

AMERICAN UNIVERSITY OF BEIRUT

PREVALENCE OF FOOD INSECURITY AMONG COLLEGE  
STUDENTS IN LEBANON AND ITS ASSOCIATION WITH  
MENTAL AND PSYCHOSOCIAL HEALTH PARAMETERS:  
FINDINGS FROM A CROSS-SECTIONAL STUDY

by  
RITA ZIAD ITANI

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Approved by:

---

[Dr. Lamis Jomaa, Associate Professor]  
[Nutrition and Food Sciences]

*Lamis Jomaa*  
Advisor

---

[Dr. Samer Kharroubi, Associate Professor]  
[Nutrition and Food Sciences]

*[Signature]*  
Member of Committee

---

[Dr. Lama Mattar, Associate Professor]  
[Natural Sciences, Lebanese American University]

*[Signature]*  
Member of Committee

---

[Dr. Tania Bosqui, Assistant Professor]  
[Psychology]

*[Signature]*  
Member of Committee

Date of thesis defense: January 12, 2022

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# ABSTRACT OF THE THESIS OF

Rita Ziad Itani for Master of Science  
Major: Food Security

Title: Prevalence of Food Insecurity among College Students in Lebanon and its Association with Mental and Psychosocial Health Parameters: Findings from a Cross-Sectional Study

**Background:** The transition from high school to university encompasses various prospects and challenges among young adults aged between 18-25 years old. Food insecurity (FI) and Mental Health Disorders are growing public health concerns among college students (Bruening et al., 2017, Beccera et Beccera 2020). Despite the growing interest in exploring FI among college students and its impact on various measures of wellbeing; there remains a dearth of evidence on FI among college students and young adults in low to middle-income countries (LMICs) in comparison to high-income countries (HICs).

**Objective:** This present study aimed to assess the prevalence of food insecurity (FI) among college students in Lebanon, identify the socio-demographic and economic factors associated with FI among college students within the study sample, and explore the associations between FI status and indicators of mental and psychosocial health among college students.

**Methods:** A cross-sectional study was conducted on a convenience sample of college students (aged between 18 to 24 years old) (N=745) enrolled in public and private universities across Lebanon. College students were recruited to participate in an online survey that was approved by the institutional review boards (IRB) at the American University of Beirut (AUB) and Lebanese American University (LAU) starting the spring semester of 2021. The online survey collected information on sociodemographic status, food security status, mental health, and overall well-being. FI was assessed through the Food Insecurity Experience Scale (FIES). For the Mental Health and Well-being parameters: Patient Health Questionnaire-9 (PHQ-9) was used to screen for depression, General Anxiety Disorder-7 (GAD-7) was used to screen for anxiety, and World Health Organization-5 index (WHO-5) was assessed to assess the overall well-being of college students. Chi-square tests and independent t-tests were used to examine the bivariate associations between food insecurity (FI) (Food secure vs food-insecure) and the sociodemographic characteristics and lifestyle factors of college students. Sociodemographic and lifestyle correlates of FI were explored using simple and multiple logistic regression analyses. Moreover, simple and multiple linear regression analyses were conducted to further examine the associations between FI (food secure vs. food insecure) with each mental health indicators (PHQ-9, GAD-7, WHO-5).

**Results:** Based on the Food Insecurity Experience Scale (FIES), an estimate of 39% of college students included in our sample were food insecure of 27.4%, 8.1%, and 3.5% were mildly, moderately, and severely food insecure respectively. Multiple logistic regression analysis showed that low maternal education, low household monthly income, and elevated levels of stress were significant correlates of FI ( $p$ -trend $<0.001$ ). According to the PHQ-9 (depression) and GAD-7 (anxiety) indicators, 22.6% and 34.4% of students showed severe symptoms of depression and anxiety, respectively. Multiple linear regression analysis showed that FI among college students was associated with higher scores on PHQ-9 and GAD-7 ( $\beta= 2.45$ ; 95% CI (1.41,3.49)), ( $\beta=1.4$ ; 95% CI (1.1, 2.2) ), respectively, and lower scores on WHO-5 (Wellbeing) ( $\beta=-4.84$ ; 95% CI [-8.2, -1.5]), even after adjusting other correlates of FI. One unit increase in stress level among college students was significantly associated with higher depression (PHQ-9) and anxiety (GAD-7) and lower well-being (WHO-5) ( $\beta =1.4$ , 95% CI (1.23, 1.60),  $\beta=1.506$ , 95% CI (1.331, 1.680) and  $\beta= 4.299$ ; 95% CI (-4.991, -3.606), respectively. Furthermore, College students with household monthly incomes greater than 5,000,000 LBP had significantly higher well-being (WHO-5) scores

**Conclusion:** College students in Lebanon are facing various challenges that are affecting their food security and mental health state. The results of our study highlight the need for high educational institutions to launch interventions and engage with multiple stakeholders to address and alleviate FI and improve mental health and well-being of college students.

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# CHAPTER I

## INTRODUCTION AND LITERATURE REVIEW

### A. Introduction

The transition from high school to university encompasses various prospects and challenges among young adults aged between 18-25 years old. College students are simultaneously challenged with various responsibilities at the academic, financial, and psycho-social levels as they embark into an unfamiliar environment embedded with new experiences (Howard et al., 2021, El Zein et al., 2019). Such challenges may impact the overall university experience of college students (Howard et al., 2021). Food insecurity (FI) is a growing concern among college students (Bruening et al., 2017). FI is defined as the inadequate physical, economic, or social access to safe and nutritious food that meets the preferences and dietary needs of individuals (FAO, 1996). A recent systematic review of studies conducted across college campuses in the United States showed that the prevalence of FI among college students in the US was found to be alarming, ranging between 35% and 42% (Bruening et al., 2017). In parallel, there has been also a significant rise in the prevalence of mental health disorders (25.8%) among college students (Beccera & Beccera 2020, Pedrelli et al., 2015). With the onset of COVID-19 pandemic, the rate of experiencing at least one mental health disorder increased from 20.2% in 2017 to reach 29.6% in 2020 (Winkler et al., 2020) Similarly, the prevalence of FI among university students in the US increased by an estimate of one-third during 2020 (Soldavini et al., 2021).

FI is a multifaceted phenomenon that has been shown to be associated with poor physical, mental, and psycho-social health among college students (Jones et al., 2017). In the US, food-insecure students demonstrated higher odds of stress, deteriorated

quality of sleep, disrupted eating patterns and behaviors, and a lower GPA in comparison to food secure students (El Zein et al., 2019, Nagata et al., 2019, Henry et al., 2017, Royer et al., 2021). In 2019, 27% of the undergraduate students across university in Canada were food insecure and 16.5% of students demonstrated psychological distress in 2019 (Hattangadi et al., 2021). FI in all its degrees (marginal, moderate, and severe) was shown to be associated with emotional and psychosocial distress among college students (Hattangadi et al., 2021, Breuning et al., 2017). Despite the growing interest in exploring FI among college students and its impact on various measures of wellbeing; there remains a dearth of evidence on FI among college students and young adults in low to middle-income countries (LMICs) in comparison to high-income countries (HICs).

Lebanon is a small middle-income country in the Middle East & North Africa region that continues to struggle with protracted internal, spill-over, and external conflicts with devastating economic, political, and social repercussions. The country's checkered history and ongoing crises have had serious repercussions on the food security (Jomaa et al., 2019) and mental health and wellbeing of its populations (Maalouf et al., 2016). FI is a major public health concern in Lebanon, even before the start of the recent economic and health crises. According to a study conducted in 2015 on a nationally representative sample of Lebanese households with children, authors found that more than 42% of respondents were experiencing moderate to severe FI (Jomaa et al., 2019). Another study conducted by Maalouf et al., (2016) showed that the prevalence of mental health disorders amongst adolescents and young adults (aged between 18-25 years old) reached 26.1% which was slightly higher than the average prevalence of such disorders amongst the Lebanese population (25%) (Maalouf et al., 2016). In 2020, with

COVID-19 pandemic, the tragic Beirut Port blast, and the unprecedented economic crisis, the food security status of the country and its population were further threatened. The prevalence of poverty and extreme poverty in Lebanon increased from 28% and 8% in 2019 to reach 55% and 23%, respectively, in 2020 (ESCWA, 2020) In parallel, an alarming rate of mental health disorders with anxiety was reported among young adults with anxiety reaching approximately 17% (Maalouf et al., 2016, Salemech et al., 2020). College students from various universities in Lebanon are at risk of mental health disorders due to stressors related to family, university, country status, financial challenges (Naal et al., 2020). Nonetheless, a study conducted in Lebanon in one branch of the Lebanese University, demonstrated a prevalence of 10% of FI in which 7.5% and 1.4% of students were moderately and severely food insecure respectively. However, Fares et al., (2020) did not explore the psychosocial and mental health status of college students neither did the study explore potential associations between FI and mental health parameters (Fares et al., 2020).

## **B. Food Insecurity and Health Outcomes**

The Food and Agricultural Organization (FAO) defines food insecurity (FI) as a state that exists when people lack adequate and secure access to enough, safe, and nutritious food required for adequate growth and an active, healthy lifestyle (FAO, 2021). Before the onset of the COVID-19 pandemic, there was an ongoing significant rise in the number of countries that are experiencing FI (World Bank, 2021). More than 600 million people worldwide were struggling with severe FI in 2019 (FAO, 2021). Furthermore, decreased incomes, disturbed markets, and supply chains, and hunger were increasing before the pandemic due to several aspects related to socio-economic

degradation, conflicts, wars, climate change, and natural disasters (World Bank, 2021). With the onset of the COVID-19 pandemic, the state of food security and nutrition in the world was further threatened as more than 800 million people worldwide were said to be considered severely food insecure as of the year 2020 (SOFI, 2021). A global analysis of FI presented in the SOFI (2021) showed that the prevalence of moderate or severe FI fluctuated from 18% in Central Asia to 66.2% in Sub-Saharan Africa (SOFI, 2021). According to the World Bank (2021), the most vulnerable households in nearly every country were severely affected, with long-term health and socio-economic repercussions that are projected to persist through 2021 and 2022 (Wolfson et al., 2020, World Bank, 2021).

FI is a multifaceted phenomenon that has been associated with various nutrition and dietary related health consequences such as inadequate intake of macronutrients, micronutrient deficiencies, malnutrition, cases of failure to thrive among infants, obesity, reduced physical health in both the adult and the pediatric population (Jones, 2017). Food insecure individuals consume inadequate diets that further manifest as an underlying cause of malnutrition. This further contributes to an elevated risk of developing non-communicable diseases (NCDs) such as obesity, cardiovascular diseases, hypertension, diabetes, cancer, anemia, etc. (Pourmotabbed et al., 2020, Murthy, 2016). Moreover, food-insecure individuals face various difficulties not only concerning their physical health but also their psychosocial and mental health (Murthy, 2016, Jones, 2017). In other words, the health implications of FI are not only restricted to increasing the risk of developing NCDs, but also it is associated with increased anxiety, stress, and depression (Flores & Amiri, 2019, Murthy, 2016, Jones, 2017). Therefore, FI creates a state of social and health inequity; it imposes various health and

psycho-social implications among individuals. Moreover, it exacerbates the state of vulnerability to diseases, social and economic inequities, and disparities between both food insecure and food secure populations groups (Murthy 2016, Jones 2017).

### **C. Mental Health and its Implications**

Mental health constitutes a vital component of our health and overall well-being. According to the World Health Organization (WHO), the definition of health transcends beyond the state of absence of disease to a state of physical, social, and mental well-being. The determinants of mental health and mental health disorders consist of not only individual drivers dictated by one's emotions, feelings, thoughts, behaviors, and interactions but also social, economic, political, environmental, and cultural drivers (WHO, Mental Health Action Plan 2013-2020). According to the data published by the United Nations Department of Economic and Social Affairs in 2016, mental health and substance abuse problems in low and middle-income countries (LMIC) and high-income countries (HIC) rank among the ten leading causes of disability. According to the data published by WHO in 2017, the world has witnessed a 13% increase in mental health disorders and substance abuse conditions in the last decade. Moreover, a prevalence of 7.4% of global DALYs (disability-adjusted life years) was attributed to mental and behavioral health disorders (Rehm et al., 2019). The most common and leading mental health disorders were major depressive disorders (MDD), anxiety, drug use, alcohol use, schizophrenia, and bipolar disorders with a worldwide prevalence of 34.12%, 14.49%, 10.80%, 9.53%, 8.10%, 6.95% respectively (WHO, 2010).

One in three individuals globally suffers from a mental health disorder over their lifetimes such as depression, anxiety, general distress, and somatic syndrome (Jones,

2017). Furthermore, among the most vulnerable sub-population groups are young adults aged between 18-25 years old. The prevalence of mental health disorders were found to be significantly higher among young adults aged between 18-25 years old (25.8%) in comparison to adults aged 26–49 years old (22.2%) and 50 years or older (13.8%) (Beccera, 2020). Moreover, it was observed that mental health services for mental health disorders were sought more by adults in comparison to young adults (Becerra, 2020). Only 38.4% of 18–25-year-olds received mental health services in comparison to 43.3% of adults aged 26–49 years and 44.2% aged 50 years and older (Becerra, 2020). The WHO World Mental Health International College Student project that overlooked 19 colleges across 8 countries: Australia, Belgium, Germany, Mexico, Northern Ireland, South Africa, Spain, and the United States of America demonstrated that 35% of college students showed a minimum of one lifetime, common mental health disorder. Furthermore, 31% demonstrated a positive screening for a minimum of one 12-month disorder (Auerbach et al., 2018).

#### **D. The relationship between Food Insecurity and Mental health**

A systematic review conducted by Bruening et al., (2017) demonstrated a strong association between FI and psychosocial well-being among both children and adults. Furthermore, a systematic review by Weaver et al., (2009) focused on examining the associations between FI and mental health among young adults. It concluded that FI was being directly associated with increased symptoms of mental health disorders i.e., anxiety, stress, and depression. Moreover, the systematic review demonstrated a correlation between the FI and experiences of anxiety, stress, shame, and acute psychological suffering (Weaver et al., 2009).



According to Pourmotabbed (2020), FI may contribute to mental health disorders through different mechanisms. First, food-insecure individuals show signs and symptoms of psychological distress that include anxiety and depression. FI can trigger a cycle of doubt and vagueness towards the ability of individuals to procure and afford food that is safe, nutritious, and culturally acceptable to feed themselves and their families (Pourmotabbed, 2020). As a result of the consistent and continuous uncertainty that dominates the lives of these food-insecure individuals; increased stress and fear further induce an exacerbation towards additional anxiety and depression (Jones, 2017). Second, FI heightens the sense of socio-economic discrepancies within the household and the community, and this leads to increased cultural sensitivities and disparities which themselves lead to adverse mental health outcomes (Weaver et al., 2009). Third, a deterioration in mental health can lead to an overall decrease in productivity, which further translates to a decline in overall salary, deterioration in academic achievement, increased vulnerability towards food insecurity, and/or exacerbation in existing food insecurity status (Meza et al., 2019, Jones, 2017).

### **E. Food Insecurity and Mental health among College Students**

Over the past decade, there has been an increased interest in examining the current trends of FI among college students. Before the onset of the COVID-19 pandemic, studies showed that there is an increase in the prevalence of FI across university campuses in the US ranging between 21 to 59% (Hanna, 2014). Nonetheless, it was estimated that one in three university students were found to be food insecure in the US (Laska et al., 2020). A more recent systematic review of studies conducted across college campuses showed that the prevalence of FI among college students in the

US was found to be alarming, with prevalence ranging between 35% and 42% based on published data to date (Bruening et al., 2017).

In parallel, the prevalence of mental health disorders such as anxiety, depression, eat disorders, substance abuse, and suicidal behavior has significantly increased among young adults aged 18-24 years old (Jurewicz, 2015). Such increase in rates is being attributed to the internal and external stressors that young adults are experiencing concerning family responsibilities, finances, academic pressure, peer pressure, etc. (Pedrelli et al., 2014). According to El Zein et al., (2019) 19% of the college population group assessed among eight universities were food insecure and 25.3% were at risk of FI. Moreover, food-insecure students demonstrated a higher odds ratio of stress, deteriorated quality of sleep, disrupted eating patterns and behaviors, and a lower GPA in comparison to food secure students. In addition, only 22.2.% of food insecure students resorted to food pantries on campuses while an estimate of 57% did not know about the presence of such services (El Zein et al., 2019). Another cross-sectional study conducted in Canada (2017) showed that 27% of the undergraduate students were food insecure and 16.5% of students demonstrated psychological distress. Food insecurity in all its degrees (marginal, moderate, and severe) was associated with emotional and psychosocial distress among college students (Hattangadi et al., 2021).

The COVID-19 pandemic further complicated and worsened the state of mental health and food insecurity respectively (Winkler et al., 2020, Soldavini et al., 2021). The rate of experiencing a minimum of one common mental health disorder increased from 20.2% in 2017 to reach 29.63% in 2020 (Winkler et al., 2020). In parallel, prevalence of FI across university students in the US increased by an estimate of one-third during the spring semester of 2020 (Soldavini et al., 2021).

Such interest in this target population can be attributed to two factors i.e., the higher prevalence of mental health disorders and serious mental illness among this population age group of 18-25 and the increased prevalence and vulnerability risk of college students to food insecurity (Becerra, 2020). Thus, assessing the effect of FI on the mental health of young adults and college students became critical and essential with such high prevalence rates (Becerra, 2020).

Despite the growing interest in exploring FI among college students and its impact on various measures of wellbeing, there remains a dearth of evidence of FI among college students and young adults in LMICs (low to middle income countries). Only one cross-sectional study on 272 college students enrolled in a public university in Tehran, Iran demonstrated a prevalence of 44.1% and 62.5% of food insecurity and depression, respectively ( Zolfaghari et al., 2021). Moreover, 54.3% of food-insecure students were found to be depressed while 19.1% of food secure students were depressed (Zolfaghari et al., 2021).

#### **F. Food Insecurity and Mental Health in the MENA region and Lebanon**

The Middle East and North Africa (MENA) region remains one of the regions with the highest rates of FI worldwide. According to the latest SOFI report (2021), the MENA region presents with a significant and alarming prevalence of FI with an estimate of 30.2% experiencing severe levels of FI in 2020. Moreover, the MENA region holds a history of protracted wars and conflicts and is known to be the host of the largest number of refugees worldwide (IFPRI, 2015). The MENA region, with a population growth that is expected to grow beyond 700 million in 2050, presents with significant challenges that are threatening its food and nutrition security. Climate Change is

significant instigator that is threatening local agriculture in specific and the overall food system in general (World Bank, 2021). More than 50% of the population in the MENA is living under significant water scarcity thus, affecting overall livelihoods and food security of millions of people (World Bank, 2021). Nonetheless, more than 50% of the region's food is imported. Thus, this creates significant challenges on countries that are struggling with their collapsed economies such as Lebanon, Syria, and Yemen to procure food to its nationals (World Bank, 2021).

Lebanon, a small middle-income country in the MENA region, has been struggling with consistent protracted internal, spill-over, and external conflicts with devastating economic, political, and social repercussions. According to the United Nations High Commissioner for Refugees (UNHCR), Lebanon also hosts the largest number of refugees per capita with an estimated 1.5 million registered Syrian refugee present since the beginning of the Syrian war in 2011 (UNHCR, 2021). Such heavy and continuous influx of refugees on a limited country with resources and persistent conflicts may have further exacerbated the FI situation in the country.

A most recent, cross-sectional study conducted in 2015 on a nationally representative sample of Lebanese households (with 4–18-year-old-children and their mothers emphasized FI as a major public health concern, even before the start of the current ongoing crisis (Jomaa et al., 2019). The study demonstrated that almost half of the sample were food insecure with more than 42% experiencing moderate to severe FI.

Moreover, with the ongoing crisis that has initiated since the end of 2019, Lebanon started witnessing one of its worst economic crises in the last decades (Hubbard, 2020). Lebanese citizens decided to revolt against the regime and demand reform. By October 17, 2019, the Lebanese revolution started, with citizens demanding resignation

of all political parties from government (Hubbard, 2020). The economic problems in Lebanon have been accumulating over the years as the country is severely indebted (Hubbard, 2020). The situation was further worsened as the Lebanese currency (LBP (Lebanese pounds) depreciated and lost more than 90% of its value over the course the course of the year 2020. This has resulted in Lebanon witnessing brutal inflation of prices (Lebanon Food Security Portal, 2020). Nonetheless, the collective crises were further heightened, with the COVID-19 pandemic and the tragic Beirut Port blast that took place on August 4th, the country's fiscal crisis deepened. This posed further threats to the food and nutrition security of the country and its population at large. Such downfall was reported to severely impact the overall food and nutrition security state in the country. According to reports published by FAO and ESCWA which were based on surveys of representative sample of the Lebanese population, 49% of Lebanese citizens reported that they were anxious regarding their capability to access and procure food and 31% reported their inability to eat healthy and nutritious food during the past year of 2020 (ESCWA, 2020, FAO, 2020). Furthermore, the prevalence of poverty and extreme poverty in Lebanon has increased from 28% and 8% in 2019 to reach 55% and 23%, respectively, in 2020 (ESCWA, 2020)

Studies exploring the mental health situation of the Lebanese population also showed worrisome trends even prior to the recent compounded crises that the country has been facing. According to Maalouf et al., (2016) who followed a clustering sample, the prevalence of mental health disorders in 2012 reached 25% and anxiety disorder was found to be the most common with a prevalence of 16.7%. Furthermore, adolescents and young adults had a prevalence of 26.1% which is higher than the average population prevalence (Maalouf et al., 2016). The health care system in Lebanon is predominantly

privatized. Mental health services in the country are provided through the private sector or non-governmental organizations. There exist no national policies set by the government on promoting mental health and/or ensuring adequate services. Furthermore, planning and mental health surveillance is further lacking the country (Lee, 2015).

To date, studies focusing on mental health and food insecurity in Lebanon have been rather minimal. According to Naal et al., (2020), who conducted a cross-sectional study on 171 college students from various universities in Lebanon during the academic year of 2018 concluded that college students present with significant vulnerability risk to mental health disorders because of all the stressors related to family, university, country status, financial challenges, etc... The results of the PHQ-9 (patient health questionnaire-9) demonstrated a prevalence of 56.4% of university students showing mild to moderately severe symptoms of depression while 5.5% showing severe symptoms of depression (Naal et al., 2020). Furthermore, 55% of the sampled university students showed “borderline abnormal” to “abnormal” symptoms of a general anxiety disorder (GAD) per the HADS (Hospital Anxiety & Depression Scale). Moreover, 24.1% of college students have passively contemplated suicide while 15.6% have actively planned for it and 8.4% have committed suicide at least once during their life per SBQ-R (suicidal behavior questionnaire) (Suicidal Behavior Questionnaire-Revised) (Naal et al., 2020). A recent study conducted by Fares et al., (2020) among college students from one of the branches of the public Lebanese University, Hadath campus, demonstrated a prevalence of 9% of FI in which 7.5% and 1.4% were moderately and severely food insecure respectively (Fares et al., 2020). However, the study did not address any potential psychosocial or mental health parameters.

## **G. Rationale and Study Objectives**

As presented in the literature, FI is a critical global, public health challenge that is significantly prevalent among university students aged between 18-25 years old. In parallel, there is a significant increase in the prevalence of reported mental health disorders among this population group. There exist significant gaps in the scientific literature that explore the prevalence of food insecurity among college students in LMICs including countries of the MENA region and only one has been identified that explored the association of FI with mental health parameters.

The present study aimed to address this research gap in Lebanon, a country that has been witnessing multiple crises taking a toll on the FI and mental wellbeing of its population, including young adults. The specific objectives of the study are to (1) determine the overall prevalence of food insecurity among college students in Lebanon, (2) identify the socio-demographic and economic factors associated with food insecurity among college students within the survey population, and (3) explore the association between food insecurity status and indicators of mental and psychosocial health among college students.

## CHAPTER II

### METHODOLOGY

#### **A. Study Design and Sampling**

A cross-sectional study was conducted on a convenience sample of college students (aged between 18 to 24 years old) enrolled in public and private universities across Lebanon.

##### Sample size calculation

A minimum sample of 139 students was needed to estimate the prevalence of FI in the present study using estimates from a recent study conducted in Lebanon (10%) (Fares et al. 2020) while considering a 95% confidence interval (i.e., 5% margin of error). Power analysis was also done for the secondary objective of the study to explore associations between FI and mental health outcomes. Sample size calculations were performed based on estimates from a multi-institutional study assessing food insecurity among college students across eight U.S. universities (El Zein et al 2019) showing odds ratio (OR) of high stress among food-insecure participants to be 4.65 (95% CI: 2.66–8.11) vs. food secure. Thus, a minimum sample of 634 students was required with a 95% confidence interval and precision level of 40%. The final intended sample for the present study was 730 students accounting for an additional 15% due to incomplete responses. Sample size calculations were performed using the *Select Statistical Services sample size calculator* (Brooks, 2020).



## **B. Recruitment**

College students were recruited through convenience sampling approach to participate in an online survey that was approved by the institutional review boards (IRB) at the American University of Beirut (AUB) and Lebanese American University (LAU) starting the spring semester of 2021. The online survey was available in two languages English and Arabic so that participants can select their preferred language. The recruitment of participants was conducted through two main methods. The first method included sharing an online survey with interested and eligible participants through various social media platforms (Instagram, Facebook, Twitter, etc.). The second method included the recruitment of a convenience sample of college students from the AUB and LAU through sending email invitations to participate in a research study. The HRPP/IRB (Human Research Protection Program/IRB) office was responsible to send email invitations to AUB students while a non-administrative level employee through the Dean of Student Office at LAU was responsible to send the invitations to students in their respective university. Accessing the link to the survey included the consent form at the beginning; students who approved to participate were prompted to complete the online survey. The duration to complete the survey ranged from 15 to 20 minutes.

## **C. Ethical Considerations**

Invitations were sent to students through the two IRB-approved methods for recruitment (as presented earlier). Accessing the link to the survey included the consent form at the beginning; students who approved to participate were prompted to the online survey. The consent form included a brief description of the purpose, objectives, procedure, risks, benefits, confidentiality, and referral system of the research study.

Participation in the study was completely anonymous; the collected data remained confidential and anonymous. All records will be monitored, and they may be audited by the IRB while assuring confidentiality. Participants were able to withdraw at any time and their withdrawal or refusal to participate involved no loss or penalty and did not affect their status and relationship with AUB and/or AUBMC (American University of Beirut Medical Center). Online survey responses were saved in a secure database on password-protected computer at the PI office at the Faculty of Agriculture and Food Sciences/ Department of Nutrition and Food Sciences for a total duration of 5 years. There was no collection of personal identifiers (ex. names, numbers or any other data that can relate ID to the questionnaire) to ensure anonymity and confidentiality of participants.

## **D. Survey and Screening Indicators**

### ***1. Sociodemographic Factors and FI indicators***

Data on demographic and socioeconomic characteristics of the study sample were addressed through 19 questions. Students were asked to determine their gender (female, male, non-binary), age, university, class level, major, residence, GPA, personal income, household monthly income, parental education, parental employment, financial aid status, and earnings in foreign currency. Students had 5 items to select their university. Such items were further categorized under public and private university. Furthermore, students had 5 items to select their class level (freshmen, sophomore, junior, senior, and graduate). Such items were further grouped into 2 categories (undergraduate and graduate). Furthermore, student major was regrouped from 6 items (business, engineering, health related, arts, sciences, others) to 2 groups (Health related

and non-health related). For parental education, students were asked to choose from 4 items (Elementary or less, Intermediate, High school, Graduate) the educational level of their fathers and mothers separately. The 4 groups were further recategorized into 3 groups (Intermediate, High School, University Degree or Higher). Similarly, for parental employment, 3 groups (Not working, employed part-time, employed full-time) were regrouped into 2 groups (Not employed and employed). For household monthly income, students were given 9 items to select their monthly income; items were further grouped into 4 groups (<2,000,000 LBP, 2,000,000-5,000,000 LBP, >5,000,000LBP, and refuse to answer).

Furthermore, 6 questions were used to collect information on lifestyle habits. Students were asked to determine their average sleeping hours per day, quality of sleep (regular or irregular), average studying hours per day, physical activity level, perceived stress (scale of 1-10), and smoking status (never smoked, occasional smoker, current smoker, ex-smoker, refuse to answer).

**Food Insecurity (FI)** was measured using the Food Insecurity Experience Scale (FIES), an experience-based measure that was developed and validated by the FAO organization 'Voices of the Hungry (VOH)' project (Ballard et al., 2014). The FIES is a reliable, valid, and internally consistent indicator with an adequate Cronbach's alpha coefficient of 0.759 (Helmi et al., 2020). The FIES is strong tool that has been used to assess FI across Arab countries such as Lebanon in the Gallup World Poll (GWP) surveys (Diab-El-Harake et al., 2022). The tool consists of an eight-point scale assessing people's actual experiences in accessing food. Respondents were asked whether, at any time during the previous 12 months, they have worried about their ability to obtain enough food, their household has run out of food, or they have been

forced to compromise the quality or quantity of the food that they ate owing to limited availability of money or other resources to obtain food. Respondents were assigned a score value of “1” for any specific question that they have answered “yes” and “0” if their answer was “no”. For each respondent, the assigned values for the eight questions were summed to obtain a raw score that ranges from 0 to 8. The total score was used to classify individual-level FI status: food secure (raw scores = 0); mild FI (1-3); moderate FI (4–6); and severe FI (7–8) (Ballard et al., 2014). For analyses, FI was further recoded into two categories: 1- food secure (raw score = 0) and 2- food insecure (raw score  $\geq$  1); the latter included individuals experiencing mild, moderate, or severe FI). The tool was provided in its validated English and Arabic version.

## ***2. Mental Health Status***

**Psychosocial Status:** This section was set to focus on the mental health of and thus indicators related to depression, general anxiety disorder, stress, and wellbeing were as screening indicators (PHQ-9, GAD-7, and WHO-5 respectively).

**Patient Health Questionnaire (PHQ-9):** is a 9-item self-reported depression scale of the patient health questionnaire; PHQ-9 is set to be considered one of the most validated tools in screening for mental health. The PHQ-9 is an internally consistent and reliable indicator among college students with a Cronbach’s alpha coefficient  $>0.8$  (APA, 2022, Al Hadi et al., 2017). According to a study conducted by Sawaya et al., 2016, it is a valid indicator to screen for depression across the Lebanese population. Students were asked in a period set in the last 2 weeks if they have been feeling sad or depressed, tired, or having little to no energy, experiencing episodes of low appetite or overeating, feeling guilty or worthless and thus, denote a time-frequency of

experiencing such episodes whether not all, several days, more than half of the days, nearly every day. Each item can be graded on the Likert scale indicating 0 which is the equivalent absence of a symptom to 3 which is equivalent to the presence of a symptom nearly every day. The total score of the PHQ-9 represents the total sum of the scores of 9 items can range from 0 up to 27, with 0-4, 5-9, 10-14, 15-19, and 20 or greater attributing to minimal, mild, moderate, moderately severe, and severe depression, respectively (Kroenke et al., 2001). The tool was provided in its validated English and Arabic version.

**General Anxiety Disorder-7 (GAD-7):** It is a 7-item self-reported anxiety scale. GAD-7 is set to be considered a validated, efficient, and adequate tool of screening for general anxiety disorder and thus, assess its level of severity. GAD-7 is set to be considered a validated, efficient, and adequate tool of screening for general anxiety disorder and thus, assess its level of severity across the Lebanese population (Sawaya et al., 2016). GAD-7 is an acceptable and reliable indicator among college students in Lebanon with a Cronbach's alpha coefficient  $>0.7$  in English and its Arabic version (Byrd-Bredbenner et al., 2020, Sawaya et al., 2016, Al Hadi et al., 2017). Students were asked if they have been nervous or anxious or on edge, not being able to stop or control worrying, having trouble relaxing, worrying too much about different things, restless, easily irritated, and annoyed, afraid that something might happen. Students will then select a time-frequency of experiencing such episodes whether not all, several days, more than half of the days, nearly every day which will be given scores of 0,1,2,3, respectively. The total scores of GAD-7 range from 0 to 21 with 0-4, 5-9, 10-14, 15-21 representing minimal anxiety, mild anxiety, moderate anxiety, severe

anxiety (Sawaya et al., 2016). The tool was provided in its validated English and Arabic version.

**The World Health Organization (five) index WHO-5:** The 5-item World Health Organization Well Being Index is considered one of the most frequently used questionnaires to assess overall subjective wellbeing. It is a validated and internally consistent tool with a Cronbach alpha of 0.83 in its Arabic version and 0.85 in its English version (Sibai et al., 2009, Topp et al., 2015, Garland et al. 2018). WHO-5 presents a 5-items related to feelings of cheerfulness and good spirits, calmness and relaxation, activeness and vigorousness, freshness, and restfulness. Students were asked to denote a time-frequency of experiencing such a series of episodes i.e., at no time, some of the time, less than half of the time, more than half of the time, most of the time, all of the time which denote a score of 0,1,2,3,4,5, respectively. The total score of WHO-5 ranges from 0 to 25 and is then multiplied by 4 to provide a final score ranging from 0 which represents diminished being to 100 representing optimal wellbeing (Topp et al., 2015). The tool was used in its validated English and Arabic versions.

### **E. Statistical Analysis**

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 25.0. Descriptive statistics were presented as means and standard errors (SEs) for continuous variables and as proportions and frequencies for categorical variables. Normality tests were carried out for all variables through examining Q-Q plots of variables and assessing mean, median, and mode. Variables of equal median, mode, and mean were said to be normal. Variables with different mean, mode, and median were considered not normal and hence, log transformation was further done to assess

normality. Chi-square tests and independent t-tests were used to examine the bivariate associations between food insecurity (FI) and the sociodemographic characteristics and lifestyle factors of college students. Sociodemographic and lifestyle correlates of FI were explored using simple and multiple logistic regression analyses. The dependent variable in these models was FI status, which was recoded into two categories: 1- food secure versus 2- food insecure (combining mildly, moderately, and severely food insecure individuals). All sociodemographic and lifestyle variables that were found significantly associated with the dependent variables were adjusted for in the multiple logistic regression model. To further examine the associations between FI with mental health indicators, simple and multiple linear regression analyses were conducted. More specifically, simple linear regression models were used to examine the associations between FI (food secure vs. food insecure) with PHQ-9, GAD-7, and WHO-5 scores; three mental wellbeing scores were treated as dependent variables. All sociodemographic and lifestyle variables found significantly associated with the dependent variables were adjusted for in the multiple linear regression model. Results from the logistic regression models were expressed as odds ratio (OR) with 95% confidence intervals (CI). Results from the linear regression models were expressed as Beta coefficients ( $\beta$ ) with 95% confidence intervals (CI). All reported p-values were based on two-sided tests and were compared with a significance level of 5%.

## CHAPTER III

### RESULTS

#### **A. Food Insecurity Prevalence**

Overall, the prevalence of food insecurity (FI) among college students in Lebanon was 39%. Specifically, just over a quarter of (27.4%) of college students were mildly food insecure, 8.1% were moderately food insecure, and 3.5% were severely food insecure. Furthermore, 41.7% of study sample reported that the state of COVID-19 pandemic increased their state and vulnerability towards FI while 44% reported no change in FI status due to COVID-19.

#### **B. Demographic and Sociodemographic Characteristics of Study Participants**

A total of 745 students from different universities across Lebanon fully completed the launched online survey accounting for a 98% online completion rate. The average age of college students was 20.84 (SE=0.2) years, and the majority were Lebanese (90%) (Table 1). Moreover, the gender distribution varied between 64%, 30%, and 6% identifying as females, males, and non-binary, respectively. Majority of college students (85.4%, n =725) were from private universities and 14.6% were from public universities. Most of the college students (71.2%, n=715) were at an undergraduate level while just over a quarter (29%) were at a graduate (Master's level). More than half of study sample (64%, n=734) had non-health-related majors and 36% had health-related majors. Most of the recruited students (80%, n=712) resided with their families during the university term and greater than three-quarter of students were unemployed (n = 716). Results showed comparable educational level among parents



(mother, father) with 56% having university degree or higher. Similarly, the employment level of parents was comparable with 72% and 63% respectively being employed (i.e., self-employed full/part-time). In addition, almost 30% of the study sample (n = 681) had a monthly household income below 2,000,000 LBP (equivalent to \$250) and 68% were only getting paid in Lebanese currency. However, the average monthly allowance of the college students was 530,000 LBP (equivalent to \$66.25). Approximately 60% of college students in the study sample (n =650) had financial aid, loans, and/or scholarships. In terms of academic outcomes and performance, the average current and expected GPA of students were 3.5 and 3.72, respectively, with students studying for an average 23.35 hours per week. Most students (77%) had adequate sleep (more than 7 hours/day) with 54.8% had regular sleeping patterns. On the other hand, the average stress level of college was high 6.7. Additionally, college students attributed their stress to several factors including personal financial reasons (41%), security situation in the country (66%), fear of COVID-19 (72%), and other factors including social and health concerns (26%).

### **C. Socio-economic Correlates of FI**

Simple logistic regression analysis showed that FI was significantly associated with mother's education, mother's employment, household monthly income, foreign currency, financial aid/loan/scholarship (no payment required), average sleeping hours/day, and level of stress (Table 1). In the unadjusted model, college students who identified as non-binary had significantly lower odds of being food insecure in comparison to other genders (OR=0.43; 95% CI [0.21, 0.90]). In addition, college students enrolled in private universities were 1.7 times more likely to be food insecure

compared to college students attending public universities (OR=1.7; 95% CI [1.1, 2.5]). College students who had mothers with university degree or higher or those who had employed mothers were less likely to be food insecure (OR=0.49; 95% CI [ 0.31, 0.79] and OR= 0.59; 95% CI [0.43, 0.80]) respectively. Moreover, college students with higher monthly household income (2,000,000-5,000,000 LBP and greater than 5,000,000 LBP) were less likely to be food insecure than those with lowest income (OR=0.59, 95% CI [0.38, 0.90], OR= 0.20, 95% CI [0.12, 0.32], respectively). Also, college students not receiving any financial assistance had 38% lower probability of being food insecure (OR=0.62, 95% CI [0.45, 0.86]). Multiple logistic regression model showed that college students who had mothers with higher educational level or those with highest monthly household income (greater than 5,000,000 LBP) had significantly lower risk of FI compared to their counterparts (OR=0.48; 95% CI [0.27,0.86] and OR=0.26; 95% CI [0.15, 0.4], respectively) after adjusting for significant sociodemographic correlates of FI including age, gender, mothers' education. Also, in the adjusted model, stress level remained significantly associated with FI. Specifically, as the stress level among college students increases, the risk of FI increases by 25 % compared to food secure students (OR=1.2; 95% CI [1.1, 1.4], Table 1).

#### **D. Mental health and well-being of college students**

The results of the PHQ-9 among the study sample demonstrated that 8.2% of college students showed minimal symptoms of depression, while 69.2% presented with mild to moderately severe symptoms, and 22.6% showed severe symptoms of depression (Fig. 1). Furthermore, the results of GAD-7 showed that 16.1% of participants showed minimal symptoms of anxiety, while 49.4% presented with mild to

moderate symptoms of anxiety, and 34.4% of students showed severe symptoms of anxiety (Fig. 2). In terms of overall wellbeing and on scale of 0-100, the average score on the WHO-5 was 36.11. Bivariate analysis showed that several sociodemographic and lifestyle variables were found to be significantly associated with indicators of mental health and well-being including age ( $p < 0.001$ ), student major ( $p = 0.03$ ), mother employment ( $p = 0.04$ ), food security status ( $p < 0.001$ ), household monthly income ( $p = 0.002$ ), average sleeping hours per day ( $p < 0.001$ ), and level of stress ( $p < 0.001$ ) (Table S1).

Table 2 shows simple and multiple linear regression models examining the associations between FI and mental health indicators of college students. Using simple linear regression analysis, FI among college students was associated with higher scores on PHQ-9 and GAD-7 ( $\beta = 4.2$ ; 95% CI [3.2, 5.3],  $\beta = 3.6$ ; 95% CI [2.7, 4.5], respectively). However, FI was significantly associated with lower scores on WHO-5 in comparison to food secure students ( $\beta = -11.8$ ; 95% CI [-15.2, -8.4]). Such associations remained statistically significant even after adjusting for age and other socio-demographic variables ( $\beta = 2.45$ ; 95% CI [1.41, 3.49];  $\beta = 1.4$ ; 95% CI [0.53, 2.20],  $\beta = -4.84$ ; 95% CI [-8.17, -1.51], respectively). In the adjusted model, college students with household monthly income greater than 5,000,000 LBP had significantly higher well-being (WHO-5) compared to college students with lowest income ( $\beta = 3.821$ ; 95% CI [0.071, 7.572]) after adjusting for sociodemographic characteristics. Furthermore, one unit increase in stress level among college students was significantly associated with higher depression (PHQ-9) and anxiety (GAD-7) and lower well-being (WHO-5) ( $\beta = 1.330$ , 95% CI [1.123, 1.538],  $\beta = 1.506$ , 95% CI [1.331, 1.680] and  $\beta = 4.299$ ; 95% CI [-4.991, -3.606], respectively). Also, college students with adequate sleep ( $> 7$  h/d) had

significantly lower scores on PHQ-9 and higher scores on WHO-5 compared to those who had inadequate sleep ( $=\beta -2.369$ ; 95% CI [-3.508, -1.229] and  $\beta=5.529$ ; 95% CI [1.727, 9.332]), respectively.

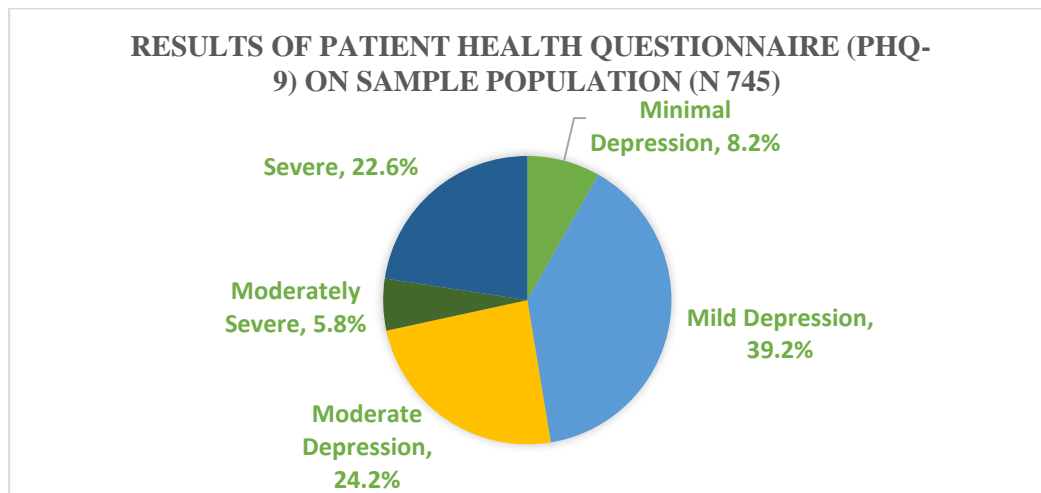


Figure 1 Levels of depression symptoms among college students in the study sample according to the Patient Health Questionnaire-9 (PHQ-9 scale).

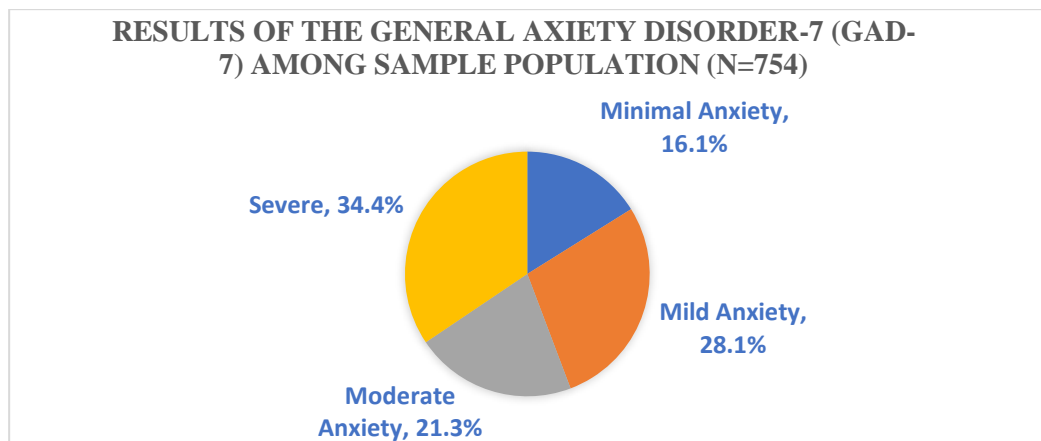


Figure 2 Levels of anxiety symptoms among college students in the study sample according to the General Anxiety Disorder-7 (GAD-7 scale).

| <b>Sociodemographic Characteristics</b> | <b>Total sample (n=745)</b> | <b>Food Secure (n=455; 61.0%)</b> | <b>Food Insecure (n=290;39.0%)</b> | <b>p-value</b> | <b>Unadjusted OR†(95% CI)</b> | <b>Adjusted OR‡ (95% CI)</b> |
|---|-----------------------------|-----------------------------------|------------------------------------|----------------|-------------------------------|------------------------------|
| <b>Gender</b>                           |                             |                                   |                                    | <b>0.041</b>   |                               |                              |
| Male                                    | 223 (30.0)                  | 124 (27.3)                        | 99 (34.1)                          |                | Ref                           | Ref                          |
| Female                                  | 479 (64.0)                  | 299 (65.7)                        | 180 (62.1)                         |                | 0.75 (0.55, 1.04)             | 0.821 (0.54 to 1.25)         |
| Non-binary*                             | 43 (6.0)                    | 32 (7)                            | 11 (3.8)                           |                | <b>0.43 (0.21, 0.90)</b>      | 0.340 (0.09 to 1.16)         |
| <b>Age (years)</b>                      | 20.84 ± 0.2                 | 20.9 ± 0.15                       | 20.74 ± 0.2                        | 0.501          | 0.98 (0.939, 1.031)           | -                            |
| <b>Nationality</b>                      |                             |                                   |                                    | 0.099          |                               |                              |
| Lebanese                                | 653 (90.1)                  | 401 (91.6)                        | 252 (87.8)                         |                | Ref                           |                              |
| Non-Lebanese                            | 72 (9.79)                   | 37 (8.4)                          | 35 (12.2)                          |                | 0.66 (0.408, 1.083)           | -                            |
| <b>University Type**</b>                |                             |                                   |                                    | <b>0.013</b>   |                               |                              |
| <b>Public</b>                           | 106 (14.6)                  | 53 (12)                           | 53 (18.7)                          |                | Ref                           | Ref                          |
| <b>Private</b>                          | 618 (85.4)                  | 388 (88)                          | 230 (81.3)                         |                | <b>1.70 (1.1, 2.5)</b>        | 0.80 (0.42, 1.51)            |
| <b>Class level</b>                      |                             |                                   |                                    | 0.550          |                               |                              |
| Undergraduate                           | 509 (71.2)                  | 304 (70.4)                        | 205 (72.5)                         |                | Ref                           |                              |
| Graduate                                | 206 (29.0)                  | 128 (29.6)                        | 78 (27.6)                          |                | 0.90(0.6, 1.2)                | -                            |
| <b>Major</b>                            |                             |                                   |                                    | 0.230          |                               |                              |
| Non-Health-related                      | 471 (64.0)                  | 262 (58.4)                        | 179 (62.8)                         |                | Ref                           |                              |
| Health-related                          | 263 (36.0)                  | 187 (41.6)                        | 106 (37.2)                         |                | 0.83 (0.61 2, 1.125)          | -                            |
| <b>Residence</b>                        |                             |                                   |                                    | 0.171          |                               |                              |
| Alone                                   | 52 (7.3)                    | 30 (6.9)                          | 22 (8)                             |                | Ref                           |                              |
| Family                                  | 588 (82.6)                  | 367 (84.6)                        | 221 (79.5)                         |                | 0.82(0.46,1.46)               | -                            |
| Roommates                               | 72 (10.1)                   | 37 (8.5)                          | 35 (12.6)                          |                | 1.29 (0.63, 2.65)             | -                            |
| <b>Father's Educational Level</b>       |                             |                                   |                                    | 0.092          |                               |                              |
| Intermediate or less                    | 128 (18.0)                  | 74 (17)                           | 54 (19)                            |                | Ref                           |                              |
| High School                             | 166 (22.5)                  | 92 (21)                           | 74 (26)                            |                | 1.10 (0.69,1.76)              | -                            |

|   |            |            |            |                  |                           |                         |
|---|------------|------------|------------|------------------|---------------------------|-------------------------|
| University Degree or Higher                       | 416 (56.3) | 268 (61)   | 148 (53)   |                  | 0.76 (0.50, 1.13)         | -                       |
| <i>p-trend</i>                                    |            |            |            | 0.075            | 0.08                      |                         |
| <b>Mother's Educational Level</b>                 |            |            |            | <b>&lt;0.001</b> |                           |                         |
| Intermediate or less High School                  | 89 (12.3)  | 45 (10.2)  | 44 (15.5)  |                  | Ref                       | Ref                     |
| University Degree or Higher                       | 227 (31.3) | 121 (27.4) | 106 (37.5) |                  | 0.90 (0.559, 1.5)         | 0.84 (0.45, 1.6)        |
| <i>p-trend</i>                                    | 408 (56.4) | 275 (62.4) | 133 (47)   | <b>&lt;0.001</b> | <b>0.49 (0.31, 0.79)</b>  | <b>0.48 (0.27,0.86)</b> |
| <b>Father's Employment status</b>                 |            |            |            | 0.053            | <b>0.01</b>               |                         |
| Not Employed                                      | 162 (23.0) | 89 (21.0)  | 73 (27)    |                  | Ref                       |                         |
| Employed/Self-employed                            | 538 (72.2) | 341 (79.0) | 197 (72.9) |                  | 0.70 (0.49, 1.01)         | -                       |
| <b>Mother's Employment status</b>                 |            |            |            | <b>0.001</b>     |                           |                         |
| Not Employed                                      | 268 (37.0) | 143 (32.0) | 125 (44.3) |                  | Ref                       | Ref                     |
| Employed/Self-employed                            | 461 (63.0) | 304 (68.0) | 157 (55.7) |                  | <b>0.59 (0.43, 0.80)</b>  | 0.96 (0.634, 1.444)     |
| <b>Household Monthly Income (LBP)<sup>¶</sup></b> |            |            |            | <b>&lt;0.001</b> |                           |                         |
| <2,000,000 (<250~ USD)                            | 192 (28.2) | 75 (18.1)  | 117 (44.3) |                  | Ref                       | Ref                     |
| 2,000,000-5,000,000 (250-625 USD)                 | 161 (23.6) | 84 (20.1)  | 77 (29.1)  |                  | <b>0.59 (0.38, 0.90)</b>  | 0.76(0.465,1.254)       |
| >5,000,000 (>625 USD)                             | 149 (22)   | 114 (27.3) | 35 (13.3)  |                  | <b>0.20 (0.12, 0.32)</b>  | <b>0.26 (0.15, 0.4)</b> |
| Refuse to answer                                  | 179 (26.3) | 144 (34.5) | 35 (13.3)  |                  | <b>0.16 (0.097,0.249)</b> | <b>0.19 (0.1, 0.35)</b> |
| <i>p-trend</i>                                    |            |            |            | <0.001           | <b>&lt;0.001</b>          | <b>&lt;0.001</b>        |
| <b>Earnings from income as Foreign Currency</b>   |            |            |            | <b>&lt;0.001</b> |                           |                         |

|   |               |                |                |              |                          |                   |
|---|---------------|----------------|----------------|--------------|--------------------------|-------------------|
| Yes   | 117 (15.7)    | 82 (18.1)      | 35 (12.1)      |              | Ref                      |                   |
| No  | 506 (68.1)    | 278 (61.4)     | 228 (78.6)     |              | <b>0.52 (0.34, 0.80)</b> | 0.71 (0.48,1.12)  |
| <b>Average Student Personal Income/month (LBP)</b>          | 530,00±47,630 | 570,000±72,144 | 464,000±46,721 | 0.278        | 1.000 (1.000, 1.000)     | -                 |
| <b>Student Current Job</b>                                  |               |                |                | <b>0.014</b> |                          |                   |
| Unemployed  | 551 (77.0)    | 344 (79.0)     | 207 (73.9)     |              | Ref                      |                   |
| Employed  | 165 (23.0)    | 92 (21.1)      | 73 (26.1)      |              | 1.32 (0.93,1.88)         | -                 |
| <b>Financial aid/loan/scholarship (No Payment required)</b> |               |                |                | <b>0.004</b> |                          |                   |
| Yes   | 379 (58.3)    | 212 (53.8)     | 167 (65.2)     |              | Ref                      | Ref               |
| No  | 271 (41.7)    | 182 (46.2)     | 89 (34.8)      |              | <b>0.62 (0.45, 0.86)</b> | 0.84 (0.54, 1.30) |
| <b>Financial aid/loan/scholarship (Payment required)</b>    |               |                |                | 0.456        |                          |                   |
| Yes   | 114 (18.7)    | 65 (17.8)      | 49 (20.2)      |              | Ref                      |                   |
| No  | 495 (81.3)    | 301 (82.2)     | 194 (79.8)     |              | 1.17 (0.77, 1.77)        | -                 |
| <b>Current GPA (out of 4)</b>                               | 3.5± 0.124    | 3.6 ± 0.2      | 3.3 ± 0.3      | 0.298        | 0.93 (0.782, 1.11)       | -                 |
| <b>Expected GPA (out of 4)</b>                              | 3.72 ± 0.173  | 3.6 ± 0.13     | 3.2 ± 0.4      | 0.248        | 1.02 (0.99, 1.05)        | -                 |
| <b>Lifestyle Factors</b>                                    |               |                |                |              |                          |                   |
| <b>Average Sleeping hours/day</b>                           |               |                |                | <b>0.042</b> |                          |                   |
| < 7 hours   | 163 (22.4)    | 88 (19.9)      | 75 (26.3)      |              | Ref                      | Ref               |
| ≥ 7 hours   | 565 (77.6)    | 355 (80.1)     | 210 (73.7)     |              | <b>0.69 (0.50,0.99)</b>  | 0.97 (0.61, 1.55) |

| <b>Description of Sleeping Habits</b> |               |            |             | <b>0.002</b>     |                          |                       |
|---------------------------------------|---------------|------------|-------------|------------------|--------------------------|-----------------------|
| Irregular                             | 326 (45.2)    | 219 (49.8) | 107 (37.9)  |                  | <i>Ref</i>               |                       |
| Regular                               | 396 (54.8)    | 221 (50.2) | 175 (62.1)  |                  | 1.62 (1.20, 2.2)         | -                     |
| <b>Average Studying hours/week</b>    | 23.35 ± 0.731 | 24.3 ± 0.9 | 22± 1.24    | 0.085            | 0.99 (0.986,1.00)        | -                     |
| <b>Average Level of Stress (1-10)</b> | 6.7 ± 0.08    | 6.2 ± 0.1  | 7.44 ± 0.13 | <b>&lt;0.001</b> | <b>1.28 (1.19, 1.38)</b> | <b>1.2 (1.1 ,1.4)</b> |

1 Categorical variables were presented as n (%) and continuous variables were presented as means and standard errors (SE).

2 Chi-square tests were conducted to determine differences between categorical variables and binary food security status.

3 Independent t-tests were used to determine differences between continuous variables and binary food security status.

\*Non-Binary Individuals cannot identify within the margins of gender i.e., females or males.

\*\*Lebanese University is the only public university in the country. Private Universities included American University of Beirut, Lebanese American University, Beirut Arab University, University of Balamand, Lebanese International University, Modern University of Business and Science.

† Odds Ratio (ORs) of the dependent variable (food-insecure vs. food-secure) are presented with 95% Confidence Intervals (CI) ( using simple logistic regression. The food-insecure category included mildly, moderately, and severely food-insecure participants.

‡ Adjusted ORs are presented with 95% CIs using multiple logistic regression analysis. The models were adjusted for age and sociodemographic characteristics found to be significant correlates of FI (gender, university type, mother's educational level, mother's employment, household monthly income, foreign currency, financial aid (no payment required, average sleeping hours and level of stress).

¶ 1USD= 8,000 LBP. This exchange rate at the time of the study.

Table 1 Simple and multiple logistic regression models examining the association between food insecurity (FI) and the socio-demographic characteristics and lifestyle factors of college students in Lebanon in the study sample (n 745), 2021



|   | Patient Health Questionnaire-9 (PHQ-9) |                             | General Anxiety Disorder-7 (GAD-7) |                             | World Health Organization Index-5 (WHO-5) |                          |
|---|--|-----------------------------|------------------------------------|-----------------------------|---|--------------------------|
|   | $\beta$ (95% CI)                       | a $\beta$ (95% CI)          | $\beta$ (95% CI)                   | a $\beta$ (95% CI)          | $\beta$ (95% CI)                          | a $\beta$ (95% CI)       |
| Food Insecurity   | <b>4.2 (3.2, 5.3)</b>                  | <b>2.45 (1.41, 3.49)</b>    | <b>3.6 (2.7, 4.5)</b>              | <b>1.4 (1.1, 2.2)</b>       | <b>-11.8 (-15.2, -8.4)</b>                | <b>-4.8 (-8.2, -1.5)</b> |
| Socioeconomic & lifestyle Correlates  |  |                             |                                    |                             |   |                          |
| Age   | <b>-0.2 (-0.40, -0.62)</b>             | <b>-0.15 (-0.27, -0.06)</b> | <b>-0.24 (-0.38, -0.95)</b>        | <b>-0.20 (-0.32, -0.09)</b> | 0.53 (-0.003, 1.1)                        | -                        |
| Gender: Male (Ref)  |  |                             |                                    |                             |   |                          |
| Female  | -0.84 (-2.01, 0.33)                    | -                           | -0.28 (-1.26, 0.71)                | -                           | -1.19 (-4.78, 2.40)                       | -                        |
| Non-Binary  | -0.15 (-2.66, 2.36)                    | -                           | 1.34 (-0.67, 3.36)                 | -                           | 1.15(-6.30, 8.59)                         | -                        |
| University: Public (Ref)  |  |                             |                                    |                             |   |                          |
| Private   | -1.10 (-2.58, 0.37)                    | -                           | 0.04 (-1.307, 1.39)                | -                           | 3.96 (-0.99, 8.91)                        | -                        |
| Mother's Education level Intermediate or less (Ref)   |  |                             |                                    |                             |   |                          |
| High school   | 1.3 (-0.50, 3.1)                       | -                           | 0.36 (-0.65,1.4)                   | -                           | -0.22 (-3.9, 3.5)                         | -                        |
| University degree or higher   | 0.43 (-1.3, 2.1)                       | -                           | 0.11 (-0.85, 1.1)                  | -                           | -0.12 (-3.6, 3.4)                         | -                        |
| Mother's employment status Unemployed (Ref)   |  |                             |                                    |                             |   |                          |
| Employed/Self-employed  | <b>-1.1 (-2.2, -0.01)</b>              | -0.20 (-1.2,0.814)          | -0.76 (-1.7, 0.22)                 | -                           | 2.4 (-1.2, 5.9)                           | -                        |
| Household Monthly Income (LBP) † <2,000,000 (<250~ USD) (Ref)   |  |                             |                                    |                             |   |                          |
| 2,000,000-5,000,000 (250-625 USD)   | <b>-1.6 (-3.1, -0.11)</b>              | -1.27 (-2.5, 0.14)          | 1.1 (-0.01, 2.3)                   | -                           | -2.6 (-6.8, 1.5)                          | -                        |
| >5,000,000 (>625 USD)   | <b>-2.5 (-4.0, -0.95)</b>              | -1.4 (-2.8, 0.03)           | -0.87 (-2.0, 0.30)                 | -                           | <b>5.7 (1.5, 10.0)</b>                    | <b>3.82 (0.07, 7.6)</b>  |
| Refuse to answer  | <b>-2.0 (-3.5, -0.44)</b>              | -0.36 (-1.73, 1.01)         | <b>-1.7(-2.8, -0.57)</b>           | <b>-0.99 (-1.9, -0.06)</b>  | 2.4 (-1.7, 6.6)                           | -                        |
| Level of stress   | <b>1.5 (1.3, 1.7)</b>                  | <b>1.4 (1.23 1.6)</b>       | <b>1.6 (1.5, 1.8)</b>              | <b>1.5 (1.3, 1.7)</b>       | <b>-4.9 (-5.6, -4.3)</b>                  | <b>-4.3 (-5.0, -3.6)</b> |
| Average sleeping (>=7hours/day)   | <b>-**</b>                             | -                           | <b>-2.8 (-3.9, -1.7)</b>           | -0.86 (-1.8, 0.09)          | <b>10.8 (6.8, 14.9)</b>                   | <b>5.5 (1.7, 9.3)</b>    |
| * $\beta$ of the dependent variables (PHQ-9, GAD-7, WHO-5) are presented with 95 % CI using simple linear regression. Adjusted $\beta$ (a $\beta$ ) are presented with 95 % CI using multiple linear regression analysis. The models were adjusted for sociodemographic characteristics and lifestyle factors found to be significant with these indices (food insecurity, age, gender, mother's education, mother's employment, household monthly income, and level of stress.). |  |                             |                                    |                             |   |                          |

The PHQ-9 is a 9-item self-report depression scale that is used to screen and measure the severity of depression. The scoring of the PHQ-9 is obtained by the sum of the scores of the 9 items ranging from 0-37, 0-4, 5-9, 10-15, 15-19, and 20 or greater representing minimal, mild, moderate, moderately severe, and severe depression. The GAD-7 is a 7-item self-report anxiety scale that is used to screen and measure the severity of generalized anxiety disorders. The GAD-7 score is calculated by assigning scores of 0, 1, 2, and 3, to the response categories of “not at all,” “several days,” “more than half the days,” and “nearly every day,” respectively, and then adding together the scores for the seven questions. GAD-7 total score for the seven items ranges from 0 to 21. The WHO-5 well-being index measures current well-being. The raw score is calculated by totaling the figures of the five answers. The raw score ranges from 0 to 25, 0 representing worst possible and 25 representing the best possible quality of life. To obtain a percentage score ranging from 0 to 100, the raw score is multiplied by 4.

<sup>†</sup> 1USD= 8,000 LBP. This exchange rate at the time of the study.

\*\*Average sleeping hours was removed from the PHQ-9 linear regression model as the PHQ-9 test consists of a question related to sleep

Table 2 Simple and multiple linear regression models examining the associations between food insecurity (FI) and mental health indicators of college students in Lebanon aged 18–25 years (*n* 745), 2021\*

| Variable                                     | All Students<br>(N=745) | Patient Health<br>Questionnaire-9<br>(PHQ-9) (Mean,<br>SE) | P-<br>Value  | General<br>Anxiety<br>Disorder-<br>7(GAD-7)<br>(Mean, SE) | P-value      | World Health<br>Organization Index-<br>5 (WHO-5)<br>(Mean, SE) | P-Value      |
|--|-------------------------|--|--------------|---|--------------|--|--------------|
| Gender                                       |                         |  | 0.191        |   | 0.342        |  | 0.521        |
| Female                                       | 479 (64.0)              | 11.60 ( $\pm$ 0.31)  |              | 11.10 ( $\pm$ 0.28)                                       |              | 35.70 ( $\pm$ 1.04)  |              |
| Male   | 223 (30.0)              | 12.50 ( $\pm$ 0.54)  |              | 11.15 ( $\pm$ 0.47)                                       |              | 36.82 ( $\pm$ 1.71)  |              |
| Non-Binary                                   | 43 (6.0)                | 12.35 ( $\pm$ 1.25)  |              | 12.45 ( $\pm$ 1.00)                                       |              | 37.00 ( $\pm$ 4.00)  |              |
| Age (Mean, SE)                               | 20.84 $\pm$ 0.2         |  | <b>0.008</b> |   | <b>0.001</b> |  | 0.051        |
| Nationality                                  |                         |  | 0.454        |   | 0.381        |  | 0.745        |
| Lebanese                                     | 653 (90.1)              | 12.03 ( $\pm$ 0.28)  |              | 11.29 ( $\pm$ 0.25)                                       |              | 35.9 ( $\pm$ 0.92)   |              |
| Non-Lebanese                                 | 72 (9.79)               | 11.35 ( $\pm$ 0.87)  |              | 10.60 ( $\pm$ 0.75)                                       |              | 36.84 ( $\pm$ 2.91)  |              |
| University Type,<br>n(%)                     |                         |  | 0.142        |   | 0.952        |  | 0.116        |
| Public                                       | 106 (14.6)              | 12.86 ( $\pm$ 0.75)  |              | 11.16 ( $\pm$ 0.62)                                       |              | 32.76 ( $\pm$ 2.39)  |              |
| Private                                      | 618 (85.4)              | 11.76 ( $\pm$ 0.29)  |              | 11.20 ( $\pm$ 0.26)                                       |              | 36.73 ( $\pm$ 0.95)  |              |
| Class Level, n(%)                            |                         |  | 0.255        |   | 0.345        |  | 0.321        |
| Undergraduate                                | 509 (71.2)              | 12.13 ( $\pm$ 0.33)  |              | 11.36 ( $\pm$ 0.29)                                       |              | 35.57 ( $\pm$ 1.08)  |              |
| Graduate                                     | 206 (29)                | 11.44 ( $\pm$ 0.48)  |              | 10.85 ( $\pm$ 0.44)                                       |              | 37.50 ( $\pm$ 1.56)  |              |
| Major, n(%)                                  |                         |  | <b>0.029</b> |   | 0.101        |  | <b>0.038</b> |
| Health Related                               | 263 (36)                | 11.26 ( $\pm$ 0.40)  |              | 10.73 ( $\pm$ 0.38)                                       |              | 38.32 ( $\pm$ 1.41)  |              |
| Non-Health Related                           | 471 (64)                | 12.46 ( $\pm$ 0.36)  |              | 11.53 ( $\pm$ 0.30)                                       |              | 34.59 ( $\pm$ 1.11)  |              |
| Residence during<br>University Term,<br>n(%) |                         |  | 0.530        |   | 0.102        |  | 0.825        |
| Family                                       | 588 (82.6)              | 12.00 ( $\pm$ 0.30)  |              | 11.27 ( $\pm$ 0.26)                                       |              | 36.19 ( $\pm$ 0.99)  |              |
| Roommates                                    | 72 (10.1)               | 12.15 ( $\pm$ 0.83)  |              | 11.62 ( $\pm$ 0.73)                                       |              | 32.40 ( $\pm$ 2.40)  |              |
| Alone  | 52 (7.3)                | 11.16 ( $\pm$ 0.96)  |              | 9.33 ( $\pm$ 0.86)  |              | 39.29 ( $\pm$ 3.17)  |              |

|   |            |                       |              |                      |              |                      |              |
|---|------------|-----------------------|--------------|----------------------|--------------|----------------------|--------------|
| Father Educational Level, n(%)          |            |                       | 0.80         |                      | 0.90         |                      | 0.57         |
| Intermediate or Less                    | 128 (18)   | 11.34 ( $\pm 0.60$ )  |              | 11.00 ( $\pm 0.52$ ) |              | 35.96 ( $\pm 2.12$ ) |              |
| High School                             | 166 (22.5) | 12.59 ( $\pm 0.56$ )  |              | 11.50 ( $\pm 0.48$ ) |              | 34.87 ( $\pm 1.92$ ) |              |
| University Degree or Higher             | 416 (56.3) | 11.86 ( $\pm 0.36$ )  |              | 11.07 ( $\pm 0.32$ ) |              | 36.77 ( $\pm 1.14$ ) |              |
| Mother Educational Level, n(%)          |            |                       | 0.776        |                      | 0.441        |                      | 0.861        |
| Intermediate or Less                    | 89 (12.3)  | 11.29 ( $\pm 0.75$ )  |              | 10.33 ( $\pm 0.62$ ) |              | 36.57 ( $\pm 2.53$ ) |              |
| High School                             | 227 (31.3) | 12.61 ( $\pm 0.48$ )  |              | 11.41 ( $\pm 0.42$ ) |              | 35.78 ( $\pm 1.61$ ) |              |
| University Degree or Higher             | 408 (56.4) | 11.72 ( $\pm 0.36$ )  |              | 11.21 ( $\pm 0.33$ ) |              | 35.87 ( $\pm 1.15$ ) |              |
| Father Employment Status, n(%)          |            |                       | 0.106        |                      | 0.495        |                      | 0.074        |
| Not Employed                            | 162 (23)   | 12.74 ( $\pm 0.58$ )  |              | 11.48 ( $\pm 0.52$ ) |              | 33.06 ( $\pm 1.81$ ) |              |
| Employed/Self Employed (Full/Part time) | 538 (72.2) | 11.68 ( $\pm 0.311$ ) |              | 11.08 ( $\pm 0.27$ ) |              | 36.85 ( $\pm 1.02$ ) |              |
| Mother Employment Status, n(%)          |            |                       | <b>0.047</b> |                      | 0.130        |                      | 0.193        |
| Not Employed                            | 268 (37)   | 12.72 ( $\pm 0.46$ )  |              | 11.70 ( $\pm 0.40$ ) |              | 34.38 ( $\pm 1.44$ ) |              |
| Employed/Self Employed (Full/Part time) | 461 (63)   | 11.61 ( $\pm 0.33$ )  |              | 10.94 ( $\pm 0.30$ ) |              | 36.75 ( $\pm 1.10$ ) |              |
| Household Monthly Income (LBP), n(%)    |            |                       | <b>0.002</b> |                      | <b>0.001</b> |                      | <b>0.005</b> |
| <2,000,000                              | 192 (28.2) | 13.22 ( $\pm 0.58$ )  |              | 12.05 ( $\pm 0.46$ ) |              | 33.05 ( $\pm 1.78$ ) |              |
| 2,000,000-5,000,000                     | 161 (23.6) | 11.60 ( $\pm 0.52$ )  |              | 11.97 ( $\pm 0.50$ ) |              | 34.49 ( $\pm 1.66$ ) |              |

|   |                      |                      |                  |                      |                  |                      |                  |
|---|----------------------|----------------------|------------------|----------------------|------------------|----------------------|------------------|
| >5,000,000  | 149 (22)             | 10.72 ( $\pm 0.57$ ) |                  | 10.43 ( $\pm 0.54$ ) |                  | 40.92 ( $\pm 2.00$ ) |                  |
| Refuse to answer                                      | 179 (26.3)           | 11.25 ( $\pm 0.53$ ) |                  | 9.86 ( $\pm 0.47$ )  |                  | 38.31 ( $\pm 1.77$ ) |                  |
| Average Student Personal Income/month (LBP), Mean, SE | 530,000 $\pm 47630$  |                      | 0.393            |                      | 0.145            |                      | 0.116            |
| Student Food Security Status                          |                      |                      | <b>&lt;0.001</b> |                      | <b>&lt;0.001</b> |                      | <b>&lt;0.001</b> |
| Food Secure   | 455 (61.0)           | 10.23 ( $\pm 0.31$ ) |                  | 9.74 ( $\pm 0.30$ )  |                  | 40.82 ( $\pm 1.11$ ) |                  |
| Food Insecure   | 290 (39.0)           | 14.47 ( $\pm 0.44$ ) |                  | 13.36 ( $\pm 0.36$ ) |                  | 29.02 ( $\pm 1.29$ ) |                  |
| Average Level of Stress (scale 1 to 10)               | 6.7 ( $\pm 0.08$ )   |                      | <b>&lt;0.001</b> |                      | <b>&lt;0.001</b> |                      | <b>&lt;0.001</b> |
| Current GPA (out of 4) Mean, SE                       | 3.5( $\pm 0.124$ )   |                      | 0.361            |                      | 0.860            |                      | 0.635            |
| Expected GPA (out of 4) Mean, SE                      | 3.72 ( $\pm 0.173$ ) |                      | 0.790            |                      | 0.593            |                      | 0.169            |
| Average Sleeping hours/day, n(%)                      |                      |                      | <b>&lt;0.001</b> |                      | <b>&lt;0.001</b> |                      | <b>&lt;0.001</b> |
| < 7 hours   | 163 (22.4)           | 15.25 ( $\pm 0.63$ ) |                  | 13.39 ( $\pm 0.51$ ) |                  | 27.56 ( $\pm 1.77$ ) |                  |

|   |            |                      |       |                      |       |                      |       |
|---|------------|----------------------|-------|----------------------|-------|----------------------|-------|
| >= 7 hours  | 565 (77.6) | 11.00 ( $\pm 0.28$ ) |       | 10.55 ( $\pm 0.26$ ) |       | 38.39 ( $\pm 0.98$ ) |       |
| Student Current Job,<br>n (%)                                 |            |                      | 0.115 |                      | 0.535 |                      | 0.231 |
| Unemployed  | 551 (77)   | 12.18 ( $\pm 0.31$ ) |       | 11.31 ( $\pm 0.28$ ) |       | 35.40 ( $\pm 1.01$ ) |       |
| Employed  | 165 (23)   | 11.17 ( $\pm 0.52$ ) |       | 10.96 ( $\pm 0.50$ ) |       | 37.92 ( $\pm 1.78$ ) |       |
| Financial<br>aid/loan/scholarship<br>(No Payment<br>required) |            |                      | 0.145 |                      | 0.203 |                      | 0.052 |
| Yes   | 379 (58.3) | 12.30 ( $\pm 0.37$ ) |       | 11.77 ( $\pm 0.33$ ) |       | 34.73 ( $\pm 1.18$ ) |       |
| No  | 271 (41.7) | 10.92 ( $\pm 0.40$ ) |       | 10.18 ( $\pm 0.38$ ) |       | 38.32 ( $\pm 1.41$ ) |       |
| Financial<br>aid/loan/scholarship<br>(Payment required)       |            |                      | 0.372 |                      | 0.981 |                      | 0.715 |
| Yes   | 114 (18.7) | 11.42 ( $\pm 0.66$ ) |       | 11.16 ( $\pm 0.61$ ) |       | 36.11 ( $\pm 2.90$ ) |       |
| No  | 495 (81.3) | 12.09 ( $\pm 0.32$ ) |       | 11.14 ( $\pm 0.29$ ) |       | 35.22 ( $\pm 1.02$ ) |       |

The PHQ-9 is a 9-item self-report depression scale that is used to screen and measure the severity of depression. The scoring of the PHQ-9 is obtained by the sum of the scores of the 9 items ranging from 0-37, 0-4, 5-9, 10-15, 15-19, and 20 or greater representing minimal, mild, moderate, moderately severe, and severe depression.

The GAD-7 is a 7-item self-report anxiety scale that is used to screen and measure the severity of generalized anxiety disorders. The GAD-7 score is calculated by assigning scores of 0, 1, 2, and 3, to the response categories of “not at all,” “several days,” “more than half the days,” and “nearly every day,” respectively, and then adding together the scores for the seven questions. GAD-7 total score for the seven items ranges from 0 to 21. The WHO-5 well-being index measures current well-being. The raw score is calculated by totaling the figures of the five answers. The raw score ranges from 0 to 25, 0 representing worst possible and 25 representing the best possible quality of life. To obtain a percentage score ranging from 0 to 100, the raw score is multiplied by 4.

Table S1 Supplementary Table examining the association between sociodemographic factors, lifestyle factors and the indicators of mental health (PHQ-9, GAD-7, WHO-5).

## CHAPTER IV

### DISCUSSION

The present study is the first to our knowledge to examine the prevalence of FI on a large sample of college students in Lebanon and to explore potential associations with mental and psychosocial health and well-being amid the country's multiple crises.

Findings from the present study showed that 39% of college students were experiencing FI of which 12% were moderately to severely food insecure. The prevalence of FI among college students in the study sample was found to be significantly higher than rates reported in 2020 among young adults in Lebanon during the COVID-19 pandemic and economic crisis (Fares et al., 2020). The difference between our present study and the previous survey conducted amongst the Lebanese university students in one of the branches of the public university in the country may be attributed to the latter's limited sample size amongst other methodological discrepancies (Fares et al., 2020). Yet, our results were in line with the reported averages among college students presented from other studies conducted in LMICs and HICs, including Iran (44%), US. (35-42%), and Canada (30%) respectively (Zolfaghri et al. 2021, Bruening et al., 2017, Bhawra et al., 2021 respectively).

Worth noting that our study findings were also in line with previous studies published on the prevalence of FI amongst Lebanese households with children (42%) in 2019 pre-the Covid-19 and economic crisis (Jomaa et al., 2019). Similarly, using the GWP data from 2015-2017, authors showed that the projections of FI post- the Covid-19 pandemic



and economic crisis range between 36 and 39% considering 50 to 70% income reduction scenarios (Kharroubi et al., 2021).

According to other recent reports published in the country, the ongoing economic crisis and the COVID-19 pandemic have left more than 49% of the Lebanese population to experience limited access to food with 31% being unable to eat nutritious food in 2020 (ESCWA, 2020). Poverty rates have also reached alarming levels in 2020 with 55% and 23% of the population experiencing poverty and extreme poverty, respectively (ESCWA, 2020). During the past two years, the Lebanese currency has depreciated in its value resulting in a brutal inflation of prices with a 441% and 137% increase in the pricing of food and non-alcoholic beverages and the Lebanese Consumer Price Index (CPI), respectively (Lebanon, Food Security Portal, 2020). Such turmoil could have contributed to the exacerbated FI levels among all population groups including college students who are appearing to be severely impacted by all ongoing circumstances in the country.

Our results showed FI was associated with lower maternal education and unemployment, low household monthly income, and increased reported stress levels. Previous studies on college students in Lebanon (Fares et al., 2020) and Iran (Zolfaghri et al., 2021) have only reported low household monthly income as an economic correlate of FI among college students. Yet, our results were in accordance with findings from HICs such as the US, Canada, and France that demonstrated that low parental education, low household income, and stress can be strong socio-economic correlates of FI among college students (El Zein et al., 2019, Bhawra et al., 2021, Frank, 2018, Bocquier et al., 2015). Also, in contrary to other studies published on college students in other settings including Malaysia (Ahmad et al., 2021), the US (El Zein et

al., 2019, Riddle et al., 2020), and Canada (Frank, 2018), female sex or people identifying as non-binary (individuals who do not identify as males or females) were not found to be significant, correlates of FI among college students in our study sample. The lack of association between female sex, non-binary gender identity, and higher FI may be explained by the overall economic and political challenges that is affecting various demographic and population groups. Nevertheless, this is an area that requires much further exploration given the gender disparities in FI recently reported in Lebanon and other countries in the Arab world (Jomaa et al., 2021). Researchers have highlighted the need for more studies to examine the experiences and perceptions of people with different gender identities on their FI and other health outcomes (Jomaa et al 2021).

In parallel, with respect to depression and anxiety screening, 69.2% and 23% of study participants showed mild to moderately severe and severe symptoms of depression respectively. Furthermore, 49.4% and 34.4% showing mild to moderate and severe symptoms of anxiety, respectively. College students with higher perceived stress in our study sample were also approximately twice more likely to be screened for depression, anxiety, and diminished well-being than those with lower perceived stress levels. The alarming depression and anxiety rates based on the PHQ-9 and GAD-7 scale were significantly higher than previous results reported among university students in Lebanon. Previous studies using identical indicators demonstrated that 56% and 5.4% of college students in Lebanon showed mild to moderately severe and severe symptoms of depression (Kronfol et al., 2018). In addition, 36% and 34% of college students showed combined symptoms of depression and anxiety, respectively (Naal et al., 2020). Such increase in s trends is attributed to the ongoing collective crises and the COVID-

19 pandemic in the country. With the COVID-19 pandemic and the deterioration of Lebanese economy, young adults are appearing to be negatively impacted by the ongoing crises (Salameh et al. 2020, Chalhoub et al., 2021). Alarming, the depression and anxiety levels reported in the present study were remarkably higher than those reported among college students in high-income countries (HICs) such as US (12.8% and 15.9%) (Kronfol et al., 2018), Canada (19% and 32.6%) (Meckmalil et al., 2019). Nonetheless, our findings validated the relationship between increased perceived stress and poor mental health among young adults, as previously reported in the scientific literature (Pascoe et al., 2020, Varma et al., 2021).

Upon exploring the associations between food insecurity and mental health parameters, regression models showed that food insecure college students were more likely to have higher anxiety and depression scores on the GAD-7 and PHQ-9 scales respectively, compared to food secure ones. Such association remained statistically significant even after adjusting for further correlates of FI. In addition, food insecure students had lower overall wellbeing scores compared to their food secure counterparts. Our study findings were in accordance with other studies highlighting the associations between food insecurity and adverse mental and psychosocial health outcomes related to increase anxiety, depression, and stress (El Zein et al., 2019, Bruening et al., 2017, Beccera et al., 2020, Hattangandi et al., 2021, Zolfaghri et al., 2021, Pourmotabbed et al., 2020, Meza et al., 2019). Our results showed that food insecurity is associated with an increase in self-reported depression and anxiety scores and a decrease in wellbeing scores. FI among college students in our study sample was associated with an increase in self-reported depression score by 2.5 units which was in line with the findings of Reeder et al., 2020 (2.4 units) among college students in southeastern US. Furthermore,

FI was associated with 1.4 unit increase on the GAD-7 scale which was in line with the results reported among college students in Iran (1.53 units). The association between FI and mental health can be bidirectional and may be explained by various pathways. FI may interfere with the psycho-social health and well-being of college students through inducing a series of uncertainty towards the ability to access food that is safe and nutritious as demonstrated in the systematic review of Pourmotabbed et al., (2020). Hence, food insecure students may show signs and symptoms of psychological distress that include anxiety and depression (Pourmotabbed et al., 2020). Furthermore, food insecure students might feel that they are less worthy of adequate living in contrast to their more food secure counterparts (Meza et al., 2019). Therefore, such a state might impact their mental health and overall wellbeing. On the other hand, a deterioration in mental health can lead to an overall decrease in one's productivity, which in turn translates to an increased vulnerability towards FI (Meza et al., 2019). Regardless of the mechanisms that may explain such associations, the high prevalence of FI and the decline in mental health represent serious threats to the overall health and well-being of college students in the short and long-term. The impact of poor mental health and FI among college students induces not only short-term effects such as fatigue, lack of productivity, decreased motivation, and poorer academic achievement, but can also have long-term effects. Such adverse effects may lead to an increased risk of mental health disorders along with and increased risk of chronic diseases on the long-run (Pourmotabbed et al., 2020, Hattangandi et al., 2021, Jones et al., 2017).

## CHAPTER V

### CONCLUSION AND RECOMMENDATIONS

This study sheds the light on the alarming FI, anxiety and depression rates reported among college students in Lebanon. It is the first in Lebanon to determine the prevalence of FI among various universities in Lebanon and explore the association between FI and the indicators of mental and psychosocial health and well-being among university students aged 18-24 years in one of the toughest and critical phases in Lebanon.

Our study explored a less examined association between food insecurity and mental health, further highlighting the need to examine the mental and psychosocial outcomes related to poverty and food insecurity among various population groups including young adults. The repercussions of food insecurity and deteriorated mental health manifest not only through short-term outcomes but also long-term consequences.

The multiple crises in the country are heightening the severity of challenges experienced by college students on campuses. College students are appearing to be highly impacted with all ongoing crises; their food security and mental health status are being threatened with the overall situation in Lebanon. Our study echoes the need for higher educational institutions to consider initiatives and interventions that can help address and mitigate the growing problem of food insecurity on campuses. Universities may consider establishing food banks on campuses or subsidizing meals in cafeterias to help alleviate food insecurity while also ensuring that there would be no stigmatization for those benefiting from such services (El Zein et al., 2019). Such interventions also need to extend beyond university campuses to engage with key stakeholders across the

country including the Ministry of Education and Higher Education and the Ministry of Health among other governmental and non-governmental entities. Nonetheless, In Lebanon, with the extensive presence of the international humanitarian community and active nongovernmental agencies and community-based organizations, it is key to engage with multiple stakeholders to address the overlapping needs of various population groups, while also addressing those most in need.

This study represents a foundational block in food security research in Lebanon and thus, echoes the need for further research among this population group. With the ongoing collective crises in the country, college students are suffering from increase tuition prices and ongoing fluctuations in the currency. Such challenges may further exacerbate and heighten their existing stress. We hypothesize that students will further be indebted to afford funding their education amid a collapsed economy. Hence, the choice of having an education comes with a high cost. Such problems will persist and worsen if no reform is established to protect the future of university students in Lebanon. Future studies need to further explore the experiences, perceptions, and coping strategies of college students combating FI on campuses in the country. In addition, qualitative and mixed methods studies may need to be conducted to further explore the acceptance of college students to different initiatives and programs that may be implemented at college campuses to help alleviate food insecurity and mental and psychosocial challenges. It is particularly important to represent and resonate the voices of college students and understand not only their challenges but also their coping methods. Such understanding may help guide and strengthen university and public health interventions aimed to mitigate FI and its repercussions on various health outcomes including the mental and psychosocial health and wellbeing of young

adults. Moreover, it is important to conduct prospective studies to further explore the causal associations between food insecurity and mental health parameters and elucidate the mechanisms involved in this relationship to better guide future programming at university and national levels.

## APPENDIX I

### ONLINE CONSENT FORM ARABIC

#### وثيقة الموافقة على المشاركة في دراسة بحثية عبر الإنترنت

هذا الإشعار خاص بدراسة بحثية معتمدة من الجامعة الأميركية في بيروت ولجنة الأخلاقيات للعلوم الإجتماعية والسلوكية للدكتورة لميس جمعة في الجامعة الأميركية في بيروت.  
\*ليست رسالة رسمية من الجامعة الأميركية في بيروت\*

أنت مدعوة للمشاركة في دراسة بحثية بعنوان **انعدام الأمن الغذائي وروابطه بين طلاب الجامعات في لبنان: دراسة بحثية عينية** التي تقوم بإجرائها الدكتورة لميس جمعة من كلية الزراعة وعلوم الغذاء في الجامعة الأميركية في بيروت. إن إجراء هذه الدراسة سيلتزم بالبروتوكول المعتمد من لجنة الأخلاقيات للعلوم الإجتماعية والسلوكية.

الطريقة المعتمدة لمقاربة الموضوعات هي من خلال الرابط الذي تم إنشاؤه بواسطة لايم سرفي والذي سيتم مشاركته على وسائل التواصل الاجتماعي المختلفة.

الهدف الرئيسي من الدراسة الحالية هو فحص مدى انتشار انعدام الأمن الغذائي والعوامل المؤثرة بين طلاب الجامعات في لبنان. على وجه الخصوص ، أهداف الدراسة هي: (1) تحديد مدى الانتشار العام للأمن الغذائي بين طلاب الجامعات؛ (2) تحديد الخصائص الاجتماعية والاقتصادية والديموغرافية وعوامل أخرى عند الطلاب وعلاقتها بالأمن الغذائي بين طلاب الجامعات ؛ (3) تقييم العلاقة بين الأمن الغذائي ومؤشرات الصحة النفسية والاجتماعية ؛ (4) استكشاف العلاقة بين انعدام الأمن الغذائي ، والمعرفة الغذائية ، وعادات الأكل لدى طلاب .

#### الإجراءات

تدعوك هذه الرسالة إلى:

1. اقرأ وثيقة الموافقة وفكر فيما إذا كنت تريد المشاركة في الدراسة.

وللملاحظة:

- المشاركة طوعية تماما.
- سيستغرق استكمال الاستبيان حوالي 15-20 دقيقة.
- سيتم جمع وتحليل البيانات التي قدمتها في الاستبيان فقط.
- لن يتمكن فريق البحث من الوصول إلى اسمك أو تفاصيل الاتصال بك.
- سننشر نتائج الاستطلاع في مقالات بحثية / أطروحة / تقرير مشروع متاحًا مطبوعة من مكتبات الجامعة الأميركية في بيروت وإلكترونيًا.
- ستكون معايير المشاركة:
- طلاب جامعيين بين 18 و 25 عامًا يعيشون في لبنان و هم مسجلين في إحدى الجامعات في لبنان للعام الدراسي 2020-2021 .
- طلاب من جميع التخصصات (الزراعة ، التغذية ، التمريض ، الأعمال ، الطب ، الصحة العامة ، الأعمال التجارية ، أدب الهندسة ، الفنون ، العلوم ، إلخ ..) ومستويات الفصل (البكالوريوس ، الدراسات العليا).

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21 JAN 2021

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الفوائد المحتملة للمشاركين / أو للمجتمع:



لن تتلقى مدفوعات مقابل المشاركة في هذه الدراسة. لا توجد فوائد مباشرة للدراسة للطلاب على وجه الخصوص ، ولكن نتائج هذه الدراسة ستزودنا بفهم أفضل لانتشار وشدة انعدام الأمن الغذائي بين طلاب الجامعات في لبنان والعوامل المرتبطة بهذه الظاهرة.

يمكن أن تساهم نتائج التي تسفر عنها هذه الدراسة في تحسين السياسات القائمة في الحرم الجامعي لتحسين الأمن الغذائي، مثل برامج المساعدات الغذائية والمالية داخل وخارج الحرم الجامعي.

### **المخاطر المحتملة للمشاركين / أو للمجتمع:**

لا توجد مخاطر متوقعة مرتبطة بمشاركتك في هذه الدراسة. لا توجد إجابات خاطئة أو صحيحة ، لذا كن صريحًا وعبر عن نفسك دون تردد. إذا كنت تفضل في أي وقت أو لأي سبب من الأسباب عدم الإجابة عن أي أسئلة ، فلا تتردد في تخطي هذه الأسئلة. لن يتم معاقبتك على قرار إيقاف المشاركة في أي وقت.

### **السرية:**

ستبقى البيانات التي تم جمعها سرية.

ستتم مراقبة السجلات وقد يتم تدقيقها من قبل لجنة الأخلاقيات للعلوم الإجتماعية والسلوكية مع ضمان السرية.

### **المشاركة والانسحاب:**

إذا وافقت على المشاركة في هذه الدراسة ، فيمكنك تغيير رأيك والانسحاب في أي وقت دون عواقب. لن يترتب على رفضك المشاركة أو الانسحاب من الدراسة أي عقوبة أو فقدان أي مزايا تتمتع/ي بها، ولن يؤثر ذلك على علاقتكم بالجامعة الأمريكية في بيروت أو المركز الطبي في الجامعة الأمريكية في بيروت.

### **أسئلة حول الدراسة:**

إذا كان لديك أي أسئلة حول الدراسة ، يمكنك الاتصال بفريق البحث: لميس جمعة ، [lj18@aub.edu](mailto:lj18@aub.edu) ، مروة دياب الحركة ، [md106@aub.edu](mailto:md106@aub.edu) ، ريتا عيتاني ، [rzi02@mail.aub.edu](mailto:rzi02@mail.aub.edu)

### **الوصول إلى الاستبيان:**

إذا كنت بعد قراءة وثيقة الموافقة و بعد أن تمت الإجابة على جميع أسئلتك ، موافق على المشاركة في الدراسة ؛ يمكنك الوصول إلى الاستطلاع بالضغط على الرابط التالي.

### **لمزيد من المعلومات والأسئلة حول البحث/ حول حقوقك**

مجلس مراجعة مؤسسي العلوم الإجتماعية والسلوكية

العنوان: الجامعة الأمريكية في بيروت؛ شارع رياض الصلح، بيروت 1107 2020، لبنان

هاتف: 961-1-374374، تحويلة (5445)، البريد الإلكتروني: [irb@aub.edu.lb](mailto:irb@aub.edu.lb)

## APPENDIX II

### ONLINE CONSENT FORM ENGLISH

#### Consent to participate in an Online Research Study

This notice is for an AUB-IRB Approved Research Study for Dr *Lamis*

*Jomaa* at AUB.

**\*It is not an Official Message from AUB\***

You are invited to participate in a research study entitled “ **Food Insecurity Prevalence and Correlates among College Students in Lebanon : A Cross-sectional Study**”.  
conducted by **Dr Lamis Joma, Faculty of Agriculture and Food Science** at the American University of Beirut. The conduct of this study will adhere to the IRB approved protocol.

The IRB approved method for approaching subjects is through LimeSurvey generated link shared on various social media outlets.

*The purpose* of the study is to examine the prevalence and correlates of food insecurity (FI) among college students in Lebanon. In particular, the objectives of the study are: 1) to measure the overall prevalence of FI among college students; 2) to determine the socioeconomic, demographic characteristics and university-level factors associated with food insecurity among college students; 3) to assess the associations between FI and indicators of psychosocial health, 4) to explore the relationship between food insecurity, food literacy, and eating habits of college students.

#### **PROCEDURES:**

A total of 760 students (18 years or older) will be invited to participate in an online survey. The survey will be administered to a convenient sample of students from the universities starting fall 2021 and upon receiving IRB approval. The survey link will be distributed by a variety of mechanisms to widely reach college students. For AUB and LAU universities, the online survey will be emailed to students enrolled in these universities from all majors to obtain a diverse pool of students (undergraduates, graduates, different majors and faculties). Email invitations will be sent to AUB students by HRPP/IRB office and to LAU students by someone in a non-administrative level through the Dean of Student Office to avoid any undue influence on students. For all other universities, recruitment of students will take place through posting a flyer/

invitation on different social media platforms (e.g. Facebook pages) and social networking of the research team and the co-investigators where participants will be invited to the research. The invitation will include the link to the consent form and survey. Students who approve the consent form will be prompted to complete the survey. The online survey will be conducted via *Lime Survey* and includes the following sections: 1) socioeconomic, demographic characteristics and university-level factors; 2) the Food Insecurity Experience Scale (8 items) ;3) lifestyle habits including smoking and physical activity; 4) reported anthropometrics (weight and height); 5) the Eating and Food Literacy Behaviors Questionnaire (19 items); and 5) psychosocial health tool. The completion of the questionnaire should take approximately 15-20 minutes.

This message invites you to:

1. Read the consent document and consider whether you want to be involved in the study.

And to note:

- *Participation is completely voluntary.*
- *Completing the questionnaire will take around 30 minutes.*
- *Only the data you provide in the questionnaire will be collected and analyzed.*  
*The research team will not have access to your name or contact details.*
- *The results of the survey will be published in a –research thesis/project report available in printed form and electronically from AUB Libraries.*

***Inclusion criteria:***

- *Students aged 18 years or older, from public and private universities in Lebanon such as AUB, LAU, LIU, the Lebanese university, and others.*
- *Students from all majors (agriculture, nutrition, nursing, business, medicine, public health, business, engineer literature, arts, sciences etc..) and class levels (undergraduate, graduate).*

## **POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY**

There are no direct benefits to the study for students, but findings from this study will provide us with a better understanding of the prevalence and severity of FI among college students in Lebanon and the factors associated with this phenomenon.

You will not receive payment for participation in this study.

The results of the study will contribute to evidence-based campus interventions and policies to alleviate food insecurity, such as on-campus food assistance programs,

education initiatives, and off-campus food assistance programs or financial aid modifications.

### **POTENTIAL RISKS TO SUBJECTS AND/OR SOCIETY**

There are no anticipated risks associated with your participation in this study. There are no wrong or right answers so be honest and express yourself with no hesitation. If at any time or for any reason, you would prefer not to answer any questions, please feel free to skip those questions. You will not be penalized for deciding to stop participation at any time.

### **CONFIDENTIALITY**

The collected data will remain confidential and anonymous.

Records will be monitored and may be audited by the IRB while assuring confidentiality.

### **PARTICIPATION AND WITHDRAWAL**

If you voluntarily consent to take part in this study, you can change your mind and withdraw at any time without consequences of any kind.

Refusal to participate or withdrawal from the study will involve no penalty or loss of benefits to which the subject is otherwise entitled, and neither will it affect their relationship with their organization and AUB/AUBMC.

### **QUESTIONS ABOUT THE STUDY**

If you have any questions about the study, you can contact the research team: Lamis Jomaa, [lj18@aub.edu](mailto:lj18@aub.edu), Marwa Diab El Harake, [md106@aub.edu](mailto:md106@aub.edu), Rita Itani, [rzi02@mail.aub.edu](mailto:rzi02@mail.aub.edu)

### **ACCESS TO THE SURVEY**

**If after reading the consent document and having all your questions answered, you voluntarily agree to take part in the study; you can access the survey by clicking on the following link.**

### **CONCERNS OR QUESTIONS ABOUT YOUR RIGHTS**

If you have concerns about the study or questions about your rights as a participant, you can contact the **AUB IRB Office at: Social & Behavioral Sciences Institutional Review Board [01-350000, Extension: 5445, [irb@aub.edu.lb](mailto:irb@aub.edu.lb)]**.

*Institutional Review Board  
American University of Beirut*

*21 JAN 2021*

**APPROVED**

## APPENDIX III

### ONLINE INVITATION ARABIC

العلوم الاجتماعية والسلوكية في الجامعة الأميركية في بيروت  
نص دعوة

#### دعوة للمشاركة في دراسة بحثية

هذا الإشعار خاص بدراسة بحثية معتمدة من الجامعة الأميركية في بيروت و لجنة الأخلاقيات للعلوم الإجتماعية والسلوكية للدكتورة لميس جمعة في الجامعة الأميركية في بيروت. (هاتف: 961-1-350000، تحويلة (4544))

(البريد الإلكتروني: lj18@aub.edu.lb)

\*ليست رسالة رسمية من الجامعة الأمريكية في بيروت \*

أدعوكم للمشاركة في دراسة بحثية بعنوان *انعدام الأمن الغذائي وروابطه بين طلاب الجامعات في لبنان: دراسة بحثية عينية*.

الهدف الرئيسي من الدراسة الحالية هو فحص مدى انتشار انعدام الأمن الغذائي و العوامل المؤثرة بين طلاب الجامعات في لبنان. على وجه الخصوص ، أهداف الدراسة هي: (1) تحديد مدى الانتشار العام للأمن الغذائي بين طلاب الجامعات؛ (2) تحديد الخصائص الاجتماعية والاقتصادية والديموغرافية وعوامل أخرى عند الطلاب وعلاقتها بالأمن الغذائي بين طلاب الجامعات ؛ (3) تقييم العلاقة بين الأمن الغذائي ومؤشرات الصحة النفسية والاجتماعية ؛ (4) استكشاف العلاقة بين انعدام الأمن الغذائي ، والمعرفة الغذائية ، وعادات الأكل لدى طلاب .

سيطلب منك إكمال استطلاع قصير عبر الإنترنت يتضمن أسئلة حول خصائصك الاجتماعية والديموغرافية وأمنك الغذائي وصحتك البدنية والنفسية الاجتماعية بالإضافة إلى قياساتك الأنتروبومترية ونمط حياتك وعاداتك الغذائية.

نقوم بدعوة طلاب جامعيين بين 18 و 25 عامًا يعيشون في لبنان و هم مسجلين في إحدى الجامعات في لبنان للعام الدراسي 2020-2021 .

الوقت المقدر لإكمال هذا الاستطلاع حوالي 30 دقيقة.

يتم إجراء البحث عبر الإنترنت وسيتم دعوتك للمشاركة في الدراسة البحثية عبر سيرفر الامن لدى الجامعة الأميركية في بيروت.

يرجى قراءة نموذج الموافقة المرفق والنظر فيما إذا كنت تريد المشاركة في الدراسة البحثية.

إذا كان لديك أي أسئلة حول هذه الدراسة ، يمكنك الاتصال بفريق البحث: د. لميس جمعة ، lj18@aub.edu.lb ، مروة دياب الحركة ، md106@aub.edu.lb ، رينا عيتاني ، rzi02@mail.aub.edu .

Institutional Review Board  
American University of Beirut

21 JAN 2021

APPROVED

21 JAN 2021

**APPROVED**

## APPENDIX IV

### ONLINE INVITATION ENGLISH

#### **AUB Social & Behavioral Sciences INVITATION SCRIPT**

##### **Invitation to Participate in a Research Study**

This notice is for an AUB-IRB Approved Research Study for Dr. Lamis Jomaa at AUB.  
(Phone: (01) 350 000 Ext: 4544)

(Email: [lj18@aub.edu.lb](mailto:lj18@aub.edu.lb))

##### **\*It is not an Official Message from AUB\***

I am inviting you to participate in a research study about the *Food Insecurity Prevalence and Correlates among College Students in Lebanon: A Cross-sectional Study*

The purpose of the study is to examine the prevalence and correlates of food insecurity among college students in Lebanon. In particular, the objectives of the study are: 1) to measure the overall prevalence of food insecurity among college students; 2) to determine the socioeconomic, demographic characteristics and university-level factors associated with food insecurity among college students; 3) to assess the associations between food insecurity and indicators of psychosocial health, 4) to explore the relationship between food insecurity, food literacy, and eating habits of college students.

You will be asked to complete a short online survey that includes questions on sociodemographic characteristics, food security, overall physical and psychosocial health, anthropometrics, lifestyle and eating habits.

We are recruiting college students between 18 and 25 years old living in Lebanon and enrolled in a Lebanese university for the academic year 2020-2021.

The estimated time to complete this survey is approximately 30 minutes. The research is conducted online and is hosted on AUB secure server.

Please read the enclosed consent form and consider whether you want to be involved in the research study.

If you have any questions about this study, you may contact the research team: Dr. Lamis Jomaa, [lj18@aub.edu.lb](mailto:lj18@aub.edu.lb), Marwa Diab El Harakeh, [md106@aub.edu.lb](mailto:md106@aub.edu.lb), Rita Itani, [rzi02@mail.aub.edu](mailto:rzi02@mail.aub.edu)

## APPENDIX V

### QUESTIONNAIRE ARABIC

عنوان الدراسة البحثية: انعدام الأمن الغذائي و وروابطه بين طلاب الجامعات في لبنان: دراسة بحثية عينية  
الباحث الرئيسي: د. لميس جمعة، كلية العلوم الزراعية والغذائية، الجامعة الأميركية في بيروت

**تعليمات** يرجى منك إكمال هذا الاستبيان بأفضل ما لديك من معرفة. بالنسبة إلى أسئلة الاختيار من متعدد، حدد  
إجابة واحدة فقط، ما لم تتم الإشارة إلى خلاف ذلك.

1. الجنس  
أ. ذكر  
ب. أنثى

2. العمر: \_\_\_\_\_ سنة

Institutional Review Board  
American University of Beirut

21 JAN 2021

**APPROVED**

3. الجنسية  
أ. لبناني  
ب. غير لبناني

4. ما الجامعة التي تدرس فيها؟

- أ. الجامعة الأميركية في بيروت  
ب. LAU  
ج. LIU  
د. LU

ه. آخر. يرجى الإشارة إلى \_\_\_\_\_

5. السنة الدراسية في الجامعة؟  
أ. طالب/ة في السنة الأولى من الجامعة  
ب. طالب/ة في السنة الثانية من الجامعة  
ت. طالب/ة في السنة الثالثة من الجامعة  
ث. طالب/ة في السنة الأخيرة من الجامعة  
ج. متخرج من الجامعة

6. التخصص الجامعي

- أ. الأعمال و التجارة  
ب. الهندسة و علوم الكمبيوتر  
ت. الصحة (التغذية ، المختبرات الطبية ، الصحة العامة ، العلوم الطبية)  
ث. الفنون  
ج. العلوم (الكيمياء والأحياء والفيزياء)  
ح. آخر: \_\_\_\_\_



7. أين تسكن خلال فترة الدراسة الجامعية؟  
أ. مع العائلة  
ب. مع الأصدقاء  
ت. بمفرده  
ث. آخر. رجاء حدد: \_\_\_\_\_

8. المدخول الشهري / مخصصاتك الشهرية الشخصية؟ LL \_\_\_\_\_  
دولار أمريكي \_\_\_\_\_

9. ما هو أعلى مستوى تعليمي لوالدك؟  
أ. ابتدائي أو أقل  
ب. متوسط  
ت. المدرسة الثانوية  
ث. متخرج من الجامعة

9. ما هو أعلى مستوى تعليمي لوالدتك؟  
أ. ابتدائي أو أقل  
ب. متوسط  
ت. المدرسة الثانوية  
ث. متخرج من الجامعة

10. الوظيفة الحالية:  
أ. لا وظيفة  
ب. بدوام جزئي على مدى 20 ساعة في الأسبوع  
ت. بدوام جزئي أقل من 20 ساعة في الأسبوع  
ث. دراسة العمل بدوام جزئي

11. ما هي حالة عمل والدك؟  
أ. لا يعمل  
ب. موظف بدوام كامل  
ت. موظف بدوام جزئي

12. ما هي حالة عمل والدتك؟  
أ. لا تعمل  
ب. موظفة بدوام كامل  
ت. موظفة بدوام جزئي

13. هل لديك أي مساعدة مالية أو منحة لا تتطلب السداد؟  
أ. نعم.  
ب. لا  
(إذا كانت الإجابة لا ، يرجى تخطي السؤال رقم 14)

14. ما هو دخلك الشهري (بالليرة اللبنانية)؟

- أقل من 675,000
- 1,000,000 – 675,000
- 1,500,000 – 1,000,001
- 2,000,000 – 1,500,001
- 2,500,000 – 2,000,001
- 3,000,000 – 2,500,001
- 5,000,000 – 3,000,001
- أكبر من 5,000,000
- رفض الإجابة

15. هل تحصل على دخل بعملة أجنبية بالدولار الأمريكي أو اليورو؟

o نعم ، يرجى تحديد متوسط الدخل: \_\_\_\_\_

16. الحصول على مساعدة مالية أو منحة لا تتطلب السداد؟

أ. نعم.

ب. لا

(إذا كانت الإجابة لا ، يرجى تخطي السؤال رقم 14)

17. ما هو نوع المساعدة المالية / القرض أو المنحة؟

أ. تغطية جزئية

ب. تغطية كاملة

18. هل لديك مساعدة مالية لا تتطلب السداد؟

أ. نعم

ب. لا

19. متوسط المعدل التراكمي (GPA): \_\_\_\_\_

## 2. قياسات الأثر وبومترية ونمط الحياة

20. الوزن (تقرير ذاتي): \_\_\_\_\_ Kg

21. الطول (تقرير ذاتي): \_\_\_\_\_ cm

22. كيف تصف وزنك؟

أ. نقص الوزن

ب. عادي

ت. زيادة الوزن أو السمنة

ث. لا أعرف

32. هل أنت راض عن وزنك؟

- أ. نعم  
ب. لا

24. متوسط عدد ساعات الدراسة في الأسبوع \_\_\_\_\_

25. كم متوسط عدد ساعات النوم التي تحصل عليها يوميًا؟

- أ.  $6 \geq$  ساعات  
ب. 7 ساعات  
ت. 8 ساعات  
ث.  $8 \leq$  ساعات

26. كيف تصف عادات نومك؟

- أ. منتظم  
ب. غير عادي

27. على مقياس من 1 إلى 10 ، إلى أي مدى تعتبر حياتك مرهقة؟

(1 = غير مرهق على الإطلاق ، 10 = مرهق للغاية)

(إذا كانت إجابتك 1 = غير مرهق ، يرجى تخطي السؤال رقم 25)

28. ما هي العوامل المؤثرة على إجهادك؟

- أ. المشاكل العائلية  
ب. الوضع الأمني في البلد  
ج. المشاكل المالية الشخصية  
د. قلة الموارد  
هـ. آخر. رجاء حدد \_\_\_\_\_

29. هل تدخن السجائر ، السجائر الإلكترونية ، الأرجيلة (الشيشة) و / أو السيجار؟

- أ. لا أدخن  
ب. مدخن اجتماعي / عرضي  
ت. مدخن حالي / منتظم  
ث. مدخن سابق  
ج. ارفض الإجابة

30. هل سبق لك أو هل أنت حالياً جزء من فريق رياضي أو من رياضة منظمة؟ مثال (فريق الرياضة الجامعي أو فريق الرياضة الجامعي للمبتدئين)

- أ. نعم  
ب. لا

31. في أسبوع عادي ، هل تشارك في أنشطة بدنية أو تمارين مثل الجري ، والسباحة ، والتمارين الرياضية ، ورفع الأثقال ، أو لعب كرة السلة؟

- أ. نعم  
ب. لا

(إذا كانت الإجابة لا ، يرجى تخطي السؤال رقم 29 و30)

32. كم مرة تشارك في هذا النشاط خلال أسبوع عادي؟

مرات في الأسبوع المدة كل مرة \_\_\_\_\_ (ساعات: دقائق)

33. ما نوع الأنشطة التي تقوم بها؟

أ. نشاط خفيف (التمدد ، اليوجا ، المشي البطيء ، البولينيغ)

ب. نشاط معتدل (حمل أوزان خفيفة ، ركوب الدراجات بوتيرة منتظمة ، لعب تنس الطاولة ، المشي السريع)  
نشاط قوي (الركض والجري ورفع الأحمال الثقيلة والتمارين الرياضية ولعب كرة السلة والتنس والرجبي والرقص الشرقي والكرة الطائرة والسباحة أو ركوب الدراجات السريعة)

### 3مقياس معاناة انعدام الأمن الغذائي

|  |   |   |
|--|---|---|
| 34. أرغب بسؤالك بعض الأسئلة عن استهلاكك للغذاء.<br>خلال ثلاثين (30) يوماً" الماضية ، هل حدث وأن:   |   |   |
| أ- كلا<br>ب- نعم<br>ت- لا أعرف<br>ث- أرفض التصريح  | هل شعرت أنت أو غيرك في المنزل بالقلق بسبب عدم توفر الطعام الكافي لأسباب اقتصادية أو أسباب أخرى؟                                       | 1 |
| أ- كلا<br>ب- نعم<br>ت- لا أعرف<br>ث- أرفض التصريح  | خلال الأيام الثلاثين الماضية، هل واجهتم صعوبة في أكل الطعام الصحي والمغذي لأسباب اقتصادية أو أسباب أخرى؟                              | 2 |
| أ- كلا<br>ب- نعم<br>ت- لا أعرف<br>ث- أرفض التصريح  | هل أكلت أنت أو غيرك في منزلك أنواع قليلة من الأطعمة لأسباب اقتصادية أو أسباب أخرى؟  | 3 |
| أ- كلا<br>ب- نعم<br>ت- لا أعرف<br>ث- أرفض التصريح  | هل تخلّيت أنت أو غيرك في المنزل عن وجبة طعام لأسباب اقتصادية أو أسباب أخرى؟   | 4 |
| أ- كلا<br>ب- نعم<br>ت- لا أعرف<br>ث- أرفض التصريح  | خلال الأيام الثلاثين الماضية، هل أكلت أنت أو غيرك في منزلك أقل مما اعتدتم أن تأكلوا أو عليكم أن تأكلوا لأسباب اقتصادية أو أسباب أخرى؟ | 5 |
| أ- كلا<br>ب- نعم<br>ت- لا أعرف<br>ث- أرفض التصريح  | هل نفذ الطعام لدى أسرته لأسباب اقتصادية أو أسباب أخرى؟  | 6 |
| أ- كلا<br>ب- نعم<br>ت- لا أعرف<br>ث- أرفض التصريح  | هل عانيت أنت أو أي فرد من العائلة من الجوع لأسباب اقتصادية أو أسباب أخرى؟   | 7 |
| أ- كلا<br>ب- نعم<br>ت- لا أعرف<br>ث- أرفض التصريح  | هل بقيت أنت أو غيرك في منزلك دون تناول الطعام ليوم كامل لأسباب اقتصادية أو أسباب أخرى؟  | 8 |
| منظمة الغذاء والدواء (الفاو) (2015). نسخة الأختبار التجريبي لعام 2015 خل مقياس (سلم) تجربة (معاناة) انعدام الأمن الغذائي <a href="http://www.fao.org/3/a-be898a.pdf">http://www.fao.org/3/a-be898a.pdf</a> العالمي. ال مؤسسة غالوب العالمية للأستطلاع. |   |   |

35. كيف أثرت جائحة فيروس كورونا المستجد COVID-19 على أمنك الغذائي؟

- أ. زاد بشكل ملحوظ  
ب. زيادة بطريقة ما  
ت. لا تغيير  
ث. انخفض إلى حد ما

- ج. انخفض بشكل ملحوظ  
ح. لست متأكدًا / لا أعرف

#### 4. استبيان سلوكيات الأكل ومحو الأمية الغذائية

36. يرجى قراءة البيانات أدناه. باستخدام المقياس المكون من 4 نقاط أدناه ، يرجى توضيح إلى أي مدى تتعرف على البيانات من خلال ملء إجابتك بالكامل.

????????? ?????? ?????? ?????????? ?????????? ?????????? ?????????? ?????????? ??????????  
????????? ?????????? ?????????? ?????????? ?????????? ?????????? ?????????? ?????????? ??????????  
????????? ?????????? (?????????) ?????????? ?????????? ?????????? ?????????? ?????????? ??????????  
????????? ?????????? ?????????? ?????????? ?????????? ?????????? ??????????

| دائما | غالبا | نادرا | أبدا |   |
|-------|-------|-------|------|---|
|       |       |       |      | الصحة والتغذية                                  |
|       |       |       |      | أشتري الأطعمة الصحية.                           |
|       |       |       |      | أختار الوجبات المتوازنة من الناحية الغذائية.    |
|       |       |       |      | أطبخ الأطعمة الصحية.                            |
|       |       |       |      | أختار الأطعمة الصحية.                           |
|       |       |       |      | أنا أكل نظام غذائي متوازن.                      |
|       |       |       |      | أقرأ معلومات التغذية قبل شراء الأطعمة.          |
|       |       |       |      | أنا أستهلك أطعمة صحية.                          |
|       |       |       |      | المذاق  |
|       |       |       |      | أشتري أطعمة لذيذة.                              |
|       |       |       |      | اختر الأطعمة التي طعمها جيد بالنسبة لي.         |
|       |       |       |      | أنا أكل الأطعمة المناسبة لي.                    |
|       |       |       |      | تحضير الطعام                                    |
|       |       |       |      | أتبع الوصفات عند تحضير الطعام.                  |
|       |       |       |      | أقيس بدقة المكونات السائلة عند تحضير الطعام.    |
|       |       |       |      | أقيس بدقة مكونات الطعام الجاف عند تحضير الطعام. |
|       |       |       |      | التخطيط واتخاذ القرار                           |

|  |  |  |  |  |
|--|--|--|--|--|
|  |  |  |  | أنا أقرر ما أريد أن أكله قبل الوجبة.             |
|  |  |  |  | أنا أخطط لما سأكله.                              |
|  |  |  |  | أنا أكل الأطعمة التي خططت لتناولها من قبل.       |
|  |  |  |  | السهولة أو الراحة                                |
|  |  |  |  | أنا أكل الأطعمة المناسبة لي.                     |
|  |  |  |  | أنا أقوم بإعداد الأطعمة التي يمكن تحضيرها بسرعة. |
|  |  |  |  | أنا أقوم بإعداد وجبات جيدة المذاق.               |
|  |  |  |  | أنا أشتري الأطعمة التي تناسبني.                  |
| 5. الصحة البدنية والنفسية الاجتماعية الشاملة<br>37. كيف تصف حالتك ؟؟؟؟؟؟؟؟؟ ؟؟؟؟؟؟؟<br>أ. ممتازة<br>ب. جيدة<br>ت. معتدلة<br>ث. فقيرة<br>ج. فقيرة جدا<br>6. استبيان الصحة الشخصية (PHQ-9)<br>38. على مدار الأسبوعين الماضيين ، كم مرة أزعجتك أي من المشكلات التالية؟<br>i. تدني الاهتمام أو المتعة في فعل الأشياء<br>ii. الشعور بالاكتئاب أو اليأس<br>iii. صعوبة في النوم أو الاستمرار في النوم أو النوم كثيرًا<br>iv. الشعور بالتعب أو قلة الطاقة<br>v. ضعف الشهية أو الإفراط في الأكل<br>vi. الشعور بالسوء تجاه نفسك - أو أنك فاشل أو أنك تخذل نفسك أو عائلتك<br>vii. صعوبة في التركيز على الأشياء ، مثل قراءة الجريدة أو مشاهدة التلفزيون<br>viii. التحرك أو التحدث ببطء شديد لدرجة أن الآخرين قد يلاحظونه. أو العكس - أن تكون متوترًا جدًا أو قلقًا لدرجة أنك تتحرك كثيرًا أكثر من المعتاد<br>ix. التفكير في أنك ستكون أفضل حالًا ميتًا أو أن تؤذي نفسك بطريقة ما<br>2<br>ليس صعبًا على الإطلاق<br>صعب نوعًا ما<br>صعب جدًا<br>صعب للغاية |  |  |  |  |

|  |  |  |  |  |
|--|--|--|--|--|
|  |  |  |  | 39. إذا قمت بتحديد أي مشكلة ، فما مدى صعوبة هذه المشكلات بالنسبة لك للقيام بعملك ، أو الاعتناء بالأشياء في المنزل ، أو التعامل مع أشخاص آخرين؟ |
| مقتبس من: Kroenke ، K. ، Spitzer ، & PHQ-9 (2002). R.L. مقياس جديد لتشخيص الاكتئاب وشدته. حوليات الطب النفسي ، 32 (9) ، 509-515. |  |  |  |  |

### 7. مقياس اضطراب القلق العام (GAD-7)

| تقريباً كل يوم | أكثر من نصف الأيام | عدة أيام | إطلاقاً | 40. على مدار الأسبوعين الماضيين ، كم مرة تضايقت من أي من المشكلات التالية؟  |
|----------------|--------------------|----------|---------|---|
|                |                    |          |         | 1. الشعور بالتوتر أو القلق أو التوتر  |
|                |                    |          |         | 2. عدم القدرة على التوقف أو السيطرة على القلق   |
|                |                    |          |         | 3. القلق كثيراً حول أشياء مختلفة  |
|                |                    |          |         | 4. صعوبة الاسترخاء  |
|                |                    |          |         | 5. أن تكون قلقاً لدرجة أنه من الصعب الجلوس  |
|                |                    |          |         | 6. الانزعاج أو الانزعاج بسهولة  |
|                |                    |          |         | 7. الشعور بالخوف وكأنه شيء مروع   |
|                |                    |          |         |   |
|                |                    |          |         | أضف النتيجة لكل عمود مجموع النقاط (أضف نقاط العمود) =   |
|                |                    |          |         | 41. إذا قمت بفحص أي مشاكل ، ما مدى صعوبة هذه المشكلات بالنسبة لك للقيام بعملك ، أو الاعتناء بالأشياء في المنزل ، أو التعامل مع أشخاص آخرين؟ |
|                |                    |          |         |   |
|                |                    |          |         | Low B Williams JBW Kroenke K Spitzer RL . 1097-1092 :166 2006 . 1097-1092 :166 2006 .   |

### 8. WHO-5 مؤشر الرفاهية

| لا وقت | بعض من الوقت | أقل من النصف الوقت | أكثر الوقت | معظم الوقت | 42. يرجى الإشارة لكل من العبارات الخمسة الأقرب لما كنت تشعر به خلال الأسبوعين الماضيين. |
|--------|--------------|--------------------|------------|------------|---|
|        |              |                    |            |            | لقد شعرت بالبهجة ومعنوياتي عالية  |
|        |              |                    |            |            | لقد شعرت بالهدوء والاسترخاء   |
|        |              |                    |            |            | لقد شعرت بالنشاط والقوة   |
|        |              |                    |            |            | استيقظت وأنا أشعر بالانتعاش والراحة   |
|        |              |                    |            |            | حياتي اليومية مليئة بالأشياء التي تهمني   |
|        |              |                    |            |            | DepCare (1998).   |



## APPENDIX VI

### QUESTIONNAIRE ENGLISH

**Study Title: Food Insecurity Prevalence and Correlates among College Students in Lebanon: A Cross-sectional Study**

**Instructions** *You are kindly requested to complete this questionnaire to the best of your knowledge. For multiple choice questions, select only one answer, unless otherwise noted.*

#### **I. Socio-demographic characteristics**

1. Gender
  - a. Male
  - b. Female
2. Age: \_\_\_\_\_years
3. Nationality
  - a. Lebanese
  - b. Non-Lebanese
4. What university are you attending?
  - a. AUB
  - b. LAU
  - c. LIU
  - d. LU
  - e. Other. Please indicate-----
5. Year of college?
  - a. Freshman
  - b. Sophomore
  - a. Junior
  - b. Senior
  - c. Graduate
6. Major
  - a. Business
  - b. Engineering, Computer Science
  - c. Health-related (Nutrition, Medical Lab, Public Health, Medical Sciences)
  - d. Arts
  - e. Sciences(Chemistry, Biology, Physics)
  - f. Other:

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American University of Beirut*

*21 JAN 2021*

**APPROVED**

7. Where do you live during university term time?
- With family
  - With room-mates
  - Alone
  - Other. Please specify: \_\_\_\_\_
8. **What is your personal monthly income/allowance?**
- LL**
- USD**
9. What is the highest educational level of your father?
- Elementary or less
  - Intermediate
  - High school
  - Graduate
10. What is the highest educational level of your mother?
- Elementary or less
  - Intermediate
  - High school
  - Graduate
11. Current job:
- No job
  - Part-time over 20 hrs a week
  - Part-time under 20 hrs a week
  - Part-time work study
12. What is your father's employment status?
- Not working
  - Employee, full time
  - Employee, part time
13. What is your mother's employment status?
- Not working
  - Employee, full time
  - Employee, part time
14. What is your monthly income (in LBP)?
- Less than 675,000
  - 675,000 – 1,000,000
  - 1,000,001 – 1,500,000
  - 1,500,001 – 2,000,000

- 2,000,001 – 2,500,000
- 2,500,001 – 3,000,000
- 3,000,001 – 5,000,000
- Greater than 5,000,000
- Refuse to answer

15. Do you earn income in foreign currency USD or EURO?

- Yes, Please specify average income : \_\_\_\_\_
- No

16. Receive financial aid or scholarship that does **not** require repayment?

- a. Yes.
- b. No

*(If No, please skip question #14)*

17. What is the type of financial aid /loan or scholarship?

- a. Partial coverage
- b. Full coverage

18. Receive financial aid that does require repayment?

- c. Yes
- d. No

19. Grade point average (GPA): \_\_\_\_\_

## **II. Anthropometrics and Lifestyle habits**

20. Weight (Self-reported): \_\_\_\_\_ kg

21. Height (Self-reported): \_\_\_\_\_ cm

22. How do you describe your weight?

- a. Underweight
- b. Normal
- c. Overweight or obese
- d. Don't know

23. Are you satisfied with your weight?

- a. Yes
- b. No

24. **Average number of studying hours per week** \_\_\_\_\_

25. **On average, how many hours of sleep do you get daily?**

- a.  $\leq$  6 hours
- b. 7 hours
- c. 8 hours
- d.  $\geq$  8 hours

26. **How would you describe your sleeping habits?**

- a. Regular

b. Irregular

27. **On a scale from 1 to 10, how stressful would you consider your life?**

(1=not stressful at all, 10= extremely stressful)\_\_\_\_\_

*(If you answered 1=not stressful, please skip question #25)*

28. What are the factors influencing your stress?

- a. Family problems
- b. Situation of the Country
- c. Personal Financial problems
- d. Lack of resources
- e. Other. Please specify\_\_\_\_\_

29. **Do you smoke cigarettes, e-cigarettes, argileh (hookah) and/or cigars?**

- a. Never smoked
- b. Social/Occasional smoker
- c. Current/Regular smoker
- d. Ex-smoker
- e. Refuse to answer

30. **Have you ever been or are currently part of an athletic team (varsity) or organized sport? (Ex. university varsity or junior varsity team)**

- a. Yes
- b. No

31. In a typical week, do you participate in regular physical activities or exercises such as running, swimming, aerobics, weight lifting, or basketball playing?

- a. Yes
- b. No

*(If No, please skip to question #29 & #30)*

32. How many times do you take part in this activity during a typical week?

\_\_\_\_\_Times per week    Duration every time \_\_\_\_\_(hours: minutes)

33. What type of activities do you perform?

- a. Light (stretching, yoga, slow walking, bowling)
- b. Moderate (carrying light weights, bicycling at a regular pace, playing table tennis, brisk walking)
- c. Vigorous (jogging , running, heavy lifting, aerobics, basketball playing, tennis, rugby, belly dancing, volleyball, swimming laps or fast bicycling)

### III. Food Insecurity Experience Scale

34. This section comprises questions pertaining to your food security status.

| NUMBER | QUESTION   | RESPONSE OPTIONS                                   |
|--------|--|--|
|        | During the last <b>30 DAYS</b> , was there a time when:  |  |
| 1      | You or others in your household worried about not having enough food to eat because of a lack of money or other resources?   | a- No      c- Don't Know<br>b- Yes      d- Refused |
| 2      | Still thinking about the last 30 DAYS, was there a time when you or others in your household were unable to eat healthy and nutritious food because of a lack of money or other resources? | a- No      c- Don't Know<br>b- Yes      d- Refused |
| 3      | Was there a time when you or others in your household ate only a few kinds of foods because of a lack of money or other resources?   | a- No      c- Don't Know<br>b- Yes      d- Refused |
| 4      | Still thinking about the last 30 DAYS, was there a time when you or others in your household ate less than you thought you should because of a lack of money or other resources?           | a- No      c- Don't Know<br>b- Yes      d- Refused |
| 5      | Was there a time when your household ran out of food because of a lack of money or other resources?  | a- No      c- Don't Know<br>b- Yes      d- Refused |
| 6      | In the past 4 weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?              | a- No      c- Don't Know<br>b- Yes      d- Refused |
| 7      | Was there a time when you or others in your household were hungry but did not eat because there was not enough money or other resources for food?  | a- No      c- Don't Know<br>b- Yes      d- Refused |
| 8      | Was there a time when you or others in your household went without eating for a whole day because of a lack of money or other resources?   | a- No      c- Don't Know<br>b- Yes      d- Refused |

*Adapted from: Food and Drug Organization (FAO) (2013). Global food insecurity experience scale survey modules .<http://www.fao.org/3/a-b1404e.pdf>*

35. How did **COVID-19** pandemic affect your **food security**?

- Increased significantly
- Increased somehow
- No Change
- Decreased somehow
- Decreased significantly
- Not sure/Don't know

#### IV. Eating and Food Literacy Behaviors Questionnaire

**Instructions:** Please read the statements below. Using the 4-point scale below, please indicate the extent to which you identify with statements by completely filling in your response.

36. **For the purposes of this survey, fruits, vegetables, low-fat milk and fat-free milk and dairy products, protein foods, and whole grains are considered healthy foods, while foods high in sodium (salt), solid fats, and added sugars are considered less healthy.**

|  | Never                 | Seldom                | Often                 | Always                |
|--|-----------------------|-----------------------|-----------------------|-----------------------|
| <b>Health and Nutrition</b>                                    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I buy foods that are healthy.                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I choose nutritionally balanced meals.                         | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I cook healthy foods.  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I select foods that are healthy.                               | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I eat a balanced diet.   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I read nutrition information before purchasing foods.          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I consume healthy foods.                                       | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| <b>Taste</b>   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I buy foods that are tasty.                                    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I choose foods that taste good to me.                          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I eat foods that are convenient for me.                        | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| <b>Food preparation</b>  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I follow recipes when preparing food.                          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I accurately measure liquid ingredients when preparing food.   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I accurately measure dry food ingredients when preparing food. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| <b>Planning and decision-making</b>                            | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

|  |                       |                       |                       |                       |
|--|-----------------------|-----------------------|-----------------------|-----------------------|
| I decide what I want to eat before a meal.   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I plan what I will eat.  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I eat foods that I have previously planned to eat.   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| <b>Convenience</b>   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I eat foods that are convenient for me.  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I prepare foods that can be made quickly.  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I prepare good tasting meals.  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I purchase foods that are convenient for me.   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| <i>Adapted from: Rhea, K. C., Cater, M. W., McCarter, K., &amp; Tuuri, G. (2020). Psychometric Analyses of the Eating and Food Literacy Behaviors Questionnaire with University Students. Journal of Nutrition Education and Behavior.</i> |                       |                       |                       |                       |

**V. Overall Physical and Psychosocial health**

37. How do you describe your *physical health status*?

- a. Excellent
- b. Good
- c. Average
- d. Poor
- e. Very poor

**VI. Personal Health Questionnaire (PHQ-9)**

| 38. Over the <b><u>LAST 2 WEEKS</u></b> , how often have you been bothered by any of the following problems? | Not at all | Several days | More Than Half the Days | Nearly Every Day |
|--|------------|--------------|-------------------------|------------------|
| i. Little interest or pleasure in doing things   | 0          | 1            | 2                       | 3                |
| ii. Feeling down, depressed or hopeless  | 0          | 1            | 2                       | 3                |
| iii. Trouble falling asleep, staying asleep, or sleeping too much  | 0          | 1            | 2                       | 3                |
| iv. Feeling tired or having little energy  | 0          | 1            | 2                       | 3                |

|   |   |                      |                    |                |                     |
|---|---|----------------------|--------------------|----------------|---------------------|
| v.  | Poor appetite or overeating   | 0                    | 1                  | 2              | 3                   |
| vi.   | Feeling bad about yourself - or that you're a failure or have let yourself or your family down  | 0                    | 1                  | 2              | 3                   |
| vii.  | Trouble concentrating on things, such as reading the newspaper or watching television   | 0                    | 1                  | 2              | 3                   |
| viii.   | Moving or speaking so slowly that other people could have noticed. Or, the opposite - being so fidgety or restless that you have been moving around a lot more than usual | 0                    | 1                  | 2              | 3                   |
| ix.   | Thoughts that you would be better off dead or of hurting yourself in some way   | 0                    | 1                  | 2              | 3                   |
|   |   | Not difficult at all | Somewhat difficult | Very difficult | Extremely difficult |
| 39.   | If you checked off any problems, how difficult have those problems made it for you to do your work, take care of things at home, or get along with other people?          |                      |                    |                |                     |
| Adapted from: Kroenke, K., & Spitzer, R. L. (2002). <i>The PHQ-9: a new depression diagnostic and severity measure. Psychiatric annals, 32(9), 509-515.</i> |   |                      |                    |                |                     |

## VII. General Anxiety Disorder scale (GAD-7)

| 40. Over the <b><i>LAST 2 WEEKS</i></b> , how often have you been bothered by any of the following problems? | Not at all | Several days | More Than Half the Days | Nearly Every Day |
|--|------------|--------------|-------------------------|------------------|
| a. Feeling nervous, anxious or on edge   | 0          | 1            | 2                       | 3                |
| b. Not being able to stop or control worrying  | 0          | 1            | 2                       | 3                |
| c. Worrying too much about different things  | 0          | 1            | 2                       | 3                |
| d. Trouble relaxing  | 0          | 1            | 2                       | 3                |



|   |                           |                          |                            |   |
|---|---------------------------|--------------------------|----------------------------|---|
| e. Being so restless that it is hard to sit still   | 0                         | 1                        | 2                          | 3 |
| f. Becoming easily annoyed or irritable   | 0                         | 1                        | 2                          | 3 |
| g. Feeling afraid as if something awful might happen  | 0                         | 1                        | 2                          | 3 |
| <p>41. If you checked off <u>any</u> problems, how <u>difficult</u> have these problems made it for you to do your work, take care of things at home, or get along with other people?</p> |                           |                          |                            |   |
| <b>Not difficult at all</b>   | <b>Somewhat difficult</b> | <b>Very difficult</b>    | <b>Extremely difficult</b> |   |
| <input type="checkbox"/>  | <input type="checkbox"/>  | <input type="checkbox"/> | <input type="checkbox"/>   |   |
| <p><i>Adapted from: Spitzer RL, Kroenke K, Williams JBW, Lowe B. A brief measure for assessing generalized anxiety disorder. Arch Intern Med. 2006;166:1092-1097.</i></p>                 |                           |                          |                            |   |

### VIII. WHO-5 Wellbeing Index

| 42. Instructions: Please indicate for each of the five statements which is closest to how you have been feeling over the last <b>2 WEEKS</b> .                                    | All of the time | Most of the time | More than half the time | Less than half the time | Some of the time | At no time |
|---|-----------------|------------------|-------------------------|-------------------------|------------------|------------|
| I have felt cheerful and in good spirits  | 5               | 4                | 3                       | 2                       | 1                | 0          |
| I have felt calm and relaxed  | 5               | 4                | 3                       | 2                       | 1                | 0          |
| I have felt active and vigorous   | 5               | 4                | 3                       | 2                       | 1                | 0          |
| I woke up feeling fresh and rested  | 5               | 4                | 3                       | 2                       | 1                | 0          |
| My daily life has been filled with things that interest me  | 5               | 4                | 3                       | 2                       | 1                | 0          |
| <p><i>Adapted from: World Health Organization (WHO). Wellbeing Measures in Primary Health Care. Regional Office for Europe, Copenhagen: The DepCare Project. WHO (1998a).</i></p> |                 |                  |                         |                         |                  |            |

## REFERENCES

1. AlHadi, A. N., AlAteeq, D. A., Al-Sharif, E., Bawazeer, H. M., Alanazi, H., AlShomrani, A. T., Shuqdar, R. M., & AlOwaybil, R. (2017). An arabic translation, reliability, and validation of Patient Health Questionnaire in a Saudi sample. *Annals of general psychiatry, 16*, 32. <https://doi.org/10.1186/s12991-017-0155-1>
2. Arenas, D. J., Thomas, A., Wang, J., & DeLisser, H. M. (2019). A systematic review and meta-analysis of depression, anxiety, and sleep disorders in US adults with food insecurity. *Journal of general internal medicine, 1-9*.
3. Arzhang, P., Gargari, B. P., Sarbakhsh, P., & Farzaneh, H. (2019). Household food insecurity and associated factors among rural and urban high school students in Kurdish population of Iran. *PROGRESS IN NUTRITION, 21*, 56-64.
4. Auerbach, R. P., Mortier, P., Bruffaerts, R., Alonso, J., Benjet, C., Cuijpers, P., . . . Kessler, R. C. (2018). WHO World Mental Health Surveys International College Student Project: Prevalence and distribution of mental disorders. *J Abnorm Psychol, 127*(7), 623-638. doi:10.1037/abn0000362
5. Ballard, T., A. Kepple, and C. Cafiero (2013). The food insecurity experience scale: development of a global standard for monitoring hunger worldwide. Rome: Food and Agriculture Organization

6. Becerra, M. B., & Becerra, B. J. (2020). Psychological Distress among College Students: Role of Food Insecurity and Other Social Determinants of Mental Health. *International Journal of Environmental Research and Public Health*, *17*(11), 4118.
7. Bhawra, J., Kirkpatrick, S. I., & Hammond, D. (2021). Food insecurity among Canadian youth and young adults: insights from the Canada Food Study. *Canadian Journal of Public Health*, 1-13.
8. Bocquier, A., Vieux, F., Lioret, S., Dubuisson, C., Caillavet, F., & Darmon, N. (2015). Socio-economic characteristics, living conditions and diet quality are associated with food insecurity in France. *Public Health Nutr*, *18*(16), 2952-2961. doi:10.1017/s1368980014002912
9. Bruening, M., Argo, K., Payne-Sturges, D., & Laska, M. N. (2017). The struggle is real: a systematic review of food insecurity on postsecondary education campuses. *Journal of the Academy of Nutrition and Dietetics*, *117*(11), 1767-1791.
10. Bruening, M., Brennhofner, S., Van Woerden, I., Todd, M., & Laska, M. (2016). Factors related to the high rates of food insecurity among diverse, urban college freshmen. *Journal of the Academy of Nutrition and Dietetics*, *116*(9), 1450-1457.

11. Bruening, M., Dinour, L. M., & Chavez, J. B. R. (2017). Food insecurity and emotional health in the USA: a systematic narrative review of longitudinal research. *Public health nutrition*, 20(17), 3200-3208.
12. Byrd-Bredbenner, C., Eck, K., & Quick, V. (2020). Psychometric properties of the generalized anxiety disorder-7 and generalized anxiety disorder-mini in United States university students. *Frontiers in Psychology*, 11, 2512.
13. Chalhoub, C., Obeid, S., Hallit, R., Salameh, P., & Hallit, S. (2021). Addictive profiles of Lebanese university students in terms of smoking, alcohol, and illegal drug use. *Environmental Science and Pollution Research*, 28(41), 57657-57666. doi:10.1007/s11356-021-14751-3
14. Darling, K. E., Fahrenkamp, A. J., Wilson, S. M., D'Auria, A. L., & Sato, A. F. (2017). Physical and mental health outcomes associated with prior food insecurity among young adults. *Journal of health psychology*, 22(5), 572-581.
15. Davis, H., Sisson, S. B., & Clifton, S. (2020). A call for evidence to support food security interventions on college campuses. *Journal of American College Health*, 1-3.
16. Duffin, E. (2021, May 3). *U.S. number of college students 1965-2020*. Statista. Retrieved from: <https://www.statista.com/statistics/183995/us-college-enrollment-and-projections-in-public-and-private-institutions/#:~:text=There%20were%20approximately%2019.6%20million,students%20enrolled%20in%20private%20colleges.>

17. Elgar, F. J., Pickett, W., Pförtner, T. K., Gariépy, G., Gordon, D., Georgiades, K., . . . Melgar-Quinonez, H. R. (2021). Relative food insecurity, mental health and wellbeing in 160 countries. *Soc Sci Med*, 268, 113556.  
doi:10.1016/j.socscimed.2020.113556
18. El Zein, A., Shelnutt, K. P., Colby, S., Vilaro, M. J., Zhou, W., Greene, G., ... & Mathews, A. E. (2019). Prevalence and correlates of food insecurity among US college students: a multi-institutional study. *BMC public health*, 19(1), 660.
19. Education in Lebanon, Statistics In Focus (SIF), Central Administration of Statistics, Lebanon, Issue number 3, April (2012). Retrieved from:  
[http://www.cas.gov.lb/images/PDFs/SIF/CAS\\_Education\\_In\\_Lebanon\\_SIF3.pdf](http://www.cas.gov.lb/images/PDFs/SIF/CAS_Education_In_Lebanon_SIF3.pdf)
20. El Zein, A., Mathews, A. E., House, L., & Shelnutt, K. P. (2018). Why are hungry college students not seeking help? Predictors of and barriers to using an on-campus food pantry. *Nutrients*, 10(9), 1163.

21. ESCWA. (2020, August 19). POVERTY IN LEBANON: SOLIDARITY IS VITAL TO ADDRESS THE IMPACT OF MULTIPLE OVERLAPPING SHOCKS. Retrieved December 06, 2020, from <https://www.unescwa.org/news/Lebanon-poverty-2020>
22. *Food security and COVID-19*. World Bank: Food Security and COVID-19. (2021, July 16). <https://www.worldbank.org/en/topic/agriculture/brief/food-security-and-covid-19>.
23. Food and Agriculture Organization of the United Nations (2021) The State of Food Insecurity in the World. <http://www.fao.org/publications/sofi/2021/en/> (accessed July 2021).
24. FAO. 2020. Lebanon | Revised humanitarian response (May–December 2020). Rome. <https://doi.org/10.4060/cb0204en>
25. Food and Agriculture Organization of the United Nations (2017) The State of Food Insecurity in the World. <http://www.fao.org/3/a-I7695e.pdf> (accessed January 2018).
26. Fang, D., Thomsen, M. R., & Nayga, R. M. (2021). The association between food insecurity and mental health during the COVID-19 pandemic. *BMC public health*, 21(1), 1-8.
27. Fares, K., Barada, D., Hoteit, M., & Haidar, M. A. (2020). Prevalence and correlates of food insecurity among Lebanese University students of Hadath Campus. *Atena Journal of Public Health*, 2-11.

28. Flores, H. L., & Amiri, A. (2019). CE: Addressing Food Insecurity in Vulnerable Populations. *AJN The American Journal of Nursing*, 119(1), 38-45.  
doi:10.1097/01.NAJ.0000552585.15471.a7
29. Fouad, F. M., Barkil-Oteo, A., & Diab, J. L. (2021). Mental Health in Lebanon's Triple-Fold Crisis: The Case of Refugees and Vulnerable Groups in Times of COVID-19. *Frontiers in Public Health*, 8(1049).  
doi:10.3389/fpubh.2020.589264
30. Frank, L. (2018). “Hungry for an Education”: Prevalence and Outcomes of Food Insecurity Among Students at a Primarily Undergraduate University in Rural Nova Scotia. *Canadian Journal of Higher Education/Revue canadienne d'enseignement supérieur*, 48(2), 109-129.
31. Freudenberg, N., Goldrick-Rab, S., & Poppendieck, J. (2019). College students and SNAP: The new face of food insecurity in the United States. *American Journal of Public Health*, 109(12), 1652-1658.
32. Gaines, A., Robb, C. A., Knol, L. L., & Sickler, S. (2014). Examining the role of financial factors, resources and skills in predicting food security status among college students. *International Journal of Consumer Studies*, 38(4), 374-384.  
doi:https://doi.org/10.1111/ijcs.12110

33. Garland, A. F., Deyessa, N., Desta, M., Alem, A., Zerihun, T., Hall, K. G., ... & Fish, I. (2018). Use of the WHO's Perceived Well-Being Index (WHO-5) as an efficient and potentially valid screen for depression in a low income country. *Families, Systems, & Health*, 36(2), 148.
34. Hagedorn, R. L., McArthur, L. H., Hood, L. B., Berner, M., Anderson Steeves, E. T., Connell, C. L., ... & Waity, J. F. (2019). Expenditure, Coping, and Academic Behaviors among Food-Insecure College Students at 10 Higher Education Institutes in the Appalachian and Southeastern Regions. *Current developments in nutrition*, 3(6), nzz058.
35. Hattangadi, N., Vogel, E., Carroll, L. J., & Côté, P. (2021). Is Food Insecurity Associated with Psychological Distress in Undergraduate University Students? A Cross Sectional Study. *Journal of Hunger & Environmental Nutrition*, 16(1), 133-148. doi:10.1080/19320248.2019.1658679
36. Henry, L. (2017). Understanding food insecurity among college students: Experience, motivation, and local solutions. *Annals of Anthropological Practice*, 41(1), 6-19.
37. Helmi, N. Z., Isa, K. A. M., & Masuri, M. G. (2020). Exploratory factor analysis on Food Insecurity Experience Scale (FIES): latest food insecurity measurement tool by FAO. *Healthscope: The Official Research Book of Faculty of Health Sciences, UiTM*, 3(2), 31-34.



38. International Food Policy Research Institute (2015) 2014–2015 Global Food Policy Report. Chapter 7: Conflict and food insecurity. [https://www.ifpri.org/sites/default/files/gfpr/2015/feature\\_3086.html](https://www.ifpri.org/sites/default/files/gfpr/2015/feature_3086.html) (accessed August 2018).
39. Jurewicz, I. (2015). Mental health in young adults and adolescents - supporting general physicians to provide holistic care. *Clinical medicine (London, England)*, 15(2), 151-154. doi:10.7861/clinmedicine.15-2-151
40. Jomaa, L., Naja, F., Kharroubi, S., & Hwalla, N. (2019). Prevalence and correlates of food insecurity among Lebanese households with children aged 4-18 years: findings from a national cross-sectional study. *Public health nutrition*, 22(2), 202-211. doi:10.1017/S1368980018003245
41. Jones, A. D. (2017). Food insecurity and mental health status: a global analysis of 149 countries. *American journal of preventive medicine*, 53(2), 264-273.
42. Kang, Y., Hurley, K. M., Ruel-Bergeron, J., Monclus, A. B., Oemcke, R., Wu, L. S. F., . . . Christian, P. (2019). Household food insecurity is associated with low dietary diversity among pregnant and lactating women in rural Malawi. *Public Health Nutr*, 22(4), 697-705. doi:10.1017/s1368980018002719

43. Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: validity of a brief depression severity measure. *Journal of general internal medicine, 16*(9), 606-613.
44. Lee, C. (2015, November 5). *Addressing mental health needs in Lebanon*. Humanitarian Practice Network. Retrieved February 4, 2022, from <https://odihpn.org/magazine/addressing-mental-health-needs-in-lebanon/>
45. Maalouf, F. T., Ghandour, L. A., Halabi, F., Zeinoun, P., Shehab, A. A., & Tavitian, L. (2016). Psychiatric disorders among adolescents from Lebanon: prevalence, correlates, and treatment gap. *Soc Psychiatry Psychiatr Epidemiol, 51*(8), 1105-1116. doi:10.1007/s00127-016-1241-4
46. Maroto, M. E., Snelling, A., & Linck, H. (2015). Food insecurity among community college students: Prevalence and association with grade point average. *Community College Journal of Research and Practice, 39*(6), 515-526.
47. Maynard, M., Andrade, L., Packull-McCormick, S., Perlman, C. M., Leos-Toro, C., & Kirkpatrick, S. I. (2018). Food insecurity and mental health among females in high-income countries. *International journal of environmental research and public health, 15*(7), 1424.

48. Meckamalil, C., Brodie, L., Hogg-Johnson, S., Carroll, L. J., Jacobs, C., & Côté, P. (2020). The prevalence of anxiety, stress and depressive symptoms in undergraduate students at the Canadian Memorial Chiropractic College. *J Am Coll Health*, 1-6. doi:10.1080/07448481.2020.1751173
49. Meza, A., Altman, E., Martinez, S., & Leung, C. W. (2019). “It’s a Feeling That One Is Not Worth Food”: A Qualitative Study Exploring the Psychosocial Experience and Academic Consequences of Food Insecurity Among College Students. *Journal of the Academy of Nutrition and Dietetics*, 119(10), 1713-1721.e1711. doi: <https://doi.org/10.1016/j.jand.2018.09.006>
50. Milojevich, H. M., & Lukowski, A. F. (2016). Sleep and mental health in undergraduate students with generally healthy sleep habits. *PLOS ONE*, 11(6), e0156372
51. Murthy, V. H. (2016). Food insecurity: a public health issue. *Public Health Reports (1974-)*, 131(5), 655-657.
52. Nagata, J. M., Palar, K., Gooding, H. C., Garber, A. K., Whittle, H. J., Bibbins-Domingo, K., & Weiser, S. D. (2019). Food insecurity is associated with poorer mental health and sleep outcomes in young adults. *Journal of Adolescent Health*, 65(6), 805-811.

53. Naal, H., Tavitian-Elmadjian, L. R., & Yacoubian, H. A. (2020). Predictors of mental health literacy in a sample of university students in Lebanon. *International Journal of Mental Health*, 1-23.  
doi:10.1080/00207411.2020.1838239
54. Nikolaus, C. J., An, R., Ellison, B., & Nickols-Richardson, S. M. (2020). Food Insecurity among College Students in the United States: A Scoping Review. *Advances in Nutrition*, 11(2), 327-348.
55. Patton-López, M. M., López-Cevallos, D. F., Cancel-Tirado, D. I., & Vazquez, L. (2014). Prevalence and correlates of food insecurity among students attending a midsize rural university in Oregon. *Journal of nutrition education and behavior*, 46(3), 209-214.
56. Pascoe, M. C., Hetrick, S. E., & Parker, A. G. (2020). The impact of stress on students in secondary school and higher education. *International Journal of Adolescence and Youth*, 25(1), 104-112. doi:10.1080/02673843.2019.1596823

57. Payne-Sturges, D. C., Tjaden, A., Caldeira, K. M., Vincent, K. B., & Arria, A. M. (2018). Student hunger on campus: Food insecurity among college students and implications for academic institutions. *American Journal of Health Promotion, 32*(2), 349-354.
58. Patient health questionnaire (PHQ-9 & PHQ-2). American Psychological Association. American Psychological Association (2022) Retrieved from: <https://www.apa.org/pi/about/publications/caregivers/practice-settings/assessment/tools/patient-health>
59. Pourmotabbed, A., Moradi, S., Babaei, A., Ghavami, A., Mohammadi, H., Jalili, C., ... & Miraghajani, M. (2020). Food insecurity and mental health: a systematic review and meta-analysis. *Public health nutrition, 23*(10), 1778-1790.
60. Prince, M., Patel, V., Saxena, S., Maj, M., Maserko, J., Phillips, M. R., & Rahman, A. (2007). No health without mental health. *The lancet, 370*(9590), 859-877.
61. Raskind, I. G., Haardorfer, R., & Berg, C. J. (2019). Food insecurity, psychosocial health, and academic performance among college and university students in Georgia, USA. *Public health nutrition, 22*(3), 476.
62. Rehm, J., & Shield, K. D. (2019). Global burden of disease and the impact of mental and addictive disorders. *Current psychiatry reports, 21*(2), 1-7.

63. Reeder, N., Tapanee, P., Persell, A., & Tolar-Peterson, T. (2020). Food Insecurity, Depression, and Race: Correlations Observed Among College Students at a University in the Southeastern United States. *International journal of environmental research and public health*, *17*(21), 8268.  
<https://doi.org/10.3390/ijerph17218268>
64. Sawaya, H., Atoui, M., Hamadeh, A., Zeinoun, P., & Nahas, Z. (2016). Adaptation and initial validation of the Patient Health Questionnaire–9 (PHQ-9) and the Generalized Anxiety Disorder–7 Questionnaire (GAD-7) in an Arabic speaking Lebanese psychiatric outpatient sample. *Psychiatry research*, *239*, 245-252.
65. Sheikomar, O. B., Dean, W., Ghattas, H., & Sahyoun, N. R. (2021). Validity of the Food Insecurity Experience Scale (FIES) for Use in League of Arab States (LAS) and Characteristics of Food Insecure Individuals by the Human Development Index (HDI). *Current developments in nutrition*, *5*(4), nzab017.  
<https://doi.org/10.1093/cdn/nzab017>
66. Soldavini, J., Andrew, H., & Berner, M. (2021). Characteristics associated with changes in food security status among college students during the COVID-19 pandemic. *Transl Behav Med*, *11*(2), 295-304. doi:10.1093/tbm/ibaa110
67. Salameh, P., Aline, H. A. J. J., Badro, D. A., Abou Selwan, C., Randa, A. O. U. N., & Sacre, H. (2020). Mental health outcomes of the COVID-19 pandemic and a collapsing economy: perspectives from a developing country. *Psychiatry research*, *294*, 113520.

68. Sheikomar, O. B., Dean, W., Ghattas, H., & Sahyoun, N. R. (2021). Validity of the Food Insecurity Experience Scale (FIES) for Use in League of Arab States (LAS) and Characteristics of Food Insecure Individuals by the Human Development Index (HDI). *Current developments in nutrition*, 5(4), nzab017.
69. Sternman, C., & Jack, A. (2018, November). When Students are Hungry: An Examination of Food Security in Higher Education. Retrieved from: <https://www.gse.harvard.edu/news/uk/18/11/food-insecurity-college-campuses>
70. Topp, C. W., Østergaard, S. D., Søndergaard, S., & Bech, P. (2015). The WHO-5 Well-Being Index: a systematic review of the literature. *Psychotherapy and psychosomatics*, 84(3), 167-176.
71. Weaver, R. R., Vaughn, N. A., Hendricks, S. P., McPherson-Myers, P. E., Jia, Q., Willis, S. L., & Rescigno, K. P. (2019). University student food insecurity and academic performance. *Journal of American College Health*, 1-7.
72. Weaver, L. J., & Hadley, C. (2009). Moving beyond hunger and nutrition: a systematic review of the evidence linking food insecurity and mental health in developing countries. *Ecology of food and nutrition*, 48(4), 263-284.
73. Winkler, P., Formanek, T., Mlada, K., Kagstrom, A., Mohrova, Z., Mohr, P., & Csemy, L. (2020). Increase in prevalence of current mental disorders in the context of COVID-19: analysis of repeated nationwide cross-sectional surveys. *Epidemiology and psychiatric sciences*, 29, e173-e173.  
doi:10.1017/S2045796020000888

74. Wolfson, J. A., & Leung, C. W. (2020). Food Insecurity During COVID-19: An Acute Crisis With Long-Term Health Implications. *American Journal of Public Health, 110*(12), 1763-1765. doi:10.2105/AJPH.2020.305953
75. UNHCR. (2021). Lebanon. Retrieved March 21, 2021, from <https://reporting.unhcr.org/lebanon#:~:text=Lebanon%20remains%20the%20country%20hosting%20Palestinian%20refugees%20under%20UNRWA's%20mandate>
76. United States Department of Agriculture Economic Research Service. Definitions of food security. Retrieved from <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security.aspx>. Accessed 18 Dec 2021.
77. Zolfaghari, H., Bayat, B., Izadi, A., Askari, G., & Piran, F. (2021). Food Insecurity and Depressive Symptoms among university Students: A Cross-Sectional Study from Iran. *Journal of Nutrition and Food Security, 6*(1), 6-13. doi:10.18502/jnfs.v6i1.5295