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RECEIVED 06 December 2023

ACCEPTED 19 January 2024

PUBLISHED 14 February 2024

CITATION

Makoukji M, Amhez NEH, Yehya AAK,
Ghattas H, Abunnasr Y and Zurayk R (2024)
Food systems under shock: the evolution of
food security status of Karantina residents
after the Beirut explosion.
Front. Sustain. Food Syst. 8:1351541.
doi: 10.3389/fsufs.2024.1351541

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Food systems under shock: the evolution of food security status of Karantina residents after the Beirut explosion

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Robust food systems are crucial for ensuring access to affordable and nutritious food, particularly in times of crisis. Economic instability, currency devaluation, and political turmoil can disrupt food systems, leading to higher food prices, compromised nutrition, and increased vulnerability. Lebanon is a stark example of this, where a catastrophic explosion in Beirut's Port in 2020 worsened an existing economic and humanitarian crisis. The depreciation of the Lebanese currency led to soaring food prices, impacting people's ability to buy food, and pushing many into poverty, illustrating the significant impact of the state food systems during crises (FAO, 2021). In times of crisis, a simplified food system, relying on emergency food aid supplies, replaces conventional food system, as food aid and cash transfers become the primary source upon which the affected population depends to ensure their food security and meet their essential needs. In this article we report on research conducted between 2020 and 2022 focusing on the impacts of the Beirut explosion on food security status of the permanent residents the Karantina neighborhood—the closest residential area to the Beirut port. We surveyed 100 households chosen at random, examining shifts in food security and nutrition at three intervals: 6 months prior to the explosion, 6 months following it, and 2 years after the event. The findings revealed a sharp decline in food security and diet quality among residents in the two-year period following the explosion. The proportion of food-secure households fell from 71% to 2%, while those with acceptable food consumption decreased from 96% to 30%. Additionally, income and debt situations worsened significantly. Almost 95% of residents resorted to crisis coping strategies, such as using savings, borrowing money for food, selling furniture, withdrawing children from school, and reducing education and health expenses, rendering them highly vulnerable. Food and cash assistance were provided to all households for 6 months to one-year post-explosion, resulting in improved food security and consumption after 6 months. However, these gains diminished 2 years later, once the assistance ended, revealing a lack of resilience in the food system. In conclusion, soon after the assistance stopped, the prolonged deterioration of Lebanon's economic situation, compounded by multiple crises, pushed these households further into poverty, exacerbating food insecurity. This research underscores the critical importance of sustained support and comprehensive economic reforms to rebuild food systems and promote nutrition resilience in crisis-affected regions.

KEYWORDS

food (in)security, Beirut blast, food systems, simplified emergency food system, humanitarian assistance, Lebanon

Introduction

On 4th August 2020, a massive explosion occurred at the Port of Beirut, causing extensive destruction in the Lebanese capital, resulting in over 200 fatalities and more than 5,000 injuries (ACTED, 2020). This devastating event led to the obliteration and impairment of over 40,000 structures within a 10-km radius of the port area, encompassing both residential and commercial buildings (Beirut Urban Lab, 2021).

At the time of the blast, Lebanon had already confronted a series of crises, commencing with an economic downturn in 2019 that has continued to deteriorate. The World Food Programme reported that food inflation rates in Lebanon surged by 245% between October 2019 and June 2020, as a result of the compounding impact of the financial crisis and the advent of the COVID-19 pandemic (UNICEF, 2021). Since 80% of the food available in Lebanon's market is imported, the drastic depreciation of the Lebanese currency and the restrictions imposed on food trade during COVID-19 rendered food less available, more expensive, and sometimes even unaffordability (FAO, 2009). In 2020, both food and commodity prices experienced further substantial increases, stemming from the devaluation of the Lebanese currency, which had a direct detrimental effect on the purchasing capacity and food access of households (Kharroubi et al., 2021). By 2021, 1 year after the catastrophic port explosion, the economic crisis's reverberations persisted and intensified due to the absence of urgently needed economic reforms and a lack of accountability and governance. The economic crisis has led to the currency depreciation, high inflation, and increasing food and non-food prices, making it increasingly challenging for households to access and afford an adequate and nutritious diet, resulting in a growing number of Lebanese and refugee families falling deeper into poverty, with millions of people requiring humanitarian aid (World Food Programme, 2021a; Integrated Food Security Phase Classification, 2022).

Adding to the adversity, the COVID-19 pandemic exacerbated the circumstances. Successive lockdown measures resulted in income losses and reduced purchasing power, business shutdowns, and an economic downturn (Béné, 2020). Thus, resulting in the most severe and protracted economic crisis, ranked among the world's top three most severe crises (Kharroubi et al., 2021). By the end of 2021, food insecurity among the population rose to 46% (World Food Programme, 2022).

The Karantina neighborhood was identified as one of the most severely affected areas by the explosion due to its proximity to the port, and consequently, it received a significant portion of the humanitarian aid (Beirut Urban Lab, 2021). This research seeks to ascertain whether the humanitarian aid which largely consisted of cash assistance, extended to the permanent residents of Karantina, exerted enduring and sustainable effects on their food security status and enhance the resilience of the food system. Resilience is the ability of the food system to bounce back after shocks, transcending the immediate recovery phase, in terms of both quantity and quality of

their dietary intake. Therefore, in this research, we hypothesize that cash assistance, when given in conjunction with in-kind food assistance, can be used to catalyze sources of income, and therefore rebuild livelihoods.

Complex food system, and simplified emergency food system

Food security is a fundamental concept that underscores the well-being of individuals and communities. It is articulated as follows: "Food security exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO, 2009). This definition encapsulates the multi-dimensional nature of food security, emphasizing not just the quantity of food available but also the quality, safety, and equitable access to it. In the broader context of global challenges, achieving food security is a paramount goal, and it relies heavily on the functioning and resilience of food systems, which must adapt to the changing needs and demands of a population (Fanzo, 2023).

Food systems comprise the entirety of individuals, institutions, environments, and activities involved in the production, processing, distribution, marketing, sale, preparation, and consumption of food (Fanzo et al., 2020). Food systems involve food production, considering economic, social, and environmental dimensions. As food systems evolve and adapt, they directly influence the availability, accessibility, and quality of food for people and communities on a global scale (FAO, 2018). Hence, ensuring the resilience and sustainability of food systems as a fundamental component of achieving and upholding food security for all (FAO, 2018; Fanzo, 2023). Resilience and sustainability are characteristics that are bolstered by the complexity of food systems: the higher the diversity of actors, institutions, and activities, the more likely the system will be able to absorb shocks and bounce back to its initial state (FAO, 2021).

Food systems are not immune to crises, and they often face significant challenges that can have far-reaching impacts on food security (FAO, 2018). These crises can manifest in various forms, such as natural disasters, economic shocks, conflicts, and health emergencies. Natural disasters like droughts, floods, or extreme weather events can disrupt agricultural production, leading to food shortages and price spikes. Economic shocks, such as inflation or recession, can affect people's purchasing power and ability to access affordable, nutritious food (Rother et al., 2022). Conflict and political instability can disrupt food supply chains and displace communities, leading to food insecurity among vulnerable populations. Health emergencies, like pandemics, can disrupt food distribution, labor availability, and consumer behavior, further straining food systems (FAO, 2021).

In times of crisis and in the context of humanitarian aid, the functioning of the food system is intentionally simplified to efficiently meet urgent needs. Effective responses and strategies are crucial to mitigate the impacts of these crises on food security. We call this a Simplified Emergency Food System (SEFS) which primarily constitutes emergency food aid, social safety nets, infrastructure repair, and policies aimed at stabilizing prices and ensuring equitable food access (FAO, 2021). Simplified Emergency Food System (SEFS) often play a crucial role in the efficient delivery of food aid. This system is designed to streamline processes, reduce complexity, and ensure that aid reaches those in need as swiftly as possible. SEFS may involve providing readily consumable and non-perishable food items which require minimal preparation and can be distributed without the need for complex cooking facilities or storage (Barrett, 2006).

By focusing on simplicity, food aid organizations can maximize the reach of their assistance, even in challenging conditions (FAO, 2021). SEFS is valuable in emergency situations, such as natural disasters or conflicts, where immediate relief is essential. Additionally, SEFS reduce the burden on the affected populations, who may lack the resources or facilities to engage in elaborate food preparation during a crisis (Barrett, 2006).

Humanitarian assistance post-conflict and crises plays a crucial role in addressing immediate needs, providing essential resources like food, cash, water, health services, and shelter. This aid not only responds to urgent humanitarian requirements but also facilitates community empowerment, allowing for self-reliance, the restoration of essential services, and the revival of economic activities (Martin Belmonte et al., 2021). In times of crisis, the purchasing power of vulnerable, low-income populations significantly affects their food security, leading to prolonged recovery periods due to factors such as the loss of breadwinners and habitat, as well as the elimination of income sources (Deraniyagala, 2016). Therefore, cash assistance plays a pivotal role in times of crisis by fostering resilience within communities and individuals. In the face of emergencies such as natural disasters, pandemics, or economic downturns, providing direct financial support empowers people to navigate challenges and rebuild their lives with dignity (Fadlallah, 2022).

While a simplified food system is effective for addressing short-term food security needs, it is important to recognize that it may not provide the full spectrum of diversity necessary for long-term food security, nutrition and health. Therefore, alongside this simplified approach, there should be a broader strategy to transition affected communities back to more diverse and sustainable food system as they recover from the crisis. This dual approach, incorporating simplified food system for immediate relief and a longer-term plan for recovery and resilience, is key to addressing food security challenges in crisis situations (FAO, WTO, and WB, 2023).

Food assistance in times of crises: the case of Lebanon

In Lebanon, the confluence of the economic crisis, currency devaluation, and food price inflation precipitated a dire food security situation. Reports by the World Food Programme (2022) and the Integrated Food Security Phase Classification (2022)

illustrate the escalating food insecurity in the country. The ongoing economic turmoil is expected to persist, exacerbating food prices and undermining individuals' ability to afford essential necessities. These reports reveal that a substantial proportion of the Lebanese population experienced inadequate diets and food insecurity in 2021 and 2022, with the situation projected to deteriorate further in 2023. Coping strategies have become commonplace, including food-based and livelihood-based measures (Integrated Food Security Phase Classification, 2022; World Food Programme, 2022).

Collectively, these reports highlight the inextricable link between food insecurity, unemployment, fragile livelihoods, limited access to education and healthcare, and the erosion of purchasing power. Notably, even substantial levels of cash assistance have encountered diminishing effectiveness in the face of reduced purchasing power, inflation, unfavorable currency exchange rates, and surging food prices. Thus, addressing the underlying causes of food insecurity in Lebanon becomes paramount, necessitating sustained humanitarian interventions that focus on augmenting household incomes and enhancing access to nutritious and affordable food for all Lebanese residents (Integrated Food Security Phase Classification, 2022; World Food Programme, 2022).

Objective of the study

This research aims to assess changes in food security in Karantina following the August 4th explosion, focusing on assistance and support provided.

We therefore set out to describe the changing socio-demographic and food security situation of the permanent households of the Karantina neighborhood, immediately after and 2 years after the Beirut port explosion.

Materials and methods

Study area

Karantina, a neighborhood near the Port of Beirut, was severely affected by the Beirut blast in August 2020. Historically a low-income community, it currently houses some of Lebanon's poorest families and Syrian refugees. This region was already facing economic, pandemic-related, and post-explosion challenges, with many residents losing their jobs (ACTED, 2020).

Karantina's population includes Palestinians, Lebanese Christians, Syrian refugees, and migrant workers. It has two main residential zones: Al-Saydeh (Christian majority) and Al-Khodor (Lebanese Sunni Muslims and Syrian refugees). The neighborhood's infrastructure is inadequate, lacking public transportation and social facilities (Beirut Urban Lab, 2021).

Following the explosion, humanitarian organizations swiftly mobilized to provide aid. Non-governmental organizations (NGOs) and volunteers extended assistance in the form of food distribution, housing repairs, and monetary aid. Nonetheless, with the passage of time, humanitarian organizations gradually phased out their support, leaving Karantina's residents, much like the rest of Lebanon, grappling with the persisting economic crisis (Beirut Urban Lab, 2021). Due to

its elevated vulnerability and the substantial impact of the explosion, Karantina was selected as the focal point of this research.

Study population and sample

This study targeted permanent household residents in Karantina. Eligibility criteria mandated that households be permanent residents of Karantina and that interviewees be adult males or females aged between 18 and 65, possessing familiarity with the household, and the capability to provide responses to inquiries concerning socio-demographics, food security, and dietary habits.

A systematic approach was used to select a sample of 100 households (33% of the population) from approximately 300 in Karantina (Beirut Urban Lab, 2021). Face-to-face interviews were conducted covering household demographics, food security, and food consumption. The data was gathered at three distinct time points to facilitate the comparison of residents' food intake and food security before, during, and 2 years after the explosion. This approach enabled the examination of the explosion's impact on the households.

Data collection

Data were collected via an online app, Survey123, in February and March 2022, covering three periods: pre-explosion (6 months before the explosion, using recall), during the explosion (6 months after the explosion), and almost 2 years after.

After introducing the project to each of the 100 heads of household, interviews were conducted using five questionnaire modules:

- 1 Socio-demographic: A set of 30 questions explored socio-economic characteristics and demographics, including household size, education, employment, income, expenditures, and debt.
- 2 Assistance Received After the Explosion: Four yes-or-no questions aimed to understand the type of assistance received in Karantina following the explosion.
- 3 Food Insecurity Experience Scale (FIES): This scale, developed by the FAO, comprises eight yes-or-no questions to assess individuals' ability to access sufficient food. The cutoff points used in this study are based on the global standard: 0–3 indicates food security, 4–6 indicates moderate food insecurity, and 7–8 indicates severe food insecurity (Food and Agriculture Organization of the United Nations, 2013).
- 4 Food Consumption Score (FCS): This indicator assessed food consumption and dietary diversity using nine distinct food groups. The adjusted cutoff points used were: 0–28 for poor food consumption, 28.5–42 for borderline food consumption, and >42 for acceptable food consumption (World Food Programme, 2008).
- 5 Livelihood Coping Strategies (LCS-FS): These strategies assessed how households respond to food shortages or insufficient funds for food purchases, categorized into stress coping, crisis coping, and emergency coping (World Food Programme, 2021b).

Statistical analysis

STATA/SE 15.1 was used for statistical analysis. Significance was determined using *p*-values ($\alpha=0.05$) and 95% confidence intervals (95% CI). Chi-square and logistic regression were used to assess significant differences and associations.

Limitations

The study is constrained by several limitations, notably a small sample size of only 100 households, which hinders the ability to detect significant changes over time and assess the impact of assistance on food security. While suitable for a descriptive community case study, the sample size is insufficient for running a multivariable model and thus adjusting for confounders. Consequently, the study is limited to examining associations rather than causations. Additionally, due to the small sample size and the absence of variability in the FCS 6 months post-explosion and the FIES 2 years post-explosion, a bivariate logistic regression was deemed unsuitable. Consequently, the application of bivariate logistic regression was restricted to the FCS at the two-year mark and the FIES at the six-month mark. Thus, a simultaneous analysis within the same timeframe was not feasible.

Results and discussion

Socio-demographic indicators

Eighty of the hundred households identified as Lebanese, while 20% were of Syrian nationality (Table 1). Household composition is shown in Table 1, with larger households predominating; 40% of households consisted of more than five occupants. Educational attainment levels among the heads of households were generally middle to high, with 41% having attained middle to high school education, and 18% having a university-level education (Table 1).

When comparing the socio-demographic characteristics of permanent residents in the Karantina neighborhood 6 months after the explosion with those 2 years later, several noteworthy trends emerge. There was a slight decrease in unemployment, dropping from 57 to 54% over 2 years. The income landscape shifted, with a decline in the percentage of households with no income (from 42 to 31%) and an increase in middle-income earners (from 5 to 19%), although fewer households earned above the minimum wage of \$118 in 2022 (from 49 to 29%). Most notably, the percentage of residents with debt surged from 18 to 53% over the two-year period, reflecting a significant financial challenge faced by the community in the aftermath of the explosion.

Six months after the explosion, everybody received food assistance, and 76% of the population received cash assistance. Whereas, 2 years after the explosion, all households did not receive food assistance nor cash assistance.

Food security indicators

Acceptable food consumption decreased from 97% 6 months prior to the explosion to 30% 2 years after. In parallel severe food insecurity increased from 3% to 34% over the same time period (Table 2).

TABLE 1 Socio-demographic characteristics of the permanent residents of Karantina 6 months after and 2 years after the explosion.

Variable	Categories	% 6 months post-explosion	% 2 years post-explosion
Household size	1–2	28	28
	3–4	32	32
	≥5	40	40
Nationality	Lebanese	80	80
	Syrian	20	20
Education of head of household	Never attended	8	8
	Elementary	33	33
	Middle/High School	41	41
	University	18	18
Employment of head of household	Yes	43	46
	No	57	54
Income quintiles	Low	42	31
	Lower-Middle	0	10
	Middle	33	19
	Upper-Middle	5	25
	High	20	15
Food expenditure quintiles	Low	22	31
	Lower-Middle	29	15
	Middle	14	18
	Upper-Middle	31	16
	High	4	20
Total expenditure quintiles	Low	24	20
	Lower-Middle	19	20
	Middle	22	22
	Upper-Middle	18	18
	High	17	20
Food assistance	Yes	100	0
	No	0	100
Cash assistance	Yes	76	0
	No	24	100
Debt	Yes	18	53
	No	82	47

Dietary changes in the population 6 months and 2 years after the explosion were examined. Significant changes were observed in the following food groups, fruits, vegetables, and pulses from 6 months after to 2 years after the explosion.

Household consumptions of food groups is shown in Figures 1, 2, showing worsening consumption over time. Six months post-explosion, many households consumed fruits, vegetables, and pulses more than four times per week; with 33, 71, and 39%, respectively. In contrast, 2 years after the explosion, fruits were mostly consumed less than one time per week; 85% of the households consuming fruits less than one time per week. As for vegetables and pulses, most of the households were consuming them between two to three times per week; with 70% and 93%, respectively (Figures 1, 2).

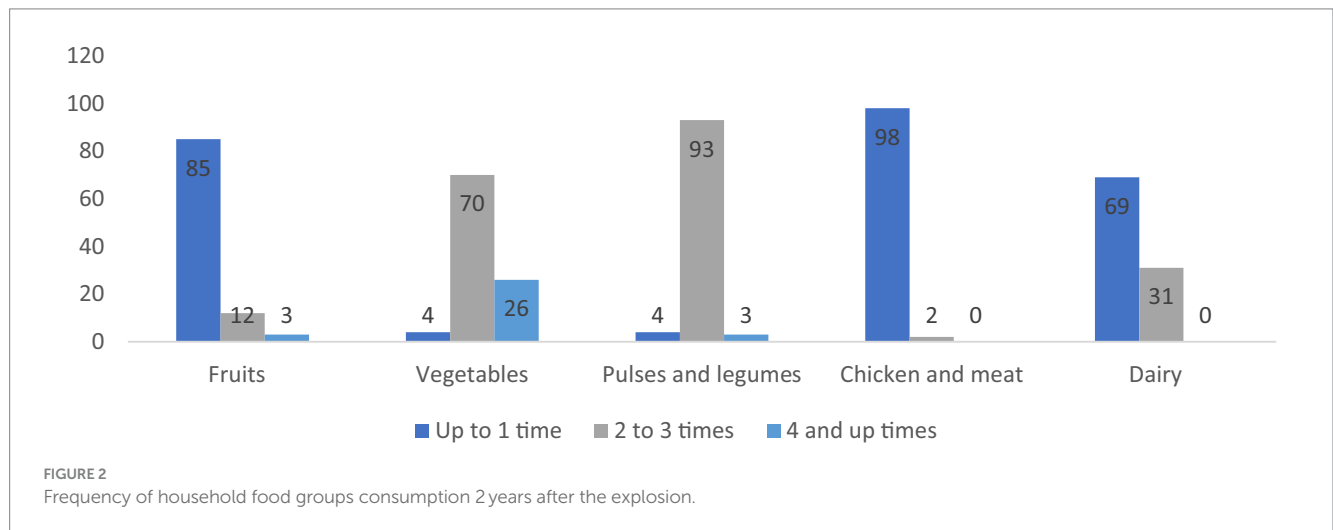
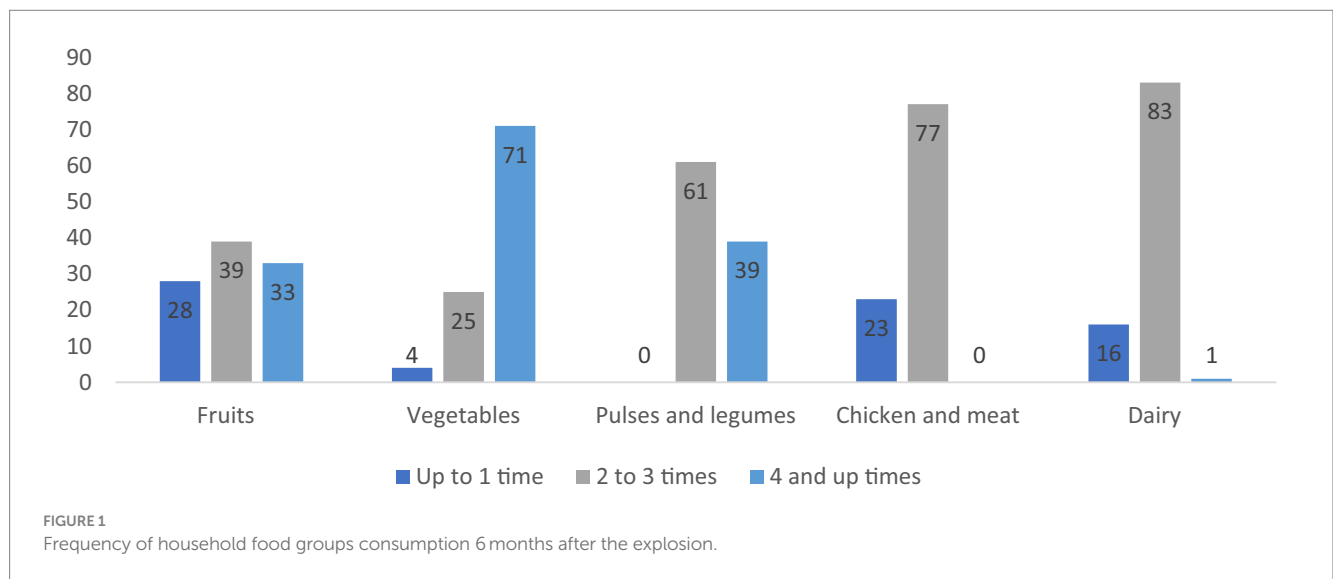
We investigated the socio-demographic correlates of adequacy of food consumption score 2 years after the blast. A significant negative

association was observed between household size and adequate FCS, and debt and adequate FCS. In contrast, a significant positive association was identified between adequate FCS and Lebanese nationality, household income, and receipt of cash assistance (Figure 3; Table 3).

We investigated the socio-demographic correlates of food insecurity 2 years after the blast. A significant negative association was detected between household size and indebtedness when considering the Food Insecurity Experience Scale (FIES). Conversely, FIES was significantly positively correlated with Lebanese nationality, the educational attainment of household heads, and the receipt of cash assistance. The purchasing power of a population significantly influences their food security, especially in times of crises. Vulnerable, low-income populations, who are often the hardest hit by disasters and crises, frequently face prolonged recovery periods. There is a strong association between food security and that other factors like

TABLE 2 Food Consumption Scores and Food Security during the three time periods as reported by the permanent residents of Karantina.

Food security indicators	Categories	6 months before the explosion (% of households)	6 months after the explosion (% of households)	2 years after the explosion(% of households)
FCS	Poor FCS	1	0	4
	Borderline FCS	2	4	66
	Acceptable FCS	97	96	30
FIIES	Food Security	80	71	2
	Mild food insecurity	17	29	64
	Severe food insecurity	3	0	34



education, employment status, and income levels are intimately linked to food security status (Ahmadi and Melgar-Quiñonez, 2018).

A significant positive correlation was found between cash assistance and food security, indicating that that receiving cash assistance increased the odds of being food secure. This association allows cash assistance to emerge as a viable intervention in crisis contexts (Daniels and Anderson, 2018; Parvez et al., 2022; Table 4).

Livelihood coping strategies

The Livelihood Coping Strategies (LCS-FS), developed by the World Food Programme, were used to identify coping strategies among the Karantina population (World Food Programme, 2022). This tool assesses household food security and categorizes results into three levels: stress coping, crisis coping, and emergency

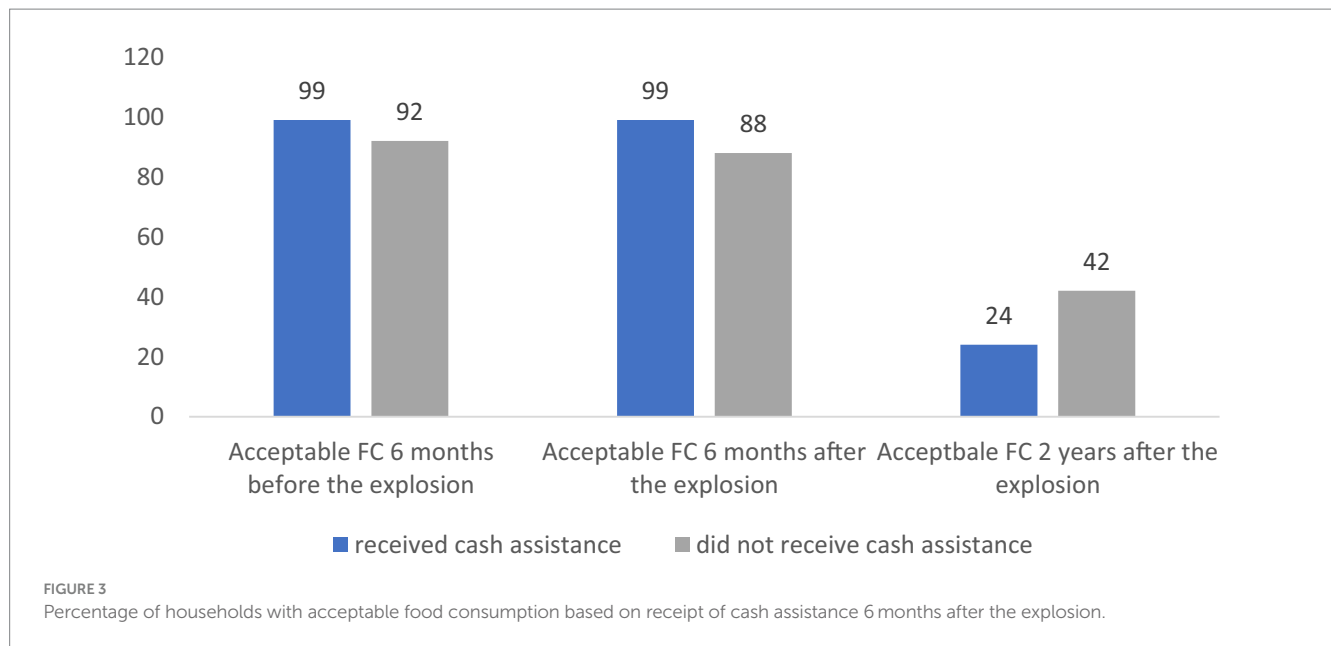


TABLE 3 Bivariate logistic regression between socio-demographic variables and adequate food consumption score 2 years after the explosion.

Variable	Categories	Odds ratio ¹	p-value ²
Household size	1-2	0.86	0.706
	3-4	0.16	0.006*
	≥5	0.43	0.111*
Nationality	Syrian	0.11	0.003*
	Lebanese	4.33	0.061*
Household income	Low income earner	0.29	0.003*
	Middle income earner	1	1.000
	Highest income earner	2.25	0.139*
Debt	No	0.62	0.112
	Yes	0.37	0.034*
Cash assistance	No	0.71	0.416
	Yes	10.71	0.045*

¹Odds Ratio (OR) is a measure of association between an exposure and an outcome. An OR greater than 1 indicates increased odds of association (more likely to occur). An OR equal to 1 indicates no association. And an OR less than 1 indicates decreased odds of association (less likely to occur). ²A value of p is a measure used in statistical hypothesis testing to determine the evidence against a null hypothesis. It represents the probability of obtaining observed or more extreme results, when the null hypothesis is true. In general, a lower value of p suggests stronger evidence against the null hypothesis, leading to the rejection of the null hypothesis in favor of an alternative hypothesis. Typically, a significance level is chosen, and if the value of p is below this threshold, the results are considered statistically significant. *means that the values are significant (above the threshold alpha).

coping strategies. Stress strategies, include using savings, borrowing money for food, and selling furniture, indicate reduced resilience. Crisis coping strategies, including withdrawing children from school or reducing education and health expenses, hinder future productivity. Emergency coping strategies, include taking high-risk jobs or involving children in income generation, and are the most extreme and difficult to reverse (VASyR, 2021; Table 5).

Six months after the explosion, 8% of the population were not adopting any coping strategies, 51% of the population were adopting stress coping strategies, 40% of the population were adopting crisis coping strategies, and 2% of the population were adopting emergency coping strategies.

Whereas, 2 years after the explosion, one household was not adopting any coping strategies, 3% of the households were adopting stress coping strategies, 94% of the households were adopting crisis coping strategies, and 2% of the households were adopting emergency coping strategies.

Discussion

Six months after the explosion, all the households received food assistance and 76% of the households received cash assistance. The immediate provision of food aid following the Beirut explosion initiated a phase of simplified food system within the Karantina

TABLE 4 Bivariate logistic regression socio-demographic variables 6 months after the explosion and food insecurity.

Variable	Categories	Odds ratio	p-value
Household size	1–2	8.33	0.001*
	3–4	0.3	0.104*
	≥5	0.16	0.008*
Nationality	Syrian	1	1
	Lebanese	3.21	0.025*
Education of head of household	Never attended	0.6	0.484
	Elementary	4.44	0.072*
	Middle/Highschool	3.21	0.145*
	University	28.3	0.008*
Debt	No	3.31	0.000*
	Yes	0.24	0.009*
Cash Assistance	No	1.18	0.683
	Yes	2.72	0.041*

*means that the values are significant (above the threshold alpha).

TABLE 5 Livelihood coping strategies during the two time periods as reported by the permanent residents of Karantina.

Livelihood coping categories	6 months after the explosion	2 years after the explosion
None	8	1
Stress coping	51	3
Crisis coping	40	94
Emergency coping	2	2

neighborhood, profoundly impacting consumption patterns and household reliance on external support. This aligns with studies by [Castetbon et al. \(2011\)](#) and [Tranchant et al. \(2019\)](#), which discuss the initial stages of aid distribution in crisis-stricken regions, emphasizing its pivotal role in stabilizing food access but potentially restricting dietary diversity due to reliance on provided items.

The data from the study revealed a stabilization in food consumption patterns immediately post-aid distribution. In the 6 months following the explosion, none of the households had poor food consumption, and 96% of the households had acceptable food consumption. These findings resonate with findings from the research by [Susanty et al. \(2023\)](#), suggesting aid-induced stability in meeting basic nutritional needs within disaster-affected communities.

However, as aid gradually diminished over time, the food system transitioned back to its usual complexities, mirroring findings in studies by [Norwegian Refugee Council \(2023\)](#) and [Caritas \(2023\)](#), which highlight the challenges faced by communities when aid ceases or diminishes. Two years after the explosion, none of the households reported receiving food or cash assistance. In addition, 72% of the population had poor food consumption, and 28% had acceptable food consumption ([Figure 3](#)). The declining receipt of aid indicates a reemergence of challenges related to food access and choices, signifying the community's return to navigating diverse but potentially limited food options ([Falb et al., 2020](#)). While cash assistance initially contributed to a positive correlation with improved food security, the absence of sustained support resulted in a regression to the previous vulnerabilities of the food system ([Figure 5](#)). The

temporary nature of cash assistance became evident as the community faced difficulties in maintaining the gains achieved during the aid period. As depicted in [Figure 5](#), the graph illustrates the sustained stability of food security among recipients of cash assistance, after the explosion. Food security, being an outcome of the food system, remained resilient as long as cash assistance was provided, highlighting the dependence of resilience on financial support. However, upon cessation of cash assistance, the observed decline in resilience suggests that the fostering of resilience may not solely be attributed to cash assistance itself, but rather to factors such as the amount and duration of cash assistance.

This underscores the need for comprehensive and long-term interventions that address the root causes of food insecurity and enhance the resilience of the food system beyond immediate relief efforts that are created in a SEFS. The findings align with the broader discourse on the limitations of short-term aid in fostering lasting improvements in food security and emphasize the importance of sustained initiatives for building a resilient food system ([Haji and Himpel, 2024](#)). Studies by [Daniels and Anderson \(2018\)](#), [Romano et al. \(2020\)](#), and [Susanty et al. \(2023\)](#) reveal that cash assistance positively impacts food consumption and dietary diversity in crisis-affected areas such as West Bank, Gaza, and Syria, respectively. Additionally, while another study, [Falb et al. \(2020\)](#) found improvements in food security in Syria with cash assistance, concerns arose about the sustainability of these gains once the program ends. Despite recognizing the immediate benefits, all studies emphasize the need for longer-term interventions for sustainable enhancement of food security and livelihoods, particularly in crisis-driven areas.

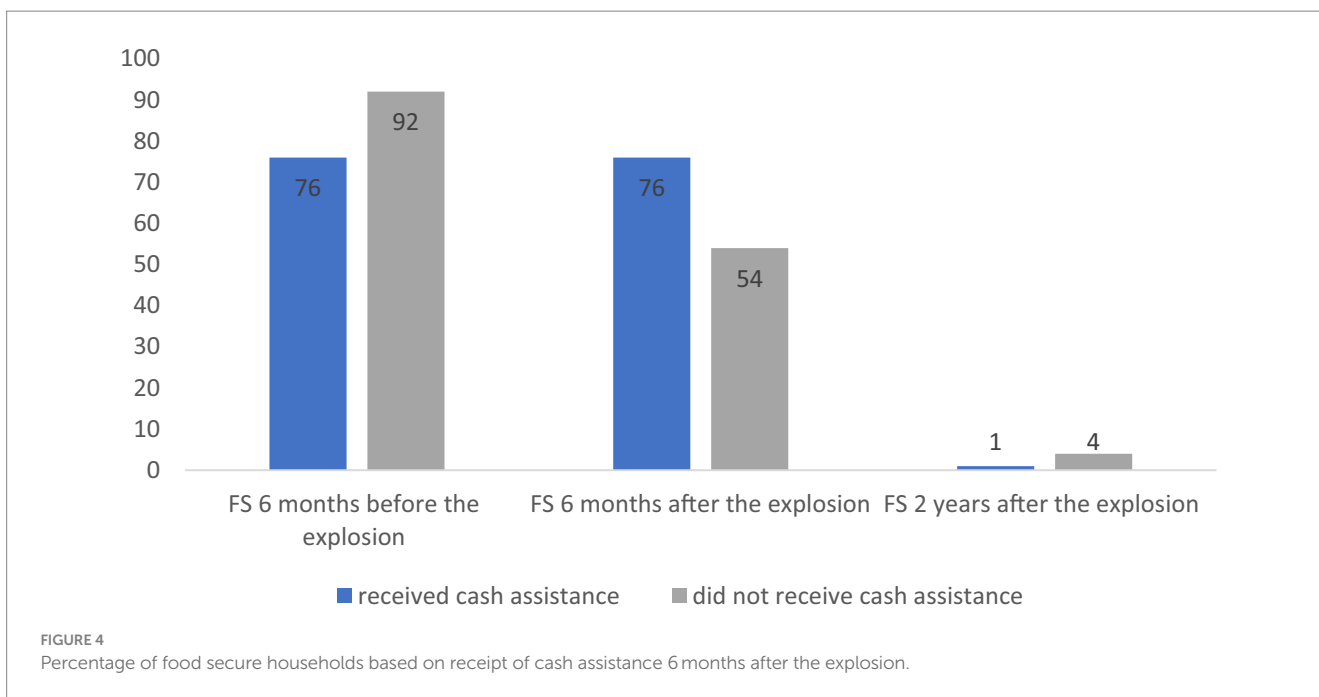


FIGURE 4 Percentage of food secure households based on receipt of cash assistance 6 months after the explosion.

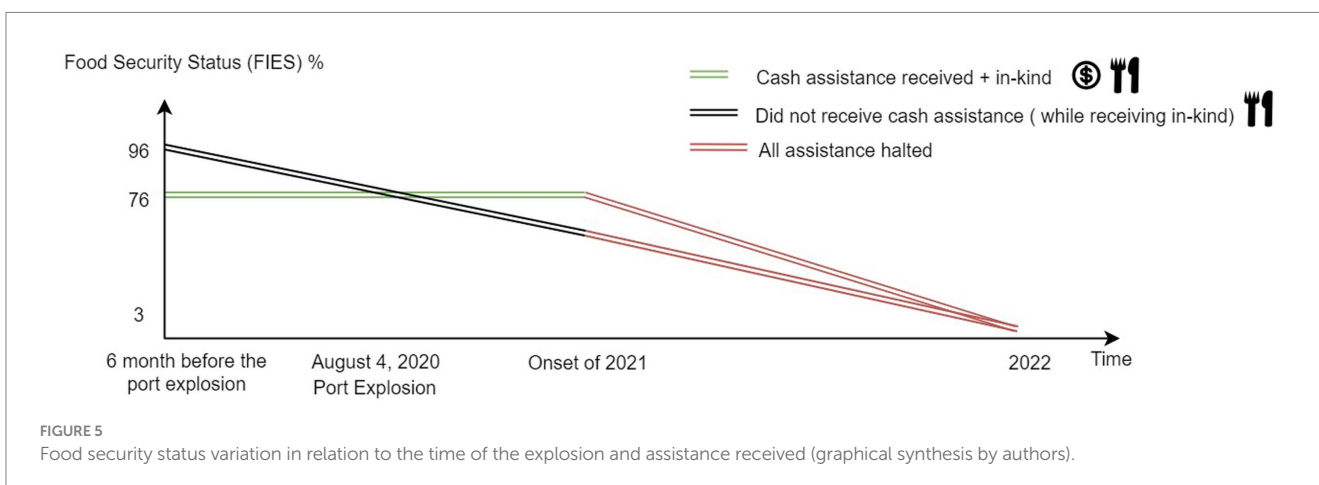


FIGURE 5 Food security status variation in relation to the time of the explosion and assistance received (graphical synthesis by authors).

Two years post-explosion, there has been a notable reduction in the intake of high-micronutrient foods and high-quality animal proteins compared to the time of the explosion. In 2022, a substantial percentage of the population, namely 97%, exhibited a frequency of less than three times per week in the consumption of fruits and pulses, while 70% reported a parallel infrequency in vegetable consumption. Additionally, diminished frequencies were recorded in the consumption of meat (100%) and dairy products (83%), all falling below the three-times-per-week threshold. The observed shift in food consumption patterns over time is common in post-disaster settings (Hoteit et al., 2021; Hunter et al., 2022). This emphasizes the necessity for adaptive dietary habits as households navigate varying food availability and affordability, consistent with findings in similar contexts.

The concerning increase in food insecurity levels over the two-year period emphasizes the vulnerability of communities facing prolonged crises (Tawodzera, 2011). Two years after the explosion, the percentage of households with mild food insecurity increased to 64%,

and severe food insecurity appeared in the population with 34% being severely food insecure (Figure 4). The rise in severely food-insecure households underscores the urgency for sustained support mechanisms stressing the prolonged impact of crises on food security (Parvez et al., 2021).

The transition in coping strategies from stress to crisis coping mechanisms highlights adaptive mechanisms in response to changing food dynamics post-aid distribution, emphasizing on the importance of understanding evolving coping strategies within crisis-affected communities (Bekele and Abdissa, 2015). From 6 months to 2 years after the explosion, the use of crisis coping strategies increased from 40 to 94%. This is evident in the adoption of the following coping mechanisms 2 years after the explosion: 81% of households sold their goods because of the lack of food or money to buy food, 74% spent some or all their household savings, 97% of households reduced expenses on health, and 94% of households bought food on credit.

However, despite the high prevalence of coping mechanisms, it is noticeable that the Mediterranean diet is profoundly embedded within

the cultural and habitual practices of the inhabitants in Karantina. Following the termination of assistance, nutrient-dense foods experienced a decline in dietary inclusion; however, staples of the Mediterranean diet, namely vegetables and legumes, persisted. Notably, the consumption of vegetables and legumes maintained prominence even among households employing severe coping strategies and pushed further into poverty. This dietary adaptation involved a shift away from meat, with individuals substituting meat with increased reliance on legumes and vegetables.

Long-term recovery strategies should emphasize enhancing access to diverse and nutritious foods, rebuilding economic stability, and fostering community resilience. Building upon existing literature, the observed shifts post-aid cessation underscores the necessity for sustained support mechanisms beyond immediate assistance (Camealeon, 2020; Falb et al., 2020; Susanty et al., 2023).

Conclusion

In conclusion, the study reveals the immediate impact of food aid in stabilizing food access following the Beirut explosion in the Karantina neighborhood. Aid distribution led to a phase of simplified food system and a subsequent stabilization in consumption patterns. However, as aid diminished over time, the food system reverted to its usual complexities, resulting in increased food insecurity levels 2 years post-explosion. Our hypothesis was accepted; cash assistance successfully maintained resilience of the food security status within the Karantina community. Despite being implemented for a brief duration, cash assistance proved effective in catalyzing income sources and, consequently, facilitating the rebuilding of livelihoods. The data also indicates a shift in dietary patterns, with reduced consumption of high-nutrient foods and high-quality animal proteins. The observed increase in severe food insecurity underscores the short-term benefits of a simplified food system for vulnerable communities facing prolonged crises. The transition in coping strategies from stress to crisis coping mechanisms further emphasizes the adaptive nature of communities in response to changing food dynamics post-aid distribution. The findings underscore the need for sustained support mechanisms beyond immediate aid, advocating for long-term recovery strategies that enhance access to diverse and nutritious foods, rebuild economic stability, and foster food system resilience.

Exploring the long-term impact of cash assistance programs on vulnerable populations at a national level is essential, with a focus on understanding how sustained financial support contributes to lasting food security. These findings also emphasize the importance of well-organized cash assistance following the explosion. Entities responsible for aid distribution should have implemented effective monitoring and evaluation measures, examining how individuals utilized the received cash, whether it covered essential needs like food, was allocated for education-related expenses, or invested in initiating small businesses. Additionally, investigating the efficacy of livelihood improvement strategies alongside cash assistance is crucial for designing comprehensive interventions.

Overall, the study's findings align with existing literature, highlighting the profound influence of food aid and its subsequent cessation on food system dynamics, consumption patterns, food security levels, and adaptive coping strategies within crisis-affected communities. However, some key questions arise for further

exploration, including the efficiency and financial feasibility of longer-term interventions, the role of technology in enhancing program effectiveness, gender dynamics, and comparative analyses between cash assistance and livelihood improvement strategies. These considerations are crucial for determining the precise amount of cash assistance required and establishing criteria for discontinuing and resuming fund distribution by organizations. It is essential to note that the decision-making process is tied to donor funding availability rather than solely being driven by the actual needs of the community. Exploring this dynamic is vital for research efforts aiming to shape policies, impacting not only those of the state but also those of non-state entities.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by Human Research Protection Program (HRPP). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

MM: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Project administration, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing. NA: Formal Analysis, Methodology, Project administration, Resources, Supervision, Writing – original draft. AY: Methodology, Project administration, Software, Supervision, Writing – review & editing. HG: Conceptualization, Data curation, Investigation, Methodology, Supervision, Writing – review & editing. YA: Project administration, Supervision, Writing – review & editing. RZ: Conceptualization, Formal Analysis, Investigation, Methodology, Supervision, Writing – original draft.

Funding

The author(s) declare that no financial support was received for the research, authorship, and/or publication of this article.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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