

# ASSESSING FOOD SAFETY CULTURE AND CLIMATE IN LEBANESE INDUSTRIES

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In Fulfillment

of the Requirements for the Degree

Masters in Food Safety and  
Quality Management

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By

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## **Abstract**

*Introduction:* Food safety has been evolving tremendously in the past century and its importance in food industries is now very well established. However, with all the regulations, training, audits and inspections foodborne outbreaks continue to happen. Food safety climate has a great impact on food safety output of food companies. However, the organizational characteristics, food handlers' behavior, knowledge and motivation of individual employees could also contribute to the food safety output.

*Objective:* The purpose of this study was to determine the major factors contributing to the food safety climate of food handlers in the Lebanese food industries during the COVID-19 pandemic and the Lebanese economic crisis.

*Methods:* A cross sectional study was carried out on 204 participants from 23 Lebanese industries between July and September 2021 to evaluate the food safety climate, behavior, and knowledge of employees in food industries across Lebanon. The questionnaire was composed of two sections. One section dealing with socio demographic and economic status and one section assessing the food safety climate. A validated model of food safety climate self-assessment tool was used. This tool was developed and validated by De Boeck et al. in 2015 and it consists of 28 indicators. Company characteristics were also filled out. The association between food safety climate from one hand and socio-demographic and work-related determinants from another hand was investigated.

*Results:* Out of the 23 participating companies, 26.1% were micro, 17.4% small, 30.4% medium and 26.1% large. Most of the industries (34.8%) were food service (restaurants/ diet center), 30.4%

bakeries and confectionary, 17.4% meat and dairy products and 17.4% canned food and beverage. Most of the participating companies (65.2%) do not export their products, and 39.1% were ISO 22000 certified. Among the recruited participants ( $n = 204$ ) with a mean age equal to  $34.6 \pm 8.6$  years, 65.2% were males, 91.7% were Lebanese, 51.5% were married, 45.1% had a monthly net income ranging between 1,500,000-2,999,000 Lebanese pound, and 53.9% had a bachelor's degree. Furthermore, 28.4% of the participants had a degree in sciences/food science/ nutrition and 35.8% had degrees in other majors. The mean score of the food safety climate score that included 28 questions divided into five categories was  $119.09 \pm 11.14$ . Moreover, the mean score of the food safety motivation that included five questions was  $20.71 \pm 2.36$ , burnout/job stress that included six questions was  $17.06 \pm 5.71$  and lastly conscientiousness that included six questions with a mean of  $20.73 \pm 2.25$ . Socio-demographic variables that showed a significant association ( $p < 0.05$ ) with food safety climate score were gender, age, education level, and major. A multiple regression was performed after adjusting for confounders, which included gender, age, education level, major, income, level of food handling, job role, medical checkups, number of working hours, food safety motivation, burnout, conscientiousness, food safety courses, feeling of losing job and salary drop in addition to company related parameters. The results showed that exporting companies, food safety motivation, and conscientiousness were positively associated with food safety climate, while working hours per day and burnout/job stress were negatively associated with the climate score.

*Conclusion:* This is the first study done after the COVID-19 pandemic and during the current economic crisis in Lebanon that will assess the current food safety climate situation. Therefore, managers and business owners can use this data to work on improving food safety climate and



make it more resilient and prepared to similar future events.

Keywords: food safety climate, food safety culture, COVID-19, food safety

## Chapter 1: Background

### *1.1 Introduction*

Food safety has been evolving tremendously in the past century and its importance in food industries is now very well established. However, with all the regulations, training, audits and inspections foodborne outbreaks continue to happen (De Boeck, 2017). A well elaborated and fit to purpose Food Safety Management System (FSMS) does not always guarantee food safety and proper hygiene (Jacxsens *et al.*, 2015). This led to research on human behavior since food poisoning incidents and outbreaks are usually tracked back to food handlers' errors and non-compliance with good working practices and procedures (De Boeck, 2015). During the 1980s the concepts of food safety climate and food safety culture was introduced to better understand food safety through the human dimension (De Boeck, 2015). Culture and climate have been gaining great attention with researchers and food safety practitioners lately (Sharman *et al.*, 2019). Human behavior and psychology have an important role in food safety and were used in many studies to understand barriers in Hazard Analysis Critical Control Points (HACCP) implementations (Gilling *et al.*, 2001). The Global Food Safety Initiative (GFSI) believes that to be successful, food safety must go beyond formal regulations to live within the culture of a company. All GFSI approved food safety management systems now have a food safety culture to be audited and assessed. This is all dedicated to advancing food safety systems in organizations. The guiding questions includes questions on communication, training, and feedback from employees (GFSI, 2020).

### *1.2 Differentiating between food safety climate and food safety culture*

Often the terms food safety, food safety culture and food safety climate are sometimes used interchangeably (De Boeck, 2015). According to the Food and Drug Administration (FDA) food safety is a system to ensure that illness or harm will not result from eating food. Everyone along the farm-to-table continuum should be involved. Farm (production), processing, transportation, retail, and table (home) plays a role in keeping food supply safe (FDA,2020).

The concept of safety culture was first introduced 34 years ago after the Chernobyl nuclear disaster (Nayak & Waterson, 2016). The International Nuclear Safety Group (INSAG) report concluded that poor safety culture was the leading factor that led to the accident. The INSAG came to the conclusion that “the need to create and maintain a ‘safety culture’ is a precondition for ensuring nuclear power plant safety. The concept of ‘safety culture’ relates to a very general concept of dedication and personal responsibility of all those involved in any safety related activity at a nuclear power plant”. They also emphasized the importance of training personnel, understanding the importance of the safety plan, and be fully aware on the consequences of violating the safety plan (IAEA, 1992). The International Atomic Energy Agency (IAEA) has developed a framework for a ‘strong’ safety culture consisting of five characteristics:



FIG.1. The IAEA normative safety culture framework (IAEA, 1992).

Many worldwide incidents drew attention to food safety culture such as Melamine poisoning in China, Enterohemorrhagic *Escherichia coli* (EHEC) outbreak in Germany, and *Clostridium botulinum* in New Zealand (Jespersion, 2017). Following several series of food safety scandals around the world consumers' confidence in food safety and in the food chain was staggered. Here comes the need to create and enforce food safety culture and climate in food industries (Olsen & Banati, 2014).

Safety culture is used to refer to human and organizational behavior (what people do and the way a company operates). Organizational safety culture is defined as “the combination of safety related behaviors which either increase or decrease the risk of harm” (Jespersion, 2017). A good food safety culture is characterized as one in which employees share a sense of purpose in maintaining food safety standards. It also includes shared attitudes, values and beliefs (Jespersion, 2017). Therefore, food safety culture can be defined as the interplay of the food safety climate as perceived by the employees and the managers of a company and the context in which a company is operating, the current implemented FSMS, consisting out of control and assurance activities resulting in a certain (microbiological) output (De Boeck, 2015). When an organization has positive food safety culture new employees will directly adapt to the dominant behavior by simply learning from colleagues and leaders (Livesey & Clayton, 2010). Evaluating food safety culture in organizations leads to identifying gaps in food safety management systems that leads to foodborne hazards (Jespersion, 2017).

Organizational climate is the common and shared perceptions between employees of an organization regarding the policies, procedures, and practices (Nickell & Hinsz, 2010). It has been found to influence many behaviors in organizations including food safety. Organization climate

usually includes employees' perceptions of various aspects of the work environment, such as the physical environment, safety, supervision, management, and relationship with colleagues. Instead of focusing on an overall measure of organizational climate, researchers usually study specific climates at a time such as the climate of safety or the climate of customer service. These specific climates help in the understanding of issues and challenges. A climate of food safety is based on the individual's perception of the policies, procedures, and practices toward keeping food safe and uncontaminated (Nickell & Hinsz, 2010). So, to differentiate between the two concepts, food safety culture is considered as the bigger picture or framework of which food safety climate is a component (De Boeck, 2015). Food safety culture is long term concept that is deeply rooted in the beliefs and behaviors of all employees at the organizational level while food safety climate is more of a temporary concept existing at the individual level and related to the perceptions and attitudes of individuals and how they influence others in an organization (Sharman *et al.*, 2019).

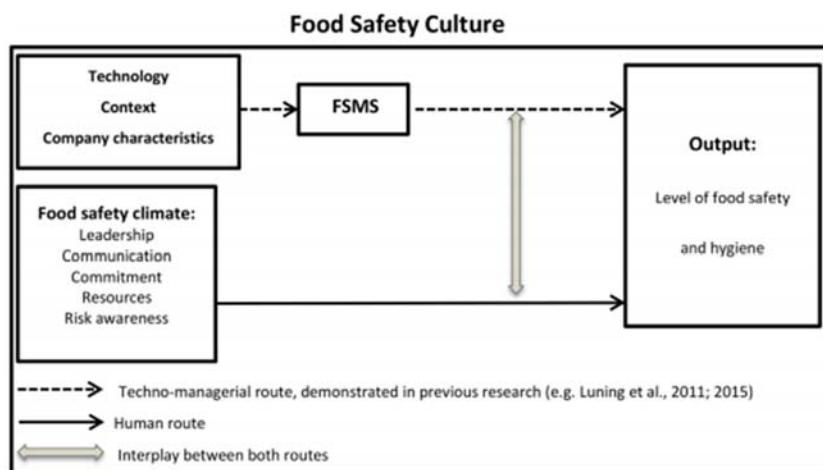


FIG.2. Food safety culture conceptual model as defined in De Boeck et al. (2015).

### 1.3 Components of food safety climate

Several different components are used in the definition and assessment of food safety climate. Many researchers studied food safety climate and each identified different components. Some of these components includes leadership, confidence of employees, accountability at all levels, clear management, sharing knowledge and information, and psychological factors such as motivation, risk awareness and self-efficacy (De Boeck, 2015). The most recurrent and used components in food safety studies are leadership, communication, commitment, resources and risk awareness (Griffith *et al.*, 2010).

### Leadership

Food safety leadership is defined as the perception of the extent to which the organization leaders are able to engage staff in hygiene and safety performance to meet the organization's goals and visions. There are different types of leadership but for leadership to be effective it should have a food safety vision with well-defined goals and objectives (Griffith *et al.*, 2010). Management belief systems play a major role in shaping employee attitudes (Clark *et al.*, 2018)

### Communication

The second component is communication which is vital in the functioning of any organization. It is defined as the perception of the extent of transfer of hygiene and food safety-related information within the organization (De Boeck, 2015). In a study that compared affiliated and non-affiliated butcher shops, leadership and communication were associated with a stronger food safety management system and superior microbiological hygiene (Clark *et al.*, 2018)

### Commitment

Commitment is the third component of food safety climate and is extremely important. Almost all food safety standards now include commitment as one of the important clause. Such as the BRC

food safety (Brand Reputation through Compliance) and the SQF 2000 (Safe Quality Food) standards both included clauses requiring commitment from top management. It is the perception of the extent of engagement and involvement when it comes to hygiene and safety among all the employees of an organization (Griffith *et al.*, 2010). Studies showed that management commitment can positively affect food safety training outcomes by motivating employees to commit to food safety practices (Clark *et al.*, 2018).

### Resources

Fourth component is resources and is defined as the perception of the extent to which physical (infrastructure, inventory...) and nonphysical (time, personnel...) means are present in an organization. A study done in central and eastern Europe showed that food service organizations should provide sufficient support to their employees (human resources) when it comes to necessary infrastructure such as modern equipment, appropriate working environment and financial resources to make sure food safety measures are in check (Tomasevic *et al.*, 2020). The availability of staff also influences food safety practices since it assures that each employee is able to deal with food safety matters in a timely manner (Tomasevic *et al.*, 2020).

### Risk awareness

The fifth and last one is risk awareness that is the perception of the extent to which the organization is aware of the risks regarding hygiene and safety and has them under control (De Boeck, 2015). Therefore, food safety climate is the shared perception of employees when it comes to leadership, communication, commitment, resources and risk awareness regarding food safety and hygiene (De Boeck, 2015). In a study conducted in Iowa on food safety operations, participants admitted that some of their food safety practices are influenced by the degree to which organizations were aware

of the risks of not adhering to food safety regulations and the extent of precaution measures were taken to avoid the risk. Financial reasons were usually noted as the motive in making decisions involving risk (Abidin, 2013).

In addition to these components, a study done on 311 food service employees in the United States of America indicated that by properly communicating with employees, enforcing reward-punishment, and providing resources, leaders can increase the likelihood that employees will be motivated to perform safe food handling practices. These functions can be controlled, achieved, and influenced by the managers or the leaders (Ellis *et al.*, 2010).

#### *1.4 Food safety culture and climate evaluation models*

Since there is still no agreement as to what exactly constitutes a valid and reliable approach to measure safety culture and climate. Despite that they are considered an attractive approach to enhance organizational efficiency and effectiveness (Griffith *et al.*, 2010). Reasons to measure food safety culture are numerous. To name a few, assessing potential employee compliance with safety management system, raise awareness on food safety, promote commitment, evaluate risks and identify weaknesses (Jespersen *et al.*, 2017).

Many validated assessment tools have been created to identify a company's food climate or culture. Tools are divided into qualitative and quantitative methods. Qualitative methods gather data through group interviews, narrative interviews and discussion groups. While quantitative methods gather information through questionnaires. Therefore, quantitative methods are chosen more frequently due to ease of administration and time constraints (Neal *et al.*, 2012).

##### **4.1.A 28-indicators validated tool**



A validated 28 indicators tool for the assessment of food safety climate was developed and used in many studies (De Boeck, 2015). This self-assessment tool was divided into 5 components that included leadership, commitment, communication, resources and risk awareness. Each component included 5 to 6 questions and each question was evaluated based on Likert answer scale from 1 to 5 (totally disagree, disagree, neutral, agree, totally agree). This tool helps a company evaluate the climate concerning hygiene and safety as perceived by the employees. Therefore, it is not an audit nor an inspection tool (De Boeck, 2015). In addition to facilitating comparisons between the perceptions of employees with different hierarchical positions in the organization. Employees, employers, and leaders each has a different perception on safety so this tool also allows the comparison between positions and between different departments to identify imbalances and see how it can be improved (Martins *et al.*, 2018).

#### 4.2. Denison model

Denison model that was developed in 1989 consists of four traits and is a self-assessment survey. It focused on organizational culture with a section in the food safety domain. So, it is broader than food safety culture. This method has the strongest proof of validity based on both quantitative and qualitative research (Jespersen *et al.*, 2017).

#### 4.3. Jespersen model

This system was developed by Lone Jespersen in 2010 (Jespersen *et al.*, 2017). This system focuses on the food safety domain and consists of five capability areas. It was tested with a global food manufacturing company in North America. The evaluation was carried on using triangulation between self-assessment survey; behavioral observations and interviews; and performance

assessments and made use of combined deductive and inductive content analysis and quantitative self-assessment data (Jespersen *et al.*, 2017).

#### 4.4. Micheal wright toolkit

The food safety culture diagnostic tool is intended to assess food businesses in respect of food safety management, including management culture. In addition to the application of good practices and pre-requisite programs. This will help inspectors start to understand the attitudinal drivers to food safety and hygiene behavior and the type of advice that can be provided to help influence attitudes and, ultimately, the culture within a food business (Food Standards Agency, 2012). Different elements are available that the inspectors can explore in order to profile the attitudes and behaviors of the business. The eight elements are: priorities and attitudes, food hygiene risk perceptions and knowledge, confidence in food hygiene and safety requirements, business ownership of food hygiene, competence, learning, training, knowledge, leadership on food hygiene, employee engagement in review and development of food hygiene practices, and finally communications and trust to engage in food hygiene and report issues (Food Standards Agency, 2012).

Table 1. Comparison of different validated tools for the assessment of food safety climate (Jespersen *et al.*, 2017).

Tool	Reference	Advantages	Disadvantages	Validity Methodology
validated 28 indicators tool	De Boeck	Piloted at eight affiliates of a large, centrally coordinated meat distribution company in Belgium	Meets nine of the 12 NRC (Nuclear Regulatory Commission) guidelines  Not clear from how comprehensive the literature review was  Systematic bias	External population validation through peer review.
Denise Model	Jespersen et al 2017	Strongest proof of validity based  Meets all 12 NRC guidelines	60 questions so considered a time consuming questionnaire	External population and historical validation through analysis of existing performance data
Jespersen Model	Jespersen et al 2017	Makes use of both quantitative and qualitative research methods	Validation gap was tested in one organization only  Meets eight of the 12 NRC guidelines	External population and ecological validation through review of existing food safety performance data and adoption

### *1.5 Factors affecting food safety climate*

Many studies have been carried out to assess what affects food safety climate in an organization. Several factors were reported to affect significantly food safety climate including leader attitude, motivation, training frequency, whereas the organization characteristics did not show any significant effect.

#### **5.1 Leaders' attitude**

In one study results showed that organizations with better leaders are more productive, competitive and responsive. Since an organizations food safety climate starts at top management and flows downwards (Griffith *et al.*,2010). Therefore, results showed that management attitudes and values may be the most important components of a healthy food safety climate in an organization (Griffith *et al.*,2010). So, food safety climate is both directly and indirectly related to employees' food safety compliance, participation, and behavior.

#### **5.2 Motivation and human factors**

A study done in Belgium showed that food safety motivation plays an important role in the relationship between food safety climate and human behavior and participation (De Boeck *et al*, 2016). This study showed that industries with multiple sites had higher leadership and communication scores thus affecting food safety climate positively (De Boeck *et al*, 2016). Employee behavior had a positive relationship with food safety climate according to a study by De Boeck in 2015. Human factors impact the application and follow up of a food safety management system. Keeping employees motivated when it comes to food safety issues enhances the food safety climate in an organization. Higher food safety motivation is related to a higher

compliance (De Boeck et al, 2017). This study proved that human behavior has an important role affecting food safety climate.

### 5.3 Training frequency

Training frequency in companies had a significant role in overall food safety climate. Organizations that provided more than one training per year but a better food safety climate than those who didn't (De Boeck *et al*, 2017).

### 5.4 Organization characteristics

No difference was found in organization characteristics such as company size, sector, or presence of quality department (De Boeck *et al*, 2017). Another study done in affiliated butcher shops showed very similar results. When comparing independent butcheries to affiliated butcheries both leadership and communication were perceived to be better in affiliated butcheries. This could be due to the fact that having multiple branches gives an organization a more structured and formal communication especially when communicating food safety policies. In addition to having more trained employees who formally communicate those policies (De Boeck *et al*, 2017).

### 5.5 Presence of Laws and Regulations

Another study done in the European union (EU) and compared EU and non-EU operating organizations showed that EU operating had to follow extensive legislation and abide by strict laws. Due to this they developed an excellent food safety climate. Therefore, having clear rules and laws makes it easier to follow food safety practices properly thus having a good food safety climate in the organization (Tomasevic *et al*, 2020).

## I.6 ABC Model

There are two reasons why organizations establish strong food safety cultures. The first is the recognition of the safety of customers and employees, and the second is the way they react to major events, such as a foodborne illness outbreak (Yiannas, 2009). When organizations plan a food safety culture program, they should take into consideration the ABC model. “A” stands for a set of antecedents that precedes the behavior, “B” for the desired behavior and “C” is the consequences that follow (Yiannas, 2009). When employees properly understand the ABC model, they will be able to better implement the food safety culture program. According to Frank Yiannas one of the main reasons employees do not perform as desired is because they don’t know what is expected of them. Food safety performance expectations should be simple, clear, and relevant (Yiannas, 2009).

#### I.7 Limitations

Food safety culture and climate are still considered complex phenomenon so the main limitation in all studies assessing them is common. Measuring human behavior is a very complex task and completely predicting or modeling behavior is not likely (Griffith *et al*, 2010). The conscientious and feeling of every individual will affect the way they answer those questions. Personal feelings, job demands, burnout and stress should all be taken into consideration for proper results (De Boeck *et al*, 2017). In addition to that all studies use self-report measures which may lead to self-report bias where individuals tend to give the answer that is socially desired. This will lead to the overreporting of desirable behaviors and underreporting of undesirable ones (De Boeck *et al*, 2017). Many studies had a small sample size due to budget constraint. Another study suggested that future research should focus on developing new models that take into consideration competing subcultures and so can explain the variance observed in food safety behaviors (Griffith *et al*, 2010)

#### I.8 Business characteristics that affect food safety culture and climate

Business characteristics can highly affect food safety culture and climate in food industries. Characteristics such as management systems, size and product type can highly influence organizations food safety culture and climate (Nyarugwe *et al.*, 2019). Many small businesses want to work on improving safety culture and climate but are unable due to the financial constraints which doesn't allow them to spend on food safety expertise (Nayak & Waterson, 2017). In addition to the fact that small businesses tend to employ ethnically diverse personnel on a part time basis leaving them with no time for training and the difficulty to install business safety culture in employees who only work part time. When employees have various traditional backgrounds; each will have their own safety practices based on their culture. Therefore, it is tough for small business to set a predefined food safety culture and climate plan. Add to that the fact that part time employees lead to high employee turnover (Nyarugwe *et al.*, 2019). Consequently, they are considered temporarily affiliated with the companies. Therefore, companies might not invest in their training, incentives, and protective clothing, which can influence food handlers' perceptions on the prioritization of food safety and hygiene in the companies (Nyarugwe *et al.*, 2019). The importance of a stable workforce composition for proper execution of food safety has been stated before in many studies (Nyarugwe *et al.*, 2019). Another factor that affects the culture and climate is having a national or local business. National businesses have guidance and a culture more or less imposed on them. On the other hand small businesses do not have the support and expertise offered to national business (Nayak & Waterson, 2017). All food businesses have pre-set attitudes towards food safety and hygiene which they try to install into their employees. There are two types of food businesses: ones that prioritized profits over hygiene and safety; and ones that prioritized hygiene and good practices over profits. Hence there is a relationship between the size of the business, safety culture policy and the likelihood of compliance with safety culture (Nayak &

Waterson, 2017). Large companies that implemented ISO22000 (International Organization for Standardization)/FSSC22000 (Food Safety System Certificate) and exporting companies had some form of implemented or certified food safety program when compared to small companies (Nyarugwe *et al.*, 2019). The political, economic, and sociotechnical environment may influence the way food safety culture and climate are prioritized and perceived (Nyarugwe *et al.*, 2019).

### I.9 COVID-19 pandemic and its impact on food safety climate and culture

To date there is still no evidence that COVID-19 a respiratory illness can be transmitted via food or food packages (Duda-Chodak *et al.*, 2020). However, there is a constant concern from consumers on the safety of food during this pandemic. Food is considered a product of the first need therefore it is important to monitor the way food is handled. Contact with food cannot be considered as completely safe and measures had to be implemented to ensure safety (Duda-Chodak *et al.*, 2020). The World Health Organization (WHO) emphasized the importance of frequent hand hygiene, respiratory etiquette and environmental cleaning and disinfection, in addition to the importance of maintaining social distancing. This posed a challenge to the food industries since posing new working practices need training sessions in the midst of a pandemic (Duda-Chodak *et al.*, 2020). The food industry globally has been affected hugely by this ongoing pandemic. Industries were affected in different ways based on size and the type of products (Nakat & Bou-Mitri, 2020). To start with the consumer purchasing behavior has changed. Consumption patterns changed from eating away from home to meals consumed at home. Consumers also started panic buying of groceries due to lockdown. Trade between countries was disrupted and industries had to search for local products to replace imported ones (Nakat & Bou-Mitri, 2020). The economics of agriculture and aquaculture for the last quarter of the year 2020 has shown a major decline, which affected the live hood for millions of people worldwide (Ling Ma *et al.*, 2021). As this pandemic



started from a food market, it is crucial that the governance and policy for food processing and manufacturing be revised. If new ways of collaboration and actions between government, industries and individual are not taken, the world is even less prepared in the future for the next pandemic (Ling Ma *et al.*, 2021). To date to our knowledge there is still no data regarding food safety climate and culture in the midst of this pandemic.

#### I.10 How the Lebanese food industry is dealing with the pandemic and the economic crisis

Globally food safety has become a public health concern and a major development challenge (Abebe *et al.*, 2019). Lebanon ranked third among the region with the highest burden of foodborne disease per population (Kharroubi *et al.*, 2020). Lebanon is now facing extreme challenges from pollution, weak infrastructure, political turmoil, and the worst economic crisis in recent history. Add to all that the novel coronavirus pandemic we are currently going through. Therefore, both food safety and food security problems are now on the rise. Recently national attention has been drawn on many cases of spoiled or expired food and frauds were reported (Kharroubi *et al.*, 2020). The food industry in Lebanon consists of 18.2% of all factories and 25% of the total workforce (Cortas, 2018). Food products are the number one exports in Lebanon, estimating for around \$1.7 billion in revenue. Accordingly, it is extremely important to enhance food safety in Lebanon and to raise awareness on what affects it and how to assess it in a food industry.

#### I.11 Latest updates

##### New Era of smarter food safety blueprint

As the world is dealing with an ongoing pandemic the U.S. Food and Drug Administration (FDA) is working hard to help ensure the foods we are consuming is safe (FDA, 2021). The face of the food industry is changing, new production methods are being enforced and new food items are

hitting the market (FDA, 2021). On July 13 2020, the FDA published the New Era of Smarter Food Safety Blueprint. It includes simpler, more effective, and modern approaches to food safety. The new era focuses on four core elements that will help reduce foodborne illness: Tech-Enabled Traceability, smarter tools and approaches for prevention and outbreak response, new business models and retail modernization and food safety culture. The new era highlighted the importance of strengthening food safety culture in food industries to reduce the burden of foodborne disease. It is a prerequisite to effective food safety management. Influencing the beliefs, attitudes, and the behaviors of people and the actions of organizations will lead to an improvement in food safety outbreaks. To be able to achieve that the industry has to conduct research on barriers, and opportunities to influence attitudes and modify behaviors related to food safety culture, develop an FDA food safety culture social marketing plan to strengthen a culture of food safety, encourage influencers (chefs, bloggers, cooking shows, celebrities) to model safe-food behaviors and make smarter food safety part of the national dialogue and social norm and finally ensure that proper education and trainings are in place (FDA, 2020).



FIG.3 Foundational pillars of the New Era of Smarter Food Safety (FDA, 2020)

## A Culture of Food Safety: Global Food Safety Institute (GFSI):

Today any GFSI audit a company participates in will include assessing the company's food safety culture. They define and assess food safety culture by five dimensions: vision, mission ,people ,consistency , adaptability and hazards/ risk Awareness. Every company has varying levels of maturity in each dimension .Food safety practices must be applied throughout the whole organization. The must haves for a successful GFSI food safety culture compliance are vision and mission, all employees must embrace and practice the vision and mission. Also employees should be well trained consistently to make the right food safety decisions even when no one is looking. In addition a foundation should be in place for quick response and adaptation to a change in company's environment or supply chain. Hazards and risk awareness are also assessed by conducting enterprise-wide food safety and regulatory risk assessment.

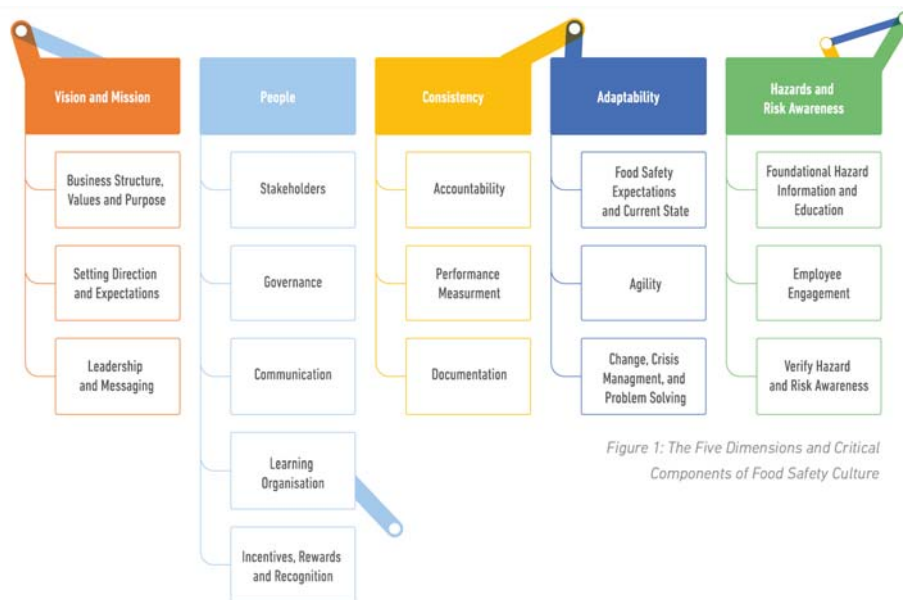


FIG 4. A Culture of Food Safety: Global Food Safety Institute (GFSI)

## I.12 Objective

Having a dominant food safety culture and climate in food industries contribute to the health of consumers, the hospitality industry, and the economy. The objective of this research was to assess the food safety climate in the Lebanese food industry and its determinants. In addition to expanding the body of knowledge on food safety culture and climate especially after the pandemic and the economic crisis in Lebanon.

## **Chapter 2. Assessing food safety culture and climate in Lebanese food industries**

### **II.1 Introduction**

Each year foodborne illnesses sicken 48 million Americans (approximately 17% of people in the United States) and lead to 128,000 hospitalizations and 3,000 deaths (CDC, 2021). According to the WHO unsafe food causes 600 million cases of foodborne diseases and 420 000 deaths worldwide. 30% of foodborne deaths occur among children under 5 years of age. WHO estimated that 33 million years of healthy lives are lost due to eating unsafe food globally each year, and this number is underestimated (WHO, 2021). Food safety has been evolving tremendously in the past century and its importance in food industries is now very well established. However, with all the regulations, training, audits and inspections foodborne outbreaks continue to happen (EFSA,2015). A well elaborated and fit to purpose Food Safety Management System (FSMS) does not always guarantee food safety and proper hygiene (Jacxsens et al., 2015). Food poisoning incidents and outbreaks are usually tracked back to food handlers' errors and non-compliance with good working practices and procedures, leading to research on human behavior during food production (De Boeck et al, 2015). The Codex Alimentarius Commission adopted a revision of its global standard on *General Principles of Food Hygiene* (CXC 1-1969) introducing the concept of 'food safety culture' as a general principle. "Food safety culture enhances food safety by increasing the awareness and improving behavior of employees in food establishments. Such impact on food safety has been demonstrated in several scientific publications" (Official Journal of the European Union, 2021). In addition in November 2020 a new version FSSC 5.1 was released and one of the key changes was the addition of management commitment and food safety culture. This includes

communication, training, feedback from employees and performance measurement on food safety related activities (FSSC, 2020).

Food safety culture can be defined as the interplay of the food safety climate as perceived by the employees and the managers of a company and the context in which a company is operating (De Boeck, 2015). A climate of food safety is based on the individual's perception of the policies, procedures, and practices toward keeping food safe and uncontaminated (Nickell & Hinsz, 2010). To differentiate between the two concepts food safety culture is considered as the bigger picture or framework of which food safety climate is a component (De Boeck, 2015). Food safety culture is long term concept that is deeply rooted in the beliefs and behaviors of all employees at the organizational level while food safety climate is more of a temporary concept existing at the individual level and related to the perceptions and attitudes of individuals and how they influence others in an organization (Sharman *et al.*, 2019). The commonly recurring and used components of food safety climate are leadership, communication, commitment, resources and risk awareness (Griffith *et al.*, 2010). Studies also found that other factors such as knowledge, motivation, burnout and job stress of the individual employees in the organization can highly affect food safety culture as well (De Boeck *et al.*, 2017).

Many validated assessment tools have been created to identify a company's food safety climate or culture. A tool of 28 indicators was developed and used in many studies for the assessment of food safety climate (De Boeck, 2015). This self-assessment tool was divided into 5 components that included leadership, commitment, communication, resources and risk awareness. This tool helps a company to evaluate the climate concerning hygiene and safety as perceived by the employees.

Several factors were reported to affect food safety climate including leader attitude, motivation, training frequency, and the presence of laws and regulations. Business characteristics can highly

affect food safety culture and climate in food industries (Nayak & Waterson, 2017). Characteristics such as management systems, size and product type can highly influence organizations food safety culture and climate. There is a relationship between the size of the business, safety culture policy and the likelihood of compliance with safety culture (Nayak & Waterson, 2017). Large companies that implemented ISO22000 (International Organization for Standardization)/FSSC22000 (Food Safety System Certificate) and exporting companies had some form of implemented or certified food safety program when compared to small companies (Nyarugwe *et al.*, 2019). The political, economic, and sociotechnical environment may influence the way food safety culture and climate are prioritized and perceived (Nyarugwe *et al.*, 2019).

Globally food safety has become a public health concern and a major development challenge (Abebe *et al.*, 2019). Lebanon ranked third among the region with the highest burden of foodborne disease per population (Kharroubi *et al.*, 2020). Unfortunately Lebanon still lacks proper laws and legislations when it comes to food safety in general and food safety culture and climate in particular. Lebanon is now facing extreme challenges from the novel coronavirus pandemic, weak infrastructure, political turmoil, and the worst economic crisis in recent history. Therefore, both food safety and food security problems are now on the rise. Recently national attention has been drawn on many cases of spoiled or expired food and various fraud incidences were reported (Kharroubi *et al.*, 2020). The food industry in Lebanon consists of 18.2% of all factories and 25% of the total workforce (Cortas, 2018). Food products are the number one exports in Lebanon, estimating for around \$1.7 billion in revenue in the year 2018 (Cortas, 2018). Accordingly, it is extremely important to enhance food safety in Lebanon and to raise awareness on what affects it and how to assess it in a food industry. Although the number of studies on food safety climate is

growing, this topic needs to be explored further, especially when it comes to the experiences of various countries (Wisniewska *et al.*, 2019).

Having a dominant food safety culture and climate in food industries contribute to the health of consumers, the hospitality industry, and the economy. The objective of this research was to assess the food safety climate, behavior, and knowledge of employees in food industries in Lebanon. The association with some socio-demographic and work-related determinant were investigated. The results of this survey will help collect information of interest for consultants as well as for food safety managers. This survey will also help in pointing out the gaps that certified food industries face at the level of food safety management system in relation to the food safety climate.

## II.2 Material and methods

### *II.2.1 Study design*

A cross sectional study on 204 participants from 23 Lebanese industries was carried out between July to September 2021 to evaluate the food safety climate, behavior, and knowledge of employees in food industries across Lebanon.

### *II.2.2. Participants and questionnaire design*

After screening the list of Lebanese industries, the company owner, general manager, or food safety quality control managers were contacted via phone calls and then by email. After approval, the link to the online questionnaire (Google Forms) was sent via Email or WhatsApp to all the food handlers and quality control managers. A brief short explanation was given about this survey while emphasizing the fact that responses would be used anonymously by the researchers. To be eligible for inclusion the participant has to be an employee in a food industry and is either a quality manager, plant manager, production manager or a food handler.



The questionnaire was available in both English and Arabic language. The questionnaire was translated to the Arabic language and back translated to English, and adjustments were made to secure identical questionnaires in both languages. The participant had the choice of answering the questionnaire in either language. A pilot study was conducted among 10 adults pilot testing with face to face interview; additionally, 30 adults pilot study was made to get a preliminary validation of the online questionnaire. The questionnaire needed approximately seven minutes to be filled out properly. The clarity, suitability of wording and the average time needed for its completion were assessed.

The questionnaire was composed of two sections. One section dealing with socio demographic and economic status and one section assessing the food safety climate. In addition to that a form on the company characteristics were filled out. A validated model of food safety climate self-assessment tool was used. This tool was developed and validated by De Boeck *et al.* in 2015 and it consists of 28 indicators. Every indicator includes statements where respondents answer by means of a five-point Likert answer scale (1 → 5: totally disagree → totally agree). This tool also enables the measurement of the five components of food safety climate. Leadership (6 indicators), communication (5 indicators), commitment (6 indicators), resources (6 indicators) and risk awareness (5 indicators) (De Boeck *et al.*, 2019). Additionally, 5 questions on food safety motivation, 6 questions on job stress and burnout and 6 questions on conscientiousness were used based on the study De Boeck *et al.* (2017).

### *II.2.3. Statistical analysis*

Data was analyzed using Statistical Package for the Social and Sciences statistical software package (SPSS) version 22. The responses frequency and percentages in each category were calculated and tabulated. Spearman correlations were calculated for all continuous variables such

as age and working years. For the non-continuous dichotomous variables such as gender independent t-test was executed. ANOVA and Kruskal-Wallis H tests were carried out to compare statements between variables with more than 2 categories, such as education level. In addition a multiple linear regression was performed after adjusting for confounders to assess the association of different variables with the food safety climate. The level of statistical significance was set at 0.05

#### *II.2.4. Ethical considerations*

The study protocol was approved by institutional review boards from the Notre Dame University-Louaize (Protocol Ref#: IRBF2018\_1\_FNHS). Information on the research objective was read to the participants. The nature of the study was fully explained to respondents to obtain consent and all information was collected after securing consent. Data obtained from each study participant were kept confidential and the privacy and confidentiality of respondents was also maintained. No false promise such as remuneration, food or financial aids was given. No psychological damage to the interviews will take place since the questionnaire is online and each participant will fill it out privately.

### **II. 3. Results**

#### **II.3.1 Characteristics of recruited companies**

Out of the 40 contacted industries, 23 agreed to participate. In this study, 26.1% of the participating companies were micro, 17.4% small, 30.4% medium and 26.1% large. Most of the industries (34.8%) were food service (restaurants/ diet center), 30.4% bakeries and confectionary, 17.4% meat and dairy products and 17.4% canned food and beverage. Most of the participating companies (65.2%) do not export their products, and 39.1% were ISO 22000 certified (Table 1).

Table 1. General characteristics of the recruited industries (n = 23).

	Frequency (n)	Percentage (%)
<i>Industry size<sup>1</sup></i>		
Micro	6	26.1
Small	4	17.4
Medium	7	30.4
Large	6	26.1
<i>Industry type</i>		
Food service	8	34.8
Bakery/Confessionary and cereal	7	30.4
Meat and dairy products	4	17.4
Canned food/Beverage	4	17.4
<i>Export</i>		
Yes	8	34.8
No	15	65.2
<i>Food safety management system<sup>2</sup></i>		
ISO22000	9	39.1
ISO22000+FSSC	2	8.7
ISO22000+HACCP+FSSC	3	13.1
None	9	39.1

<sup>1</sup> According to the Lebanese Ministry of Economy and Trade: micro enterprise less than LBP 500 million and less than 10 employees , Small Enterprise less than LBP 5 billion and less than 50 employees , Medium Enterprise less than LBP 25 billion and less than 100 employees. Exceeding either of these thresholds would lead to recognizing enterprises as large (Inventis, 2020).

<sup>2</sup> ISO22000 (International Organization for Standardization) HACCP (Hazard Analysis Critical Control Points) FSSC (Food Safety System Certificate)

### II.3.2 Socio-demographic characteristics of food handlers

Socio-demographic characteristics of food handlers in the Lebanese industries was presented in Table 2. Among the recruited participants (n = 204) with a mean age equal to  $34.6 \pm 8.6$  years, 65.2% were males, 91.7% were Lebanese, 51.5% were married, 45.1% had a monthly net income ranging between 1,500,000-2,999,000 Lebanese lira, and 53.9% had a bachelor's degree. Furthermore, 28.4% of the participants had a degree in sciences/food science/ nutrition and 35.8% had degrees in other majors. Most of them (75.5%) did not suffer from any health conditions.

Table 2. Socio-demographic characteristics of food handlers in Lebanese industries (n = 204).

Sociodemographic characteristics	Frequency (n) or mean $\pm$ SD	Percentage (%)
<i>Gender</i>		
Male	133	65.2
Female	71	34.8
<i>Age</i>	$34.66 \pm 8.666$	
<i>Nationality</i>		
Lebanese	187	91.7
Non Lebanese	17	8.3
<i>Education Level</i>		
Less than high school	11	5.4
Highschool	58	28.4
Bachelor	110	53.9
Master	25	12.3
<i>Major</i>		
No major	73	35.8
Sciences/FS/Nutrition	58	28.4
Other	73	35.8
<i>Monthly net income (LBP)<sup>1</sup></i>		
Less than 749.000	6	2.9
750.000-1.499.000	44	21.6
1.500.000-2.999.000	92	45.1
3.000.000-4.499.000	40	19.6
More than 4.500.000	22	10.8
<i>Marital status</i>		
Single	93	45.6

Married	105	51.5
Divorced	5	2.5
Widowed	1	0.5
<i>Health Condition</i>		
No	154	75.5
Yes	50	24.5

<sup>1</sup>LBP (Lebanese pound)

### II.3.3. Job related parameters

Job related parameters were also assessed (Table 3), and results showed that 57.4% of the participants asked for a day off if they are sick and 48.4% did one medical checkup per year. The mean number of years that the employee had been working in the same job was  $5.86 \pm 4.35$ . Out of the 204 participants, 10.3% were in managerial positions and 27% worked in the quality department. Most of the participants (82.4%) had food safety and hygiene trainings and 42.2% had trainings more than once per year. Furthermore, questions were asked to assess the status of the employees after the COVID-19 pandemic and during the economic crisis that Lebanon is currently facing. 85.8% had received a salary raise after the COVID-19 pandemic and economic crisis, 57.8% had a salary drop and 55.9% felt that they might lose their jobs.

### II.3.4 Food Safety Climate Assessment Score

The mean score of the food safety climate score that included 28 questions divided into five categories was  $119.09 \pm 11.14$ . The range was 84 and the maximal score that can be reached is 140.

Moreover, the mean score of the food safety motivation that included five questions was  $20.71 \pm 2.36$ , burnout/job stress that included six questions was  $17.06 \pm 5.71$  and lastly conscientiousness that included six questions with a mean of  $20.73 \pm 2.25$  (Table 4).

Table 3. Job related parameters of the food handlers in Lebanese industries (n = 204).

Job related parameters	Frequency (n) or mean $\pm$ SD	Percentage (%)
<i>If you are sick?</i>		
Ask for a day off	117	57.4
Take medication randomly	13	6.4
Follow a prescription	73	35.8
<i>Frequency of medical checkups per year</i>		
One time/month	3	1.5
One time/year	99	48.5
Two times/year	36	17.6
Four times/year	9	4.4
Only in case of sickness	52	25.5
Never	5	2.5
<i>Working hours per day</i>	8.44 $\pm$ 1.73	
<i>Working hours per week</i>	46.18 $\pm$ 10.61	
<i>Days off per year</i>	19.84 $\pm$ 10.86	
<i>Years in current job</i>	5.86 $\pm$ 4.4	
<i>Job role</i>		
Managerial positions	21	10.3
Quality department	55	27
Other <sup>1</sup>	128	62.7
<i>Attend a course on food hygiene and foodborne diseases</i>		
No		
Yes	36	17.6
	168	82.4
<i>Frequency of food safety and hygiene training</i>		
None	31	15.2
More than 1 training/year	86	42.2
Yearly	66	32.4
Less than 1 training/year	21	10.3
<i>Salary raise</i> Yes	175	85.8
<i>Salary dropped</i> Yes	118	57.8
<i>Felt that you can lose your job</i> Yes	114	55.9

<sup>1</sup>Other: Food handler and cleaner

Table 4. Total food safety climate score

	Mean	Standard Deviation
<i>Food safety climate score (Leadership, communication, commitment, resources, and risk awareness)</i>	119.09	11.14
<i>Food safety motivation</i>	20.71	2.36
<i>Burnout/Job stress</i>	17.06	5.71
<i>Conscientiousness</i>	20.73	2.25

### II.3.5 Association between socio-demographic characteristics and food safety climate of participants in Lebanese industries

The association of different variables with food safety climate was investigated using bivariate analysis (Table 5). Socio-demographic variables that showed a significant association ( $p < 0.05$ ) with food safety climate score were gender, age, education level, and major.

In fact, males had a significantly lower mean score ( $117.25 \pm 9.71$ ) than females ( $122.54 \pm 12.81$ );  $p = 0.003$ . A negative weak correlation was found between the mean score of food safety climate and age ( $r = -0.167$ ;  $p = 0.017$ ), meaning that as the age increases food safety climate score decreases. Furthermore, participants having a high school education had significantly lower score levels ( $114.86 \pm 6.24$ ) than those holding a bachelor's or master's degrees ( $121.11 \pm 10.53$ ,  $p < 0.001$  and  $120.64 \pm 17.23$ ,  $p = 0.007$ , respectively).

Moreover, participants having a degree in science/food science/nutrition had a significantly higher score mean ( $124.10 \pm 13.35$ ) than those majoring in other fields ( $118.84 \pm 10.01$ ) and those with no major ( $115.38 \pm 8.65$ ).

Table 5. The association between socio-demographic characteristics with food safety climate of participants in Lebanese industries

	Food safety climate		
	Mean	SD	p value
<i>Gender</i>			
Male	117.25	9.71	<b>0.003</b>
Female	122.54	12.81	
<i>Age</i>	r= -0.16		<b>0.017</b>
<i>Nationality</i>			
Lebanese	118.92	11.075	0.464
Non-Lebanese	121.00	12.129	
<i>Marital status</i>			
Single	120.27	13.33	0.228
Married	118.00	8.78	
Divorced	121.40	11.21	
Widowed	112.00		
<i>Education level</i>			
Less than high school	117.82	14.95	<b>&lt;0.001</b>
Highschool <sup>a,b</sup>	114.86	6.24	
Bachelor(license) <sup>a</sup>	121.11	10.53	
Master <sup>b</sup>	120.64	17.23	
<sup>a</sup> p <0.001; <sup>b</sup> p=0.007			
<i>Major</i>			
No major <sup>a</sup>	115.38	8.66	<b>p&lt;0.001</b>
Sciences/Food science/Nutrition <sup>a, b</sup>	124.10	13.35	
Other <sup>a, b</sup>	118.83	10.01	
<sup>a</sup> p=0.013 and p<0.000; <sup>b</sup> p=0.011			
<i>Monthly net income (LBP)<sup>1</sup></i>			
Less than 749.000	122.83	13.74	0.126
750.000-1.499.000	117.13	9.78	
1.500.000-2.999.000	118.18	12.73	
3.000.000-4.499.000	120.12	7.93	
More than 4.500.000	123.95	9.91	
<i>Health condition</i>			
No	119.38	11.76	0.456
Yes	118.20	9.04	

Significance level set at p<0.005

<sup>1</sup>LBP (Lebanese pound)



### II.3.6. The association between job related parameters with food safety climate of participants in Lebanese industries

Never performing a medical checkup had significantly higher mean of food safety climate score (123.80) compared to those doing 4 checkups per year (111.77), with  $p=0.022$ . In addition, participants working at the preparation level had significantly lower scores than those working in other positions ( $115.75\pm9.61$  and  $123.31\pm13.50$  respectively,  $p=0.013$ ). Moreover, individuals working at the managerial level and in the quality department had significantly higher climate scores ( $125.14\pm9.50$  and  $121.65\pm14.55$ , respectively) than those having other roles in the industry ( $117.00\pm9.00$ ) with  $p<0.001$ .

Moreover, a negative correlation was found between the mean score of food safety climate and the weekly working hours ( $r= -0.18$ ;  $p=0.008$ ) same goes for daily working hours a negative correlation with the mean score of food safety climate was found ( $r= -0.19$ ;  $p=0.05$ ).

Additionally, food safety motivation and conscientiousness were moderately positively associated with the mean score of food safety climate with a  $r=0.34$  and  $r=0.28$  respectively,  $p<0.001$ , while a negative correlation was found between burnout and job stress and the mean score of food safety climate  $r= -0.37$  and  $p<0.001$ . As the burnout and job stress increase the food safety climate score decrease.

Concerning food safety trainings, participants who attended a food safety course had significantly higher scores of food safety climate ( $117.08\pm7.65$  and  $121.27\pm13.69$  respectively,  $p=0.008$ ).

A significantly lower mean score was found in participants who felt that they can lose the job ( $117.64\pm11.31$ ) and those who didn't ( $120.94\pm10.72$ ),  $p=0.035$ .

No significant association was detected between mean score of food safety climate and association nationality, marital status, monthly net income, health condition, case of sickness, days off per year, years in current job, source of information on food hygiene, attending a course on food hygiene and foodborne diseases, receiving a salary raise or a salary drop.

Table .6 The association between job related parameters with food safety climate of participants in Lebanese industries

	Food safety climate		
	Mean	SD	P value
<i>If you are sick:</i>			
Ask for a day off	120.13	8.97	0.305
Take medication randomly	115.84	8.94	
Follow a prescription	118.50	13.61	
<i>Medical checkups per year</i>			
One time/month	121.33	16.16	0.022
One time/year <sup>b</sup>	117.71	8.58	
Two times/year <sup>c</sup>	119.61	10.15	
Four times/year <sup>a</sup>	111.77	11.08	
Only in case of sickness <sup>a, b, c</sup>	122.05	14.78	
Never	123.80	11.03	
<sup>a</sup> <i>p</i> <0.012; <sup>b</sup> <i>p</i> =0.002; <sup>c</sup> <i>p</i> =0.043			
<i>Level of food handling</i>			
Reception of raw ingredients	119.68	9.14	0.013
Preparation (cleaning, cutting, cooking) <sup>a</sup>	115.75	9.61	
Packaging	119.22	8.76	
Transportation from kitchen to ward	117.66	9.81	
Distribution on the floor	120.66	11.22	
Collecting of the food waste	116.66	11.43	
Other <sup>a</sup>	123.31	13.50	
<sup>a</sup> <i>p</i> <0.002			
<i>Job title</i>			
Managerial position <sup>a</sup>	125.14	9.50	<0.001
Quality department <sup>b</sup>	121.65	14.55	

Other <sup>a,b</sup>	117.00	9.00	
<sup>a</sup> p=0.001, <sup>b</sup> p=0.001			
<i>Working hours per week</i>		r= -0.18	<b>0.008</b>
<i>Working hours per day</i>		r= -0.19	<b>0.005</b>
<i>Days off have per year</i>		r= 0.17	0.805
<i>Years in current job</i>		r= -0.05	0.404
<i>Food safety motivation</i>		r= 0.34	<b>p&lt;0.001</b>
<i>Burnout/job stress</i>		r= -0.37	<b>p&lt;0.001</b>
<i>Conscientiousness</i>		r=0.28	<b>p&lt;0.001</b>
<i>Source of information on food hygiene and foodborne diseases</i>			
Education courses on food hygiene /Trainings at your facility.	118.86	11.33	0.384
Audio/visual materials and mass-media	123.40	9.65	
Social media	118.09	11.50	
Not specified	117.00	6.63	
Other	131.00	8.48	
<i>Attend a course on food hygiene and foodborne diseases</i>			
No	118.86	9.38	0.889
Yes	119.14	11.51	
<i>Attend a course on food safety</i>			
No	117.08	7.65	<b>0.008</b>
Yes	121.27	13.69	
<i>Frequency of food safety and hygiene training</i>			
None			
More than 1 training/year	118.51	9.77	0.947
Yearly	119.46	12.80	
Less than 1 training/ year	119.22	10.88	
	118.04	5.90	
<i>Salary raise</i>			
No	119.65	10.75	0.772
Yes	119.00	11.24	
<i>Salary dropped</i>			
No	120.52	13.21	
Yes	118.05	9.28	0.140
<i>Felt that you can lose your job</i>			
No	120.94	10.72	
Yes	117.64	11.31	<b>0.035</b>

Significance level set at p<0.005

### II.3.6. The association between company characteristics and food safety climate

Regarding the participating companies' characteristics further statistical analyses (Table 7) showed that company size ( $p=0.109$ ), the type of industry ( $p=0.096$ ) and the type of food safety management system implemented ( $p=0.050$ ) did not have a significant association with food safety climate. However, whether the industry exports or not was associated with food safety climate. Companies who export had a higher score mean of  $121.63 \pm 10.67$  while companies who did not export had a mean of  $118.11 \pm 11.21$ ;  $p=0.043$ .

Table 7. The association between company characteristics and food safety climate

	Food safety climate		
	Mean	SD	P value
<i>Industry size</i>			
Micro	118.53	7.15	0.109
Small	123.76	11.22	
Medium	119.37	12.96	
Large	117.71	10.58	
<i>Industry type</i>			
Food service	120.08	11.55	0.096
Fish/dairy/poultry	119.41	10.94	
Bakery/confectionary	116.57	10.79	
Canned food/beverage	122.25	10.47	
<i>Export</i>			
No	118.11	11.21	<b>0.043</b>
Yes	121.63	10.67	
<i>Food safety management system</i>			
None	120.39	8.81	0.050
ISO22000	119.14	11.73	
ISO22000+HACCP+FSSC	121.48	10.34	
ISO22000+FSSC	114.35	12.80	

### II.3.7. Regression

A multiple regression was performed after adjusting for confounders, which included gender, age, education level, major, income, level of food handling, job role, medical checkups, number of

working hours, food safety motivation, burnout, conscientiousness, food safety courses, feeling of losing job and salary drop in addition to company related parameters. The results showed that exporting companies, food safety motivation, and conscientiousness were positively associated with food safety climate, while working hours per day and burnout/job stress were negatively associated with the climate score. In fact, companies who export their goods have significantly ( $p=0.018$ ) higher food safety climate score by 4.69 than those who did not. Furthermore, for each increase of 1 working hour per day, the food safety climate decreases by 1.47 (unstandardized beta 1.47;  $p=0.001$ ). Similarly, as the burnout/job stress score increases by 1 unit, the food safety climate decreases by 0.39;  $p = 0.04$ . However, when the food safety motivation and conscientiousness scores increase by 1 unit, the food safety climate score increases respectively by 1.15 and 1.68;  $p<0.001$  (Table 8).

When it comes to the food safety systems classifications were done based on whether food safety system was available (HACCP or ISO22000 or FSSC or have more than one food safety system in place) or not to assess the impact of having a food safety system on the total food safety climate score however no association was found.

Table 8. Association of different variables with the food safety climate as assessed by the multiple linear regression

	Unstandardized Coefficients	95.0%Confidence Interval for B		Standardized Coefficients	p-value
	B	Lower	upper	Beta	
<i>Gender</i>	1.66	-1.52	4.86	0.071	0.304
<i>Age</i>	-0.09	-0.29	0.10	-0.07	0.358
<i>Education level</i>	-1.74	-4.21	0.72	-0.12	0.164
<i>Major</i>	0.29	-0.36	0.95	0.07	0.381
<i>Income</i>	0.60	-1.27	2.41	0.052	0.528
<i>Level of food handling</i>	-0.02	-0.70	0.66	-0.05	0.951
<i>Job role</i>	-0.05	-1.02	0.91	-0.009	0.910
<i>Medical checkups</i>	0.20	-0.93	1.34	0.025	0.724
<i>Working hours per day</i>	-1.47	-2.32	-0.62	-0.22	<b>0.001</b>
<i>Felt lose job</i>	-0.42	-3.42	2.58	-0.02	0.784
<i>Food safety motivation</i>	1.15	0.55	1.74	0.24	<b>&lt;0.001</b>
<i>Burnout/ Job stress</i>	-0.39	-0.66	-0.13	-0.20	<b>0.004</b>
<i>Conscientiousness</i>	1.68	1.04	2.32	0.34	<b>&lt;0.001</b>
<i>Attend food safety course</i>	0.70	-2.81	4.21	0.032	0.694
<i>Salary drop</i>	-0.34	-3.23	2.55	-0.01	0.816
<i>Company type</i>	-1.26	-2.85	0.32	-0.12	0.117
<i>Company size</i>	-0.56	-1.95	0.83	-0.05	0.431
<i>Export</i>	4.69	0.79	8.59	0.19	<b>0.018</b>
<i>Foodsafety system (with/without)</i>	0.536	-1.29	0.22	-0.089	0.167

*R square = 0.353*

## II.4. Discussion

Previous studies already demonstrated the association between food safety climate and individual socio-economic characteristics, training, knowledge as well their motivation, stress, and burnout. Additionally, it was reported in several studies that company characteristics like company size, food production characteristics and the food safety management system employed could influence food safety climate (Ungku Fatimah, Strohbehn, & Arendt, 2014). This study provides novel information and reveals many new insights about the food safety climate condition in Lebanese industries especially during the COVID-19 pandemic and the economic crisis.

### *II.4.1. Characteristics of the companies and representativeness of the overall industries in Lebanon*

In this study 34.8% were food service (restaurants/ diet center), 30.4% bakeries and confectionary, 17.4% meat and dairy products and 17.4% canned food and beverage. In addition, 73.9% of the participating companies were micro, small and medium enterprises. Making the results very similar to the official percentage published by the Lebanese chamber of commerce regarding the characteristics Lebanese food industries (79%) (CCIA-BML, 2019); however, none of the olive oil and the wine making industries participated (CCIA-BML, 2019). In the future adding more industry types such as olive oil and alcoholic beverages can increase representativeness but in this case, it was not possible since the time of conducting data collection (July/August) those industries do not operate.

### *II.4.2. Economic characteristics of the employees during the current crisis in Lebanon*

When 40 Lebanese industries were contacted and only 23 agreed to be part of this study, it was attributed to the fact that Lebanon is currently going through the worst economic collapse in recent

history (Dawson, 2021). The Lebanese lira has lost more than 90% of its value, three in four Lebanese citizens are now below the poverty line and a huge shortage in fuel leading to electricity shortage and constant blackouts (Dawson, 2021). Most of the industry production was disrupted, employees' number was low, and a general frustration could have led the companies to not respond positively to participate in research. In addition, to that it highly depends on the person who is contacted whether it is the companies' general manager or a secretary that highlights the noncommitment and unprofessionalism of several employees. Add to all that is the fact that during data collection COVID-19 cases in Lebanon were on the rise daily ranging between 632 new cases on July 20 2021 and 2,591 new cases on August 11 2021 (MOPH, 2021). This could also have led companies not to be very responsive.

When asked about the salary raise 85.8% of the participants reported receiving a salary raise, while 57.8% had a salary drop. This is attributed to the fact the Lebanese currency was losing significantly its value day by day, and even though the salary were being raised its value was negligible. It is important to state here that during the time of data collection (July 2021-September 2021) the black market dollar rate was ranging between 16,000 LL(Lebanese Lira) and 21,000,LL (Al Ain, 2020) while the BDL (Banque du Liban) set the dollar rate at 3,900 LL (BDL, 2020). Dollar rate confusion, banks refusing to let people withdraw money, basic medicines are often unavailable, and weekly grocery bills can equal months of a typical family's income this is what the Lebanese population has been going through recently (New York Times, 2020).

#### *II.4.3. Food Safety Climate*

The indicators and answer scale of the 28 questions food safety climate score was constructed in a way that a higher score on the answer scale corresponds with a better perceived food safety



climate in the company. Therefore, we can conclude that the overall score of food safety climate in the Lebanese industries was actually good ( $119.09 \pm 11.14$ ). A study done by Tomasevic et al in 2019 on 503 food business companies showed that the total FS-climate scores in Companies in EU (European Union) cluster perceived the FS-climate to be on a higher level ( $4.36 \pm 0.40$ ) than companies in non-EU cluster ( $3.99 \pm 0.69$ ) (Tomasevic *et al.*, 2020).

Another study done on 136 responses from the Belgian food processing companies found that the overall perceived status of the food safety climate can be considered good. 50.5% of the responding companies “agreed” and 24.7% “totally agreed” with the indicators of the food safety climate assessment tool. This number however is not a representative sample of the Belgian food industry (De Boeck *et al.*, 2017).

#### *II.4.4. Sociodemographic variables*

This study also identified the influence of sociodemographic variables on food safety climate. No significant association was detected between mean score of food safety climate and nationality, marital status, monthly net income, health condition. On the other hand, age, gender, education level and major had a significant association with food safety climate score.

In this study food safety climate decreased with age. Olumakaiye and Bakare (2013) or Akabanda *et al.* (2017) showed that older workers had better scores than their younger colleagues; however, Wisniewska et al. (2019) showed that when assessing small franchise restaurant in Poland (18 participants), age did not have a significant impact. On the other hand, research has also shown that millennial employees value organizational philanthropy and social awareness. A study on generational differences, millennial age workers (born between 1979 and 2001) see themselves as accountable for the improvement of society and perceive that employers should join their altruistic causes (Cone Inc., 2006). Younger employees were less likely to provide

a biased response regarding organization behavior, particularly when the risk taken on food safety is not aligned with their personal values concerning social responsibility (Fatimah & Abidin, 2013).

Education background and level was positively associated with food safety climate. Participants holding a bachelor's or master's degrees and those having a degree in science/food science/nutrition had a significantly higher score mean than those having high school education and majoring in other fields. Many studies have already proved that food safety climate is impacted by the background culture that employees bring with them to the organization combined with the education they have received (Mayorga, 2017).

It is suggested that to ensure proper food safety climate it is important during the recruitment process to select employees with proper educational and work experience. Make sure through proper interviewing that the selected employee has the culture and background needed to fit with the companies food safety climate.

In contrast to previous studies females had significantly higher food safety climate score as compared to males. A study done in onsite foodservice operations found a significantly different across gender however further research was needed to support the findings on the differences between male and female because the male sample was relatively small compared to females (Fatimah & Abidin, 2013). While in a study conducted in two Belgian vegetable processing companies no significant differences were seen for all dependent variables between men and women, gender was still taken as a control variable in line with previous safety research (De Boeck *et al.*, 2017).

More studies need to be done to compare the difference in food safety climate scores between genders. However, since females had a significantly higher food safety climate score, we can suggest that companies could give more trainings to males to increase awareness and therefore increase the food safety climate scores. Companies can also consider hiring females in potentially hazardous sections and high-risk zones since they have higher food safety climate scores.

#### *II.4.5. Impact of job-related parameters on the food safety climate*

No significant association was found between case of sickness, days off per year, years in current job, source of information on food hygiene, attending a course on food hygiene and foodborne diseases, receiving a salary raise and a salary drop.

Concerning food safety trainings, participants who attended a food safety course had significantly higher scores of food safety climate. This was also the case in a study conducted in 37 hospitals and 24 school foodservices that showed that employees who had received food safety training showed a more positive view regarding food safety climate than untrained employees (Fatimah & Abidin, 2013). Another study done in fruit and vegetable export plants in Honduras and Panama showed that workers who received trainings had an increased knowledge of food safety compared to the workers who did not receive trainings (Mayorga, 2017). In the latest guidance document published by the FSSC 22000 they stressed the importance of properly interviewing personnel to make sure that they have participated in food safety trainings.

Therefore, it is highly encouraged for companies to offer trainings as much as possible both for old and new employees. In addition, during the recruitment process it is favorable to recruit employees who have received trainings related to food safety (FSSC, 22000).

One of the important findings of this study is that for each increase of 1 working hour per day the food safety climate decreases. Previous studies have tackled the issue of work fatigue, which can result in errors and accidents. A large review study (5 international scientific databases and 443 publications) on the effects of work hours on various health outcomes, safety, and performance found that shift work and long working hours present a substantial and well-documented detrimental effect on safety (Wagstaff *et al*, 2011). Work periods of more than 8 hours carry an increased risk of accidents that cumulates, so that the increased risk of accidents at around 12 hours is twice the risk at 8 hours (Wagstaff *et al*, 2011).

Here it is suggested that the importance of having a proper work schedule with lunchbreak included so that the employee don't reach a phase of fatigue that affects their productivity and food safety climate score.

In addition, the findings revealed that participants working at the preparation level had significantly lower scores than those working in other positions. Moreover, individuals working at the managerial level and in the quality department had significantly higher climate scores than those having other roles in the industry. Similarly, to other studies that showed that employees perceptions toward organizational climate differed significantly based on their job positions. Front-of-the-house employees had a more positive perception of the organizations food safety climate than back-of-the-house employees. This implies that a heterogeneous culture exists within an organization, and thus assessment of food safety culture should be measured separately across those subcultures (Fatimah & Abidin, 2013). As explained and illustrated by De Boeck et al. (2016) human behavior of all employees, regardless of their hierarchical position in the company, is believed to be influenced by the food safety climate prevailing in the company.

Another important finding is that a significantly lower mean score was found in participants who felt that they can lose their job. This is unfortunately the current case of the Lebanese employees, and no studies can be found to support this since it is a very novel topic that Lebanon is currently undergoing. Further studies should be done in the near future to see how the situation of both the employees and the industries can be improved in order to perform better. Feeling of losing the job could also be due to the COVID-19 pandemic not just the economic crisis however this study did not assess this point nor asked questions directly related to the pandemic.

#### *II.4.6. Company characteristics and its impact on food safety climate*

Regarding the participating companies' characteristics statistical analyses showed that company size, the type of industry and the type of food safety management system implemented did not have a significant association with food safety climate. However, whether the industry exports or not was associated with food safety climate.

When it comes to company characteristics a positive association was found between whether the industries export or not and food safety climate. To the best of our knowledge no previous study have studies this link directly. However, in the case of Lebanon it was important to assess this question in the middle of an economic crisis since companies who export are not affected by the crisis as much as the ones who don't therefore having more time and resources to focus on food safety climate. Others studies only mentioned export as a means to describe how advanced the food safety management system implemented is such as a study done in Zimbabwe that studied the link between exporting and having a proper food safety system in place. Since most African companies have certified food safety programs only as an export requirement (Nyarugwe *et al.*,2019). The study done in Zimbabwe in a transition economy was done in similar circumstances as our study since Lebanon is also currently going through political and economic problems

similarly as Zimbabwe was at the time the study was conducted. Those results should be assuring to for importing countries that Lebanese industries even with an economic crisis and a pandemic the food safety culture is still maintained.

Exporting companies who participated had similar characteristics to non exporting companies yet had a better food safety climate scores. 87.7% received a salary raise, 56.1% had a salary drop and 52.6% were scared to lose the job (Data not shown). Even the total mean score of food safety motivation(20.85) , burnout and job stress(16.77) and consciousness (20.71) were very similar. However when it comes to the food safety management system 87.5% had a food safety system while compared to the none exporting 46.7% had a food safety system (Data not shown).

In this study no association was found between the type of the industry and food safety climate score similarly to what was previously supported by De Boeck et al. (2018), who did not find a significant correlation between food safety climate and food sector. However other studies showed that companies place stricter requirements and priority on food safety in production of high-risk products such as meat and dairy than for other products. Since high-risk products are hazardous if processed under non-conforming circumstances, we can conclude that companies working with high-risk food products possess a pro-active food safety climate (Nyarugwe *et al.*,2019).

We are fully aware that having a food safety system does not guarantee good food safety climate (De Boeck et al., 2015). This was proved in our study since we have not observed any significant association between the type of food safety system implemented and food safety climate just like previously reported in central and eastern Europe (De Boeck et al., 2015).

Company size did not have a significant association with food safety climate. Similarly, to the study done in central and eastern Europe, no significant differences between small, medium and

big industries (Tomasevic *et al.*, 2020). This suggests that both small and large companies can manage to have a good food safety climate.

This evaluation shows that a company can have a good food safety climate score regardless of its size, sector and food safety management system implemented.

#### *II.4.7. Conscientiousness, job stress and food safety motivation*

The results in this study showed that participants conscientiousness and motivation are positively associated with food safety climate, whereas the job stress is negatively associated. As the motivation and conscientiousness scores increase by 1 unit, the food safety climate score increases respectively.

Conscientiousness is a fundamental personality traits that reflects the tendency to be responsible, organized, hard-working, goal oriented, and to adhere to norms and rules. Therefore it is the quality of wishing to do one's work or duty well and thoroughly (Jackson & Roberts, 2015). A study conducted on 260 employees at a fully-integrated turkey processing plant located in a small upper Midwestern community, reported that both food safety climate and workers conscientiousness contributed to the prediction of food safety behaviors (Nickell & Hinsz, 2010). This study reported relatively high conscientious (5.81 out of 7) and as predicted, individuals having higher trait conscientiousness reported relatively higher food safety behaviors when they perceived a stronger climate of food safety (Nickell & Hinsz, 2010). Conscientiousness is one of the few personality traits that has shown to be a consistent predictor of job performance across different occupations (Barrick & Mount, 1991).

This was also the case in a study done in two Belgian vegetable processing companies that showed that organizations should work on keeping their employees motivated regarding food issues since

higher food safety motivation is related to a higher food safety compliance (De Boeck *et al.*, 2017). The relationship between lack of motivation amongst employees in an organization and a poor food safety climate was also considered by Nayak and Waterson (2016).

De Boeck *et al.* (2017) also reported that job stress and burnout are both statistically negatively significantly correlated to food safety climate and food safety behavior.

These results show the importance of human factors in the context of food safety. It also suggests the importance of focusing on food safety behavior, knowledge, motivation, burnout and job stress of employees in the organization since it can lead to a better implementation of food safety management systems (De Boeck *et al.*, 2017).

Finally based on the results we can conclude that “People” are the critical component of a food safety culture. A position paper from the global food safety initiative (GFSI) stressed the importance of employee behavior and activities, from farm to serving customers, contribute to the safety of food and potentially decrease or increase the risk of foodborne illness. To be successful, food safety must go beyond formal regulations to live within the culture and climate of an industry (GFSI, 2018). The FDA also supported this idea in its recently published the New Era of Smarter Food Safety Blueprint. They stated that no dramatic improvements in reducing the foodborne disease will take place without doing more to influence and change human behavior. The importance of a food safety culture has been highlighted during COVID-19 pandemic with its focus on keeping food workers safe (FDA, 2021).

## II.5 Limitations

This study provides valuable information about the current situation of food safety climate in Lebanese industries. Several limitations are recognized in the design of the study. The sample of



the study did not include all types of food industries (olive oil and alcoholic beverages were missing) therefore generalization cannot be made to all types of industries as some operations might feature different characteristics that contribute to an organizational food safety climate. Another limitation is that companies choosing to participate can be considered to be already food safety oriented and pro-actively interested in improving food safety management in the organization so there might be some bias in the participating companies. In addition, the use of a self-reported measurement of food safety climate could have produced a biased result as respondents may have provided socially desirable responses even though a guarantee of confidentiality was provided (Podsakoff *et al.*, 2003). These limitations should be taken into account and interpretation of the findings must be made with cautions. Finally, the use of cross-sectional survey provides a snapshot of the current prevailing food safety climate, therefore results of this study may not capture a comprehensive view of employees' perceptions across time.

## II.6 Conclusion

Assessment of the total food safety climate score in 23 Lebanese industries showed that gender, age, education level, and major were significantly associated with food safety climate. Food safety motivation and conscientiousness were moderately positively associated with the mean score of food safety climate. Moreover, individuals working at the managerial level and in the quality department had significantly higher climate scores than those having other roles in the industry. Overall, the total mean score of food safety climate was perceived to be good. Based on our findings companies need to consider these factors to work on improving the food safety climate, such as giving employees trainings, proper working hours and recruiting employees with a specific educational background. Further research is needed by evaluating more industries operating in Lebanon during the current economic crisis to be able to draw more conclusions on the food safety

climate situation. Based on our knowledge and extensive research no studies are available in the Arab region on food safety climate in industries so this should also be addressed in research. In addition, no recent studies have been done to assess the food safety climate after the COVID-19 pandemic so research is highly needed to see how this pandemic affected both culture and climate in food industries.

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## Appendix 1

### Questionnaire

This survey is carried out by students enrolled in the programs of Food Safety and Quality Management at the Department of Nursing and Health Sciences at Notre Dame University-Louaize (NDU). The study aims to evaluate the food safety climate, behavior, knowledge of employees in Lebanese food industries. The association with some socio-demographic and work-related determinant will be investigated.

The results of this survey will help collect information of interest for consultants as well as for food safety managers. This survey will also help in pointing out the gaps that certified food industries face at the level of food safety management system in relation to the food safety climate.

Please circle the number that best matches you answer unless otherwise indicated

ID: \_\_\_\_\_

#### **Part A- Socio-Demographic and Economic Status:**

SES1. Your gender?

1. Male                      2. Female

SES2. How old are you? \_\_\_\_\_ (years)

SES3. What is your marital status?

1. Single      2. Married      3. Divorced      4. Widowed

SES4. What is (or are) your nationality (ies)? (You can select more than one answer)

1. Lebanese
2. Syrian
3. Palestinian
4. Egyptian
5. North American (USA, Mexico and Canada)
6. Latin American
7. European
8. Australian
9. Other: \_\_\_\_\_

SES5. What is your highest education level?

1. No High School
2. Less than high school
3. High school
4. Bachelor (License)
5. Master
6. Doctorate
7. Other: \_\_\_\_\_

SES6. What is your major?

1. No major
2. Sciences
3. Management
4. Business
5. Engineer
6. Food Science/Food Safety
7. Nutrition
8. Other: \_\_\_\_\_

SES7. Do you suffer or had suffered from any health condition?

1. Yes
2. No

SES8. If you answered yes to “SES7” please indicate which one. (You may choose more than one answer)

1. Diabetes
  2. Gluten Intolerance
  3. Cancer
  4. Gastro-Intestinal
  5. Cardiovascular diseases (e.g. hypertension)
  6. Lactose Intolerance
  7. Chronic constipation
  8. Chronic Stress
- Other : \_\_\_\_\_

SES9. In which range does your monthly net income fall (after tax and social insurance deduction)?

1. Less than 749.000 L.L.
2. 750.000-1.499.000 L.L.
3. 1.500.000-2.999.000 L.L.
4. 3.000.000-4.499.000 L.L.
5. More than 4.500.000 L.L.

SES10. Did you receive a salary raise after the COVID-19 pandemic/economic crisis?

1. Yes
2. No

SES11. Did your salary dropped due to the economic crisis/COVID-19 pandemic?



- 1.Yes      2.No

SES12. Have you felt that you can lose your job due to the economic crisis/COVID-19 pandemic?

- 1.Yes      2.No

### **Part B- Work Related Questions**

W1. Which department are you working in? \_\_\_\_\_

W2. For how many years have you been working in the present department?  
\_\_\_\_\_ years

W3. For how many years have you been doing the current job? \_\_\_\_\_ years

W4. At which level do you handle the food?

1. Reception of raw ingredients
2. Preparation (cleaning, cutting, cooking)
3. Packaging
4. Transportation from kitchen to ward
5. Distribution on the floor
6. Collecting of the food waste
7. Other, specify \_\_\_\_\_

W5. If you are sick,

1. You don't declare it.
2. You ask for a day off.
3. You take medications randomly.
4. You follow a medical prescription.

W6. What is your role in this company?

1. General Manager      2. Production Manager      3. Quality Assurance Manager
4. Quality Control      5. Quality Assurance      6. Food Handler      7. Cleaner

Other: \_\_\_\_\_

W7. How many times you do medical checkups and laboratory tests?

1. 1 time/ month
2. 1 time/year
3. 2 times/year
4. 4 times/year
5. Only in case of sickness
6. Never

W8. Who is responsible of food safety at your premises? \_\_\_\_\_

W9. Do you refer to him/her if you realize a food safety problem?

1. Yes
2. No

W10. How many hours do you work per day? \_\_\_\_\_ hour/day

W11. How many hours do work per week? \_\_\_\_\_ hour/week

W12. How many days off do you have per year? \_\_\_\_\_ days/year

### **Part C- Food Safety Climate Assessment Tool**

I am (indicate): ☐ General Manager ☐ Production Manager ☐ Quality Assurance Manager

☐ Quality Control ☐ Quality Assurance ☐ Food Handler

☐ Cleaner ☐ Other: \_\_\_\_\_

Please read each of the following statements about food hygiene and safety practices in your organization and indicate whether you: strongly disagree (1), disagree (2), not agree nor disagree (3), agree (4) or strongly agree (5).

Leadership	Strongly disagree	Disagree	Not agree nor disagree	Agree	Strongly agree
L1 In my organization, the leaders set clear objectives concerning hygiene and food safety.	1	2	3	4	5
L2 In my organization, the leaders are clear about the expectations concerning hygiene and food safety towards employees.	1	2	3	4	5
L3 In my organization, the leaders are able to motivate their employees to work in a hygienic and food safe way.	1	2	3	4	5
L4 In my organization, the leaders listen to employees, if they have remarks or comments concerning hygiene and food safety.	1	2	3	4	5
L5 In my organization, hygiene and food safety issues are addressed in a constructive and respectful way by the leaders.	1	2	3	4	5
L6 In my organization, the leaders strive for a continuous improvement of hygiene and food safety.	1	2	3	4	5

Communication	Strongly disagree	Disagree	Not agree nor disagree	Agree	Strongly agree
C1 In my organization, the leaders communicate regularly with the operators about hygiene and food safety.	1	2	3	4	5
C2 In my organization, the leaders communicate in a clear way with the operators about hygiene and food safety.	1	2	3	4	5
C3 In my organization, it is possible for the operators to communicate about hygiene and food safety with the leaders.	1	2	3	4	5
C4 In my organization, the importance of hygiene and food safety is permanently present by means of, for example, posters, signs and/or icons related to hygiene and food safety.	1	2	3	4	5
C5 I can discuss problems concerning hygiene and food safety with colleagues in my organization.	1	2	3	4	5

Commitment	Strongly disagree	Disagree	Not agree nor disagree	Agree	Strongly agree
E1 In my organization, the leaders clearly consider hygiene and food safety to be of great importance.	1	2	3	4	5
E2 My colleagues are convinced of the importance of hygiene and food safety for the organization.	1	2	3	4	5
E3 In my organization, working in a hygienic and food safe way is recognized and rewarded.	1	2	3	4	5
E4 In my organization, the leaders set a good example concerning hygiene and food safety.	1	2	3	4	5
E5 In my organization, the leaders act quickly to correct problems/issues that affect hygiene and food safety.	1	2	3	4	5
E6 In my organization, employees are actively involved by the leaders in hygiene and food safety related matters.	1	2	3	4	5

Resources	Strongly disagree	Disagree	Not agree nor disagree	Agree	Strongly agree
M1 In my organization, employees get sufficient time to work in a hygienic and food safe way.	1	2	3	4	5
M2 In my organization, sufficient staff is available to follow up hygiene and food safety.	1	2	3	4	5
M3 In my organization, the necessary infrastructure (e.g. good work space, good equipment ...) is available to be able to work in a hygienic and food safe way.	1	2	3	4	5
M4 In my organization, sufficient financial resources are provided to support hygiene and food safety (e.g. lab analyses, external consultants, extra cleaning, purchase equipment ...).	1	2	3	4	5
M5 In my organization, sufficient education and training related to hygiene and food safety is given.	1	2	3	4	5
M6 In my organization, good procedures and instructions concerning hygiene and food safety are in place.	1	2	3	4	5

Risk Awareness	Strongly disagree	Disagree	Not agree nor disagree	Agree	Strongly agree
R1 In my organization, the risks related to hygiene and food safety are known.	1	2	3	4	5
R2 In my organization, the risks related to hygiene and food safety are under control.	1	2	3	4	5
R3 My colleagues are alert and attentive to potential problems and risks related to hygiene and food safety.	1	2	3	4	5
R4 In my organization, the leaders have a realistic picture of the potential problems and risks related to hygiene and food safety.	1	2	3	4	5
R5 In my organization, the operators have a realistic picture of the potential problems and risks related to hygiene and food safety.	1	2	3	4	5

Food Safety Motivation	Strongly disagree	Disagree	Not agree or disagree	Agree	Strongly agree
Mot1: I believe that work place hygiene and food safety are important issues to help motivate employees to have better performance.	1	2	3	4	5
Mot2: I believe that being involved in all food processing flow of work will help in giving better performance.	1	2	3	4	5
Mot3: Financial incentives motivates me more than non financial incentives.	1	2	3	4	5
Mot4: I am satisfied with the lunch break, rest breaks and leaves given in the organization.	1	2	3	4	5
Mot5: The salary increments given to employees who do their jobs very well motivates them.	1	2	3	4	5

Burnout/ Job stress	Strongly disagree	Disagree	Not agree or disagree	Agree	Strongly agree
BJ1. I feel mentally exhausted by my job.	1	2	3	4	5
BJ2. I feel recurrent headaches because of my job.	1	2	3	4	5
BJ3. I feel I am highly stressed most of the time because of the nature of my job.	1	2	3	4	5

BJ4. I feel I cannot enjoy anything anymore.	1	2	3	4	5
BJ5. I have to work very fast.	1	2	3	4	5
BJ6. I don't have enough time to do everything.	1	2	3	4	5

Conscientiousness	Strongly disagree	Disagree	Not agree or disagree	Agree	Strongly agree
Consc1. I pay attention to details.	1	2	3	4	5
Consc2. I leave the area I am working on without cleaning.	1	2	3	4	5
Consc3. I complete my task completely.	1	2	3	4	5
Consc4. I do more than what is expected of me.	1	2	3	4	5
Consc5. I tell the truth if any outbreak happened.	1	2	3	4	5
Consc6. I often forget to put things back in their proper place.	1	2	3	4	5

#### **Part D- Source of Information of**

Inf1- From where do you get information about food hygiene and prevention of foodborne diseases?

(You can choose more than one answer)

1. Education courses on food hygiene/Trainings at your facility.
2. Audio/visual materials and mass-media
3. Social media
4. Not specified
5. Other (please specify) \_\_\_\_\_

Inf2- Did you ever attend a course on food hygiene and foodborne diseases?

1. Yes
2. No

Inf3- If you ever took an education course on food hygiene please specify the organizing company

Name: \_\_\_\_\_

Inf4- Did you ever attend a course on food safety?

1. Yes
2. No

Inf5- If you ever took an education course on food safety please specify the organizing company

Name: \_\_\_\_\_

Inf6-What is the frequency of food safety and hygiene training for employees?

1. None
2. More than 1 training/year
3. Yearly
4. Less than 1 training/ year

Thank you for your  
participation

رقم المشترك : \_\_\_\_\_

الجزء أ- الحالة الاجتماعية والديمغرافية والاقتصادية:

SES1. جنسك؟

1. ذكر
2. أنثى

SES2. كم عمرك؟ \_\_\_\_\_ (سنوات)

SES3. ما هو وضعك العائلي؟

1. غير مرتبط / غير مرتبطة
2. متزوج / متزوجة
3. مطلق / مطلقة
4. أرمل / أرملة

SES4. ما هي جنسيتك / جنسياتك؟ (يمكنك اختيار أكثر من إجابة واحدة)

1. لبناني
2. سوري
3. فلسطيني
4. مصري
5. أمريكا الشمالية (الولايات المتحدة الأمريكية ، المكسيك وكندا)
6. أمريكا اللاتينية
7. أوروبي
8. أسترالي
9. أخرى: \_\_\_\_\_

SES5. ما هو أعلى مستوى تعليمي؟

1. دون ثانوية
2. أقل من المدرسة الثانوية
3. المدرسة الثانوية
4. البكالوريوس (رخصة)
5. ماستر
6. دكتوراه
7. أخرى: \_\_\_\_\_

SES6. ما هو اختصاصك؟

1. دون اختصاص
2. علوم
3. الإدارة
4. اعمال
5. مهندس
6. علم الغذاء / سلامة الأغذية
7. تغذية



8. أخرى: \_\_\_\_\_

SES7. هل تعاني أو عانيت من أي حالة صحية؟

1. نعم

2. لا

SES8. إذا أجبت بنعم على "SES7"، فيرجى الإشارة إلى أي منها. (يمكنك اختيار أكثر من إجابة واحدة)

1. مرض السكري

2. حساسية الغولتين

3. سرطان

4. المعدة والأمعاء

5. أمراض القلب والأوعية الدموية (مثل ارتفاع ضغط الدم)

6. عدم تحمل اللاكتوز (حساسية على الحليب)

7. امساك مزمن

8. قلق مزمن

9. آخر: \_\_\_\_\_

SES9. ما هو صافي دخلك الشهري (بعد خصم الضرائب والتأمين الاجتماعي)؟

1. أقل من 749.000 ل.ل.

2. 750.000-1.499.000 ل.ل.

3. 1.500.000-2.999.000 ل.ل.

4. 3.000.000-4.499.000 ل.ل.

5. أكثر من 4.500.000 ل.ل.

SES10. هل حصلت على زيادة في الراتب بعد فيروس كورونا أو /الأزمة الاقتصادية؟

1. نعم

2. لا

SES11. هل انخفض راتبك بسبب فيروس كورونا أو /الأزمة الاقتصادية ؟

1. نعم

2. لا

SES12. هل شعرت أنه يمكنك أن تفقد وظيفتك بسبب فيروس كورونا أو /الأزمة الاقتصادية ؟

1. نعم

2. لا

الجزء ب- أسئلة متعلقة بالعمل

W1. في أي قسم تعمل؟ \_\_\_\_\_

W2. كم عدد السنوات التي عملت بها في القسم الحالي؟ \_\_\_\_\_ سنوات

W3. كم سنة مضت كنت تقوم بالوظيفة الحالية؟ \_\_\_\_\_ سنوات

W4. على أي مستوى تتعامل مع الطعام؟

1. استقبال المكونات الخام
2. التحضير (التنظيف ، القطع ، الطبخ)
3. التعبئة والتغليف
4. النقل من المطبخ إلى الجناح
5. التوزيع على الأرض
6. جمع النفايات الغذائية
7. أخرى ، حدد \_\_\_\_\_

W5. ماذا تفعل إن كنت مريضاً ؟

1. أنت لا تعلن ذلك.
2. أنت تسأل عن يوم عطلة.
3. تأخذ الأدوية بشكل عشوائي.
4. اتباع وصفة طبية.

W6. ما هو دورك في هذه الشركة؟

1. مدير عام
2. مدير الإنتاج
3. مدير ضمان الجودة
4. مراقبة الجودة
5. تأكيد الجودة
6. عامل للتنظيف
7. آخر: \_\_\_\_\_

W7. كم مرة تقوم بفحوصات طبية واختبارات في المختبر ؟

1. مرة في شهر
2. مرة في السنة
3. مرتين في السنة
4. أربعة مرات في السنة
5. فقط في حالة المرض
6. أبدا

W8. من المسؤول عن سلامة الأغذية في شركتك؟ \_\_\_\_\_

W9. هل تشير إليه / إليها إذا أدركت مشكلة سلامة الغذاء؟

1. نعم

2. لا

W10. كم ساعة تعمل في اليوم؟ \_\_\_\_\_ ساعة / يوم

W11. كم ساعة تعمل في الأسبوع؟ \_\_\_\_\_ ساعة / أسبوع

W12. كم يوم عطلة لديك في السنة؟ \_\_\_\_\_ أيام / سنة

الجزء C - أداة تقييم مناخ السلامة الغذائية

أنا (تشير إلى): مدير عام مدير إنتاج مدير ضمان الجودة

مراقبة الجودة تأكيد الجودة معالج الطعام

منظف آخر: \_\_\_\_\_

يرجى قراءة كل عبارة من العبارات التالية حول ممارسة نظافة وسلامة الأغذية في مؤسستك وبيان ما إذا كنت أنت: لا أوافق

بشدة (1) ، تعارض (2) ، لا أوافق ولا اعارض (3) ، أوافق (4) أو أوافق بشدة (5).

القيادة	لا أوافق بشدة	تعارض	لا أوافق ولا اعارض	أوافق	أوافق بشدة
L1 في منظمنا ، وضع القادة أهدافاً واضحة تتعلق بالنظافة والسلامة الغذائية.	1	2	3	4	5
L2 في منظمنا ، القادة واضحون بشأن التوقعات المتعلقة بالنظافة والسلامة الغذائية تجاه الموظفين.	1	2	3	4	5
L3 في مؤسستى ، يستطيع القادة تحفيز موظفيهم للعمل بطريقة صحية وأمنة بالطعام.	1	2	3	4	5
L4 في منظمنا ، يستمع القادة إلى الموظفين ، إذا كانت لديهم ملاحظات أو تعليقات تتعلق بالنظافة والسلامة الغذائية.	1	2	3	4	5
L5 في منظمنا ، نتم معالجة قضايا الصحة والسلامة الغذائية بطريقة بناءة ومحترمة من قبل القادة.	1	2	3	4	5
L6 في مؤسستى ، يسعى القادة إلى تحسين مستمر في النظافة والسلامة الغذائية.	1	2	3	4	5

الاتصالات	لا أوافق بشدة	تعارض	لا أوافق ولا أعارض	أوافق	أوافق بشدة
C1 في منظمتي ، يتواصل القادة بانتظام مع المشغلين حول النظافة والسلامة الغذائية.	1	2	3	4	5
C2 في مؤسستي ، يتواصل القادة بطريقة واضحة مع المشغلين حول النظافة وسلامة الأغذية.	1	2	3	4	5
C3 في مؤسستي ، من الممكن أن يتصل المشغلون بالسلامة الصحية وسلامة الأغذية مع القادة.	1	2	3	4	5
C4 في منظمتنا ، فإن أهمية النظافة والسلامة الغذائية موجودة بشكل دائم عن طريق ، على سبيل المثال ، الملصقات والعلامات و / أو الرموز المتعلقة بالنظافة وسلامة الأغذية.	1	2	3	4	5
C5 يمكنني مناقشة المشاكل المتعلقة بالنظافة وسلامة الأغذية مع الزملاء في مؤسستي.	1	2	3	4	5

التزام	لا أوافق بشدة	تعارض	لا أوافق ولا أعارض	أوافق	أوافق بشدة
E1 في منظمتنا ، ينظر القادة بوضوح إلى النظافة والسلامة الغذائية لتكون ذات أهمية كبيرة.	1	2	3	4	5
E2 زملائي مقتنعون بأهمية النظافة والسلامة الغذائية للمنظمة.	1	2	3	4	5
E3 في منظمتنا ، فإن العمل بطريقة صحية وأمنة للطعام معترف به ومكافأته.	1	2	3	4	5
E4 في منظمتنا ، وضع القادة نموذجاً جيداً فيما يتعلق بالنظافة والسلامة الغذائية.	1	2	3	4	5
E5 في منظمتي ، يتصرف القادة بسرعة لتصحيح المشاكل / القضايا التي تؤثر على النظافة والسلامة الغذائية.	1	2	3	4	5
E6 في مؤسستي ، يشارك الموظفون بشكل نشط من قبل القادة في المسائل المتعلقة بالنظافة والسلامة الغذائية.	1	2	3	4	5

مصادر	لا أوافق بشدة	تعارض	لا أوافق ولا أعارض	أوافق	أوافق بشدة
M1 في مؤسستي ، يحصل الموظفون على الوقت الكافي للعمل بطريقة صحية وأمنة للطعام.	1	2	3	4	5
M2 في مؤسستي ، يتوفر عدد كاف من الموظفين لمراقبة النظافة والسلامة الغذائية.	1	2	3	4	5
M3 في مؤسستي ، تتوفر البنية التحتية الضرورية (مثل مساحة العمل الجيدة ، المعدات الجيدة ...) لتكون قادرة على العمل بطريقة صحية وأمنة بالطعام.	1	2	3	4	5
M4 في مؤسستي ، يتم توفير موارد مالية كافية لدعم النظافة والسلامة الغذائية (مثل التحليلات المختبرية ، والاستشاريين الخارجيين ، والتنظيف الإضافي ، ومعدات الشراء ...).	1	2	3	4	5
M5 في مؤسستي ، يتم توفير ما يكفي من التعليم والتدريب فيما يتعلق بالنظافة والسلامة الغذائية.	1	2	3	4	5
M6 في مؤسستي ، توجد إجراءات وتعليمات جيدة تتعلق بالنظافة وسلامة الأغذية.	1	2	3	4	5

الوعي بالمخاطر	لا أوافق بشدة	تعارض	لا أوافق ولا أعارض	أوافق	أوافق بشدة
R1 في منظمتي ، فإن المخاطر المتعلقة بالنظافة وسلامة الأغذية معروفة.	1	2	3	4	5
R2 في منظمتي ، يتم التحكم في المخاطر المتعلقة بالنظافة والسلامة الغذائية.	1	2	3	4	5
R3 ينبه زملائي إلى المشاكل والمخاطر المحتملة المتعلقة بالنظافة والسلامة الغذائية.	1	2	3	4	5
R4 في مؤسستي ، لدى القادة صورة واقعية عن المشاكل والمخاطر المحتملة المتعلقة بالنظافة وسلامة الغذاء.	1	2	3	4	5
R5 في مؤسستي ، لدى المشغلين صورة واقعية عن المشاكل والمخاطر المحتملة المتعلقة بالنظافة وسلامة الأغذية.	1	2	3	4	5

دافع سلامة الغذاء	لا أوافق بشدة	أوافق	تعارض	لا أوافق أو لا أعارض	أوافق بشدة
Mot1: أعتقد أن النظافة في مكان العمل وسلامة الأغذية قضايا مهمة للمساعدة في تحفيز الموظفين للحصول على أداء أفضل.	1	2	3	4	5
Mot2: أعتقد أن المشاركة في جميع عمليات تجهيز الأغذية ستساعد في تحسين الأداء.	1	2	3	4	5
Mot3: الحوافز المالية تحفزني أكثر من الحوافز غير المالية.	1	2	3	4	5
Mot4: أنا راضٍ عن الوقت المتوفر للغداء ، وأوقات الراحة المعطية من المنظمة.	1	2	3	4	5
Mot5: زيادة الرواتب التي تعطى للموظفين الذين يقومون بعملهم جيداً تحفزهم.	1	2	3	4	5

الإرهاق / ضغط العمل	لا أوافق بشدة	أوافق	تعارض	لا أوافق أو لا أعارض	أوافق بشدة
BJ1. أشعر بالإرهاق الذهني من وظيفتي.	1	2	3	4	5
BJ2. أشعر بصداق متكرر بسبب وظيفتي.	1	2	3	4	5
BJ3. أشعر أنني متوتر للغاية في معظم الأوقات بسبب طبيعة وظيفتي.	1	2	3	4	5
BJ4. أشعر أنني لا أستطيع الاستمتاع بأي شيء بعد الآن.	1	2	3	4	5
BJ5. يجب أن أعمال بسرعة كبيرة.	1	2	3	4	5
BJ6. ليس لدي وقت كاف للقيام بكل شيء.	1	2	3	4	5

الضمير الحي	لا أوافق بشدة	أوافق	تعارض	لا أوافق أو لا أعارض	أوافق بشدة
Consc1. أنا أهتم بالتفاصيل.	1	2	3	4	5
Consc2. أترك المنطقة التي أعمل عليها دون تنظيف.	1	2	3	4	5
Consc3. أكمل مهمتي تمامًا.	1	2	3	4	5
Consc4. أفعل أكثر مما هو متوقع مني.	1	2	3	4	5
Consc5. أنا أقول الحقيقة إذا حدث أي تفشي.	1	2	3	4	5
Consc6. غالباً ما أنسى وضع الأشياء في مكانها الصحيح.	1	2	3	4	5

#### الجزء د- مصدر معلومات

Inf1 - من أين تحصل على معلومات عن نظافة الأغذية والوقاية من الأمراض التي تنتقل عن طريق الأغذية؟ (يمكنك اختيار أكثر من إجابة واحدة)

1. دورات تدريبية حول النظافة الغذائية / التدريبات في منشأتك.
2. المواد السمعية / البصرية و وسائل الاعلام الجماهيرية
3. وسائل الاعلام الاجتماعية
4. غير محدد
5. غير ذلك (يرجى التحديد)

Inf2 - هل سبق لك حضور دورة حول نظافة الغذاء والأمراض المنقولة بالغذاء؟

1. نعم
2. لا

Inf3 - إذا سبق لك أن أخذت دورة تعليمية في مجال النظافة الغذائية ، يرجى تحديد الشركة المنظمة.  
اسم: \_\_\_\_\_

Inf4 - هل سبق لك حضور دورة حول سلامة الغذاء؟

1. نعم
2. لا

Inf5- إذا سبق لك أن أخذت دورة تعليمية حول سلامة الأغذية ، يرجى تحديد الشركة المنظمة

اسم: \_\_\_\_\_

Inf6- كم عدد المرات التي دربت فيها الموظفين على سلامة و نظافة الأغذية؟

1.ابدا

2.أكثر من تدريب واحد في السنة

3.سنويه

4.أقل من تدريب واحد /سنة

أشكركم على مشاركتكم