be possible for health promotion groups such as local health departments.

Social Media

The idea and ability to share online has been around as far back as the 1970’s with the advent of Usenet from researchers Tom Truscott and Jim Ellis at Duke University (152). This early form of social media allowed users to share public messages and discussions. Social media applications common today came about in the early to mid 2000’s with MySpace and Facebook as social networking applications.

Social media relies on user generated content, rather than the simple consumption of media by end users. We may define social media as a group of internet based applications built on ideological and technological foundations of Web 2.0, and that allow the creation and exchange of user generated content(85). Under the umbrella of social media there are a variety of applications such as Wikipedia, YouTube, Facebook, Twitter that represent a portion of the spectrum of social media applications. Social media applications may be generally grouped as collaborative projects, blogs, content communities, social networking sites, and virtual social and/or game worlds (85). However, the delineation between what is a blog, content community, or social network is less and less clear with some applications crossing over into multiple areas and new innovative applications popping up everyday.

Necessity of Food Safety Risk Communication Presence on Social Media Networks

The amount of time spent on social media applications is growing at a rate 3 times faster than the increase of time spent on the Internet overall (Nielsen, 2009). Consumers are not only spending more time on the Internet, but are also spending more of this time using social media applications. This is drastically changing how consumers obtain information about a wide array of topics. Social media influences how individuals obtain information and will effect how consumers behave (Mangold & Faulds, 2009; Nielsen, 2009; Thackeray & Neiger, 2009). Reynolds (2011) states that to effectively communicate risk, trust must be established. There are five elements that must be present in communications to establish trust: Empathy and caring; competence and expertise; honesty and openness; commitment; and accountability (B. J. Reynolds, 2011). Social media may be used to demonstrate all of

these elements in a variety of ways. For example, social media creates a record of what has been written and discussed. This promotes accountability and congruity and is important, as credibility is lost when communicators are not seen as accountable or the message changes without explanation (B. J. Reynolds, 2011).

Potential Pitfalls of Social Media Presence:

While social media can be a great asset to risk communicators, it can serve as a hindrance as well. Chung (2011) writes of the social amplification of risk that the Internet facilitates regarding environmental impacts of construction of a high-speed rail line in South Korea. In the study, articles and comments from print media, government offices, and environmental were evaluated and it was found that the lay public could (and did) become active communicators, amplifying the perceived risk and repeatedly slowing the project, and increasing costs.

Misinformation and false assertions may be easily disseminated via social media with or without malicious intent and be widely believed (Chung, 2011). This can be seen in the food industry as in the case of pink slime or lean finely textured beef and the social and traditional media firestorm of negative comments. In 2001 Beef Products Inc. (BPI) began using a process of centrifuging trimmings to separate fat from lean beef, with a treatment of ammonium hydroxide gas to reduce potential pathogen load. The resulting product is named lean finely textured or LFTB. In 2009 the New York Times ran a story with quote from microbiologist David Zirnstein in which he describes LFTB as “pink slime”(106). The negative reaction began, reaching its peak in 2012 when ABC World News with Diane

Sawyer runs a story on LFTB. Prior to the news story however, reports and stories were already spreading across the Internet(58). Bettina Siegel initiated a change.org petition garnering over 250,000 signatures to petition the USDA to remove LTFB from school lunches(131). As a result of the media firestorm and loss of business, BPI shut 3 of it's 4 plants(105). It may be argued that a lack of information early in this process by BPI and other safety and food experts may have averted some of the uproar and ensuing consequences. The hashtag #pinkslime is still used as of June, 2014. Blame attribution on social media usually begins rapidly after a crisis or tragedy and is not helped by attempts to shift blame onto others (Schwarz, 2012). This must be accounted for with a strong presence of knowledgeable experts constantly participating in various applications.

Social Media Applications or Platforms:

Twitter:

Twitter is a micro blogging application that allows users to share 140 character long messages called tweets. One may follow other users so that they automatically receive tweets that user has generated. It is not uncommon for popular users to have many thousands of followers, all of which will receive their tweets. Tweets are searchable so that tweeted messages may be found by others looking for a particular keyword or topic. Hash tagging is a meta-data organizing system where users may add a hash tag before words of interest that aids identifying trending discussions or topics.

There are a variety of applications that work in conjunction with Twitter to allow businesses and other organizations to monitor what is being said about their products or topics they are interested in, as well as proactively engaging with Twitter users. Twitter offers access to its “fire-hose” of data, which is the term used to describe the massive amount of data generated as millions of twitter users tweet. There are other services that provide go between to simplify the process of listening and engaging users.

Within Twitter it has been found that one quarter of tweets are directed, meaning they have an @ symbol followed by another user’s twitter name (133). This notation notifies the user the tweet is directed and that they have been mentioned in a tweet, but the message is still viewable to the general public. Users with more followers tweet more often, but this increase eventually becomes saturated, at 800 tweets to 300 followers(77). When the number of friends (defined as a user whom one has @ tweeted more than twice) is compared to tweet number, the correlation does not reach a saturation point of tweets versus number of friends(77). Based on this research users that receive more attention tweet more often and number of “friends” or users with whom they engage is predictive of their activity level or number of tweets.

Further research shows that a majority of Twitter users are passive, not contributing content or re tweeting it, rather only consuming. It is demonstrated that high popularity (large number of followers) is not necessarily correlated with high influence (propagation of their content through the network)(122).

The Users of Twitter:

Individuals, businesses, health departments etc. use twitter in a variety of ways. In a large content analysis of tweets compared to traditional media, researchers found that similar topics are covered, but with more attention to pop culture on twitter versus traditional media. Twitter users spend less time tweeting about world events, but do actively re-tweet content related to world events, which increases the spread of news.(158) As of December 2013, 18% of US adults are Twitter users, up from 16% in 2012(53). Twitter users are split equally between men and women, and adoption levels tend to be higher among young adults and African Americans. Both Instagram and Twitter have a significant overlap in users at 53% of each using the other service as well. Twitter is a highly engaged network, meaning 67% use the service a least weekly, and 46% use it daily.

YouTube:

The video sharing service YouTube was founded in 2005 and has become an enormous repository of videos of and about nearly any topic imaginable. Self reported statistics note one billion plus unique visitors per month. One hundred hours of video is uploaded to YouTube every minute, with over six billion hours of video watched each month. YouTube is localized in fifty-six nations and across sixty-one languages. Mobile viewers now comprise 25% of YouTube's global watch time per day (155).

As of 2010 69% of internet users (52% of adults in the US) had watched or downloaded video content online and 14% had uploaded content and as of 2014, it is estimated that 85% of the US internet users had viewed video content online(117, 150).

According to reports from comScore, an Internet technology firm specializing in creating metrics to understand Internet usage for marketers, 189 million Americans watched 48.7 billion online videos in 2013. YouTube had 157.6 million unique visitors, suggesting that nearly every American user of online videos uses YouTube (150). The manner in which online videos are used is changing; in 2010, 38% of adult users watched educational videos, compared to 22% in 2007(117).

A 2011 study found that 188 reports, journal articles, and papers had been written about YouTube. The majority of these are related to information technology, but 39 covered teaching methodologies, or information pertaining to using YouTube in a classroom setting. The information includes tips for searching for content, how to produce videos, and other supplementary content(135).

Blogs:

Online blogs provide a medium with which bloggers can share their opinions, news, and even data on a variety of topics (3). Mom bloggers number approximately 3.9 million in the US and are a widely sought after segment of the population by marketers(65, 107, 114, 126). Past research has focused on why some bloggers are more influential than others, or the motivations behind blogging(56, 99, 115). There is no current research focusing on food safety attitudes and knowledge specific to mom bloggers and norovirus.

Behavior Change and Learning Theory:***Social Cognitive Theory (Social Learning Theory) and Self Efficacy***

Albert Bandura developed the Social Cognitive Theory (SCT) as a means to explain learned behaviors. In a famous study utilizing “Bobo dolls”, Bandura exposed young children to a film of another researcher violently yelling and hitting at the doll. The children were then observed at recess. The children proceeded to imitate the violent behavior seen in the film(11). It was proposed that they had learned the behavior by observation, without prior positive reinforcement. Social Cognitive Theory states behavior is learned from the environment by observation, but that there is also interaction of cognitive and behavioral influences (9, 10, 14)

SCT differs from many models of human behavior in that it is not purely external or internal mechanisms that determine behavior, but rather a model of triadic reciprocal determinism, of behavior, cognitive, and environmental factors that exert influence over human behavior. It does not, however, suggest that the significance of the factors is equal or static over time. When first introduced in the 1960’s, SCT placed critical importance on learning through observation, or imitation(70) whereas most learning theories prior had either not considered imitation or relegated it to a position of non-factor.

Observation has 4 components:

1. The observer must pay attention to events or actions; attention may be affected by many variables such as medium (TV, Twitter, Lecture) or even model attractiveness.
2. After observing, the material must be retained. Often written modeling along with visual observation enhances retention.

3. Conversion of symbolic representation to the original modeled behavior. This may be simple or very complex (learning to tie ones shoes versus playing the oboe).
4. The learner must then have sufficient motivation to appropriately model the given behavior(12, 70).

Self-Regulation and Self-Efficacy

Self-regulation is required for one to continue a learned behavior once social or external sources of reinforcement are absent. Self-Efficacy is central to self-regulation. Self-efficacy as described by Bandura, comprises domain-specific beliefs held by people about their abilities and characteristics that determine what they try to achieve and how much effort is put into a given effort. A behavior that a person feels they have the necessary ability to perform is more likely to be performed. More effort will be put forth to achieve that behavioral goal. Self-efficacy beliefs may be influenced by past successes or failures, others' persuasion, given physiological state, or observing what others have accomplished (70)(12). Bandura proposed triadic reciprocal determinism, or the interrelationship of individual, environment and behavior. All three interact and determine learning outcomes(12, 70).

Past Application to Health Behavior Learning

The SCT has been used extensively to explain health promotion and health related behavior, both positive and negative. Previous studies of health promotion used SCT to predict caterers' hand washing practices and consumers' food safety practices(40, 41). The use of the SCT in health promotion campaigns is discussed at length by Bandura(13). One of the chief concerns is that self-efficacy may be a determinant of whether or not viewers of

YouTube videos will perform food safety related behaviors. We may expect if videos present behavior that will lower risk as easy and do-able for the average viewer, then sense of self efficacy will increase and increase the likelihood of performing these positive food safety behaviors. In addition, outcome expectations may be set such that the behaviors modeled will lead to a desired outcome, therefore viewers are more likely to model the given behavior, be it positive or negative.

Theory of Reasoned Action (TRA)

The Theory of Reasoned Action was the precursor to the Theory of Planned Behavior (TPB) in which attitude predicts intention, which predicts behavior. Attitude consists of belief that behavior will lead to certain outcome combined with subjective norms and then evaluating whether or not the expected outcomes will be favorable. Ultimately attitude predicts behavior, but TRA has fewer inputs than TPB (perception of control ignored) and thus is not as strong of a predictor of behavior (1, 63, 128).

TRA is limited as it assumes the prerequisite skills and resources are available to the individual intending to perform a given behavior. Sheppard et al criticize TRA as being limited by the use of attitudes and subjective norms to predict intentions, and using intentions to predict performance of a given behavior in three situations. The first condition, goals versus behaviors, such as the desire to achieve an “A” mark in class being the ultimate goal, in which measuring intent may not accurately predict the intended result, but measuring intent to perform a behavior linked to the goal may. The second situation is the presence of choice that may alter the intention formation process and thus muddle the intent

measurement. The third is the idea that what one intends to do is what one actually expects to happen (intent to quit smoking, but does not expect it to happen). This is called intentions versus estimates by the researchers(128)

Theory of Planned Behavior

The Theory of Planned Behavior (TPB) states behavior is predicted by intention to perform the given behavior. Developed by Icek Ajzen in the 1980's TPB is an extension of the TRA. It is expanded to include perceived behavioral control as dictated by past experience and anticipated impediments to behavior in question such as whether or not resources are readily available. Including perceived behavioral control increases the accuracy in which TPB can predict behavior versus TRA as it accounts for one's belief that they have more or less control over the given behavior. This is important as one may wish to quit smoking and their subjective norm is that smoking is a negative behavior, showing an attitude that would likely predict the intention of quitting; one may not believe they have control over the behavior.

Intention is a function of attitude toward behavior combined with subjective norms. Intention is the best predictor of change according to TPB. Perception of control, attitude toward subjective norms, and attitude toward behavior in question all contribute to intention

Important Variables within TPB

- Behavioral Belief: belief regarding consequences of a given behavior, based on perceived likelihood that the behavior will produce desired outcome.
- Attitude Toward Behavior: perception of the behavior as positive or negative
- Normative Belief: perception of social normative pressures that one should or should not perform the behavior in question. Pressure may come from those who are important in actor's eyes such as family, friends, and possibly co-workers, managers, doctors, professors, or others.
- Subjective Norm: perceived social pressure to perform or not perform a given behavior, determined by the total set of accessible normative beliefs concerning expectations of important referents.
- Perceived Behavioral Control: perceived ease or difficulty of performing the given behavior, determined by a total set of control beliefs.
- Control Beliefs: the beliefs by an individual regarding factors that may facilitate or impede performing the given behavior.
- Behavioral Intention: readiness of individuals to perform a given behavior. This is derived from the attitude toward the behavior, subjective norms, perceived behavioral control, and how important each predictor is in relation to behavior.
- Behavior: Individuals action, observable response. Function of compatible intentions and perceptions of behavioral control such that perceived behavioral control is expected to moderate intention of behavior. Favorable intention of behavior causes behavior only if

perception of behavioral control is strong and actual control over behavior exists, i.e. does the individual possess the requisite skills, knowledge, resources and time? If so, then intention is a strong indicator of behavior(2).

Behavior Change Model for Internet Interventions:

This is a model for change in health behaviors proposed by researchers at the University of Virginia to use for Internet based health interventions. It was developed to meet three needs as identified by the researchers: (1) to describe and explain how behaviors change and symptoms improve through the use of Internet interventions; (2) to guide program development and facilitate testing of the intervention; and (3) to firmly establish this method of treatment with a theoretical foundation. This model is based on multiple theories, empirical evidence, and clinical experience. The intervention model incorporates theories of motivation, various psychological models, social marketing and advertising strategies, web based design and development techniques, information architecture and design, models of knowledge transfer and behavior change, and general research along with clinical experience. The authors' goal of the model was to facilitate behavior change and symptom improvement by helping to conceptualize, identify, and measure factors that may determine behavior change and symptom improvement. This behavior change model is predicated on the use of an online treatment delivered as a website. This website treatment is made up of the appearance, behavioral prescriptions, burdens, content, delivery, message, participation, and assessment.

While the behavior change model may be work well for health behavior change through online interventions, it has not been utilized as a theoretical grounding for food safety interventions. As such, it is not well accepted and widely used such as TPB or SCT. Due to the unproven nature of this model it is not an acceptable choice for grounding of the Internet based interventions proposed. Finally, the proposed food safety interventions or experiments are aimed at prevention of illness or mitigating the spread of disease when illness has occurred. Food borne illness serious enough to merit intervention by a health care provider requires the physical presence with a clinician(121).

Norovirus is responsible for 58% of foodborne illness and infects approximately 20 million people in the US annually. STECs cause over 175,000 illnesses annually and are one of the most expensive and damaging food borne pathogens, costing over 298 million dollars in losses yearly. The way the Internet is used has changed dramatically in recent years, with a shift toward an interactive web from a static non-interactive web. The effect that use of services such as YouTube may have on food safety behaviors has not been investigated. The following two chapters will investigate how YouTube cooking videos on hamburgers may affect food safety behavior and the knowledge and attitudes of mom bloggers around norovirus.

CHAPTER 3. YOUTUBE AND HAMBURGER: A CONTENT ANALYSIS

Abstract:

Ground beef is linked to 41% of *E. coli* O157:H7 outbreaks and hamburgers account for 68% of these ground beef linked outbreaks. Safe preparation and cooking methods mitigate the risk of *E. coli* infections. Consumers learn how to cook from a variety of sources including family, friends, print media, television, and online media in print or video form. Consumers use the Internet for health related information and recipes to prepare at home. The Social Cognitive Theory posits learning occurs by modeling, or observing others behavior and the subsequent consequences. YouTube videos encompass verbal instruction and symbolic behavior that may influence food safety behaviors. Searching for the term *burger* on YouTube returned over 200,000 hits. It was hypothesized that YouTube videos will contain significantly greater number of negative behaviors than positive behaviors. It was also believed that home cooks in outdoor settings show the greatest number of negative food safety behaviors versus home cooks in indoor settings, chefs in professional kitchens, or chefs in outdoor settings, due to a lack of training and poor sanitation while outside. Evaluating food handling on YouTube is important because modeled practices may have negative influence on consumer food safety behavior.

Content analysis was used to create objective, replicable data from media to compare concepts, actions, instructions, and other information. Coding schedule development was designed to record risk factors present, as well as modeling of positive food safety practices, in short video common to YouTube. Negative food safety behaviors were modeled in 100% of sample (n=89) videos included for analysis. Cross-contamination was present in 72% of

the videos. One video modeled proper use of a food thermometer, with 103 instances of incorrect determination of doneness as some videos showed more than one risky method, and 11 videos utilized multiple risky methods.

YouTube, STECs, and Burger How-To Videos

Founded in 2006, YouTube is a video hosting and sharing website. Content grows at a rate of more than 100 hours per minute and reaches more adults in the 18-36 age bracket than any US cable network (155). Users may upload their own content, comment on other's content, and even earn income by creating highly watched videos as part of YouTube's Partner Program(156). With over 1 billion unique visitors and over 6 billion hours of content viewed each month, YouTube has an enormous reach (155).

YouTube contains a vast amount of content relating to cooking ground beef burgers. As ground beef is implicated in 41% of *E. coli* O157:H7 outbreaks and hamburgers account for 68% of these infections it is important to understand the food safety practices being taught around this potentially risky food through YouTube content(86, 118). STEC infections are often serious with *E. coli* O157:H7 resulting in hospitalization in approximately 17% of infections, with 4% resulting in HUS. Mead et al estimated both *E. coli* O157:H7 and non O157:H7 STEC infections to result in in a hospitalization rate of 29.5%(101). STEC infections in the United States were estimated to be 265,232 cases per year by Scallan et al(125). Most recent estimates of STEC infections suggest 2409 hospitalizations and approximately 20 deaths due to STEC infection in the US per year. Further, the cost of STEC infections is estimated to be 298 million dollars per year and a loss

of 1892 QALYs (Quality Adjusted Life Years, measure of health related quality of life) per year in the U.S.(17).

Ground beef that is used to make hamburgers carries an increased risk of food borne illness from STEC infection versus intact muscle cuts.. A Canadian risk analysis of interventions aimed at reducing STECs in beef found that ground beef carried a risk infection that was 3 orders of magnitude greater than intact cuts of beef, 8.7×10^{-6} versus 2.9×10^{-9} (134). Grinding whole muscle cuts of beef into hamburger mixes the potentially contaminated outer surface throughout the product. The subsequent solution is that the entire hamburger must be cooked to an internal temperature sufficient to yield an acceptable log reduction in STEC population.

The literature indicates five categories of food handling behaviors that are critical to reducing risk of foodborne illness. These are cooking adequately, personal hygiene, cross contamination, unsafe foods, and proper storage of food (102, 103). As hamburgers are a non-intact meat, the interior must reach a greater internal temperature of 160°F versus 145°F for intact cuts, due to the mixing of exterior and interior(61). Raw ground beef used to make burgers requires care in handling to avoid cross contamination and temperature abuse. All of these behaviors are critical to safely preparing hamburgers as failure in any one may result in STEC illness.

YouTube videos may provide opportunities to learn positive or negative food safety behaviors. The Social Cognitive Theory helps explain the influence that YouTube how-to videos may have on learning behaviors that may increase or decrease the likelihood of food

borne illness. Bandura, the theory's creator, posits that learning occurs through modeling behavior of others (14). Behavior may be learned by observing other actions and the resulting reaction or consequences (15).

Previous content analyses of food safety behaviors have focused on more traditional media, such as televised cooking programs(39, 81, 97). Current research has not focused on food safety behaviors found in YouTube cooking videos of any type, creating a knowledge gap. It was hypothesized that how-to videos on YouTube about hamburgers will display a significantly greater proportion of negative behaviors versus total possible negative behaviors than shown positive behaviors versus total possible positive behaviors. Further, professional chefs will perform significantly better than home cooks in their handling of food safety in the videos, that is they will display a greater ratio of shown positive to total possible positive behaviors versus shown negative to total possible negative behaviors than home cooks.

Materials and Methods:

Video Selection

The amount of hamburger related content on YouTube is enormous, with three separate searches for the terms “burger”, “cheeseburger recipe”, and “hamburger” yielding a combined 3,320,000 videos that comprised our video population. Videos were searched out on YouTube to create a library of a sample population to evaluate food-handling practices. Search terms were determined by use of an online survey aimed at eliciting the most common terms users would utilize to find burger recipes on YouTube. The survey was administered using the service SurveyMonkey.com. It was distributed by convenience by distributing the survey link via www.barfblog.com and Facebook and twitter. 114 properly completed surveys were returned, with three most common search terms of “burger”, “cheeseburger recipe”, and “hamburger” being used to conduct searches for videos to analyze.

To ensure that only videos relevant to the hypothesis to be investigated, selection criteria were developed. The selection criteria for inclusion in the study consisted of a minimum view count of 5000, beef must have begun raw and be cooked in the video, burgers have been formed of mainly beef, but other foods, such as onion, breadcrumbs, pork, were allowed to be mixed in. All included videos must have been in the first ten pages of search results for the given search term to avoid including videos that are unlikely to be viewed due to their relative position in the search results citation (78).

To reduce the influence of Google predicted relevant results YouTube viewing and searches, all searches were performed without logging into Google services and cache and

browsing history were deleted. Of the search results, 93 videos of a pool of 600 returned by three independent searches were initially selected for the study. Four videos were culled due to not meeting all criteria for inclusion, as they did not show the hamburger preparation process and/or the cooking method used. The total video time was 9:17:46 with an average length of 6:20 and a total view count of 15,204,020 with an average number of views of 170,831 at the time of viewing.

Coding Content

A literature review was conducted to determine potential food safety behaviors to inform the coding schedule used to analyze the selected YouTube videos. Past research on food safety within video media identified a large variety of behaviors that impact the safety of the food being prepared (39, 81, 95, 96, 136). The behaviors used in these studies were adapted into a coding schedule to be piloted before use. Prior to viewing videos included in the study, two coding schedules were piloted to ensure relevant data was collected. Owing chiefly to the short and highly edited nature of these short videos, some behaviors that were identified in previous content analysis of food safety related content as positive or negative were not included. Positive food handling behaviors decrease the likelihood of foodborne illness while negative behaviors increase the likelihood of food borne illness. After piloting the coding scheme with 10 videos (not included in the study) it was determined that 13 (7 positive and 6 negative) behaviors were relevant to YouTube videos. These behaviors were determined to be relevant to safe food handling through a review of pertinent literature (Table 1) and were found at least once during piloting of the coding schedule. Behaviors that

were relevant to safe food handling, but did not appear during piloting were not included in the final coding schedule.

Two trained researchers watched each video twice from beginning to end and paused as necessary to accurately code behaviors. Positive and negative food safety behaviors were recorded as either occurring, or not.

Content Analysis

Content analyses are aimed at producing reliable and replicable data (89) and may use a deductive or inductive approach(18). This study uses a deductive approach, only recording behaviors that are shown or explicitly stated, not likely behaviors. Initial coding schemes were developed to encompass behaviors from all five categories and included 16 behaviors. The coding schedule was piloted on 10 sample videos and modified based on behaviors that were entirely absent and as such not included in the final schedule.

Results:

The average number of views per video was 170,831.7 with a standard deviation of 29,611. Video view counts varied substantially with a minimum of 5,467 and maximum of 4,303,807 and 15.2 million views total. Mean video length is 6:20 with a standard deviation of 4:32. Of the sample population of 89 videos, 87 (98.9%) used risky methods or did not specify any method to determine that the burger meat was cooked to a safe temperature. While three videos did suggest the safe USDA recommended endpoint temperature of 160°F, only one video actually demonstrated the proper use of a food thermometer to check the temperature. Cross-contamination was shown in 64 (71.9%) of the sample videos. The

remaining videos (25, 28.1%) did not show cross-contamination at any point. Hand washing was evaluated as occurring in 4 videos, with 1 video showing use of soap and water, and 0 videos washing hands according to CDC hand washing guidelines. One video used alcohol based hand sanitizer (Table 2).

In total, 103 instances of negative methods for determining doneness were shown, with 11 videos showing or describing more than one risky method. The sampled videos showed or described 36 total positive behaviors within 29 videos and 167 negative behaviors.

Chi-square testing was performed to determine if there was a significant difference ($p=0.05$) in the proportion of shown behaviors versus total possible behaviors when compared by the location and video host type (Table 3). It was found that only one behavior (N5) had a significantly differently likelihood of occurring or not based on the location/video host type. All other positive and negative behaviors showed no significant difference when compared by location type. The proportion of positive behaviors shown versus total possible positive behaviors was significantly different from the proportion of negative behavior versus total possible negative behaviors in chi-square testing ($p<0.0001$) and using the Glimmix procedure ($p<0.0020$) (SAS).

Discussion:

Within the sampled videos, the number negative food safety behaviors were overwhelming. Only 1 video showed or described the proper method to determine if a hamburger is cooked, and even in this video there was a clear instance of cross contamination. It is noteworthy that the Beef Checkoff produced this video. The Beef

Checkoff is an organization dedicated to marketing and research to increase demand for beef. As YouTube allows for amateurs and professional alike to upload content, the videos in the sample were a mixture of home cooks and professional chef's. Formally trained chefs produced some content with professional appearing production, and one video was a 30-minute long cooking show hosted by a professional chef. Food safety mistakes within these videos will contribute to learning of unsafe or risky behaviors when cooking beef burgers.

In his description of the Social Cognitive Theory (SCT) Bandura, (1961) suggests that learning occurs by modeling. After further research, Bandura proposed the SCT that explained how learning occurs through a triadic of reciprocal determinism. That is, behavioral, cognitive, and environmental factors influence human behavior and learning. A person's behavior both influences and is influenced by their environment. The factors are not equally weighted and will vary according to specific events and circumstances. YouTube videos provide models from which consumers may learn cooking and food safety behaviors. The consumers choose to use YouTube (environmental influence) as a source of cooking knowledge and are then influenced by what they view and hear.

Observation or watching YouTube hamburger cooking videos may affect the learned behaviors of the viewers and may be better understood in the context of observation as described by Bandura and Grusec. Observers must pay attention to events or actions; attention may be affected by many variables such as medium (TV, Twitter, Lecture) or even model attractiveness. We can approximate attention as the number of views a given video has amassed, as YouTube's view number only counts videos that have been watched to

completion. After observing, the material must be retained; often, written modeling along with visual observation enhances retention. In the case of YouTube cooking videos, using the shown and described techniques in one's own cooking environment enhances retention. Converting symbolic representation of the original modeled behavior may be simple or very complex (learning to tie one's shoes versus learning to play the violin). The learner must now have sufficient motivation to appropriately model the given behavior (12, 70). It is not possible to know the motivation level of specific viewers, but it is worth noting that motivation level is great enough that the videos are sought out and viewed.

It is noteworthy that there was no statistically significant difference in the proportion of shown behaviors compared to total possible behaviors versus location/host type for any behavior with the exception of advising the use of time to determine doneness (N5). This indicated that there was no effect on the positive or negative behaviors shown based on the video location/host type. Home cooks were more likely to recommend using time to determine doneness when cooking indoors than chefs cooking indoors, outdoors, and home cooks cooking outdoors. Professional chefs in a professional kitchen were equally likely as home cooks in their home kitchen to make food safety errors in hamburger cooking videos. The overall proportion of shown positive and shown negative behaviors versus total possible positive and negative behaviors was significant with $p=0.01$ and indicates the difference found between the mean number of negative behaviors per video (167/534 or 0.3065) versus the mean of positive behaviors (36/623 or 0.05620) is not due to chance, and there were significantly more negative behaviors shown for every one positive behavior. The

overwhelming amount of negative behavior shown and described in the YouTube Hamburger cooking videos versus the relatively small number of instances where positive food safety behavior was shown or described created a learning experience that is likely to foster risky food safety behaviors.

A better how-to recipe or cooking video should address how to make safe food. Simple and easy to follow explanations of hazards specific to the food being prepared, as well as practical tips to safely prepare the food should be included. Explaining the risk and the simple methods to reduce it could not only make for safer cooking practices by home cooks, but also increase quality. For example, it is worth exploring not only risk communication, but also quality communication, such as the increase in meat quality when properly cooked versus overcooking or undercooking due to unsafe and unreliable methods to determine doneness.

Limitations:

YouTube content grows at an enormous rate, estimated to be 100 hours of video uploaded every minute. As the research is carried out by only two researchers and requires that the researchers watch each video, the amount of content that may be included is limited. Further, there is not an estimate of the total number of YouTube videos available, and more importantly, the number of videos that would be considered hamburger-cooking videos is difficult if not impossible to ascertain. In determining what the population will be defined as, human limitations were considered. The definition of population for this study was: the sum of the number of individual videos returned by searching for the terms “hamburger”,

“burger”, and “cheeseburger”. As noted by Internet marketing firm Hubspot.com, most (75%) of Internet users do not delve deeper than the first page of results returned for a given search(78). In light of typical search habits, only the first ten pages of search results for each term, totaling 600 videos that comprised the sample population. Of the 600, only 92 met the screening criteria and a further 3 videos were disqualified upon full examination, leaving 89 (n=89) videos that qualified for the study sample.

Table 3.1 Coding Schedule Definitions

Coding Schedule for food safety behaviors in YouTube videos around STECs in beef burgers.			
Code Category	Reference Number	Definition of Code	Reference
Cross Contamination	P1	Is cross contamination consistently prevented at each possible event?	(102, 119, 136, 157)
Adequate Cooking	P2	Is a food thermometer used to determine doneness?	(72, 103, 119)
Adequate Cooking	P3	Is a thermometer used properly (inserted to center and correct temperature) to determine if the burger is cooked?	(72, 103, 119)

Table 3.1 Continued

Adequate Cooking	P4	Are proper safe cooking temperatures used to determine if the burger is done?	(72, 103, 119, 146, 147)
Personal Hygiene	P5	Are hands washed?	(32, 103)
Personal Hygiene	P6	Are hands washed with soap and running water?	(32, 103)
Personal Hygiene	P7	Are hands washed according to CDC guidelines?	(32, 103)
Cross Contamination	N1	Does cross contamination occur (or is a likely instance of it shown)?	(102, 119, 136, 157)
Proper Cooking	N2	Is flesh color used to determine doneness	(72)
Proper Cooking	N3	Is juice color used to determine doneness	(72)
Proper Cooking	N4	Is meat firmness used to determine doneness	(72)
Proper Cooking	N5	Is time used to determine doneness	(72)
Proper Cooking	N6	No reason declared for doneness/fully cooked	(72, 119)

Table 2. Positive and Negative Food Handling Behaviors and Location Type and sum of occurrences and percentage of videos in which behaviors occurred.

Code	Commercial Kitchen	Home Kitchen	Home/ Outdoor	Commercial/ Outdoor	Total
Video type	15	55	6	13	89
P1	2	19	1	3	25
P2	0	1	0	1	2
P3	0	0	0	1	1
P4	0	1	1	1	3
P5	0	3	0	1	4
P6	0	1	0	0	1
P7	0	0	0	0	0
Total P	2	25	2	7	36
N1	13	36	5	10	64
N2	2	12	0	0	14
N3	1	5	0	0	6
N4	1	2	0	1	4
N5	2	25	4	3	34
N6	11	23	2	9	45
Total N	30	103	11	23	167

Table 3. Chi Square comparison of behaviors versus location type.

Negative Behaviors	Chi-Square p value	Significant Difference
N1	0.3475	NO
N2	0.1612	NO
N3	0.6027	NO
N4	.8372	NO
N5	0.0372	YES
N6	0.0624	NO

Positive Behaviors	Chi-Square p Value	Significant Difference
P1	0.3475	NO
P2	0.5157	NO
P3	0.1159	NO
P4	0.1768	NO
P5	0.7018	NO
P6	0.8906	NO
P7	No value	NO

Table 4. Difference in ratio of shown positive behaviors to total possible versus shown negative behaviors to total possible.

Procedure	P value	Significance (p=.05)
Chi Square	<.0001	YES
Glimmix Procedure	0.0020	YES

Ratio of shown positive to total possible positive behaviors versus shown negative behaviors to total possible negative behaviors

CHAPTER 4. MOM BLOGGERS AND NOROVIRUS

Abstract:

Mom bloggers represent an influential subset of Internet users. Little is known about this group's knowledge or attitudes around norovirus. It is hypothesized that that they will be more knowledgeable and concerned about norovirus than the general population. An online survey was used to generate data that will provide insight into the attitude and knowledge of mom bloggers around norovirus, as well as elements that contribute to trust in online and traditional media. Convenience sampling was used to recruit participants, with an n of 99. This study aimed to provide a quantitative measure for comparison to a similar study of the general population. Mom bloggers were found to have high levels of knowledge about norovirus symptoms, used various methods to determine if a child could re-enter social activities, and had a poor sense of how food may contribute to norovirus infections. The attributes that contributed a sense of trust and reliability to online versus traditional media did not vary significantly in the proportion of respondents that indicated a given attribute built trust in the media form in question.

Introduction:

Mom bloggers, defined for this research as mothers that maintain an active blog about any aspect of their motherhood or family life, that may have a few readers or millions. Some wield considerable influence and as subset of Internet users they are considered highly influential. They are a population often targeted by marketers of consumer goods and services as a way to engage with consumers, build awareness and influence, and expend less

resources versus traditional marketing tactics (107, 114, 116, 151). Food producers are becoming increasingly aware of this influence and risk communicators must reach out to mom bloggers as well (65). Little is known about this group's knowledge of and attitude toward norovirus and norovirus infections. Norovirus strikes 19-21 million in the US every year, with 400,000 emergency room visits, 56 to 71 thousand hospitalizations, and 570- 800 deaths. Norovirus is the most common cause of acute gastroenteritis amongst children under 5 years of age, and this is most likely segment of the population to be hospitalized (73, 111).

As a population in caring for children, it is important to understand the knowledge level and concern that may effect how norovirus and food safety information shared and utilized. Carney et al conducted a nationally representative survey of adults to determine if demographic characteristics influenced perceived severity of and susceptibility to norovirus infections(62). The results of the current survey will be compared to the aforementioned survey for potential similarities and differences in attitude and knowledge levels between the different demographic groups. Cornell conducted a survey of 89 mom bloggers designed to assess whether they believed social media made the bloggers better parents. The majority of the mom bloggers (75%) believed use of social media did make them better parents. In addition, the average amount of time spent on social media per week was 4 hours (43). It is not currently known if food safety and norovirus specifically are topics that are discussed or shared in any way.

It is important to be aware of the current state of mom bloggers' attitudes, and knowledge around norovirus. In a study of the role that interpersonal discussion may have on

perception of a biological research facility, Binder et al found that frequency and most recent discussion valence (positive or negative) affected perception of risk and benefits. Most recent discussion valence had the strongest effect(19). Mom bloggers and risk communicators may benefit from increased frequency of engagement and discussion valence that indicates the importance of the exchange at hand.

The purpose of this study was to elicit general descriptive data with which to compare the data of the previous national study on norovirus perceptions to determine if the mom blogger population varies in significant ways from the general public. These data may aid in the design of higher quality engagement and risk communication methods in food safety risk communication with mom bloggers.

Materials and Methods:

Survey

To determine the attitudes and knowledge level of mom bloggers around norovirus risks and management, an online survey was used. Online surveys have been used effectively for market research specific to mom bloggers' attitudes and knowledge on various topics previously(107, 114, 116, 126). Participants were compensated for their time with ten dollar gift cards redeemable at Target© stores.

Instrument development

Survey questions were developed to match a portion of those used in the Carney study and were posed in the same manner to allow for comparison between the two different study populations. Survey Questions may be found in Appendix A.

A variety of question types were used, including multiple-choice single answer, multiple-choice with multiple answers, ranking questions, true and false statements, and rating questions. All questions required an answer, and for questions that required a selection between multiple choices, an “other” category was offered in the case that the given choices were insufficient.

Questions aimed at gauging concern or perception of risk were phrased such that participants could rate their perceived likelihood of the given threat or disease effecting them. Questions around cleaning methods, and some general knowledge questions, were structured as multiple choices to simplify the survey in the effort to increase response rate. Other general knowledge questions were posed as statements that were to be selected as “true”, “false”, or “don’t know” to allow for comparison of knowledge around specific but related topics like whether norovirus is potentially foodborne, specific foods that may be vectors for norovirus; or proper handling of food items.

Recruitment

Convenience sampling was used to obtain the survey sample population. A randomized sampling of mom bloggers was prohibitive due to the required anonymity of the survey and survey responses. As no demographic or identifying information was linked to survey responses, the data are random and it could not be confirmed if sampling was in fact representative of mom bloggers. Recruitment for the survey was performed as follows: researchers compiled lists of popular mom bloggers as determined by mom blog aggregating websites www.topmommyblogs.com, www.circleofmoms.com, and www.babble.com.

These aggregators were chosen based on self-supplied readership information indicating large user bases. Each researcher compiled a list of the top 100 most popular blogs on the three websites. Institutional Review Board approval was sought and granted by the North Carolina State University IRB prior to recruitment and administration of the survey.

Initial recruitment

Once three lists of mom bloggers were compiled, they were sorted into one list and repeats were removed. An introduction statement informing potential participants of the content, risks, and compensation was sent to bloggers via email either directly (if email addresses were available), or indirectly (through “contact us” services). The recruitment statement is available in Appendix B.

The online survey service www.SurveyMonkey.com was used to administer the survey as well as collect survey response data (139).

Secondary Recruitment

Further recruitment was necessary as direct email only elicited 12 completed surveys. The secondary recruitment was carried out by promotion by two blog posts on www.barfblog.com and with Facebook posts and tweets on Twitter (37, 38). A blog post outlining the goals, risks, and compensation for survey participation was posted and subsequently automatically shared via Twitter and Facebook to reach as many mom bloggers as possible. The barfblog post, Facebook post and tweets all contained a hyperlink to bring survey participants directly to the instrument.

Results:***Trust***

WebMD and the Mayo Clinic were selected as trustworthy sources of online health information by 70% and 62.5% of participants respectively, while 40% and 42.3% found the NIH and CDC to be reliable sources of online health information. Of the five major news networks (Fox News, NBC, CBS, MSNBC, and CNN) none were selected as trustworthy by more than 17.5% of participants with CNN being the most trusted. Online articles citing peer-reviewed literature were the most commonly selected attributes contributing to trust in traditional media forms of health information (67.5%), with traditional medical experts trusted by 65% of participants. Citing non- peer reviewed research was trusted by 15% of participants. Logical sounding explanation and easy to understand terminology and writing were both found to be attributes that contributed to trust by over one third of participants (33.8% and 37.5%) respectively. Comparing attributes of online versus traditional media contributing to the mom bloggers perception that it was reputable, reliable, and trustworthy information did not yield any significant differences. Using Chi² testing, the two media sources were compared for independence at significance level of p=0.05. Citing other webpages is significant at a greater p value of 0 .1 (Chi² p value= .09) (Figure 3).

Awareness

Norovirus was identified by 52.5% of participants as the most likely cause of illness described as the 24 hour flu, stomach flu, or stomach bug, all common descriptions of norovirus infections(35) (Figure 6). Nearly 80% of participants identified vomiting as a

symptom of norovirus (79.7%), with diarrhea, abdominal cramps, and nausea identified by greater than two thirds of participants (75.9%, 67.1%, 68.4%) respectively while 2.5% did not think any of the available symptoms applied to norovirus infections (Figure 7).

Previous Experiences

Regarding past infections, 41.8% of participants believe it was extremely likely they or immediate family have experienced norovirus infections in their lifetimes. Over 70% believed it was at least somewhat likely to have experienced norovirus infections (70.9%) with 12.7% unsure and 16.4% believing it somewhat or extremely unlikely to have experienced norovirus infections. In the last 12 months, 69.4% of respondents had read or heard about norovirus specifically (Figure 8).

General Norovirus Knowledge

Over 80% of participants were aware that norovirus infections may occur many times to the same person and contact with an infected person's vomit and feces may lead to infection (84.4%, 84.4%). The statements "norovirus is not contagious" and "only young children and older adults can become infected with norovirus, not the general public" were recognized as false by 77.9% and 80.5% of respondents (Figure 9). Washing hands with soap and water was correctly identified as a way to prevent the spread of norovirus by 84.4% of the respondents, with 57.1% identifying hand sanitizers as an effective means of preventing norovirus infection (Figure 10).

Note on survey data, some results may be effected by a malfunction within the survey administration service that allowed participants to skip questions without answering.

Discussion:

Mom bloggers obtain health and food safety information from a variety of sources and have varying knowledge levels and attitudes around norovirus. When asked about trusted sources of online health information, there were clusters of services that were trusted by a similar number of respondents. www.WebMD.com and www.mayoclinic.com were the most popular choices with 56 (70%) and 50 (62.5%) of respondents indicating these as trustworthy resources. These two were followed by the CDC, American Academy of Pediatrics, then NIH with 37 (46.3%), 34 (42.5%), and 32 (40%) respondents selecting them as trusted resources. Online outlets for large news organizations such as FOX, NBC, CBS, MSNBC, and similar were not as well trusted. Of these information sources the most trusted was CNN at 14 (17.5%) respondents. Collectively it is important to maintain accurate and easily digested information at these outlets as they will likely be the most used sources and the instructions or advice given is more likely to be acted upon than other media outlets. When asked about the likelihood that they or their families had experienced norovirus, 55 (69.5%) mom bloggers believed it was at least somewhat to extremely likely they had experienced the illness, while 13 (16.5%) indicated it was somewhat to extremely unlikely they had experienced norovirus illness at some time in their lives. Norovirus infections typically strike approximately 19-21 million individuals per year in the US. It is estimated that norovirus will have struck the majority of US families, consistent with the self reported data in this survey(73).

When asked to rank the best indicator that a child was ready to return to social activities after norovirus illness, “ A total lack of symptoms for 24 hours or more” was rated the best determinant by 65 (85.3%) of bloggers, which is inconsistent with the 44 (57.1%) of respondents that reported this as the method they used to determine if a child was ready to return to social activities. However, there remain 21 bloggers that report this as the best method to determine readiness to resume social activities, but may not withhold children from social activities using the guidelines they believe to be the best. These results indicate that while a majority of the respondents are aware that it is advisable to wait until symptoms have abated for at least 24 hours prior to returning to social activities, many do not follow this advice, which may lead to increased transmission of norovirus.

The four most common symptoms of norovirus (vomiting, nausea, diarrhea, abdominal cramps) were identified by at least two thirds of respondents indicating that mom bloggers are familiar with the illness caused by norovirus. Further, over half of mom bloggers identified norovirus as the most common cause of food borne illness, again showing knowledge of the virus.

When asked to determine if statements regarding norovirus were true or false, over two thirds of respondents correctly identified statements about norovirus infectivity such as if vomit from an ill person is likely to contain virus particles and that it can infect individuals repeatedly; as well as that washing hands with soap and water is a good way to reduce the risk of infection. Respondents were not as knowledgeable about food vectors of norovirus and ways to mitigate the spread of norovirus (with the exception of washing hands). There is

a knowledge gap around mitigation of norovirus. This knowledge gap combined with the indicated level of concern with stopping the spread of norovirus within their own family and outside of their family is indicative of an audience that may be more receptive to risk communication messages than the general public.

Limitations

There are some potential limitations of the study, and results should be viewed in light of these. Recruitment of mom bloggers was more difficult than anticipated and the number of participants was limited to 99. Of the 99, 7 did not qualify to participate as they were not the primary caretakers of children. Another 2 participants skipped the question, so the sample n is 90 individuals of an unknown population as the number of mom bloggers is not known and is expected to change continuously. Further, due to a malfunction in survey administration, participants were able to skip questions without providing an answer. This should not have been possible as all 25 survey questions were explicitly set to require an answer before a participant could move forward in the survey. The cause for this malfunction is unknown. The number of participants that skipped questions varied, with a mean of 22.18 skips per question and a standard deviation of 3.04. Two of the questions, numbers 10 and 11 had 44 skips each and were not included in the data analysis. This reduces our sample size and thus reliability at each data point.

Online surveys should be designed to ensure anonymity to encourage a higher response rate. Other factors that may increase response rate include offering incentives, highlighting the public value of the survey, and that it is sponsored by or affiliated with a

reputable institution(45) A Dutch investigation of online survey efficacy indicated that incentives drive response rates more so than donation of time for longer surveys and that a lottery for a prize is the most effective method to recruit responses for short surveys. The researchers tested the response rate and quality (completeness and accuracy) by email campaigns to elicit survey responses regarding and measuring the results obtained by different incentive options(48).

Future research should be aimed at refining survey design and administration to obtain more reliable data. It is notable that there did not appear to be a difference in the attributes that built trust in a media source, if it was online media or traditional media. Further exploration of why mom bloggers do or do not use the same attribute to judge trust in online versus traditional media may help in shaping future risk communication and engagement by food safety professionals.

Mom Blogger Figures

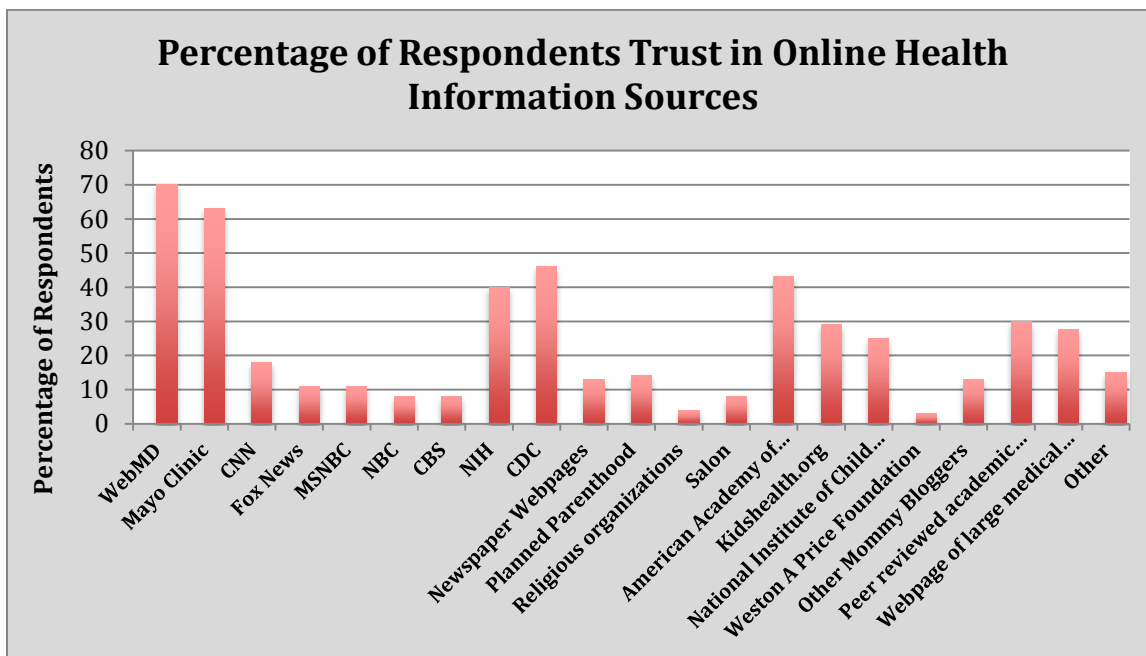


Figure 1. Question 3. Trusted Sources of Online Health Information

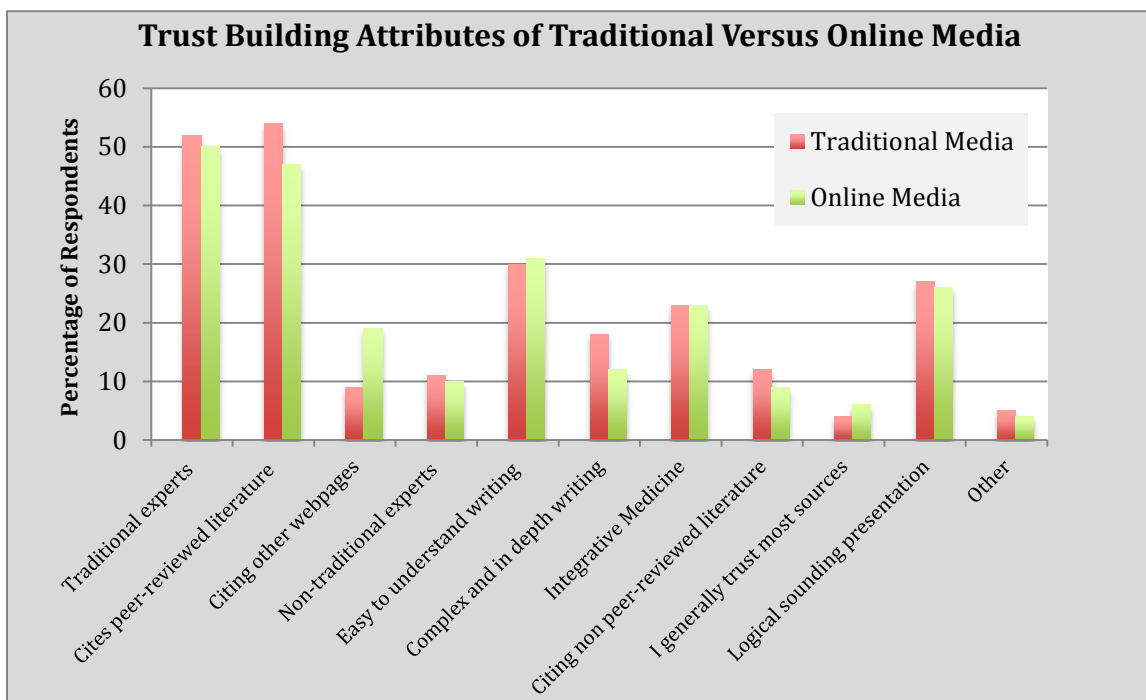


Figure 2. Questions 4 and 5. Attributes of Online and Traditional Media that Build Trust

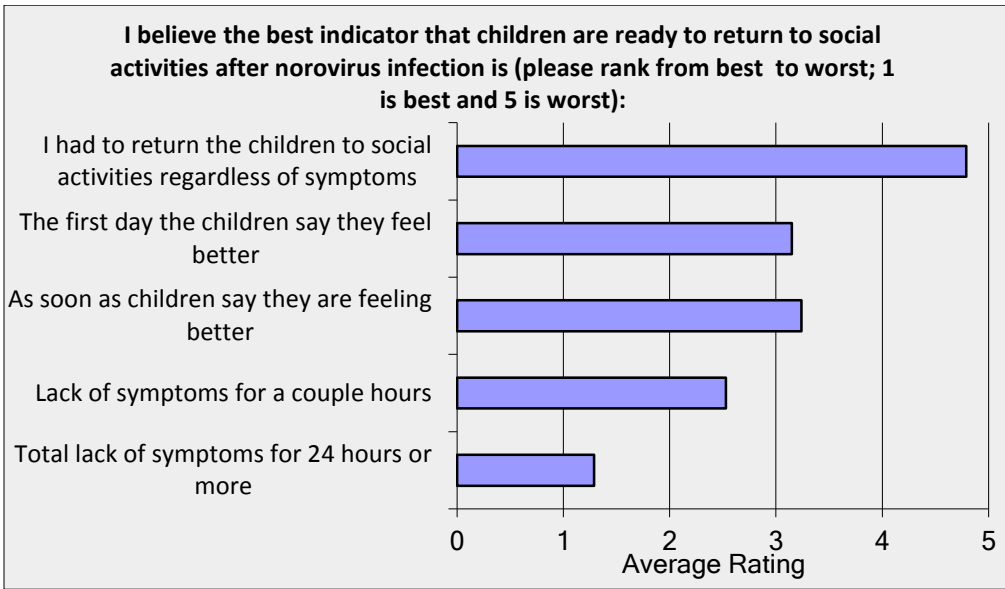


Figure 3. Question 15. Return to Social Activities

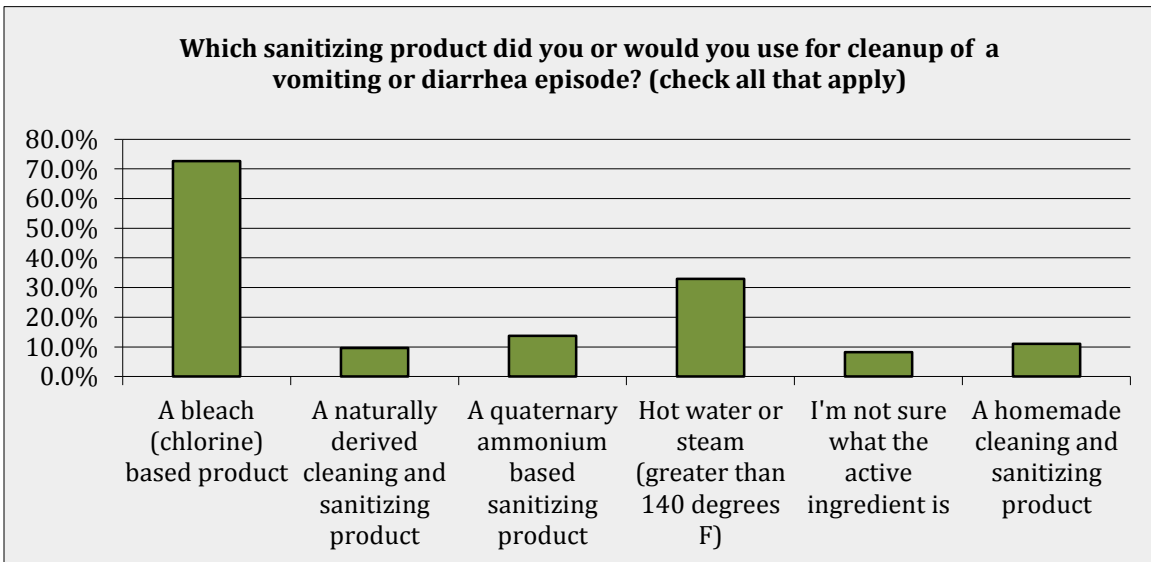


Figure 4. Question 16. Preferred Sanitizing Products

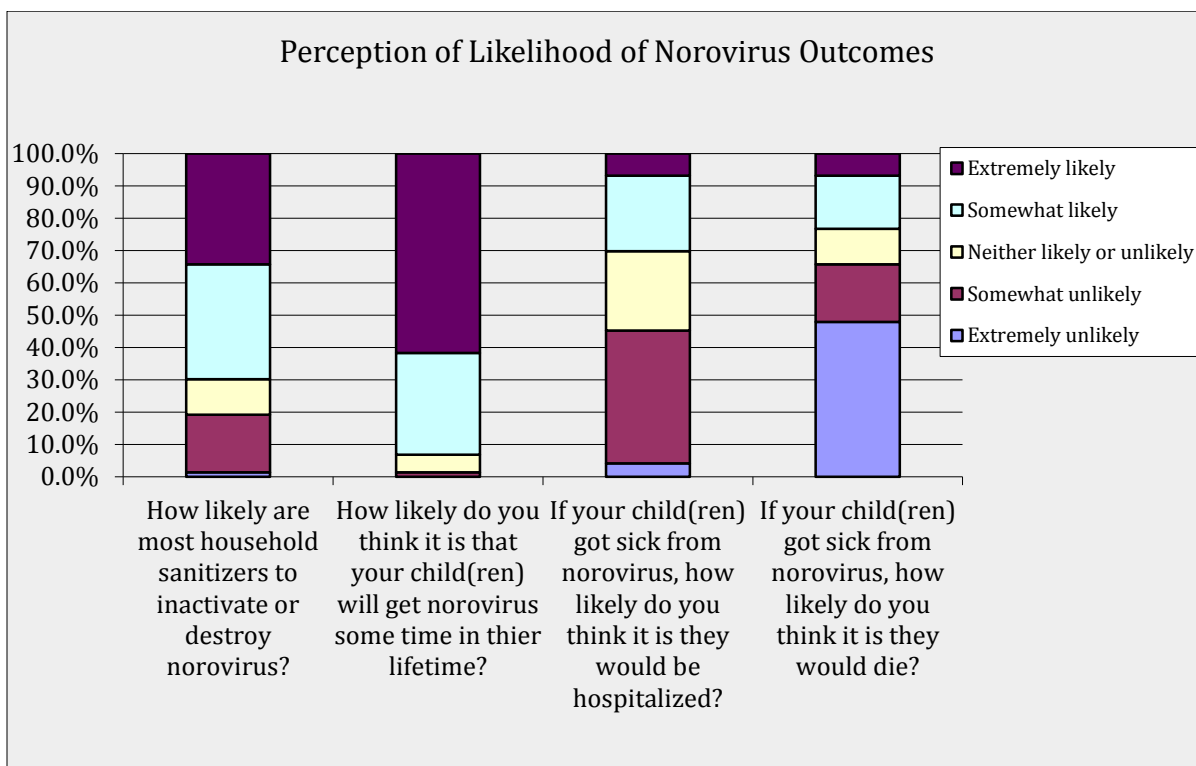


Figure 5. Question 18. Perception of Likelihood of Norovirus Related Outcomes.

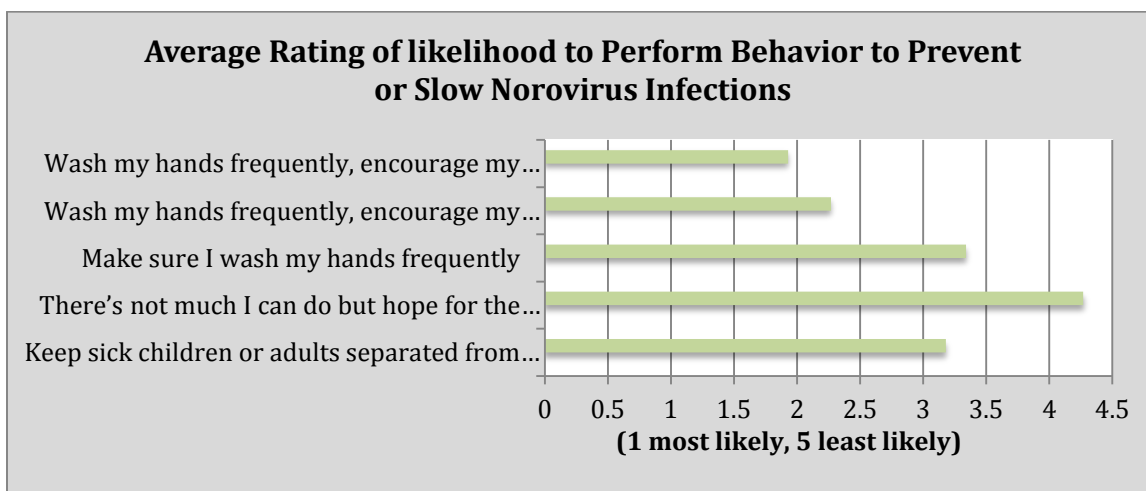


Figure 6. Question 20. Performing Behaviors to Prevent Norovirus Transmission

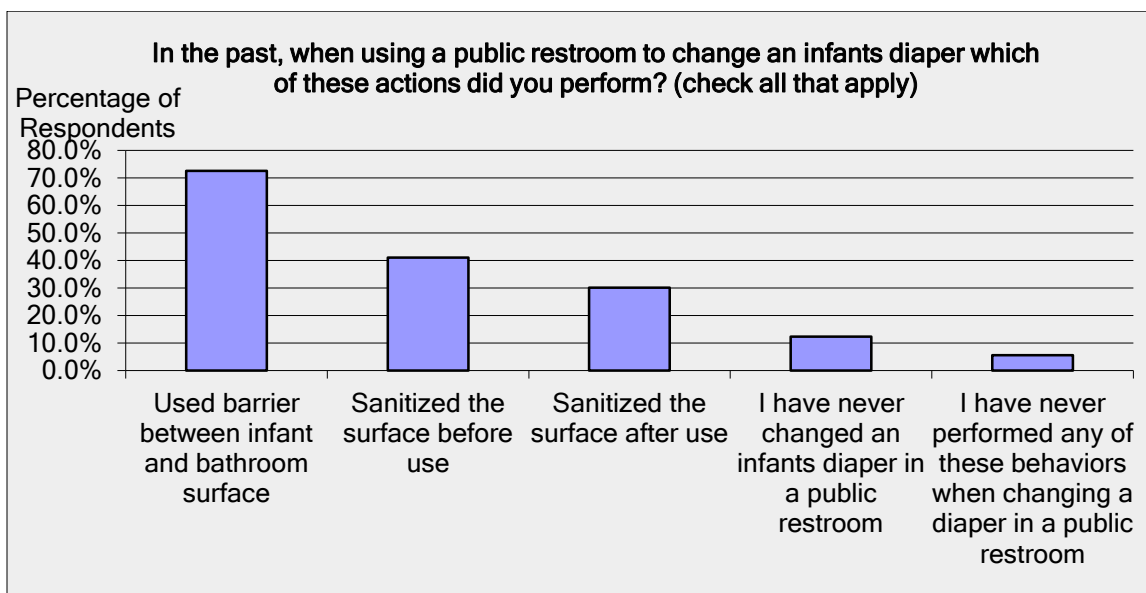


Figure 7. Question 22. Public Restroom Diaper Changing

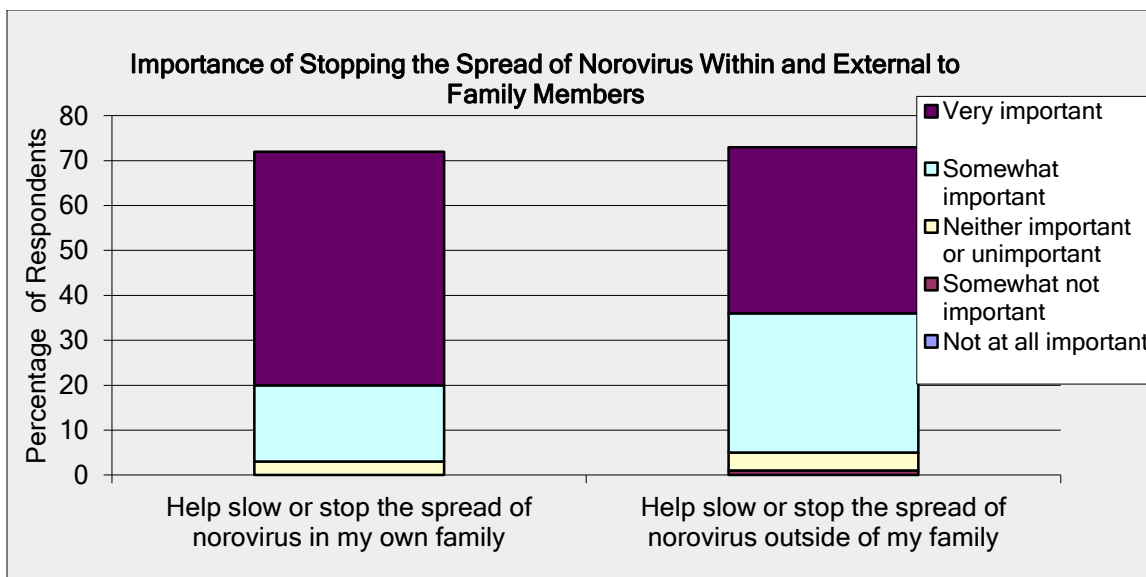


Figure 8. Question 24. Perceived importance of helping to stop or slow spread of norovirus within family and external family.

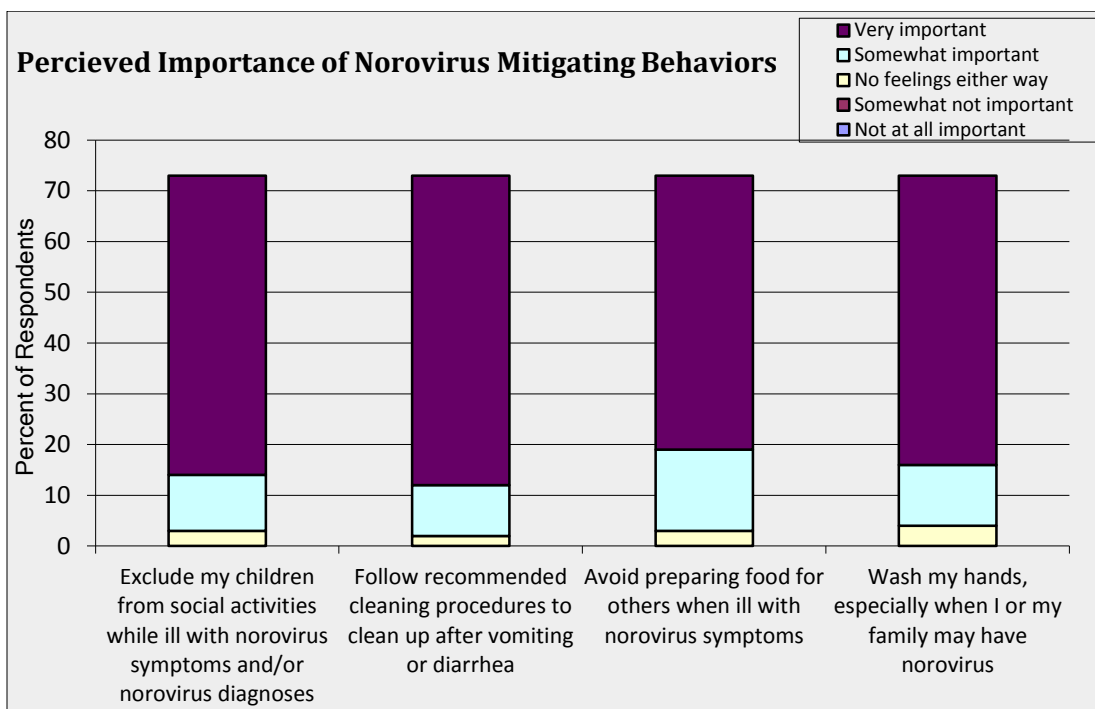


Figure 9. Question 25. Perceived Important Behaviors to Stop or Slow Spread of Norovirus.

Mom Blogger Tables

Table 1. Questions 4 and 5. Difference in Attributes that Build Trust and Reliability; Online vs. Traditional Media

Attributes that Build a Sense of Trust and Reliability of Health Information	Traditional Media	Online Media	Independence at p=.05	Chi Sq. p value
Traditional experts	52	50	NO	0.92
Cites peer-reviewed literature	54	47	NO	0.55
Citing other webpages	9	19	NO	0.09
Non-traditional experts	11	10	NO	0.15
Easy to understand writing	30	31	NO	1
Complex and in depth writing	18	12	NO	0.27
Integrative Medicine	23	23	NO	1
Citing non peer-reviewed literature	12	9	NO	0.51
I generally trust most sources	4	6	NO	0.53
Logical sounding presentation	27	26	NO	0.89
Other	5	4	NO	1

Table 2. Questions 6 and 7. Perception of the most common cause of and symptoms of norovirus.

Question 6. What is the most common cause of the 24-hour flu, stomach flu, or stomach bug? (n=80)	
Answer Options	Response Count
E. coli	7
Salmonella	1
Norovirus	42
Spoiled food	8
Influenza	11
I have no idea	11
If a person gets sick from norovirus, what symptoms will they have?	
Answer Options	Response Count
Vomiting	63
Diarrhea	60
Abdominal Cramps	53
Asthma	4
Cough	9
Fever	35
Rash	5
Nausea	54
None of the above	2

Table 3. Questions 12 and 13. General Knowledge of Norovirus.

STATEMENT	TRUE	FALSE	UNSURE
	Response Count (n=77)		
Norovirus is not contagious	11	60	6
Only young children and older adults can become infected with norovirus, not the general public	10	62	5
People can become infected with norovirus many times in their life	65	7	5
People can become infected with norovirus if they come in contact with feces or vomit from an infected person	65	7	5
Most norovirus outbreaks occur in the summer	14	34	29
The best way to prevent norovirus infections is to cook meat and poultry thoroughly	24	35	18
Raw meat and poultry are commonly involved in norovirus outbreaks	22	34	21
Norovirus outbreaks have been commonly linked to contaminated green, leafy vegetables, such as lettuce and spinach	19	28	30
Norovirus is the most common cause of foodborne-disease outbreaks in the United States	36	16	25
About half of all outbreaks of food-related illness are caused by norovirus	29	17	31
Most norovirus infections occur on cruise ships	14	40	23
Most foodborne outbreaks of norovirus are caused by eating food that was handled or prepared by a person infected with norovirus	59	6	12
Washing your hands with soap and water can prevent the spread of norovirus	65	4	8
Using hand sanitizer can prevent the spread of norovirus	44	20	13
It is safe for people infected with norovirus to prepare food for others	6	64	7
People infected with norovirus may be able to spread norovirus for at least 2 weeks even if they feel better	46	11	20
People can become infected with norovirus if they have direct personal contact with an infected person	58	10	9
People can become infected with norovirus if they touch objects and surfaces that have been touched by a person with a norovirus infection	54	13	10
Clothes that are contaminated with vomit or feces should be washed in warm water	38	18	21
Norovirus infection can easily be treated with antibiotics	8	60	9
Any food can become contaminated with norovirus	42	12	23
Noroviruses can survive cooking temperatures as high as 140°F	33	16	28
Household bleach is the best sanitizer to use on surfaces contaminated with norovirus	49	12	16
To clean up a surface contaminated with vomit or feces, apply a solution of one tablespoon bleach to one gallon of water and let sit for ten minutes	43	12	22
People can get vaccinated to prevent norovirus infection	9	53	15

Table 4. Question 14. Return to Social Activities

How did you decide your children were ready to return to social activities illness with suspected or diagnosed norovirus? (n=77)	
Answer Options	Response Count
Total lack of symptoms	18
Symptoms were greatly improved	6
Lack of symptoms for 24 hours	44
I needed time to do other things	2
I don't know exactly	7

Table 5. Question 19. Mitigating the Transmission of Norovirus.

What is the best way to stop or slow the spread of norovirus?	
Answer Options	Response Count (n=73)
Keep sick children or adults separated from healthy individuals	6
There's not much I can do but hope for the best	3
Wash my hands frequently, encourage my family to wash their hands frequently, separate ill and healthy individuals and clean with sanitizers and/or hot water/steam.	50
Wash my hands frequently, encourage my family to wash their hands frequently, and keep ill and healthy individuals separated.	11
Make sure I wash my hands frequently	3

Table 6. Question 21. Public Restroom Hygiene Habits

When using a public restroom, how do you wash up afterward?	Response Count (n=73)
If I didn't touch anything I don't worry about it	0
I use soap and water to wash my hands and paper towels or electric hand dryers	50
I use hand sanitizer	4
I wash my hands with soap and water and use hand sanitizer	9
I prefer to use hand sanitizer over washing with soap and water	4
I prefer to use soap and water over hand sanitizer	6
Other	3

Table 7. Question 22. Bathroom Hygiene

When using a public restroom, how do you wash up afterward?	
Answer Options	Response Count (n=73)
If I didn't touch anything I don't worry about it	0
I use soap and water to wash my hands and paper towels or electric hand dryers	50
I use hand sanitizer	4
I wash my hands with soap and water and use hand sanitizer	9
I prefer to use hand sanitizer over washing with soap and water	4
I prefer to use soap and water over hand sanitizer	6
Other	3

CHAPTER 5. CONCLUSION with DISHWASHER BLOG POST

Project Overview

Social media encompasses a variety of platforms and includes blogs and video sharing such as YouTube. Previous research has focused on a variety of topics, but currently there is little known regarding mom bloggers and their knowledge and attitudes about norovirus. YouTube how to videos on hamburger preparations are widely viewed and may contribute to learning or reinforcement of positive or negative food handling behaviors. An online survey of mom bloggers increases understanding of the group's attitudes and knowledge about norovirus that may be compared to a study of the general us population. A content analysis of YouTube how to videos on hamburgers sheds light on behaviors shown that may influence the learning and performance of safe or risky food handling behaviors when preparing hamburgers at home. Lastly a sample of a blog post designed to generate readership and sharing using the latest communication research is presented.

Mom Bloggers and Norovirus

Survey research has long been used to gain insight into the attitudes and knowledge of specific groups(45). Mom bloggers attitudes and knowledge about norovirus were investigated utilizing an online survey. Information including perception of severity and susceptibility of the bloggers and their families to norovirus infection, attitude toward the importance of halting norovirus transmission, and elements of online versus traditional media that build trust was obtained. Previous research on this group has focused on marketing and

demographic research, this is the first contribution to risk communicators that may enable better and more focused discussion and engagement around topics such as norovirus.

Mom bloggers were aware that norovirus is the most common cause of foodborne illness, as half of the sample group correctly identified it as such. Most (greater than 2/3) were familiar with the common symptoms common to norovirus infection, again indicating some level of knowledge or familiarity with the illness. Attribute of online media and traditional media that contributed trust in the source varied; how messages are crafted and evidence used should be tailored to the medium as it may effect acceptance and trust in the message. Mom bloggers were aware that washing hands with soap and water is an effective means to reduce spread of norovirus, but did not have a strong sense of how food may serve as a disease vector, or which foods may be more likely to spread norovirus, how cooking may effect norovirus, or the efficacy of some sanitizers. There is a knowledge gap to be filled, and a high level of concern with stopping norovirus within their own families, and while the concern level is significantly lower outside of the family unit, mom bloggers are also concerned with stopping the spread of norovirus in general.

YouTube How to Videos: Learn to Cook Hamburgers Online

Content analysis is a widely accepted method designed to create valid and replicable inferences from data to their context(89). The basic process creates quantifiable data from media to allow for analysis and comparison within similar or dissimilar media. Content analysis was used to create usable data on occurrence of positive and negative food safety behaviors within YouTube how to videos on hamburger preparation. The content analysis

was designed such that behavior could be compared by location and host type in addition to ratios of positive and negative behavior shown to total possible counts of positive and negative behaviors.

YouTube how to videos are a great resource for a variety of learning topics, but should be viewed skeptically at best as a source for food safety modeling and learning. The results of the content analysis of YouTube videos showed that negative or risky food safety behaviors occurred significantly more in comparison to the total possible number of negative behaviors than positive to total possible positive behaviors did. This creates a learning situation that may encourage unsafe or risky food handling behaviors and attitudes. When comparing for behaviors versus location/setting of the videos, the only significant difference was found to be for using time as determination of doneness as significantly more home cooks versus professional chefs relied on the time a burger had been cooking to determine if it was cooked. YouTube videos around hamburger cooking create an environment in which viewers will be exposed to increased negative food safety behaviors that are encouraged by home cooks and chefs like, that model the negative behaviors.

Final Conclusions

The research presented indicates that YouTube how to videos on Hamburger preparation are at best unreliable for learning positive food safety behaviors, and are likely to model and teach risky or negative food safety behaviors. Mom bloggers are concerned about norovirus but there are knowledge gaps around how to effectively handle infection within their families. There is no significant difference in how they evaluate online versus

traditional media to be trustworthy. Food safety in social media still a research area in it's infancy and there remains serious gaps in literature on topics such as risk communication strategies for food safety and mom bloggers or the behaviors being modeled on YouTube videos. This research helps to fill these gaps and aides in creating better engagement and risk communication strategies around food handling and safety.

Blog Post

You Won't Believe What They in the Dishwasher.

Have you ever unloaded freshly washed dishes and thought, "Hey that's really hot? Maybe I could cook something in there"? Neither had I, but apparently it's a thing. Online media outlets such as The Salt (NPR), The Stir, Slate, Huffington Post, ABC News, RealSimple.com, LA Times, Life Hacker, Food Network, WineX.com, The Telegraph, Daily Mail, Grist, YouTube (Slate produced) and Oprah to name a few have suggested it as a way to cook everything from Turkey to Salmon to Vegetables (6, 21, 22, 23, 50, 59, 67, 69, 75, 88, 109, 120, 132, 143, 144, 148). All of these articles appear in the first two pages of a Google search for "dishwasher cooking" well within the range of search results that most consumers will actually use(78). Credit is due as well to Lisa Casalli, author of the one and only "La Cucinare in Lavastoviglie" or Cooking in the Dishwasher who appeared on the NPR's The Salt and inspired Slate to produce a video about a feast made in the dishwasher(30). The common aspects shared by all articles are that they swear up and down it is a great idea 'It will be delicious!' and 'Try it!' I cry foul, there no way is this a good idea.

As a food safety nerd, and food nerd in general my first thought was “could this actually cook something potentially risky like chicken or turkey to a safe internal temperature?” My second thought, “Even if it cooks safely; will it be gross”? Lucky for me, I’m a grad student with access to some neat little gadgets that will allow me to test out both questions. As a scientist I’ll couch the questions as hypothesis; my home dishwasher will not cook chicken to a safe internal temperature and the quality will be less than satisfactory.

The results? It works. Kind of, sort of, but not really. The chicken was (subjectively) gross. I would never “cook” chicken this way again. However, it was technically cooked. Endpoint temperature is the way the USDA and FDA suggest consumers cook meat, its simple and quick, but not the only way. Bacteria are complicated beasts, and destroying them can be just as complex. It is entirely possible to safely cook food at temperatures lower than the FDA recommended endpoint temperatures, as long as the food is held at a given temperature for the appropriate amount of time. This is the concept behind sous-vide cooking, lower heat with extended exposure time. It works, but it requires more control (more complicated and expensive equipment) and knowledge than the majority of average cooks are likely to have. This concept is familiar to microbiologists and food scientists, but maybe not so much to the home cook. USDA Appendix A is a handy tool to use to determine how long one would need to cook meat at a given temperature to render it safe to eat, defined as a 7 log reduction in Salmonella. This means at the given time and temperature combinations from 131°F /121 minutes to 158°F / 0 seconds 99.999999% of Salmonella present will be killed or a ten million fold reduction(147). This will render the chicken or

other meat safe to eat. This may sound excessive, but when the median infectious dose is considered, or how many Salmonella you would likely need to eat to get sick, and the huge number that may be present on a piece of chicken, it seems more reasonable.

So how did my dishwasher do? I was able to cook the chicken at or above 135°F for greater than the minimum of 37 minutes to safely cook it(147). Full data set may be found in Appendix B. The problem, aside from requiring hundreds of dollars in gadgets to measure the temperature, the chicken texture was awful. Not firm, still somewhat translucent and not firm (just imagine raw chicken texture). This is because chicken breast meat contains a mixture of proteins that do not denature and set into a firm piece of cooked chicken until they reach about 155°F(20, 87, 142). So, the chicken may be safe to eat, but still not of an acceptable quality to be considered “delicious” or even ok in my eyes.

All things considered, it is possible to cook safely in MY dishwasher, but the same can't be said for other dishwashers without the requisite gadgets and knowledge.

REFERENCES

1. Ajzen, A., and M. Fishbein. 1980. Understanding attitudes and predicting social behavior. Prentice Hall, New Jersey.
2. Ajzen, I. 1991. The theory of planned behavior. *Organ. Behav. Hum. Decis. Process.* 50:179–211.
3. Akritidis, L., D. Katsaros, and P. Bozanis. 2011. Identifying the Productive and Influential Bloggers in a Community. *IEEE Trans. Syst.* 41:759–764.
4. Altekruse, S. F., S. Yang, B. B. Timbo, and F. J. Angulo. 1999. A Multi-State Survey of Consumer Food-Handling and Food Consumption Practices. *Am. J. Prev. Med.* 16:216–232.
5. Anderson, J. B., T. a Shuster, K. E. Hansen, A. S. Levy, and A. Volk. 2004. A camera’s view of consumer food-handling behaviors. *J. Am. Diet. Assoc.* 104:186–91.
6. Andriani, L. 2013. Summer Show-Stopper: Dinner in the Dishwasher. www.oprah.com.
7. Atmar, R. L. 2010. Noroviruses - State of the Art. *Food Env. Virol* 2:117–126.
8. Atmar, R. L., A. R. Opekun, M. a Gilger, M. K. Estes, S. E. Crawford, F. H. Neill, and D. Y. Graham. 2008. Norwalk virus shedding after experimental human infection. *Emerg. Infect. Dis.* 14:1553–7.
9. Bandura, A. 1977. Self-efficacy: toward a unifying theory of behavioral change. *Psychol. Rev.* 84:191–215.
10. Bandura, A. 2001. Social cognitive theory: an agentic perspective. *Annu. Rev. Psychol.* 52:1–26.
11. Bandura, A., D. Ross, and S. A. Ross. 1961. Transmission of aggression through imitation of aggressive models. *J. Abnorm. Soc. Psychol.* 63:575–82.
12. Bandura, A. 1971. *Bandura_SocialLearningTheory.pdf*, 1st ed. General Learning Press, New York.
13. Bandura, A. 2004. Health promotion by social cognitive means. *Health Educ. Behav.* 31:143–64.

14. Bandura, A. 1989. Social cognitive theory, p. 1–60. *In Annals of Child Development: 6 Theories of Development*, 6th ed. JAI Press, Greenwich.
15. Bandura, A. 2009. Social Cognitive Theory of Mass Communication Social Cognitive Theory of Mass Communication. *Media Psychol.* 3:265–299.
16. Barclay, L., M. Wikswo, N. Gregoricus, J. Vinje, B. Lopman, U. D. Parashar, and A. J. Hall. 2013. Surveillance for foodborne disease outbreaks--United States, 2009-2010. *MMWR. Morbidity and mortality weekly report*.
17. Batz, M., S. Hoffman, and J. G. J. Morris. 2011. Ranking the Risks: The 10 Pathogen-Food Combinations with the Greatest Burden on Public Health University of Florida.
18. Berg, B. L. 2000. *Qualitative Research Methods for the Social Sciences*, 4th ed. Allyn and Bacon, Needham Heights.
19. Binder, A. R., D. a Scheufele, D. Brossard, and A. C. Gunther. 2011. Interpersonal amplification of risk? Citizen discussions and their impact on perceptions of risks and benefits of a biological research facility. *Risk Anal.* 31:324–34.
20. Bircan, C., and S. a. Barringer. 2002. Determination of Protein Denaturation of Muscle Foods Using the Dielectric Properties. *J. Food Sci.* 67:202–205.
21. Blumer, B. 2013. Bob Blumer’s Dishwasher Salmon Recipe. www.realsimple.com.
22. Blumer, B. 2013. Dishwasher Salmon with a Piquant Dill Sauce. www.foodnetwork.com.
23. Blumer, B. 2013. Dishwasher-Salmon. *WineXMagazine*.
24. Boxman, I., R. Dijkman, L. Verhoef, A. Maat, G. van Dijk, H. Vennema, and M. Koopmans. 2009. Norovirus on swabs taken from hands illustrate route of transmission: a case study. *J. Food Prot.* 72:1753–5.
25. Brackett, R. E., Y. Had, and M. P. Doyle. 1994. Ineffectiveness of Hot Acid Sprays to Decontaminate *Escherichia coli* 0157 : H7 on Beef. *J. Food Prot.* 57:198–203.
26. Brooks, J. T., E. G. Sowers, J. G. Wells, K. D. Greene, P. M. Griffin, R. M. Hoekstra, and N. a Strockbine. 2005. Non-O157 Shiga toxin-producing *Escherichia coli* infections in the United States, 1983-2002. *J. Infect. Dis.* 192:1422–9.

27. Bull, R. a, J.-S. Eden, W. D. Rawlinson, and P. a White. 2010. Rapid evolution of pandemic noroviruses of the GII.4 lineage. *PLoS Pathog.* 6:1–10.
28. Bull, R. A., E. T. V Tu, C. J. Mciver, W. D. Rawlinson, and P. A. White. 2006. Emergence of a New Norovirus Genotype II . 4 Variant Associated with Global Outbreaks of Gastroenteritis Emergence of a New Norovirus Genotype II . 4 Variant Associated with Global Outbreaks of Gastroenteritis.
29. Bushery, J., L. S. Cahoon, M. Chapin, J. S. Corteville, D. Fenstermaker, R. Fisher, R. Griffiths, C. A. Gunlicks, W. Hollmann, D. V Hornick, V. J. Huggins, M. Kraus, J. Mackey, K. A. Mansur, P. D. MCGovern, T. F. Moore, M. Reed, B. L. Rigby, J. M. Rothgeb, R. Rothhaas, W. Scholetzky, I. Schreiner, H. H. S. Jr, J. Thompson, R. R. Tucker, G. D. Weyland, P. Wilson, G. P. Green, H. R. Hamel, B. Harris-kojetin, D. E. Herz, C. Vernon, B. R. Jayasuriya, J. K. Lent, R. J. Mcintire, S. Mason, T. Nardone, A. E. Polivka, E. Robison, P. L. Roness, R. Tiller, C. Tucker, T. S. Zimmerman, S. Berwager, M. A. Braham, C. L. Wellons-hazer, K. D. Ottenstein, C. G. Brooks, F. B. Scott, and S. M. Kelly. 2014. Current Population Survey Design and Methodology. Washington, D.C.
30. Casali, L. 2013. About Me. *ecocucina*.
31. CDC. 2013. Foodborne Outbreak Online Database (FOOD). *FOOD*.
32. Centers for Disease Control and Prevention. 2014. Show Me the Science - How to Wash Your Hands. *CDC*.
33. Centers for Disease Control and Prevention (CDC). 2014. For Food Handlers Norovirus and Working With Food. *CDC Featur*.
34. Centers for Disease Control and Prevention (CDC). 2012. National Enteric Disease Surveillance: STEC Surveillance Overview. Atlanta.
35. Centers for Disease Control and Prevention (CDC). 2014. Norovirus Overview. *CDC*.
36. Centers for Disease Control and Prevention (CDC). 2011. Updated norovirus outbreak management and disease prevention guidelines.MMWR. Recommendations and reports : Morbidity and mortality weekly report. Recommendations and reports / Centers for Disease Control. Atlanta.
37. Chapman, B. 2014. Looking for mom blogger survey participants. *barfblog*.
38. Chapman, B. 2014. Still looking for online moms/mom bloggers to participate in a survey. *barfblog*.

39. Chapman, B. J., T. Maclaurin, and D. A. Powell. 2013. Video Observation and Data Coding Methods to Assess Food Handling Practices at Food Service. *Food Prot. Trends* 33:146–156.
40. Clayton, D. a, and C. J. Griffith. 2008. Efficacy of an extended theory of planned behaviour model for predicting caterers' hand hygiene practices. *Int. J. Environ. Health Res.* 18:83–98.
41. Clayton, D. a., C. J. Griffith, and P. Price. 2003. An investigation of the factors underlying consumers' implementation of specific food safety practices. *Br. Food J.* 105:434–453.
42. Cormode, G., and B. Krishnamurthy. 2008. Key Differences between Web1.0 and Web2.0. *First Monday.* Florham Park 13:1–30.
43. Cornell, K. H. 2012. *The Mommy Blogger Market: Social Media's Effect on Motherhood.* Greenville.
44. Daniels, N. a, D. a Bergmire-Sweat, K. J. Schwab, K. a Hendricks, S. Reddy, S. M. Rowe, R. L. Fankhauser, S. S. Monroe, R. L. Atmar, R. I. Glass, and P. Mead. 2000. A foodborne outbreak of gastroenteritis associated with Norwalk-like viruses: first molecular traceback to deli sandwiches contaminated during preparation. *J. Infect. Dis.* 181:1467–70.
45. De Vaus, D. A. 2002. *Surveys In Social Research*, 5th ed. Allen and Unwin, Sydney.
46. De Wit, M. a S., M. P. G. Koopmans, and Y. T. H. P. van Duynhoven. 2003. Risk factors for norovirus, Sapporo-like virus, and group A rotavirus gastroenteritis. *Emerg. Infect. Dis.* 9:1563–70.
47. Desai, R., C. D. Hembree, A. Handel, J. E. Matthews, B. W. Dickey, S. McDonald, A. J. Hall, U. D. Parashar, J. S. Leon, and B. Lopman. 2012. Severe outcomes are associated with genogroup 2 genotype 4 norovirus outbreaks: a systematic literature review. *Clin. Infect. Dis.* 55:189–93.
48. Deutskens, E., K. de Ruyter, M. Wetzels, and P. Oosterveld. 2004. Response Rate and Response Quality of Internet-Based Surveys: An Experimental Study. *Mark. Lett.* 15:21–36.
49. Diez-Gonzalez, F. 1998. Grain Feeding and the Dissemination of Acid-Resistant *Escherichia coli* from Cattle. *Science (80-).* 281:1666–1668.

50. Doucleff, M. 2013. Dishwasher Cooking: Make Your Dinner While Cleaning The Plates. *Weekend Ed.*
51. Doultree, J. C., J. D. Druce, C. J. Birch, D. S. Bowden, and J. a Marshall. 1999. Inactivation of feline calicivirus, a Norwalk virus surrogate. *J. Hosp. Infect.* 41:51–7.
52. Doyle, M. P., J. Ford, J. Loeffelholz, and K. Glass. 1992. Fate of Escherichia coli O157 : H7 as affected by pH or sodium chloride and in fermented , dry sausage. *Appl. Environ. Microbiol.* 58.
53. Duggan, M., and A. Smith. 2014. Social Media Update 2013.
54. Duizer, E., P. Bijkerk, B. Rockx, A. De Groot, F. Twisk, and M. Koopmans. 2004. Inactivation of Caliciviruses. *Appl. Environ. Microbiol.* 70:4538–4543.
55. EFSA. 2011. Tracing seeds , in particular fenugreek (*Trigonella foenum-graecum*) seeds , in relation to the Shiga toxin-producing E . coli (STEC) O104 : H4 2011 Outbreaks in Germany and France 1. Parma.
56. Ekdale, B., K. Namkoong, T. K. F. Fung, and D. D. Perlmutter. 2010. Why blog? (then and now): exploring the motivations for blogging by popular American political bloggers. *New Media Soc.* 12:217–234.
57. Elder, R. O., J. E. Keen, G. R. Siragusa, G. a Barkocy-Gallagher, M. Koohmaraie, and W. W. Laegreid. 2000. Correlation of enterohemorrhagic Escherichia coli O157 prevalence in feces, hides, and carcasses of beef cattle during processing. *Proc. Natl. Acad. Sci. U. S. A.* 97:2999–3003.
58. Engber, D. 2012. The Sliming How processed beef trimmings got rebranded, again and again and again. *www.slate.com.*
59. Evans, J. R. 2013. 5 Foods You Can Cook in Your Dishwasher ... if You Dare. *www.thestir.cafemom.com.*
60. Fankhauser, R. L., S. S. Monroe, J. S. Noel, C. D. Humphrey, J. S. Bresee, U. D. Parashar, T. Ando, and R. I. Glass. 2002. Epidemiologic and molecular trends of “Norwalk-like viruses” associated with outbreaks of gastroenteritis in the United States. *J. Infect. Dis.* 186:1–7.
61. FDA. 2014. Safe Cooking Temperatures. Silver Springs.

62. Finney, M., M. Carney, S. Cates, K. Kosa, J. Brophy, and A. Fraser. 2014. Need for Education about Noroviruses: Findings from a Nationally Representative Survey of U.S. Adults. *Submitt. Publ.*
63. Fishbein, M., and I. Ajzen. 1975. Belief, attitude, intention, and behavior: An introduction to theory and research. Addison-Wesley, Reading.
64. Flat World Business. 2013. Web 1.0 vs Web 2.0 vs Web 3.0 vs Web 4.0 – A bird’s eye on the evolution and definition. *Flat World Bus.*
65. Food Product Design. 2014. I Want...Navigating Consumer Activism. *Boardr. J.*
66. Fox, S. 2011. Health Topics 80% of internet users look for health information online. Washington DC.
67. Gates, S. 2014. Lunch Cooked in the Dishwasher. *www.Oprah.com.*
68. Getting, B. 2007. Basic Definitions: Web 1.0, Web. 2.0, Web 3.0. *Pract. Commer.*
69. Graff, V. 2013. Hungry to save cash? Cook dinner in the dishwasher! The latest money-saving technique to cut down on fuel bills. *www.Dailymail.co.uk.*
70. Grusec, J. E. 1992. Social learning theory and developmental psychology: The legacies of Robert Sears and Albert Bandura. *Dev. Psychol.* 28:776–786.
71. Gyles, C. L. 2007. Shiga toxin-producing Escherichia coli: An overview. *J. Anim. Sci.* 85:E45–62.
72. Hague, M. a., K. E. Warren, M. C. Hunt, D. H. Kropf, C. L. Kastner, S. L. Stroda, and D. E. Johnson. 1994. Endpoint Temperature, Internal Cooked Color, and Expressible Juice Color Relationships in Ground Beef Patties. *J. Food Sci.* 59:465–470.
73. Hall, A. J., B. a Lopman, D. C. Payne, M. M. Patel, P. a Gastañaduy, J. Vinjé, and U. D. Parashar. 2013. Norovirus disease in the United States. *Emerg. Infect. Dis.* 19:1198–205.
74. Hall, A. J., J. Vinje, B. Lopman, G. Woo Park, C. Yen, N. Gregoricus, and U. D. Parashar. 2011. Notes from the Field: Emergence of New Norovirus Strain GII.4 Sydney — United States, 2012. *Morb. Mortal. Wkly. Rep.*
75. Harris, J. 2013. Cooking in your dishwasher revisited for the modern, eco-friendly millennial. *www.latimes.com.*

76. Hovde, C. J., P. R. Austin, K. A. Cloud, C. J. Williams, and C. W. Hunt. 1999. Effect of Cattle Diet on Escherichia coli O157:H7 Acid Resistance Effect of Cattle Diet on Escherichia coli O157:H7 Acid Resistance. *Appl. Environ. Microbiol.* 65:5–8.
77. Huberman, B. A., D. M. Romero, and F. Wu. 2008. Social networks that matter : Twitter under the microscope. Palo Alto.
78. Hubspot.com. 2013. MARKETING.
79. Hunt, M. C., K. M. Killinger, and R. E. Campbell. 1999. INCIDENCE OF PREMATURE BROWNING DURING COOKING IN GROUND BEEF PURCHASED AT RETAIL. *Cattleman's Day*.
80. Hussein, H. S. 2007. Prevalence and pathogenicity of Shiga toxin-producing Escherichia coli in beef cattle and their products. *J. Anim. Sci.* 85:E63–72.
81. Irlbeck, E. G., C. Akers, and M. Brashears. 2014. A Content Analysis of Food Safety Measures. *J. Food Prot.* 1:1–11.
82. Jeon, S. J., M. Elzo, N. Dilorenzo, G. C. Lamb, and K. C. Jeong. 2013. Evaluation of Animal Genetic and Physiological Factors That Affect the Prevalence of Escherichia coli O157 in Cattle. *PLoS One* 8:e55728.
83. Johnson, R. P., R. C. Clarke, J. B. Wilson, S. C. Read, K. Rahn, S. A. Renwick, K. A. Sandhu, D. Alves, M. A. Karmali, H. Lior, S. A. Mcewen, J. S. Spika, and C. L. Gyles. 1996. Growing Concerns and Recent Outbreaks Involving Non-0157 : H7 Serotypes of Verotoxigenic Escherichia coli. *J. Food Prot.* 59:1112–1122.
84. Juneja, V., and B. Marmer. 1999. Lethality of heat to Escherichia coli 157:H7: D and z value determination in turkey, lamb, and pork. Wyndmoor.
85. Kaplan, A. M., and M. Haenlein. 2010. Users of the world, unite! The challenges and opportunities of Social Media. *Bus. Horiz.* 53:59–68.
86. Kaspar, C., M. E. Doyle, and J. Archer. 2010. White Paper on Non-O157 : H7 Shiga Toxin-Producing E . coli from Meat and Non-Meat Sources. Madison.
87. Kijowski, J. M., and M. G. Mast. 1988. Thermal Properties of Proteins in Chicken Broiler Tissues. *J. Food Sci.* 53:363–366.
88. Kinder, L. 2013. Why using the dishwasher is the latest cooking phenomenon. *Telegr.*

89. Krippendorff, K. 1989. *Content Analysis*. Philadelphia.
90. Kyodo, J. 2014. Food-poisoning laid to bread firm. *Japan Times*.
91. L'Abée-Lund, T. M., H. J. Jørgensen, K. O'Sullivan, J. Bohlin, G. Ligård, P. E. Granum, and T. Lindbäck. 2012. The highly virulent 2006 Norwegian EHEC O103:H25 outbreak strain is related to the 2011 German O104:H4 outbreak strain. *PLoS One* 7:e31413.
92. Lin, J., M. P. Smith, K. C. Chapin, H. S. U. K. Baik, G. N. Bennett, and J. W. Foster. 1996. Mechanisms of acid resistance in enterohemorrhagic *Escherichia coli*. Mechanisms of Acid Resistance in Enterohemorrhagic *Escherichia coli*. *Appl. Environ. Microbiol.* 62.
93. Liu, P., B. Escudero, L.-A. Jaykus, J. Montes, R. M. Goulter, M. Lichtenstein, M. Fernandez, J.-C. Lee, E. De Nardo, A. Kirby, J. W. Arbogast, and C. L. Moe. 2013. Laboratory Evidence of Norwalk Virus Contamination on the Hands of Infected Individuals. *Appl. Environ. Microbiol.* 79:7875–7881.
94. Liu, P., D. R. Macinga, M. L. Fernandez, C. Zapka, H.-M. Hsiao, B. Berger, J. W. Arbogast, and C. L. Moe. 2011. Comparison of the Activity of Alcohol-Based Handrubs Against Human Noroviruses Using the Fingerpad Method and Quantitative Real-Time PCR. *Food Environ. Virol.* 3:35–42.
95. Mathiasen, L. A., B. J. Chapman, B. J. Lacroix, and A. Douglas. Television cooking shows as a source of food safety information 1–25.
96. Mathiasen, L. A., B. J. Chapman, B. J. Lacroix, and D. A. Powell. 2004. Spot the Mistake : Television Cooking Shows as a Source of Food Safety Information. *Food Prot. Trends* 24:328–334.
97. Mathiasen, L. A., B. J. Chapman, B. J. Lacroix, and D. A. Powell. 2004. Spot the Mistake : Television Cooking Shows as a Source of Food Safety Information. *J. Food Prot.* 24:328–334.
98. Matthews, J. E., B. W. Dickey, R. D. Miller, J. R. Felzer, B. P. Dawson, a S. Lee, J. J. Rocks, J. Kiel, J. S. Montes, C. L. Moe, J. N. S. Eisenberg, and J. S. Leon. 2012. The epidemiology of published norovirus outbreaks: a review of risk factors associated with attack rate and genogroup. *Epidemiol. Infect.* 140:1161–72.
99. McDaniel, B. T., S. M. Coyne, and E. K. Holmes. 2012. New mothers and media use: associations between blogging, social networking, and maternal well-being. *Matern. Child Health J.* 16:1509–17.

100. Mead, P. S., and P. M. Griffin. 1998. *Escherichia coli* O157:H7. *Lancet* 352:1207–12.
101. Mead, P., L. Slutsker, V. Dietz, L. McCaig, J. Bresee, C. Shapiro, P. Griffin, and R. Tauxe. 1999. Food-related illness and death in the United States. *Emerg. Infect. Dis.* 5:840–2.
102. Medeiros, L. C., V. N. Hillers, P. a Kendall, and a Mason. 2001. Food safety education: what should we be teaching to consumers? *J. Nutr. Educ.* 33:108–13.
103. Medeiros, L. C., P. Kendall, V. Hillers, G. Chen, and S. DiMascola. 2001. Identification and classification of consumer food-handling behaviors for food safety education. *J. Am. Diet. Assoc.* 101:1326–1339.
104. Meng, J., M. P. Doyle, T. Zhao, and S. Zhao. 2007. Enterohemorrhagic *Escherichia coli*, p. 249–269. In M.P. Doyle, and L.M. Beauchat (eds.), *Food Microbiology: Fundamentals and Frontiers*, 3rd ed. ASM Press, Washington, D.C.
105. Michel, M. 2012. BPI plant closures over “pink slime” become permanent. www.globalmeatnews.com.
106. Moss, M. 2009. Safety of Beef Processing Method Is Questioned. www.nytimes.com.
107. Nielsen. 2009. WHERE THE MOMS ARE: SHOPPING, BLOGGING, NETWORKING AND STRATEGIZING ONLINE. www.nielsen.com.
108. Noris, M., and G. Remuzzi. 2005. Hemolytic uremic syndrome. *J. Am. Soc. Nephrol.* 16:1035–50.
109. Orchant, R. 2013. How To Cook Your Thanksgiving Turkey In The Dishwasher. www.huffingtonpost.com.
110. Painter, J. A., R. M. Hoekstra, T. Ayers, R. V Tauxe, C. R. Braden, F. J. Angulo, and P. M. Griffin. 2013. Attribution of Foodborne Illnesses , Hospitalizations , and Deaths to Food Commodities by using Outbreak. *Emerg. Infect. Dis.* 19:407–415.
111. Patel, M. M., A. J. Hall, J. Vinjé, and U. D. Parashar. 2009. Noroviruses: a comprehensive review. *J. Clin. Virol.* 44:1–8.
112. Patel, M. M., M.-A. Widdowson, R. I. Glass, K. Akazawa, J. Vinjé, and U. D. Parashar. 2008. Systematic literature review of role of noroviruses in sporadic gastroenteritis. *Emerg. Infect. Dis.* 14:1224–31.

113. Payne, D. C., J. Vinjé, P. G. Szilagyi, K. M. Edwards, M. A. Staat, G. a. Weinberg, C. B. Hall, J. Chappell, D. I. Bernstein, A. T. Curns, M. Wikswo, S. H. Shirley, A. J. Hall, B. Lopman, and U. D. Parashar. 2013. Norovirus and Medically Attended Gastroenteritis in U.S. Children. *N. Engl. J. Med.* 368:1121–1130.
114. Piersall, W. 2014. 16 Market Research Facts Proving Social Media Moms' Influence. <http://www.wendypiersall.com/>.
115. Powell, D. a., C. J. Jacob, and B. J. Chapman. 2011. Using Blogs and New Media in Academic Practice: Potential Roles in Research, Teaching, Learning, and Extension. *Innov. High. Educ.* 37:271–282.
116. Punchbowl. 2013. How Brands Can Create Fabulous Content for Moms.
117. Purcell, K. 2010. The State of Online Video. Washington DC.
118. Rangel, J. M., P. H. Sparling, C. Crowe, P. M. Griffin, and D. L. Swerdlow. 2005. Epidemiology of Escherichia coli O157:H7 Outbreaks, United States, 1982-2002. *Emerg. Infect. Dis.* 11:603–609.
119. Redmond, E. C., and C. J. Griffith. 2003. Consumer food handling in the home: a review of food safety studies. *J. Food Prot.* 66:130–61.
120. Richmond, H. 2013. Here's how to cook your Thanksgiving turkey in the dishwasher. www.grist.org.
121. Ritterbrand, L., F. Thorndike, D. Cox, B. Kovatechev, and L. Gonder-Frederick. 2009. A Behavior Change Model for Internet Interventions. *Ann Behav Med* 38:18–27.
122. Romero, D. M., W. Galuba, S. Asur, and B. a. Huberman. 2011. Influence and passivity in social media Proceedings of the 20th international conference companion on World wide web - WWW '11. ACM Press, New York, New York, USA.
123. Ruggenti, P., M. Noris, and G. Remuzzi. 2001. Thrombotic microangiopathy, hemolytic uremic syndrome, and thrombotic thrombocytopenic purpura. *Kidney Int.* 60:831–46.
124. Scallan, E., R. M. Hoekstra, F. J. Angulo, R. V. Tauxe, M.-A. Widdowson, S. L. Roy, J. L. Jones, and P. M. Griffin. 2011. Foodborne Illness Acquired in the United States—Major Pathogens. *Emerg. Infect. Dis.* 17:7–15.

125. Scallan, E., R. M. Hoekstra, F. J. Angulo, R. V. Tauxe, M.-A. Widdowson, S. L. Roy, J. L. Jones, and P. M. Griffin. 2011. Foodborne Illness Acquired in the United States—Major Pathogens. *Emerg. Infect. Dis.* 17:7–15.
126. Scarborough. 2014. Mom Bloggers Mom Bloggers.
127. Schroeder, T. C., G. T. Tonsor, J. M. E. Pennings, and J. Mintert. 2007. Consumer Food Safety Risk Perceptions and Attitudes: Impacts on Beef Consumption across Countries Consumer Food Safety Risk Perceptions and Attitudes : Impacts on Beef Consumption across Countries *. *B.E. J. Econ. Anal. Policy Contrib.* 7.
128. Sheppard, B. H., J. Hartwick, P. R. Warshaw, and J. O. N. Hartwick. 2013. The Theory of Reasoned Past Action : Meta-Analysis of with Modifications for Recommendations and. *J. Consum. Res. Res.* 15:325–343.
129. Shin, G.-A., and M. D. Sobsey. 2008. Inactivation of norovirus by chlorine disinfection of water. *Water Res.* Elsevier Ltd 42:4562–8.
130. Siebenga, J. J., H. Vennema, D.-P. Zheng, J. Vinjé, B. E. Lee, X.-L. Pang, E. C. M. Ho, W. Lim, A. Choudekar, S. Broor, T. Halperin, N. B. G. Rasool, J. Hewitt, G. E. Greening, M. Jin, Z.-J. Duan, Y. Lucero, M. O’Ryan, M. Hoehne, E. Schreier, R. M. Ratcliff, P. a White, N. Iritani, G. Reuter, and M. Koopmans. 2009. Norovirus illness is a global problem: emergence and spread of norovirus GII.4 variants, 2001-2007. *J. Infect. Dis.* 200:802–12.
131. Siegel, B. 2012. Tell USDA to STOP Using Pink Slime in School Food! www.change.org.
132. Slate.Video. 2013. How to Cook With Your Dishwasher. www.youtube.com.
133. Smith, A., and J. Brenner. 2012. Twitter Use 2012. Washington, D.C.
134. Smith, B. a., A. Fazil, and A. M. Lammerding. 2013. A risk assessment model for Escherichia coli O157:H7 in ground beef and beef cuts in Canada: Evaluating the effects of interventions. *Food Control.* Elsevier Ltd 29:364–381.
135. Snelson, C. 2011. YouTube across the Disciplines : A Review of the Literature. *J. Online Learn. Teach.* 7:159–169.
136. Spa, B., L. Meredith, R. Lewis, and M. Haslum. 2001. Contributory factors to the spread of contamination in a model kitchen. *Br. Food J.* 103:23–35.

137. Sukhrie, F. H. a, J. J. Siebenga, M. F. C. Beersma, and M. Koopmans. 2010. Chronic shedders as reservoir for nosocomial transmission of norovirus. *J. Clin. Microbiol.* 48:4303–5.
138. Suri, R. S., M. P. Rosas-arellano, R. B. Haynes, W. F. Clark, H. E. Hemolytic, and U. Syn. 2003. Long-term Renal Prognosis of Diarrhea-Associated Hemolytic Uremic Syndrome. *J. Am. Med. Assoc.* 290.
139. SurveyMonkey. 2014. www.SurveyMonkey.com. *SurveyMonkey*.
140. Todd, E. C. D., J. D. Greig, C. a Bartleson, and B. S. Michaels. 2008. Outbreaks where food workers have been implicated in the spread of foodborne disease. Part 5. Sources of contamination and pathogen excretion from infected persons. *J. Food Prot.* 71:2582–95.
141. Topping, J. R., H. Schnerr, J. Haines, M. Scott, M. J. Carter, M. M. Willcocks, K. Bellamy, D. W. Brown, J. J. Gray, C. I. Gallimore, and a I. Knight. 2009. Temperature inactivation of Feline calicivirus vaccine strain FCV F-9 in comparison with human noroviruses using an RNA exposure assay and reverse transcribed quantitative real-time polymerase chain reaction-A novel method for predicting virus infectivity. *J. Virol. Methods* 156:89–95.
142. Tornberg, E. 2005. Effects of heat on meat proteins - Implications on structure and quality of meat products. *Meat Sci.* 70:493–508.
143. Tuder, S. 2013. Does Dishwasher Cooking Really Work? www.abcnews.com.
144. Tulley, G., and J. Spiegler. 2010. How to Cook Something in the Dishwasher. www.lifehacker.com.
145. United States Census Bureau. 2014. MEASURING AMERICA. Washington, D.C.
146. United States Department of Agriculture. 2014. Safe Minimum Cooking Temperatures. *FoodSafe.gov*.
147. USDA. 1999. Compliance Guidelines For Meeting Lethality Performance Standards For Certain Meat And Poultry Products Appendix A. Omaha.
148. Velez, A. 2013. Food and Party. www.thestir.cafemom.com.
149. WHO. 2011. Outbreaks of E. coli O104:H4 infection: update 30. *World Heal. Organ.*

150. www.comScore.com. 2014. comScore Releases January 2014 U.S. Online Video Rankings. *Online Video Rank*.
151. www.emarketer.com. 2010. Word-of-mouth, often shared online, is most trusted source. *www.emarketer.com*.
152. www.giganews.com. 2014. GigaNew's History of Usenet. *www.giganews.com*.
153. Yen, C., M. E. Wikswo, B. a Lopman, J. Vinje, U. D. Parashar, and A. J. Hall. 2011. Impact of an emergent norovirus variant in 2009 on norovirus outbreak activity in the United States. *Clin. Infect. Dis.* 53:568–71.
154. Yomiuri, S. 2014. Norovirus carriers found at Hamamatsu bakery. *Japan News*.
155. YouTube. 2013. About. *YouTube*.
156. YouTube. 2013. The Official YouTube Blog. *YouTube*.
157. Zhao, P., T. Zhao, M. P. Doyle, J. R. Rubino, and J. Meng. 1998. Development of a model for evaluation of microbial cross-contamination in the kitchen. *J. Food Prot.* 61:960–3.
158. Zhao, W. X., J. Jiang, J. Weng, J. He, and E. Lim. 2011. Comparing Twitter and Traditional Media Using, p. 338–349. *In Advances in Information Retrieval*. Springer-Verlag Berling Heidelberg, Peking.

APPENDIX

Appendix A

Survey Instrument Questions

Page 1. Informed Consent Form

1. Informed Consent Form

Mom Blogger Food Safety Project

Principal Investigator: Benjamin Raymond

Faculty Sponsor: Benjamin Chapman

Your participation in this study is voluntary. The purpose for the study is to identify how mom bloggers determine reliable sources of health information online. In addition to this attitudes, knowledge, and behaviors will be asked about regarding specific practices within the home and outside, specific to human pathogens.

There is minimal personal or professional risk involved in this study. Your responses will be anonymous and identifying information collected will not be connected to survey answers at any point. Compensation will be a \$10 gift card valid at Target. Compensation will only be given for completed surveys.

If you have any questions you may contact the researchers, Benjamin Raymond, beraymon@ncsu.edu, 802-353-7840; Dr. Benjamin Chapman, Benjamin_chapman@ncsu.edu, 919-809-3205.

If you feel you have not been treated according to the description in this form, or your rights as a participant in research have been violated during the course of the project, you may contact Deb Paxton, Regulatory Compliance Administrator, Box 7514, NCSU Campus (919/5154514).

Consent to participate

“I have read and understand the above information. I may request a copy of this form or print this page. I agree to participate in this study with the understanding that I may choose not to participate or stop participating at any time without penalty.”

Participate

Not Participate

(If participate move to page 2, if not move to exit survey and thank you page)

Page 2. Survey Eligibility

2. Are you the primary caretaker for one or more children?

- Yes
 No

(If yes move to page 2, if no move to exit survey and thank you page)

Page 3. Health Information Sources and Trust

3. When searching for health related information online for you or your family, which websites do you find trustworthy? (select all that apply)

- WebMD
 Mayo Clinic
 CNN
 Fox News
 MSNBC
 NBC
 CBS
 NIH
 CDC
 Newspaper Webpages
 Planned Parenthood
 Religious organizations
 Salon
 American Academy of Pediatrics
 Kidshealth.org
 National Institute of Child Health and Human Development (NICHD)
 Weston A Price Foundation
 Other Mommy Bloggers
 Peer reviewed academic articles
 Webpage of large medical institution

Other (please specify)

4. Please tell us what you look for in a reputable, reliable, and trustworthy source of health information from traditional media such as print (books, magazines) video (TV shows, documentaries) or audio (radio)?

- Easy to understand writing and terminology
- Logical sounding presentation, regardless of traditional or non traditional references
- Integrative Medicine (combination of traditional and alternative health advice)
- Non-traditional experts (Alternative medicine)
- Citing non peer-reviewed literature or evidence
- Citing peer-reviewed literature (published in scientific journals)
- Information from traditional experts in the field (Medical doctors, researchers at academic or governmental institutions, health care professionals)
- Complex and in depth writing
- I generally trust that most sources are truthful and reliable
- Citing other webpages
- Other (please specify)

5. Please tell us what you look for in a reputable, reliable, and trustworthy source of health information from online media.

- Citing peer-reviewed literature (published in scientific journals)
- Citing other webpages
- Complex and in depth writing
- Logical sounding presentation, regardless of traditional or non traditional references
- Non-traditional experts (Alternative medicine)
- Information from traditional experts in the field (Medical doctors, researchers at academic or governmental institutions, health care professionals)
- Citing non peer-reviewed literature or evidence
- Integrative Medicine (combination of traditional and alternative health advice)
- Easy to understand writing and terminology
- I generally trust that most sources are truthful and reliable
- Other (please specify)

Page 4. Knowledge

6. What is the most common cause of the 24 hour flu, stomach flu, or stomach bug?

- Influenza
- E. coli
- Norovirus
- Salmonella
- I have no idea
- Spoiled food

Page 5. Past Norovirus Experience

The stomach flu, stomach bug, 24-hour flu, cruise ship virus, and food poisoning are all terms that may be used to describe norovirus. Norovirus is an infectious illness.

7. If a person gets sick from norovirus, what symptoms will they have?

- Vomiting
- Diarrhea
- Asthma
- None of the above
- Fever
- Nausea
- Rash
- Cough
- Abdominal Cramps

8. Do you believe you or your family members have had norovirus infection/s?

Extremely likely	Somewhat likely	Unsure	Somewhat unlikely	Extremely unlikely
<input type="radio"/> o	<input type="radio"/> o	<input type="radio"/> o	<input type="radio"/> o	<input type="radio"/> o

9. Have you read or heard anything specific about norovirus in the past 12 months?

- Yes

No

Page 6. Norovirus General

10. When did you read or hear something about norovirus?

- Less than a month ago
- 1-6 months ago
- 7-12 months ago

11. What did you read or hear about norovirus?

- Symptoms of norovirus
- How to prevent norovirus
- How to clean/disinfect surfaces to prevent spread of norovirus
- When to see doctor about diarrhea and/or vomiting
- How to prepare raw meat and poultry safely to prevent norovirus
- How to treat norovirus
- Specific foods that can cause norovirus
- Importance of hand washing to prevent norovirus
- An outbreak of norovirus
- Cause or source of norovirus outbreak
- Other (please specify)

Page 7. Norovirus General

12. Select one for each

	True	False	Don't Know
Norovirus is not contagious	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Only young children and older adults can become infected with norovirus, not the general public	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People can become infected with norovirus many times in their life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	True	False	Don't Know
People can become infected with norovirus if they come in contact with feces or vomit from an infected person	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Most norovirus outbreaks occur in the summer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The best way to prevent norovirus infections is to cook meat and poultry thoroughly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Raw meat and poultry are commonly involved in norovirus outbreaks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Norovirus outbreaks have been commonly linked to contaminated green, leafy vegetables, such as lettuce and spinach	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Norovirus is the most common cause of foodborne-disease outbreaks in the United States	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
About half of all outbreaks of food-related illness are caused by norovirus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Most norovirus infections occur on cruise ships	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page 8. Norovirus General

13. Please select one for each statement

	True	False	Don't Know
Most foodborne outbreaks of norovirus are caused by eating food that was handled or prepared by a person infected with norovirus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Washing your hands with soap and water can prevent the spread of norovirus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using hand sanitizer can prevent the spread of norovirus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	True	False	Don't Know
It is safe for people infected with norovirus to prepare food for others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People infected with norovirus may be able to spread norovirus for at least 2 weeks even if they feel better	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
People can become infected with norovirus if they have direct personal contact with an infected person	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People can become infected with norovirus if they touch objects and surfaces that have been touched by a person with a norovirus infection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
People can get vaccinated to prevent a norovirus infection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Norovirus infection can easily be treated with antibiotics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Any food can become contaminated with norovirus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Norovirus can survive cooking temperatures as high as 140°F	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Household bleach is the best sanitizer to use on surfaces contaminated with norovirus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To clean up a surface contaminated with vomit or feces, apply a solution of one tablespoon bleach to one gallon of water and let sit for ten minutes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clothes that are contaminated with vomit or feces should be washed in warm water	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page 9. Re-entry to social activities

14. How did you decide your children were ready to return to social activities illness with suspected or diagnosed norovirus?

- I don't know exactly
- Symptoms were greatly improved
- Total lack of symptoms
- I needed time to do other things
- Lack of symptoms for 24 hours

Page 10. Re-entry to Social Activities

15. I believe the best indicator that children are ready to return to social activities after norovirus infection is (please rank from best to worst; 1 is best and 5 is worst):

Total lack of symptoms for 24 hours or more

Lack of symptoms for a couple hours

As soon as children say they are feeling better

The first day the children say they feel better

I had to return the children to social activities regardless of symptoms

Page 11. Mitigation Practices

16. If there were an episode vomiting or diarrhea outside of the toilet, how would you clean it up? (Please note most household laundry machines will not reach 140 degrees F° unless the water line going in is hotter than 140 degrees F°. Clothes dryers and dishwashers may reach or exceed 140 degrees F°; please consult your users manual.)

Removed obvious liquids and solids with paper towels or cloth rag and used a homemade sanitizing product

Removed obvious liquids and solids with paper towels or cloth rag and used a commercial sanitizing product and washed soft products in hot water (>140 degrees F°) or steam cleaned.

Removed obvious liquids and solids with paper towels or cloth rag and used a homemade sanitizing product and washed soft products in hot water (>140 degrees F°) or steam cleaned

Removed obvious liquid and solids with paper towels, cloth rag, or another means

Removed obvious liquids and solids with paper towels or cloth rag and used a commercial sanitizing product

17. Which sanitizing product did you or would you use for cleanup of a vomiting or diarrhea episode? (check all that apply)

A homemade cleaning and sanitizing product

A naturally derived cleaning and sanitizing product

A quaternary ammonium based sanitizing product

Hot water or steam (greater than 140 degrees F)

A bleach (chlorine) based product

I'm not sure what the active ingredient is

18. Please select one for each statement

	Extremely likely	Somewhat likely	Neither likely or unlikely	Somewhat unlikely	Extremely unlikely
How likely are most household sanitizers to inactivate or destroy norovirus?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How likely do you think it is that your child(ren) will get norovirus some time in their lifetime?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If your child(ren) got sick from norovirus, how likely do you think it is they would be hospitalized?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If your child(ren) got sick from norovirus, how likely do you think it is they would die?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19. What is the best way to stop or slow the spread of norovirus?

- Wash my hands frequently, encourage my family to wash their hands frequently, and keep ill and healthy individuals separated.
- Make sure I wash my hands frequently
- Keep sick children or adults separated from healthy individuals
- Wash my hands frequently, encourage my family to wash their hands frequently, separate ill and healthy individuals and clean with sanitizers and/or hot water/steam.
- There's not much I can do but hope for the best

20. How are you most likely to try and stop or slow the spread of norovirus (please rank from most to least likely; 1 is most likely and 5 is least likely)?

Keep sick children or adults separated from healthy individuals

Wash my hands frequently, encourage my family to wash their hands frequently, and keep ill and healthy individuals separated.

There's not much I can do but hope for the best



Make sure I wash my hands frequently



Wash my hands frequently, encourage my family to wash their hands frequently, separate ill and healthy individuals and clean with sanitizers and/or hot water/steam.

Page 12. Hygiene

21. When using a public restroom, how do you wash up afterward?

- I prefer to use hand sanitizer over washing with soap and water
- I prefer to use soap and water over hand sanitizer
- I use soap and water to wash my hands and paper towels or electric hand dryers
- I use hand sanitizer
- If I didn't touch anything I don't worry about it
- I wash my hands with soap and water and use hand sanitizer

Other (please specify)

22. In the past, when using a public restroom to change an infants diaper which of these actions did you perform? (check all that apply)

- Sanitized the surface before use
- I have never changed an infants diaper in a public restroom
- Used barrier between infant and bathroom surface
- I have never performed any of these behaviors when changing a diaper in a public restroom
- Sanitized the surface after use

Page 13. Attitude

23. When choosing my child/s preschool or day care, I considered the cleaning and hygiene practices of the facility and the health inspection (if available).

- N/A I do not or did not have children in daycare or preschool
- I have not or would not consider the cleaning and hygiene practices of the facility and the health inspection (if available)
- I did or would consider the cleaning and hygiene practices of the facility and the health inspection (if available)

24. It is important for me to:

	Very important	Somewhat important	Neither important or unimportant	Somewhat not important	Not at all important
Help slow or stop the spread of norovirus in my own family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Help slow or stop the spread of norovirus outside of my family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

25. To help slow or stop the spread of norovirus, it is important to

	Very important	Somewhat important	No feelings either way	Somewhat not important	Not at all important
Exclude my children from social activities while ill with norovirus symptoms and/or norovirus diagnoses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Follow recommended cleaning procedures to clean up after vomiting or diarrhea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Avoid preparing food for others when ill with norovirus symptoms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wash my hands, especially when I or my family may have norovirus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page 14. Thank You!

To receive your Target gift card please navigate to the following URL. If you are unable to open the page please try copying and pasting it into your web browser.
<https://www.surveymonkey.com/s/SNHK8LQ>

Once there please enter your preferred physical mailing address for mailing of the gift cards. This is a necessary step to ensure total anonymity of survey results.

Thank you again.

Appendix B

“Hello, my name is Benjamin Raymond from NC State University.

I am conducting a research project at NC State University to learn more about attitudes and knowledge toward health information available online and current knowledge and practices regarding specific food and health related topics. All information collected is anonymous.

Please take a few minutes (approximately 10-15) to complete the [survey](#) to assist in this important research. **Completion of the survey is rewarded with a \$10 Target gift card!**

The survey may be found [HERE](#).

THANK YOU!”