

Policy approaches to advancing food safety:
aligning culture with science for behavior change in Bangladesh

by

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Abstract

Policies, formal or informal, can be determinants of the effectiveness of any organization, no matter how big or small. Formal policies can take the form of primary laws or secondary regulations, while informal policies may only apply on the honor of individuals, businesses, or societies. Throughout history, food safety policies have evolved from isolated experiences of trial and error to standardized, scientific method-driven approaches. Still, the burden of foodborne disease remains a global concern, and governments often maintain the responsibility of curbing the deleterious effects.

The policy decisions made to i) train food safety professionals, ii) educate producers and consumers on food-safe handling practices, and iii) conduct outreach activities can mean the difference between sickness and health in constituencies. In Bangladesh, these three policy priorities are led by the Bangladesh Food Safety Authority (BFSA). As a human-driven system, improving food safety requires behavior change. Policymakers can implement mechanisms for behavior change through their understanding of the national culture. Leaders should not use this information to exploit or manipulate but rather to embrace cultural nuance and share resonate messaging. Religion, specifically the Islamic faith, is a dominant cultural element in Bangladesh.

Recognizing the connection between Muslim food laws—called Halal food laws and derived from Islamic text—and food safety is essential to writing effective food safety policies. An estimated 150 million Muslims live in Bangladesh and presumably abide by Halal food laws. Though many of the Halal principles of good hygiene and wholesomeness align with safe food production and consumption practices, high rates of foodborne disease persist.

This research aims to i) describe the global history of governance around food safety, ii) outline existing international approaches to food safety, iii) discuss current theories of behavior

change, iv) assess the capacity of the government of Bangladesh to improve food safety practices and outcomes, and v) evaluate the results and policy applications of the Food Safety Culture Assessment. The hypothesis of the Food Safety Culture Assessment is that there are observable patterns in food safety-related values, opinions, and perceptions, particularly as it relates to the cultural element of religion. The most apparent patterns were the significance respondents placed on faith, handwashing, partiality to taste over other factors of food selection, and the value of women and healthcare providers in food safety information dissemination.

These resources were developed to inform policy decisions and build capacity at the Bangladesh Food Safety Authority (BFSA). As the BFSA establishes itself to be the proper authority on food safety issues, it will be well-served to align national culture considerations like the Islamic faith with data-driven, scientific findings when working to improve food safety policy.

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Chapter 1 – Literature Review

1.1 A Brief History of and Motivation for Food Safety Governance

Before the last few hundred years, there was minimal evidence or recordkeeping concerning the occurrence of foodborne disease (Motarjemi et al., 2014). Foodborne disease, also called foodborne infection, food poisoning, or foodborne illness, occurs following exposure to physical, chemical, and biological hazards present in food (Singh et al., 2019). The effects can range from mild to deadly consequences (Singh et al., 2019). Today, food safety specialists use data collection tools and programs to gather and analyze samples from food production facilities, food service establishments, and patients experiencing the symptoms of foodborne disease.

These tools perform the critical role of informing public health professionals of the size, scope, and source of an outbreak, but the global burden of foodborne disease remains substantial. Worldwide, foodborne illnesses account for an estimated 420,000 deaths, 30% of which are connected to children under five years of age (WHO, 2021b). At the local, regional, national, and international levels, policies, both formal and informal, aim to address this public health crisis. Public and private sector successes and failures can be identified and analyzed over time, and policymakers can learn much from these experiences.

Though the scientific study of the causes and effects of foodborne disease is a relatively recent development, such ailments have impacted public health since prehistoric times. Whether conscious or unconscious to the deleterious impact of foodborne illness, cultures have been recommending, or in some cases requiring, food preparation and consumption-related practices for millennia. An epidemiologic justification for such methods may not have always been present.

Still, the enforcement of and compliance with guidelines have saved generations of humans from poor food safety-induced harm.

1.1.1 Prehistoric Times

The earliest humans had no choice but to be “opportunistic” eaters (Motarjemi et al., 2014, p. 1). For these ancestors, the option was to “gather or kill” whatever was available on the land and in the waters to which they had access (Motarjemi et al., 2014, p. 1). Their diets were likely defined by sporadic periods of feast, eating those stores, and famine. The feasts in no small part included the consumption of already dead and decaying animals as well as those sickened and weakened, which were easier to obtain (Motarjemi et al., 2014).

While the human microbiome can adapt to and manage specific microbial challenges, evidence suggests that the life expectancy of humans during this era was only 20-30 years, with poor health being a common cause of death (Motarjemi et al., 2014). After the addition of fire to the food preparation process, fresh and stored foods likely became safer as the heat presumably killed a large percentage of any present and potentially pathogenic microorganisms (Motarjemi et al., 2014). Besides changing the taste and texture of food, other preservation methods like salting, drying, and fermenting also inhibited microbial growth, leading to significant improvements in food safety (Griffith, 2006). Records of the earliest Chinese civilizations indicate the practice of preserving vegetables through fermentation (Griffith, 2006). Fermentation remains a central component of Chinese cuisine.

Trial-and-error may have been the best teacher of safe food selection, preparation, and consumption practices for these earliest humans (Griffith, 2006; Motarjemi et al., 2014). For items like berries and mushrooms, the passed-down knowledge of tribal elders would have been the most

valuable source of this information (Motarjemi et al., 2014). This practice of acting on the food-related advice of community leaders is among the first examples of informal policies around food consumption. The incentives to act accordingly were clear: follow the example of elders or risk death when trying something new.

1.1.2 Ancient Egypt

Though organized recordkeeping is a more modern reference source, the remnants of our forbearers provide evidence of foodborne disease. In ancient Egypt, the practice of mummification has allowed for the availability of “coprolites (desiccated or fossilized feces or intestinal contents)” (Motarjemi et al., 2014, p. 2). Unlike soft tissue, coprolites remain in a state to be studied, and from them, archaeologists have identified “beef and pork tapeworms, liver flukes, whipworms, guinea worms, huge intestinal roundworms, *Trichinella*, *Ascaris*, and many other food and waterborne parasites,” (Motarjemi et al., 2014, p. 2). With this physical evidence, scientists can deduce that ancient Egyptians experienced foodborne illness.

While “highly structured and sophisticated” as a culture, the same cannot be said about their hygienic and sanitation practices of these societies (Motarjemi et al., 2014, p. 2). The lack of handwashing and other hygienic and sanitary precautions exposed Egyptians of all classes to infections related to spreading microorganisms and pathogens from the hands and other objects to the mouth. (Motarjemi et al., 2014). This lack of formal or informal policies around food safety and public health was at the expense of the Egyptian population.

1.1.3 Biblical Times

The Jewish Torah, also the Old Testament of the Christian Bible, makes repeated references to food consumption. These references include the description of foods that were prohibited from eating, proper means of food preparation, and “the pathological conditions that could result from improper consumption” (Motarjemi et al., 2014, p. 2). Collectively, these directives, in addition to law Moses received from G-d on Mount Sinai and transposed in the Talmud (ancient teachings), inform Jewish dietary laws called kosher food laws (Regenstein et al., 2003). Similar to Jewish dietary laws but limited in scope, halal food laws dictate what is permitted (halal also extends beyond food and drink to clothing, occupations, relationships, etc.) or prohibited (haram) for believers of the Islamic faith (Riaz & Chaudry, 2003). However, halal food laws originated later—in the 7th century—and are found in the Muslim Quran and Hadith (the traditions of the Prophet Muhammad) (Riaz & Chaudry, 2003).

Contrary to popular belief, Jewish dietary laws, or kosher laws, do not stem from public health or hygiene concerns. Some scholars identify the presence and related health-based consequences of trichinosis in pork as its reason for prohibition from consumption. However, Regenstein et al. (2003) explain this connection as dubious for three main reasons. The first is that trichinosis is not limited to pigs and pork products. Even if it were, traditional Jewish cooking methods should provide sufficient pathogen control (Regenstein et al., 2003). The second reason given by Regenstein et al. (2003) is the lack of evidence of trichinosis in mummified pork. Thirdly, the likelihood that ancient Israelites could have made the association between trichinosis and pork consumption is minimal because of the relatively long incubation period of the pathogen (10 to 14 d) (Regenstein et al., 2003). Instead, the purpose of these laws on an individual level is “to aspire to holiness and perfection by emphasizing certain moral and ethical obligations” (Motarjemi et al.,

2014, p. 3). For Jews, following these laws is a pursuit of freedom and autonomy in the moral sense; successful adherence to these laws is considered an indication that one has mastered manhood (Regenstein et al., 2003). These laws outline what is acceptable for Jews and generally relate to specific animals, the consumption of blood, and the mixing milk and meat, the latter two of which are prohibited (Regenstein et al., 2003). However disconnected from public health and hygienic motivations, many of the practices outlined in the Jewish dietary laws also align with human health and sanitation needs.

Within halal food laws, the consumption of specific animals (namely pork), blood, and alcohol are prohibited (Regenstein et al., 2003). Halal food laws differ from kosher in that their primary goal in practice is to advance wellness, including health, among Muslims (Riaz & Chaudry, 2003). Freedom is also emphasized in these eating and drinking practices and can be achieved without limitation, except for that which is specifically denoted as haram (prohibited) (Regenstein et al., 2003). By following these practices, Muslims are seen to be living their lives in accordance with God's intention. As a result, they believe that everything halal will be beneficial for human consumption.

The goal to earn favor with one's creator is about as formal as a policy can be. Regardless of the reasoning behind following such guidelines, Islamic and Jewish believers who practiced the dietary laws of their faiths have experienced substantially fewer instances of gastrointestinal disease than their cultural counterparts (Motarjemi et al., 2014). There could be many reasons for this salubrious outcome, but in effect, these laws "happened to make good sanitary sense" (Motarjemi et al., 2014, p. 3)

1.1.4 Old Europe

One government policy related to food safety was widespread among ancient Greek royalty: food tasters. The practice of intentional food poisoning is one of the earlier forms of what is today considered to be bioterrorism. At the time, however, microbial swabs, chemical residue tests, etc., were not available to deduce the source and severity of the risk. Instead, the life-or-death reaction of a human body was used as the indication for the absence or presence of a deleterious adulterant.

During this time, food adulteration was also completed without malicious intent. Diseased animals, animals that had died before slaughter due to disease, and other unsuitable ingredients were commonplace. Spices like nutmeg could mask the otherwise pungent smell and unpleasant taste of spoiled meat (Motarjemi et al., 2014). Theophrastus (372-287 BC), a Greek plant pathologist and successor to Aristotle, published a ten-volume treatise, "Enquiry into the Plants," which reported on the use of food adulterants for economic reasons (Fortin, 2009).

Ancient Roman Law went so far as to codify its concern for the adulteration of food with punishments that could result in condemnation to the mines or temporary exile (Fortin, 2009). In the 13th century, trade guilds, including bakers, butchers, cooks, fruiterers, and others, were within their rights to search and seize products deemed unwholesome (Fortin, 2009). In the latter example, the primary motivation was to protect the markets by maintaining the integrity of goods sold. This goal exemplifies the importance of quality and safety standards in gaining competitive economic advantage and the opportunity for legal action to support the pursuit of financial success (Fortin, 2009).

1.1.5 Modern US History

The United States is now considered to be a global leader in food safety, but the field has not always been widely regarded as a public health priority. This is both because the risk was previously not widely understood, and its consequences were not widely felt (Fortin, 2009). In the colonial era of the United States, state and local governments had chief oversight in regulating domestic food and food-related products, while the federal government oversaw imported foods (Fortin, 2009). In the mid-1800s, food production experienced a shift from home to factory. As a result, food and ingredients needed to travel increased distances to food processors and manufacturers. This change challenged the assumptions of quality and safety among consumers and producers alike (Fortin, 2009). Many manufacturers became concerned with the perceived integrity of their products and the market implications of counterparts with dishonest and unsafe items (Fortin, 2009). Through this evolving landscape and growth in national markets, demand for legislative oversight increased (Fortin, 2009).

The United States Department of Agriculture was the result of an act of Congress under the administration of President Abraham Lincoln in 12 Stat. 387, now codified at 7 USC § 2201 (1862). The Act marked the need for formalized government oversight into food and agriculture. The government entity was created to “diffuse among the people of the United States useful information on subjects connected with agriculture in the most general and comprehensive sense of that word, and to procure, propagate, and distribute among the people new and valuable seeds and plants,” (12 Stat. 387; 7 USC § 2201). The foundation of Federal food safety policy in the United States, however, began with Congress’ initiative to prohibit the adulteration of domestic and imported food.

The first federal food protection law was enacted by Congress in 1883 to prevent the importation of adulterated tea (Fortin, 2009). Shortly thereafter, Congress passed a statute in 1886 that added a tax on margarine and sought to regulate products that imitated butter and cheese (Merrill, 2005). Dairy farmers and the dairy industry played an outsized role in influencing this legislation, as they sought to maintain the competitiveness of their products (Fortin, 2009). Three years following the latter statute came the appropriation of funds for a “Chemical Division”, which is the regulatory authority we now call the Food and Drug Administration (FDA) (Merrill, 2005).

Harvey Wiley, chief chemist at US Bureau of Chemistry and later the first commissioner of the FDA “expanded research and testing of food and documented the widespread adulteration” of food products (Fortin, 2009). Dr. Wiley emphasized a federal approach to food and drug law, and his publications were instrumental in engaging the public in that push (Fortin, 2009). As part of Dr. Wiley’s aggressive approach to regulatory change, he spearheaded the “Poison Squad” (Fortin, 2009). As members of this daring group, volunteers tested dubious food additives, including boric acid and formaldehyde, to demonstrate how consumption impacted human health (Fortin, 2009). This approach, however unconventional, provides a call back to the trial-and-error ways of our Stone Age ancestors and represented the drastic steps Dr. Wiley was willing to take to advance food safety (Fortin, 2009).

In the 1890s, Congress began to turn its focus toward meat inspection as European countries, which were primary customers of the American meat industry, expressed concerns about the safety of American beef (Hulebak & Schlosser, 2002). These safety concerns stemmed from issues of animal health connected to diseases like bovine pleuro-pneumonia, a lung disease in cattle, as well as trichinosis, a parasite commonly associated with pork products (Kastner, 2011). Both diseases threatened American access into European export markets (Kastner, 2011). This

consequence compromised the industry's profitability and drove the US to action (Kastner, 2011). Congress had previously tasked the US Department of Agriculture (USDA) with regulating the US meat supply. In 1891, the legislative body, motivated mainly by economic factors, added the responsibility of inspecting livestock, both ante- and postmortem (Hulebak & Schlosser, 2002).

Around this same period, so-called “muckraking” journalists—for their work to expose corruption and misconduct in the food industry—were the final push for this era of campaigning for improved food safety standards. In particular, Upton Sinclair's 1905 work of fiction, *The Jungle*, is a detailed depiction of the gross abuse of immigrant labor in stockyards and slaughterhouses of Chicago. The author's hope for the book was to highlight the plight of immigrant laborers and their unacceptable working conditions. Regardless of Sinclair's intent, his writing helped to persuade then-President Theodore Roosevelt to execute the passage of the Pure Food and Drug Act and the Federal Meat Inspection Act. The pair of legislation was passed on the same day, June 30, 1906, and transformed the regulatory practices of the food industry (Fortin, 2009; Merrill, 2005). In response to the book's widespread popularity and impact on food safety, Sinclair reflected, “I aimed at the public's heart and by accident I hit it in the stomach” (Chicago Tribune, 2006).

The Food, Drug, and Cosmetic Act of 1938 (FD&CA) was written and passed following the consequential use of diethylene glycol, a sweet-tasting liquid, as a palatizing additive for sulfanilamide (Fortin, 2009). The product was never tested for safety because such a test wasn't required prior to the passage of FD&CA. Sulfanilamide was an effective treatment for strep throat, but it naturally tasted unappetizing (Fortin, 2009). Though the addition of diethylene glycol reportedly improved the taste, it tragically resulted in at least 107 deaths, many of whom were children (Fortin, 2009).

The FD&CA also “provided that safe tolerances be set for unavoidable poisonous substances in food; authorized standards of identity, quality, and fill-of-container for foods; authorized factory inspections; and added court injunctions to the previous penalties of seizures and prosecutions” (Fortin, 2009). In 1958, the Food Additives Amendment to the FD&CA required the evaluation of food additives to establish food safety (Fortin, 2009). The Delaney Clause of the Food Additives Amendment forbade the use of any substance in food that was found to cause cancer in animals or humans (Fortin, 2009). In 1960, the Color Additive Amendment to the FD&CA required manufacturers to establish the safety of color additives in foods, drugs, and cosmetics (Fortin, 2009). Each of these measures was in response to often deleterious or deadly crises but served to improve the outlook for food safety in the United States through legislation. These actions offered a model for the rest of the world.

1.1.6 Present Day Advances in the US

What first began as a collaboration between the Pillsbury Company, the National Aeronautics and Space Administration (NASA), and the US Army Laboratories to protect the quality and safety of food consumed in space during the 1960s has become one of the most important advancements to food safety systems and risk management in the modern age (Safe Food Alliance Team, 2019). This collaboration amounted to the principles of Hazard Analysis and Critical Control Points (HACCP), with the portion of its namesake, “CCP,” having been repurposed from NASA’s engineering management requirements (Safe Food Alliance Team, 2019). This approach moved the primary focus of food safety away from finished product analysis and instead emphasized monitoring, testing, and sampling throughout the food production process while targeting vulnerabilities.

As years passed and scientific and legislative communities began to accept the effectiveness of HACCP, the concept was adapted in 1973 for a broader scope of the food industry through low-acid canned foods regulations (Hulebak & Schlosser, 2002; Safe Food Alliance Team, 2019). The primary intent of this legislation was to combat the related risk of botulism. The new regulations were implemented in part through an inspection training program titled “Food Safety through Hazard Analysis and Critical Control Point System” (Hulebak & Schlosser, 2002; Safe Food Alliance Team, 2019). This training program, held in September of 1972, was the first of its kind to educate food facilities on the use of HACCP (Safe Food Alliance Team, 2019). Now nearly 50 years later, many companies are leading similar training for food businesses around the world to promote education on HACCP principles.

The most profound push for the integration of HACCP into the broader food system, however, was in reaction to the devastating and highly public *E. coli* O157:H7 outbreak connected to hamburgers served at Jack in the Box restaurants in December of 1992 (Nestle, 2010). Investigators of the scandal pinned wrongdoing most directly on Jack in the Box. Still, the outbreak also exposed several failures within the US food system that ultimately led to the untimely deaths of four young children and sickness in countless others (Nestle, 2010). At the time, the meatpackers who supplied the beef were compliant with Federal regulations, but few microbial samples were collected or tested at the inspection stage (Nestle, 2010). Additionally, Jack in the Box was cooking hamburgers to 120 °F (with the goal of improving taste and texture) instead of following the FDA guidelines of 140 °F (Nestle, 2010). Because of the publicity surrounding this food safety scandal, the status quo was no longer an option, at least as it related to ground beef.

While this Jack in the Box outbreak was a catalyst for the widespread implementation of HACCP, true food safety progress within the whole food industry took years to achieve and a

plethora of special interests to overcome (Nestle, 2010). In 1994 and in response to the Jack in the Box hamburger outbreak, the Food Safety and Inspection Service of the USDA exclusively declared *E. coli* O157:H7 an adulterant, which requires testing in the singular product of raw ground beef (FSIS, 2002; Nestle, 2010). This limited stance, however, left out the consideration of a variety of other potentially lethal pathogens and food-based vehicles.

It was also in the year 1994 that the FDA first proposed the voluntary application of HACCP rules, though not within the realm of red meat. Seafood and shellfish were the first to undergo pilot testing, followed by raw sprouts and eggs and later fresh juices (Nestle, 2010). Other than for seafood and shellfish, all these programs were, again, voluntary, and none of them required microbial testing. It was not until 1996 that a plan for implementing HACCP began to take shape for the meat and poultry industries. Pathogen Reduction: HACCP plans, as they were called, marked a significant shift in USDA food safety policy and were to be carried out by large companies beginning in January 1998 and smaller companies by January 2000. These new rules required meat and poultry companies to use these HACCP plans to test for generic *E. coli*, have USDA inspectors test ground meat for *E. coli* O157:H7 and spot check for *Salmonella* spp., and meet acceptable standards for pathogen reduction (Nestle, 2010).

In the years to come, the United States would experience many other transformative crises of food safety. These included but were not limited to the biological threats following the attack on New York City's World Trade Center on September 11, 2001; Melamine adulteration in pet food (2007) and infant formula (2008) from Chinese food production facilities; a spinach outbreak of *E. coli* O157:H7 (2006) in the US through which 50 acres of spinach production sickened people from 26 states; and *Salmonella* Typhimurium-contaminated peanut butter produced by the Peanut Corporation of America, which resulted in the largest outbreak in US history with many schools

and nursing homes as impacted consumers. Following each of these experiences, there was a public outcry, political reactions and promises, consequences for some, and business-as-usual for many more. It wasn't until the Food Safety Modernization Act (FSMA) that a true pivot for the sake of food safety that the system of largely performative reactions gave way to a more systematic method.

In the US food system, the most consequential application of HACCP principles has been through FSMA in the form of “Preventive Controls” (Safe Food Alliance Team, 2019). After much debate, then-President Barack Obama signed this legislation into US federal law in January 2011 as an amendment to the FD&CA (1938). The goal of this comprehensive legislation was to shift the approach of food safety from response to prevention and to view food safety as a shared responsibility among all involved parties. Additionally, the Act granted enforcement authority to the FDA for prevention- and risk-based food safety standards. Beyond regulatory initiatives, food safety has gained momentum through improved methods of monitoring, measuring, and reporting on instances of foodborne disease. Programs like the Centers for Disease Control and Prevention's PulseNet and FoodNet provide data necessary for executing food safety policy and prevention efforts (CDC, 2020). Many years in, with many final rules enacted, the food safety system in the US reflects science, protocol, and standardization for the benefit of producers and consumers alike.

1.1.7 Summary

In ancient history, there is evidence of individual experiments, instincts, and advice relenting to religious authorities on food and dietary law, as is seen with kosher and halal restrictions. In more recent history, the diets of populations have become more dependent on the discretion of secular governments. Now in the age of scientific reasoning, governments must

employ appropriate, evidence-based enforcement and regulatory mechanisms to keep people and their food safe.

Within those governments, most of the historical innovation around food safety was a reaction to crises. These crises have taken many forms, including economic loss related to trade; public outcry after senseless deaths from adulteration or contamination; or the attempt to salvage the reputation of a country, company, or commodity. Now many crises in, there is no reason to wait for the next outbreak. With a wide range of tools, we can plan for, prevent, and minimize the potential effects of crises long before they impact public health.

1.2 International Food Safety Systems

Particularly in the past century, governments have turned to policy solutions when approaching food safety challenges. Not all policies are created equally or equitably, however. The only way to objectively measure and monitor the differences between food safety policies and related outcomes is through comparative data collection. Unfortunately, “there is currently no metric that captures the entire food safety system, and performance data are not collected strategically on a global scale” (Le Vallée & Charlebois, 2014, p. 2). In place of a global initiative for food safety accountability, a disparate system of trade-related expectations, exclusive ranking practices, and regional exchange groups dominate the regulatory landscape.

The Global Outbreak Alert and Response Network (GOARN) through the World Health Organization (WHO) is an example of a far-reaching effort to provide technical support, risk assessment, and improved response capacity to address public health crises (WHO, 2020). Another is the International Food Safety Authorities Network (INFOSAN), an organization that emphasizes the importance of transparency and information exchange within the global food supply chain

(WHO, 2021a). Both of these initiatives represent promising developments in international collaboration and cooperation but depend heavily on international participation and member data collection and sharing. The former is challenged by the latter when countries lack the capacity to measure and monitor their food safety systems.

Many countries in the Global North, particularly Canada, Ireland, and France, display high levels of transparency in written standards and efficacy in execution (Le Vallée & Charlebois, 2014). These factors enable a systematic ranking and subsequent benchmarking. The 2014 World Ranking of Food Safety Performance report evaluated 17 Organization for Economic Co-operation and Development (OECD) countries based on ten food safety performance indicators within the domains of risk assessment, risk management, and risk communication (Le Vallée & Charlebois, 2014). Additional rankings for global food safety performance consider food traceability (2014), and food labeling and allergenic risks (2013) (Le Vallée & Charlebois, 2014). The Economist Intelligence Unit (EIU) produces an annual Global Food Security Index through which it publishes three food safety indicators, but it is limited in scope (Le Vallée & Charlebois, 2014). Comparison is a primary tool of evaluation. Robust data collection and transparency within each government are important for fair and objective global assessments. Limited information hinders the potential for valid comparison of food safety processes and outcomes.

The international food safety community relies on the authority of the World Trade Organization (WTO) when working to safeguard plant and animal health as well as economic interests. In this leadership role, the WTO emphasizes the terms of its *Agreement on the Application of Sanitary and Phytosanitary Measures* (the SPS Agreement) (Kastner, 2011). Within this SPS Agreement, Article 3.1 recognizes three multilateral, scientific standard-setting bodies, which includes Codex Alimentarius Commission (Codex), the World Organization for Animal

Health, and the International Plant Protection Convention (IPPC) (Kastner, 2011). Known collectively as “The Three Sisters,” each listed body represents a set of complementary standards and guidelines to shape international decision-making on food safety, animal health, and plant health, respectively (Kastner, 2011). Together, The Three Sisters, along with the World Trade Organization (WTO), Secretariat, and SPS Committee, encourage best practices for producers and manufacturers as well as nation-state governments (Kastner, 2011).

Trade blocs like the Southern Common Market (MERCOSUR) and the Association of Southeast Asian trade (ASEAN) can expand on these best practices as members strive to be competitive in international markets (MERCOSUR, 2021). Southern Common Market was formed in 1991 by Argentina, Brazil, Paraguay, Uruguay, Venezuela, and Bolivia to promote collaboration among business ventures and integrate investment opportunities within the region (MERCOSUR, 2021). Through agreements addressing commercial, political, or cooperation-based initiatives, members benefit from the resources and markets of nations and organizations around the world (MERCOSUR, 2021). The Association of Southeast Asian Trade (ASEAN) operates with similar intentions. By joining forces through ASEAN, the countries of Brunei Darussalam, Burma, Cambodia, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand, and Vietnam increase their collective standing in the world as a dynamic sizable trading partner. Together, ASEAN represents “a market with a GDP of more than \$2.9 trillion and a population of 647 million people,” far more than any nation on its own (USTR, 2021). At this time, the country of Bangladesh does not belong to a major trade bloc (Khatun, 2020).

1.2.1 Domestic v. Export Market Systems

In practice, each of the standard-setting bodies, guidelines, benchmarks, and trade blocs described above operate in the context of exports and international trade. International groups and agreements act as rule-makers and set expectations, but each individual government must establish its own standards. In the Global North, countries operate their food systems with considerations for the environment and public health, but in developing countries, the challenges of malnutrition remain dominant themes of concern (Hammoudi & Hamza, 2015). When a nation struggles to meet its basic needs, such as providing enough food, prioritizing food safety can be overwhelming. As a result, food safety progress is limited in developing countries, and domestic consumers have historically paid the price with their health.

Particularly when applied to food safety in low- and middle-income countries, domestic food products are often inferior to their exported counterparts for reasons related to oversight and resource allocation (Hammoudi & Hamza, 2015). Compared to high-income countries, low- and middle-income countries experience less standardization and fewer sanitary requirements in their domestic markets (Hammoudi & Hamza, 2015). In effect, local markets within developing countries are, in certain circumstances, susceptible to “dumping” (Unnevehr, 2015). In this context, dumping is the practice of releasing food products for sale in the domestic market that would not meet international trading partners' quality or safety standards. Compromised food safety can lead to foodborne illness. In contrast, developing countries' export markets are often “carefully controlled by customers from developed countries” (Hammoudi & Hamza, 2015, p. 21). These international customers make financial investments and provide human capital, technical expertise, and equipment.

Foreign stakeholders do not necessarily make investments with the interests of the home country in mind, but over time could improve the food safety landscape of the latter (Hammoudi & Hamza, 2015). Constructive spillover effects from the development of select export sectors including the investments listed above, could benefit domestic producers and consumers (Hammoudi & Hamza, 2015). This form of externality is a source of hope for a salubrious future for food safety, but additional measures are necessary to expedite the food safety development process.

1.3 Behavior change on a policy level

In general and as described by the late philosopher Adam Smith in *An Inquiry into the Nature and Causes of the Wealth of Nations*, the primary responsibilities of a government are threefold: ensuring national defense, enforcing law and order, and providing certain public goods (Smith, 1776). Because it directly benefits the public's wellbeing, food safety is a public good for both national and international government systems (Unnevehr, 2007). Policies are the mechanisms with which governments influence outcomes and drive change around subjects such as food safety. These policies can range from voluntary to mandatory, formal to informal, and take on many forms (Kastner, 2021; Mozaffarian et al., 2018). These forms include proposed laws or bills; laws, acts, and statutes approved by legislative and executive branches; government agency interpretation and application of legislation and implementation through regulations; court decisions; guidelines, which serve as recommendations but without mandate; or directives (Mozaffarian et al., 2018). Policies can be divided even further by classification: city, state, or national government levels; international agencies; organizations like businesses, schools, healthcare faculties, etc.; and local neighborhoods and communities (Mozaffarian et al., 2018)

When governments seek to change behavior, they typically employ one or more of the following tactics within policy interventions: incentives, bans and mandates, information campaigns, and nudges (Tummers, 2019). Policies effectively influence behavior and drive people to change when they incorporate appropriate tactics and enjoy support from various stakeholders (Tummers, 2019). One of the more popular and compelling behavior change publications of the last few decades is Thaler and Sunstein's *Nudge* (2008). As the name suggests, the book describes the practice of gently influencing human behavior through public policy in the realms of health, finance, education, the environment, and interpersonal relationships. *Nudge* argues that the success of behavior change policies is mainly dependent on the presentation of information and choices.

Because humans are susceptible to any number of internal and external influencers—fallacies, heuristics, and biases—people may benefit from a “choice architecture” when making decisions (Thaler & Sunstein, 2009). A choice architecture, again, relies on presentation, and Thaler and Sunstein recommend the “nudge” in this context (Thaler & Sunstein, 2009). In the context of food safety, an example of a “nudge” could be in labeling. Customers could be influenced in their purchase decision if packaging indicated the level of food safety to be expected upon consumption. Alternatively, if food producers had increased transparency requirements related to food safety, it may “nudge” them into improve related measures or standards.

Another notable work of the last decade to analyze behavioral science is *Thinking, Fast and Slow* by Daniel Kahneman (2011). Kahneman, a recipient of the Nobel laureate in Economic Sciences among other accomplishments, examines the human thought processes that drive decision-making. His main argument is that two systems of thinking, “System 1,” instinctive and automatic, and “System 2,” deliberate and calculating, are regularly in competition but can also be complementary to one another (Kahneman, 2011).

Questions and concerns around food safety likely fall more into the System 1 area of thinking. Food is consumed with relative frequency, and foodborne illness is a relatively underappreciated public health concern. In the absence of alternative information, the average consumer may quickly judge the integrity of a food item based on the taste and smell. Unfortunately, taste and smell are not reliable indicators for the safety of food, but rather the possible desirable or undesirable qualities of the food (Van Rijswijk & Frewer, 2008). Food safety and food quality are not interchangeable, nor do they have a causal relationship (Van Rijswijk & Frewer, 2008). With food safety, consumers have limited information about the risks associated with consuming certain food products. They cannot know for sure what their food was or was not exposed to, how the food was stored, and if it has maintained its integrity from the farm to the point of sale.

Food producers have many tools at their disposal to keep food safe. In addition to good sanitation and hygiene practices from employees, food producers can use heat; pressure; pasteurization (a treatment combining heat and pressure); food-grade sanitizers; and gamma, electron beam, or x-irradiation technology to reduce the microbial load and reduce potentially pathogenic bacteria from growing. (Tauxe, 2001). The type of food and the amount of processing required for sale will influence the devices food producers can employ before products reach the consumer.

For this study, the focus is on the food safety instruments of the consumer, which involve far less technology and fewer resources. To inform consumers of their ability to preserve or reinforce the safety of their food within the home, the World Health Organization (WHO) has focused on the message of “Five Keys to Safer Food.” (WHO, 2006). These keys embrace (1) keeping the self, food, and food surfaces and utensils clean; (2) separating raw and cooked; (3)

cooking food thoroughly; (4) keeping food at safe temperatures; and (5) using safe water and raw materials (WHO, 2006). The WHO has translated the "Five Keys to Safer Food" manual into more than 87 languages for audiences worldwide, Bangladesh included (WHO, 2006). Sharing the message of this manual is an example of an information campaign described by Tummers (2019).

Information campaigns, or health communication campaigns, can be presented in three primary forms and often occur in tandem: (i) direct exposure, (ii) indirect exposure, and (iii) institutional diffusion (Popova, 2016). Direct exposure follows the receipt of campaign messaging, indirect exposure involves exposure to campaign messaging through interpersonal conversation, and institutional diffusion results when information campaigns lead to changes in public policy (Popova, 2016). Within these forms, campaign leaders can place emphasis on either individual or institutional responsibility (Popova, 2016). For example, when sharing messages with the goal of reducing tobacco use, campaigns demonizing the tobacco industry were found to be more effective at changing behavior than those displaying the negative consequences of smoking on an individual level (Popova, 2016). Food safety, however, is a shared responsibility. Considering the many points of potential hazards from farm to fork, to frame the onus exclusively on one group (e.g., producers, consumers, or regulators) could have undue consequences ranging from public health to the health of the economy.

With food safety, the style of the messaging, rather than the identification of a scapegoat, may be more appropriate. In a study conducted on food safety messaging preferences among African-American and Latino consumers, participants shared the preferences for informational food safety messages or informational, guilt-inducing, and fear-induced messages, respectively (Patten et al., 2018). These findings suggest a cultural element to informational campaign messaging preferences.

Chapter 2 –Bangladesh

2.1 A Brief History of Bangladesh

Perhaps the most defining characteristic of the country of Bangladesh is the nation's ability to overcome the seemingly insurmountable forces of resource scarcity, nature, and violence. At present, the nation's population is about 163 million people with a land area of 56,977 mi², which makes Bangladesh one of the most population-dense nations in the world (World Bank, 2019). Another notable distinction of Bangladesh is its delta landscape and propensity for regular, catastrophic flooding, as 80% of the country lies in a floodplain (Van Schendel, 2020). Finally, after a long-fought and hard-won war of independence from Pakistan, Bangladesh still struggles with self-governance as corruption, fear-mongering, and political in-fighting persist (Riaz, 2016). This reality of intense demand for resources in an environment that is vulnerable to natural disasters as well as intense public and government discord has developed a Bangladeshi culture of resilience and boundary-pushing (Van Schendel, 2020).

Bangladesh gained independence with the help of its Indian neighbors in 1971. The nation had previously been designated as Muslim-majority East Pakistan and Bengal as part of British India (Sabharwal & Berman, 2013). Many Buddhist, Hindu, and Muslim dynasties ruled the largely agrarian society before British influence and colonial rule, though the Islamic faith remains a dominant element of the culture and institutions of Bangladesh. The struggle for sovereignty was marked by immense violence and loss stemming from genocide, and a culture supportive of martyrdom emerged along with the new nation (Riaz, 2016).

One of the new country's most notorious martyrs was Sheikh Mujibur Rahman, a leader of the Awami League (which continues to be a dominant political party in Bangladesh) and a champion of the Bangladesh Liberation Movement. Throughout his life, Sheikh Mujib was jailed

for his efforts to advance the causes of resistance against the West Pakistani Army and to support Bangladeshi independence (Riaz, 2016). Bangladesh was founded in large part due to the sacrifice and leadership of Sheikh Mujib, and he filled the subsequent roles of president and prime minister under various forms of Bangladeshi government (Riaz, 2016). Tragically, Mujibur was assassinated in 1975. Though the nation remained independent, it resorted to military rule until the first democratic elections in 1991.

Nepotism and a dictatorship under the guise of an emerging democracy are components of political leadership in Bangladesh (Riaz, 2016). The current and longest-serving Prime Minister of Bangladesh is Sheikh Hasina, the daughter of Sheikh Mujib and a member of the Awami League (Riaz, 2016). Many members of their family also serve in various ranks of the government. However, Sheikh Hasina's leadership marks a shift in trajectory with initiatives that have led to economic growth, reduction in poverty, a decrease in maternal mortality and infant mortality rates, and an increase in equitable access to education as well as life expectancy (Riaz, 2016). Each of these indicators displays remarkable progress on the path to development, but as it relates to this research, the most compelling initiative is that which surrounds food safety.

2.2 The Development of Food Safety Systems in Bangladesh

The current food safety concerns in Bangladesh are adulteration and unhygienic practices related to personal cleanliness and the handling of food at all levels of production (Ali, 2013; Noor & Feroz, 2015). Though there is limited incidence data, public health experts consider food adulteration and contamination to be major threats to public health (Noor & Feroz, 2015). They may lead to enteric disease, malnutrition, and a variety of chronic diseases (Noor & Feroz, 2015).

Decades of duplicative laws, a lack of coordination among governing bodies, and overlapping oversight responsibilities have led to ineffective food safety governance in Bangladesh.

The first food safety-based laws in Bangladesh are contained in the Penal Code, 1860 (PC 1860) (Ali, 2013). Sections 272 and 273 of PC 1860 specifically identify food adulteration as a criminal offense, as do various sections of three subsequent laws: the Pure Food Ordinance, 1959; the Special Powers Act, 1974; Consumer Rights Protection Act, 2009; and the most recent food safety legislation, the Food Safety Act, 2013. This multiplicity of laws for singular purposes is not a common legislative strategy, and this lack of legislative integration likely leads to confusion among manufacturers, processors, retailers, and enforcement authorities (Ali, 2013).

Despite its duplicative nature, the Food Safety Act, 2013, which was enacted in February of 2015, is landmark legislation for many reasons. As it was written, the Act seeks to modernize institutional food safety rules and streamline the approach to enforcement. One of the most substantial changes brought about by the Act was its charge to establish the Bangladesh Food Safety Authority (BFSA). This government agency is housed within the Ministry of Food and was modeled after the United States Food and Drug Administration (FDA). BFSA was created to “regulate and monitor the activities related to manufacture, import, processing, storage, distribution and sale of food so as to ensure access to safe food through the exercise of appropriate scientific methods, and to coordinate the activities of all the organizations concerned with food safety management” (Act No. 43, 2013).

In 2018, the government of Bangladesh declared February 2nd, the 3-year anniversary enacting of the Food Safety Act, 2013, and the creation of BFSA, to be National Food Safety Day. This annual celebration signifies the commitment of the country to provide safe food for everyone. The motivation for this celebration stems from two main objectives: improving public health and

expanding economic opportunity. Through this event, both Bangladeshi President Abdul Hamid and Prime Minister Sheikh Hasina have issued messages and commitments to making progress toward food safety goals. Though progress is evident in the increase of food safety personnel, the following investments are still needed: education-based programming and outreach, competency training and appropriate infrastructure to conduct testing and improvements in food safety coordination and collaboration.

2.3 Persisting Challenges for Food Safety in Bangladesh

Beyond the broad strokes of coordination led by BFSA, the government of Bangladesh has divided the responsibilities of food safety governance and oversight among 15 federal ministries and 18 agencies. This widespread delegation has led to inefficiencies, resource waste, confusion, and duplication in communication, management, and regulatory responsibilities. A gap analysis conducted by Alcumus Bangladesh shows that challenges with overlapping laws and authority, insufficient resources to implement laws as they are written, and gaps in coordination and capacity have come at the expense of efficient programmatic execution (Fatema, 2020).

Gaps in governance are experienced in many different forms in Bangladesh. Notably, there is a lack of government programs designed to sufficiently measure, monitor, and mitigate the sources of food safety-related indicators, which can exacerbate the consequences of foodborne illness while underappreciating the magnitude of the problem. The availability of this data is essential to the construction of relevant policy solutions. For food safety-related information that is available, minimal transparency and willingness to share have led to an underestimated scope of foodborne illness in the eyes of food producers and consumers alike. This lack of awareness can dampen efforts to educate the public on the urgency of the problem. Context-based solutions

that account for the culture around food safety coupled with scientifically informed decision-making are also missing in the legislative process.

At all levels, the country of Bangladesh needs help creating the infrastructure needed to execute food safety programs. The technical capacity to standardize the training of personnel to carry out sampling procedures and interpret the test results is a significant shortcoming. These challenges make governance and oversight difficult, even with vocal support for food safety initiatives at the highest levels of government. Technical leadership at the government level, robust resource investment in food safety systems, and improved coordination among involved parties are imperative priorities for food safety development in Bangladesh.

Each of these priorities offers promising advancements in food safety production, distribution, and regulatory sectors. However, as a shared responsibility, food safety programs must also recognize the active participation of the consumer. Regardless of the relative safety of a food product at the point of sale, environmental factors like temperature, relative humidity, and sanitation can compromise product integrity. Increasing the awareness of regulations, practices, and policies that improve food safety outcomes among the general population is crucial. As more consumers become aware of the consequences of foodborne illness and learn about the methods and mechanisms for improvement, the food safety landscape may begin to evolve. Food safety training, education, and outreach should be the primary tools for improving related knowledge and changing behaviors. For these reasons, this study aims to capture the values, attitudes, and perceptions connected to food safety knowledge, behaviors, and outcomes. This information has the potential to direct the evolution of food safety regulatory and policy instruments and environments, particularly as they apply to the responsibilities of the BFSA.

Chapter 3 – Food Safety Culture Assessment

3.1 Introduction

As the country of Bangladesh strengthens its ability to provide enough food resources for its people, food safety has emerged as a relatively new national priority. The government, namely BFSA, is responsible for creating strategies and regulatory initiatives to improve public health and food safety-related outcomes. Understanding the current food safety environment is necessary to support the development of these new policies and influence behavior. Culture may be the best lens through which to view this information.

To learn more about the application of behavior change interventions, a survey tool was created to capture the perceptions, attitudes, opinions, and values surrounding the culture of food safety in Bangladesh. A religious component, a prominent cultural element in the country, is present throughout the questionnaire.

While other organizations, institutions, and researchers had previously done some survey work to connect food safety practices on an individual level with food safety outcomes in Bangladesh, they paid little attention to food safety culture and values. Previous studies have explored the general attitudes and understanding around food safety practices among consumers (Brewer & Prestat, 2002; Jevšnik et al., 2008) and compared expressed attitudes toward and knowledge of food safety with actions in practice (Odeyemi et al., 2019; Wilcock et al., 2004). Little research has been done on the values and culture of food safety among the general population of consumers, particularly as it relates to religion and Bangladesh.

The Bangladesh Livestock Research Institute, in collaboration with and funded by the International Livestock Research Institute (ILRI) and International Food Policy Research Institute (IFPRI), conducted a food safety study in Bangladesh to evaluate the foodborne pathogens,

chemicals, and metals in the Bangladesh food supply and included a survey component (Bangladesh Livestock Research Institute, 2019). This survey sought to gain information on retailers' and consumers' knowledge, attitude, and practices but did not address comparative values and "why" people behave, believe, or think the way they do. The goal of the Food Safety Culture Assessment was to fill in this information gap. As the BFSA works to strengthen its capacity as a food safety oversight body and rightful public health authority, the results of this survey may provide a resource to BFSA policymakers that would better predict and prepare for the potential reception of rules and regulations in this environment.

3.2 Materials and Methods

Before survey dissemination, the research protocol and data collection tools were reviewed and approved by the Institutional Review Board at Kansas State University (IRB protocol #9925). A survey tool was designed to capture the degree to which, and the context in which, food preparation and consumption practices—especially as they relate to food safety—are flexible to change among the general Bangladeshi population. The questionnaire was created using KoBoToolbox, an online data collection tool developed by the Harvard Humanitarian Initiative (KoBoToolbox, 2021). The final version of this survey tool included multiple-choice, ranked, and short answer questions and was translated into Bangla. Trained student surveyors orally administered the questions in person to survey respondents.

In November of 2019, the Kansas State University organized a day-long survey training program for students from around the country to be trained on survey development and dissemination. A total of 62 students from 16 Bangladeshi universities participated in the training session. The purposes of this training were to: i) provide new knowledge and a certificate of

completion to participants, ii) gain feedback from participants on the relevance and their interpretation of the Food Safety Culture Assessment, and iii) prepare participants to give the Food Safety Culture Assessment in each of Bangladesh's eight divisions. This team of student surveyors confirmed informed consent before orally administering the survey tool and was instructed to select people representing the diversity of their population. No monetary or other incentive was promised or given to survey respondents. Students were tasked with surveying women, men, parents, youth, seniors, and people from a range of occupations and education levels across Bangladesh.

Survey demographics

The project team received 403 completed surveys. Of these results, about 60 % (n=237) of participants were male respondents and 40 % were female (n=161) (Table 3.1). Each of Bangladesh's eight divisions were represented, and the split between rural and urban respondents was nearly even (Table 3.1). In slight contrast, World Bank data describes the percentage of rural Bangladeshis to be closer to 63 % while the urban population is near 37 % (2018).

Survey respondents also represented varying marital statuses, with 53 % married and 41 % single (Table 3.1). Similar percentages were expressed in having or being without caretaking responsibilities, respectively (Table 3.1). The survey results reflect a range of educational achievement, with most holding at least an undergraduate degree (53%), but those with minimal if any education or only primary, secondary, or higher secondary schooling are also included (47%) (Table 3.1). Finally, a significant portion (62%) of respondents were between the ages of 15 and 35—with a smaller number of individuals indicating being younger (3%) or as old as 65 (3%)—which is relatively reflective of information on median age in the country (Islam & Nath, 2012) (Table 3.1).

3.3 Results

3.3.1 Overall results

This survey was written with some recognition of the importance of religion among the Bangladesh population, so results related to religion were of interest. When asked to rank the value of religion compared to traditional foods, social norms, language, traditional clothing, art and literature, and traditional gender, 50% of respondents indicated religion as their first choice of the listed cultural elements (Figure 3.1) to remain unchanged. Societal norms was the most commonly selected second choice (29%), and traditional foods appearing as a common second or third choice (20% for each) (Figure 3.1). Just under 2% of respondents indicated traditional gender roles as their first choice of cultural component to conserve; values for this selection peaked at around the fourth or fifth choice (23% and 20%, respectively, Figure 3.1).

To make connections between food and cultural values, a series of questions addressed feelings around the importance of food preparation and consumption. Forty-nine percent of respondents shared that they think more about the look and taste of food than how it was prepared (Table 3.2). Fewer respondents, 12%, indicated that food consumption has religious significance (Table 3.2). An additional question focused on decision factors in food purchase, and again, the most common answer was taste (67%, Table 3.2).

Food safety was also presented in this survey as an element of public health. Given the survey title (Food Safety Culture Assessment) and the recurring theme of food safety throughout the questionnaire, these questions and connected answers may not accurately represent individual perspectives. However, it is notable that food safety was ranked the most important public health concern (48%) among given choices (including maternal and child health, communicable and non-communicable diseases, and malnutrition) (Figure 3.2). To reinforce the legitimacy of this

expressed importance, many (44%) respondents marked that food safety is something they regularly think about when making choices (Table 3.2). Another question prompted respondents to select the best definition of food safety, and about 50 % correctly defined it as intending to prevent foodborne illness. The second most popular answer (27 %), again, related to the look and taste of food (Table 3.2).

Previous surveys have addressed consumer food safety knowledge, but the literature would benefit from an expanded representation of perceptions around the inherent safety of food among Bangladeshis. In this survey, a question asks respondents to mark all given answer choices that may make people sick. Nearly 60% of people surveyed believed that sick food handlers made other people sick, 46% thought strange colors, smells, and blemishes cause illness, and 45% indicated that foods eaten raw were more likely to make people sick (Table 3.3). Fewer respondents (30%) marked that the processing and handling of food could impact food safety (Table 3.3).

When asked about foodborne illness indicators, most respondents (87%) knew to expect diarrhea, and 40% knew that those who are young, old, pregnant, or immunocompromised were most susceptible (Table 3.3). Eighty-seven percent of respondents shared that they or someone close to them had experienced foodborne illness, and 54% of those experiences resulted in a behavior change: the food was no longer purchased or eaten (Table 3.3). Forty-five percent of respondents indicated they consulted a doctor or other health professional on reducing the risk of foodborne illness (Table 3.3). This answer is consistent with another of this questionnaire's findings that just under 27% of respondents prefer to receive and learn information on topics like food safety from a healthcare provider, which was the most common answer to that question. Thirty-two percent of respondents marked that they no longer purchase the food that caused the

illness from the same seller, but nearly a quarter (22%) of respondents shared that they made no behavior changes following an experience with foodborne illness (Table 3.3).

Sixty percent of respondents saw handwashing, cleanliness of cookware and cooking surfaces, and proper storage as the most important food safety practices. Similar numbers of respondents said that they, themselves, implemented these practices. Respondents did not identify food safety training as commonly as a priority. However, almost all respondents (96%) thought that consumers should have information about the safety of their food, and 95% would be interested to know if their food providers were using good food safety practices (Table 3.2). Contrarily, in a follow-up question, more than half (51%) of respondents marked that access to this information would not impact what they bought. Still, 97% of respondents said they were interested in learning more about food safety (Table 3.2).

With information on what people think and feel regarding food safety, it is also essential to learn where these thoughts and feelings may have originated and how they may still be influenced. To revisit the role of gender, one question asked about who shaped this definition of food safety on an individual level. Answer choices varied, but the most common answer, about 22 % of respondents, chose a mom or mother figure, while 19% selected formal education (Table 3.2). About 10% selected a dad or father figure, social media, or a personal experience with foodborne illness (Table 3.3). A follow-up question asked respondents to describe that influential person as a member of their community, and more than half (53%) called them a “general influencer” (Table 3.3). A general influencer could be someone with or without an official position of authority who nonetheless shapes behavior and mindsets within the community or family unit.

3.3.2 Gender disaggregated results

As a conservative country, Bangladeshis commonly emphasize traditional gender roles and differing expectations for men and women (Alim, 2009). To understand how these differences are reflected in food safety, disaggregating the data among men and women is necessary.

The importance of conserving traditional religious practices was similarly significant among men and women, and the spread of other cultural values also appears to be relatively consistent (Figures 3.3 and 3.4). Notably, respondents did not indicate maintaining gender norms to be a top cultural priority (Figures 3.3 and 3.4). Answer selections remained consistent for males and females throughout the survey except for in two questions. Though answers about who most shaped individual definitions of food safety for males and females varied (Table 3.4), their most popular responses differed in comparison. Females were most likely to have first learned from a mom or mother figure (27 % of females), while males were more likely to have first learned from formal education (20 % of males). When continuing their education or receiving new information, male and female answers also differed. Women were most likely to seek out the advice of a healthcare provider (34 % of females, Table 3.4), while men were most likely to participate in formal training classes (48 % of males, Table 3.4).

3.3.3 Education disaggregated results

Despite relative economic prosperity, an individual's level of education can be a strong determinant for health outcomes, particularly in developing countries like Bangladesh (Chowdhury et al., 2013). Disaggregating the survey results based upon education level can help distinguish food safety-related responses of those with varying degrees. Among all education levels, respondents indicated religion as the most essential element of their culture to maintain

(Figure 3.5). Sharing that the look and taste of food was more important than the food's preparation was also consistent regardless of the level of education. While many subsequent answers followed similar patterns for all levels of education, there were a few differences related to information sources. The more education an individual had, the more likely they seemed to prefer to receive information from formal training, as 35% of respondents with graduate degrees and 26% of those with undergraduate degrees indicated this preference. The less education, the more likely people were to seek a healthcare provider (Table 3.5).

3.4 Discussion

As the BFSa works to write and implement new food safety laws, regulations, and policies to change behavior, consideration for food safety culture may improve the efficacy of education and outreach efforts. The Food Safety Culture Assessment provides insight into effective policymaking strategies related to the Islamic faith, current food safety perceptions and practices, the impact of taste preferences, and influential groups and individuals among the general population. Even as the institutional framework of the food safety system in Bangladesh takes shape, this system remains a shared responsibility among regulators, producers, distributors, and consumers. Consumers would be well-served to reevaluate or reinforce their food safety practices in the home to prevent the introduction of potential microbial hazards in food. Regarding consumer behavior change on a policy level, there are many approaches to writing policies to influence people.

The survey focused on cultural values, preferred sources of information, and the likelihood of experiencing behavior change. Bangladesh is a predominantly Muslim country, and the cultural concept of religion is highly influential. The Bangladeshi constitution designates Islam as the state

religion, and Sunni Muslims constitute 89% of Bangladesh's total population (Office of International Religious Freedom, 2018). From the survey information collected, the additional cultural values of societal norms (which may inhibit behavior change) and traditional foods (which directly connect to food safety) are also valued as they are, without interference. When asked to rank the value of religion compared to traditional foods, social norms, language, traditional clothing, art and literature, and traditional gender, 50% of respondents indicated religion as their first choice of the listed cultural elements (Figure 3.1) to remain unchanged. Societal norms was the most commonly selected second choice (29%), and traditional foods appearing as a common second or third choice (20% for each) (Figure 3.1).

In consequence, behavior change may require strategic approaches that integrate each of the three values. Duckworth and Gross (2020) describes behavior change as dependent upon a combination of self-control and environmental influences. "Shared structural affordances and impediments, social norms, culture-wide practices, and more" contribute to this environment (Duckworth & Gross, 2020). To merge the findings of this survey tool with the perspective of Duckworth and Gross (2020), the "culture-wide practices" related to religion, societal norms, and traditional foods may contribute most directly to the food safety environment among the Bangladeshi population.

Of these cultural elements and based on the survey tool results, the Islamic faith may be the most effective guide for drafting information campaigns to change societal norms around food production and consumption and impact food safety-driving behavior. Abiding by the halal food laws of the Islamic faith is one way Muslims carry out their lives according to their God's intention for wellness and health among followers (Regenstein et al., 2003). When aligning one's actions with the teachings and expectations of religion or another doctrine, it is necessary to "regulate

impulses,” a concept described as essential for changing behavior on a personal level by Duckworth and Gross (2020). People of faith are likely to regulate their impulses based upon the messages embedded within religious texts like the Quran.

In many ethnic, social, and religious groups, food is central to everything from holiday celebrations to welcoming new neighbors to building community; the Islamic faith is no exception (Riaz & Chaudry, 2003). For Muslims around the world and in Bangladesh, halal food laws shape food production and consumption practices in private and public settings. In their traditional interpretation, halal food laws exclude the consumption of specific animals, blood, and alcohol. However, their origins are largely based on human health and sanitation concerns (Regenstein et al., 2003). As such, there may be more of a religious justification for the significance of food safety in halal food laws than has previously been experienced (Neio Demirci et al., 2016).

Within these food laws, several terms illuminate that which is permitted to eat and guide related decision making (Riaz & Chaudry, 2003). Halal is a general term used to describe something as “permissible and lawful” and encompass everything from meat and poultry to cosmetics, personal care products, and even interpersonal and community relationships (Riaz & Chaudry, 2003). Opposite to halal is haram, that which is forbidden (Riaz and Chaudry, 2004). Everything is halal unless it is specifically named haram.

“Mashbooh is something questionable or doubtful, either due to the differences in scholars’ opinions or the presence of undetermined ingredients in a food product” (Riaz & Chaudry, 2003, p. 7). “Makrooh is a term generally associated with someone’s dislike for a food product or, while not clearly haram, is considered dislikable by some Muslims” (Riaz & Chaudry, 2003, p. 7). The interpretation of mashbooh and makrooh is far more subjective than their halal and haram counterparts. While halal and haram products are backed by the authority of the Quran or the

Prophet Muhammad, mashbooh and makrooh designations are open to interpretation from individuals with far less sovereignty.

“Toyyiban” may directly relate to food safety, as it translates roughly to “good or wholesome” (Neio Demirci et al., 2016). One unofficial interpretation of the “Toyyiban” joins it with halal to create the concept of “Halalan Toyyiban” (Neio Demirci et al., 2016). In this form, Toyyiban can mean “nourishing, safe, hygienic, and of good quality” (Neio Demirci et al., 2016). Neio Demirci et al. (2016) describes many international Halal production and certification bodies adopting the idea that halal foods should assume “high standards regarding quality, safety, packaging, and labeling.” A universally agreed-upon translation and application of “Toyyiban” and “Halalan Toyyiban” does not yet exist in practice but holds promise for the advancement of food safety in the Muslim world, representing 90% of Bangladeshis and 26% of the global population (Neio Demirci et al., 2016).

All these terms help to frame the culture of food safety in a majority-Muslim nation like Bangladesh. When preparing to influence existing food production systems and consumption in Bangladesh on a policy level, mashbooh, makrooh, and Halalan Toyyiban provide an understanding of the potential for religious justification for food safety behavior change on a consumer level—both concepts in theory and terms in practice. Information campaigns, one of the policy tools described by Tummers (2019), may be an effective mode of delivery. These information campaigns could incorporate Halalan Toyyiban principles like “wholesomeness” in food safety education and awareness messaging to emphasize the parallels with Halal food laws. The intention would not be to exploit a religious association with food safety but instead to use terms that resonate and may a depth of responsibility in the cultural context.

Despite the apparent connection between Halal in concept and food safety in practice, more research is necessary to determine if Bangladesh's government and domestic Halal food production market would explore this development (Neio Demirci et al., 2016). Still, health-centric Islamic dietary laws existed independently from food safety regulations for centuries—the latter would come later (Neio Demirci et al., 2016; Riaz & Chaudry, 2003). One direct and early application of Islamic teachings in public health is handwashing. The Prophet Muhammad specifically recommended regular handwashing as an important measure for advancing public health (Ataee et al., 2017). Handwashing, along with the cleanliness of cookware and cooking surfaces and proper storage were seen by more than 60% of respondents as the most important food safety practices. Similar numbers of respondents said that they, themselves, implemented these practices.

Many of the questions in the survey relate to consumer behavior, but the expectations consumers have of their food producers may also inform policymakers. Following an experience with foodborne illness, 32% of respondents marked that they no longer purchased the food that caused the illness from the same seller. This response could invite an economic argument for food safety from the perspective of food sellers and vendors. If it became widely accepted that customer loyalty is dependent in part on food safety, food producers might feel increased pressure to supply safer food. However, as promising as these responses may be for the public health officials and food safety policymakers, nearly a quarter (22%) of respondents shared that they made no behavior changes following an experience with foodborne illness. A 2019 study in Bangladesh analyzed customer loyalty with respect to fast food (Uddin, 2019). Researchers identified three main factors driving customer satisfaction and loyalty: i) food quality, ii) price, and iii) service quality (Uddin, 2019). The study did not list food safety among these factors, but neither was it mentioned in the

survey instrument nor addressed in the literature. Future studies exploring customer loyalty may benefit from prompts and questions related to safe food handling, cooking, and serving practices.

To expand on the relationship between producer and consumer, three survey questions evaluated the potential impact of food safety information on food purchases, as with a label. A label is an example of a “nudge,” a discreet, if not passive, approach to impacting behavior. Ninety-seven percent of respondents said they thought consumers should have information on how to keep their food safe before, while, and after preparing it. Ninety-five percent shared that they were interested to know if their individual food providers were using good food safety practices, but 51% of respondents said this food safety information would not impact their food purchases (Table 3.2). It is challenging to discern food safety-related actions in practice versus in theory. Still, these results suggest the “nudge” of a food safety label may not be effective in changing consumer behavior. In a study measuring the impact of health-related food labeling, researchers marked relatively nutritious items as “healthy” with green labels in French and American workplace cafeterias (Montagni et al., 2020). Over time, the study found health food labeling to improve employee healthy eating choices (Montagni et al., 2020). Safe food and healthy food may not be perceived interchangeably, and consumers in France, the United States, and Bangladesh likely have different eating habits. Still, these findings may provide insight into the impact of a food safety-related label.

The questions related to feelings on the importance of food preparation and consumption may offer helpful insight for policymaking and messaging strategies. With 49% of respondents indicating they think more about the look and taste of food than how it is prepared, public health may benefit when food safety messages are presented as a component of food quality, acceptability, and wholesomeness. Additionally, 46% of respondents thought strange colors,

smells, and blemishes cause illness, though these factors are typically more of an indication of food quality rather than food safety (Van Rijswijk & Frewer, 2008). With behavior change, it is not always enough to improve public awareness of a health concern or teach people how to reduce or eliminate related risks (Duckworth & Gross, 2020). This reality could be the result of “present bias, the tendency to care more about our current experiences than about what might happen to us in the future” (Duckworth & Gross, 2020). Kahneman’s (2011) System 1 thinking seems to mirror this psychology. Because humans must eat so often, in the absence of external forces or accountability, consumers may underappreciate the consequences of future foodborne illness because they are focused more on quality factors like the look and taste of the food than its safety. Consumers’ association with food safety and food quality is not unique to Bangladesh, but it was surprising to see the low number of responses (12%) indicating religious significance food consumption (Table 3.2). Respondents may have interpreted this question to be less about abiding by Halal food laws and more about viewing the act of eating as a form of religious expression.

Concerning an initial understanding of food safety, this survey indicates that mothers are the most common source of this information (for 22 % of respondents, Table 3.2). This finding suggests that food safety-related education and awareness efforts may be most effective when targeted at women and mothers. This is because women may share the learning beyond themselves. As primary caretakers and family cooks, they are likely to also be the “final line of defense” for the food safety of home kitchens, so a health-conscious understanding of the subject is critical (Sudershan et al., 2008).

As respondents seek to expand their understanding of food safety, their preferences for certain information sources shift. Forty-five percent of respondents indicated that they consulted a doctor or other health professional to reduce the risk of foodborne illness. This answer is consistent

with another finding from this questionnaire. Just under 27% of respondents prefer to receive and learn information on topics like food safety from a healthcare provider, which was the most common answer to that question. Upon disaggregating this question by education level, however, it appears the more education an individual had, the more likely they seemed to prefer to receive information from formal training. Thirty-five percent of respondents with graduate degrees and 26% of those with undergraduate degrees indicated a preference for formal training—the most common answer in those two categories. The less education, the more likely people were to seek out a healthcare provider or social media in the case of respondents with secondary school educations (Table 3.5). The later answer is consistent with another of this questionnaire’s findings that just under 27% of respondents prefer to receive and learn information on topics like food safety from a healthcare provider, which was the most common answer to that question.

One interpretation of these results is that people with more education sought out ways to learn about and diagnose their own problems and solutions for food safety. In contrast, those without as much education preferred to be told how to respond and what to do. The literature reflects a wide range of preferred sources for health-related information, so it is difficult to conclusively state if the findings from this survey accurately represent the reality in Bangladesh (Rains, 2007; Redmond et al., 2010).

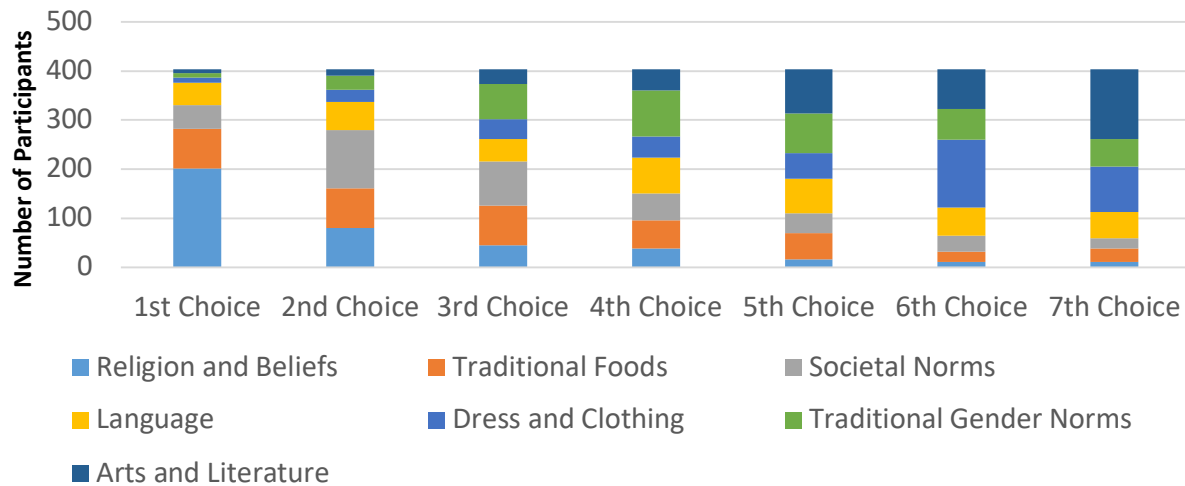


Figure 3. 1 Ranked cultural preservation preferences among the general population of Bangladesh ($n=403$ respondents)

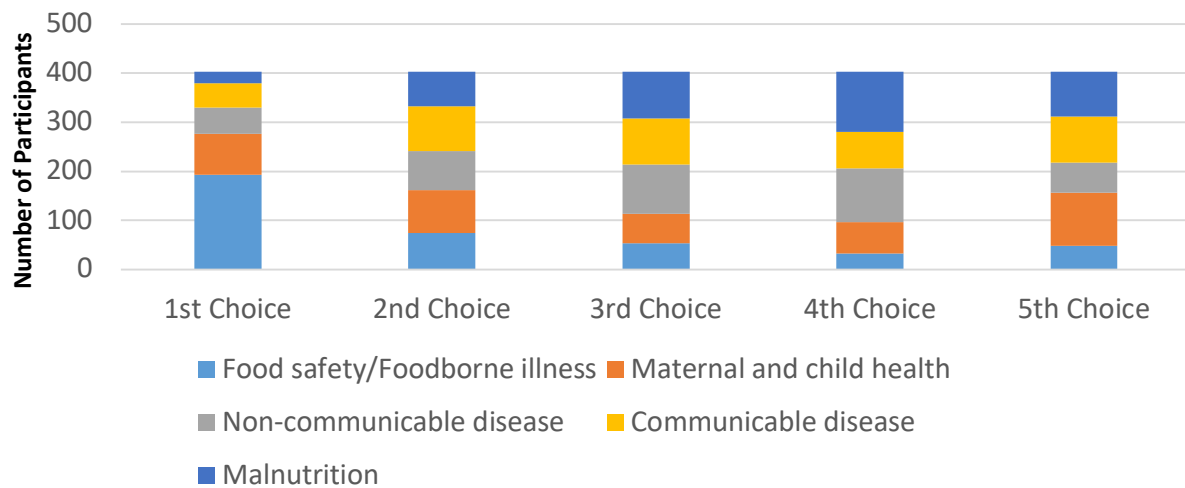


Figure 3. 2 Ranked public health concerns among the general population of Bangladesh ($n=403$ respondents)

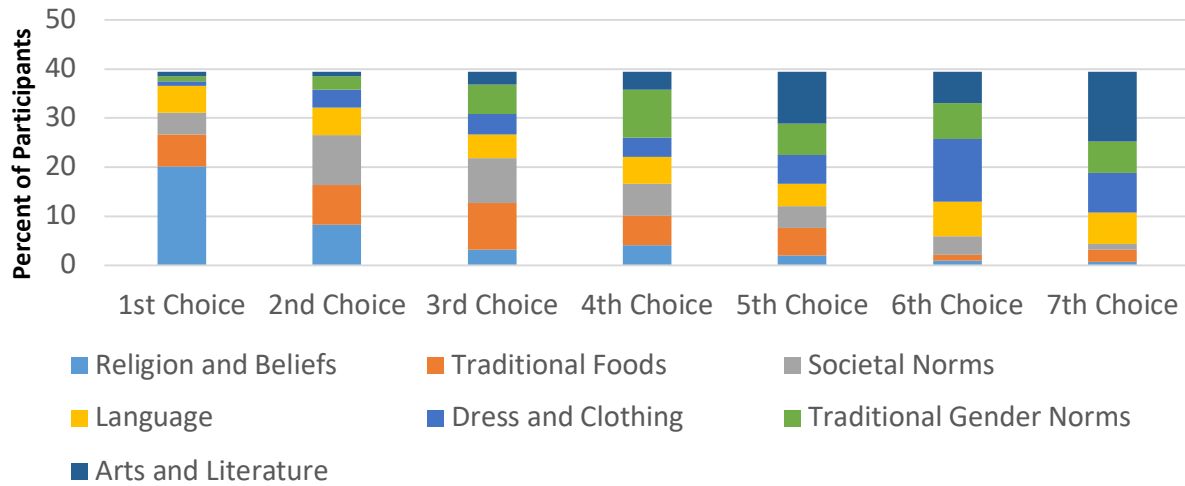


Figure 3. 3 Ranked cultural preservation preferences among the female, percent of the whole ($n=161$ respondents)

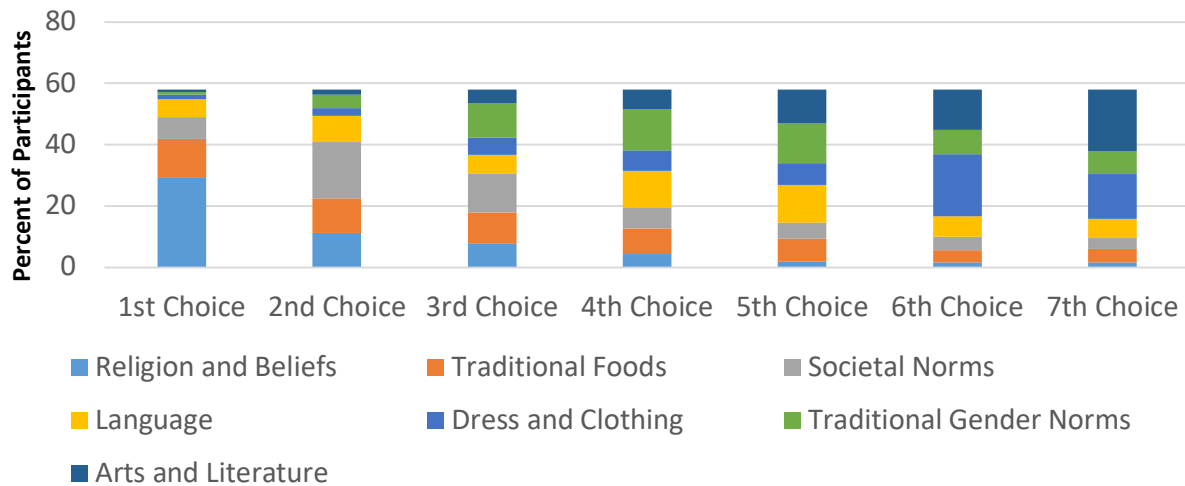


Figure 3. 4 Ranked cultural preservation preferences among the male, percent of the whole ($n=237$ respondents)

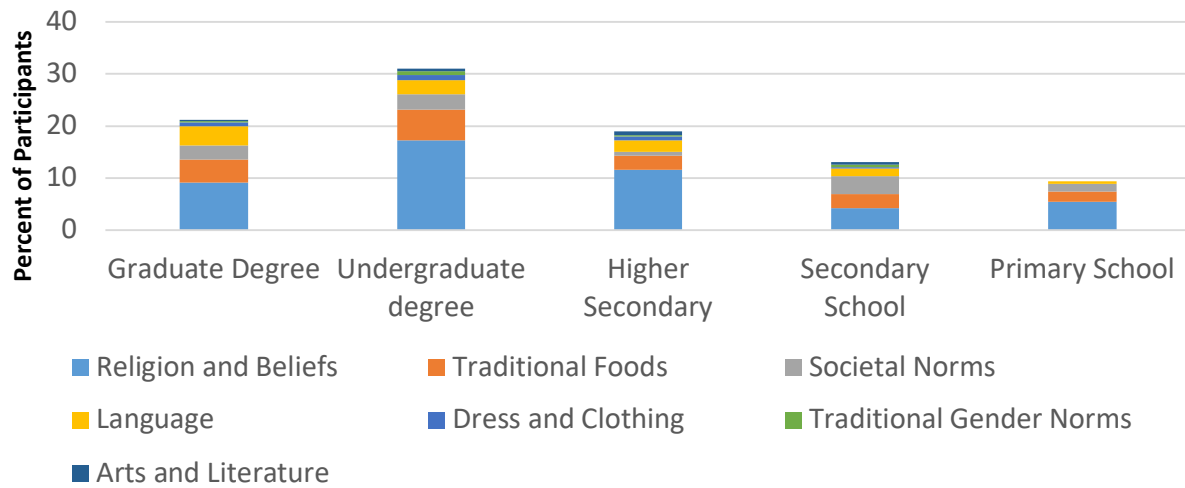


Figure 3. 5 First-ranked cultural preservation preference among the varying levels of education, represented as a percent of the whole ($n=403$ respondents)

Table 3. 1 Overall demographic information of survey respondents ($n=403$)

Responses	Percentage of Respondents
Gender	
Male	59%
Female	40%
Year of birth	
2005 and later	3%
1995-2004	36%
1985-1994	26%
1975-1984	20%
1965-1974	11%
1955-1964	3%
Home division	
Chittagong	26%
Khulna	19%
Rajshahi	17%
Barisal	12%
Dhaka	12%
Rangpur	7%
Mymensingh	3%
Sylhet	3%
Comfort in rural v. urban settings	
Urban	50%
Rural	47%
Unsure	1.5%
Marital status	
Married	53%
Single	41%
Widowed	3.5%
Divorced	2%
Prefer not to answer	0.25%

Parent or primary caretaker of children	
Yes	57%
No	42%
Highest level of education	
Graduate degree	21%
Undergraduate degree	31%
Higher secondary	19%
Secondary school	13%
Primary school	9%
None of these choices	5%
If you are or have been a university student, what is your area of study?	
I did not go to university	39%
Life Sciences/Medicine/Public Health	21%
Business/Economics	12%
Art/Language/Literature	12%
Mathematics/Computer Science	9%
Government/Political Science	4%

Table 3. 2 Preferential, perspective, and decision-making questions of food safety ($n=403$)

Reponses	Total responses (%)
Which question best reflects your feelings on the importance of food preparation and consumption?	
I think more about the look and taste of food than how it was prepared.	49%
I enjoy spending time in food preparation and consumption with others.	23%
Food consumption has religious significance to me.	12%
I view food only as fuel and do not worry about its quality or preparation.	9%
Food preparation and consumption are community-building activities.	6%
How do you decide which foods to eat or purchase? Please select the quality or qualities you most often consider when eating or purchasing food.	
Taste	67%
Nutrition content	60%
Price	52%
Religious factors	43%
What is familiar	40%
What is available	38%
Tradition	37%
Confidence in food safety	31%
What is easy to prepare	27%
Trust in the seller	22%
Please choose the answer that best aligns with your perspective on food safety.	
Food safety is something I regularly think about when making food choices.	44%
Abiding by religious rules of eating is my primary decision factor.	15%
I assume that those who sell food are safely handing and preparing what I purchase, so I do not worry about food safety.	14%
I know who I buy my food from, so I trust them to keep it safe.	13%
I buy raw ingredients and trust that they are safe.	6%
Food safety is not something I think about when making food choices.	4%
I buy processed foods and trust that they are safe.	4%
How do you define food safety? Please choose the option that best aligns with your thinking.	

Handling, preparing, and storing food with the goal of preventing foodborne illness	49%
High quality food that looks and tastes good	27%
Protecting the nutrients in food for the health of consumers	20%
Food that is more expensive	2%
Who/what most shaped your definition of "food safety"?	
A mom or mother figure	21%
Formal education	20%
A dad or father figure	9%
A personal experience with foodborne illness	9%
Social media	9%
A Bangladesh government agency	6%
A food producer or seller	5%
Educational resources like graphics or pamphlets	5%
Aid workers	4%
Other	4%
Research done personally on the topic	2%
A religious leader or authority	2%
A community leader	1.5%
A celebrity	0.5%
What role does this individual, entity, or thing that most shaped your definition of "food safety" play in your community?	
General influencer	55%
Thought-leader	34%
Care-giver	32%
Spokesperson	27%
How do you prefer to receive and learn information on topics like food safety?	
From a healthcare provider	23%
At formal training classes	26%
Through social media	18%
From informational posters and displays	10%
From the food seller	9%
From the food package	5%

By doing my own research	3%
Other	0.5%
Which of the following practices do you regularly use when preparing food?	
Washing hands before preparing foods	67%
Washing hands before eating food	63%
Serving food with clean serving utensils and dishes	61%
Cleaning storage containers and cooking utensils before and after use	59%
Keeping different foods separate from each other	58%
Preparing food on clean surfaces	57%
Cleaning produce with filtered, drinking quality water	45%
Refrigeration, storing food at appropriate temperatures	44%
Using approved cooking time and temperature recommendations	41%
Preparing food on elevated surfaces	35%
Paying more money for higher quality foods	24%
Teaching/training people who handle food about food safety	22%
Buying from sellers who have completed food safety training	17%
Which of the following practices do you think could help to make food safer to eat? Please select all that apply.	
Refrigeration, storing food at appropriate temperatures	67%
Cleaning storage containers and cooking utensils before and after use	67%
Washing hands before preparing foods	67%
Serving food with clean serving utensils and dishes	66%
Keeping different foods separate from each other	64%
Washing hands before eating food	63%
Preparing food on clean surfaces	62%
Using approved cooking time and temperature recommendations	61%
Cleaning produce with filtered, drinking quality water	57%
Teaching/training people who handle food about food safety	47%
Preparing food on elevated surfaces	40%
Buying from sellers who have completed food safety training	39%
Paying more money for higher quality foods	30%
None of the above	0.25%

Which of the following practices do you look for, if any, when deciding who to buy food from? Please select all that apply.	
Serving food with clean serving utensils and dishes	62%
Washing hands before eating food	61%
Keeping different foods separate from each other	59%
Preparing food on clean surfaces	58%
Washing hands before preparing foods	55%
Cleaning storage containers and cooking utensils before and after use	54%
Cleaning produce with filtered, drinking quality water	49%
Refrigeration, storing food at appropriate temperatures	48%
Using approved cooking time and temperature recommendations	43%
Preparing food on elevated surfaces	36%
Paying more money for higher quality foods	34%
Teaching/training people who handle food about food safety	31%
Buying from sellers who have completed food safety training	27%
None of the above	1%
Where do you buy most of your food? Please select the option you choose most often.	
Convenience stores	45%
Wet markets	34%
Indoor supermarkets	8%
Community, outdoor markets	7%
I grow and raise my own food	3%
Other	1%
What percentage of your income would you estimate is spent on food?	
11-30%	
31-50%	
51% or more	
10% or less	
Do you think consumers should have information included with their food purchases about how to keep their food safe before, while, and after preparing it?	
Yes	97%
No	0.5%
Do not care	2%

Would you be interested to know if your individual food providers were using good food safety practices?	
Yes	95%
No	1.5%
Do not care	2.5%
Would access to information about the safety of food impact what you buy?	
Yes	44%
No	51%
Do not care	5%
Are you interested in learning more about food safety?	
Yes	97%
No	2%
Do not care	0.25%

Table 3. 3 Survey responses concerning the experience of foodborne disease ($n=403$, overall)

Responses	Total responses (%)
How often do you consider food safety and/or the consequences of foodborne illness?	
Always	53%
Sometimes	41%
Never	5%
How do you know if you have experienced a foodborne illness? Please select all symptoms that apply.	
Diarrhea (loose, watery stools)	87%
Upset stomach	72%
Stomach cramps	56%
Vomiting	47%
Nausea	45%
Headache	24%
Fever	19%
None of the above	2%
What is it about food that can make people sick? Please select all answers that align with your thinking.	
Food that has been around or handled by people who are sick may make other people sick.	58%
Strange colors, smells, or blemishes on foods can tell you whether or not they will make people sick.	47%
Foods that are eaten uncooked/served raw are more likely to make people sick.	45%
The more that food is handled or processed, the more likely it is to make people sick.	30%
Processed foods are less likely than other foods to make people sick.	28%
Low priced food is more likely to make people sick.	22%
Meats are more likely to make people sick than other foods.	19%
Produce is more likely to make people sick than other foods.	17%
Dairy products are more likely to make people sick than other foods.	14%
Grains are more likely to make people sick than other foods.	10%
Food cannot make people sick.	0.25%
Who is most at risk for foodborne illnesses? Please select the answer that best aligns with your thinking.	
People who are young, old, pregnant, and/or immunocompromised	39%

People who lack access to adequate food storage and sanitation	26%
Anyone can be at risk for foodborne illness	20%
Not all people experience foodborne illnesses, some are immune.	7%
People who are already sick from another ailment	6%

Table 3. 4 Detailed, selected, gender disaggregated survey responses of notable deviation from the overall respondents ($n=403$)

	Female % of total respondents	Male % of total respondents
Who/what most shaped your definition of “food safety?”		
A mom or mother figure	11.06	9.83
Formal education	7.13	12.29
A dad or father figure	3.19	6.14
A personal experience with foodborne illness	4.91	4.18
Social media	2.95	6.14
A Bangladesh government agency	1.72	4.18
A food producer or seller	1.23	3.93
Educational resources like graphics or pamphlets	2.7	1.97
Aid workers	0.49	3.19
Research done personally on the topic	1.23	1.23
A religious leader or authority	0.49	1.72
A community leader	0.49	0.98
A celebrity	0	0.49
Other	1.97	1.97

Table 3. 5 Detailed, selected, education-disaggregated survey response of notable deviation from the overall respondents ($n=403$)

Question	% response
Percent of respondents who answered that they “think more about the look and taste of food than how it was prepared” when asked which answer best reflects their feelings on the importance of food preparation and consumption.	
% with Graduate Degree	55%
% with Undergraduate Degree	51%
% with Higher secondary	45%
% with Secondary	47%
% with Primary	45%
% with no formal education	42%

Chapter 4 - Conclusions

Throughout human history, consumers have been battling foodborne disease with varying degrees of success (Fortin, 2009; Motarjemi et al., 2014). The evidence is clear: science-driven approaches to food safety—backed by governments and implemented by constituents—result in better health outcomes than the trial-and-error ways of our ancestors (Fortin, 2009; Motarjemi et al., 2014). From farm to fork, scientists, policymakers, and educators have brought us a long way on our collective public health journey. Their lessons, however, must be taught and retaught to every new generation. Food safety goes far beyond knowing the difference between cross-contact and cross-contamination; recognizing the financial burden of recalled product; or feeling the pain of gastroenteritis. The maintenance or neglect of food safety reflects our perceptions, values, and opinions.

Food safety is a shared responsibility across the food system, but the last few steps before consumption can be among the most consequential for human health. The current study emphasizes the relationship between food safety policy and consumer behavior. The Food Safety Culture Assessment findings can connect the needs and expectations of the individual consumer with the messaging and objectives of the policymaker. Food safety can be learned, and consumers can be educated, but the messaging mechanisms can impact the reception.

Access to refrigeration and freezers; potable water for cooking, cleaning and drinking; and proper storage for perishable and nonperishable food items are all determinants of food safety outcomes. In some places around the world, including Bangladesh, many of the keys to food safety can be challenging to implement for producers and consumers alike. As traditional cooking practices fuse with modern convenience, we have lost many of the safeguards our ancestors once developed—knowingly or unknowingly—to keep them safe from physical, chemical, and

biological hazards. Food safety is something that can be easily taken for granted. There have been three primary waves of food security within the past several decades of international development and investment: providing enough food through caloric intake values, providing nutritious food, and now providing safe food and minimizing the risk of foodborne disease. Governments must be proactive in addressing the public health concern of food safety, and policy approaches must align culture with science to effectively influence behavior.

This research suggests that as the BFSA works to write and implement new food safety laws, regulations, and policies to change behavior, consideration for the culture of food safety may improve the efficacy of education and outreach efforts. The Food Safety Culture Assessment provides insight into effective policymaking strategies as they relate to the Islamic faith, current food safety perceptions and practices, the impact of taste preferences, and influential groups and individuals among the general population. Framing information campaigns to complement the religious principles of Halal food laws could be an important method of message-sharing. Additionally, empowering women through food safety education could serve both the individual and her entire family. Finally, exploring the addition of food safety certification identification or labeling on food packaging may have the potential to “nudge” both producers and consumers to improve and expect more regarding food safety practices, respectively.

Regardless of the policy strategies BFSA selects to advance food safety, it may take time to implement the institutional components necessary to effectively monitor, measure, and mitigate food safety hazards from production and regulatory standpoints. Consumers would be well-served to reevaluate or reinforce their food safety practices in the home to prevent the introduction of potential microbial hazards in food. Information campaigns have the potential to direct and advise

these practices, so policymakers must approach them with the food safety culture of Bangladesh in mind.

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Appendix A - Food Safety Culture Assessment

4/9/2021

Food Safety Culture Assessment / নিরাপদ খাদ্য সংস্কৃতির মূল্যায়ন

Food Safety Culture Assessment / নিরাপদ খাদ্য সংস্কৃতির মূল্যায়ন

Please acknowledge the following two statements by clicking the "OK" button before beginning the survey.

* বাংলাদেশে খাদ্য নিরাপদতার বিপত্তি বিশ্লেষণের মাধ্যমে ঝুঁকি নিরূপণ ও নিয়ন্ত্রণের লক্ষ্যে সৃজনশীল পদ্ধতির সাহায্যে প্রশিক্ষকদের সমক্ষতা বৃদ্ধির প্রকল্প প্রকল্প অনুমোদনের তারিখ: ১২/০১/২০১৮ প্রধান নিরীক্ষক জেসি ভাইফাম প্রাণী বিজ্ঞান ও শিল্প ২৪৭ ওয়েবার হল কানসাস স্টেট ইউনিভার্সিটি মানহ্যাটন, কেএস ৬৬৫০৬ +১(৭৮৫) ৫৩২-৩৪৮৬ jessiev@ksu.edu আইআরবি প্রধানের যোগাযোগের তথ্য (IRB Chair Contact Information) RickScheidt,Chair,CommitteeonResearchInvolvingHumanSubjects,203FairchildHall,KansasStateUniversity,Manhattan,KS66506, (785)532-3224;CherylDoerr,AssociateVicePresidentforResearchCompliance,203FairchildHall,KansasStateUniversity,Manhattan,KS66506, (785)532-3224. প্রকল্পের দাতা সংস্থা: কৃষি বিষয়ক বিদেশ দপ্তর, আমেরিকার কৃষি অধিদপ্তর জরিপের উদ্দেশ্য: এই জরিপ কার্যক্রমে অংশগ্রহণের জন্য আমরা আপনাকে অনুরোধ করছি। জরিপে অংশগ্রহণ করার আগে আপনার জানা দরকার কেন আমরা এই জরিপ কার্যক্রমটি হাতে নিয়েছি এবং জরিপ কার্যক্রমটিতে কি কি বিষয় অন্তর্ভুক্ত আছে। দয়া করে নিচের তথ্যগুলো ভালোভাবে পড়ুন। যদি কোন কিছু বুঝতে অসুবিধা হয় অথবা আরও তথ্যের দরকার হয়, তবে আমাদেরকে জিজ্ঞাসা করুন। জরিপ কার্যক্রমটির উদ্দেশ্য হলো, নিরাপদ খাদ্য বিষয়ে আমাদের উপলব্ধি, মনোভাব ও প্রেরণার উপরে অধিকতর ধারণা অর্জন করা। এই জরিপ থেকে প্রাপ্ত তথ্য বাংলাদেশ নিরাপদ খাদ্য কর্তৃপক্ষ এর জন্য খুবই গুরুত্বপূর্ণ। ইহা কর্তৃপক্ষের জন্য বিভিন্ন প্রশিক্ষণ কর্মসূচী, জনগণের জন্য নিরাপদ খাদ্য বিষয়ে বিভিন্ন জনসচেতনতা তৈরিতে শিক্ষামূলক কার্যক্রম পরিচালনায় সহায়তা করবে। এছাড়াও, এই জরিপটি খাদ্য শৃঙ্খলে নিরাপদ খাদ্যের বিভিন্ন বিপত্তি চিহ্নিতকরণ ও নিয়ন্ত্রণের জন্য দক্ষ পরিবীক্ষণ কার্যক্রম গ্রহণে সহযোগিতা করবে। জরিপ কার্যক্রম পরিচালনার পদ্ধতি: জরিপটিতে ৫১ টি প্রশ্ন আছে এবং এগুলো সম্পূর্ণ করতে প্রায় ১৫ মিনিট সময় লাগবে। খাবার খাওয়া ও নিরাপদ খাদ্য বিষয়ে আপনার ব্যক্তিগত উপলব্ধি, মনোভাব, প্রেরণা ও আপনার আশে-পাশে বিভিন্ন নিয়ামক নিয়ে জানার আগে আপনার ব্যক্তিগত বিষয়ে কিছু জিজ্ঞাসা করা হবে। ঝুঁকি: এখানে অংশগ্রহণ করলে আপনার কোনরূপ ঝুঁকি নেই এবং ইহা আপনাকে কোনরকম অস্বস্তিতেও ফেলবে না। যাইহোক, আপনি চাইলে অংশগ্রহণ করতেও পারেন, আবার নাও পারেন। অধিকন্তু, জরিপ দলের কেউ আপনার কোন ছবি তুলবে না, এমনকি আপনার পরিচয় পাওয়া যাবে এমন কোন তথ্য নিতে পারবে না। উপকারিতা: এই জরিপে অংশগ্রহণ করলে আপনার সরাসরি কোন লাভ হবে না। কিন্তু, এই জরিপ থেকে প্রাপ্ত তথ্য বাংলাদেশ নিরাপদ খাদ্য কর্তৃপক্ষ এর জন্য দিক নির্দেশনা প্রণয়নে সহযোগিতা করবে যার ফলে দেশে উন্নত নিরাপদ খাদ্য ব্যবস্থাপনার সম্ভব হবে এবং খাদ্যবাহিত অসুস্থতা দূরীকরণে ভূমিকা রাখবে। গোপনীয়তা সমীক্ষায় ব্যক্তিগত পরিচয় গোপনীয়তার রক্ষার্থে আপনার প্রদত্ত তথ্যগুলো অন্য নামে রেকর্ড করা হবে। প্রত্যেকটি বিষয়ে গোপনীয়তা রক্ষার জন্য নিম্নবর্ণিত উপায় অবলম্বন করা হবে: • অংশগ্রহণকারীদের নামের পরিবর্তে সংক্ষেপে কোড নির্ধারণ করা যা সমস্ত গবেষণায় নোট এবং নথিগুলিতে ব্যবহৃত হবে। • ব্যক্তিগত পরিচয় বহন করে এমন তথ্য পরিহার করা। সুনির্দিষ্ট ঘটনা রিপোর্ট করার জন্য আইনগত বাধ্যবাধকতা ব্যতীত অংশগ্রহণকারীদের তথ্য গোপন রাখা হবে। সুনির্দিষ্ট ঘটনাগুলোর মধ্যে রিপোর্টের অপব্যবহার ও আত্মহত্যার মত ঘটনা; তবে, ইহা ছাড়াও অন্য কিছু হতে পারে। যোগাযোগের তথ্য: এই জরিপ সম্পর্কে আপনার যদি কোন প্রশ্ন থাকে বা আপনি এই জরিপে অংশ নেওয়ার ফলে বিরূপ প্রভাব অনুভব করেন, আপনি প্রথম পৃষ্ঠায় প্রদত্ত যোগাযোগের ঠিকানায় যোগাযোগ করতে পারেন। জরিপ নিয়ে যদি আপনার কোন প্রশ্ন থাকে অথবা এমন কোন সমস্যা যা আপনি প্রাথমিক জরিপকারীর সাথে বলতে চান না, তাহলে দয়া করে আমাদের প্রাতিষ্ঠানিক পর্যালোচনা বোর্ডে (865) 354-3000, ext. 4822. নম্বরে যোগাযোগ করতে পারেন। স্বেচ্ছাসেবী অংশগ্রহণ এই জরিপে আপনার অংশগ্রহণ স্বেচ্ছাসেবীমূলক। এটা একান্তই আপনার ইচ্ছা, আপনি জরিপে অংশগ্রহণ করবেন কিনা। যদি আপনি অংশগ্রহণ করেন, তাহলে আপনাকে একটা সম্মতিপত্র স্বাক্ষর করতে হবে। আপনি সম্মতিপত্রে স্বাক্ষর করার পরেও জরিপ থেকে নিজেকে প্রত্যাহার করতে পারেন; ইহাতে জরিপকারীর সাথে আপনার সম্পর্কের কোন অবনতি হবে না। তথ্য সংগ্রহ শেষ হওয়ার আগে আপনি যদি জরিপ থেকে নিজেকে প্রত্যাহার করে নেন তবে, আপনার তথ্য আপনাকে ফিরিয়ে দেওয়া হবে বা ধ্বংস করা হবে।

☐ OK

* সম্মতি আমি ভালোভাবে প্রদত্ত তথ্যগুলি পড়েছি, আমি বুঝতে পেরেছি এবং প্রশ্ন জিজ্ঞাসার সুযোগ পেয়েছি। আমি বুঝতে পেরেছি যে, আমার অংশগ্রহণ স্বেচ্ছাসেবীমূলক এবং আমি কোন কারণ ছাড়াই এবং ব্যয় ছাড়াই যে কোন সময় জরিপ থেকে প্রত্যাহার হতে পারি। আমি বুঝতে পেরেছি যে, আমাকে এই সম্মতিপত্রের একটি অনুলিপি দেওয়া হবে। আমি স্বেচ্ছায় এই জরিপে অংশ নিতে সম্মত।

☐ OK

What is your gender?

আপনার লিঙ্গ কি?

- ☐ Male / পুরুষ
- ☐ Female / মহিলা
- ☐ Other / অন্যান্য

Appendix B - IRB #9925 Approval Letter



University Research Compliance Office

TO: Dr. Jessie Vipham
Animal Sciences and Industry
247 Weber Hall

Proposal Number: 9925

FROM: Rick Scheidt, Chair 
Committee on Research Involving Human Subjects

DATE: 11/06/2019

RE: Proposal Entitled, "Capacity Building and Development for Food Safety in Bangladesh Creative Approaches to Train the Trainer Programs for Hazard Analysis Critical Control Points HACCP"

The Committee on Research Involving Human Subjects / Institutional Review Board (IRB) for Kansas State University has reviewed the proposal identified above and has determined that it is EXEMPT from further IRB review. This exemption applies only to the proposal - as written – and currently on file with the IRB. Any change potentially affecting human subjects must be approved by the IRB prior to implementation and may disqualify the proposal from exemption.

Based upon information provided to the IRB, this activity is exempt under the criteria set forth in the Federal Policy for the Protection of Human Subjects, **45 CFR §46.101, paragraph b, category: 2, subsection: ii.**

Certain research is exempt from the requirements of HHS/OHRP regulations. A determination that research is exempt does not imply that investigators have no ethical responsibilities to subjects in such research; it means only that the regulatory requirements related to IRB review, informed consent, and assurance of compliance do not apply to the research.

Any unanticipated problems involving risk to subjects or to others must be reported immediately to the Chair of the Committee on Research Involving Human Subjects, the University Research Compliance Office, and if the subjects are KSU students, to the Director of the Student Health Center.