Impact of the Economic Crisis and Covid 19 on Behaviors and Attitudes Shaping Household Food Waste Generation: The Case of Lebanon

By

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A thesis
Submitted in partial fulfillment of the requirements For the degree of Master of Science in Nutrition

School of Arts and Sciences
May 2022
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Program: Nutrition

Department: Natural Sciences

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Dedication Page

To my beloved parents
ACKNOWLEDGMENT

Foremost, I would like to express my sincere gratitude to my thesis advisor Dr. Lama Mattar for her continuous support. Thank you for your encouragement motivation. Your guidance and support carried me throughout the performance of the analysis and writing of this thesis. You have always present whenever I needed help and you have devoted much time to make my research journey highly fruitful. I would also like to thank Dr. Hussein Hassan who was also a great supporter and motivator. All your help and support are highly appreciated. I am honored to have had the chance to work with both of you.

I would also like to thank all my Nutrition professors at LAU. I have learned a lot from their expertise in the research domain and they have contributed to the growth of my passion in this field.

Last but not least, a debt of gratitude is owed to my beloved parents. You supported me at every step of my life. You have believed in me when I was at my lowest and have always motivated me to reach my goals no matter how difficult they were. You provided me with strength, continuous encouragement and emotional support throughout this enduring journey. You have paved the way for me to achieve my dreams. I can’t be more grateful to have you by my side.
Impact of the Economic Crisis and Covid 19 on Behaviors and Attitudes Shaping Household Food Waste Generation: The Case of Lebanon

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ABSTRACT

The Food and Agriculture Organization (FAO) estimated in 2011 that approximately one-third of all food produced worldwide is either lost or wasted and half of the wasted food is at the level of households. The COVID-19 pandemic has interrupted economies and food systems globally, with substantial consequences on food security, which is also influenced by political crises and by economic factors. This study aims to present and discuss the influences of numerous socio-demographical, behavioral and attitudinal factors on the generation of food waste in Lebanese households in the middle of an economic crisis and global pandemic. Participants in this study were called upon their availability and they filled a questionnaire with the help of trained researchers. The results showed that no association was found between the employment status and food waste, same result for the educational level and number of householders. As for reporting feelings of guilt and thinking of ways to use leftovers, these variables were negatively associated with food waste, and this result was supported by previous studies. Concerning eating out and buying special offers, these were positively associated with food waste. In conclusion, the final outcomes of the COVID-19 pandemic and the Lebanese economic crisis greatly depend on the epidemiological situation, the baseline situation and resilience to shocks. In this context, the study results are valuable country-specific inputs for designing evidence-based policies during the post-pandemic and post-economic crisis recovery phase in Lebanon.

Keywords: Food security, Household food waste, COVID-19, Economic crisis, Lebanon
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List of Abbreviations

**FAO:** Food and Agriculture Organization

**FL:** Food loss

**FW:** Food waste

**UNEP:** United Nations Environment Programme

**ICU:** Intensive Care Unit

**WHO:** World Health Organization
Chapter 1

Literature Review

1.1 Introduction

The rapid world population growth is a major factor for the rise in the demand on food globally (Depenbusch et al., 2019). On the other hand, the Food and Agriculture Organization (FAO) estimated in 2011 that approximately one-third of all food produced worldwide is either lost or wasted and half of the wasted food is at the level of households (Whitacre et al., 2019). In 2019, the proceedings of a workshop organized by the National Academies of Sciences, Engineering, and Medicine indicated that despite the fact that malnutrition, in the form of under and overnutrition, is affecting the health and well-being of millions of people worldwide, there is a significant amount of food that is lost or wasted every single day, in every country, and at every stage of the supply chain from the farm to the household. More specifically, the accumulation of food waste is becoming a major problem worldwide because of the continuous increase in the world population (Paritosh et al., 2017). This has several important effects on food security with food loss and waste being major contributors to it. For this reason, food waste and food security are receiving an increasing amount of interest among researchers as well as policy-makers in both developed and developing countries. Food loss and waste represent a global problem in the ethical, social, environmental, and economic contexts. Wasted food have a lot of sustainability consequences which have been extensively defined by previous literature, mostly focusing on the losses of water, fertilizers, and land resources alongside greenhouse gas emissions, economic costs, and the nutritional value of the wasted food (Babbitt et al., 2021). Moreover, traditional management of food waste, such as landfilling, results in the release of carbon dioxide and methane, which have several impacts on the climate. Globally, there has been a recent rise in the attention given to food waste in policy and in research proving that this topic has acquired great importance and prominence (Von Massow et al., 2019). Under the prime concern of “Responsible Consumption and Production”, decreasing food waste was included among the United Nations Sustainable Development Goals. Moreover, the European Union has taken food
waste measurements and interventions as primary and important concerns since 2012 under several projects entitled “FUSIONS and REFRESH” (United Nations, 2015); (Von Massow et al, 2019). Reducing food waste is a sustainable and essential way to feed a world population, where around 821 million people still don’t have access to appropriate and enough nourishment (Slorach et al, 2020).

1.2 Food security, food loss and food waste

1.2.1 Definitions

Food Security

Food security is described as having stable access to sufficient and adequate nutritious food which satisfies dietary requirements and food preferences (Niles et al, 2020). It can be realized by having access to a balanced diet and essential nutrition to live a healthy life. Nowadays, one of the most important goals of governments and international organizations is to achieve food security because the number of people exposed to food insecurity is on the rise. Vulnerability to food security has significantly increased from 1693.3 million in 2014 to 2013.8 million in 2018 (Nosratabadi et al, 2020). In addition to that, the estimated number of people who faced serious food insecurity in 2018 is 704.3 million. There are several factors that significantly increased the demand for food including rapid population growth, changing lifestyles, and international organizations’ attempts and efforts to reduce poverty. While the number of undernourished people has reached 815 million in 2018, it is approximated that the world’s population will be more than 10 billion by 2050. Food security is when all people have access to the nutrition and food preferences needed to live a healthy life (Schmidhuber et al, 2007). As to how food security can be measured, there are four criteria that should be considered which are food availability, food accessibility, food utilization, and food system stability. First, food availability indicates that high quality foods rich in nutrients should be available in an area, whether it is produced locally or internationally. Second, food access is when people are able to access food physically and economically. Third, food utilization means that all age groups should have access to healthy food.
Finally, food system stability is a system that supplies enough food to the community and is also strong enough to absorb economic and climate shocks (Ruane et al., 2011).

**Food Loss**

Currently, there are no universally accepted definitions of the terms “food loss” (FL) and “food waste” (FW), either applied in a European/national legal framework, or detected in publications (Gorzeń-Mitka et al., 2020). As per the FAO, FL is the decrease in the quantity or quality of food which often results from actions and decisions taken by food suppliers in the chain. It is defined as the reduction in mass or nutritional value of the food initially intended for human consumption and is usually lost at the production, postharvest and processing stages (Chalak et al., 2019). In other words, food losses are all the crop and livestock human-edible products that completely exit the post-harvest/slaughter production/supply chain, either in a direct or indirect way which can be achieved by either discarding the products or incinerating them or otherwise. This means that they do not re-enter in any other utilization, such as animal feed or industrial use, up to and excluding the retail level. Food losses that occur during storage, transportation and processing, are therefore all included even for imported products (Li et al., 2022). On one hand, losses at the stage of agricultural production may be the result of overproduction or grading because of quality standards. On the other hand, losses in food production and distribution may be the result of excess stock. Finally, losses at the stage of consumers may be the results of either consumer preferences or the preparation of oversized meals (Gorzeń-Mitka et al., 2020).

**Food waste**

Food waste is defined as food suitable for human consumption that gets discarded, either because it expired or because it was left to spoil and is usually lost at the level of retail merchants and purchasers (Mattar et al., 2018). It includes food that spoiled before getting disposed and food that was still edible when discarded (Lahath et al., 2021). While FL occurs in the earliest stages, mainly agriculture and food processing businesses that change agricultural products to food, FW is linked to later stages like the wholesale and
retail division that delivers the food products to the final point of use, such as households, caterers, restaurants and others (Campoy-Muñoz et al, 2021). It is linked to the behavior of the consumer and the retailer (Brennan et al, 2021). Worldwide, enough food is wasted yearly to feed around 2 billion people a 2,100 kcal/day diet. This increases the negative environmental consequences related to agriculture and increases resource shortages. FW is a critical indicator of sustainability because it represents the total amount of resources that is used to produce uneaten food, including cropland and irrigation water (Conrad et al, 2018). To put it in other words, these inputs are used to grow food that is eventually wasted by buyers and consumers. Recently, estimates have shown that global FW stands at USD 1 trillion yearly, causing economic burdens in addition to food insecurity. The UNEP food waste index report (2021) approximates that food waste from households, retail businesses and the food service industry are equal to a total of 931 million tons yearly. The percentage of worldwide greenhouse gas emissions from wasted food is approximated to be 8–10% (Teng et al, 2021). Because there is an extensive quantity of food waste coming from households, decreasing household food waste is very important to minimize overall food waste and providing various benefits and advantages for both people and the environment. With regards to an environmental health perspective, FL and FW represent a waste of many resources related to production, including land, water, fertilizer, pesticides, and energy. They also contribute to unnecessary emissions of carbon dioxide emissions. FW also puts a non-essential load on waste management systems, with different environmental effects based on the system being used (Brennan et al, 2021). Therefore, FW clearly has serious threats for economic, social, and environmental characteristics. This issue needs a thorough understanding of food consumption and wastage patterns so that organized systems for waste management can be developed and implemented (Attiq et al, 2021)

1.2.2 Factors associated with food waste

Concerning the reasons why people usually waste food, a growing literature is showing that various interactions and decisions related to purchasing and managing food are the main causes. This identifies a wide and diverse set of behavioral,
sociodemographic and attitude-related factors (Dusoruth et al. 2020). Factors including food appearance and taste, socio-economic status and shopping attitudes of consumers, poor knowledge, packaging mistakes, and incorrect health and safety-related beliefs about leftovers all affect food waste and contribute to its increase (Mattar et al., 2018). Concerning appearance, it is considered a universal attribute to all products and demonstrates the first sensory impression of the food item. It influences the item’s acceptability by approving or disapproving the consumers’ sensory and hedonic expectations and assumptions (Dusoruth et al. 2020). Damages and blemishes that occur post-harvest on fruits and vegetables majorly affect consumer perception of quality and reduce purchase decisions. Moreover, it has been confirmed that FW increases when consumers buy their food from large supermarkets compared to small or local markets (Berjan et al. 2022). These factors have an effect on consumer behavior and differ between persons, eras (rural/urban), and even countries. FW mostly result from poor food-management routines and behaviors, including planning, purchasing, storing, cooking, eating, and managing leftovers. These routines and behaviors significantly affect food waste performance (Schanes et al. 2018). Several FW studies showed that households contribute to a significant amount of total FW. As a result, the end consumers represent one of the biggest contributors to total FW, specifically at the consumption stage. According to several other research studies, people are conscious of the problems related to sustainable FW, but unconscious and unintentional practices lead to excessive FW. In fact, household FW ranges from 28.4% to 31.9%, which appears to be significantly higher than in other businesses (Attiq et al., 2021). According to several studies, households represent the main contributor to the generation of food waste (92 kg per person). Next comes the processing sector (33 kg per person), followed by food service (21 kg per person), primary production (18 kg per person) and the wholesale and retail sector (9 kg per person) (Iulia et al., 2022).
1.3 The covid-19 pandemic

1.3.1 Introduction

The emergent coronavirus disease, also known as COVID-19, had its outbreak in early December 2019 in Wuhan, China and has represented a serious and significant threat to global health ever since (Wu et al., 2020). An infected person can easily transmit the virus through droplets released from the mouth or nose (Filho et al., 2021). The virus soon spread to other parts of the world because of its easy transmission and in March 2020, COVID-19 was classified as a pandemic by the World Health Organization (WHO, 2020a). Later after that in early 2021, the world has experienced a second wave. This is when the virus, and its mutated variants, have been widely transmitted worldwide. The onset of the COVID-19 pandemic resulted in global challenges, mainly in the areas related to health. A huge number of patients required hospitalization and ICU spaces were a major burden on healthcare systems (Remuzzi and Remuzzi, 2020). To reduce the burden on healthcare systems and to provide patients with the best care possible countries have imposed atypical public health measures together with exceptional social and economic interventions to decrease and retard community transmission (Aldaco et al., 2020). In addition to that, most countries imposed various lockdown regulations, causing many businesses to decrease the extent of their activities, or to simply stop operating and close, which caused increased rates in unemployment rates (Bonaccorsi et al., 2020). The COVID-19 pandemic, which came with social distancing attempts applied to decelerate its spread, have interrupted economies and food systems globally, with substantial food security consequences (Niles et al, 2020). What started as a mere but serious health issue has turned into an economic threat to food security globally in the forms of lockdowns, food trade limitations, economic decline and increasing food inflation (Erokhin et al, 2020).

1.3.2 COVID-19 and Food Insecurity

Since the beginning of the COVID-19 pandemic in March 2020, several studies assessed its impact on different aspects of food insecurity, which incorporated food
availability, access, and utilization (Kharroubi et al., 2021). The various imposed regulations including movement limitations, interruptions of food supply chains, and inflation of food prices posed a significant threat on food security of global populations (Food and Agriculture Organization, 2020). Before the pandemic took over the world, hundreds of millions of people were already dealing with hunger and malnutrition. For this reason, immediate action needs to be implemented to avoid a worldwide food emergency (UN, 2020b). The latest approximations demonstrate that between 83 and 132 million more people, in addition to 38-80 million people in low-income countries who depend on imported food will deal with food insecurity because of the COVID-19 pandemic. Countries like Lebanon, Yemen and South Sudan, in addition to at least 22 countries might suffer from food security collapses as a result of the secondary socio-economic effects of the pandemic. The number of people who are in need of food support in Latin America has tripled in 2020 (UN, 2020a). Moreover, the future food productivity could be impacted, especially if the virus is not controlled and the lockdown measures proceed. On another note, the COVID-19 pandemic has severely and negatively affected the world economy because of the huge lockdowns alongside the economic recession and stagnation. Food systems are under severe threat as the spread of the COVID-19 virus continues to weaken people’s ability to harvest, buy and sell food (Torero, 2020).

1.3.3 COVID-19 and Food Waste

Because of the COVID-19 pandemic, almost all avoidable outdoor human activities have paused worldwide. The various lockdown measures affected different supply chains, which resulted in the decrease in economic growth. No supply chains were exempted from these disruptions, including food supply chains, defined by the processes describing how food from a farm reaches our tables (Aldaco et al., 2020). Since the beginning of the pandemic, COVID-19 has caused major shifts in food security, FL and FW and sustainability challenges in the food system have become even more evident (Babbitt et al. 2021). For example, food production systems optimized for supplying food products to food service sectors could not rapidly respond when schools, restaurants, and hospitality companies closed their doors all of a sudden (Chenarides et al., 2020). Even
grocery stores saw a sharp increase in demand as consumers attempted to stockpile food. This incompatible supply and demand resulted in unsold crops and therefore, food waste. Additionally, families that previously ate food away from home, and went grocery shopping several times a week reduced time devoted to these activities to near zero all of a sudden. On one hand, eating food away from home decreased as restaurants closed their doors. On the other hand, health officials encouraged visiting the grocery store once every 2 weeks only. As a result of these significant changes in household time, household food waste was remarkably affected (Scharadin et al., 2020). Additionally, as a response to the fear and uncertainty that the pandemic has imposed, people have resorted to panicky impulse buying, and this has led to food waste (Lahath et al., 2021). People began to panic-buy and stockpile essential and non-perishable products to face possible scarcity conditions. The increase in purchases affected carbohydrate-rich staples like bread and pasta, UHT (ultra-high temperature) milk, canned fish and food, flours, eggs, frozen foods, cold cuts, and water (Schacchi et al., 2021). Factors such as less socialization, eating at home in place of eating out, and having children at home instead of schools and nurseries all increase cooking activities and hence increase waste generation (Filho et al., 2021). However, according to Pappalardo et al. (2020), several early studies assessing the impact of COVID-19 on household food waste have discussed that the amount of food waste may decrease if consumers are paying more attention to avoid wasting food due to fear of disruptions in food supply or shopping difficulties. Therefore, even if people panic and stockpile food during the COVID-19 pandemic, household food waste may possibly decrease if people try to use or consume everything they have bought (Wang et al, 2020). Finally, it has been reported that even though food waste may decrease during the COVID-19 pandemic, it remains possible that food waste might increase later on the long term because of stockpiled food expiring and going to waste (Cosgrove et al., 2021).
1.4 **Economic crisis**

1.4.1 **Economic Crisis Impact on Food Security and Food Waste**

Food security is thought to result from political economy and social inclusion. According to Sousa LRM et al (2019), food security is influenced by economic factors such as unemployment, expensive food prices, low incomes and growth stagnation. Moreover, political crises are inversely correlated with food security and negatively affect food economies’ stability and governmental dedications towards food security policies. Food insecurity has also been correlated with poor economic growth. The likelihood of being food insecure has been reported to decrease with income. Household income is actually one major and critical known determinant of food insecurity (Maia et al., 2019).

In other words, negative shocks related to income are predicted to increase the chances of being in a state of food insecurity (Vilar-Compte et al., 2015). People have a right to have access to food which rely, alongside various other things, on their income. This means that despite sufficient food supplies, food insecurity can be present. As mentioned by the Brazilian Federal Constitution, it is the government’s responsibility to ensure that all citizens have access to adequate food and proper nutrition by aiding the most vulnerable individuals and by securing access to adequate food to everyone by their own efforts.

This condition relies greatly on the economic stability of the government (Costa et al., 2017). As for the effects of economic crises on household food waste generation, the research is relatively scarce. One study done in Greece found that the people living in this country, which have gone through an economic crisis, have positive attitudes towards avoiding food waste and that their habits and behaviors are in the direction of food waste reduction. Most of the study’s respondents reported planning food shopping lists and being very careful in their food supplies’ purchases. The severe recession experienced in Greece was found to strongly influence these positive findings since it makes consumers more conscious of their spending and purchasing behaviors, thus leading to a reduction in food waste (Abeliotis et al., 2014). On the other hand, another study that used an online questionnaire to collect data presented results which revealed that the amount of food wasted is not affected by economic crises (Fanelli et al., 2016).
1.4.2 The situation in Lebanon: COVID-19 pandemic and economic crisis

Lebanon is a small Middle Eastern country located in Western Asia on the eastern coast of the Mediterranean Sea. It was part of the upper middle-income countries (Mattar et al., 2018). According to a report by the World Bank published in 2020, Lebanon is undergoing a serious and lengthy economic depression mainly due to inappropriate policy responses to a group of compounded crises like the country’s biggest financial crisis, the covid-19 pandemic and the Port of Beirut explosion. Additionally, the World Bank has classified the current Lebanese economic crisis one of the top 10 most severe crises globally since the 19th century. The financial crisis and the collapse of the Lebanese pound have put the food security of vulnerable Lebanese at risk. Between 2019 and 2020, the consumer price index increased by 240% and food prices increased by an alarming 367%. This has not only affected food security by increasing prices but also by threatening the country’s ability to produce food. An updated report, the Spring 2021 Lebanon Economic Monitor, mentioned that Lebanon’s economic and financial crisis possibly ranks in the top 10, or even top three, hardest and most severe crises events worldwide since the middle of the nineteenth century. Lebanon’s GDP severely decreased from about $55 billion in 2018 to around $20.5 billion in 2021. In addition to that, the real GDP per capita decreased by 37.1%, a number which is usually seen when there are conflicts or wars. As for the COVID-19 pandemic in Lebanon, from 3 January 2020 to 3 February 2022, there have been 939,282 confirmed cases of COVID-19 accompanied by 9,638 deaths (World Health Organization, 2022). This number was increased in 15 March 2022 to 1,085,232 confirmed cases of COVID-19 and 10,211 deaths, reported to WHO. The outbreak of this pandemic is further contributing to the economic decline, aggravating existing weaknesses and increasing vulnerabilities of all Lebanese residents. On one hand, it placed extra pressure on an already collapsing economy and has overloaded national social safety nets as well as the health system. On another hand, poor social safety nets, limited water and electricity supply, weak solid waste management and disposal alongside overcrowded living conditions in many Lebanese areas increased the risk of the virus spread. According to a report by the United Nations (2020), the already declining food security situation was worsened a lot because of movement restrictions, income loss, and food and non-food price inflation which we imposed by the virus outbreak. Finally, and
as simultaneously seen in many countries worldwide and in the MENA region, Lebanese consumers demonstrated increased food-hoarding and panic-shopping behaviors. They also increasingly bought more processed foods than nutritious and perishable food items because that are cheaper in price and have longer shelf lives. The changes that accompanied the economic crisis such as inflation, increases in food prices and shortage of many food items may have contributed to the adoption of the panic-buying and hoarding behaviors which were noticed among the Lebanese population (Kharroubi et al., 2021).
Chapter 2

Aims and Hypotheses

2.1 Gaps in the literature

The current scientific literature does not provide enough evidence on how Lebanese families would react to emergency crises, such as economic problems and pandemics, in terms of the amount of food waste produced. In other words, no previous study was done in Lebanon to assess the Lebanese household food generation during the current economic crisis and the pandemic, and compared it to previous results.

2.2 Research objective and significance

The objective of this study is to assess current household attitudes and behaviors that determine food waste in Lebanon as compared to the period before the COVID-19 pandemic and the economic crisis. This will be done for a better understanding of how the current situation affected the Lebanese behaviors and attitudes related to food waste. In specific, it aims to present and discuss the influences of numerous socio-demographical, behavioral and attitudinal factors on the generation of food waste in Lebanese households in the middle of an economic crisis and global pandemic.

2.3 Hypotheses

\textit{H1}: The amount of food waste is more likely to increase because of the COVID-19 pandemic due to the stock-pile effect. People are more likely to stock food as a result of fear from total lockdowns and thus decrease in the access to food. This might result in food expiring before they actually get the chance to consume it.

\textit{H2}: It is hypothesized that the amount of food waste will decrease as a result of the economic crisis and the dramatic increase in food prices. People will pay more
attention to the amount of food prepared and will probably consume leftovers more often to avoid wasting food and having to buy food more often.

*H3:* Since the economic crisis and the COVID-19 pandemic relatively happened at the same time in Lebanon, it is hypothesized that the effect of the economic crisis will be more significant on food waste and will result in its decrease because of people’s lower purchasing ability and because of the hyperinflation and the collapse of the Lebanese Lira which will probably result in dramatic increases in food prices and prevent people from stocking a lot of food while paying more attention to what they are consuming and how much they are wasting.
Chapter 3

Materials and methods

3.1 Study Design

The design of this study is a cross-sectional one. It is an observational study that analyzed data from a population at a single point in time. Participants were called upon their availability and they filled a questionnaire with the help of the trained researchers. The results were then compared to a previous study conducted in 2018 by Mattar et al. entitled: Attitudes and behaviors shaping household food waste generation: Lessons from Lebanon.

3.2 Questionnaire development

A culturally specific and phone-based questionnaire in the English language, composed of 3 sections and 31 questions, was developed using layman terms. It was piloted to assess the readability and the average time needed for completion. The first section was composed of 13 questions which covered the participants’ demographic characteristics. It included questions about gender, role of the participant in the household, educational level of the participant, household area and number of rooms, total household monthly income, person in charge of food grocery shopping, and number of household members. The second section was composed of 8 questions and covered the attitudes of participants related to food shopping and eating. It included questions about the amount of money usually spent on food, frequency of grocery shopping from minimarkets and supermarkets for food and non-food items and how the covid-19 pandemic and the economic crisis affected these behaviors. One example: “What is your current behavior as compared to before the COVID-19 pandemic concerning eating/dining out?” Another example: “In your opinion, which crisis had more impact on your behavior?” Finally, the third section was composed of 10 questions and covered attitudes related to food waste. One question example: “Compared to before the economic crisis and the COVID-19
pandemic, how often do you eat everything you prepare/serve?” Another example: “Compared to before the economic crisis and the COVID-19 pandemic, please indicate how much you agree with the following statement: “I feel guilty when I throw food away” and the answer was based on a scale from 1 to 5 where a response of 1 means the participant strongly disagrees and a response of 5 means that the participant strongly agrees. The average time that was needed to complete the questionnaire was 15 minutes.

3.3 Study population

A convenient sample of 1251 households from the five governates of Lebanon were called in 2021 and 2022 by trained researchers from the Lebanese American University (LAU). The phone numbers were obtained through the snow-ball sampling or chain-referral sampling, which is purely based on referrals that allowed the generation of a sample where existing participants provided additional phone numbers of future participants from their acquaintances. The researcher explained the objectives of the survey, ensured the anonymity and confidentiality and obtained the consent of the participants. The phone call took approximately 15 minutes where the researcher asked the questions and recorded the answers. Questions were translated to Arabic on the spot when needed by the participants since there was not a translated Arabic version of the survey. The survey was approved for ethical compliance by the Institution Review Board (IRB) of the LAU. No personal identifiers were collected to ensure the anonymity of the respondents. The study was completely voluntary, and participants were informed that they can withdraw from the study at any time, or refrain from answering any question(s).
Chapter 4

Statistical analysis

The effect of numerous behavioral and socio-demographic factors was estimated by the use of a Logistic regression, using STATA. There was a search for variables that could be an appropriate proxy for food waste because of the absence of a single variable that accounts for the total quantity of food waste. Among all the variables, three are considered to be possible and acceptable substitutes: “throw food when cook too much”, “eat everything prepared”, and “use leftovers in anyway”. A simple OLS regression of weight was conducted on each of the variables mentioned in the 7-day diary sample formed of 250 households from the previous study. Because the two variables “throw food when cook too much” and “use leftovers in anyway” showed no correlation with weight, regression of weight on “eat everything prepared” was used since it revealed a negative significant coefficient. Results of the OLS regression are presented in Table 2. According to this result, the variable “eat everything prepared” was eventually used as a proxy for food waste. Since total weight is inversely related to “eat everything prepared”, any increase in this variable will be interpreted as a decrease in the amount of food wasted. The variable “eat everything prepared” will be then used as a dependent variable which takes values of 1 if the respondent marked “Frequently/Regularly” and 0 if the respondent marked “Sometimes at most”. Since “eat everything prepared” (eatall) is a binary variable, the micro-data collected on food waste was modeled using a logit model with k regressors denoted x is:

\[
Pr(\text{eatall} = 1|x_1, x_2, ..., x_k) = \frac{1}{1 + e^{-\sum \beta_i x_i}}
\]

Through an iterative procedure, and beginning with a big list of explanatory variables, logit model was conducted and variables that attained statistical significance with at least 90% confidence were chosen to reach a working model (see Table 2).
Chapter 5

Results

5.1 Descriptive Results

The participants were all carriers of the Lebanese nationality. Sixty-two-point-three percent (62.3%) \((N = 1243)\) of the sample constituted of female participants. Seventy-one-point-two percent (71.2%) \((N = 1239)\) were employed with 24.9% self-employed, 39.4% employed full-time and 6.9% employed part-time. Forty-seven-point-two percent (47.2%) \((N = 1233)\) of the population had a university graduate as the highest educated family member and 26.8% had a post-graduate as the highest educated family member. On the other hand, 0.5% of the population only finished elementary school. As for the crisis that had the greatest impact on the participants’ food shopping and eating behaviors, the majority of the participants \((68.8\%, N = 1242)\) reported that the economic crisis had a greater impact. All participants had to be aged 18 or older to be able to participate in the study. As for the effect of the COVID-19 pandemic on food waste generation, the majority of participants \((65.2\%, N = 1237)\) reported that their household food waste generation didn’t change because of the pandemic. As for the impact of the economic crisis, 47.4% \((N = 1197)\) reported that their household food waste generation decreased because of the economic crisis while 52.6% reported that there was no impact. The descriptive results are presented in table 1.
<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (N = 1243)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>37.7</td>
</tr>
<tr>
<td>Female</td>
<td>62.3</td>
</tr>
<tr>
<td>The person in charge of food shopping is (N = 1239)</td>
<td></td>
</tr>
<tr>
<td>Employed/Self-employed</td>
<td>71.1</td>
</tr>
<tr>
<td>Unemployed</td>
<td>28.9</td>
</tr>
<tr>
<td>Highest level of education in household (N = 1211)</td>
<td></td>
</tr>
<tr>
<td>Elementary/Intermediate/Vocational</td>
<td>3.1</td>
</tr>
<tr>
<td>Secondary/Highschool/University</td>
<td>96.9</td>
</tr>
<tr>
<td>The crisis that had greater impact on your food shopping and eating behaviors</td>
<td></td>
</tr>
<tr>
<td>COVID-19</td>
<td>25.9</td>
</tr>
<tr>
<td>Economic crisis</td>
<td>68.8</td>
</tr>
<tr>
<td>Don’t know/refuse to answer</td>
<td>5.3</td>
</tr>
<tr>
<td>Effect of COVID-19 on the amount of food waste (N = 1237)</td>
<td></td>
</tr>
<tr>
<td>Decreased</td>
<td>27.7</td>
</tr>
<tr>
<td>Unchanged</td>
<td>65.2</td>
</tr>
<tr>
<td>Increased</td>
<td>7.1</td>
</tr>
<tr>
<td>Effect of the economic crisis on the amount of food waste (N = 1197)</td>
<td></td>
</tr>
<tr>
<td>Decrease</td>
<td>47.4</td>
</tr>
<tr>
<td>Unchanged</td>
<td>52.6</td>
</tr>
</tbody>
</table>
5.2 **Determinants of Food Waste at a Household Level**

After cleaning the data and managing all missing data, the final sample size was 1101 participants. In terms of model estimates, the participants’ employment status, level of education and total number of householders had no significant effect on food waste. All the variables included in the model were analyzed currently as compared to before the economic crisis and the COVID-19 pandemic. The place where a participant usually eats his meals was included in the model as a variable that acts as a contributor to food waste and the results suggest that the more a person eats out of his home, the less he eats everything prepared and the more he wastes food. Additionally, eating meals out was negatively correlated with the variable `eatall`, meaning the more people eat out, the less they eat everything prepared at home and the more they waste food \((r = -1.644)\). For participants who partly eat their meals at home and partly out (including workplace), the probability of not eating everything prepared and wasting more food is 0.63 \((OR = 0.37)\), whereas for participants who mainly or only eat their meals out, the probability is higher with a value of 0.81 \((OR = 0.19)\). Participants who prepare different dishes each day “frequently/regularly” compared to “sometimes at most”, have a higher tendency to eat everything prepared and reduce food waste, with a significantly positive coefficient of a value equal to 1.122. They are also 3 times more likely to eat everything prepared and waste less food \((OR = 3.07)\). In addition to that, participants who report feeling guilty when wasting food have a higher probability to eat everything prepared with a significantly positive coefficient \((r = 1.413)\), and this indicates a decreased wasteful behavior. They are also 4 times more likely to eat everything prepared and less likely to waste food \((OR=4.11)\). This also applies to participants who think of ways to use leftovers but in a lower magnitude (almost more than half). Participants who think of ways to use leftovers are almost two times more likely to eat everything prepared compared to those who don’t \((OR = 1.94)\). Moreover, the coefficient of the variable “Buy special offers” is significantly negative \((r = -0.465, OR = 0.63)\), indicating that participants who buy more special offers are 0.37 times less likely to eat everything prepared and thus, 0.37 times more likely to waste food.
Table 2 Model estimation results for the Logit analysis

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Robust Standard Errors</th>
<th>P &gt; z</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Eat everything prepared</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed/Self-Employed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>-</td>
<td>(base)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Yes</td>
<td>0.216</td>
<td>0.164</td>
<td>0.189</td>
<td>1.24</td>
</tr>
<tr>
<td><strong>Highest level of education in household</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elementary/Intermediate/Vocational</td>
<td>-</td>
<td>(base)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Secondary/High School/University</td>
<td>0.329</td>
<td>0.383</td>
<td>0.391</td>
<td>1.39</td>
</tr>
<tr>
<td><strong>Total number of people in household</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 occupant</td>
<td>-</td>
<td>(base)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2-3 occupants</td>
<td>0.140</td>
<td>0.509</td>
<td>0.783</td>
<td>1.15</td>
</tr>
<tr>
<td>&gt;3 occupants</td>
<td>-0.082</td>
<td>0.495</td>
<td>0.868</td>
<td>0.92</td>
</tr>
<tr>
<td><strong>Place where usually eat meals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mainly at home</td>
<td>-</td>
<td>(base)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Partly at home, partly out</td>
<td>-0.989***</td>
<td>0.164</td>
<td>0.000</td>
<td>0.37***</td>
</tr>
<tr>
<td>Mainly eating out/only eating out</td>
<td>-1.644***</td>
<td>0.374</td>
<td>0.000</td>
<td>0.19***</td>
</tr>
<tr>
<td><strong>Prepare different dishes each day</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sometimes at most</td>
<td>-</td>
<td>(base)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Frequently/Regularly</td>
<td>1.122***</td>
<td>0.164</td>
<td>0.000</td>
<td>3.07***</td>
</tr>
<tr>
<td><strong>Feeling guilty when throw food away</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disagree/Neither</td>
<td>-</td>
<td>(base)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Agree</td>
<td>1.413***</td>
<td>0.233</td>
<td>0.000</td>
<td>4.11***</td>
</tr>
<tr>
<td><strong>Think of ways to use leftovers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disagree/Neither</td>
<td>-</td>
<td>(base)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Agree</td>
<td>0.661***</td>
<td>0.159</td>
<td>0.000</td>
<td>1.94***</td>
</tr>
<tr>
<td><strong>Buy special offers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disagree/Neither</td>
<td>-</td>
<td>(base)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Agree</td>
<td>-0.465***</td>
<td>0.163</td>
<td>0.004</td>
<td>0.63***</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.866</td>
<td>0.618</td>
<td>0.161</td>
<td>0.42</td>
</tr>
<tr>
<td>----------</td>
<td>--------</td>
<td>-------</td>
<td>-------</td>
<td>------</td>
</tr>
<tr>
<td>Model Fit</td>
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<tr>
<td>Log pseudolikelihood</td>
<td>-545.69</td>
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<td></td>
<td></td>
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<tr>
<td>Prob &gt; chi2</td>
<td>0.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pseudo R²</td>
<td>0.151</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>1101</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p<0.10, **p<0.05, ***p<0.010
Chapter 6

Discussion

To our knowledge, the current scientific literature does not provide enough evidence on how Lebanese families would react to emergency crises, such as economic problems and pandemics, in terms of the amount of food waste produced. Thus, no previous research has tackled this issue and therefore, the current study is important to assess how the deteriorating economic situation and the current pandemic has affected food security and waste in Lebanese households. The present study examined how household characteristics and food-related behaviors affected food waste generation in light of a deteriorating economic crisis and a pandemic. According to Mejia et al. (2021), the literature shows that in any crisis, if people feel threatened, their behaviors will be changed in a way that results in taking measures to avoid suffering the negative consequences.

Concerning socio-demographic characteristics, and compared to the times before the pandemic or the economic crisis, being self-employed or employed was not found to be correlated with eatall and hence was not associated with the amount of food waste. This is not in line with a study done by Mattar et al. done in 2018 before the current pandemic and economic crisis, which demonstrated that being self-employed or employed decreased the probability of eatall and thus increased the chances of generating more food waste. Moreover, Abeliotis et al. (2016) presented similar results showing that lower income households generate less leftover compared to higher income households. Another study by Pappalardo et al. (2020) done in Italy during the COVID-19 pandemic, found that a low household income also decreases the probability of generating too much food waste, assuming that employed and self-employed participants earn more money than unemployed ones. On the contrary, an economic crisis took place in Italy during the pandemic and was caused by the national lockdown (Pappalardo et al., 2020). This issue increased the tendency of all people to decrease food waste and eat everything that has
been bought, proving that economic crises can cause all people to become more aware about food waste, irrespective of their income or employment status. This could be due to the fact that during emergencies, and especially emergencies that can have an effect on food security like economic crises and pandemics, people of all economic statuses become aware of food waste due to fear of losing access to food. A major example is the Beirut port explosion that hit Lebanon in 2020, completely destroying the national wheat silos and interrupting all import and export processes, thus posing a serious threat on food security. Acquiring basic commodities, including food, became a major concern because 70% of Lebanon’s overall trade passed through the Beirut port before the blast (WFP, 2022). In fact, even if people earn high incomes but the country is experiencing food insecurity, it will be difficult to find food to buy in the first place, which would result in people paying more attention to food and food waste.

In terms of educational level, no association was found and as a result, the current study couldn’t show that education is an influential factor that affects household food waste generation in light of a pandemic and an economic crisis. This is not in line with the study done in 2018 by Mattar et al. which showed that the higher the level of education in a household, the less food waste it generates. Another study done in Egypt also presented results opposite to the ones found in the current study where it was shown that having a university degree is inversely related to household food waste generation when compared to secondary education or no education at all (Abdelradi, 2017). On the other hand, a study done on Finnish households found no correlation between the amount of food waste and the level of education (Koivupuro et al., 2012). It must be kept in mind that these studies were done prior to the pandemic. However, a study done during the pandemic also showed that the education level was an important factor in Poland, where a university-degree level proved to be related to higher income and less time for the household management with consequences for the expired products or products stored inappropriately (Muresan et al., 2022). It has been previously mentioned that a large amount of food waste appears because of an individual’s education. Hence, the current results could be explained by the fact that during emergencies, all people pay extras attention to food waste, irrespective of the educational level. Moreover, the social impact of the current economic crisis has been dreadful for all Lebanese population groups with
no exceptions, while they were already suffering from the economic recession caused by the COVID-19 pandemic.

The current results failed to show an association between the number of householders and the generation of food waste which is contrary to the results found in a study done by Mattar et al. in 2018 prior to the current pandemic and economic crisis, where there was found a positive relation between the number of householders and the food waste volume. Another study by Berjan et al. (2022) done in Serbia during the pandemic found that larger families tend to buy more food and therefore, waste more food. On the contrary, a study done in Italy reported that in large families, food waste decreased during the COVID-19 lockdown, and it was thought to be because of the fact that bigger households can reuse leftovers in an easier way and because the household food preparer has more time to organize and cook the food during the lockdown (Pappalardo et al., 2020). Also, it has been mentioned in general that the fewer members within a household, the fewer food waste is generated (Muresan et al., 2022). Additionally, a study done in Japan found that during the pandemic, smaller families understood the situation of household food waste better than larger families, while larger families showed a higher tendency of excessive food purchase (Qian et al., 2020). Therefore, the current results could be explained the same way as the previous results that found no correlation, that during hard times, such as the country experiencing the biggest economic crisis in its history alongside a pandemic, all families with no exceptions pay extra attention to the matter of food waste generation.

With regards to the participants' opinions and beliefs, individuals who report a feeling of guilt when throwing food are more likely to eat everything prepared, which often results in a decrease in food waste. This result was also demonstrated in the Lebanese study done by Mattar et al. in 2018. A study done in Romania reported that moral behaviors, including guilt about wasting food, were an important contributor to food waste-reduction and planning to reduce food waste (Parizeau et al., 2015). Similarly, a study conducted in the USA with a large sample similarly showed that respondents who expressed feelings of guilt related to disposing food generated less food waste (Qi and Roe, 2016). It was also reported in other studies that a high sense of guilt about wasting
food is expressed in most households (Schanes et al., 2018). It is suggested that guilt in particular may be a significant motivational tool underlying food waste reduction because it was shown that households that express more guilt about wasting food produce less food waste (Parizeau et al., 2015). The current study shows that this is also applicable to Lebanese families during the current pandemic and economic crisis. However, there is one limitation that exists for this type of question which is that it does not represent the real feeling of respondents who might just want to be considered as “good” and thus give out this answer.

Concerning practices related to dining out practices, the results showed that the more a participant eats out of his home including the workplace, the more he would be wasting food at home. Another significant association was found with the “preparation of different dishes each day” variable. It was shown that a participant, currently as compared to before the pandemic and the economic crisis, and who prepares different dishes daily “frequently/regularly”, is more likely to eat everything prepared compared to preparing dishes daily “sometimes at most”, meaning that he wastes less food. This result was in accordance with the results of the Lebanese study done by Mattar et al. in 2018. This could be explained by the fact that the variety or diversity of home-cooked meals might decrease the generation of household food waste. A previous study that was done a long time before the pandemic with results contrary to the current findings showed that the main generators of food waste were cooking very often and purchasing a lot of food (Lyndhurst et al., 2007). Moreover, in a study done in Italy by Pappalardo at al. (2020) during the COVID-19 pandemic, a small percentage of the participants reported an increase in food waste production which was caused by the increased amount of food they cooked. On another hand, it has been reported in a study by Laila et al. (2021) that families have been cooking more often and spending more time cooking at home since the beginning of the pandemic. The frequency of cooking at home has been found to be positively associated with unavoidable food waste such as egg shells and peels of fruits and vegetables, but negatively associated with avoidable food waste. Moreover, in a study done on U.S. consumers during the pandemic, it was reported that there were significant changes in which respondents used foods in their households, particularly through behaviors predicted to conserve available food and eliminate the need to buy groceries very often.
(Babbitt et al., 2021). These suggestions may explain the observed decrease in food waste in the current study.

According to the current results, food waste appears to be decreased for participants who think of ways to use leftovers, which was also found in the study done by Mattar et al. in 2018 prior to the current pandemic and economic crisis, which showed that thinking of ways to use leftovers decreased the amount of wasted food but in a lower magnitude (almost half). Additionally, it was mentioned in a study by Stancu et al. (2016) that planning habits and routines have the potential to contribute to more powerful routines of reusing and serving leftovers. The COVID-19 pandemic resulted in families becoming less busy because of cancellation of several activities, which led to having more time to plan meals and prepare food (Laila et al., 2021). The related restrictions also resulted in more people working remotely from home which may have led to improved food-management behaviors including using leftovers. People also worked on improving their cooking skills during the pandemic, which are closely related to the ability of a household to keep and reuse leftovers and to proper storage of leftovers (Muresan et al., 2022). Finally, Ben Hassen et al. (2021) mentioned that since the start of the COVID-19 pandemic, consumers have included multiple positive food management behaviors, including better food shopping and planning, enhanced food storage in households, and increased usage of leftovers. This suggests a noticeable shift toward a more sustainable food consumption and a positive behavioral shift in food waste which has been observed in many other countries, like Tunisia (Ben Hassen et al., 2020), Qatar (Ben Hassen et al., 2020), the US (Rodgers et al., 2021), and Italy (Principato et al., 2020), all of which support the findings of the current study. Additionally, many participants in the current research study reported that despite the increase in their visits to the supermarket because of the economic crisis, they now thoroughly plan a shopping list to buy only what they need, and this is because of the dramatic increases in food prices.

As for the variable “buy special offers”, it has been found that the participants who buy special offers don’t tend to eat everything prepared and thus tend to waste more food. This is in accordance with the period before the current economic crisis and the pandemic as reported in the comparison study by Mattar et al. in 2018. In fact, participants tend to
“buy special offers” when there exists a deteriorating economic situation like the case of Lebanon because of the search for lower prices and higher quantities. In a study done in Italy by Pappalardo et al. (2020) during the pandemic, people who buy more food than they need report an increase in food waste generation. Additionally, other studies have indicated that shopping for food on special offers often increases food waste generation by motivating and encouraging over-purchasing (Parizeau et al., 2015). In addition to that, buying special offers is one of the most important features of immoderate buying that is considered to be one of the main contributors to food waste generation (Mattar et al., 2018). Moreover, during an economic crisis, people usually tend to search for products on special offers as a way to save money and buy greater quantities for the same price. If the expiry date is not taken into consideration, this could lead to the expiration of the products and consequently, wasting them.

Finally, the majority of the participants included in the current study reported that the amount of food waste generated by their households did not change because of the current economic crisis and COVID-19 pandemic, which is a reason to reject the first two hypotheses that were done prior to conducting the study. This can be explained by the ethical views that the majority of Lebanese people have toward food waste. Many Lebanese families are raised with the idea that wasting food is extremely unethical for humanitarian and religious reasons. Thus, many participants reported donating their leftovers or feeding them to animals if they did not have a chance to consume them. However, 47.4% (N = 1197) reported a decrease in food waste because of the effect of the economic crisis, compared to only 27.7% because of the COVID-19 pandemic. This allows the acceptance of the third hypothesis which stated that the economic effect will have a greater effect on food waste among Lebanese households. In fact, it has been clearly noticed that the Lebanese people were severely affected by the economic crisis which caused them to change their views toward food and wasting food. Many participants reported that their thoughts toward food waste have changed as a result of the economic recession that the country is experiencing where they think more about ways to use leftovers and plan their shopping lists better in order to avoid spending money on items they do not really need. This proves that populations experiencing financial and
economical hardships do in fact shift their behaviors towards taking measures to avoid suffering the negative consequences (Mejia et al., 2021).

There are many limitations to the current research study. First, the use of the snowball sampling or chain-referral sampling means that the participants tend to refer those whom they know and may have similar traits which has a potential to cause a sampling bias. However, friends and family members do not always adopt the same behaviors or have the same socioeconomical status. Second, the overrepresentation of women and educated individuals compromised the sample’s representativeness and consequently, the degree to which the current results could be generalized to the whole Lebanese adult population. It is believed this is related to the cultural context and situation in Lebanon, where women are in charge of cooking, food management and food shopping in most households. As a result, women were more interested in participating in the survey. Third, the current results are based on stated, not revealed behavior. Self-reported questionnaire answers are known to be exaggerated at times, where respondents may be too embarrassed to reveal the truth regarding some questions. Fourth, a questionnaire survey is considered too subjective to measure the real situation of food waste since the participants tend to declare less food waste in the survey than has been wasted in reality. Despite the fact that one way to reveal people’s intentions is by directly asking them, other approaches are needed to collect behavior data in future studies. Fifth, regarding the changes in consumer attitudes, the behavioral changes uncovered in the current study might be temporary during the pandemic and the economic crisis, and not permanent. This issue should be verified in the future using longitudinal surveys.
In conclusion, the final outcomes of the COVID-19 pandemic and the Lebanese economic crisis greatly depend on the epidemiological situation, the baseline situation and resilience to shocks. In this context, the study results are valuable country-specific inputs for designing evidence-based policies during the post-pandemic and post-economic crisis recovery phase in Lebanon. For instance, some positive effects of these two crises, such as adoption of more sustainable diets and reduction of food wastage for instance, can be grasped to promote the transformation towards more sustainable consumption patterns in the country. While the current research study emphasized immediate, short-term effects of the pandemic and the economic crisis, which are not over yet, future studies are definitely needed to explain their medium and long-term effects on food-related behaviors, including food wastage, as well as on the country’s food and nutrition security. This and other future studies would become a critical structure and framework for government forward planning and readiness for future shocks and pandemic/economic crises.
Funding

The authors would like to thank the Department of Natural Sciences, School of Arts and Sciences, Lebanese American University for funding the study.
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Appendix: Questionnaire + IRB approval

QUESTIONNAIRE

Household Food Waste

Link to google forms: https://forms.gle/rXkJ8AQhtoKGz7S8

The following questionnaire is about the different ways people in your household including yourself consume food and handle food waste, especially during the current economic crisis and covid19 pandemic.

1.  Gender:  1. Male    2. Female

2.  Are you the head of household (Main wage earner)?  1. Yes   2. No

3.  You are:
   1. Mother    2. Father
   3. Son/daughter    4. Grandmother/grandfather
   5. Other relative    99. Other; specify: ________

4.  The person in charge of food grocery shopping is:
   1. Self-employed    2. Student    3. Employed

   Full-time
5. Specify the household monthly income (salary, family help and support): (Check all that apply)

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<thead>
<tr>
<th>Portion in LBP</th>
<th>Portion in Local Dollars (USD) - Lollars</th>
<th>Portion in Fresh Dollars (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 675,000</td>
<td>&lt; 450</td>
<td>&lt; 450</td>
</tr>
<tr>
<td>675,000 – 1,000,000</td>
<td>451 – 650</td>
<td>451 – 650</td>
</tr>
<tr>
<td>1,000,001 – 1,500,000</td>
<td>651 – 1,000</td>
<td>651 – 1,000</td>
</tr>
<tr>
<td>1,500,001 – 2,000,000</td>
<td>1,001 – 1,500</td>
<td>1,001 – 1,500</td>
</tr>
<tr>
<td>2,000,001 – 2,500,000</td>
<td>1,501-1,667</td>
<td>1,501-1,667</td>
</tr>
<tr>
<td>2,500,001 – 3,000,000</td>
<td>1,668-2,000</td>
<td>1,668-2,000</td>
</tr>
<tr>
<td>3,000,001 – 5,000,000</td>
<td>2,001-3,332</td>
<td>2,001-3,332</td>
</tr>
<tr>
<td>Greater than 5,000,000</td>
<td>Greater than 3,333</td>
<td>Greater than 3,333</td>
</tr>
</tbody>
</table>

* I DO get paid LBP but prefer not to specify amount
* I DO get paid Dollars but prefer not to specify amount
* I DO get paid Fresh USD but prefer not to specify amount
* I DO NOT get paid in LBP
* I DO NOT get paid in Dollars
* I DO NOT get paid in Fresh USD

Refuse to answer

Refuse to answer
6. Did you have any income adjustment (in LBP) following the devaluation of the Lebanese currency?
1. Yes
2. No
If yes, how much (in %)? ......................
If yes, starting which month did the adjustment happen? ...............  

7. How much do you usually spend on food? [ANSWER BASED ON EITHER MONTHLY OR WEEKLY AMOUNTS, WHICHEVER IS EASIER FOR YOU]

<table>
<thead>
<tr>
<th></th>
<th>On a WEEKLY basis (LBP/week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Less than LBP 500,000</td>
</tr>
<tr>
<td>2</td>
<td>Between LBP 501,000 and LBP 800,000</td>
</tr>
<tr>
<td>3</td>
<td>Between LBP 801,000 and LBP 1,000,000</td>
</tr>
<tr>
<td>4</td>
<td>Between LBP 1,001,000 and LBP 2,000,000</td>
</tr>
<tr>
<td>5</td>
<td>Between LBP 2,001,000 and LBP 3,000,000</td>
</tr>
<tr>
<td>6</td>
<td>Between LBP 3,001,000 and LBP 4,000,000</td>
</tr>
<tr>
<td>7</td>
<td>More than LBP 4,000,000</td>
</tr>
<tr>
<td>99</td>
<td>Don’t know/Refuse to answer</td>
</tr>
</tbody>
</table>

8. To the best of your knowledge, what percentage of your total monthly spending goes to buying food?
[%]
I don’t know/Refuse to answer

9. How often do you shop for groceries (non-food items such as soap, Kleenex, cleaning detergents, washing powders and others):

9.1. From supermarkets, per month?
   1. Once 2. Twice 3. Three times
   4. Four times 5. Five times 6. Six times

9.2. From minimarkets, per week?
   1. Once 2. Twice 3. Three times
   4. Four times 5. Five times 6. Six times

10. How often do you shop for groceries (foods and beverages):

10.1. From supermarkets, per month?
   1. Once 2. Twice 3. Three times
   4. Four times 5. Five times 6. Six times

10.2. From minimarkets, per week?
   1. Once 2. Twice 3. Three times
   4. Four times 5. Five times 6. Six times

11. Where do you usually eat your meals?
   1. Only at home
   2. Mainly at home
3. Partly at home, partly out (including workplace)
4. Mainly eating out (including workplace)
5. Only eating out (including workplace)

12. What is your current behavior as compared to before the covid-19 pandemic (now versus before):

<table>
<thead>
<tr>
<th></th>
<th>1 (Decreased Substantially)</th>
<th>2 (Decreased Slightly)</th>
<th>3 (Unchanged)</th>
<th>4 (Increased Slightly)</th>
<th>5 (Increased Substantially)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eating/dining</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>out</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ordering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visits to the</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>supermarket</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home food</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>preparation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

13. How did the economic crisis affect the following behaviors?
14. In your opinion, which crisis had more impact on your behavior?

   a. COVID-19
   b. Economic Crisis
   c. I don’t know

15. Due to the covid 19 pandemic, please describe the following behavior:

<table>
<thead>
<tr>
<th>Eating/dining out</th>
<th>Ordering delivery</th>
<th>Visits to the supermarket</th>
<th>Home food preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Decreased Substantially)</td>
<td>2 (Decreased Slightly)</td>
<td>3 (Unchanged)</td>
<td>4 (Increased Slightly)</td>
</tr>
</tbody>
</table>
16. Due to the economic crisis, please describe the following behavior:

<table>
<thead>
<tr>
<th></th>
<th>1 (Decreased Substantially)</th>
<th>2 (Decreased Slightly)</th>
<th>3 (Unchanged)</th>
<th>4 (Increased Slightly)</th>
<th>5 (Increased Substantially)</th>
</tr>
</thead>
<tbody>
<tr>
<td>the amount of your food waste (i.e., food that is not consumed and is wasted)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conditional: Based on answers from question 15, send to table “increase” or “decrease”

And unchanged: no questions 17 - 18

17. If your food waste has increased during the COVID-19 pandemic (with respect to before the pandemic), please rate your level of agreement, on a scale from 1 (I do not agree at all) to 5 (I completely agree), with the statements below:
The amount of my food waste has increased because:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>The amount of food I buy has increased</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The amount of food I cook has increased</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The amount of food I stock has increased</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I buy food that is easier to store, such as canned food</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others: please specify</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

18. If your food waste has decreased during the COVID-19 pandemic (with respect to before the pandemic), please rate your level of agreement, on a scale from 1 (I do not agree at all) to 5 (I completely agree), with the statements below:

The amount of my food waste has decreased because:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>I want to ease the work of people in the waste collection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not want to add pressure to the food management system</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
I pay more attention because we live in a period of emergency.

I buy less easily perishable food like salads or fruit

Others: please specify

----------------

Conditional: Based on answers from question 16, send to table “increase” or “decrease”

And unchanged: no questions 19 – 20

19. If your food waste has increased during the economic crisis (with respect to before the crisis), please rate your level of agreement, on a scale from 1 (I do not agree at all) to 5 (I completely agree), with the statements below:

<table>
<thead>
<tr>
<th>The amount of my food waste has increased because:</th>
<th>1 (I do not agree at all)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 (I completely agree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The amount of food I buy has increased</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The amount of food I cook has increased</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The amount of food I stock has increased</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I buy food that is easier to store, such as canned food</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
20. If your food waste has decreased during the economic crisis (with respect to before the crisis), please rate your level of agreement, on a scale from 1 (I do not agree at all) to 5 (I completely agree), with the statements below:

<table>
<thead>
<tr>
<th>The amount of my food waste has decreased because:</th>
<th>1 (I do not agree at all)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 (I completely agree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I want to ease the work of people in the waste collection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not want to add pressure to the food management system</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I pay more attention because we live in a period of emergency.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I buy less easily perishable food like salads or fruit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others: please specify</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

21. Compared as to before the Economic crisis and the COVID-19 pandemic how often do you do the following: Hardly ever [1], Rarely [2], Sometimes [3], Frequently [4], Regularly [5], Don’t know [99]
<table>
<thead>
<tr>
<th></th>
<th>Hardly Ever</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Frequently</th>
<th>Regularly</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Prepare different dishes in your household each day</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>99</td>
</tr>
<tr>
<td>b. Eat everything you prepare/serve</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>99</td>
</tr>
<tr>
<td>c. Use leftovers in any way</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>99</td>
</tr>
<tr>
<td><em>Please note: “leftovers” are any cooked/prepared and edible food that is thrown away, excluding peels, bones, and raw uneaten food in its original shape.</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Dispose food which is still originally packed</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>99</td>
</tr>
</tbody>
</table>

22. When you cook too much food, which of these do you do most often? (Please tick all applicable answers)

1. Throw it away directly
2. Keep it for a while and then throw it away
3. Keep it and eat it later
99. Other; specify: __________________________

23. Compared as to before the Economic crisis and the COVID-19 pandemic Please indicate how much you agree with the following statements: Strongly disagree [1], Disagree [2], Neither agree nor disagree [3], Agree [4], Strongly agree [5], Don’t know [99]
<table>
<thead>
<tr>
<th></th>
<th>disagree</th>
<th></th>
<th></th>
<th></th>
<th>know</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I usually plan meals based on what I want to eat, rather than what is in the fridge or the cupboards</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>b. I usually prepare a shopping list before I head to the grocery store</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>c. When I go grocery shopping I always plan ahead and buy only what I came for</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>d. I feel guilty when I throw food away</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>e. When planning meals, I always think of ways to use leftovers</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>f. When I go grocery shopping, I often buy things by impulse (items on sale/special offer)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

24. Based on what criteria do you decide to dispose of food items from your fridge or pantry? Yes [1], No [2]

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Expiry date</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>b. Appearance</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
25. What type of accommodation do you currently live in?
   1. Villa  
   2. House  
   3. Apartment  
   99. Other; specify: Other________

26. What best describes your status in the current premise?
   1. Sole owner  
   2. Renting furnished  
   3. Renting unfurnished  
   4. Free (family owned/no rent paid)  
   99. Other; specify: _________

27. What is the total area of the premise? ___________ m²

28. How many rooms are there in your premise, excluding kitchen, bathrooms, helper’s room and washing machine’s room? 
   ___________

29. How many persons live in your household, including you and the domestic helper(s)?

   Number of people

   Total | ______
   Children younger than 5 years old | ______
   Children from 6 to 15 years old | ______
   Adults from 16 to 60 years old | ______
   Adults 61 years of age or older | ______
30. What is your highest level of education in your household?

1. Elementary
2. Intermediate
3. Secondary/High school (12 years of schooling)
4. Some college, but no degree (between 1 and 3 years of college)
5. University graduate (bachelor degree or equivalent)
6. Postgraduate, master's degree, doctorate
7. Technical/vocational
99. Refuse to answer

That was the last question. Thank you for your help in this research!
Text Message:

Good morning, I hope you are doing well. My name is Yara Rizk, and I am a student at the Lebanese American University currently doing my Master’s thesis project. This is to kindly ask you if you can help out by participating in a short questionnaire. The study is entitled “Impact of the Economic Crisis and Covid 19 on Behaviors and Attitudes Shaping Household Food Waste Generation: The Case of Lebanon”. It aims to present and discuss the influences of numerous socio-demographical, behavioral and attitudinal factors on the generation of food waste in Lebanese households in the middle of an economic crisis and global pandemic. The questionnaire will take around 10-15 min to fill. Kindly let me know if you agree to participate so I can give you a phone call when you have the time and we can fill it together. If you do not wish to participate, simply say No. Thank you in advance for your help. Have a great day!

Institutional Review Board
Lebanese American University

02 JUL 2021
APPROVED
NOTICE OF IRB APPROVAL

To: Ms. Yara Rizk
Dr. Lama Mattar
Assistant Professor
School of Arts and Sciences

Date: July 2, 2021

Re: IRB #: LAU.SAS.LIM.2/Jul/2021
Protocol Title: Impact of the Economic Crisis and COVID-19 on Behaviors and Attitudes Shaping Household Food Waste Generation: The Case of Lebanon

The above referenced research project has been approved by the Lebanese American University, Institutional Review Board (LAU IRB). This approval is limited to the activities described in the Approved Research Protocol and all submitted documents listed on page 2 of this letter. Enclosed with this letter are the stamped approved documents that must be used.

APPROVAL CONDITIONS FOR ALL LAU APPROVED HUMAN RESEARCH PROTOCOLS

LAU RESEARCH POLICIES & PROCEDURES: All individuals engaged in the research project must adhere to the approved protocol and all applicable LAU IRB Research Policies & Procedures. PARTICIPANTS must NOT be involved in any research related activity prior to IRB approval date or after the expiration date.

PROTOCOL EXPIRATION: The LAU IRB approval expiry date is listed above. The IRB Office will send an email at least 45 days prior to protocol approval expiry - Request for Continuing Review - in order to avoid any temporary hold on the initial protocol approval. It is your responsibility for continuing review and receive continuing approval for the duration of the research project. Failure to send Request for Continuation before the expiry date will result in suspension of the approval of this research project on the expiration date.

MODIFICATIONS AND AMENDMENTS: All protocol modifications must be approved by the IRB prior to implementation.

NOTIFICATION OF PROJECT COMPLETION: A notification of research project closure and a summary of findings must be sent to the IRB office upon completion. Study files must be retained for a period of 3 years from the date of notification of project completion.

IN THE EVENT OF NON-COMPLIANCE WITH ABOVE CONDITIONS, THE PRINCIPAL INVESTIGATOR SHOULD MEET WITH THE IRB ADMINISTRATORS IN ORDER TO RESOLVE SUCH CONDITIONS. IRB APPROVAL CANNOT BE GRANTED UNTIL NON-COMPLIANT ISSUES HAVE BEEN RESOLVED.

If you have any questions concerning this information, please contact the IRB office by email at irb@laul.edu.lb

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Fax: +961 1 86 70 08

IRB ADMINISTRATION
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Lebanon
Tel: +961 9 54 72 02
Fax: +961 9 54 02 02

The IRB operates in compliance with the national regulations pertaining to research under the Lebanese Minister of Public Health’s Decision No.141 dated 2/7/2016 under LAU IRB Authorization reference 2019/708, the international guidelines for Good Clinical Practice, the US Office of Human Research Protection (45CFR46) and the Food and Drug Administration (21CFR56). LAU IRB U.S. Identifier as an international institution: P0170014723 and IRB Registration # IRB000060954 LAU/IRB/1

Dr. Joseph Stephen
Chair, Institutional Review Board

DOCUMENTS SUBMITTED:

- LAU IRB Exempt Application
  - Received 4 June 2021, amended to Initial Protocol
  - Application 11 June 2021

- Proposal
  - Received 4 June 2021, amended 26 June 2021

- Informed Consent
  - Received 4 June 2021

- Survey
  - Received 4 June 2021

- Link to Online Survey
  - Received 4 June 2021, amended 26 June 2021

- Text Message
  - Received 26 June 2021

- IRB comments sent:
  - 23 June 2021

- Response received:
  - 26 June 2021

- CITI Training – Lama Mattar
  - Cert. # 290242153 Dated (10 October 2018)

- CITI Training – Yara Rizk
  - Cert. # 316644183 Dated (19 May 2019)

02 JUL 2021
APPROVED

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