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April 8, 2024

What Determines the Changing Food Security of Syrian Refugees in Lebanon?

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Abstract

What Determines the Changing Food Security of Syrian Refugees in Lebanon?

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Abstract: This study investigates the factors influencing the food security of Syrian refugees in Lebanon during the years surrounding the 2019 financial crisis. Utilizing household-level data, it focuses on demographic characteristics, asset access, and adverse conditions as key variables affecting food security outcomes. Employing an economic perspective and spanning multiple years, the research utilizes two distinct measures of food security. The analysis, conducted via multiple linear regression, reveals significant impacts of household head gender, presence of children under 5, asset ownership, and access to WFP e-cards on increasing food consumption and decreasing coping strategies. The findings underscore the multidimensional nature of food security among refugees, influenced by economic conditions and changes in humanitarian aid. Further exploration of these determinants is crucial for effective intervention and policy development.

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What Determines the Changing Food Security of Syrian Refugees in Lebanon?

Sofia Lozano-Samper

March 2024

1 Introduction

Nestled along the shores of the Mediterranean, Lebanon is bordered by Syria to the North and East, and Israel to the South, with the vast expanse of the Mediterranean Sea to the West. Despite its compact size, Lebanon has grappled with one of the most significant refugee influxes per capita worldwide, largely stemming from the Syrian Civil War since 2013. According to UNHCR estimates, Lebanon currently provides refuge to approximately 1.5 million Syrian individuals out of the 6 million who have sought asylum since the onset of the Syrian conflict in 2011. [12]

The year 2019 marked a turning point for Lebanon, as it's macroeconomic situation deteriorated. It grappled with social unrest and political turmoil, catalyzing a

financial crisis further aggravated by the devastating Port of Beirut explosion in 2020. These crises have compounded existing socio-economic challenges, including unemployment, inadequate access to food and water, and structural deficiencies, affecting both Lebanese citizens and non-Lebanese residents.

Amidst these crises, food insecurity looms large, particularly among Syrian refugees in Lebanon. Food security, defined as reliable access to sufficient and nutritious food for a healthy life, is a critical concern affecting individuals and households, especially those in extreme poverty. Understanding the determinants of food insecurity among Syrian refugees in Lebanon is paramount, as it sheds light on broader social and economic phenomena and offers insights into potential solutions.

The significance of addressing food insecurity among Syrian refugees in Lebanon cannot be overstated. Beyond its humanitarian implications, the issue has far-reaching consequences for regional stability and poses moral imperatives for action. By delving into the factors driving food insecurity, this research aims to contribute to informed policy-making and interventions to mitigate recurrent food crises and their broader socioeconomic impacts.

Previous studies have highlighted the multifaceted nature of food insecurity, particularly in refugee populations. Studies by the Research, Assessment, and Monitoring unit of the WFP utilized the Vulnerability Analysis and Mapping Surveys (mVAM) for Lebanon, revealing the significant impact of unemployment on household food consumption and coping mechanisms. [10]. Other literature points to gender disparities in food insecurity outcomes, with women in the Arab region reporting higher prevalence of severe food insecurity in countries with low Human Development Index (HDI). [11]

The paper "Prevalence and Correlates of Food Insecurity among Palestinian Refugees in Lebanon: Data from a Household Survey" finds that higher food expenditure and possession of food-related assets were significantly associated with food security. After adjusting confounders, households where at least one member suffered from an acute illness remained significantly more likely to be severely food insecure [6]. Expanding from the aforementioned literature, this paper seeks to answer the following question: What determines the changing food security of Syrian refugees in Lebanon? For this purpose, a descriptive approach will be taken.

2 Historical Context

Lebanon's history is intertwined with its regional dynamics, particularly its relationship with Syria. From the Maronite Christian presence under the Ottoman Empire to their shared struggle for independence from France in 1945, both nations have navigated complex political and demographic ties. The Syrian Civil War further cemented migration flows between the two countries, with Lebanon emerging as a primary destination for Syrian refugees (along with Turkey and Jordan).

The Syrian occupation of Lebanon from 1976 to 2005 left a lasting impact on Lebanon's sociopolitical landscape, culminating in the assassination of Prime Minister Rafik Hariri in 2005, a pivotal moment in Lebanon's modern history. Despite efforts towards coexistence and democratic governance, challenges persist, further complicated by ongoing conflicts and geopolitical tensions.

Lebanon's recent history has been marked by economic downturns, political instability, and humanitarian crises, intensified by the influx of Syrian refugees. The

financial crisis that began in 2019, coupled with the Beirut port explosion and the COVID-19 pandemic, has deepened socioeconomic challenges, leading to widespread food insecurity, hyperinflation, and shortages of essential goods.

The depreciation of the Lebanese pound, along with soaring inflation rates, has strained household budgets, leading to extreme coping mechanisms such as forgoing food consumption and compromising on healthcare and education. The imposition of export bans by Saudi Arabia in 2021 further compounds the situation.

There's an evident increase in food inflation starting towards the end of 2019. Food inflation moves together with the country's inflation rate but is overall more volatile (figure 2). This price hike serves as evidence of the problem of the decreasing value of humanitarian aid given to the country. The more recent decrease in inflation could be since most of the items are now priced in dollars, as well as greater Lira stability relative to the USD. However, inflation still has triple digits, and Lebanon's macroeconomic situation is still considered recessionary.

To get a clear picture of the vulnerability of Syrian refugees in Lebanon, it's important to put it into perspective compared to the other major population groups. This is to give an overview and understand the outcomes that will be studied about food security of the refugees, in the context of the country.

The most recent report by the ILO in Lebanon sheds light on the labor force dynamics among different population groups, particularly highlighting the situation of Syrian refugees compared to Palestinians and vulnerable Lebanese. It reveals stark realities, such as the prevalence of informal employment, with a striking 95 percent of Syrian workers and 93.9 percent of Palestinian workers engaged in precarious work,

compared with 64.3 percent of vulnerable Lebanese. Income levels also reflect disparities, with 74.9 percent of Syrian workers and 65.6 percent of Palestinian workers earning less than 750,000 Lebanese pounds per month, compared to 39.6 percent of Lebanese workers. Moreover, Lebanese workers tend to work longer hours, with a notable percentage holding multiple jobs. [1]

The Lebanese labor market faces challenges in absorbing the additional labor force. Syrian refugees are allowed to work during the first six months in Lebanon but are required to obtain a work permit afterward. This process is institutionally complex due to complex labor laws, such as the requirement to obtain legal and financial guarantees from their employers. [4]

Social security coverage remains inadequate, particularly for Palestinians and Syrians, with over 90 percent not contributing to such funds. Access to paid leave, including sick and maternity leave, is also limited for Syrian and Palestinian workers compared to their Lebanese counterparts. Household composition varies, with Syrian households having the highest average number of children, and Lebanese households being the smallest. Additionally, age correlates with income, as hourly wages are lowest among youth and highest among older workers. These findings underscore the vulnerability and challenges faced by Syrian refugees in Lebanon's labor market, emphasizing the need for targeted interventions to improve their economic security and well-being. [1]

Regarding food aid and subsidies in Lebanon, according to the 2015 FAO Overview report for Lebanon, around 83 percent of the people in need of food are Syrian refugees. [4] The rest are Palestinian refugees and Lebanese households. The situation of food insecurity for Syrians in Lebanon deteriorated from 66 percent of

households to 75 percent being food insecure in 2014. 62 percent of households were labeled as mildly food insecure, 12 percent as moderately food insecure, and 0.4 percent as severely food insecure. [4]

Over half of the Syrian households assessed in the VASYR surveys lived below the national poverty line [12] and food is their main expenditure category. (As seen in Figure 1, food expenditure per capita increases with income, a relationship that will be explored further on). Subsidies are a key factor to consider when understanding the food situation. Lebanon's Ministry of Economy and Trade has been setting the price of local Lebanese flatbread, while other bakery products and bread types are not. [4]. (This is consistent with the preliminary data of bread consumption among households being one of the less affected items, compared to other food groups). Bread is the main remaining subsidy.

However, the Lebanese Central Bank (BDL) also put into place a set of subsidies for fuel, wheat, and medicine imports in September 2019. [10] In May 2020, this was expanded, by introducing a subsidized food basket composed of 30 items. However, in March 2021, the number of subsidized items was lowered (as the financing costs for the subsidy became unsustainable, growing from 12 million USD a month in 2020 to 20 million USD a month in 2021).

Food assistance provided to Syrian refugees has come primarily from the WFP and its partner organizations, through e-cards. Since December 2014, around 27,209 vulnerable households have received unconditional value-based cash transfers to make food purchases every month. The e-card program has been implemented with success, despite its initial shortfalls in funding in 2015, and is expanding its impact. It had 10,000 beneficiary households in 2019 and expanded to 75,000 in 2022. It's funded by

a World Bank loan [10] and partner organizations. Households are selected through a proxy means tests methodology, for which the VASYR surveys are used. Eligible households receive 30 USD per individual, per month, on their e-card.

The success of the e-card mechanism depends on the information available to households about food and the WFP store locations, but also on the proper functioning and responsiveness of supply in the food market. Other forms of aid include the National Poverty Targeting Program (NPTP), the Emergency Social Safety Net (ESSN), and the WFP's Emergency Response Plan (ER). The first is funded through World Bank Loans and implemented by the WFP and the Ministry of Social Affairs. The latter two are also supported by the WFP. [10]

In light of Lebanon's complex history and current challenges, understanding the determinants of food insecurity among Syrian refugees is imperative. By addressing this pressing issue, policymakers and stakeholders can formulate targeted interventions to alleviate suffering and promote sustainable solutions. This research endeavors to contribute novel insights into the determinants of food insecurity among refugees and its broader socioeconomic implications in Lebanon and beyond.

In Figure 3, Lebanon's inflation rate is measured in percentage points, and the World Food Price Index is measured in index points (left axis). [1] Due to differences in scale, the food price inflation is measured on the right axis. The Global Food Price Index measures the monthly change in international prices of a basket of food commodities [2] [3]

[1]Figure 3 source: https://tradingeconomics.com/lebanon/inflation-cpi

[2]Food Agriculture Organization definition (https://www.fao.org/worldfoodsituation/en).

[3]Figure 2 created using data from: https://data.humdata.org/dataset/wfp-food-prices-for-lebanon/resource/772bc34e-1327-4ada-b2eb-e72020a546f2

Figure 1: Relationship between Income per Capita and Food Expenditure per Capita

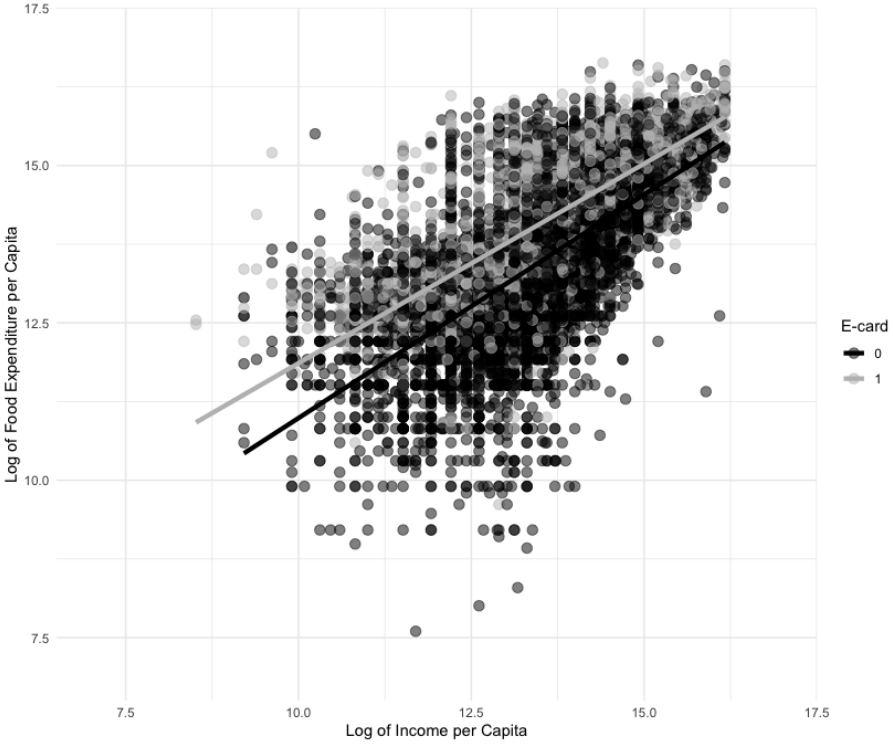


Figure 2: Price Evolution of Commodities in Lebanon

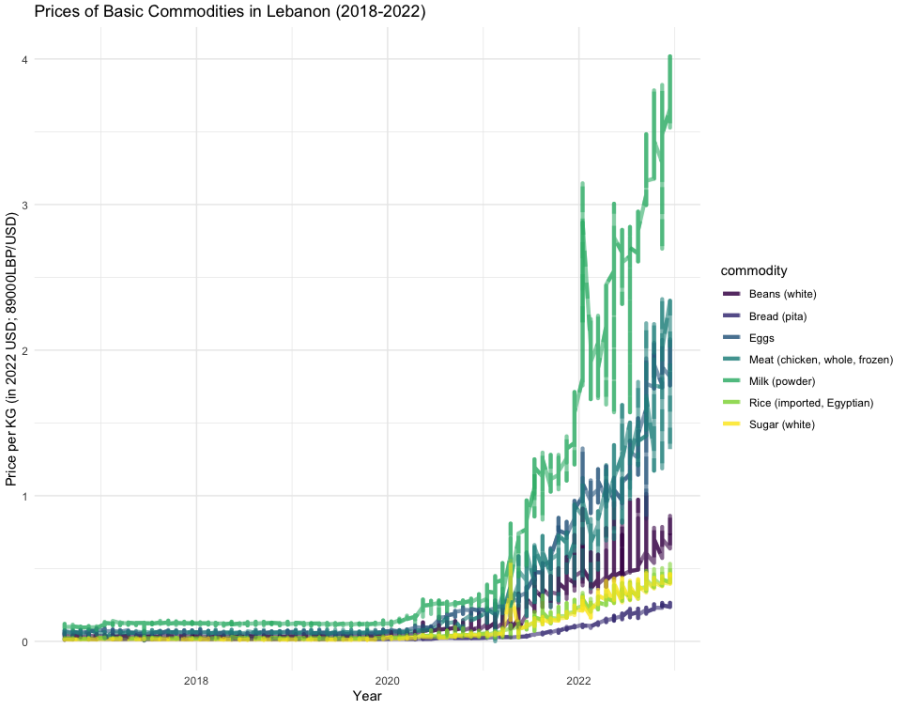
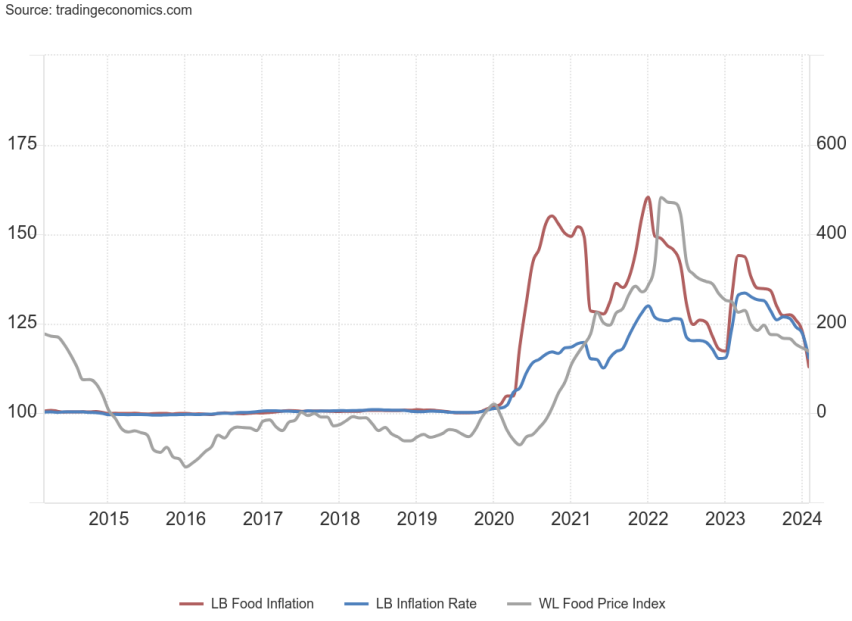


Figure 3: Food Inflation and Inflation rate as compared to Global Food Price Index.



3 Data Description

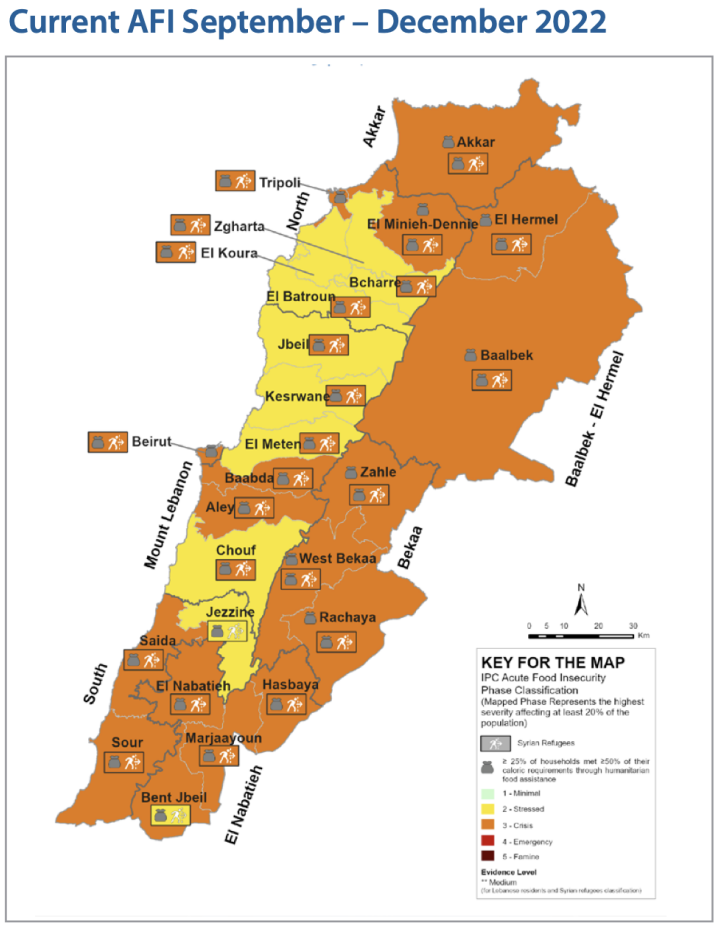
The data used in this research is derived from the UNHCR's Vulnerability Assessment of Syrian Refugees in Lebanon (VASYR). This dataset is comprised of multi-sectoral survey responses collected annually, covering over 4000 households each year. The surveys were conducted at both household and individual levels, offering comprehensive insights into Syrian refugees' circumstances from 2016 to 2022.

To compile the dataset, several data cleaning and variable matching operations were conducted. One of the key metrics created was the Food Consumption Score (FCS), calculated as a weighted average based on the frequency of consumption of various food groups within each household for the week preceding the survey. Respondents reported the number of times they consumed each major food group over the past week, using a scale ranging from 1 to 7. This data, in conjunction with the relative nutritional values assigned to each food group, was used to compute the FCS, which is represented as an index ranging from 0 to 112.

The threshold values for poor, borderline, and acceptable FCS have been established at 28 and 42, per the suggestions outlined in the WFP Emergency Food Security Assessment Handbook. This adjustment was made considering the high frequency of consumption of oil and sugar across all households surveyed. The threshold values were raised to prevent the distortion of the Food Consumption Scores (FCS) for those included in the survey.

$$\text{FCScore} = \sum_{i=1}^{7} F_i \times W_i \tag{1}$$

Figure 4: Acute Food Insecurity Phase Classification



North Lebanon and Mount Lebanon are the two governorates classified in a stress phase. The rest are considered in a crisis phase. [9]

F_i represents the frequency of consumption for food group i. P_i represents the points assigned to food group i. The summation is performed over the main seven food groups for each household:

$$FCScore = (F_1 * W_1) + (F_2 * W_2) + ... + (F_6 * W_6) + (F_7 * W_7) \tag{2}$$

The second important measure is the reduced Coping Strategies Index (rCSI). It quantifies the extent to which households employ coping mechanisms to navigate food scarcity. By analyzing shifts in the severity of coping behaviors amidst shortages, the rCSI serves as a direct indicator of food insecurity. (Specific weighting and coping strategy details are outlined in the annex for reference). Adapted to Lebanon, a low rCSI category corresponds to a score lower than 18.6; a medium corresponds to between 18.6 and 37.5, and a high coping category is indicated by a score above 37.5. The index has a maximum score of 63.

A higher rCSI indicates that Syrian refugee households adopted more strategies to deal with the lack of or access to food in the past week. A high rCSI score also implies that households have adopted severe strategies more frequently.

$$CSI = \sum_{i=1}^{5} (C_i \times W_i) \tag{3}$$

To compile the pooled cross-sectional data set used in the analysis, the VASYR data from the UNHCR Microdata Library was used, which has archival data of Syrian refugees in Lebanon. Variable matching methods were employed in R. For variable matching due to inconsistent variable labeling year to year on the surveys,

the data dictionaries, available on the VASYR repository, were used. Individual-level and household-level surveys for each year from 2018 to 2022 were selected, and after a thorough variable cleaning, the individual and household data for each year were grouped based on household ID. The five data frames were appended by year.

The dataset contains some important variables that indicate the livelihood-based coping mechanisms used by a household. During data processing, the variables were grouped into three different indexes: Stress Coping, Crisis Coping, and Emergency Coping. These three indexes are dummies that show whether the household has restored to at least one of the coping mechanisms for the category.

The tables below (Tables 1-3) present a descriptive overview of the frequency of livelihood-based coping strategies employed by Syrian refugee households. These tables are essential for conducting an initial vulnerability assessment among refugees. Understanding the prevalence and nature of these coping strategies is foundational for the coming analysis in this paper. Notably, the majority of households adopted coping mechanisms categorized as "Stress," indicating a significant level of strain on their livelihoods. Additionally, more than half of the households resorted to "Crisis" coping mechanisms, with a smaller proportion resorting to "Emergency" measures. It is particularly noteworthy that the year 2019 witnessed the highest adoption of Emergency coping mechanisms, aligning with the onset of the recession. This suggests a heightened level of vulnerability among refugee households during this period. (VASYR 2020) [12]

Harmonizing the dataset posed a considerable challenge due to the absence of directly comparable variables across the years. To ensure consistency and reliability, extensive efforts were dedicated to data cleaning and the identification of variables

Table 1: Coping Strategies in Vulnerability Categories

Stress	**Crisis**	**Emergency**
Bought Food on Credit	Reduced Expenditure on Education	Sold House
Spent Household Savings	Reduced Expenditure on Essential Items	Sold Assets
Sold Household Goods	Restored to Child Marriage	Exploitative Work
		Restored to Child Exploitative Work
		Restored to Child Labor
		Restored to Begging

Note: This table presents coping strategies associated with different vulnerability categories. i.e: If a household restored to any of the strategies on the first column, it's considered in a situation of Stress

Table 2: This table shows the frequencies of households by governorate using different levels of coping mechanisms. The variables are dummies, that indicate whether the household has used any coping mechanism under the category.

	Governorate	No Coping used	Stress	Crisis	Emergency
1	Akkar	0.15	0.77	0.56	0.10
2	Baalbeck-Hermel	0.05	0.92	0.59	0.11
3	Beirut	0.17	0.75	0.58	0.11
4	Bekaa	0.04	0.93	0.72	0.09
5	Mount Lebanon	0.19	0.75	0.51	0.11
6	Nabatiyeh	0.16	0.77	0.61	0.16
7	North Lebanon	0.16	0.78	0.61	0.10
8	South Lebanon	0.10	0.84	0.69	0.16

Table 3: Frequency of Coping Mechanisms adopted per Year

	Year	No Coping used	Stress	Crisis	Emergency
1	2018	0.14	0.82	0.55	0.08
2	2019	0.03	0.95	0.86	0.55
3	2020	0.21	0.72	0.5	0.09
4	2021	0.16	0.76	0.57	0.1
5	2022	0.12	0.8	0.6	0.12

conducive to cross-year comparison. This meticulous process involved scrutinizing various indicators related to household demographics and standard of living. Carefully examining and selecting variables that offered insights into these aspects allowed to enhance the dataset's analytical utility and facilitate robust economic analyses.

On the other hand, the asset variables provide some information about household income. Having access to more assets is usually related to lower poverty and a higher standard of living. In calculations of multidimensional poverty, assets, sanitation and electricity are used as variables for living standards.

Table 4: Summary Statistics

	Variable	Mean	StDev.
A. Food Security Indexes	rCSI	13.74	9.21
	FCScore	50.12	18.47
B. Demographic	Household Size	4.96	2.19
	Number of Children under 5	0.93	0.96
	Head of Household is Female	0.16	0.37
	Age of Head of Household	38.24	10.77
	Regular Work	0.59	0.72
	Legal Residency	0.63	1.08
	Spouse Absent	0.33	0.47
	Highest Education Level	2.61	5.88
C. Assets and Access to Services	Degree of low Shelter Quality	1.72	1.83
	Hygiene and Personal Care Supplies	2.73	1.10
	Shared Toilets	0.36	0.48
	Spent on Drinking Water	0.43	0.50
	Communication Assets	1.44	0.55
	Has Mobile Phone	0.76	0.43
	High Expenditure per Capita	0.36	0.48
	WFP E-card use	0.32	0.46
D. Adverse Conditions	Violence	0.09	0.28
	Unstable Accommodation Period	0.19	0.39
	Child Labour	0.05	0.22
	Illness	0.51	0.50
E. Additional income measures	Total Household Income (in 2018 USD)	7.94	13.38
	Income per Capita (in 2018 USD)	1.96	4.03
	Expenditure on Food	15.06	19.86
N=		**23609**	

4 Models

To evaluate the impact of demographic characteristics, asset-related factors, and standard of living variables on food security outcomes, we developed a model with two distinct outcomes. This model involves regressing demographic data, access to services, vulnerability indicators, as well as two interaction terms related to gender and expenditure. These regressions are conducted to analyze their effects on the two different food security outcomes.

Basic Model

$$Y_i = \tau_g + \delta_y + \beta X' + \epsilon \tag{4}$$

Where:

- Y_i denotes the outcome variables for household i:
  - FCScore: The Food Consumption Score is a continuous measure of household food consumption, ranging from 0 to 112.
  - rCSI: The Reduced Coping Strategies Index is a continuous measure of food-related coping strategies, ranging from 1 to 63.
- τ_g and δ_y are governorate and year fixed effects. There are six years, 2018-2022, and eight governorates, the primary administrative territorial division in Lebanon. Year 2018 and Lebanon are used as reference groups.
- X' is a vector of household level demographic, asset-related and quality of life related controls. (See annex for complete variable descriptions).
- ϵ represents the error term.

Interaction Terms For heterogeneity analysis, two interaction terms were incorporated into the model. The first interaction term investigates the interplay between having a female head of household and spouse absence. This allows to examine how the presence of a female head of household may interact with the absence of a spouse, potentially influencing household dynamics, decision-making processes, and resource allocation strategies.

The second interaction term delves into the relationship between high expenditure per capita and the use of a WFP e-card, a form of assistance provided by the World Food Program. This interaction term allows to investigate how household expenditure per capita may interact with the use of a WFP e-card, potentially affecting food security, consumption patterns, and overall household well-being. This interaction is included to explore the potential moderating effect of WFP e-card usage on the relationship between household expenditure and various socioeconomic outcomes.

The models will likely over/under estimate the effect of some covariates on food security, because of the missing values.

5 Results

In the analysis conducted, insights are gained into two pivotal measures of food security: the Reduced Coping Strategies Index (rCSI) and the Food Consumption Score (FCScore). A lower rCSI denotes reduced reliance on food-based coping strategies, signaling improved food security, while a higher FCScore reflects greater dietary diversity and availability, indicative of enhanced food security. The parallel analysis of these measures, in line with contemporary food security literature, is an adequate approximation to measuring food security. The findings shed light on several demographic variables that significantly influence food security outcomes.

Table 5: Regression Results (Coefficients)

	Dependent variable			
	rCSI (1)	FCScore (2)	rCSI (3)	FCScore (4)
Household Size	-0.075^{**}	0.802^{***}	-0.254^{***}	0.861^{***}
	(0.032)	(0.065)	(0.040)	(0.078)
Children Under 5	0.319^{***}	0.818^{***}	0.350^{***}	0.598^{***}
	(0.075)	(0.154)	(0.092)	(0.182)
Age of Head of Household	0.001	-0.021^{*}	-0.001	0.004
	(0.006)	(0.013)	(0.007)	(0.015)
Female Head of Household	1.335^{***}	-1.656^{***}	0.727^{***}	-0.775^{*}
	(0.175)	(0.360)	(0.209)	(0.415)
Spouse Absent	-0.245	0.509	-0.334	0.672
	(0.210)	(0.431)	(0.260)	(0.515)
Female head*Spouse Absent	0.143	-0.565^{**}	0.037	-0.623^{**}
	(0.124)	(0.253)	(0.149)	(0.296)
Regular Work	-1.002^{***}	1.762^{***}	-0.593^{***}	0.626^{***}
	(0.092)	(0.187)	(0.103)	(0.205)
Legal Residency Status	-0.201^{***}	0.060	-0.184^{***}	-0.318^{**}
	(0.058)	(0.118)	(0.068)	(0.134)
Highest Grade Category	-0.011	0.111^{***}	-0.013	0.114^{***}
	(0.011)	(0.023)	(0.013)	(0.025)
Low Shelter Quality			0.544^{***}	-0.496^{***}
			(0.040)	(0.078)
Personal Hygiene Assets			-0.530^{***}	2.801^{***}
			(0.091)	(0.180)
Communication Assets			-0.645^{***}	3.713^{***}
			(0.136)	(0.269)
Mobile Phone	-0.105	-0.486	0.065	-0.864^{**}
	(0.152)	(0.315)	(0.198)	(0.393)
Spent on Water	-0.625^{***}	3.213^{***}	-0.163	2.216^{***}
	(0.124)	(0.256)	(0.150)	(0.297)
High Expenditure per Capita			-2.069^{***}	4.920^{***}
			(0.185)	(0.366)
E-card	-0.411^{***}	1.647^{***}	-0.664^{***}	1.709^{***}
	(0.140)	(0.288)	(0.190)	(0.376)
HighExp*Ecard			1.123^{***}	-1.362^{**}
			(0.311)	(0.616)
Shared Toilets	1.390^{***}	-0.591^{*}	1.064^{***}	-0.284
	(0.163)	(0.337)	(0.214)	(0.423)
Violence	2.266^{***}	0.170	1.602^{***}	-0.307
	(0.213)	(0.435)	(0.249)	(0.493)
Temporary Residence	0.525^{***}	-0.973^{***}	0.740^{***}	-0.431
	(0.152)	(0.314)	(0.191)	(0.378)
Child Labour	1.727^{***}	-2.038^{***}	1.789^{***}	-1.748^{***}
	(0.272)	(0.558)	(0.323)	(0.641)
Illness	0.670^{***}	-0.743^{***}	0.365^{***}	-0.768^{***}
	(0.117)	(0.241)	(0.140)	(0.277)
Constant	13.416^{***}	52.966^{***}	18.305^{***}	40.837^{***}
	(0.370)	(0.767)	(1.429)	(3.205)

Note: Standard errors are in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 6: Regression Results (Test Statistics)

	Specification 1		Specification 2	
Observations	20,198	19,774	14,714	14,704
R^2	0.139	0.119	0.169	0.159
Adjusted R^2	0.138	0.118	0.168	0.157
Residual Std. Error	8.384	17.293	8.285	16.411
F Statistic	112.089***	92.166***	90.789***	84.141***

Note: Standard errors are in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Household composition had an important influence on the food security outcomes of Syrian refugees. Larger household size emerges as a key factor positively associated with food security, underlining the importance of familial support networks. Conversely, the presence of young children is linked to more reliance on coping mechanisms but also correlates with increased food security, suggesting a dual relationship driven by a heightened sense of urgency in meeting the nutritional needs of vulnerable family members. Female-headed households, however, exhibited lower food consumption scores. This trend was particularly notable among women with absent spouses who faced challenges in assuming household responsibilities, finding employment, and generating additional income for the family. Overall, it's clear that familial support networks played a crucial role in determining food security outcomes.

Engaging in regular employment or having attained education is associated with improved food security, although the effect of regular employment is more significant. Educated households typically gain access to higher-qualified jobs with better wages. Moreover, individuals in food-secure households tend to be better nourished, which not only contributes to their overall well-being but also enhances their performance in educational and professional settings. The FAO underscores this connection, stating that improved nutrition leads to higher cognitive achievement and increased learning

capacity, resulting in higher labor productivity and incomes [5] . However, despite these benefits, refugees in Lebanon often struggle to cover the costs of both food and essential non-food items with their wages. [12] The percentage of working refugees saw a slight increase from 26% in 2020 to 33% in both 2021 and 2022, yet it remains relatively low compared to the national labor force participation rate.

While having legal residence status is associated with reduced coping, it doesn't consistently lead to higher food consumption scores, highlighting a deeper structural issue: the high renewal fees for syrian refugees who didn't register with the UNHCR before 2015. On the other hand, access to personal hygiene and communication assets is associated with reduced reliance on food coping strategies as well as higher food consumption scores, emphasizing the importance of already having basic assets in facilitating food security.

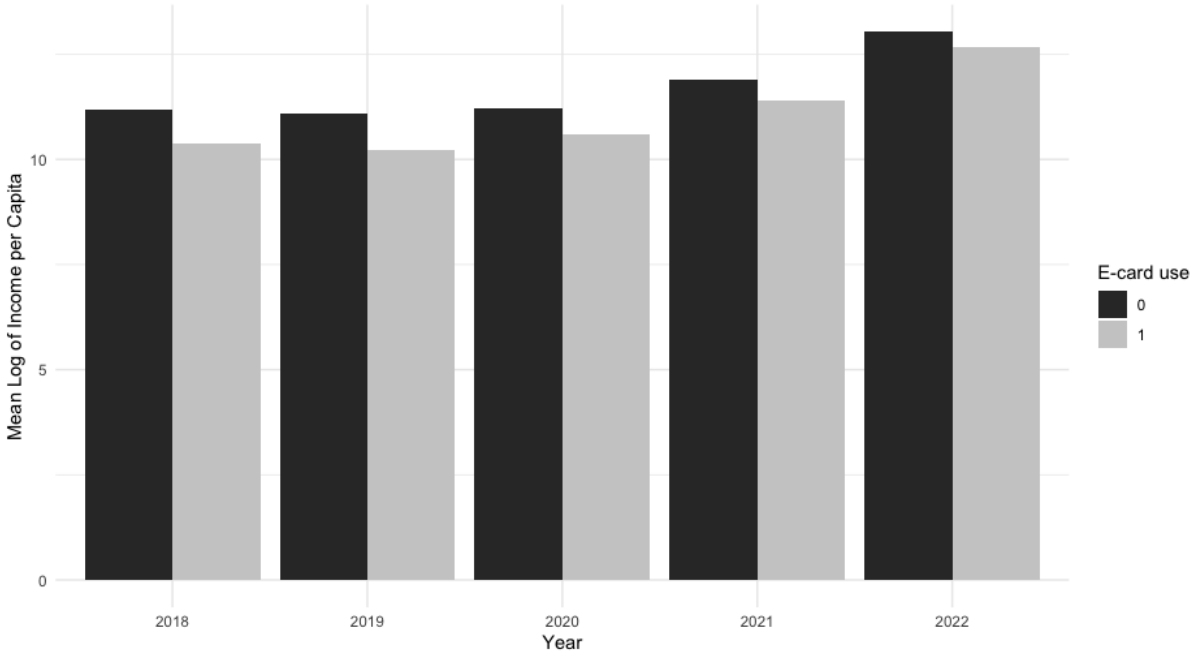
Surprisingly, mobile phone ownership is correlated with lower food consumption scores, possibly due to high initial purchase costs or ongoing cellular data and sim card service expenses [7]. Refugees benefit from being connected when they have family members back home. The use of technology could be a positive externality if used for remittance, loan and information validation purposes. Further, higher expenditure per capita and utilization of WFP e-cards are linked to enhanced food security, yet the interaction between these variables yields unexpected results warranting further investigation: households who have higher expenditure and are e-card users have lower food security.

Additionally, vulnerability indicators such as shared toilet facilities and exposure to violence are associated with higher coping strategy use, indicative of lower food insecurity. Other vulnerability measures such as temporary residence, child labor,

and illness are linked to significantly lower food security, highlighting the complex interplay between socioeconomic factors and nutritional outcomes.

Through this comprehensive analysis, valuable insights are provided into the determinants of food security among Syrian refugee households, paving the way for targeted interventions and policy initiatives aimed at alleviating food insecurity.

Figure 5: Price Evolution of Commodities in Lebanon



To see whether the differences between income per capita of those households with and without access to e-cards were statistically significant, it was necessary to conduct a statistical test. The differences are statistically significant, with lower income for e-card users. This could be due to their high reliance on the e-cards of relatively lower-income households. If households are using job coping strategies and can use e-cards, they might stop coping, which might lower their income but improve their food security.

Table 7: Results of Welch Two Sample t-test

Statistic	**Value**
Data	income_per_capita by ecard_dummy
t	10.182
df	18749
p-value	$< 2.2 \times 10^{-16}$
Alternative Hypothesis	true difference in means between group 0 and group 1 is not equal to 0
95% Confidence Interval	(37150.63, 54863.06)
Sample Estimates	
Mean in Group 0	189060.4
Mean in Group 1	143053.6

Table 8: Regression Results

	Dependent variable:	
	rCSI	FCScore
	(1)	(2)
Income per Capita, USD	-0.006^{***}	0.007^{***}
	(0.0003)	(0.001)
Ecard Income per Capita, USD	-0.024^{***}	0.099^{***}
	(0.004)	(0.009)
Constant	14.064^{***}	57.418^{***}
	(0.221)	(0.466)
Observations	23,522	23,038
R^2	0.133	0.092
Adjusted R^2	0.132	0.091
Residual Std. Error	8.578 (df = 23508)	17.589 (df = 23024)
F Statistic	277.167^{***} (df = 13; 23508)	179.422^{***} (df = 13; 23024)
Note:		*p<0.1; **p<0.05; ***p<0.01

To further investigate the relationship between income and e-card use. Table 8 complements these findings. In the context of this analysis, where income variables are measured in US dollars, the marginal effect signifies the impact of a one-dollar increase in income on the dependent variables. For income per capita, each additional dollar correlates with a reduction of approximately 0.006 units in the rCSI, indicating a lessened reliance on coping mechanisms among Syrian refugees in Lebanon. Moreover, with every one-dollar increment in income, the FCScore increases by around 0.007 units, reflecting an enhancement in their food consumption patterns.

In contrast, the marginal effect of e-card income per capita demonstrates a more substantial influence on both rCSI and FCScore. For every one-dollar increase in e-card income, the rCSI diminishes significantly by approximately 0.024 units, showcasing a more pronounced alleviation of coping strategies. Furthermore, the FCScore experiences a remarkable improvement of approximately 0.099 units with each additional dollar of e-card income. This notable disparity underscores the effectiveness of the World Food Program's (WFP) e-card assistance in bolstering the well-being and food security of Syrian refugees in Lebanon.

6 Conclusion

In an ideal food-secure world, the plans implemented by the government and non-governmental agencies would be sustained programs rather than humanitarian aid. However, the instability of the Lebanese economic situation and the hardships of its population have prevented a sustained and stable response to food insecurity.

A limitation of my measurements of food security is the fact that they're mea-

surements at the household level, and according to Drèze and Sen, 1993, this can lead to a downward bias in estimating food insecurity, as it rules out within-group variability. [3] However, it's arguable that given the granularity of the available data, aggregating at the household level can be as close as desirable to a valid measure. It's also been adopted by many similar studies measuring food security.

The results show a statistically significant impact of the number of children and WFP e-card utilization on food security outcomes, through lower vulnerability. This has interesting implications for the future of effective food assistance and calls for a change in the way aid is being delivered. The limitations of the data and variable inconstancy across the years also call for an improvement in the way data is collected. This is particularly important in developing nations, where international non-governmental organizations may assume a protagonist role in data collecting when the National Center for Statistics doesn't step up to the challenge.

While most of the focus of humanitarian organizations is provided during the initial phase of displacement, it's also important to consider prolonged refugee situations. Due to the incidence of other factors in food insecurity, it might be important to make targeted programs for other basic needs, such as rent, and non-food commodities. The benefits of value-based vouchers as opposed to cash transfers have been studied in the context of Syrian Refugees in Lebanon and Turkey. Seeing the strong positive correlation found between e-card use and better food security complements these findings.

For further research and a more complete study, it would be interesting to have a treatment and a control group, of two Syrian refugee populations with similar baseline characteristics. If only some of the refugees received e-cards, it would be possible to

better measure the effects of this product, by doing a difference in differences design. The closest data for this is refugees who receive e-cards along with an additional transfer to assist with other non-food-related needs (Multipurpose Cash Assistance).

Only refugees who are registered with the UNHCR receive e-cards. It could be interesting to explore those unregistered refugees. However, given the goal of registering refugees upon their arrival, the time frame for this experiment would be challenging: a refugee household might have been unregistered upon its arrival to Lebanon, but for the UNHCR to collect data about them and not proceed to register them would have more complex implications. Households are eligible for treatment conditional on being Syrian refugees and falling under a vulnerability category.

The e-card program was studied in Indonesia [2] using an RCT conducted by the government, where the Rastra food program was implemented at random in 42 out of 105 districts. The effects of this were a significant improvement for the sub-population in extreme poverty. An implication of expanding the e-card transfer amounts is driving demand, and as a result, increasing food inflation.

An implication of improving targeting methods to avoid inefficient allocation would be that the improvement of targeting methods might raise program implementation costs (requiring more surveys, social workers on the field, and time). If the marginal cost of targeting improvement is higher than what could be allotted to each beneficiary, then it wouldn't be worth it to improve allocation. Further, beneficiary inclusion error for E-cards in Lebanon tends to be small, and not significant, according to 2014 post-distribution monitoring findings [13].

Another interesting approach would consist of taking a population of Lebanese

residents with similar vulnerability profiles to those surveyed in VASYR and comparing the two outcomes. However, the Central Administration of Statistics (CAS) in Lebanon's last household survey was for 2018-2019. Although it includes labor and household conditions data, it doesn't have comparable food or coping variables.

Among refugee populations, it's important to consider potential relocation effects. As refugees move out of Lebanon, into Turkey and Europe, it's difficult to have a multiple-period study. Or it would need a very large sample to account for attrition. As the survey is not longitudinal, by not being able to follow the households over time incorporating concerns about relocation in the analysis is not possible.

Another possible avenue for further research includes using data from the pilot implementation of the Dalili app, a web-based application launched in 2018. It ran an initial pilot in one of the districts. However, it was discontinued in 2020. Given the VASYR data, major assumptions would need to be made, such as assuming that registered refugees with a smartphone and WiFi access are users of the app. For privacy reasons, there's no information on real-time usage of the app. If the app was still working, ML models such as web scraping could be used to see app activity by district and compare this to E-card transaction data and food security outcomes.

Additionally, looking at the spillover effects deserves attention. Does the influx of refugees affect the food security of Lebanese residents? Studies have looked at the labor market effects of the influx of Syrian refugees, and job competition. Even before the Syrian conflict, the country was already facing considerable challenges in keeping its labor force productively employed. However, the literature on food security effects is limited.[8] Prevailing Food security among refugees is a multidimensional problem, from the surrounding economic circumstances to the deteriorating value

of international humanitarian aid. The impact of this range of determinants must continue to be further studied.

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7 Annex

7.0.1 Annex 1: Technicalities of the Role of WFP and UNHCR in Lebanon

In Lebanon, the UNHCR and WFP play distinct yet complementary roles in addressing the needs of Syrian refugees. The UNHCR has shifted its approach towards fostering self-reliance among refugees since the adoption of the Executive Committee Conclusion on protracted refugee situations in 2009. This shift entails a focus on livelihoods to enhance refugees' self-sufficiency. To support this aim, the UNHCR has implemented a market-oriented, data-driven Global Livelihood Strategy (2014-2018) and established Minimum Criteria for Livelihoods Programming.

On the other hand, the WFP leverages its expertise in Vulnerability Analysis and Mapping (VAM) to provide comprehensive support in both humanitarian and developmental contexts. Drawing upon a diverse array of tools, including general distributions, nutrition assistance, livelihood asset-creation, risk insurance, and supply chain interventions, the WFP fosters resilience among refugees. Moreover, the WFP's experience in facilitating south-south and triangular cooperation, coupled with its proficiency in social protection and national safety nets, enhances its effectiveness in addressing refugee challenges.

Furthermore, the WFP offers various transfer modalities, such as food and cash-based transfers, which can be tailored to the specific needs of the context. This adaptability allows for a more responsive and efficient approach to supporting refugees. Overall, the UNHCR and WFP collaborate to provide comprehensive assistance to

Syrian refugees in Lebanon, addressing both immediate humanitarian needs and promoting long-term self-reliance and resilience. (Protracted Refugees Report, UNHCR, 2021).

7.0.2 Annex 2: Types of Variables used in Summary Statistics and Regression Tables

For clarification purposes, it's important to mention that dummy variables and categorical variables alike were used and displayed throughout the paper. Here's a more detailed account of which variables were dummies and which were categorical, to allow a better interpretation of the results for the reader. The categorical variables were assigned numerical indices. Years and Governorates were coded as dummies, as well as: Regular Work, Mobile Phone, High Expenditure per Capita, SMS Services, Shared Toilets, Insecurity, Unstable Accomodation, e-cards, and Child labor.

7.0.3 Annex 3: Data Dictionary of Variables Used

The following data descriptions are taken from the VASYR data dictionaries, and generated by the author for those variables created.

Table 9: Description of Variables

Variable Name	**Description and Notes on Computation**
rCSI	Reduced Coping Strategies Index. Weighted index using five food-based coping strategies. During the last 7 days, how many times (in days) did your household do any of the following to cope with lack of food? (Min: 1, Max: 7): Eat cheaper food that is not as good as normal (W=1.0) Borrowed food or received help from friends or relatives (W=2.0) Eaten less meals a day than normal (W=1.0) Eaten smaller amounts of food than normal at meals (W=1.0) Adults eat less so younger children can eat (W=3.0) Sent a member of household to eat elsewhere (W=1.0)

Table 9 continued from previous page

Variable Name	Description and Notes on Computation
FCScore	Food Consumption Score. Weighted score using the main food groups and their nutritional weights. The weights were calculated by the FAO according to cultural considerations for Lebanon. Main staples (W=2) Pulses (W=3) Vegetables, green/leafy (W=1) Fruit, orange (rich in vitamin C) (W=1) Meat/Fish (W=4) Milk (W=4) Sugar (W=0.5) Oil (W=0.5)
Household Size	Number of individuals in the household (Count)
Number of Children under 5	Number of young children (Count)
Head of Household is Female	Is the head of the household a female? (Dummy) Computed from "relationship" variable
Age of Head of Household	Age of head of household (Numeric) Max age, if there were two Heads in the household (uncommon scenario)
Regular Work	Is at least one member of the family working on a regular basis?
Legal Residency	Does at least one family member hold legal residence status?
Spouse Absent	Is the spouse of any member of the family absent from the household? (1-spouse present). Taken from Marital Status.
Highest Education Level	What is the highest level of education obtained amongst all members? (1 through 5, where 5 is university, and 0 is illiterate.) (Max).

Table 9 continued from previous page

Variable Name	Description and Notes on Computation
Degree of low Shelter Quality	Does the house have leakages, rottenness, broken pipes or unsealed windows? (Sum)
Hygiene and Personal Care Supplies	More than 1 member of the household has access to personal care supplies.
Shared Toilets	Do members of the household share toilets amongst themselves or community?
Spent on Drinking Water	Did the household spend part of their disposable income on water for drinking purposes?
Communication Assets	Does the household have access to WiFi and/or electricity supplies?
Has Mobile Phone	Does at least one member of the household have a phone? (Unspecified whether smartphone or other)
High Expenditure per Capita	Does the household spend more per month than the mean of its governorate and year?
WFP E-card use	Does the household use food E-cards regularly? (If E-card was amongst the 1, 2 or 3rd source of income.)
Violence	Are any members of the household exposed to violent or unsafe situations?
Unstable Accommodation Period	Did the family move in the past six months, or is planning to move in the next six?
Child Labour	Do any children younger than 14 work?
Illness	Do any members of the family have disabilities, temporary, or chronic illnesses?
Total Household Income	What is the total income of the household (LBP, Nominal).
Income per capita (LBP)	Total income divided by number of individuals in the household.