

**An In-Depth Exploration of Food Safety Performance of Independent Somali**

**Restaurants:**

*A closer look at food safety cultural norms, longitudinal inspection outcome, impact of oral training and the promise of letter grading*

**A Dissertation**

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## **Dedication**

I would like to dedicate this thesis to my mother, Katra Mohamed Aden, who never ceased to believe in me. I would also like to dedicate this thesis to my husband, Burhan Shire, and to my children, Jamal, Ahmed and Katra, for their constant emotional support and love.

## Abstract

Public health researchers have increasingly found food safety concerns with ethnic owned restaurants yet ethnic food consumption is on the increase. This dissertation provides a deeper look at ethnic food safety compliance from one immigrant community and presents its arguments and findings through three different studies. The first study analyzes data on food safety cultural norms from seven focus groups of Somali immigrants, and maps out these norms against food safety regulations. It then examines the relationship between these cultural norms and food safety inspections by examining seven years of violation data from 62 independently operated Somali restaurants. A strong correspondence was observed between cultural norms and patterns of violations typically not addressed in current food safety education programs. The second paper compares food safety compliance of independently owned and operated Somali restaurants to non-Somalis; it then compares the performance of establishments with longer inspection history with newer ones, and investigates the role that restaurant letter grading could play in improving sanitation. The results concur with current research findings on three fronts: (a) poor food safety compliance was more frequent in ethnic than non-ethnic food establishments, (b) food safety compliance was slightly related to the number of inspections, (c) inadequate facility design and maintenance were associated with poorer sanitation. And finally, the third study examines the effectiveness of an oral learner teaching strategy as a food safety teaching method for a new immigrant/refugee food service workers through certified food manger exam performance. Statistically significant differences between the oral learner teaching strategy and traditional group were observed.

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## **Chapter 1: Food Safety and Food-Borne Illnesses in Somalia**

The public health implications of food-borne illnesses range from human health concerns to economic and trade issues. At local, national, and international levels, food-borne illness surveillance initiatives aim to rapidly detect and respond to outbreaks. Through an integrated and coordinated surveillance mechanism, data from all related sectors can be used to improve food safety and lower the risk of food-borne diseases.

In Minnesota for instance, food-borne illness surveillance involves an elaborate process that links hospital labs and government regulatory agencies to food establishments that are potential sources of outbreaks. Minnesota's surveillance systems rely on diagnosis, using data from reported cases, and confirmed diagnostic testing. Unlike in developed countries, many developing countries lack the public health infrastructure for disease surveillance. Consequently, data regarding food-borne illness are extremely hard to find for most countries in Africa, particularly for Somalia, which has had over two decades of civil strife.

Several studies conducted in Somalia have indicated the prevalence of food-borne pathogens. For example, 11% of urban children in Somalia with diarrhea tested positive for enterotoxigenic *Escherichia coli* (ETEC) from 1983-84 and 16% of American military personnel in Somalia experienced episodes of diarrhea in 1992-1993 (Heppner, Magill, Gasser, Oster, Miller, Greenberg, & Campbell, 1993). In addition, in the last two decades, the World Health Organization (WHO) released several press releases regarding cholera outbreaks in many parts of Somalia. Cholera is reported to be endemic in Somalia, posing threats of annual outbreaks from December to May (Somalia's dry season). These outbreaks are mostly caused by lack of access to water, poor food quality,

and domestic hygiene. According to this report, 25% of surveyed children experienced diarrhea. The WHO remarked that this represents a very high percentage (World Health Organization, 2006). Studies have linked drinking contaminated water and eating food contaminated by infected food handlers in an unhygienic environment as the most significant vehicles of transmission (Rabbani & Greenough, 1999).

Despite these challenges, the food industry in Somalia fuels its economy, particularly the livestock and fish industries. Before the civil war, the central government had a large food quality control system, with laboratory and inspection divisions. Currently, there are no coherent or robust public health offices in the central government responsible for sanitation- and hygiene-related matters; regardless, there are many functioning and viable food entities such as catering companies, hotels, restaurants, cafeterias, and kiosks that handle food for consumers. The collapse of the Somali government over two decades ago eroded all public health enforcement entities, leaving the country with no system responsible for the investigation of adverse health effects or contaminants in food or water (World Health Organization, 2006).

However, since the civil war, diaspora investors began small food manufacturing factories to produce foods such as pasta and mineral water. Because there are no appropriate public health laws, enforcement, or inspection services in place, these companies do their own quality control with no government oversight. A large number of Somalis, particularly men, immigrated to the U.S. almost 25 years ago. As a result, Somali food service workers who are between 20 and 50 years old have had very little, if any, exposure to a regulatory public health framework. Moreover, the majority of

Somali-owned establishments cater almost exclusively to Somali consumers who are also oblivious to the public health laws as they relate to food safety.

It is important to shed light on Somalis' overall perception of food safety, shaped by their experiences prior to their arrival in the U.S. Anecdotally, most Somali food service workers immigrated to the United States as adults, and have had some exposure to the food service industry in their homeland. In Somalia, the country's climate, culture, and socio-economic structure shape food service workers' experiences and practices. Upon arrival in the U.S., most workers seek employment in Somali-owned businesses, because these establishments do not require English fluency.

Most Somalis are practicing Muslims, and their religion prohibits the handling of pork products or alcohol. These restrictions often prevent the community's food service workforce from obtaining employment outside of Somali-owned establishments. Presumably, the opportunity to work in mainstream food services would provide food service workers with experience that could potentially bridge their current food safety knowledge gaps.

I have had the opportunity to live in both Somalia and the U.S., and have developed a fundamental understanding of the food safety struggles experienced by Somali food service workers in Minneapolis. I used my cultural and technical expertise to guide the development and the execution of this study, and to explain my findings in the hopes of improving food safety practices for these Somali-owned businesses.

### **Organization of Thesis**

The thesis contains six chapters. Chapter 1 introduces the study and describes the hypothesis of the study, and defines key terms. Chapter 2 is a review of literature

relevant to the study. Chapters 3, 4, and 5 present individual case studies relating to aspects of food safety for Somali-owned businesses. Chapter 6 is a general conclusion to the study. Although each internal chapter relates to the others thematically, each represents an independent scientific case study, with introductions, methods, discussions, and conclusions segments for each study.

The three chapters offer a closer look at food safety cultural norms, longitudinal inspection outcomes, the impact of oral training, and the promise of letter grading. Although each internal chapter represents a different study, the collective thesis presents a logical flow from chapter to chapter. Chapter 3 explores Somali cultural insights to show how these norms affect food safety inspection outcomes, examining the ways that cultural norms inform adherence to food safety rules. With the backdrop of the findings from Chapter 3, Chapter 4 proceeds with a detailed look at inspection data and performs numerous analyses, including comparisons between older and newer establishments and between Somali and non-Somali establishments. Chapter 4 also compares historical records of inspection data from Somalia to modern restaurant grading in New York, analyzing longitudinal performance. The analysis found that one of the contributing factors to poor food safety performance is a lack of a certified food manager in Somali-owned establishments. Chapter 5 is an experimental study that investigates the outcome of a visual and oral food safety training that incorporates the cultural and linguistic needs of Somali food service workers.

### **Research Objectives**

In Chapter 3, the aim of the study was to determine how Somali food safety cultural norms relate to awareness of food safety regulations, and inform food safety

compliance. Chapter 4 had three aims: (a) to compare food safety compliance of independently-owned and operated Somali restaurants to non-Somali establishments; (b) to investigate the impact of inspection results on food safety compliance by comparing performances of establishments with longer inspection histories to newer businesses; and (c) to investigate the role that restaurant letter grading could play in improving sanitation. Chapter 5 sought to examine the effectiveness of an oral learner teaching strategy, as a potential alternative food safety teaching method for new immigrant or refugee food service workers through performance on certified food manager examinations. It was hypothesized that there would be no discernible difference in Food Safety Exam performance between Somali food handlers who received the oral learner food manager training and those who took traditional food manager training.

### **Data Sources and Collection Methods**

The studies use mixed-methods, collecting qualitative and quantitative data from the following three data sources:

- The qualitative data consists of a focus group study. Data collection involved the creation of focus group questions, IRB approval, participant recruitments, collection of informed consent forms, and data collection. The focus group consisted of 60 participants (30 females and 30 males), 18 years or older, who had visited live animal markets, had experience with preparing meat at home, or worked as a food handler. Each focus group session included a facilitator and a note-taker, and the discussions were recorded. Focus group narratives were coded using broad categories from reoccurring narratives.

- The Minneapolis Health Department provided inspection data for 62 independently-owned and operated Somali food establishments from 2008-2014. The database reported 5,942 violations, and most violations were observed during unannounced routine inspections (73%) and re-inspections (23%). Inspections excluded from the analysis were alleged food-borne illnesses, fire calls, and plan reviews.
- The Minneapolis Health Department provided data from 4,603 inspections from 2008-2010, including unannounced routine inspections (78%) and re-inspections (13%). During this time, inspections from Risk 1 establishments made up the highest percentage of total inspections (69%), followed by Risk 2 (14%), Risk 3 (13%) and non-risk-assigned inspections (4%).

### **Definition of Terms**

*Critical Violations:* Infractions most likely to lead to food-borne illnesses.

Critical violations can result from cooking, cooling, storing, or serving food incorrectly (FDA, 2013).

*Non-critical Violations:* Food handler practices that are not likely to be the cause of food-borne illness, primarily maintenance and sanitation issues (FDA, 2013).

*Food-borne Illness:* An illness caused by eating contaminated food (CDC, 2014).

*Food-borne Illness Outbreak:* An incident in which two or more persons experience a similar symptom or illness resulting from the ingestion of a common food (CDC, 2014).

*Independently Owned Restaurant:* A unique restaurant owned by an individual, a family, or a small group of people (Gregoire, 2012).



*Halal*: An Islamic concept which, in the context of food consumption, refers to (a) meat slaughtered in the name of God; and (b) the avoidance of alcohol or products with pork ingredients.

*Ablution*: An Islamic cleanliness procedure that involves washing parts of the body (including the hands and feet) with water. It is a mandatory and methodical process completed before the five daily prayers.

*Poor Food Safety Performance*: Failure to adhere to the following requirements (Food Code, 1993):

- Demonstration of knowledge
- Implementation of employee health policy
- Maintenance of good hand hygiene
- Assurance of time/temperature requirement
- Provide consumer advisory

*Five food safety risk factors*: Indicators of poor performance (Olsen et al., 2000), such as:

- Improper holding temperature
- Inadequate cooking
- Contaminated equipment
- Food from unsafe sources
- Poor personal hygiene

## **Chapter 2: Literature Review**

### **Food Safety, Food-borne Illness and Regulatory Guidelines**

Food-borne illness occurs when ingested food is contaminated with a sufficient number of disease causing organisms. In commercial food establishments, major contributing factors to food-borne illnesses are food worker health and hygiene, food preparation practices, food contamination prior to product arrival at the kitchen (Gould, Rosenblum, Nicholas, Phan, & Jones, 2013), and poor food handling practices that pave the way to numerous types of contamination (Hedberg, 2013). In response to these health threats, the public health system has institutionalized two interventions to prevent food-borne illness occurrence in restaurants: a food safety certification of kitchen managers, and restaurant inspections (Campbell, 1998; Irwin, Ballard, Grendon, & Kobayashi, 1989).

The 1993 FDA food code provided inspection guidelines to regulatory agencies specifying areas inspectors should monitor during inspections to protect consumer health. These areas included demonstration of knowledge, implementation of employee health policy, hand hygiene, time and temperature relationship, and consumer advisories (FDA, 2009). A less than satisfactory food safety inspection performance implies a failure to adhere to these requirements, and numerous studies have shown a failure of ethnic food establishments to improve performance regardless of the number of inspections. These guidelines are developed after evaluating epidemiological outbreak data, for instance improper holding temperatures has been repeatedly identified as a food-borne illness cause and subsequently assigned as one of the five major risk factors known to contribute to food-borne illness (FDA, 2013b).

Another risk factor is the exposing potentially hazardous food to the temperature danger zone of 41-140F, which has been identified as risk factor for pathogen growth. Examples of these pathogens of concern for meat and poultry products are *Staphylococcus aureus*, enterohemorrhagic *E. coli*, *Salmonella spp.*, *Listeria monocytogenes*, *Campylobacter jejuni/coli*, *Yersinia enterocolitica*, *Clostridium perfringens* and *C. botulinum*; for fish and seafood product's *Vibrio vulnificus*, *V. parahaemolyticus*, *V. cholerae*, and *C. botulinum* Type E, and enteric microorganisms such as *Salmonella spp.* and *Shigella spp.*, *C. botulinum*, and *Bscillius cereus* (Ray & Bhunia, 2007). A persistence of hot and cold holding violations disadvantages the public by putting them at risk of food-borne illness.

A 2015 study estimated the annual economic impact of food-borne illness in the U.S. at \$55.5 billion (Scharff, 2015). According to the Centers for Disease Control and Prevention (CDC), there are more than 250 described food-borne diseases caused by a variety of pathogens. Mead and colleagues (1999) published the first comprehensive estimate of food-borne illness disease impact and estimated annual food-borne illness incidents of 76 million, with 325,000 hospitalizations and 5,000 deaths (Mead et al., 1999). Numerous studies attribute the majority of food-borne illnesses to restaurants (Wong et al., 2015), and public health interventions have been institutionalized to reduce these occurrences. Such interventions include food handler training and education, restaurant inspections and enforcements, disclosing inspection reports, and operation managerial guidance and engineering (Thomas et al., 2013).

State and local health departments are responsible for regulating commercial kitchen food safety inspection systems for their jurisdictions. Specifically, local

jurisdictions establish and implement food safety standards for restaurants, retail food stores, and other retail food establishments. Although the 2013 Food Code provides regulatory authorities with options for increasing or decreasing frequency of inspections, the recommended inspection frequency is once every six months. The flexibility of inspection frequency provides opportunities for increasing or decreasing inspections according to performance in five priority areas as set by the Food and Drug Administration (FDA), which recommends tailoring frequency of inspections according to performance in these categories (Waters et al., 2013a). These five categories are identified as contributing factors to food-borne illnesses and include improper holding temperature, inadequate cooking, contaminated equipment, food from unsafe sources and poor personal hygiene (Olsen, MacKinnon, Goulding, Bean, & Slutsker, 2000). The 2000 FDA report designates these categories as ‘risk factors’ within retail and food service establishments, and the categories have been labeled as performance measures for regulating retail food programs.

Based on epidemiological data from repeated food-borne illness outbreaks, these risk factors provide evidence to support the Food Code’s enforceable provisions for inspection of food service operations. In response to these risk factors, the 2009 Food Code established five food safety interventions: demonstration of knowledge, employee health controls, controlling hand hygiene as a vehicle of contaminations, time and temperature control, and the consumer advisory (FDA, 2013).

Although there is widespread consensus for the role of these risk factors in preventing food-borne illness, there is much debate on inspection frequency and its role in improving sanitation. Some studies report no clear relationship between increased

inspection frequency and food safety compliance level (Mathias, Sizto, Hazlewood, & Cocksedge, 1995; Newbold, McKeary, Hart, & Hall, 2008), whereas an Allwood et al. study reports improved sanitation with increased number of inspections. (Allwood, 1999). Numerous authors have pointed out similar discrepancies between inspection scores and food-borne illnesses (Cruz, Katz, & Suarez, 2001; Leinwand, Glanz, Keenan, & Branas, 2017). A few studies have demonstrated a relationship between inspection scores and rates of food-borne illness (Buchholz, Run, Kool, Fielding, & Mascola, 2002; Cruz et al., 2001; Irwin, Ballard, Grendon, & Kobayashi, 1989), whereas others have not (Jones, Pavlin, LaFleur, Ingram, & Schaffner, 2004; Penman, Webb, Woernle, & Currier, 1996; Phillips, Elledge, Basara, Lynch, & Boatright, 2006; Waters et al., 2013b; Yeager et al., 2013).

### **The Ethnic Food Industry in the U.S.**

The 2017 United States' (U.S.) restaurant industry outlook report from the National Restaurant Association projects restaurant industry sales earnings to reach \$798.7 billion, a 1.7% increase after adjustment for inflation when compared to 2016, and the eighth consequential annual sales increase since 2008 (National Restaurant Association, 2017b). The report also projects a modest workforce growth of 10.9% over the next ten years for restaurant workers, which represent 10% of the U.S. workforce. One driver of the projected increase in sales and the workforce is a 47% increase for total food expenditure away from home that occurred from 1929-2014 according to the USDA's economic research survey. However, this increase includes non-restaurant food establishments like hospitals, airlines, boarding houses, military exchanges and clubs, etc. Moreover, food related industries generate approximately \$3.5 trillion and are considered

the third largest contributor to U.S. gross output after the financial sector and manufacturing.

In 2014, almost 30% of all new businesses were opened by immigrant entrepreneurs, a substantial increase from 13% in 1997. Immigrants are twice as likely to become entrepreneurs as native born (Fairlie, 2015). In 2012, full and limited service restaurants serving ethnic food accounted for 26% of all restaurants in the U.S. (Gallo-Torres, 2014).

The 2012 Fiscal Policy Institute paper on Immigrant Small Business owners reports immigrants make up 37% of restaurant owners in the U.S. (Kallick, Parrott, & Mauro, 2012). Moreover, one of the driving factors behind the increase of ethnic food businesses is the growing number of ethnic communities. According to 2012 Census Bureau data, minority populations make up 36.6% of the total population and they constitute 50.4% of the nation's population younger than 18 as of July 1, 2011 (Census Bureau, 2012). Although Spanish-speaking populations have been the largest immigrant sub-group in the U.S., the growth of this population has been dropping in comparison to other ethnic groups. The Hispanic population growth between 2000- 2001 was 34% in contrast to the Asian and African populations (115%, 111% respectively). (Ryan, 2013).

### **Foreign-Born Food Service Workers**

By 2015, foreign-born workers were found to be more likely to work in the service industries compared to the native borne workers (Bureau of Labor Statistics, 2016). At the same time, the 2010 U.S. Census data reported 28% of immigrants between ages 25 to 65 had not completed high school, compared to 7% of natives, and their poverty rate was almost three times the rate of adult natives without a high school

diploma (Camarota, *S.* Aug 2012).

The 2010 American Community Survey's 5 years estimate lists restaurants as the number one immigrant owned business among the top ten of immigrant owned businesses. This represents 37% of all restaurants in the U.S., accounting for 76,915 food establishments across the country. (Camarota, *S.* Aug 2012). This immigrant entrepreneur's spirit might be fueled by an eagerness to share traditional food and driven by the demand of a rapidly growing ethnic community.

Food service work is preferred by most first-generation immigrants. This is because the language barriers, lack of a U.S. college diploma and the inability to secure a professional license, which are major obstacles for career development are not barriers to food service work (Liu & Lin, 2011). According to the Bureau of Labor Statistics, the number of 16-24 years olds in the U.S. labor force is projected to decline 2.8 million between 2014- 2024. The large number of foreign-born adults pursuing low wage, entry-level employment that traditionally hire 16-24 years old would potentially off set this decline. The role of foreign-born employees will become increasingly important in the years to come. According to 2015 American Community Survey, approximately 2.3 million foreign-born restaurant workers account for 23% of U.S. restaurant employees, relative to their 19% representation in the overall economy (National Restaurant Association, 2017a). Moreover, 45% of foreign-born food service workers are more likely to be restaurant chefs or 24% managers than natives.

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### **Food Safety in Ethnic Restaurants**

An emerging trend in the restaurant industry is the growing number of ethnic restaurants resulting from shifting demographics, and researchers have raised concerns about food handling practices of these ethnic restaurants (Fraser & Alani, 2009; Lee, Niode, Simonne, & Bruhn, 2012; Mauer, Kaneene, DeArman, & Roberts, 2006). Comparative studies of ethnic food safety compliance versus non-ethnic food operators have demonstrated poorer food safety practices with ethnic food operators, and researchers have called for more investigation. The reasons for the poor performance have not been fully explored or considered and warrant attention given the growing demand for ethnic food in the U.S.

As ethnic minority populations increase, so do ethnic food operators and ethnic food consumerism. Such an increase might explain the unique associations between the frequency of certain food-borne illnesses and racial/ethnic groups (Lay et al., 2002). It may also help explain CDC findings of 3-11% increases in food-borne illness outbreaks occurring from 1990-2000 among Mexican, Asian and Italian restaurants while the estimated annual incidence of selected food-borne outbreaks in the U.S. declined



(Centers for Disease Control & Prevention, 1999). The study identified an increased need for food safety education with ethnic food establishments (Simonne et al., 2004).

A Kansas study that compared food safety violations of independently owned ethnic restaurants to non-ethnic restaurants using inspection data from 14 counties demonstrated a higher rate of critical violations, and non-critical violations, and more frequent inspections with ethnic restaurants. The authors professed a lack of clarity in understanding the observed disparities and acknowledged that little research was available on the food handling behavior in ethnic restaurants (Kwon, Roberts, Shanklin, Liu, & Yes, 2010).

To examine the food safety knowledge and food handling behavior among low income and high-risk populations from different ethnic groups, a food safety survey was administered to 1,598 participants from a national sample of the Special Supplemental Food Program for Women, Infants, and Children (WIC). Participants were asked food safety knowledge questions related to cutting board handling, sanitizing, reheating of hot food leftovers, and checking doneness of ground beef patties. To assess food-handling behaviors participants were asked questions related to cutting board handling, thawing, storing, reheating, checking doneness of ground beef patties, and handling moldy food items. The results showed statistically significant differences in the overall knowledge and behavior scores among different racial and ethnic groups. For instance, more white respondents reported using thermometer and thawing meat in the refrigerator than members of other ethnic groups. (Kwon, Wilson, Bednar, & Kennon, 2008).

Another study of the food safety practices of ethnic minority food retail business, also found less than satisfactory food safety performance and ascribed language

difficulties and lack of food safety knowledge as impediments (Rudder, 2006). The author also declared culture as an impediment and a steeper challenge when compared to the language and food safety knowledge barriers. To illustrate a cultural barrier, the author mentioned the operation of a 'caste system' in the kitchen. In this system cooks do not clean and women are hired to do the cleaning, yet the women are not allowed to clean while the cooks are in the kitchen. To overcome such cultural barriers, the author recommended a substantial time commitment with operators to develop individual action plans to sustain good practices (Rudder, 2006).

A study that examined the association between announced inspections, and inspection scores sheds light on some of the inherent difficulties experienced by ethnic food operators and separates food safety knowledge barriers from cultural/intuitive norms. In this study, an analysis of announced inspection results found a violation reduction of personal hygiene, equipment cleaning, and personal hygiene and reported these violations as easy ones to correct right prior to the inspection (Porucznik & Royal DeLegge, 2013). However, compliance related to holding temperatures, cross contamination and sanitizer concentrations were more problematic and the authors noted the Asian restaurant operators received more citations from cross-contamination violations than American food establishments. The authors described this observation as an 'inherent' challenge for operators using buffet style serving or that it might be the consequences of a 'heightened awareness and precaution on the part of the inspectors' implying that violations were driven by inspectors' bias (Porucznik & Royal DeLegge, 2013).

### **Visual/Oral Training Modalities and the Influence of Culture on Food Safety**

A person's worldview is highly correlated with cultural upbringing and life experiences within social, cultural, environmental, philosophical, and psychological dimensions (Ibrahim, 1985). A practical application of this theory is the recognition that worldview spans beyond the boundaries of attitudes, values, opinions and beliefs, but delves into how people think, define events, make decisions and behave (Sue, Rasheed, & Rasheed, 2015).

Moreover, research has substantiated differences between oral and written communication styles. The Oregon Environmental Health Specialist Network conducted a study that assessed the role of communication in food-borne disease outbreaks using a focus group with restaurant owners, food service workers, and regulators. They discussed preferred styles of receiving and giving information and their perception of why food-borne outbreaks occur (Beegle, 2004). Most focus group participants were from low-income communities and according to Beegle when food safety information is presented in print and examples used are unfamiliar to the restaurant owners and food service workers lived experiences, it impedes learning. However, the regulators who participated in the focus group felt print communication was the only approach valued and promoted it as the basis for the regulatory system.

Burke and colleagues conducted a meta-analysis study that analyzed 95 quasi-experimental studies examining the relative effectiveness of different methods of safety and health training and its impact on safety performance, safety knowledge and safety outcomes (Burke, 2006). The authors classified the training methods into three categories: (1) least engaging (lecture, films and video-based trainings) (2) moderately

engaging methods (computer-based instructions and feedback techniques), and (3) most engaging methods (behavior modeling, simulations and hands-on training). Study results demonstrated that training involving behavior modeling with ample practice and dialogue is more effective than other methods of safety training.

### **Food Safety Training**

Considering the growing role of foreign-born food service workers in the U.S. food industry, it is imperative that food safety training is conducted in an accessible and understandable way to all workers to prevent occurrences of food-borne illnesses. To prevent food-borne illness occurrences in restaurants, the public health system has institutionalized two interventions: 1) a food safety certification system, and 2) a restaurant inspection program (Campbell, 1998; Irwin, Ballard, Grendon, & Kobayashi, 1989).

A recent study found twenty-six states mandating a food certification requirement in their food code (Kambhampati et al., 2016), and this certification involves the training of a person in charge of a food establishment to complete an accredited training, and passing an accredited testing program to improve food safety practices, and prevent food-borne illness (Schilling, O'Connor, & Hendrickson, 2003). The accredited food safety testing is typically completed after an 8 hours certified food manager training.

The certified food protection manager (CFPM) provision requires each food establishment to have at least one employee with managerial duties to pass a test from an accredited food safety-training program. Furthermore, the food code expects a certified person to be able to demonstrate food safety knowledge during inspections or other requests (FDA, 2013). The U.S. Food and Drug Administration (FDA) recommends food

safety certification to be completed by the person in charge of a food establishment to demonstrate knowledge of food-borne diseases, prevention strategies, application of Hazard Analysis and Critical Control Plan principles (HACCP), and the requirements of the FDA Food Code (Feinstein, Dalbor, & McManus, 2014).

The American National Standards Institute (ANSI-CFP) is the accredited certification provider recognized by the Conference for Food Protection. ANSI-CFP approves and certifies companies to provide an accredited exam accepted in all states that have mandatory certification requirement for food management professionals. There are currently four approved food safety exam providers and their certification processes are highly dependent on print literacy and designed for the literal, analytic-oriented learner exposed to formal education systems.

### **Restaurant Grading**

Restaurant disclosure programs are becoming more common in the U.S. Policy evaluation studies from the early adopters of restaurant grading policies have found these policies to have a positive impact on both sanitation and the incidence of food-borne illness (Jin & Leslie, 2003; Simon, Leslie, Run, & Jin, 2005; Wong & Matis, 2015; Wong et al., 2015). Promising study outcomes showing improved sanitation from restaurant grading encourage widespread policy adoption.

Jin and Leslie's restaurant grading study attributed improved inspection scores to a disclosure program that heightened consumer's response to restaurant hygiene status. The design of a successful disclosure program is depends on these three attributes: (a) engages information users, (b) provides beneficial information to users, and (c) uses comprehensible information. (Fung, Graham, & Weil, 2007). They credited these

underlying factors with the observed decrease in the hospitalization incidence rate of food-borne illnesses in Los Angeles (Jin & Leslie, 2003).

A study that analyzed 18 public disclosure policies and examined successes, failures and lessons describes the Los Angeles restaurant disclosure program as a success. It attributed the ease of reporting 'A', 'B' and 'C' letter grading and its simple user comprehensibility as elements of its success (Fung, A., Graham, & Weil, D, 2007). In general, authors attributed successful disclosure policies as user-centric, designed to prioritize users' needs, and conducted by a disclosing organization with adequate capacity. They described the operative mechanism of users and disclosure as an 'action cycle' and its success is based upon the alignment of the disclosed information at the decision making points of its users ( Fung, A., Graham, & Weil, D, 2007).

Such alignment is clearly demonstrated by the New York City letter grading and disclosure policy as its restaurant grades are posted to both a website, and a free smartphone app downloaded through iTunes and Google Play (Wong & Matis, 2015). Moreover, restaurants are required to post a placard advertising their sanitation results letter grade in their front window, so potential customer can take a look prior to entering the restaurant. New York added value to their public disclosure app by incorporating interactive maps and street views of food establishments with restaurant zip code, cuisine type and letter grade filters (Wong & Matis, 2015), which encourages app user uptake. Wong et al credits New York's restaurant grading policy with the increased number of certified food managers, improved worker hygiene, increased number of restaurants with proper hand washing and fewer restaurant mice. And reported a 90% approval from a

public response survey of which 88% of the surveyed diners considered restaurant grade in dining selection (Wong & Matis, 2015).

### **Chapter 3: Examining the Effects of Food Safety Cultural Norms on Food Inspections: The Case for Independently-Owned Somali Food Establishments**

Public health researchers have increasingly found food safety concerns with ethnic owned restaurants yet ethnic food consumption is on the increase. The number of years of stay in the U.S. sheds light on the extent of cultural integration, which is known to significantly impact behavior following adaptation to a new environment. In theory, the longer a food establishment is in business, the more likely the operator is to encounter environmental cues from regulators, business associations, or other food operators that influence their food safety practices. The earliest Somali migrants to the Twin Cities are now approaching over 20 years, and the earliest food establishments operated and owned by Somalis have now been in business for 20 years. There is a dearth of literature addressing the progression of food safety compliance in newly established food businesses operated by ethnic immigrants, yet it is important to understand how their cultural norms have influenced their adherence to food safety laws in their new environment. This study analyzes data on food safety cultural norms obtained from seven focus groups of Somali immigrants, and maps out these norms against food safety regulations. It then examines the relationship between these cultural norms and food safety inspections by examining seven years of violation data from 62 independently owned and operated Somali restaurants. A strong correspondence was observed between cultural norms and patterns of violations typically not addressed in current food safety education programs. The beliefs and customs deeply rooted in Somali culture must be addressed in a culturally relevant manner to improve compliance with food safety regulations.



Shifting U.S. demographics, coupled with an adventurous consumer palate and the immigrant's entrepreneurial spirit have resulted in a surge of ethnic food businesses. In 2014, almost 30% of all new businesses were opened by immigrant entrepreneurs, a substantial increase from 13% in 1997. Immigrants are twice as likely to become entrepreneurs as the native born (Fairlie, 2015). In 2012, full and limited service restaurants serving ethnic food accounted for 26% of all restaurants in the U.S. (Gallo-Torres, 2014).

By 2015, foreign-born workers were found to be more likely to work in the service industries compared to the native borne workers (Bureau of Labor Statistics. 2016). At the same time, the 2010 U.S. Census data reported 28% of immigrants between ages 25 to 65 had not completed high school, compared to 7% of natives, and their poverty rate was almost three times the rate of adult natives without a high school diploma (Camarota, S. Aug 2012).

The 2010 American Community Survey's 5 years estimate lists restaurants as the number one immigrant owned business among the top ten of immigrant owned businesses. This represents 37% of all restaurants in the U.S., accounting for 76,915 food establishments across the country (Camarota, S, Aug 2012). This immigrant entrepreneur's spirit might be fueled by an eagerness to share traditional food and driven by the demand of a rapidly growing ethnic community.

Food service work is preferred by most first-generation immigrants. This is because the language barriers, lack of a U.S. college diploma and the inability to secure a professional license, which are major obstacles for career development are not barriers to food service work (Liu & Lin, 2011). However, researchers are increasingly finding food

safety concerns with ethnic owned restaurants (Choi, 2011; Roberts, Kwon, Shanklin, Liu, & Yen, 2011; Rudder, 2006; Simonne, Nille, Evans, & Marshall Jr, 2004). A study that looked at food safety trends over 16 years reported an increase in outbreaks from Mexican restaurants contributing to the majority of outbreaks observed in ethnic restaurants (Franco & Simonne, 2009). As ethnic minority populations increase, so do ethnic food operators and ethnic food consumerism. Such an increase might explain the unique associations between the frequency of certain food-borne illnesses and racial/ethnic groups (Lay et al., 2002). It may also help explain CDC findings of 3-11% increases in food-borne illness outbreaks occurring from 1990-2000 among Mexican, Asian and Italian restaurants while the estimated annual incidence of selected food-borne outbreaks in the U.S. declined (Centers for Disease Control & Prevention, 1999). The study identified an increased need for food safety education with ethnic food establishments (Simonne et al., 2004).

A Kansas study that compared food safety violations of independently owned ethnic restaurants to non-ethnic restaurants using inspection data from 14 counties demonstrated a higher rate of critical violations, and non-critical violations, and more frequent inspections with ethnic restaurants. The authors professed a lack of clarity in understanding the observed disparities and acknowledged that little research was available on the food handling behavior in ethnic restaurants (Kwon, Roberts, Shanklin, Liu, & Yes, 2010).

To examine the food safety knowledge and food handling behavior among low income and high-risk populations from different ethnic groups, a food safety survey was administered to 1,598 participants from a national sample of the Special Supplemental

Food Program for Women, Infants, and Children (WIC). Participants were asked food safety knowledge questions related to cutting board handling, sanitizing, reheating of hot food leftovers, and checking doneness of ground beef patties. To assess food-handling behaviors participants were asked questions related to cutting board handling, thawing, storing, reheating, checking doneness of ground beef patties, and handling moldy food items. The results showed statistically significant differences in the overall knowledge and behavior scores among different racial and ethnic groups. For instance, more white respondents reported using thermometer and thawing meat in the refrigerator than members of other ethnic groups. (Kwon, Wilson, Bednar, & Kennon, 2008).

Another study of the food safety practices of ethnic minority food retail business, also found less than satisfactory food safety performance and ascribed language difficulties and lack of food safety knowledge as impediments (Rudder, 2006). The author also declared culture as an impediment and a steeper challenge when compared to the language and food safety knowledge barriers. To illustrate a cultural barrier, the author mentioned the operation of a 'caste system' in the kitchen. In this system, cooks do not clean and women are hired to do the cleaning, yet the women are not allowed to clean while the cooks are in the kitchen. To overcome such cultural barriers, the author recommended a substantial time commitment with operators to develop individual action plans to sustain good practices (Rudder, 2006).

Food-borne illness occurs when ingested food is contaminated with a sufficient number of disease causing organisms. In commercial food establishments, major contributing factors to food-borne illnesses are food worker health and hygiene, food preparation practices, food contamination prior to product arrival at the kitchen (Gould,

Rosenblum, Nicholas, Phan, & Jones, 2013), and poor food handling practices that pave the way to numerous types of contamination (Hedberg, 2013). In response to these health threats, the public health system has institutionalized two interventions to prevent food-borne illness occurrence in restaurants: a food safety certification of kitchen managers, and restaurant inspections (Campbell, 1998; Irwin, Ballard, Grendon, & Kobayashi, 1989).

The 1993 FDA food code provided inspection guidelines to regulatory agencies specifying areas inspectors should monitor during inspections to protect consumer health. These areas included demonstration of knowledge, implementation of employee health policy, hand hygiene, time/temperature relationship and consumer advisories (FDA, 2009). A less than satisfactory food safety inspection performance implies a failure to adhere to these requirements, and numerous studies have shown a failure of ethnic food establishments to improve performance regardless of the number of inspections. For example, a longitudinal food safety inspection study of Asian restaurants failed to link an increased frequency of inspection with improved food safety compliance over time. This study recommended further studies to investigate why food safety performance was not improving despite numerous inspections (Choi, 2011).

A study that examined the association between announced inspections, and inspection scores sheds light on some of the inherent difficulties experienced by ethnic food operators and separates food safety knowledge barriers from cultural/intuitive norms. In this study, an analysis of announced inspection results found a violation reduction of personal hygiene, equipment cleaning, and personal hygiene and reported these violations as easy ones to correct right prior to the inspection (Porucznik & Royal

DeLegge, 2013). However, compliance related to holding temperatures, cross contamination and sanitizer concentrations were more problematic and the authors noted the Asian restaurant operators received more citations from cross-contamination violations than American food establishments. The authors described this observation as an ‘inherent’ challenge for operators using buffet style serving or that it might be the consequences of a ‘heightened awareness and precaution on the part of the inspectors’ implying that violations were driven by inspectors’ bias (Porucznik & Royal DeLegge, 2013). This study recommended examination of Asian food safety cultural norms to understand their food safety practices.

There is a dearth of literature addressing the relationship between cultural food safety norms and food safety rules. Proposed study investigates the food safety practices of Somali operators, a newly arrived immigrant community’s food as influenced by cultural and historical experiences and its impact on their food safety compliance. The earliest food establishments operated and independently owned by Somalis have been in business about 20 years. The number of years of stay in the U.S. sheds light on the extent of cultural integration, which is known to significantly impact behavior following adaptation to new environment. In theory, the longer a food establishment is in business, the more likely the operator is to encounter environmental cues from regulators, business associations, other food operators that influence their food safety practices. In this process they learn to integrate, and are more likely to assimilate from cultural norms.

### **Independently-Owned Somali Restaurants**

The Twin Cities area is referred to as the *de facto* capital of Somalis in the U.S., as it houses the largest Somali immigrant community in the U.S. The Somali community

first migrated to Minneapolis-St Paul in the mid-90s, and its current population is estimated to be 46,300 out of which 62% are foreign born (Economic paper\_ [https://mn.gov/admin/assets/the-economic-status-of-minnesotans-chartbook-msdc-jan2016-post\\_tcm36-219454.pdf](https://mn.gov/admin/assets/the-economic-status-of-minnesotans-chartbook-msdc-jan2016-post_tcm36-219454.pdf)). Somalis have made significant strides as entrepreneurs. According to a research article by Samatar using data obtained from the African Development Center (ADC)- a micro lending financial institute serving the East Africa community in Minnesota- there were no significant Somali owned and operated businesses in Minnesota in 1995; by 2006, ADC estimated 600 Somali run and managed business in the State (Samatar, 2008). University of Minnesota's Center for Urban and Regional Affairs' researchers identified at least 375 Somali owned businesses by 2010 in the Twin Cities metro area alone (Golden, Heger Boyle, & Jama, 2010).

### **Study Aims**

This study uses two sources of data to investigate the impact of food safety culture on longitudinal inspection outcomes. Data were obtained for a focus group study designed to investigate Somali food handling practices at live animal markets, food businesses, and homes. This focus group study was prompted by an outbreak of food-borne illness that had been associated with live animal markets throughout the United States including Minnesota. Although this study was not designed for the aims of this paper, it provides the necessary information needed to map identified cultural norms to food safety inspection data of Somali restaurateurs.

Local and state health departments sponsored the focus group study to identify Somali food safety cultural norms as insights for developing educational materials. Much is unknown regarding Somali food handling practices at live animal markets,

businesses, and homes. The focus group study examined the cultural understanding of food and food-borne illness, food storage practices, food handling practices and causes of food-borne illness. This qualitative data is being coupled with longitudinal inspection outcome data obtained from the Minneapolis Health Department for independently owned Somali food establishments. The City of Minneapolis license department does not collect information on the license owner's race, ethnicity or country of origin, therefore health inspectors helped identify a list of independently owned and operated Somali food establishments.

### **Methods**

*Focus groups:* Focus group data collection involved the creation of focus group questions, IRB approval, participant recruitment, informed consent and seven data collection sessions. The Minneapolis Health Department hired two culturally appropriate consultants to conduct the focus groups with Somali residents living in the Twin-Cities metropolitan area. Cultural consultants completed seven focus groups with 60 participants (see Table 1). To qualify for the study, participants had to meet the following selection criteria: (a) adult 18 years of age or older; and (b) and visited a live animal market to obtain meat, or (c) experience with preparing meat at home that had been obtained from a live animal market or other venue, or (d) worked as a food handler in a food service setting.

Table 1

*Focus Group Participants by Gender*

<b>Focus Group</b>	<b>Number of Female Participants</b>	<b>Number of Male Participants</b>
1	8	0
2	9	0
3	8	0
4	5	0
5	0	10
6	0	10
7	0	10
Total	30	30



Study promotional and recruitment materials were posted on bulletin boards of common visiting places including Somali strip malls, “halal” meat markets/groceries, community centers, and mosques. However, the most effective recruitment was the snowball word of mouth referrals, and its success was attributed to the Somali community’s oral communication culture. Three recruiters were actively engaged in distributing promotional materials, screening, and enlisting adult participants. At the end of the focus group sessions, participants were offered a \$40 gift card to a local retail store as a token of appreciation along with a meal and child-care if needed.

The age of participants ranged from 18-76 and the seating arrangement for the session was in a circle as would be expected in a cultural environment, and traditional *chai* tea was served with other refreshment. Each focus group session had both a facilitator and a note taker and all sessions were voice recorded. Focus group sessions were held at a community setting and started with refreshments and informal interactions designed to establish rapport with the facilitator. All dialogues were transcribed to English and a thematic report was generated (see Appendix A).

In spite of an exhaustive search, the study faced a recruitment hurdle. It was not possible to find and recruit a pool of participants who had live-animal slaughterhouse experience. Therefore, this requirement was changed to also include participants with experience in purchasing meat. Three unanticipated challenges emerged during and prior to the start of the focus groups, (a) although all participants consented to participate in the study, they still needed more information to understand why it was important to prevent food-borne illness, (b) the Somali cultural hierarchy reveres and respects elders, which dissuaded the young participants from participating and sharing their perspectives, (c)

focus group participants were of mixed backgrounds (some were brought up in Somalia and had a wealth of experience and spoke fondly about the Somali culture and some were born in Somalia, but grew up in U.S.). To overcome these unforeseen challenges, the facilitator intentionally engaged the young participants to effectively contribute, and opened up the dialogue in both English and Somali.

*Focus Group Narrative Analytic Approach:* Berkowitz, et al, focus group analytic approach was used to develop broad coding categories from the reoccurring patterns read from the narrative (Berkowitz, 1997). This study refers these broad categories as drivers and are based on responder's perspectives and ways of thinking in the context of their past environment and experiences as it relates to their behavior and attitude. Three of themes were collapsed under one driver and is referred to as cultural and historical context and direct quotes from the seven focus groups' narratives were used to explain identified themes.

*Restaurant Inspection Data Analysis:* Inspection data for 2008-2014 from 62 independently owned and operated Somali owned food establishments were obtained from the Minneapolis Health Department and used to examine violation trends. The database reported 5,942 violations and most violations were observed from unannounced routine inspections (73%) and re-inspection (23%). Inspections not included in the analysis were alleged food-borne illness investigations, fire calls, not in operation site visits, and plan reviews. The reported violations were based on the Minneapolis Food Code that adapted the Minnesota Rules Chapter 4626. The Food Code embodies the standards restaurants and other food establishments must adhere to regarding the handling, storing, preparation, and service of food to the retail customers (Minneapolis

website). Establishments were inspected according to risk category, the highest risk categorized as Risk 1, which receives two inspections per year. They were re-inspected if five or more critical violations or greater than ten non-critical violations were found during routine inspections. The other risk categories were risk 2 and 3, inspected 12 and every 18 months respectively.

The results of the inspections were entered into Excel spread sheets and were analyzed using Excel descriptive statistics and Pivot Tables.

### **Results**

Four major themes were identified from the seven focus groups: (a) religion- including avoidance of pork and alcohol products and adherence to ritual hand washing practices (b) culture and historical context- including language barriers, a unique understanding of food-borne illness and pathogen transmission modes, and exposure to a new world of massive refrigeration/ heating requirement due to ecological and historical differences, (c) gender- including gender specific roles for food processing, preparation and cleaning at home and (d) non-cultural related practices.

For each of the identified themes (or major broad categories), direct quotes from focus group narratives supported the overall assessment:

(a) Religion: Participants described how their food purchases, cooking, and service provisions are heavily influenced by their avoidance of pork and alcohol products imposed by religious restrictions. During the focus group, participants discussed the fear of mistakenly buying of pork or pork related products, which restricted their food market to ‘*halal*.’ *Halal* an Islamic concept and in the context of food consumption refers to (a) meat slaughtered in the name of God, and (b) no alcohol or products with pork

ingredients. Participants also mentioned how their language barriers discourage them from shopping at other local grocery stores as they are unable to ask about pork content information moreover, this halal food requirement also restricts their restaurant selection and dining experiences. Focus group narratives describing these experiences included:

“I know of a man who was breaking his fast (a religious observation) with pork meat for a month and he had no clue. People who can’t read or speak English language are particularly at risk-it’s much safer to buy from halal markets and halal serving restaurants.”

“When I buy from [a] halal store, I have no doubt [that] it’s halal. I don’t think of shopping [at] other places, not even [for] fish. I fear [...] pork contamination. Maybe they are [placing] different meat(s) next to each other or [have] used the same knife to cut [different types of meat].”

“We buy from halal grocery stores, because these are people that we share the same religion, so they have the halal foods that we want such as meat.”

“...You have firsthand knowledge with the meat you prepare at the slaughterhouse that is *halal*. Whereas the other meats from the grocery, one needs to trust the business that the meat is *halal*.”

One participant described the halal method of preparing meat as being the cleaner and healthier option. This participant attributed the method of animal killing that allows blood to flow back into the body as a cause of food-borne illness.

“Eating meat that has not been slaughtered *halal* cause food-borne illness. The blood of animals that are not slaughtered runs back to the body and contaminates the meat with bacteria that caused food-borne illness.”

As far as hand washing, participants admitted to not washing hands with soap prior to eating, and cooking, but washed hands with soap after bathroom use. One participant commented,

“People who use bathroom use soap, but most of U.S. (he rubs his hands together) do this with water.”

Some participants described the substitution of hand washing for ablution prior to eating. Ablution is an Islamic cleanliness procedure that involves washing parts of the body including hands and feet with water. It's a mandatory and methodical process completed before prayers. Ablution is done with clean water and involves dampening hair and washing hands, face, forearms, ears, nose, mouth and feet, three times each, and every practicing Muslim is required to sustain impeccable personal hygiene throughout the day in besides daily bath. Other participants described how easy accessibility to water makes hand washing relatively easier here in the U.S., compared to Somalia, but says habits developed during their times of water scarcity in Somalia are hard to break.

(b) Culture and historical context: In Somalia, hot weather prevails throughout the year with temperatures ranging from 86<sup>0</sup>F-104<sup>0</sup>F. Most families were restricted to cooking meals for same-day consumption due to lack of or little access to refrigeration. This problem was further exacerbated by the limited availability of cooking fuel. Participants spoke of their experiences of going to the market daily buying freshly slaughtered meat to be cooked and consumed on the same day. Participants described a customary practice of sharing leftover food with neighbors, relatives, and the poor. However, in the U.S., participants described infrequent trips to stores due to the availability of refrigeration and attributed an extended shelf life as a contributor of food-

borne illnesses.

“The truth is in Somalia we had fresh food and we would buy groceries by the day and cook it all for the day’s dinner. But here you have fridges. You can buy grocery, cook some, and store the rest. We did not have more incidents of food-borne illnesses in Somalia, as it’s the case here, I think it’s the case here, I think its because the food here goes through a lot of processes...”

“...In Somalis no one would get sick even if we ate meat we bought late in the evening. It was common in Somalia to sell fresh meat in the open market, they open early in the morning, of the earlier you buy [the meat] the better the chance of cooking fresh meat...”

“Majority of U.S. here were born in the countryside and cared for livestock, there were no refrigerators; the weather there was different from here. Food never spoiled or made you sick not even from milk that was freshly milked.”

“The food culture has changed when compared to Somalia, we used to eat fresh meat, [and] drank fresh milk, with fresh climate/environment. Coming here [U.S.] we are exposed to food that we are not accustomed to [food that needs refrigeration].”

“We cooked food back home and we ate as a family. When we slaughtered a live animal, we consumed all, gave parts or portions to neighbors and relative who come to feast with U.S. When we bought meat, it was not washed, it was straight put to the fire...pot...and there was no refrigeration. The meat was fresh...no food was expired, everything was fresh and you buy to cook and eat...we had no refrigerators and we never kept food for tomorrow.”

“Unlike in Somalia where one bought enough food for the family on a daily basis, here in America, one has to contend with eating meat you are not even sure is *halal*... we hardly had food left for another day or another time in Somalia, or did not have refrigerators to store food for the family.”

“In Somalia we ate three times, we never had leftover food, people cooked just enough not in excess, we didn’t have microwave, our meat was fresh, we didn’t worry about expired food or chemical, the milk we drank was freshly milked.”

“We didn’t have the need to re-heat food, all remaining food was given to other family members, neighbors and the poor around.”

Participants described how they encountered a new food reality in the U.S. and attributed these new exposures as contributors to their food-borne illness burden. They associated eating cold food with food-borne illness (e.g. eating cold pasta) and their description of cold food included food held at room temperature. Somali cultural food does not include cold meals (e.g. cold sandwiches) and so eating cold food is a new concept for Somalis. During the focus group, when participants were asked to define cold food, they did not use temperature to define their understanding of ‘cold’ and at times used the term interchangeably to describe food at room temperature.

“If food is cold, very cold it causes stomachache, diarrhea and worms in your stomach. Eating cold food with a hungry stomach cause stomach ache”

“In my opinion, I think coming to this country most people started eating new kind of food and this might cause food-borne illness”

“In my opinion, I think ...most people started eating new kind of food and this might cause food-borne illness”

Participants' food handling experience differed depending on whether they were urban or city dwellers. Participants from the rural areas, who were nomads, mostly slaughtered their animals at home.

“I never used to eat meat that I have not slaughtered with my hands; all goat and camel meat were slaughtered by one of U.S. Here, we go to the restaurant and buy cooked food, sometimes the food is not fresh or undercooked and causes stomach ache- this is the new reality of our food.”

Participants described the U.S. air as ‘dirty’ and the air in Somalia as ‘clean’ and attributed this difference as the reason for the higher incidence of food-borne illnesses in the U.S. This perception might come from their prior experiences of consuming freshly slaughtered meat, cooking outside in the open-air, and consuming hot cooked food right away. In comparison, their cooking experiences in the U.S. were done in a closed ventilation system in which windows are shut during summer and winter as a result of air conditioning and heaters. If food is cooked for immediate consumption with no plans for refrigeration, it creates a food flow process that eliminates the need to cool and reheat food, thus eliminating food safety hurdles that might have contributed to the participant's perception of a cleaner Somalia environment. Moreover, access to medical facility in the U.S. and the opportunity to diagnose food-borne illness has heightened its awareness. This increased awareness might have resulted to an interpretation of it being an emerging problem associated with U.S. stay. The following comment from a participant underlines prior lack of food-borne pathogen awareness:

“In Somalia, the weather was hot there were no bacteria, and the people had more resilience to diseases.”



Participants demonstrated a general understanding of the association of germs on hands and food-borne illness. The following comments illustrate this point.

“Once you cook don’t put your fingers in the dish.”

“Make sure your hands are clean when you are placing food in the fridge.”

“Before cooking, wash hands and wash dishes and wash chemicals off the food”

However, the mode of germ transmission was poorly understood as participants described the re-emergence of germs once the hot steam disappears. They mentioned airborne cross contamination of ready-to-eat meat when a container of cooked food is placed next to a container of raw meat.

“If you place a hot pot of cooked meat next to a pot of raw meat, the lingering steam around the hot pot causes contaminations from the raw meat to the cooked meat.”

“Don’t eat food that is cold, medicine for food is heat. Food that is steaming hot has all germs killed, and if there are no steam germs lingers around. [But], once the steam is gone germs return.”

Inquiring on participants cross contamination awareness, the facilitator asked how unweaned baby gets sick with food-borne infection and one participant responded:

“The children may have gotten the infection through breastfeeding, with the mother passing the germs from the breast milk.”

When participants were asked about symptoms of food-borne illness, they described feelings of diarrhea, vomiting, cramping, and headaches, but spoke of two different types of diarrhea- healthy diarrhea and diseased diarrhea. When asked to clarify how to differentiate healthy diarrhea from unhealthy one as it relates to food-borne illness

a participant responded:

“...diarrhea with cramps is sickness.”

“If a starving person eats food and gets full the person might experience diarrhea...typically yellow...this is good diarrhea.”

‘Healthy diarrhea’ was described as diarrhea that cleans the body and that it is good for the body to experience it at least 2-3 times in a year.

(c) Gender: The Somali culture assigns gender specific roles and mostly designates women with the role of cooking and cleaning. The male participants described women as the primary custodians of kitchens in their homes yet men were identified to be the majority of food service workers in commercial kitchens as one participant succinctly put it:

“We men buy the carcass from live animal market, we slaughter it, once we bring the carcass home or kitchen, we handover the meat to women and our role as men end there...and the women take over.”

Almost half of the male participants reported living alone and described a high dependency on Somali restaurants and claimed to have increased their exposure to food-borne illness.

(d) Non-cultural related practices: Several participants spoke at length about longer cooking times and high heat intensity as food safety protective measures. Participants described cooking time and temperature as their measure for pathogen control they described a meat cooking time range of 0.5 hours to 3 hours. No cooking temperature mentioned. Below are some of their comments:

“All meat is not the same, some are hard, other are soft. The meat found in this

country [U.S.] needs an hour or more of cooking, but meat from Somalia takes less time to get it ready because it's moist. We buy meat here that is dry and frozen.”

“Camel and goat meat takes three hours to cook; meat is not ready to eat until it's well cooked. Goat meat is bought while its dry and needs 1.5 to 2.0 hours to cook. Germs from meat are killed after food is cooked really well.”

“You need to cook meat at least one hour in this country for it to be safe. This meat arrives dry looking like sticks with no moisture around it, the fire has to soften it.”

Other participants attributed the maintenance of clean utensils and kitchen as ways to prevent food-borne illness. They described the importance of using clean utensils for cooking, storing and eating. A participant said:

“If you cook food with dirty dishes you become sick from eating that food. You need to wash the dishes, your hands and the kitchen.”

“...you cook a meal for example stew and you use the same pot to cook another meal such as pasta without washing in between, this causes food-borne illness.”

Another participant described the importance of drying the pot to avoid bacteria growth as important step in preventing food-borne illness and said:

“Transfer cooked food to a clean dry container prior to refrigerator; if the clean container is wet, it results in bacteria growth”

Participants also described the importance of cleaning food preparation areas of their homes and described how they divide up meat into smaller quantities before freezing or cooking. When the facilitator asked about the separation of utensils from food in most

cases, participants responded that they cleaned all utensils, cutting board, and knives before and after use. They also explained their belief that leaving food at room temperature for extended periods of time make people sick:

“When I came home, I make sure to clean the kitchen counter to from other food and utensils. I put the meat when it’s still in the big bags, in the sink and then portion them into smaller Ziploc bags.”

“I think food that are left outside, especially beef or chicken meats, sometimes overnight or longer can be dangerous. I got sick once when I left chicken meat out for long time. I had to see a doctor and I was told that the chicken I ate made the kids and me sick.”

Restaurant Inspection Data Analysis: The top ten violations accounted for 35.6% of all violations. Nine of the ten violations could be mapped to the four major cultural themes (Table 2). The other leading violation, while not cultural related to the fragile economic circumstances that most Somali food operators face in obtaining food service equipment that meets NSF International Standards.

*Table 2: Identified Themes and Corresponding Violations, During Seven Years of Inspections*

<b>Themes</b>	<b>Impact on Food Safety</b>	<b>Violation Text</b>	<b>Violation History</b>
Religion	The five times a day ritual hand washing practices does not match up with food code hand washing (towels, nail brush, soap)	Provide fingernail brush at the hand washing sink used by employee MN 4626.1440	3.8% of violations. Violation rank=3
		Provide and maintain at each hand-washing sink in the food preparation and ware sink in the food preparation and ware wash areas a supply of individual disposable towels or a continuous towel system. MN Rule 4626.1445	3.5% of violations. Violation rank=5
Cultural and historical context	Exposure to a new world of massive refrigeration/heating requirement due to ecological and historical differences. Cultural definition of cold holding is room temperature. This definition is different from food code (<41F), exposure to a new world of reheating and hot holding requirements.	Maintain all cold, potentially hazardous foods at 41 degrees F (5 degrees C) or below under mechanical refrigeration, to prevent bacterial growth and/or toxin production. MN Rule 4626.0385	3.6% of violations Violation rank=4
		Provide a temperature-measuring device located in the warmest part of mechanically refrigerated units and in the coolest part of hot food storage units. MN Rule 4626.0620	2.4% of violations Violation rank=10
	Routes of pathogen transmission are poorly understood creating a wrong perception of modes of pathogen transmission.	Store wiping cloths clean and dry or in an approved sanitizing solution MN Rule 4626.0285	3.2% of violations. Violation rank=6
	Language barriers and lack of Somali Certified Food Manager (CFM) training limit number of Somali CFM	Employ one full time State Certified Food Manager for the establishment. MN 4626.2010	3.1% of violations. Violation rank=7

Gender	Because of gender-specific roles of food processing, preparation, and cleaning at home, women are better prepared to work in kitchens yet men work in commercial kitchens impacts facility and equipment cleaning and sanitation.	Equipment food contact surfaces and utensils shall be cleaned to sight and touch. MN Rule 4626.0840	5.3% of violations Violation rank=1
		Clean and maintain all physical facilities MN Rule 4626.1520	4.8% of violations Violation rank=2
		Store all clean equipment, utensils, linens, and single-service articles in a clean, dry location where not exposed to splash, dust, or other contamination and at least six inches above the floor. MN Rule 4626.0955	2.7% of violations Violation rank=8
Non-cultural related violations	N/A	Provide or replace food service equipment to meet NSF International Standards. MN Rule 4626.0505.	2.5% of violations Violation rank=9

## Discussion

The focus group narrative provided a glimpse into food safety risks from the perspectives of Somali migrants in the Twin Cities. A person's worldview is highly correlated with cultural upbringing and life experiences within social, cultural, environmental, philosophical, and psychological dimensions (Ibrahim, 1985). A practical application of this theory is the recognition that worldview spans beyond the boundaries of attitudes, values, opinions and beliefs, but delves into how people think, define events, make decisions and behave (Sue, Rasheed, & Rasheed, 2015). Under this definition, focus group participants understanding of germs can be characterized as a 'belief' while their pre-existing knowledge of transmission mode reflects - 'how they think'- which inevitably impacts 'decisions' about relevant behaviors. Participants' pre-existing knowledge base regarding germs demonstrate an inadequate understanding of transmission modes, and the application of the above theory shows how erroneous thinking impacts decisions and behavior thus influencing food safety practice.

The top two ranking violations from the top ten violations listed on Table 2 are related to cleaning and are, (1) clean non-food contact surfaces of equipment, (2) clean and maintain all physical facilities, these violations have cross contamination implications that might not be adequately considered as a food safety hazard given the poor understanding of transmission routes. Moreover, the cultural gender role that designated women to cooking and cleaning had ill equipped men with the expected cleaning role required of their role as the majority food service worker gender.

Perhaps, the most revealing evidences regarding the poor understanding of germ transmission routes was revealed by participants' discussions of poor air quality as a

cause of food-borne illness or their disclosure of no soap use during hand-wash prior to eating. As they recognized the presence of germs on hands as evidenced in their discussion of how inserting fingers into food contaminates it yet acknowledged soap use only after bathroom use. While others considered ablution as a substitution for hand washing although ablution does not involve soap.

A study that examined the food safety knowledge gap between food handler and certified food managers interviewed 729 food handlers and 254 certified food managers from 211 participating restaurants reported that 26% food handler and 28% certified food managers responded true to, “At work if you only urinated, and did not have a bowel movement, you do not need to wash your hands” (Burke, Manes, Liu, & Dworkin, 2014). To improve hand hygiene with Somali food service workers, trainers might demonstrate correct hand washing steps, explain how soap removes microbial during hand washing, and discuss the appropriateness of religious, cultural, and traditional hand washing approaches in the food service arena.

Failure to store wiping cloths as clean and dry or in an approved sanitizing solution was one of the persistent violations revealed in the inspection data and sanitizing wiping cloths protect food contact surfaces by killing microbes and eliminating its cross contaminations. Sanitizing is also applied in numerous food codes to reduce or eliminate microbes, however, the concept of sanitizing only came up in the focus group sessions with women, though men in this community are the predominant food service workers at Somali restaurants. This persistent violation might be related to the poor understanding of the sanitizing role in the first place.

Epidemiological outbreak data have repeatedly identified improper holding



temperatures as one of the five major risk factors known to contribute to food-borne illness (FDA, 2013b); the food code provision regarding proper holding temperature prevent the growth of *Bacillus cereus*, *Clostridium botulinum*, *Clostridium perfringens*, and *Staphylococcus aureus* (FDA, 2013a). A comparison of the hot and cold violations reveals a higher rate for cold holding temperature abuse (64.3%) than hot holding (35.8%). According to the FDA's food code, cold food temperature control is set at a temperature of 5°C (41°F) and this law governs receiving, holding, and storage of potentially hazardous food. The cold food temperature rules are designed to increase shelf life; however, participants attribute increased shelf life as a new food safety hurdle that has introduced multiple food processes like cooling, re-heating, and storing left over. Moreover, their unfamiliarity with the cold food concept is perhaps responsible for their misconceptions on the causes of food-borne illness. Participants perceived eating cold food as a contributing factor to their food-borne illness describing it as new food experiences. However, participants understood that leaving food at room temperature for an extended period of time causes food-borne illness, although one participant from the women's group expressed that belief that leaving food outside for 24 hours is not fit for consumption, no major discussion took place that clearly articulated their thoughts about acceptable temperature danger zone times.

Potentially hazardous food exposed to the temperature danger zone of 41-140F is at risk for pathogen growth and proliferation of many pathogens. For instance, the pathogens of concern for meat and poultry products are *S. aureus*, enterohemorrhagic *E. coli*, *Salmonella spp.*, *L. monocytogenes*, *Campylobacter jejuni/coli*, *Y. enterocolitica*, *C. perfringens* and *C. botulinum*; for fish and seafood product's *Vibrio vulnificus*, *V.*

*parahaemolyticus*, *V. cholerae*, and *C. botulinum* Type E, and enteric microorganisms such as *Salmonella* spp. and *Shigella* spp, *C. botulinum*, and *B. cereus* (Ray & Bhunia, 2007). A persistence of hot and cold holding violations that tops the violation list disadvantages the public by putting them at risk of food-borne illness. The restriction imposed by the *halal* food requirement makes Somali customers the overwhelming majority customers of Somali restaurateurs and places them at a higher risk of endemic food-borne illnesses. One study found fewer hot holding temperature abuses when compared to cold holding violations for establishments with Certified Kitchen Managers, the authors attributed the discrepancy to the limited hot holding period of time when compared to ongoing expectation of cold holding (Cates et al., 2009). This is because potentially hazardous food is typically stored in refrigerators unless its cooked and held for customers typically around meal times i.e. breakfast, lunch, and dinner. The cold temperature violations could potentially be caused by the constant opening and closing of refrigerators doors, refrigerators closeness to cooking stoves, and/or perhaps inspectors recording of refrigerated potentially hazardous food temperatures during peak hours.

During the focus groups, no specific temperatures were mentioned, but there was broad consensus on the role of cooking for controlling pathogens. Participants described high temperatures and long cooking times as measures for pathogen control, and described the disappearance of steam as a signal to reheat. Participants also described the important role of washing vegetables, food contact surfaces, and preventing raw meat contamination with knives and cutting boards.

Islamic *halal* food requirement makes the Somali food establishment a preferred shopping and dining venue for Somali community member. Moreover, religious

restrictions limit the community's acquisition of food safety training through employment, as Muslim food service workers are restricted from working in establishments that serve alcohol and pork products, which are also more likely to provide rigorous food safety training. This limits opportunities to learn food safety practices from dominant food establishments.

### **Study Limitations**

To fully understand major contributing components related to the observed persistent cleaning violations, future studies are needed to tease out contributing factors driving these violations as it relates to operator's cultural and socio-economic conditions. Other study limitations include health inspector's subjectivity and their various levels of experiences; the analysis did not factor inspectors' standardization levels.

### **Conclusion**

Cultural and historical experiences have significantly shaped the food safety understanding of Somali migrants, as evidenced by the relationship between food-safety cultural norms and the top persistent inspection violations (see Table 2). This study demonstrates a need for food safety training for new immigrants interested in food business that incorporates awareness of cultural norms and beliefs of the immigrant community. In addition to knowledge-based training, ethnic restaurants could benefit from hands-on training and innovative enforcement approaches.

## **Chapter 4: Inspection Effects of Independent Somali Restaurants: A Pilot Case for Letter Grading**

The popularity of ethnic food restaurants in the U.S. is growing. However, many studies have demonstrated poor food safety performance for ethnic owned and operated restaurants. The standard public health assurance program that ensures food safety compliance in restaurants involves periodic inspections and food safety trainings. This study looks at food safety compliance of 62 establishments from one ethnic community of relatively new immigrants. The goal of this paper is; to compare food safety compliance of independently owned and operated Somali restaurants to non-Somalis; to investigate the role of inspection on food safety compliance by comparing performance of establishments with longer inspection history to newer ones, and; to investigate the role that restaurant letter grading could play in improving sanitation. The results concur with current research findings on three fronts: (a) poor food safety compliance was more frequent in ethnic than non-ethnic food establishments, (b) food safety compliance was slightly related to the number of inspections, (c) inadequate facility design and maintenance were associated with poorer sanitation. This paper models a restaurant letter grading analysis process using New York restaurant grading policy, and discusses the theoretical implications of letter grading and its promise for improving sanitation compliance of ethnic food establishments.

Food-borne illness is a common and preventable public health problem and is caused by the consumption of contaminated food or water. A 2015 study estimates the annual economic impact of food-borne illness in the U.S. at \$55.5 billion (Scharff, 2015). According to the Centers for Disease Control and Prevention (CDC), there are more than

250 described food-borne diseases caused by a variety of pathogens. Mead and colleagues (1999) published the first comprehensive estimate of food-borne illness disease impact and estimated annual food-borne illness incidents of 76 million, with 325,000 hospitalizations and 5,000 deaths (Mead et al., 1999). Numerous studies attribute the majority of food-borne illnesses to restaurants (Wong et al., 2015), and public health interventions have been institutionalized to reduce these occurrences. Such interventions include food handler training and education, restaurant inspections and enforcements, disclosing inspection reports, and operation managerial guidance and engineering (Thomas et al., 2013).

State and local health departments are responsible for regulating commercial kitchen food safety inspection systems for their jurisdictions. Specifically, local jurisdictions establish and implement food safety standards for restaurants, retail food stores, and other retail food establishments. Although the 2013 Food Code provides regulatory authorities with options for increasing or decreasing frequency of inspections, the recommended inspection frequency is once every six months. The flexibility of inspection frequency provides opportunities for increasing or decreasing inspections according to performance in five priority areas as set by the Food and Drug Administration (FDA), which recommends tailoring frequency of inspections according to performance in these categories (Waters et al., 2013a). These five categories are identified as contributing factors to food-borne illnesses and include improper holding temperature, inadequate cooking, contaminated equipment, food from unsafe sources and poor personal hygiene (Olsen, MacKinnon, Goulding, Bean, & Slutsker, 2000). The 2000 FDA report designates these categories as ‘risk factors’ within retail and food service

establishments, and the categories have been labeled as performance measures for regulating retail food programs.

Based on epidemiological data from repeated food-borne illness outbreaks, these risk factors provide evidence to support the Food Code's enforceable provisions for inspection of food service operations. In response to these risk factors, the 2009 Food Code established five food safety interventions: demonstration of knowledge, employee health controls, controlling hand hygiene as a vehicle of contaminations, time and temperature control, and the consumer advisory (FDA, 2013).

Although there is widespread consensus for the role of these risk factors in preventing food-borne illness, there is much debate on inspection frequency and its role in improving sanitation. Some studies report no clear relationship between increased inspection frequency and food safety compliance level (Mathias, Sizto, Hazlewood, & Cocksedge, 1995; Newbold, McKeary, Hart, & Hall, 2008), whereas Allwood et al. study reports improved sanitation with increased number of inspections. (Allwood, Paul 1999). Numerous authors have pointed out similar discrepancies between inspection scores and food-borne illnesses (Cruz, Katz, & Suarez, 2001; Leinwand, Glanz, Keenan, & Branas, 2017). A few studies have demonstrated a relationship between inspection scores and rates of food-borne illness (Buchholz, Run, Kool, Fielding, & Mascola, 2002; Cruz et al., 2001; Irwin, Ballard, Grendon, & Kobayashi, 1989), whereas others have not (Jones, Pavlin, LaFleur, Ingram, & Schaffner, 2004; Penman, Webb, Woernle, & Currier, 1996; Phillips, Elledge, Basara, Lynch, & Boatright, 2006; Waters et al., 2013b; Yeager et al., 2013).

A Los Angeles county study is one case supporting the FDA view of inspection results as a restaurant's food safety proxy. This study involves a cohort of 10,267 restaurants, and it compared routinely inspected restaurants both with and without a subsequently investigated food-borne incident. Results indicated a lower overall inspection score as one of the factors significantly associated with the occurrence of investigated food-borne incidents (Buchholz et al., 2002). As a counterexample, a Florida study found that 45% of restaurants associated with food-borne illness outbreaks had no critical violation infractions during their most recent inspections (Cruz et al., 2001).

Numerous authors offer various explanations for these equivocal findings. One study argues it results from the challenges associated with the epidemiology of food-borne illness in locating the source of exposure, and the uncertainty of substantiating the occurrences of sub-clinical cases (Wong et al., 2015; Yeager et al., 2013), while others attribute it to the socio-economic status discrepancies of restaurants' neighborhoods (Chang, Groseclose, Zaidi, & Braden, 2009; Yeager et al., 2013). Additionally, Jones and colleagues attribute this problem to difficulties in standardizing inspectors' processes, making it difficult to refrain from subjective food code interpretation (Jones et al., 2004). While the debate surrounding food inspection programs and their relation to compliance and food-borne illness is ongoing, some studies propose restaurant letter grading as a more appropriate mechanism for promoting sanitation by using a public disclosure system.

### **Restaurant Grading**

Restaurant disclosure programs are becoming more common in the U.S. Policy evaluation studies from the early adopters of restaurant grading policies have found these

policies to have a positive impact on both sanitation and the incidence of food-borne illness (Jin & Leslie, 2003; Simon, Leslie, Run, & Jin, 2005; Wong & Matis, 2015; Wong et al., 2015). Promising study outcomes showing improved sanitation from restaurant grading encourage widespread policy adoption.

Jin and Leslie's restaurant grading study attributed improved inspection scores to a disclosure program that heightened consumer's response to restaurant hygiene status. The design of a successful disclosure program is depends on these three attributes: (a) engages information users, (b) provides beneficial information to users, and (c) uses comprehensible information. (Fung, Graham, & Weil, 2007). They credited these underlying factors with the observed decrease in the hospitalization incidence rate of food-borne illnesses in Los Angeles (Jin & Leslie, 2003).

A study that analyzed 18 public disclosure policies and examined successes, failures and lessons describes the Los Angeles restaurant disclosure program as a success. It attributed the ease of reporting 'A', 'B' and 'C' letter grading and its simple user comprehensibility as elements of its success (Fung et al., 2007). In general, authors attributed successful disclosure policies as user-centric, designed to prioritize users' needs, and conducted by a disclosing organization with adequate capacity. They described the operative mechanism of users and disclosure as an 'action cycle' and its success is based upon the alignment of the disclosed information at the decision making points of its users (Fung et al., 2007).

Such alignment is clearly demonstrated by the New York city letter grading and disclosure policy as its restaurant grades are posted to both a website, and a free smartphone app downloaded through iTunes and Google Play (Wong & Matis, 2015).



Moreover, restaurants are required to post a placard advertising their sanitation results letter grade in their front window, so potential customer can take a look prior to entering the restaurant. New York added value to their public disclosure app by incorporating interactive maps and street views of food establishments with restaurant zip code, cuisine type and letter grade filters (Wong & Matis, 2015), which encourages app user uptake. Wong et al credits New York's restaurant grading policy with the increased number of certified food managers, improved worker hygiene, increased number of restaurants with proper hand washing and fewer restaurant mice. And reported a 90% approval from a public response survey of which 88% of the surveyed diners considered restaurant grade in dining selection (Wong & Matis, 2015).

Figure 1 below illustrates the role of the 'action cycle' in restaurant disclosure and how this concept translates to restaurant settings. In sum, the desired disclosure policy effect of improved food safety practices is contingent on diners' understanding of the grading system and how they incorporate disclosed information into their dining selections.

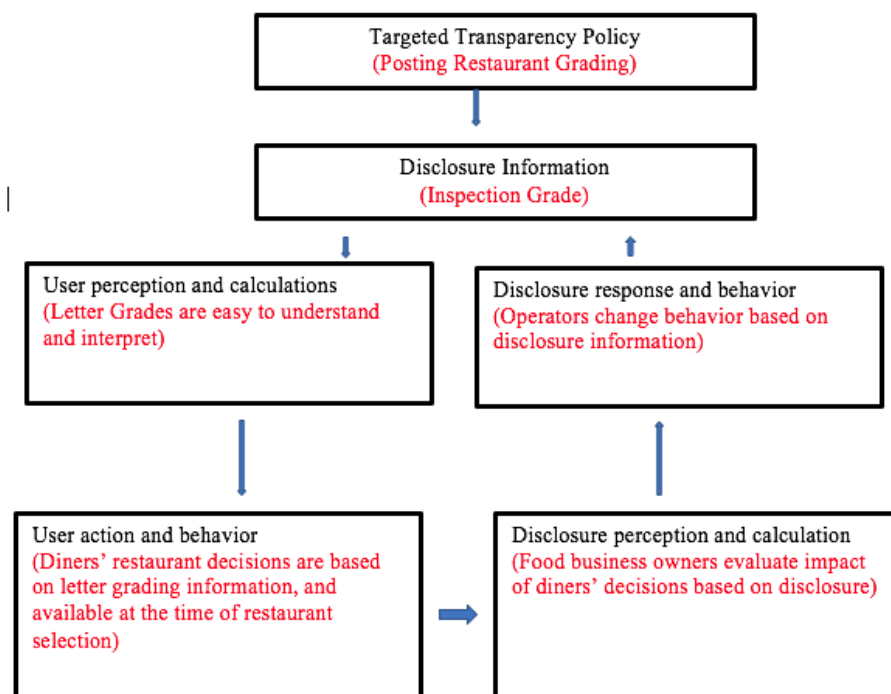


Figure 1. Role of the action cycle in restaurant disclosure.

Source: Transparency Action Cycle Fund et al. (2007).

A study that conducted economic analysis of letter grading demonstrated a 5% increase in revenue for restaurants with “A” grades when compared to “B”-graded establishments (Jin & Leslie, 2003). These authors attributed restaurant grading to reduced restaurant search costs for diners because their awareness of the grade motivates them to choose restaurants with improved sanitation. Consequently, many diners that use restaurant letter grading to select places to dine may not differentiate between high and low-end restaurants (Jin & Leslie, 2003). This lack of differentiation, they argue, might spread higher paying patrons impact pricing. This change yields higher average price for low-end restaurants and creates competition, and the authors credit this to the improved sanitation quality. Moreover, Jin and Leslie describe how restaurant with poor hygiene

may improve their sanitation, but they do it at a cost, and if the cost of increasing restaurant quality is less than the benefit, operators may opt for improvement (Jin & Leslie, 2003). Meaning, if projected costs of inspector-requested changes are higher than an operator's perceived benefit, operators might forgo improvements.

An emerging trend in the restaurant industry is the growing number of ethnic restaurants resulting from shifting demographics, and researchers have raised concerns about food handling practices of these ethnic restaurants (Fraser & Alani, 2009; Lee, Niode, Simonne, & Bruhn, 2012; Mauer, Kaneene, DeArman, & Roberts, 2006). Comparative studies of ethnic food safety compliance versus non-ethnic food operators have demonstrated poorer food safety practices with ethnic food operators, and researchers have called for more investigation. The reasons for the poor performance have not been fully explored or considered and warrant attention given the growing demand for ethnic food in the U.S.

In Chapter 1, we illustrated how some aspects of the Somali cultural norms do not match up with the food code. For example, Somalis, who are mostly Muslims, practice ritual hand washing five times a day and during these times each hand is washed three times to the wrist, and three more times to the elbow, but these mandatory hand-washing rituals do not require soap and a hand towel. The ritual hand washing nevertheless results in a perception of hygiene that may affect restaurant hand washing practices that meet food code standards.

### **Minneapolis Food Inspections**

The Minneapolis Health Department inspects approximately 4,200 restaurants, food manufacturers, food distributors, caterers, meat markets, groceries, and

confectioneries per year, under the Minnesota Rule 4626 food code (Minneapolis Enforcement and Ordinances). Its food inspection system utilizes a risk-based platform in determining frequency of inspections, and classifies its inspection establishments according to Hazard Analysis Critical Control Point (HAACCP) criteria, a globally recognized food system that involves the identification of areas in the food production process where problems are known to occur.

All food establishments inspected by the Minneapolis Health Department are categorized into three risk categories. Risk 1 food establishments are the highest risk and involve complex food handling of perishable food known to support the growth of food-borne pathogens. Most of these establishments include restaurants, and typically, inspection occurs at least twice a year. Risk 2 food establishments are annually inspected and serve perishable food, but with minimal preparations, while Risk 3 establishments sell retail pre-packaged food items and are inspected once every 18 months.

During inspections, Minneapolis food inspectors emphasize the citation of violations likely to lead to food-borne illness, as recommended in the 2009 FDA Food Code (FDA, 2013). In the field, food inspectors use a standardized form to conduct inspections, and establishments with less than five critical violations or ten non-critical violations are not re-inspected again until the next routine inspection. However, inspection findings of five or more critical violations or greater than ten non-critical violations warrant a re-inspection and monetary fines are imposed for repeat violations.

This study aims to study food safety inspection performance of Somali owned food establishments by comparing food safety compliance of independently owned and operated Somali restaurants to non-Somalis; investigating the role of inspection on food

safety compliance by comparing performance of establishments with longer inspection history to newer ones, and examines the role that restaurant letter grading could play in improving sanitation.

### **Method: Data Collection**

Restaurant inspections results used in this study originate from two different databases collected under the same food safety laws and procedures by trained inspectors. Violation data were gathered using standard data, collection forms, and the reported violations were based on Minneapolis Food Code, adapted Minnesota Rules Chapter 4626. These are the standards restaurants and other food establishments must adhere to regarding the handling, storing, preparation, and service of food to the retail customers (Minneapolis website). The first database was obtained from an unpublished thesis consisting of two years of violations from Minneapolis Health Department that were categorized and analyzed for a different study (unpublished: Singh, 2012). These violations were cited between January 2008 and January 2011. The unannounced inspection purposes ranged from routine (78%), re-inspection (13%), plan review (4.25%), and others (4.75%), totaling 4,603 inspections. During this time, inspections from risk 1 establishments made up the highest percentage of total inspections (69%), followed by risk 2 (14%), risk 3 (13%) and non-risk assigned inspection (4%).

Data available for each inspection included overall score, specific violations cited, establishment name and license number, address, date of inspection, and violation cited. Violation data were summarized for each inspection into five groups; (1) active managerial control, (2) employee health and hygiene, (3) food safety and food protection, (4) facility operation, (5) chemical handling, and (6) licensing and complaints (for

category details, see Appendix D). This study uses these categories in its analysis to identify the statistical difference between non-Somali food establishments and independently owned and operated Somali restaurants (see Table 1, Figures 1-2).

The second database consisted of inspection data from 2008-2014 from 62 independently owned and operated Somali owned food establishments that were identified and used to examine violation trends. The database consists of 5,942 violations and most violations were observed from unannounced routine inspections (73%) and re-inspection (23%). Other inspections from this database not included in this analysis include alleged food-borne illness investigations, fire calls, and plan reviews.

The standardized form used in the field to gather violations has 58 numerically ordered items that fall into two categories: food-borne illness risk factors and good retail practices. Each of the 58 violation items consists of a class of violations listed from a core list of violations drawn from Minnesota Food Code and Minneapolis ordinances (see Appendix E). Appendix F shows an example of all possible violations on the standardized form.

Table 2 lists seven years of cited violations for three establishments with the highest number of inspections and it aims to illustrate the level of repeat violations for each establishment over time using all inspection types (routine, re-inspection, and complaint based). All these establishments were operating under the same licensee during this time period. Figure 4 ranks top violations from Minnesota Food Code lists for older establishments (history of 10-20 inspections) and compares it to newer establishments (history of 1-9 inspections).

The 2008-2014 violations database was classified according to the New York grading system and each of the 5,942 violations was assigned an item code according to Chapter 23 (Food Service Establishment Sanitary Inspection Procedures and Letter Grading), using appendices 23-A (Food Service Establishment Inspection Worksheet), and 23-B (Food Service Establishment Inspection Scoring Parameters-A Guide to Conditions) of the New York food safety code. Comments for each violation in the inspection report were used to determine condition level that justified the violation score. Violations were scored and grouped together according to inspection identification number, and the total scores from each inspection were tallied to determine a letter grade. The New York letter grading system allocates ‘A’ for score range 0-13, ‘B’ for score range 14-27, and a ‘C’ for scores above 28+. Figure 5 shows a summary of the overall grading results from this analysis, and Appendix C shows the Minnesota food code associated with New York violation items). Longitudinal grading outcomes are illustrated in Figure 3. And to see the association between the letter grade and violations, we used binary logistic regression where the dependent variable “Grade” was coded as A or (B or C). The violations were fitted into the regression model and was considered once using simple logistic regression model. Some of the violations columns were dropped from association analysis due to sparseness. Table 4 shows the statistically significant associations.

(2) Analysis: The study objectives are two-fold:

1. Examine the role of inspection in food safety compliance by comparing the performance of establishments the duration of inspection history.

2. Investigate letter grading and public disclosure as a potential policy approach for improving establishments' sanitation compliance.

This study positions Somali establishments as ethnic owned establishments, and it begins by first investigating the conformity of violation trends in Somali establishments to empirical study findings of poor food safety practices in non-Somali ethnic owned restaurants. The paper concludes with the central question of the study-how does converting these inspection scores to letter grading affect food safety compliance outcomes-and uses study results to discuss the theoretical effects of restaurant grading on ethnically owned and operated food,

### **Results**

Table 3 compares violation rates between Somali and non-Somali food establishments using t-tests and Wilcoxon Rank sum tests (used due to skewed data). The results indicate a statistically higher total number of violations, a greater number of employee health & hygiene violations, and a greater number of food safety & food protection related violations. Other types of violations were not statistically different between groups.

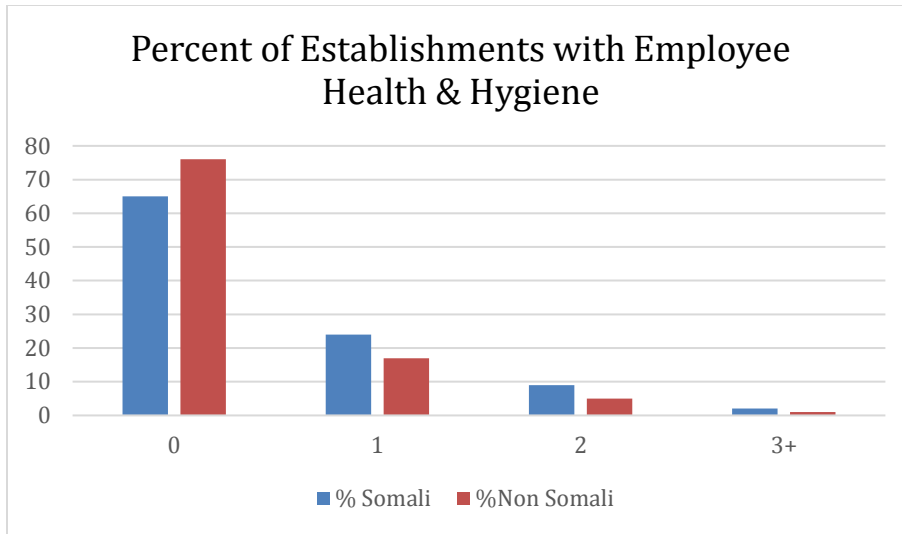


Table 2

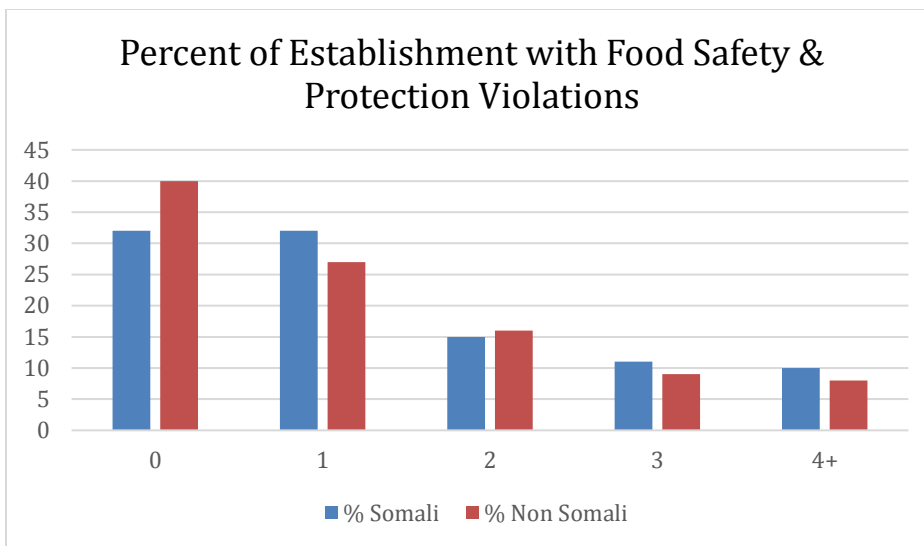
*A Comparison of Two Years of Food Safety Violations, Between Somali and non-Somali Food Establishments*

	Non-Somali Owned (# of inspections =3767)		Somali Owned (# of inspections =332)		P-value (Wilcoxon test)
	Mean	Median	Mean	Median	
<b>Number of Total Violations</b>	<b>5.87</b>	<b>5</b>	<b>6.77</b>	<b>5</b>	<b>0.005</b>
Critical Violations	1.56	1	1.73	1	0.110
Active Managerial Control	0.36	0	0.38	0	0.640
<b>Employee Health &amp; Hygiene</b>	<b>0.33</b>	<b>0</b>	<b>0.54</b>	<b>0</b>	<b>&lt;0.001</b>
<b>Food Safety and Food Protection</b>	<b>1.26</b>	<b>1</b>	<b>1.41</b>	<b>1</b>	<b>0.030</b>
Chemical Handling	0.22	0	0.22	0	0.580
License and Compliance	0.07	0	0.05	0	0.110

*Note.* \*Bold values indicate statistically significance.



*Figure 2.* Univariate analysis of employee health & hygiene and food safety and protection

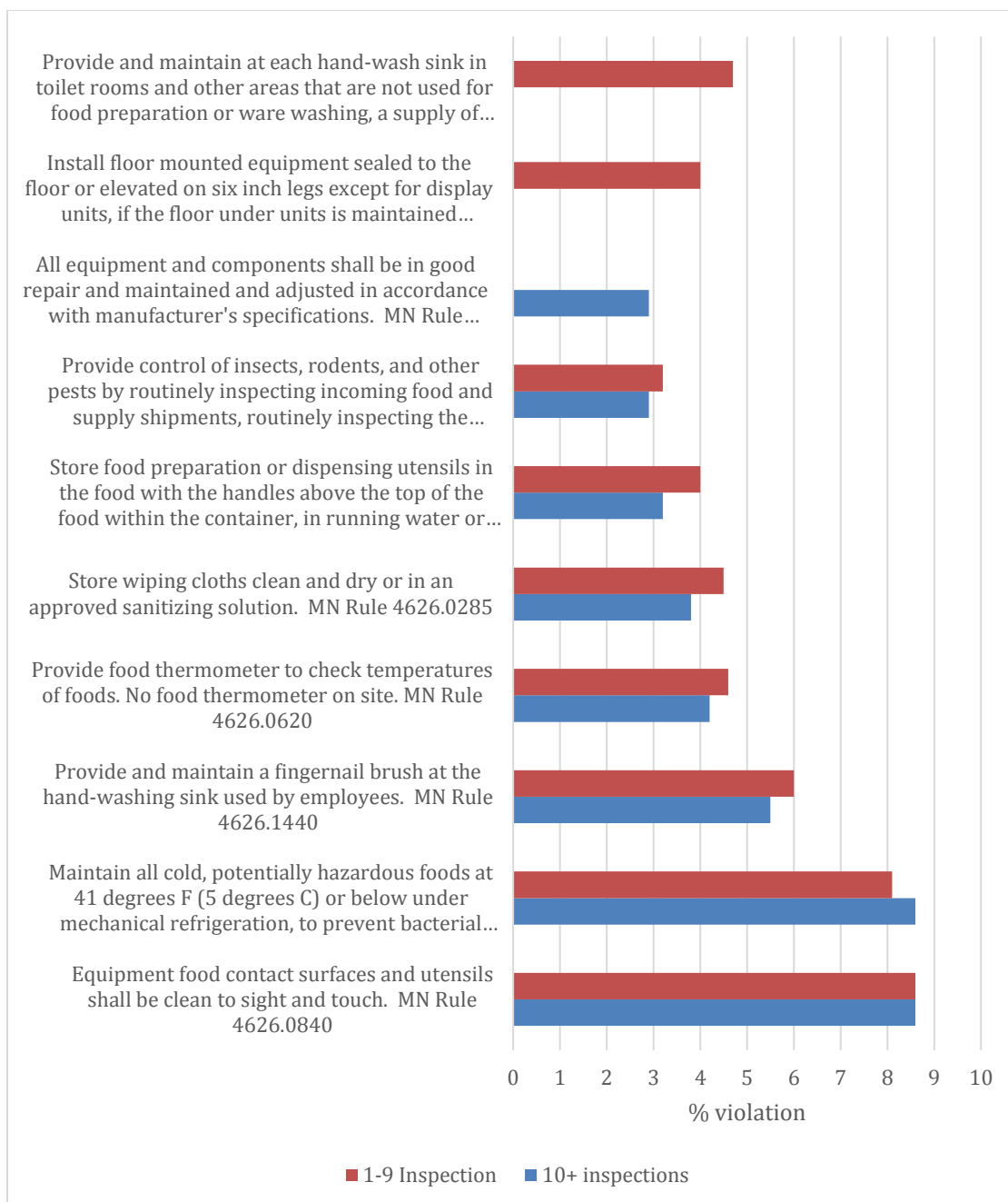


*Figure 3.* Univariate analysis of food safety & protection violation data.

Table 4: Longitudinal Compliance Comparison for Three Establishments (X, Y, Z) to Investigate Patterns of Violations Re-occurrences

	Violations (New York Code)	YEAR (Cited Violation)						
	Establishment violation type (representative violation)	2010	2011	2012	2013	2014	2015	2016
X/20	Lighting inadequate		Yes	Yes		Yes		
	Mechanical or natural ventilation system not provided/improperly installed/disrepair/fails to prevent excessive build-up			Yes				
	Proper sanitation not provided for utensils and ware washing operations					Yes		
	Evidence of rats or live rats present in facility's food or non-food contact areas		Yes	Yes				
	Tobacco use, eating or drinking from open containers in food preparation, food storage or dishwashing area	Yes						
	Food not protected from potential source of contamination during storage, preparation, transportation, display or service	Yes		Yes				
	Food contact surfaces not washed, rinsed or sanitized after each use and following any activity when contaminated may have occurred		Yes					
	Hand washing facility not provided in or near food preparation area and toilet room/Water pressure/Unacceptable hand drying devise		Yes	Yes				
Y/18	Lightening Inadequate		Yes		Yes			
	Mechanical or natural ventilation system not provided		Yes	Yes				
	Proper sanitation not provided for utensils and ware washing operations		Yes				Yes	
	Evidence of rats or live rats present in facility's food or non-food contact areas		Yes	Yes	Yes		Yes	Yes
	Hand washing facility not provided in or near food preparation area and toilet room. Hot/cold running water at adequate pressure to enable cleanliness of employee not provided at facility. Soap and an acceptable hand drying device not provided			Yes			Yes	Yes
	Tobacco use, eating or drinking from open containers in food preparation, food storage or dishwashing area							
	Food not protected from potential source of contamination during storage, preparation, transportation, display or service				Yes	Yes		
	Food contact surfaces not washed, rinsed or sanitized after each use and following any activity when contamination may have occurred		Yes					
	Hand washing facility not provided in or near food preparation area and toilet room/Water pressure/Unacceptable hand drying devise			Yes				
Z/17	Proper sanitation not provided for utensils ware washing operations	Yes	Yes	Yes				
	Evidence of rats or live rats present in facility's food or non-food contact areas		Yes	Yes	Yes		Yes	Yes
	Hand washing facility not provided in or near food preparation area and toilet room. Hot/cold running water at adequate pressure to enable cleanliness of employee not provided at facility. Soap and an acceptable hand drying device not provided	Yes		Yes	Yes		Yes	Yes
	Food contact surface not washed, rinsed or sanitized	Yes						
	Hand washing facility not provided in or near food preparation area and toilet room/Water pressure/Unacceptable hand drying devise	Yes		Yes	Yes		Yes	Yes

Establishment X, unlike the other two establishments substantially dropped its violation occurrences in 2015; the most significant change that occurred during with this establishment is a move to a new location in 2013.

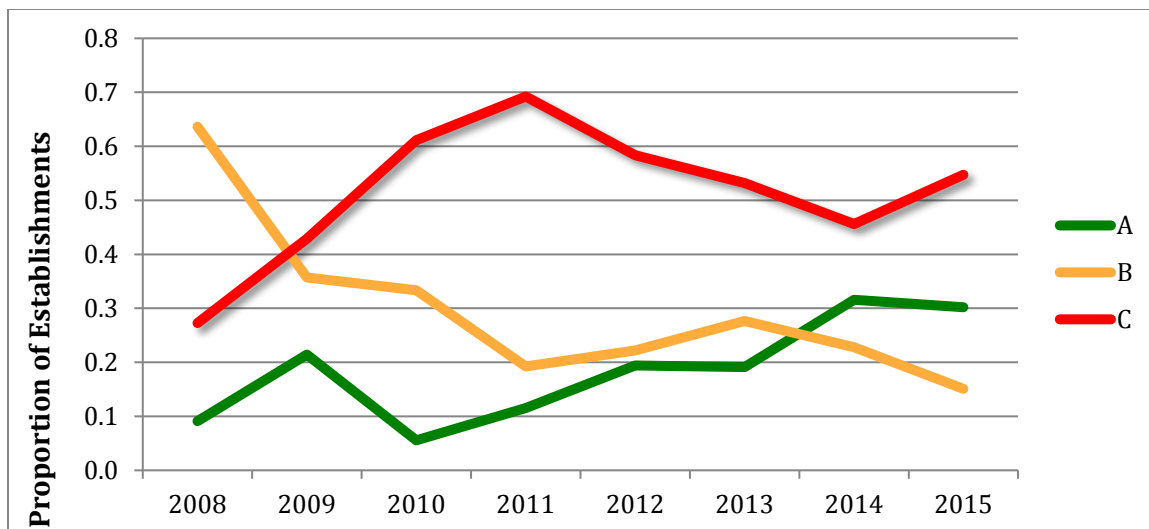


*Figure 4.* Comparison of the top ten violations between facilities inspected 1-9 times vs. 10-20 times. Seven out of ten violations were the same violations regardless inspection frequency. These data suggest that more inspections do not necessarily result in improved compliance.

Table 5  
*Performance Outcomes According to New York Grading Classification*

<b>Final Grade</b>	<b><sup>a</sup>Routine Inspection</b>	<b><sup>b</sup>Re-inspection<sup>c</sup> (Final grade)</b>	<b>Total Inspections</b>
A	68 (23%)	114(60%)	182
B	75 (26%)	47 (25%)	47
C	181 (51%)	29(15%)	29
Totals	291 (100%)	190 (100%)	

*Note.* <sup>a</sup>33 routine inspections qualified for re-inspection using NY code but did not meet Minneapolis re-inspection threshold. <sup>b</sup>Minneapolis re-inspection is determined by the presence of 5 or more critical violations or 10 or more non-critical violations. <sup>c</sup>These re-inspection results are the final grades that would post.



*Figure 5.* Routine inspection performance over time.

Figure 5 shows routine inspection and re-inspection results using New York grading score sheets. Although only 23% of the establishments scored a letter grade of ‘A’ during the initial routine inspection, ‘A’ grades substantially increased to 60% during re-inspection. A longitudinal grading of all establishments over seven years shows an overall improvement of performance over time. In 2008, less than 10% of establishments scored ‘A’ and the percent increased to 30% by 2015.



Table 6

*Statistically-Significant Associations, Between A Grades vs. B or C*

<b>Violation Category</b>	<b>*NY CODE Violations</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>	<b>p-value</b>
Facility Maintenance	10B-Plumbing not properly installed or maintained	0.85	0.75-0.95	0.005
	10C-Lightening inadequate	0.85	0.75-0.96	0.009
	10D-Mechanical or natural ventilation system not provided	0.81	0.68-0.97	0.022
	10F-Non food contact surface improperly constructed	0.93	0.89-0.98	0.004
	10H-Proper sanitation not provided for utensil ware-washing operations	0.77	0.69-0.87	<0.001
	10I-Improperly stored single service item	0.79	0.64-0.98	0.032
	Food Temperature	2B-Hot food items not held at or above 140F	0.84	0.78-0.90
2H-Food not cooled by an approved method		0.77	0.59-1.02	0.071
Food Source	3A-Food from unapproved/unknown source	0.39	0.16-0.98	0.045
Food Protection	4A-No Certified Food Manager	0.83	0.76-0.90	<0.001
	4H-Raw, cooked, prepared food is adulterated	0.78	0.66-0.91	0.002
Facility Design	5C-Food contact surfaces improperly constructed	0.71	0.61-0.83	<0.001
	5D-Hand washing facility not provided in or near food preparation area	0.66	0.58-0.76	<0.001
Personal Hygiene	6B-Tobacco use, eating or drinking from open containers	0.83	0.72-0.96	0.010
	6C-Food not protected from potential source of contaminations	0.78	0.70-0.87	<0.001
	6D-Food contact surfaces not washed	0.89	0.84-0.94	<0.001
	6E-Sanitized equipment or utensils improperly used/stored	0.50	0.32-0.79	0.003
	6F-Wiping clothes not stored in sanitizing solutions	0.78	0.69-0.88	<0.001
Vermin	8C-Pesticide use not according with label	0.83	0.71-0.96	0.010

*Note.* See NY city self-inspection worksheet for food service establishment for detailed violation description-Form D that was revised Dec 2010).

The odd ratios for all violations listed indicate a range of 11%-61% less likely to get rating of A for each additional violation.

Violation 4A is about food manager certification and it states: Employ one full-time State Certified Food Manager for the establishment. Manuscript one discussed the language barriers related to obtaining this certificate, and this manuscript demonstrates its importance. Manuscript three evaluates the impact of a visual-oral based food safety training using Certified Food Manager Exam designed to overcome food manager certification language barrier.

### **Discussion**

The results of this study are in broad agreement with the literature; that is, an increase in the number of inspections does not necessarily mean improved compliance with food safety practices, and that ethnic restaurants have poorer food safety compliance when compared to non-ethnic restaurants. A deeper look at historic violations records of the three establishments with the most inspections and no change of ownership during that period shows a drop-in violation re-occurrences for one establishment of the three. The establishment with the most drastic decrease in violations changed location in 2013, emphasizing the role of facility infrastructure in meeting food code compliance. Generally, causes of food safety violations can be categorized into two groups (a) poor food safety practices (2) poor/inadequate facility. Table 4 shows statistically significant comparison between A and B/C performance and the outcome violations related to the facility as the highest number of violations.

Violations related to facility maintenance and design alludes to a fragile economic circumstance that most Somali food operators face. The physical infrastructure violations are typically pre-empted during plan review, a process that ensures proper food flow, acquisition of adequate equipment, and construction of the facility to meet food

grade standards. The high occurrence of infrastructure-related violations either indicates lack of ongoing capital improvements (e.g., no or lack of capital expenditure for light fixture replacements), or insufficient plan review compliance prior to start of operation. A letter grading score sheet might entice operators to eliminate these violations proactively; however, according to Jin and Leslie, if the costs of requested infrastructure changes are higher than the benefits, these violations are less likely to be abated even with letter grading disclosures.

The presupposition of restaurant letter grading is public transparency for informed decision-making on the part of diners, by influencing their choice of restaurant based on sanitation ratings. This logic works when diners have wide range of options, though this mechanism might present itself differently with the independently owned and operated Somali restaurants. In chapter one, we discussed the role of halal food in driving Muslim dining locations and food purchase decisions. Somali diners are the overwhelming majority of diners in Somali restaurants, mostly due to the restaurants' fulfillment of halal food requirements. The impact of letter grading could perhaps become an issue of direct competition between Somali restaurants, as opposed to competition within a wider selection neighboring restaurants. However, letter grading may present an opportunity for new visibility and a broader customer base for Somali and similar ethnic food establishments struggling with acquiring mainstream customers. This shift in thinking might motivate Somali restaurant owners to improve sanitation practices at their establishments.

## **Conclusion**

Restaurant letter grading offers new opportunities for improving food safety and sanitation performance when compared to non-disclosure inspection systems. Regardless of language or economic strata of restaurant operators and their patronage, letter grades are comprehensible and for ethnic restaurants, it presents new motives for sanitation improvement. However, problems related to poor facility constructions or poor designs can be pre-empted during plan review. The challenge of poor construction, poor facility design and lack of facility maintenance can be pre-empted upstream through education. For instance, prospective restaurant owners should be encouraged to consult with the inspectors on the facility design of existing food establishment prior to signing purchase agreements, or encourage prospective owners to create capital improvement expense categories. This informs prospective operators on items in need of repair or updates to be factored into the operation start-up costs.

Areas in need of further research are the contribution of the plan review process to food safety and exploring the role of operator's economic status in relation to food safety compliance.

## **Chapter 5: Evaluating the Impact of Visual-Oral Based Food Safety Training Using Certified Food Manager Exam Results for Limited English Workers in the Food Service Industry**

Increases in the size of ethnic minority populations are resulting to increases in both ethnic food operators and ethnic food consumerisms. The 2015 American Community Survey estimates 2.3 million foreign born food service workers out of which 45% are more likely to be restaurant chefs or 24% managers. However, foreign-born food service workers are challenged with cultural/language barriers and low or no formal education. This poses a challenge to the food safety education as the public health system has institutionalized the completion of a food safety certification program for restaurant managers to prevent food-borne illnesses and occurrences in restaurants. In the U.S. over thirty states requires a person in charge to complete an accredited food safety training to increase food safety knowledge and improve food safety practices. Research has indicated kitchens with Certified Food Managers to have lower odds of experiencing food-borne illnesses. However, the certification process is highly dependent on print literacy and designed for the literal analytic oriented learner exposed to formal education system. This paper examines the effectiveness of an oral learner teaching strategy as a food safety teaching method for a new immigrant/refugee food service workers through certified food manger exam performance. Although the scientific literature has resolved the merits of visual and oral training in improving knowledge and behavior, no studies we know of have examined the impact of such training on subsequent performance on a standardized food safety exam.

The 2017 United States' (U.S.) restaurant industry outlook report from the National Restaurant Association projects restaurant industry sales earnings to reach 798.7 billion, a 1.7% increase after adjustment for inflation when compared to 2016, and the eighth consequential annual sales increase since 2008 (National Restaurant Association, 2017b). The report also projects a modest workforce growth of 10.9% over the next ten years for restaurant workers, which represent 10% of the U.S. workforce. One driver of the projected increase in sales and the workforce is a 47% increase for total food expenditure away from home that occurred from 1929-2014 according to the USDA's economic research survey. However, this increase includes non-restaurant food establishments like hospitals, airlines, boarding houses, military exchanges and clubs, etc. Moreover, food related industries generate approximately \$3.5 trillion and are considered the third largest contributor to U.S. gross output after the financial sector and manufacturing.

According to the Bureau of Labor Statistics, the number of 16-24 years olds in the U.S. labor force is projected to decline 2.8 million between 2014- 2024. The large number of foreign-born adults pursuing low wage, entry-level employment that traditionally hire 16-24 years old would potentially off set this decline. The role of foreign-born employees will become increasingly important in the years to come. According to 2015 American Community Survey, approximately 2.3 million foreign-born restaurant workers account for 23% of U.S. restaurant employees, relative to their 19% representation in the overall economy (National Restaurant Association, 2017a). Moreover, 45% of foreign-born food service workers are more likely to be restaurant chefs or 24% managers than natives.

The 2012 Fiscal Policy Institute paper on Immigrant Small Business owners reports immigrants make up 37% of restaurant owners in the U.S. (Kallick, Parrott, & Mauro, 2012). In addition, one of the driving factors behind the increase of ethnic food businesses is the growing number of ethnic communities. According to 2012 Census Bureau, minority populations make up 36.6% of the total population and they constitute 50.4% of the nation's population younger than 18 as of July 1, 2011 (Census Bureau, 2012). Although Spanish-speaking populations have been the largest immigrant subgroup in the U.S., the growth of this population has been dropping in comparison to other ethnic groups. The Hispanic population growth between 2000- 2001 was 34% in contrast to the Asian and African populations (115%, 111% respectively). (Ryan, 2013).

Considering the growing role of foreign-born food service workers in the U.S. food industry, it is imperative that food safety training is conducted in an accessible and understandable way to all workers to prevent occurrences of food-borne illnesses. To prevent food-borne illness occurrences in restaurants, the public health system has institutionalized two interventions: 1) a food safety certification system, and 2) a restaurant inspection program (Campbell, 1998; Irwin, Ballard, Grendon, & Kobayashi, 1989).

A recent study found twenty-six states mandating a food certification requirement in their food code (Kambhampati et al., 2016), and this certification involves the training of a person in charge of a food establishment to complete an accredited training, and passing an accredited testing program to improve food safety practices, and prevent food-borne illness (Schilling, O'Connor, & Hendrickson, 2003). The accredited food safety testing is typically completed after an 8 hours certified food manager training.

The certified food protection manager (CFPM) provision requires each food establishment to have at least one employee with managerial duties to pass a test from an accredited food safety-training program. Furthermore, the food code expects a certified person to be able to demonstrate food safety knowledge during inspections or other requests (FDA, 2013). The U.S. Food and Drug Administration (FDA) recommends food safety certification to be completed by the person in charge of a food establishment to demonstrate knowledge of food-borne diseases, prevention strategies, application of Hazard Analysis and Critical Control Plan principles (HACCP), and the requirements of the FDA Food Code (Feinstein, Dalbor, & McManus, 2014).

To understand the size of foreign-born food in need of this certification, we developed a proxy measure to approximate the number of foreign-born food service workers completing and passing the Certified Food Manager Course. Minnesota and Illinois departments of health track CFM training completions using state registries and require the registration of CFM course, and satisfactory performance for initial and re-certification trainers. The Illinois Department of Health reported a total registration of 29,637, 28,631 and 25,716 trainees for the years 2014, 2015 and 2016 respectively, but do not track initial and re-certification numbers separately (Source: Illinois Freedom of Information Act). However, the Minnesota Department of Health approximated 5,300 (44%) annual initial test takers; additionally, there are approximately 6,700-renewal certifications offered each year. Although the re-certification period required for Minnesota is three years while Illinois is five years, the initial certification percentage for Illinois might be slightly larger than Minnesota's 44%. None of the health departments track race/ethnicity of the workers seeking certifications. Using the 2015 American



Community Survey of 2.3 million foreign born food service worker out of which 45% are more likely to be restaurant chefs or 24% are managers, and applying Minnesota 44% initial test taker as a proxy measure, we estimate a national range of 240,00 to 440,000 foreign borne food service workers eligible for the initial certification training and exam. However, the lack of food safety trainings in the many languages of the foreign borne food service workers and low literacy skills poses a significant barrier to food safety certification training. Though this paper does not study disparities in certification training of existing food managers, it looks at the outcomes of CFM training when offered in the native language of food service workers and incorporating visual and oral components to enhance learning.

Food-borne illnesses are a major public health problem in the United States. In 2011, the U.S. Centers for Disease Control estimated 48 million Americans to suffer from food-borne illness with 128,000 hospitalizations and 3,000 deaths (Mead et al., 1999). Studies have found restaurants to be the source of almost half of confirmed food-borne outbreaks (Chang, Groseclose, Zaidi, & Braden, 2009; Hedberg et al., 2006; Olsen, MacKinnon, Goulding, Bean, & Slutsker, 2000). And researchers have raised concerns regarding food-handling practices of ethnic restaurants and have substantiated a poorer performance in compliance with food safety ordinances when compared to non-ethnic restaurants (Mauer et al., 2006; Niode, Bruhn, & Simonne, 2011a). Increases in the size of ethnic minority populations are resulting in increases in both the number of ethnic food operators and growth of ethnic food consumerism. Additionally, the changing palate for ethnic flavors and cuisine in the U.S. coincides with the food service industry's highest-ever proportion employment of foreign-born workers (Mauer et al., 2006).

Food-borne illness occurs when ingested food is contaminated with a sufficient number of disease-causing organisms. Major contributing factors to food-borne illnesses are food workers' health and hygiene, food preparation practices, and food contaminations prior to product arrival to the kitchen (Gould, 2013). Poor food handling practices pave the way to numerous types of contaminations (Hedberg, 2013). Food-borne illness data from CDC showed that the total food-borne disease outbreaks from ethnic food establishments rose from 3% to 11% of total cases from 1990 to 2000 (Simonne, Nille, Evans, & Marshall, 2004). Unique associations were confirmed between the frequency of certain food-borne illnesses and racial/ethnic groups after a review of 29.5 million laboratory diagnosed food-borne illness (Lay et al., 2002).

A careful analysis of food handling practices, and policies in restaurant kitchens has shown kitchens with Certified Food Managers (CFMs) have lower odds of experiencing food-borne illness outbreak (Hedberg et al., 2006). The mandatory requirement for a Certified Food Manager in licensed food establishments was put in place in an earlier era, and it may not have adapted and kept pace with the changes in national demographics and ethnic composition and the needs of food service workers. To properly communicate food safety principles to ethnic food service workers, food safety classes should be conducted in the native language of these workers (Niode, Bruhn, & Simonne, 2011b). Furthermore, the lack of food safety training designed to address the unique risks of ethnic foods and the associated food handling practices further complicates this problem (Simonne et al., 2004)). Studies have established unique associations between racial/ethnic groups to specific food-borne pathogens, suggesting

the need for customized food safety training efforts and programs (Chang et al., 2009; Simonne et al., 2004).

A comparison of food safety violations between independent ethnic restaurants and non-ethnic restaurants in 14 Kansas counties showed a higher rate of violations in ethnic restaurants when compared to the non-ethnic establishments (Kwon, Roberts, Shanklin, Liu, & Yen, 2010). Independent ethnic restaurants are urged to be more diligent in training their employees about safe food handling (Roberts, Kwon, Shanklin, Liu, & Yen, 2011). Food safety educators in the U.S. have given much attention to food safety education programs designed for English and Spanish speakers (A. Fraser & Alani, 2009), yet the diversity of languages and ethnic cuisines is growing rapidly. Conveying culturally competent food safety education in a preferred language and learning style is important in demonstrating adequate food handling practices. The lack of adequate food safety education materials in the languages of many new immigrant's limits food safety knowledge (Tyler, 2005). In addition to lack of training materials for new immigrants, religious restrictions pose certain limitations. For instance, the Islamic religion prohibits Muslims from handling pork and serving alcohol beverages. These restrictions translate to missed-out learning opportunities for Muslim food service workers from the more established food service businesses that have established training programs in place (Abdullahi et al., 2014).

The American National Standards Institute (ANSI-CFP) is the accredited certification provider recognized by the Conference for Food Protection. ANSI-CFP approves and certifies companies to provide an accredited exam accepted in all states that have mandatory certification requirement for food management professionals. There are

currently four approved food safety exam providers and their certification processes are highly dependent on print literacy and designed for the literal, analytic-oriented learner exposed to formal education systems. This poses significant challenges for foreign-born food service workers who are more likely to be oral learners, with limited English proficiency or with little or no formal education. This challenge creates a critical barrier to progress in the field of food safety in the U.S. considering the number of minority food service workers with limited English skills. As it stands now, many foreign-born food service workers face literacy barriers in obtaining food safety certification from existing food professional certifying bodies. This significantly hampers the understanding and applicability of food safety principles to practice, and lack of this knowledge creates a critical barrier to progress in the field of food safety. A large proportion of these workers cannot read in English, and some cannot read in their native language. In 2012, 43.6% of foreign-born Hispanics in the labor force had less than a high school degree, compared to 4% and 7.3% native borne Whites and Black (Mosisa, A. T., 2013). A significant number of these workers have never taken an exam of any sort and these factors present a nearly insurmountable obstacle to passing the print-dependent Certified Food Manager examinations as required by the state and local food codes.

Moreover, research has substantiated differences between oral and written communication styles. The Oregon Environmental Health Specialist Network conducted a study that assessed the role of communication in food-borne disease outbreaks using a focus group with restaurant owners, food service workers and regulators. They discussed preferred styles of receiving and giving information and their perception of why food-borne outbreaks occur (Beegle, 2004). Most focus group participants were from low-

income communities and studies have linked the oral cultural communication style with poverty (Ong, 1982). Most focus group participants were from low-income communities and according to Beegle when food safety information is presented in print and examples used are unfamiliar to the restaurant owners and food service workers lived experiences, it impedes learning. However, the regulators who participated in the focus group felt print communication was the only approach valued and promoted it as the basis for the regulatory system.

However, the regulators who participated in the focus group felt print communication was the only approach valued and promoted it as the basis for the regulatory system.

Burke and colleagues conducted a meta-analysis study that analyzed 95 quasi-experimental studies examining the relative effectiveness of different methods of safety and health training and its impact on safety performance, safety knowledge and safety outcomes (Burke, 2006). The authors classified the training methods into three categories: (1) least engaging (lecture, films and video-based trainings) (2) moderately engaging methods (computer-based instructions and feedback techniques), and (3) most engaging methods (behavior modeling, simulations and hands-on training). Study results demonstrated that training involving behavior modeling with ample practice and dialogue is more effective than other methods of safety training.

### **Study Objectives**

The overarching goal of this study was to examine the effectiveness of an oral learner teaching strategy as a food safety teaching method for new immigrant/refugee food service workers. This study proposed to assess effectiveness of an oral learner food-

safety training program through certified food manager exam performance. The proposed training was based upon the Oregon EHS NET communication study and used an oral communication style involving stories with ‘vivid examples’, role modeling, and use of familiar terms as communication elements that influence behavior in the restaurant environment. The training used active approaches such as hand washing training, role-playing, and visual aids as advocated by Clayton and colleagues (study publication year). It incorporated numerous visual and audio teaching strategies that are culturally appropriate and used language specifically designed to stimulate conversations. Since this study examined efficacy of food safety training for one immigrant group, the customized training incorporated menu items unique to them and also addressed cultural practices not in line with the food code (see chapter 1).

*Study Hypothesis:* There is no association between CFM exam results for Somali food handlers who receive food manager training for oral learners when compared to those who took traditional food manager training and the unit of analysis is the food handler.

### **Method**

To investigate how an oral teaching method could improve food safety knowledge, the investigator conducted an experimental study with an intervention and control group. For both of these groups, a unique teaching strategy utilizing learners’ strong oral culture was employed using the learners’ mother tongue. In the intervention group, the training focused on hands-on demonstrations and used visual/oral cues to teach food safety concepts. Training sessions were incrementally paced and designed to tap into the learners’ oral language proficiency.

The study involved the completion of six food manager certification-training sessions. Each class session consisted of 10 hours of training and two hours of testing completed over three days. The registered students were randomly assigned into classrooms according to the time of sign up. The six training sessions consisted of 3 interventions and 3 control groups with a total of 79 randomly assigned learners. The study sample consisted of Somali food handlers working in independently owned and operated Somali restaurants and day cares located in Minneapolis.

This training was restricted to participants who were fluent Somali speakers with limited English proficiency, no prior food safety education training, and who were more than 18 years old. The food safety knowledge measure was measured through the Prometric Certified Professional Food Manager (CPFM) examination. This is a certified professional food manager examination accredited by the American National Standard Institute. It is a closed book proctored exam containing 80 multiple-choice questions. For language accommodation, an approved state and federally qualified exam translator was contracted to orally translate the exam.

The 12 hours (hrs.) of training were delivered on three consecutive days for four hours per day. The days were structured as follows:

- Day 1 (4 hrs.): Importance of Food Safety and Personal Hygiene including understanding bacteria and viruses, flow of food, and thermometers
- Day 2 (4 hrs.): Food Protection (purchasing, receiving, storage, preparation, cooking, cooling, hot/cold holding, and reheating), Cleaning and Sanitizing, and HACCP
- Day 3 (4 hrs.): Review and Exam

The training sessions were conducted with the assistance of training aids, hands-on activities like use of GloGerm™ to demonstrate proper hand-washing techniques, calibrating a food thermometer, and preparing sanitation solutions. Educational materials from the FDA oral culture materials were used in storyboards and role-playing. Posters were used in the training to help trainees understand the relationship between food safety practices and food-borne illnesses. The following educational materials from the FDA Oral Culture Learning Projects were used during the training: *No bare hand contact with ready to eat food, principles of employee health, proper hand washing, prevention of cross contaminations, proper hot holding of time- temperature control for safety food, and proper cooling of time-temperature control for safety food.* These materials were used for role-playing and participants were encouraged to share food safety experiences and ask questions throughout the training. Table 7 below shows topics discussed and the oral/visual cues used during training.



Table 7

*Training Plan Differences, Between the Intervention and Control Group*

<b>Importance of Food Safety and Personal Hygiene</b>	<b>Oral/Visual Cues</b>	<b>Intervention Group</b>	<b>Control Group</b>
Clean uniform/use of hair restraint	Demonstration Activity: GlowGerm™	Yes	No
Hand washing			
Employee illness			
Requirement to report illness/employee and manager	Preparing sanitizing solution	Yes	No
	Story boards (FDA)	Yes	No
	Role playing e.g. identifying violations using pictures	Yes	No
<b>Understanding bacteria, virus, and toxins</b>	Using GlowGerm™: cutting board, knife, hands, etc.	Yes	No
Allergens	Use of diagrams flow charts	Yes	No
Cross contamination	Demonstration of thermometer calibration	Yes	No
Flow of food in the kitchen	Using a thermometer/hands-on	Yes	No
Use of a Thermometer			
<b>Food Protection</b>	Activity: Chart: storage in refrigeration/puzzle to put together	Yes	No
Purchasing, receiving, storage, preparation, cooking, cooling, hot/cold holding, reheating	Activity: Chart: final cook temps/fill in by student	Yes	No
Make flow throughout discussion	Activity: Hot rice? Record temp every hour? 1 inch thick and 6 inches thick	Yes	No
	Video of receiving and storage		
	Date marking: slides	Yes	No
	Cooling: slides/FDA story boards		
	Activity: plastic baggie of different white products to identify.	Yes	No
	Demonstration of bleach water and test strip checking	Yes	No
	Activity: Using menu from student restaurants: id hazards, critical control points and critical limits	Yes	No

*Note. See Appendix G for a detailed training plan*

All Statistical analysis were done using STATA®12 using t-test.

## **Results**

The six training sessions, consisting of three interventions and three control groups, had a total of 76 randomly assigned learners working in restaurants and childcare facilities. Table 8 below shows the number of food service employees and affiliated places of work and categorical CFM exam performance.

Table 8

*Exam Performance for Restaurants and Childcare*

<b>Type of affiliated establishment</b>	<b>CFM Issued (passed)</b>	<b>CFM Issued Failed</b>	<b>Passed on retest</b>	<b>Total Learners</b>
<sup>a</sup> Restaurant (26 intervention & 13 Control)	30	9	2	39
<sup>b</sup> Child Care (20 intervention and 13 control)	28	5	0	33
Not in the job market (but aspiring to be in the food business)	1	3	0	4
<b>Total</b>	<b>59</b>	<b>17<sup>c</sup></b>	<b>2</b>	

*Note.* <sup>a</sup>Trainees from 28 unique restaurants; <sup>b</sup> Trainees from 18 unique childcare/schools; <sup>c</sup> 15 students did not return for re-test

The findings in Table 9 below are consistent with the literature: there is a general overall improvement in exam performance with the intervention group when compared to the control group. Content addressing principles of food safety made up 43% of the exam questions and 80% of these items consisted of food protection procedures and 20% addressed temperature control (see Appendix H for the number of exam questions and related number of exam questions).

Table 9

*A Comparison of CFM Exam Performance for Intervention and Control Groups*

<b>Exam Topic</b>	<b>Intervention Mean (n=49)</b>	<b>Control Mean (n=32)</b>	<b>P-Value</b>	<b>Demonstration</b>
Principles of Food Safety	26.43	24.16	*0.004	Yes
Food-borne illness	13.76	13.75	0.497	Yes
Food safety education	6.02	6.16	0.330	No
Facilities & Equipment	8.02	8.22	0.369	No
Integrated Pest Management Systems and Food Regulations	4.35	4.25	0.348	No

*Note.* \*Asterisk marks indicate statistical significance of  $p < .05$ .

Mapping exam question content with the oral/visual cues used in the training shows a concentration of training activities addressed principles of food safety (9/13 activities), food-borne illness (2/9 activities), food safety education (0/9), facilities and equipment (1/9 activities), integrated pest management (0/9) and food safety regulations (1/9) See Table 1. Statistically significant differences between the intervention and control group were observed only for the principles of food safety exam questions. No statistical differences were found for exam questions that lacked activity demonstrations in training.

Table 10

*Comparing Pass/Fail Odd Ratio for Intervention and Control Group*

	<b>Passed</b>	<b>Failed</b>	<b>Ratios</b>
Intervention Group (n=49)	40	9	4.4
Control Group (n=32)	24	8	3
			Odd Ratio: 1.46

Table 11

*Comparing the Sub-Categorical Performance of Failed Students Between the Intervention and Control Groups*

<b>Exam Topic</b>	<b>Intervention (n=9)</b>	<b>Control (n=8)</b>	<b>P-value</b>	<b>Demonstration</b>
Principle of food safety	25.67	18.75	*0.0002	Yes
Food-borne illness	13.22	10.62	*0.0400	Yes
Food safety education	5.67	4.75	0.0900	No
Facilities & Equipment	8.11	6.62	0.1000	No
Integrated Pest Management and	4.33	4.00	0.3100	No

*Note.* \*Asterisk marks indicates statistical significance of  $p < .05$

Comparing the intervention group to the control group, the odds of passing using the intervention-training model were 46% higher for intervention participants (see Table 4) . Comparing the exam performance of learners that failed the exam from both groups illustrates a statistically significant difference in performance in the principle of food safety and food-borne illness categories (see Table 5). Although students failed to meet the passing grade thresholds, the intervention group made better progress in learning the principle of food safety and food-borne illness than the control group.

### **Discussion**

The oral visual training module was created using the fundamental food flow concept and the demonstrable activities were created. This training was conducted in the native language of the participants and is the first of its kind for Somali food service workers. Prior to this training, lack of a certified Food Manager was identified as one of the leading causes of violations in independently owned Somali food service establishments (see chapter 1 and 2). In addition to providing access to CFM training by using participants' native language and translating the exam, the incorporation of visual and oral training components designed for the low literacy learners further increased the understanding of training materials.

During the conceptual development of demonstrable activities, the main focus was incorporating hand-on activities focused on personal hygiene, employee illness, food-borne illness, understanding of bacteria/virus, cross contamination, and the flow of food (receiving, storage, cooking, cooling, holding, and reheating). The lack of or use of a fewer number of demonstrable activates for topics such as food safety education, facilities and equipment, integrated pest management and food safety regulation was due

to time constraints and the provision of training in a non-commercial kitchen environment. And the resulting performance showed improved examination performance for contents with demonstrated activities underlining the important roles of visual/oral training for non-English food service employees.

Trainings that incorporated cultural relevant approaches engaged participants in discussions that fostered mutual understanding and stresses the importance of addressing cultural, social and environmental elements in training stretching beyond the biomedical model (Dutto Basu, 2008; Thomas, Fine and Ibrahim, 2004). A culturally-centered training approach recognizes the importance of incorporating marginalized voices into health discussions (Dailey, P. M. 2013). For example, during the training, a culturally-tailored perspective of diarrhea and its food safety ramifications were discussed. In Chapter 1, we discussed a cultural understanding of ‘diseased’ diarrhea and ‘healthy’ and matters related to this subject come up in trainings. The robust discussion on the cultural definition of diarrhea took place during these trainings providing the trainer an opportunity to address the topic as it related to illness and exclusion of employees experiencing it. Such cultural relevant dialogue surfaces through training programs that are designed to incorporate active participation through dialogues.

Studies have differentiated the effectiveness of several communication methods in training aimed at improving knowledge and performance. Customized training modules, especially in the health and safety arenas, are becoming more common due to the varying socio-economic, language, culture, learning styles and literacy backgrounds of the workforce. To this end, Beegle argues the existence of a distinct difference between ‘print’ and ‘oral’ communication culture. The print culture, she posits, uses a thought



process with a specific interacting characteristic described as ‘linear, abstract, analytical, ability to separate and disconnect; ability to focus and delay gratification ahead, and skills to break things into parts,’ while the characteristic of ‘oral’ culture are ‘relationship focus, spontaneous, big picture focus, repetitive, emotional, and present oriented’ (Beegle, 2004). Moreover, the oral communicator is most often described as a ‘high context’ communicator, a concept introduced by the anthropologist Edward Hall, referring to the way different cultures communicate (Edward Hall, 1976). Customized training modules, especially in the health and safety arenas, are becoming more common due to the varying socio-economic, language, culture, learning styles and literacy backgrounds of the workforce. To this end, Beegle argues the existence of a distinct difference between ‘print’ and ‘oral’ communication culture. The print culture, she describes, uses a thought process with a specific interacting characteristic described as ‘linear, abstract, analytical, ability to separate and disconnect; ability to focus and delay gratification ahead, and skills to break things into parts,’ while the characteristic of ‘oral’ culture are ‘relationship focus, spontaneous, big picture focus, repetitive, emotional, and present oriented’ (Beegle, 2004). This study demonstrates the value of incorporating visual/oral training modules in Certified Food Manager training designed to meet various learning styles. Future studies should evaluate participating food service learners’ food safety performance using pre-post inspection data, and compare these results to the inspection outcome to their exam performance.

### **Study Limitations**

Due to time constraints, this study was unable to incorporate activities across all training modules. This skewed the analysis and showed significant improvement in areas

with more activities. To overcome this challenge, study authors through funding from MnDrive- Minnesota's Discovery, Research, and Innovation Economy- a partnership funded between University of Minnesota and State of Minnesota created a user friendly and interactive food safety-training app tailored for low literacy and limited English workers, designed for iOS application. This app is designed to complement textbook for oral/visual learners and has modules organized by topics covered in food safety certification assessment exams starting with three languages including English. Another study limitation is the scarce data on the size of foreign borne certified food managers; the availability of such data provides information regarding foreign borne food service worker training accessibility and their performance

### **Conclusion**

This study compared the Certified Food Manager examination performance of Somali food service workers participating in an oral/visual training program compared to traditional format. The study developed a visual-based food safety training materials for the intervention group that utilized discussion, role playing and other hands on activities plans. Results from the study suggests improved exam performance for content areas that had demonstrable training components. Hence, the visual/oral based food safety training was able to prove improved food safety knowledge when exam performance was compared

## Chapter 6: Conclusions

This thesis explored and analyzed food safety performance of independent Somali-owned food establishments. It provided an opportunity to explore the development of more rigorous food safety standards in a relatively new American community. A detailed look at food safety performance of one ethnic group also helps to illuminate the food safety concerns of other ethnic food operators. Numerous scientific discussions on ethnic food safety matters recommended the need for studies that investigate the challenges of food safety performance for ethnic food operators. It is important to understand the underlying reasons for poor food safety practices, because of the growing role of foreign-born workers in the U.S. food service industry. Insights from such studies help to uncover factors that might be contributing to the reported increase of food-borne disease outbreak from ethnic food establishments. Due to (a) the growing trend of ethnic food businesses in the U.S.; (b) the growing base of ethnic food consumerism, (c) the increased presence of foreign-born food service workers who are challenged with cultural, language, or educational barriers; and (d) the higher rate of violations for ethnic food restaurants, this thesis undertook three different sub-studies in the internal chapters in order to better understand this phenomenon from a number of different perspectives.

This thesis explored cultural norms around food preparation, existing food safety laws, and historical inspection data. Converting inspection results to a restaurant grading metric, like those used in New York, helped to analyze performance. The results of the studies conducted in chapters three and four informed the creation of a food safety training intervention aimed at overcoming identified cultural and language barriers to

existing food safety training. Figure 6 presents the logical progression of the three internal chapters. Table 12 presents a summary of the findings from the three studies.

Figure 6. Logical progression of the three chapters.

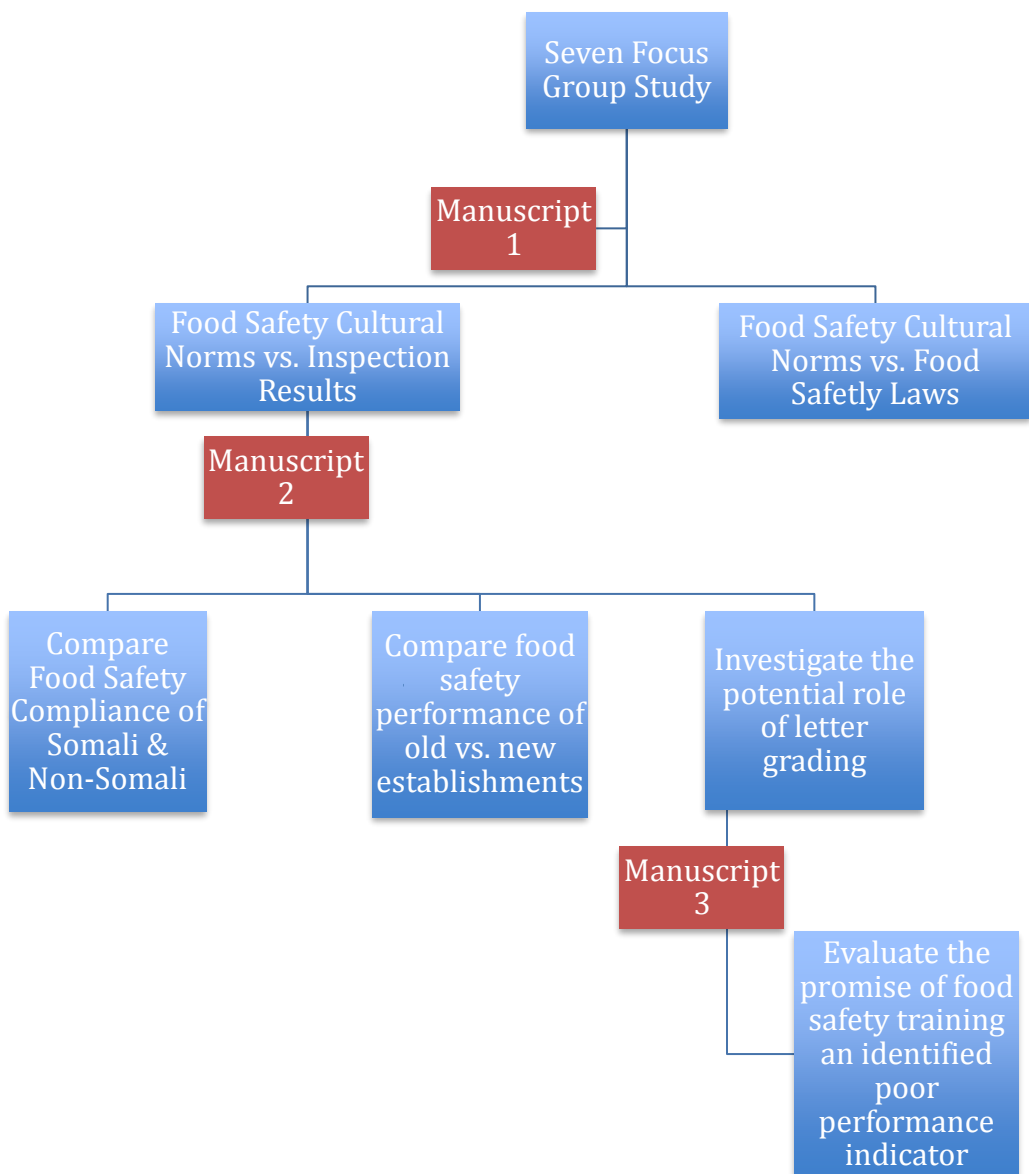


Table 12

*Summary of Findings*

<b>Chapter</b>	<b>Study Aims</b>	<b>Findings</b>
Examining Effects of Food Safety Cultural Norms on Food Inspections	Determine Somali food safety cultural norms and map out norms against food safety regulations	Major drivers of Somali food safety cultural norms: <ul style="list-style-type: none"> <li>• Religion</li> <li>• Cultural &amp; Historical Context</li> <li>• Gender</li> </ul>
	Map Somali food safety cultural norms against safety compliance record	Top ten violations ranking according to major drivers <ul style="list-style-type: none"> <li>• Gender role: Top two ranking violations</li> <li>• Religious practices: Third and fifth ranking</li> <li>• Cultural and historical experiences: fourth and tenth ranking violations</li> </ul>
Inspection Effects of Independent Somali Restaurants: A pilot case for letter grading	Compare food safety compliance of independently owned and operated Somali restaurants to non-Somalis	Statistically higher total number of violations, a greater number of employee health and hygiene violations, and a greater number of food safety and food protection related violations
	Investigate the role of inspection on food safety compliance by comparing old and new establishments	Seven out of top ten violations were the same regardless of inspection frequency
	Investigate the role that restaurant letter grading could play in improving sanitation	In 2008, less than 10% of establishments scored 'A' and the percent increased to 30% by 2015. Facility maintenance was highest violation category contributing to poor performance.
Evaluating the impact of visual-oral based food safety training using Certified Food Manager Exam results for limited English workers in the food service industry	Examine the effectiveness of an oral learner teaching strategy as a food safety teaching method for new immigrant/refugee food service workers through certified manager exam performance	Statistically significant difference observed for the intervention group when compared to the control group in areas of training with demonstrable activities.

Findings from Chapter 3 provided evidence for the presence of cultural practices that need to be considered during food safety education and inspections. Chapters 3, 4, and 5 explored some of the root causes of poor performance, and demonstrated an increase in food safety knowledge acquisition when cultural and literacy levels inform the development of teaching materials. The letter grading analysis provided evidence of easy-to-understand sanitation performance indicators; these results are useful to both the restaurant operators and regulators. Research has shown evidence of improved sanitation and a reduction of food-borne illness with the introduction of restaurant letter-grading. This study builds on that understating, demonstrating the value of using letter-grade analysis in obtaining insights aimed at improving performance. Moreover, the studies in this thesis identified that a lack of certified food managers in Somali restaurants represent one of the contributing factors to poor performance. In order to overcome existing barriers to food manager certification, agencies should strive to create and continually evaluate training interventions with these cultural and linguistic considerations in mind.

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## Appendix A: Somali Focus Group Questions

### On food handling practices and food safety & beliefs among Somali

1. What is your and your community's understanding of how people can become sick from eating or handling food?

a) If you or a family member gets abdominal cramps, diarrhea or vomiting, what do you think are some of the causes?

(Probe): Are there any Somali proverbs related to food or stories about how to safely handle food from your community?

2. Typically, where do you, your family and friends obtain meat (e.g., beef, goat, chicken, etc.)?

a) What types of places do you know where Somalis buy meat from other than the traditional "halal" grocery stores (e.g., live animal market, large grocery store chain, butcher shop, etc.)?

b) For what purposes and reasons would you buy meat at a halal grocery? For what purposes and reasons would you buy meat from a live animal market?

3. Live animals are sometimes purchased from live animal markets/slaughter centers and brought home. Explain how you or your community prepares whole animals that are purchased from a live animal market for eating.

a) Where do you usually prepare a whole animal or a large quantity of meat for cooking (kitchen, outside, etc.)? PROBE: whether uncooked meat is washed?

b) What else do you do with a whole animal carcass or large quantity of meat to prepare it for eating?

c) What role do children in the community have in preparing an animal carcass for eating (watching, helping wash meat, helping gut chickens, etc.)?

4. When you or your community buys a whole animal carcass at a live animal market; how do you bring it home (e.g., in a bag, in a laundry basket, etc.) and how do you make sure that any germs on the meat don't contaminate anything else?

5. Have you or anyone you know ever gotten sick from food (all types of food including vegetables, milk, meat, chicken) they handled or from food they ate at home or at restaurant and how?

a) What would you do if someone in your family becomes ill with abdominal cramps, vomiting and diarrhea?

6. What are the precautions you take (e.g., hand washing, cleaning counters and other surfaces, checking temperature of cooked meat) to prevent foodborne diseases when you are preparing or cooking food. Why do you take these precautions?

(Probe): Give an example of how you would prepare lunch with chicken or goat meat, on a typical day for yourself and your family, starting with fresh (uncooked) meat or a live animal.

(Probe): How is meat cooked, and when can you say it is ready (well cooked) to be eaten?

7. In which ways is the handling of food and cooking of food different in Somalia than in the US?

(PROBE): What food preparation practices (e.g., buying a whole animal for meat, using a refrigerator, etc.) have changed in US compared to Somalia.

8. What is the best way to inform report or communicate to you and you're the Somali community about ways to prevent food poisoning prevention and stay healthy when handling and eating meat and other foods?

a) If food safety messages were developed to educate the Somali community about foodborne diseases, what information would be helpful for you?

b) How should this information be distributed to you and your community (e.g., paper fliers, radio, TV., community groups, etc.)

9. Do you have any question or comments that you would like to ask about this project?

## Appendix B: Number of Possible Code Violations Per Category

Number of possible code violations per category	Total
<b>Approved Source</b>	<b>31</b>
Food in good condition, safe, and unadulterated	2
Food obtained from approved source	19
Food received at proper temperature	5
Required records available; shellstock tags, parasite destruction	5
<b>Chemical</b>	<b>26</b>
Food additives; approved and properly used	3
Toxic substances properly identified, stored and used	23
<b>Conformance with Approved Procedure</b>	<b>5</b>
Compliance with HACCP plan and variance	5
<b>Demonstration of Knowledge</b>	<b>8</b>
Certified food manager; and duties fulfilled.	5
PIC knowledgeable, duties & oversight	3
<b>Employee Health</b>	<b>15</b>
Management awareness and policy regarding handling employee health situations	7
Proper use of reporting, restriction & exclusion	8
<b>Food Protection</b>	<b>45</b>
Contamination prevented during food preparation, storage and display; segregated distressed products-non critical items	12
Food properly labeled; original container	10
Insects, rodents, and animals not present; no unauthorized persons; food employees do not handle or care for animals present	13
Personal cleanliness (fingernails, jewelry, other clothing, hair restraints)	4
Washing fruits and vegetables	1
Wiping cloths, sponges; properly used and stored	5
<b>Food Temperature Control</b>	<b>11</b>
Approved thawing methods used	2
Proper cooling methods used; adequate equipment for temperature control	3
Thermometers provided and accurate	6
<b>Good Hygienic Practices</b>	<b>3</b>
Food employees eat, drink, and use tobacco only in designated areas / do not use a utensil more than once to taste food that is sold or served	2
Food employees experiencing persistent sneezing, coughing, or runny nose do not work with exposed food, clean equipment, utensils, linens, unwrapped single-service or single-use articles	1
<b>Physical Facilities</b>	<b>386</b>
Adequate ventilation and lighting; designated areas used	32
City of Minneapolis Food Code	187
Compliance with licensing and plan review	6
Compliance with MCIAA and Choking Poster	7
Garbage and refuse properly disposed: facilities maintained	25

Hot and cold water available; capacity; adequate pressure	5
Other: Water Vending, Food Carts, Mobile Units	25
Physical facilities installed, maintained, and clean	36
Plumbing installed, maintained, proper backflow devices	34
Sewage and waste water properly disposed	21
Toilet facilities properly constructed, supplied and cleaned	8
<b>Potentially Hazardous Food Time/Temperature</b>	<b>24</b>
Proper cold holding temperatures	1
Proper cooking time and temperature	6
Proper cooling time and temperatures	3
Proper date marking and disposition	6
Proper hot holding temperatures	1
Proper reheating procedures for hot holding	2
Time as a public health control: procedures and records	5
<b>Preventing Contamination by Hands</b>	<b>17</b>
Direct hand contact with exposed, ready-to-eat food is limited by use of deli tissue, spatulas, tongs, dispensing equipment, or other utensils when possible	1
Hands clean and properly washed	6
Handwashing Facilities	10
<b>Proper Use of Utensils</b>	<b>29</b>
Gloves used properly	1
In-use utensils; properly stored	2
Single-use and single-service articles; properly stored & used	10
Utensils, equipment, and linens: properly stored, dried, and handled	16
<b>Protection from Contamination</b>	<b>25</b>
Food separated/protected from cross contamination	6
Food-contact surfaces: cleaned & sanitized	17
Proper disposition of returned, previously served, reconditioned, and unsafe foods	2
<b>Safe Food and Water</b>	<b>25</b>
Pasteurized eggs used where required	1
Water and ice from approved source	24
<b>Utensils, Equipment and Vending</b>	<b>88</b>
Food and nonfood-contact surfaces cleanable, properly designed, constructed, and used	60
Nonfood contact surfaces clean	3
Warewashing facilities: installed, maintained, and used; test strips (Accurate thermometers, chemical test kits provided, gauge cock)	25
<b>Total number of code violations</b>	<b>738</b>

### Appendix C: Focus Group Narratives and the Food Code Violation Distribution

<b>Food Code Category<sup>1</sup></b>	<b>Violation Code Distribution (738 Standard Citation Codes)</b>	<b>Did focus group question address violation premise? (Y/N)</b>	<b>Were cultural norms identified? (Y/N)</b>
Approved Source	4%	N	NA
Chemical	3.5%	N	NA
Conformance with Approved Procedure	0.67%	N	NA
Demonstration of Knowledge	1.08%	N	NA
Employee Health	2%	Y	Y
Food Protection	6%	Y	Y
Food Temperature Control	1.5%	Y	Y
Good Hygiene Practices	0.4%	Y	Y
Physical Facility	52.3%	Y	Y
Potentially Hazardous Food	3.3%	Y	NA
Preventing contamination by hand	2.3%	Y	Y
Proper use of utensils	3.9%	N	NA
Protection from contamination	3.3%	Y	Y
Safe Food and Water	3.4%	N	NA
Utensils, Equipment and Vending	11%	N	NA

<sup>1</sup>Food Code Category list obtained from Minneapolis Health Department (see Appendix B for detailed list of violations)

### Appendix D Variables and Corresponding Codes

<b>Variables and corresponding codes.</b>	
<u>Variable name</u>	<u>'Risk based inspection report' Code</u>
Active Managerial Control	Certified food manager, duties PIC knowledgeable; duties & oversight
Employee Health and Hygiene	Management awareness; policy present Proper use of reporting, restriction & exclusion Proper eating, tasting, drinking, or tobacco use No discharge from eyes, nose, and mouth Hands clean and properly washed
Food Safety and Food Protection	Food obtained from approved source Food received at proper temperature Food in good condition, safe, & unadulterated Required records available; shell stock tags, parasite destruction Food separated/protected from cross contamination Proper disposition of returned, previously served reconditioned & unsafe food Proper cooking time & temperatures Proper reheating procedures for hot holding Proper cooling time & temperatures Proper hot holding temperatures Proper cold holding temperatures Proper date marking & disposition Time as a public health control; procedures & record Food additives; approved & properly use Pasteurized eggs used where required Water & ice from approved source Approved thawing methods used Food properly labeled; original container Contamination prevented during food preparation, storage & display Wiping cloths; properly used & store Washing fruits & vegetables In-use utensils; properly stored Utensils, equipment & linens; properly stored, dried, & handle Single-use & single-service articles; properly stored & used Gloves used properly



Facility Operation	<p>Adequate hand washing facilities supplied &amp; accessible</p> <p>Food-contact surfaces; cleaned &amp; sanitizer</p> <p>Water &amp; ice from approved source</p> <p>Proper cooling methods used; adequate equipment for temperature control</p> <p>Thermometers provided &amp; accurate</p> <p>Contamination prevented during food preparation, storage &amp; display</p> <p>Wiping cloths; properly used &amp; stored</p> <p>Utensils, equipment &amp; linens; properly stored, dried, &amp; handle</p> <p>Single-use &amp; single-service articles; properly stored &amp; use</p> <p>Food &amp; non-food contact surfaces cleanable, properly designed, constructed &amp; used</p> <p>Ware washing facilities; installed, maintained, &amp; used; test strips</p> <p>Non-food contact surfaces clean</p> <p>Plumbing installed; proper backflow devices</p> <p>Sewage &amp; waste water properly disposed</p> <p>Toilet facilities: properly constructed, supplied, cleaned</p> <p>Garbage &amp; refuse properly disposed; facilities maintained</p> <p>Physical facilities installed, maintained, &amp; clean</p> <p>Adequate ventilation &amp; lighting; designated areas used</p>
Chemical Handling	Toxic substances properly identified, stored & use
Licensing and Compliance	<p>Compliance with HACCP plan and variance</p> <p>Compliance with MCIAA &amp; Choking Poster</p> <p>Compliance with licensing &amp; plan review</p>

Data Source: (Singh, 2012)

## Appendix E: Food Risk-Based Inspection Report

Food - Risk Based Inspection Report										
	Department of Regulatory Services Division of Environmental Management & Safety Environmental Health & Food Safety 250 South Fourth Street, Room 414, Minneapolis, Minnesota 55415 Phone: 612-673-2170 FAX: 612-673-2635 TTY: 612-673-2233 Web: <a href="http://www.ci.minneapolis.mn.us/environmental-health/">http://www.ci.minneapolis.mn.us/environmental-health/</a>		Total Violations	0	Date of Inspection	01/01/2011				
			Critical Violations	0	Inspection Time	12:00 PM				
			License Current and Posted	Yes	Time Out	12:00 PM				
			Reinspection Needed	No						
<b>Facility Name</b>	<b>Address</b>	<b>City/State</b>	<b>Zip Code</b>	<b>Telephone</b>						
[REDACTED]	[REDACTED]	MINNEAPOLIS, MN	55402	[REDACTED]						
<b>License #</b>	<b>Owner</b>	<b>Inspection Purpose</b>	<b>License Type</b>	<b>Risk Category</b>						
[REDACTED]	[REDACTED]	Routine	FOOD MANUFACTURER	1						
<b>FOODBORNE ILLNESS RISK FACTORS AND PUBLIC HEALTH INTERVENTIONS</b> IN=in compliance    OUT=not in compliance    N/O=not observed    N/A=not applicable    COS=corrected on-site during inspection    R=repeat violation										
<b>Compliance Status</b>			<b>Compliance Status</b>							
Foodborne Illness Risk Factors and Public Health Interventions			Foodborne Illness Risk Factors and Public Health Interventions							
1A	IN	Certified food manager, and duties fulfilled.	15	IN	Proper disposition of returned, previously served, reconditioned, and unsafe foods					
1B	IN	PIC knowledgeable, duties & oversight	16	IN	Proper cooking time and temperature					
2	IN	Management awareness and policy regarding handling employee health situations	17	IN	Proper reheating procedures for hot holding					
3	IN	Proper use of reporting, restriction & exclusion	18	IN	Proper cooling time and temperatures					
4	IN	Food employees eat, drink, and use tobacco only in designated areas / do not use a utensil more than once to taste food that is sold or served	19	IN	Proper hot holding temperatures					
5	IN	Food employees experiencing persistent sneezing, coughing, or runny nose do not work with exposed food, clean equipment, utensils, linens, unwrapped single-service or single-use articles	20	IN	Proper cold holding temperatures					
6	IN	Hands clean and properly washed	21	IN	Proper date marking and disposition					
7	IN	Direct hand contact with exposed, ready-to-eat food is limited by use of deli tissue, spatulas, tongs, dispensing equipment, or other utensils when possible	22	IN	Time as a public health control: procedures and records					
8	IN	Handwashing Facilities	25	IN	Food additives; approved and properly used					
9	IN	Food obtained from approved source	26	IN	Toxic substances properly identified, stored & used					
10	IN	Food received at proper temperature	27	IN	Compliance with HACCP plan and variance					
11	IN	Food in good condition, safe, and unadulterated	Risk factors are improper practices or procedures identified as the most prevalent contributing factors of foodborne illness or injury. Public Health Interventions are control measures to prevent foodborne illness or injury.							
12	IN	Required records available; shell stock tags, parasite destruction								
13	IN	Food separated/protected from cross contamination								
14	IN	Food-contact surfaces: cleaned & sanitized								
<b>GOOD RETAIL PRACTICES</b>										
Good Retail Practices are preventative measures to control the addition of pathogens, chemicals, and physical objects into foods.										
<b>Compliance Status</b>							<b>Compliance Status</b>			
Good Retail Practices							Good Retail Practices			
28	IN	Pasteurized eggs used where required	43	IN	Single-use and single-service articles; properly stored & used					
29	IN	Water and ice from approved source	44	IN	Gloves used properly					
30	IN	Variance obtained for specialized processing methods	45	IN	Food and nonfood-contact surfaces cleanable, properly designed, constructed, and used					
31	IN	Proper cooling methods used; adequate equipment for temperature control	46	IN	Warewashing facilities: installed, maintained, and used; test strips.(Accurate thermometers,chemical test kits provided, gauge cock)					
32	N/A	Plant food properly cooked for hot holding	47	IN	Nonfood contact surfaces clean					
33	IN	Approved thawing methods used	48	IN	Hot and cold water available; capacity, adequate pressure					
34	IN	Thermometers provided and accurate	49	IN	Plumbing installed, maintained,proper backflow devices					
35	IN	Food properly labeled; original container	50	IN	Sewage and waste water properly disposed					
36	IN	Insects, rodents, and animals not present; no unauthorized persons; food employees do not handle or care for animals present	51	IN	Toilet facilities properly constructed, supplied and cleaned					
37	IN	Contamination prevented during food preparation, storage and display, segregated distressed products-non critical items	52	IN	Garbage and refuse properly disposed; facilities maintained					
38	IN	Personal cleanliness (fingernails,jewelry,other clothing,hair restraints)	53	IN	Physical facilities installed, maintained, and clean					
39	IN	Wiping cloths,sponges; properly used and stored	54	IN	Adequate ventilation and lighting, designated areas used					
40	IN	Washing fruits and vegetables	55	IN	Compliance with MCI/AA and Choking Poster					
41	IN	In-use utensils; properly stored	56	IN	Compliance with licensing and plan review					
42	IN	Utensils, equipment, and linens: properly stored, dried, and handed	57	IN	Other Violations Noted					
			58	IN	City of Minneapolis Food Code					
<b>MATERIALS PROVIDED:</b>										

Source: Minneapolis Health Department: Standard Form

### Appendix F: Training Plan

<b>Day 1: Importance of Food Safety and Personal Hygiene (2hrs)</b>	<b>Oral/Visual Cues</b>	<b>Intervention Group</b>	<b>Control Group</b>
Clean uniform/hair restraint	Photos: correct and not correct	Yes	Yes
Hand washing	Activity: Glow germ demo	Yes	No
Employee illness	Story boards (FDA)	Yes	No
Requirement to report illness/employee and manager	Story boards/role playing	Yes	No
	Video hand washing	Yes	Yes
<b>Understanding bacteria, virus, and toxins (1.25 hrs.)</b>	Photos: virus, bacteria	Yes	Yes
Allergens	Time/temp chart for growth	Yes	Yes
	Bacteria growth curve table	Yes	Yes
Cross contamination	Photos of affected foods		
	Anagrams-Sam & Ella like chicken	Yes	No
	Glow germ: cutting board, rubber chicken, knife, hands, etc.	Yes	No
<b>Flow of food (1 hr.)</b>	Diagrams/story boards	Yes	No
<b>Thermometer</b>	Demonstration of thermometer calibration	Yes	No
<b>Day 2 Food Protection (2.5 hrs.)</b>	FIFO photos	Yes	Yes
Purchasing, Receiving, storage, prep, cook, cool, hot/cold hold, reheat			
Make flow throughout discussion (Save these for HACCP on Day 4)	Using a thermometer/hands on	Yes	No
	Activity: Chart: storage in refrigeration/puzzle to put together	Yes	No

	Activity: Chart: final cook temps/fill in by student	Yes	No
	Activity: Hot rice? Record temp every hour? 1 inch thick and 6 inches thick  Video of receiving and storage	Yes	No
	Date marking: slides Cooling: slides/FDA story boards	Yes	No
	Activity: Plastic baggies of different white products to identify. Also, plastic bottles (orange drink/orange force)	Yes	No
<b>Cleaning and Sanitizing (1 hr.):</b> Three sinks; machines Wiping cloth buckets Slicers Water temperature  Floors Garbage removal Pest control Storage of chemicals/labels	Demonstration of bleach water and test strip checking	Yes	No
	Use flow charts from Day 2 for illustration;	Yes	Yes
	Activity: Students bring menus from their restaurants: id hazards, ccp's and cl's	Yes	No
<b>HACCP: Hazards/ CCPs/ CLs (0.5 hr.)</b> Inspections	New Terms review and exam administration	Yes	Yes
<b>Day 3 (4 hrs.)</b> Review and Exam		Yes	Yes

## Appendix G: Certified Food Manager Exam Content Distribution

- |                               |     |                   |
|-------------------------------|-----|-------------------|
| I. Principles of Food Safety  | 43% | (34 questions)    |
| A. Food Protection Procedures | 80% | (27/34 questions) |
1. biological, chemical and physical contaminants
  2. cross-contamination prevention methods
  3. the spread of foodborne illness (e.g. hand, fecal-oral, person-to-person)
  4. written policies and procedures (e.g. eating, drinking, smoking, gum chewing)
  5. food contamination by employees (e.g. with bare hands, wash cloths, clothing/attire)
  6. personal hygiene practices (e.g. hand washing, hand care, clothing, hair, jewelry)
  7. hand washing station requirements (e.g. liquid soap, paper towels, water, trash)
  8. glove usage (e.g. types of gloves, when to change gloves)
  9. procedures for handling ready-to-eat foods (RTE)
  10. thawing procedures (e.g. pull/thaw process)
  11. batch cooking/prepping procedures
  12. cooling and reheating procedures
  13. microwave use (e.g. cooking, thawing, reheating)
  14. time as a food safety control
  15. potentially hazardous foods (PHF) (time/temperature control safety [TCS])
  16. food storage placement (e.g. raw, ready-to-eat, dry)
  17. First-in, First out (FIFO)
  18. food labels (e.g. date marking, allergens, ingredients)
  19. manufacturer instructions (e.g. Modified Air Packaging [MAP] specifications)
  20. types of thermometers (e.g. digital, analog, infrared)
  21. thermometer accuracy/calibration (e.g. ice point, boiling point, reference thermometer)
  22. thermometer use (e.g. reading, placement, care/maintenance)
  23. security (facility, food [deliberate contamination])
  24. admission procedures (e.g. facility entry, inspectors)
  25. delivery driver verification
  26. vehicle inspection (e.g. sanitation, temperature)
  27. approved sources (e.g. food, vendor, equipment, substitutions)
  28. receiving (e.g. order, food deliveries, order verification)
  29. accept/reject criteria
  30. Critical Control Points (CCPs) and Standard Operation Procedures (SOPs) for the operation
  31. HACCP Principles (e.g. 7 steps)
  32. food safety systems training (HACCP)
  33. hazard communication requirements (e.g. right-to-know, MSDS, labels)
  34. hazardous materials (e.g. labels, usage, handling procedures, record keeping procedures)
  35. safe storage (e.g. hazardous materials)
  36. labels laws-facility use and disposal of chemicals to prevent groundwater contamination

## B. Temperature

20% (7/34 questions)

1. Temperature Danger Zone (e.g. time limits)
2. cooking temperatures (e.g. target temperatures, microwave)
3. heating and cooling
4. holding temperatures

## II. Foodborne Illness

23% (18 questions)

- A. Food Safety Principles (e.g. preparation, storage, distribution)
- B. Health policies and practices (e.g. exclusion, restriction)
- C. Causes of foodborne illnesses (e.g. bacteria, viruses, parasites)
- D. Leading causes of foodborne illnesses (e.g. CDC risk factors)
- E. Reportable illnesses (e.g. the Big Five)
- F. Potentially hazardous foods (PHF), time/temperature control for safety (TCS)
- G. Cooking, holding, cooling, and reheating procedures
- H. Food protection (e.g. preparation to service, dented cans)
- I. Self-service protection (e.g. accessible to consumers)
- J. Foodborne illness symptoms
- K. Chemical contaminants (e.g. pesticides, cleaning agents, heavy metals)
- L. Chemicals storage (e.g. chemicals stored separate from food)
- M. Corrective action for contamination occurrences
- N. Documentation (e.g. incidents, customer complaint, employee illness, reporting, health authorities)
- O. Major foods that cause most allergic reactions
- P. Allergic reactions and symptoms (e.g. rashes, body temperatures, anaphylactic shock)
- Q. Customer notifications (e.g. allergens, undercooked foods)
- R. Food labels (e.g. ingredients)
- S. Methods to clean and sanitize food contact surfaces (FCS) and maintain self-service areas (e.g. tray supports, storage area for dishes/flatware, food shield, clean dishes on second service)
- T. Labeling techniques for date marking and identifying foods in storage
- U. Internal audit (e.g., line check, inspection of premises, food process)

## III. Food Safety Education

10% (8 questions)

- A. Employee training (e.g. hand washing, hygiene, basic cleaning and sanitizing, food time/temperature control)
- B. Unsafe food handling practices (e.g. proper utensil storage)
- C. Cross-contamination prevention practices
- D. Methods to clean and sanitize (e.g. contact/non-contact surfaces, utensils, equipment)

## IV. Facilities and Equipment

14% (11 questions)

- A. Methods to clean and sanitize (e.g. contact/non-contact surfaces, self-serving areas)
- B. Schedule(s) for cleaning and sanitizing (e.g. hourly, daily, weekly, per use)
- C. Ware washing equipment and temperatures (e.g. sanitizing, testing strips, recordkeeping, descaling)
- D. Manual washing (e.g. three-compartment sink, hot/chemical sanitizing, test strips, air drying)

- E. Hood vents and filter cleaning requirements
- F. Safe food flow (e.g., kitchen design and equipment placement)
- G. Safe practices (e.g. placement of equipment, appliances)
- H. Requirements for separate rooms and/or safe storage (e.g., hazardous material storage, chemical storage)
- I. ANSI standards and approval agencies (e.g. equipment purchasing and selection)
- J. Regulations and standards (e.g. area/task lighting, ventilation)
- K. Gauges and thermometers (calibration, maintaining measuring equipment, proper record keeping)
- L. Prevention of cross connection by air gap or backflow prevention (e.g. devices, identifying situations, proper plumbing)
- M. Waste management practices (e.g. disposal, separating, recycling, scheduling, dumpster location, dumpster cleaning, solid waste)
- N. Hazardous material (e.g., labels, usage, handling and storage procedures, MSDS/SDS record keeping methods)
- O. Type facility (e.g. type of food preparation, risk assessment)
- P. Approved food facility materials (e.g. floors, ceilings, walls)

V. Integrated Pest Management 7% (6 questions)

- A. Pests (e.g. offspring, carcasses, shedding, droppings, infestation)
- B. Pest behaviors (e.g. contaminate foods, reproductive cycles, marking territory, facility entry, survival)
- C. Surveillance techniques (e.g. pest problems)
- D. Methods to secure facilities against pests (e.g. air curtain, screen, door sweeps, crack and crevice sealing)
- E. Methods to protect food in storage
- F. Integrated pest management (e.g. cleaning practices to discourage pests, sanitation, facility control)
- G. Pest control professionals (e.g., licensed pest control operators, pesticide operator selection, frequency of pesticide operator visits)
- H. Pesticide label law (e.g. FIFRA act)
- I. Hazard communication requirements

VI. Food Safety Regulations 4% (3 questions)

- A. Food safety code
- B. Health regulatory authority
- C. Food safety inspection reports
- D. Acceptable reasons/methods for sampling
- E. Right to routine inspections
- F. Right to appeal violations (e.g. closures, suspensions, violations)
- G. Employee rights of refusal (e.g. sampling, health interviews)
- H. Process to correct violations
- I. SOPs for safe food handling (e.g. Federal Regulations)
- J. Reportable illnesses
- K. Documentation (e.g. incidents, customer complaint, employee illness, reporting, health authorities)
- L. Signage requirements (e.g., allergens, menu disclaimer, hand-washing)

- M. Obligations to honor customer contracts to deliver safe food (e.g. accurately represent menu items, disclosing undercooking hazards, label allergen information, source foods from safe sources)
- N. Code standards (e.g. building code, safety code, food code)
- O. Hazard communication requirements (e.g., MSDS/SDS, OSHA)
- P. Employee privacy of personnel and health records (e.g. HIPAA, illness log, privacy law)
- Q. HACCP plan requirement