Data Driven Vulnerability Outlook on Beirut's Neighborhoods

Beirut Neighborhood Vulnerability & Accessibility Indices

Introduction

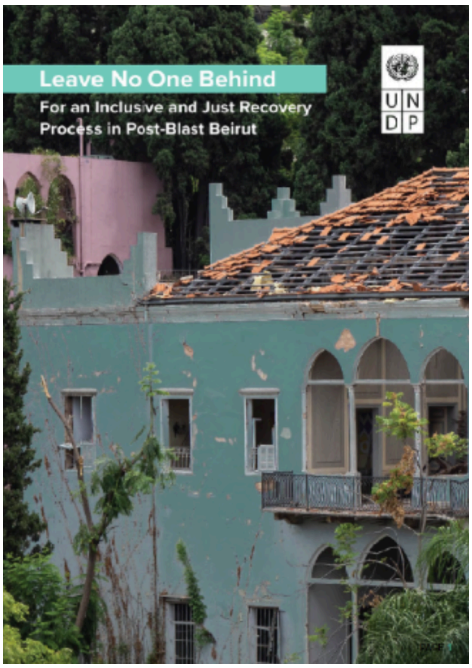
Beirut blast

On August 4th, 2020, an explosion from the Beirut Port ripped through the city causing instantaneous destruction, at a magnitude never seen before in Lebanon. The shock occurred while the country was already experiencing multiple crises, namely a currency collapse, the COVID pandemic, and full economic slowdown. Levels of unemployment climbed steadily, recurring lockdowns slowed down the economy further, and the banking crisis continued to hinder recovery efforts. Households and businesses were left vulnerable to further shocks, and when the blast occurred, the level of devastation was unimaginable. In order to understand the true extent of the impact, we use various datasets to assess vulnerability and accessibility, with the goal of supporting relief and recovery efforts.

Leave No One Behind

After the blast, the UNDP published a report entitled, "Leave No One Behind: Towards an inclusive and just recovery process in post-blast Beirut," which sought to:

- Unravel inequitable impacts of the blast and highlight the multiple recovery related vulnerabilities that co-exist,
- Define a Leave No One Behind (LNOB) framework for an inclusive recovery that is rooted on prioritizing the most vulnerable members of society,
- Understand the spatial component of vulnerabilities by considering a neighborhood lens through deeper analyses on Karantina, Mar Mikhael and Downtown Beirut.



"We're ten people in this house, which barely fits five. All my family moved in as their building nearby collapsed. The blast injured my two boys... one is still not sleeping and has short-term amnesia. My husband is Egyptian, he

Leaving no one behind is a value system that protects the rights and prioritizes the recovery of the most vulnerable individuals and groups. However, it also extends beyond immediate recovery needs towards addressing the root causes of vulnerabilities to allow for long term systemic reform.

The importance of the value system was recognized by the international community when the pledge to leave no one behind was taken unanimously by all UN Member States when they adopted the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs).

While the LNOB value system is universal in nature, it is essential to take into account the local context when designing a post-blast recovery process. The LNOB report presents a set of non-exhaustive guiding principles, rooted in the both realities of the current situation, but also in Lebanon's historical context, which has seen many attempts of post-disaster recoveries.

To ensure a post-blast recovery process that is **inclusive and just**, it is essential to design a holistic response that addresses all different types of vulnerabilities, and incorporates social groups with the most intersecting vulnerabilities. These measures need to integrate the multiple timescales at which a recovery is designed, particularly an immediate –emergency- response and a long-term response.

As such, there is a **need to collect disaggregated socio-economic and geo-referenced data** that identifies people's multiple indicators of vulnerability, namely: age, gender, nationality, race, location of residence and work, income, occupation, education, family status, physical and mental health status, tenure status, etc.

This data can help understand which people face multiple compounding disadvantages and identify the barriers to reducing their vulnerabilities. Through the examination of such people-driven data, deprived and marginalized social groups can be empowered through civic engagement, integrated and just policies, interventions and budgets can be voiced and enacted.

Socio-Economic Impact Assessment

As highlighted in the Leave No One Behind report, the only way to ensure that the recovery process is by using inclusive and just, disaggregated and geo-referenced data that identifies multiple indicators of vulnerability is essential.

After the August 4th Explosion, the UNDP conducted a Socio-Economic Impact Assessment

using Facebook Ads and call center social workers to assess the impact of the blast on the surrounding geographic areas resulting in:

5,901 households surveyed

3,680 businesses surve

Households

The household SEIA was based on a 19-question survey. Most of the data was collected between the 17th and 30th of August 2020. Respondents were asked to identify their residential neighborhood; 4359 respondents declaring Beirut as their place of residence. This includes the areas of Achrafieh, Ain el-Mreisseh, Bachoura, Marfaa, Mazraa, Medawar, Minet el-Hosn, Moussaytbeh, Ras Beyrouth, Remeil, Saifeh, Zoukak el-Blatt.

Businesses

The MSME SEIA was based on a 23-question survey. Most of the data was collected between the 17th and 30th of August 2020. Approximately two-thirds of respondents declared Beirut as the location of their business. The results are disaggregated to the neighborhood level.

Purpose

In order to design an inclusive and just relief, recovery, and reform process, which is rooted in the *Leave No One Behind* value system's fundamental principle of prioritizing the most vulnerable, several key questions must be answered:

1. **How** can we define and assess intersectional vulnerabilities?
2. **Who** are the most vulnerable groups that should be targeted, given the socio-economic crisis, COVID-19 pandemic, the Beirut blast, and the combination of these three?
3. **Where** are the most vulnerable groups located?

"The current multi-faceted crisis that Lebanon is grappling with challenges us to translate Leaving No One Behind into concrete and effective action that can make a difference in the lives of the people who are in most need… We have a responsibility to ensure that the journey to recovery helps people preserve their dignity and restore hope ultimately addressing the root causes that created their vulnerabilities."
- Celine Moyroud, UNDP Resident Representative in Lebanon

The LNOB value system and a multidimensional vulnerability approach allows us to address the **how**, while the datasets resulting from the SEIA and other complementary datasets allow us to address the **who** and the **where**.

The overall process that was undertaken to address the the above questions included the following:

1. *Defining a multidimensional vulnerability index framework*, based on the Leave *No One Behind* report, a literature review of relevant resources, including the Human Development Report's Multidimensional Poverty Index, in combination with the available data points from the collected SEIA submissions.
2. *Analyzing the SEIA datasets* using the MVI framework and aggregating to neighborhood level.
3. *Conducting additional spatial analyses* using open datasets, such as Open Street Map and Facebook Data for Good. Specifically, a population analysis provided population figures per neighborhood, an accessibility analysis provided metrics on accessibility levels to hospitals and schools per neighborhood, and finally, an urban morphology analysis estimated how neighborhoods could be defined in contrast to the government boundaries.
4. *Generating interactive visualizations* that allow users to explore the results of all of the above and other aspects of the SEIA datasets.

What defines a neighborhood?

They way neighbourhoods are defined have a profound impact on their populations. The shape and size of a single neighbourhood has far-reaching impacts on how its residents are measured, the allocation and management of public facilities within them, as well as the distribution of political clout.

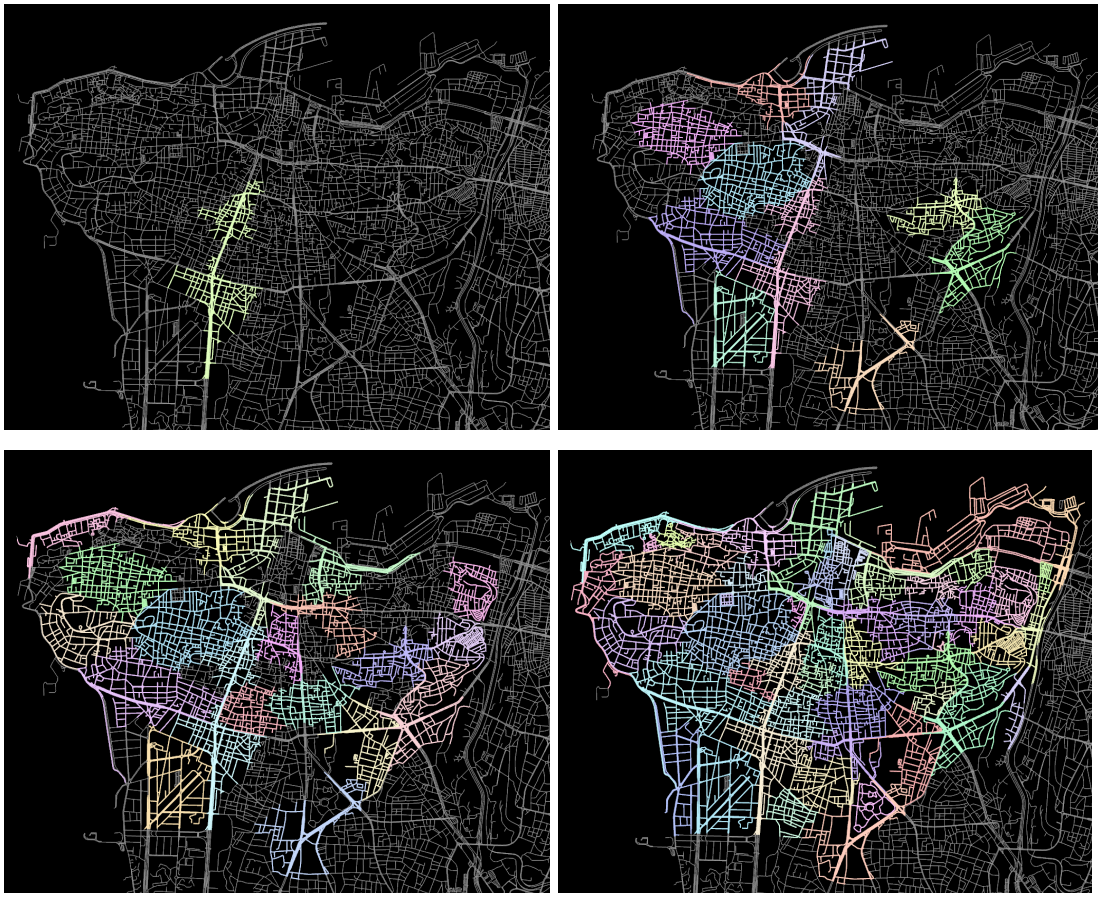
Beirut comprises 10 areas at the lowest administration level. However, these neighbourhoods are oftentimes disproportionately sized. Ras Beyrouth, for example, encompasses an area of just 2.5 km2, whereas areas such as Mazraa and Moussaytbeh are almost double in size. Yet, Ras Beyrouth holds three of Beirut's major hospitals, whereas only one major hospital is located in Mazraa and Moussaytbeh each.

Looking at this disproportionate population spread, the question of how equitable facility distribution can be achieved must be raised. Indeed, the spatial distribution of these facilities have tangible effects on how the residents of Beirut are able to use them. One dimension of this is the ease of access and reach by all populations. Given their location, questions such as how many more people in Mazraa and Moussaytbeh would need to travel a further distance to a hospital than a resident of Ras Beyrouth need to be highlighted.

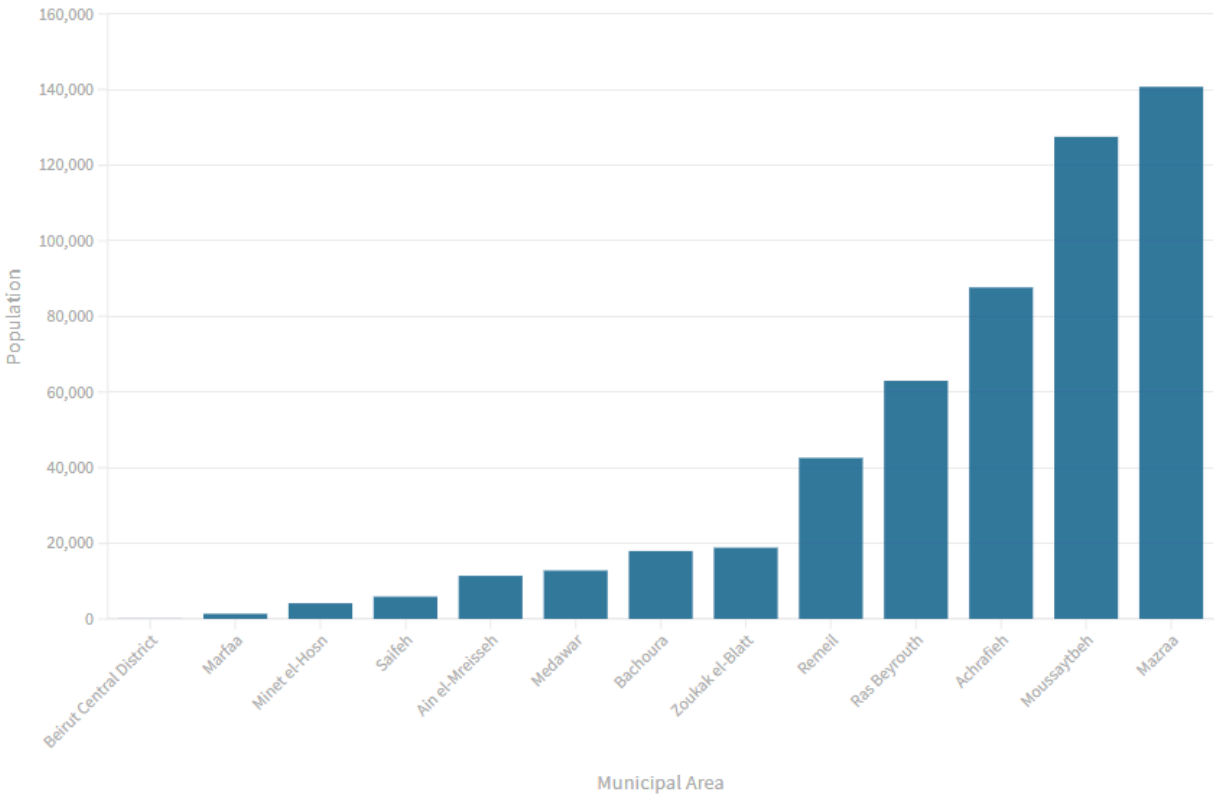
Should facilities be placed in areas distant to those considered vulnerable, an exacerbation of their condition can be expected given the increased costs of commuting and opportunity costs. These compounding costs for the country's more vulnerable groups are often difficult to quantify; and, ultimately, a call to attention should be made on how policymakers can respond to the needs of the public in these more disadvantaged areas.

Certainly, when neighbourhood statistics are not reflective of urban reality, the implementation of effective policies become limited and have an increased propensity to fail. In view of adopting data-driven approaches to understanding Beirut's neighbourhood, we consider an alternative method of defining what a neighbourhood is. In particular, we consider the effect of different neighbourhood sizes with respect to Beirut's population.

[NOVEL] The method in defining these new neighbourhoods is based on the city's urban structure, as represented by its road network. In particular, the intersections of each roadway is taken into account, whereby their density is used to uncover possible new local areas.



Our analysis clustered Beirut's road network and identified 30 unique neighbourhoods within the city. These areas each have dense, interlinked road connections that, as a whole, can be considered a single neighbourhood. Considering these new boundaries in line with Beirut's population, our analysis shows two highly disparate population distributions across the city. As aforementioned, population distribution across Beirut's official census delineations show a large skew due to large discrepancies between municipal area sizes. The size of these boundaries insofar to not seem to be linked to measurements of population density. In Beirut Central District, a population count of 102 is noted; whereas, Moussaytbeh and Mazraa hold a population of approximately 127,000 and 140,000, respectively (ref. Figure X).



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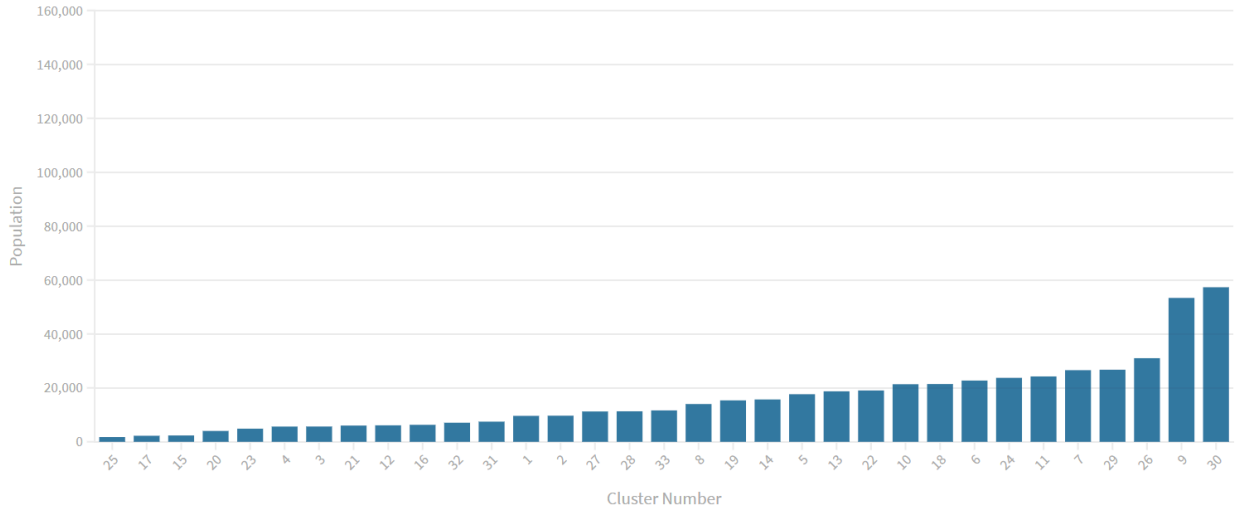
In contrast to this, population data distributed within clusters based on the Beirut road network sees a lower variances in population distribution. The smallest delineated area, Cluster 25, holds a population of around 1,700; with the largest area, Cluster 30, attributed to a population size of approximately 57,000. The clusters derived from Beirut's road network suggest a more even distribution of population within the municipality is possible. It poses a strong case to consider how resources are allocated currently to each of Beirut's 10 municipal areas. Should current resources be disproportionately distributed, calls to attention should be made to issues of equity in the distribution of essential urban facilities within these municipal areas. Similarly, disaggregating Beirut's boundaries allow a more nuanced view of where specific demographics

are located. This may perhaps be a worthwhile endeavour to better understand the hyperlocal spatial distribution between vulnerable group (i.e., low-income, elderly, LGBT, renters) and those with better economic, physical and social mobility particularly given the large number of residents already spread in these areas



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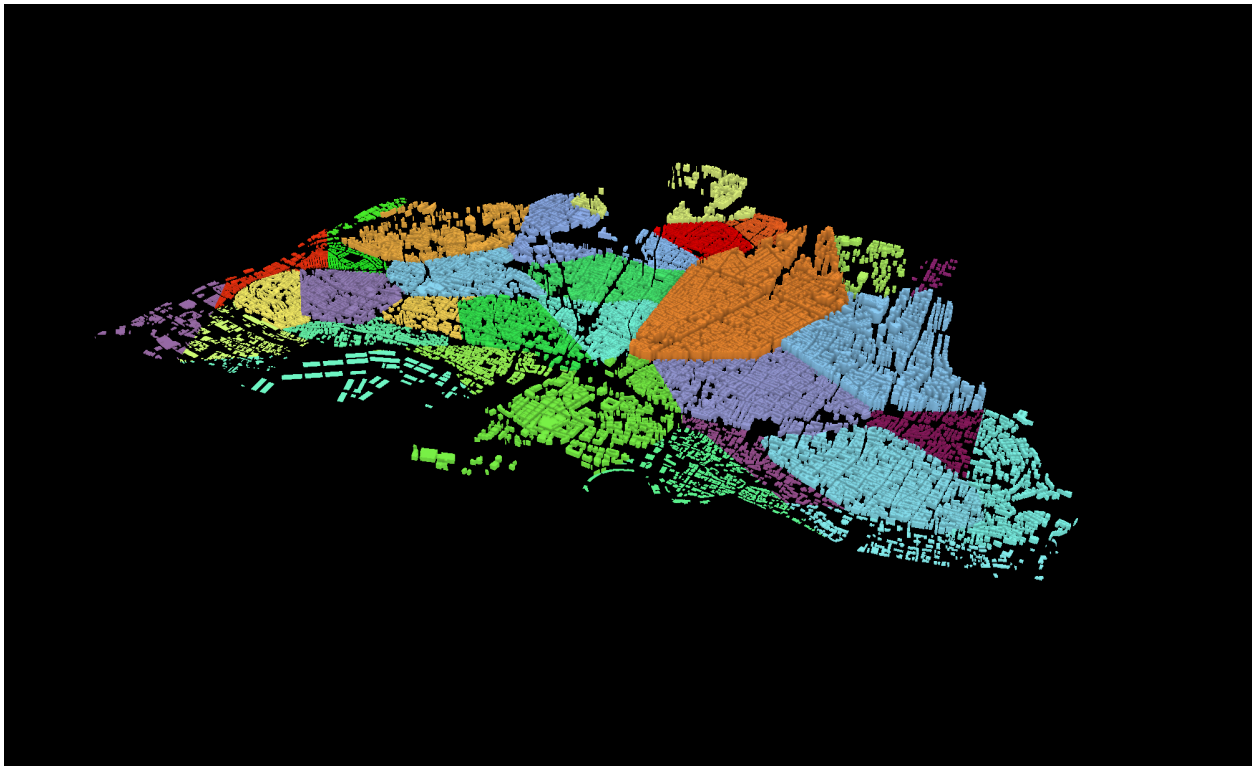
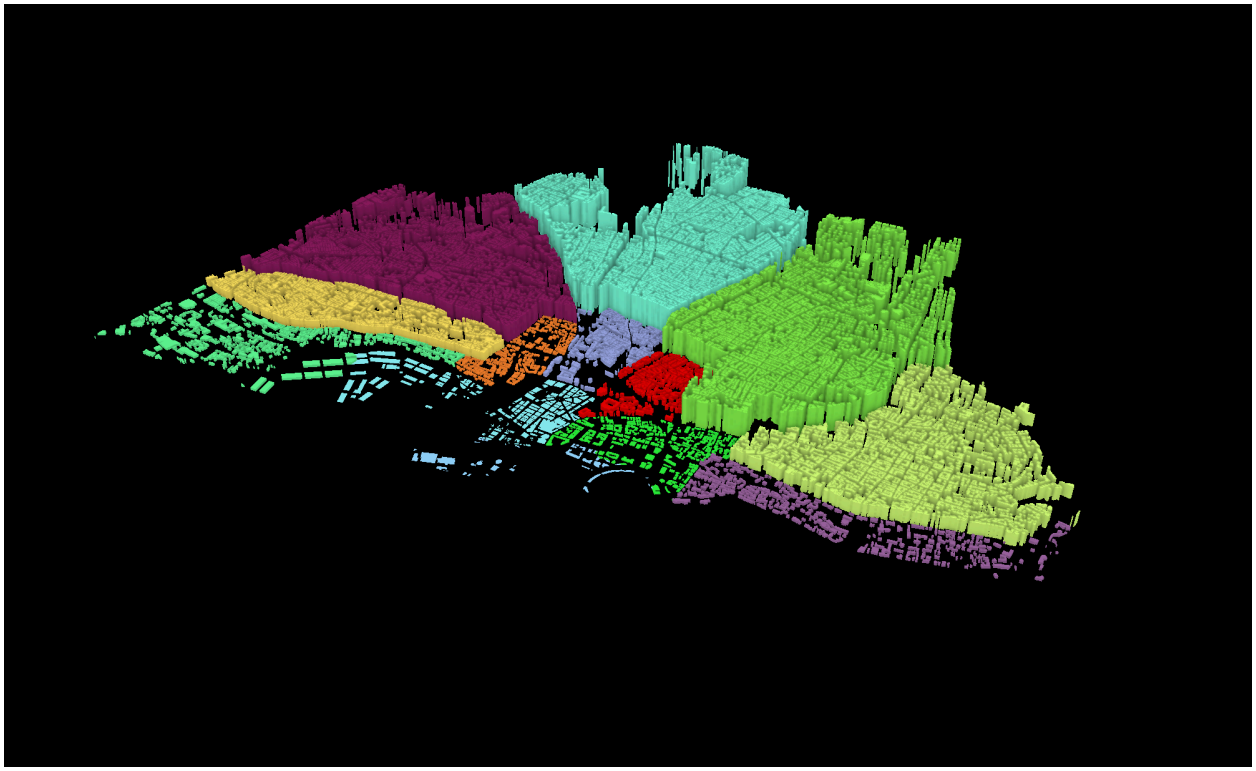




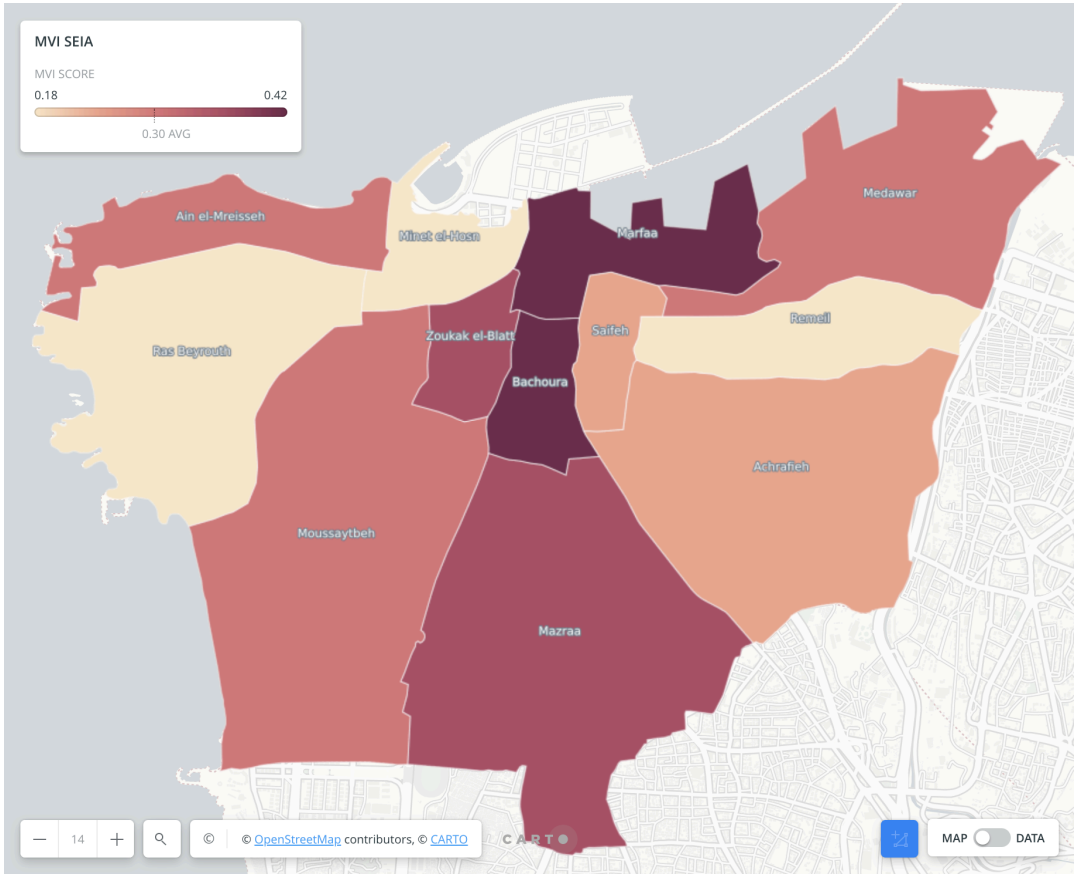
Households | Vulnerability & Accessibility

Beirut Insights

Designing Relief, Recovery, and Reform programs after a disaster requires an understanding of **where** the most vulnerable and the most impacted groups live in order to prioritize aid. The next step is understanding **who** are the most vulnerable groups within these neighborhoods in order to appropriately design interventions.

To answer the question of **where** the most vulnerable groups exist within the city, we use the [multidimensional vulnerability index] to assess intersectional vulnerabilities at the household level, and then aggregate to the neighborhood level. The dataset used from the [socio-economic impact assessment] that was conducted after the blast.

Multidimensional Vulnerability Index Neighborhood Scores



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Unsurprisingly, several neighborhoods closest to the blast sites, namely Marfaa, Medawar, Bachoura, and Zoukak el-Blatt have high multidimensional vulnerability index (MVI) scores. However, other neighborhoods within similar proximity, such as Saifeh, have lower vulnerability scores. This highlights the significance of *compounded or intersectional vulnerabilities*. The explosion had a significant impact which is explored in further detail in section X, however the impact of any disaster is a function of the magnitude of the shock, the levels of exposure to the shock, the pre-existing vulnerabilities, and resilience. For example, while the Saifeh neighborhood was greatly impacted by the blast, its inhabitants had less pre-existing vulnerabilities so when considering compounded vulnerabilities as a way to prioritize aid, Saifeh is less urgent than Marfaa, for example.

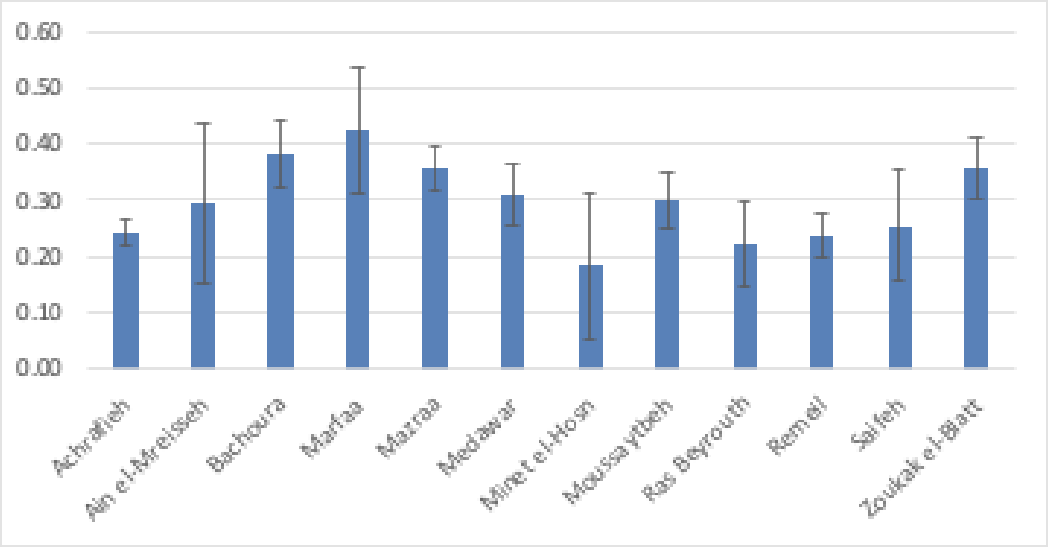


Figure X. Multidimensional vulnerability household scores for Beirut neighborhoods

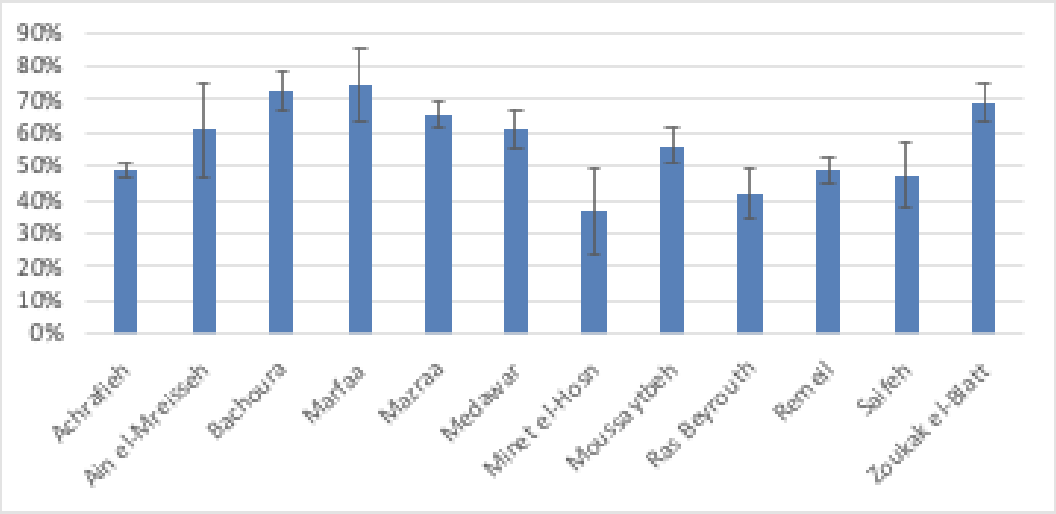


Figure X. Proportion of multidimensional vulnerable households in Beirut neighborhoods

Note: In all data analysis, it is essential to understand the accuracy of the results. For surveys such as the SEIA, a sample of people are assessed instead of all inhabitants, which can only be achieved through a census. While censuses offer comprehensive and valuable information, they are relatively extremely costly and take years to plan for and to conduct. In disaster situations, a well designed survey provides essential information within a short time frame to allow for rapid response. The SEIA dataset was collected within weeks of the blast, reaching approximately 6,000 people, which is a considerable sample size and allows for insights to be generated at the Beirut level. However, when filtering data, for example to the neighborhood level, the sample size decreases so it becomes less likely that this sample represents the population of the area. To account for this increased uncertainty, margin of error ranges are calculated. As seen in figure X, 49% of Achrafieh households are multidimensionally vulnerable +/- 2.5%, which is shown via the error bar; this means that the proportion of multidimensionally vulnerable households in Achrafieh is likely between 46.3% and 51.3%. The low margin of error is due to the high sample size (see table X). On the other hand, the proportion of multidimensionally vulnerable households in Minet el-Hosn ranges from 23.5% to 49.6%, because of the lower sample size for that neighborhood.

Neighborhood	**MVI score**	**Percentage of vulnerable HH**	**Intensity of Vulnerability**	***Margin of Error***	***Sample size***
Achrafieh	0.24	49%	50%	*2.50%*	*1540*
Ain el-Mreisseh	0.29	61%	48%	*14.10%*	*46*
Bachoura	0.38	72%	53%	*5.74%*	*234*
Marfaa	0.42	74%	57%	*11.27%*	*58*

Mazraa	0.35	65%	54%	*3.93%*	*564*
Medawar	0.31	61%	51%	*5.40%*	*313*
Minet el-Hosn	0.18	37%	50%	*13.09%*	*52*
Moussaytbeh	0.30	56%	53%	*4.94%*	*388*
Ras Beyrouth	0.22	42%	53%	*7.41%*	*170*
Remeil	0.24	49%	49%	*3.93%*	*620*
Saifeh	0.25	47%	54%	*9.94%*	*97*
Zoukak el-Blatt	0.36	69%	52%	*5.45%*	*277*

Table X. Multidimensional vulnerability score, proportion of vulnerable households, and intensity of vulnerability at the neighborhood level

Table X summarized the results from the key dimensions of the multidimensional vulnerability index. Percentage of vulnerable households indicates the proportion of households per neighborhood that are considered multidimensionally vulnerable. For example, 61% of households in Medawar are multidimensionally vulnerable. The intensity of vulnerability is an indication of the level of deprivation across the vulnerable households, on average per neighborhood. For example, the average multidimensionally vulnerable household in Medawar is deprived in 51% of the weighted indicators. Finally, the MVI score is a combination of the proportion of vulnerable households and the intensity of vulnerability. See the methodology section of further detail of the MVI index.

Health, Standard of Living, Employment & Social Security

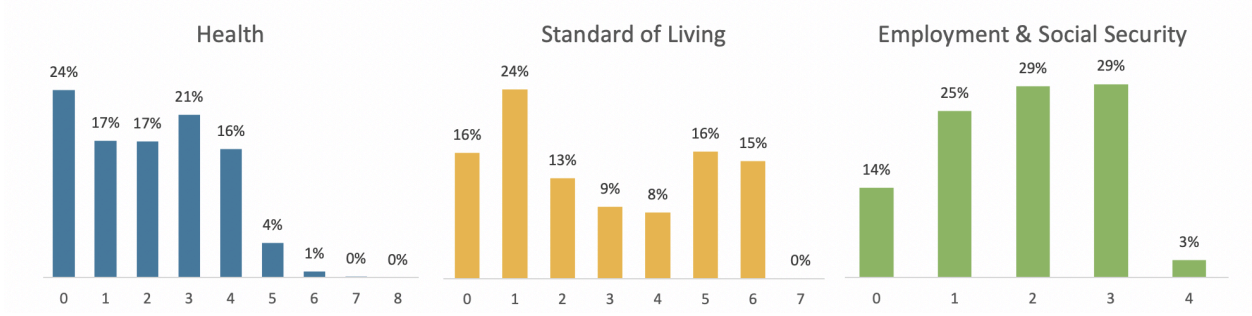


Figure X. MVI components indicator deprivation frequency distribution

The multidimensional vulnerability index is a composite of indicators on health, standard of living, and employment & social security. While the overall score is useful to understand which neighborhoods have the highest levels of multidimensional vulnerability, the breakdown of the scores across the components allows us to understand what deprivations are driving the vulnerability.

Figure X shows a frequency distribution of the proportion of indicators, per dimension. For example, under the health dimension, 24% of households are not deprived across any of the indicators, while 21% are deprived in 3 / 8 of the health indicators.

The distributions across the three indicators show that households tend to be more deprived in the employment & social security dimension and the standard of living dimension, when compared to the health dimension. In terms of overall multidimensional vulnerability, on average across all neighborhoods, the health dimension accounts 25% of the MVI score, while the standard of living dimension accounts for 38%, and the employment & social security accounts for 37% of the score. This suggests that the main deprivations faced by households in Beirut are related to standard of living and employment & social security.

It is also noteworthy to observe the distribution for each of the dimensions. For the health dimension, as the number of deprivations increase, the number of people with multiple deprivations decreases i.e. fewer people have five deprivations than those who have only two. The standard of living distribution notably has two peaks, which indicates that about one fourth of respondents are deprived in only one indicator, while about a third are deprived in 5-6 indicators. This suggests significant inequality where a significant portion of the population are not vulnerable in terms of standard of living, while another portion of the population is facing compounded vulnerabilities in this dimension. Finally, the employment & social security distribution shows that most people, approximately 60%, face two or three deprivations, while very few experience all four. This suggests that employment & social security is a vulnerability faced by many, especially as only 14% don't face any deprivation, but only a minority are fully completely vulnerable.

The findings above generally align to the vulnerability profiles identified in the Leave No One Behind (LNOB) report, which highlighted income status, unemployment, affordability of necessities, etc. among the most prominent vulnerabilities. Each MVI dimension is explored in more detail below from the context of the LNOB profiles.

Health

While the results indicate that the health dimension contributes the least to overall multidimensional vulnerability, there are still significant vulnerabilities that are evident when considering the sub-dimension indicators.

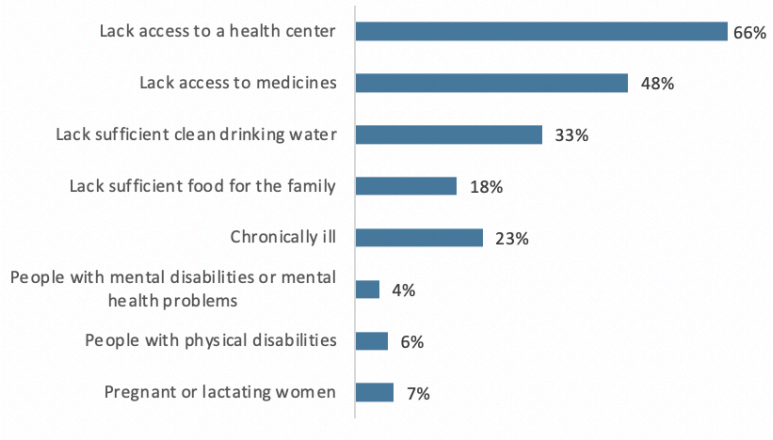


Figure X. MVI health dimensions deprivation proportions

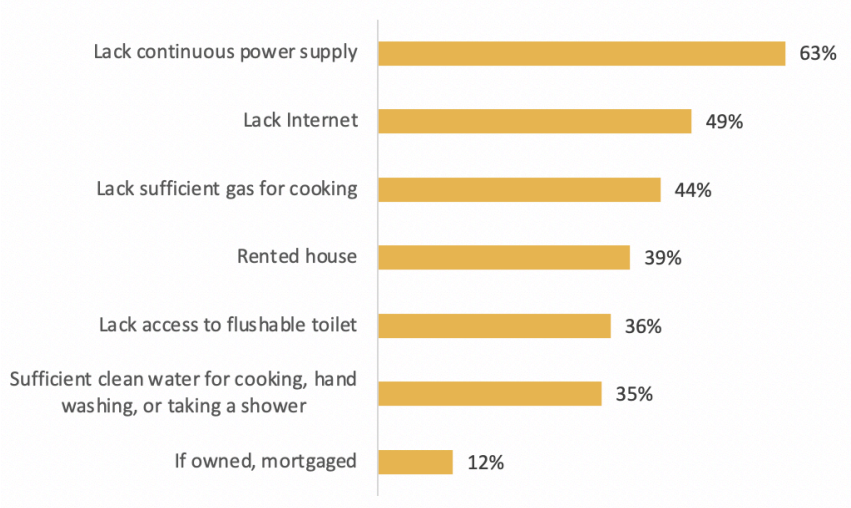
Key findings

- **Access to healthcare is the biggest driver of vulnerability in the health dimension** with 66% respondents stating that they lack access to a health center and 48% lacking access to medicines.
- **Approximately one out of four households have a chronically ill inhabitant**
- **6% of households have people with physical or mental disabilities**. While the percentage might seem low, in this sample, that equates to over 300 households. If the proportion was applied to Beirut, an estimated 300,000 households would likely have this vulnerability
- **One third of households lack sufficient access to clean drinking water.** This increases risk of illness and deterioration of other health indicators. This vulnerability is significantly compounded when the household also lacks access to healthcare.
- **One out of five households lack sufficient food for the family**. Food poverty can be hugely debilitating because malnutrition becomes the cause of other vulnerabilities, including inability to find employment, mental health issues, physical health issues, etc., all of which are exacerbated by the parallel crises of COVID-19 and the economic crisis in Lebanon.

Standard of Living

Deprivations of standard of living indicators are the most significant driver of vulnerability in the MVI scoring. Many of the vulnerable profiles identified in the Leave No One Behind report related to standard of living deprivations, such as insecure tenancy contracts, insecure housing options, affordability of necessities and challenges rehabilitating homes impacted by the blast. Given the physical devastation caused by the August 4th explosion, it is unsurprising that there

are prevalent and compounded deprivations across standard of living indicators for a majority of households.

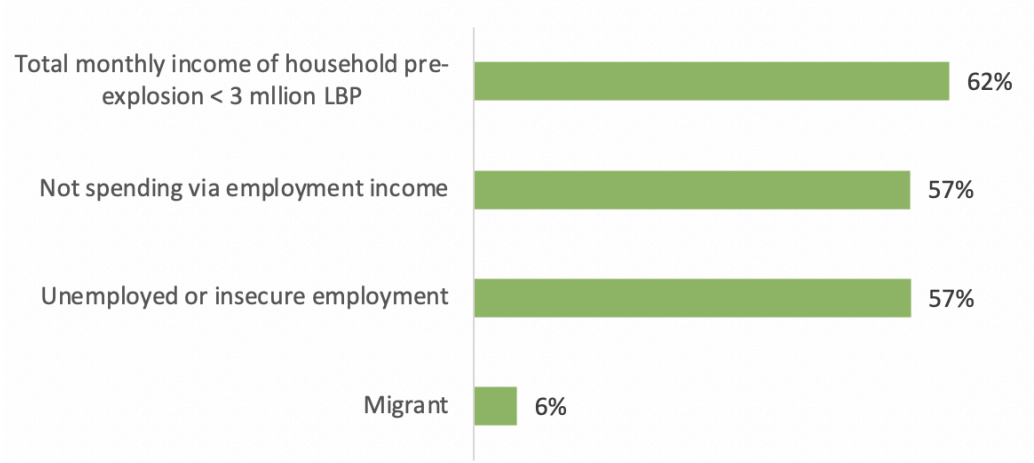


Key findings

- **Two of three households lack continuous power supply.** While power supply issues have existed for many years in Lebanon, the impact of this vulnerability is intensified when coupled with other vulnerabilities. For example, the current COVID pandemic has privileged workers who are able to access employment that allows remote working; the prerequisites for such work include continuous power supply, internet, and a personal computer, in many cases.
- **39% of families live in rented homes.** The currency crisis, which devalued the Lebanese lira by approximately 80%, has placed both tenants and landlords in precarious situations. As described in the LNOB report, tenants on old rent contracts face evictions from landlords out of fear of not receiving rehabilitation aid. Landlords who may have depended on rental income as a source of livelihood face potential income deprivation. Losing access to homes, either due to the blast or due to evictions, has led to overcrowding in many households.
- **Over a third of households lack access to clean water for cooking or washing**. This vulnerability compounded with 44% lacking sufficient gas for cooking as well as several of the health vulnerabilities, indicates significant challenges in fulfilling some of the most basic human needs. The impact of these vulnerabilities relate to survivability and illustrate how dire the situation is for the most multidimensionally vulnerable households.

Employment & Social Security

Widespread deprivations across the employment & social security dimension contributed significantly to the MVI score. This aligns well to the vulnerabilities identified in the LNOB report, namely unemployment, low incomes, legal status, and migrant groups.



Key findings

- **57% of households' main earners are unemployed or insecurely employed.** More than half the population do not have secure employment. Without a functional social security system, this level of vulnerability is a major cause for concern, especially as lack of income or lack of income security can cause deprivations in many of the other indicators.
- **62% of households have a monthly income of less than LBP 3 million, before the blast**. At the current black market rate of LBP 8,800 to USD 1, a monthly income of LBP 3 million translates to USD 11 per day, which is the upper bound of the range. Breaking down the data further shows that 25% of households make less than LBP 1 million per month, which equates to USD 3.7 per day. See household profiles section for detailed breakdown of all the indicators.

Accessibility Analysis

Accessibility in the city is multifaceted. It can refer to the physical distribution of residents and the ease of these residents to essential facilities (health, employment, education, leisure) and activities around the city. Easy access to these essential facilities is affected by the distance of o these facilities from residents. As such, equitable access in this sense can be interpreted as the equal distances to facilities by residents across the entire city at any given time.

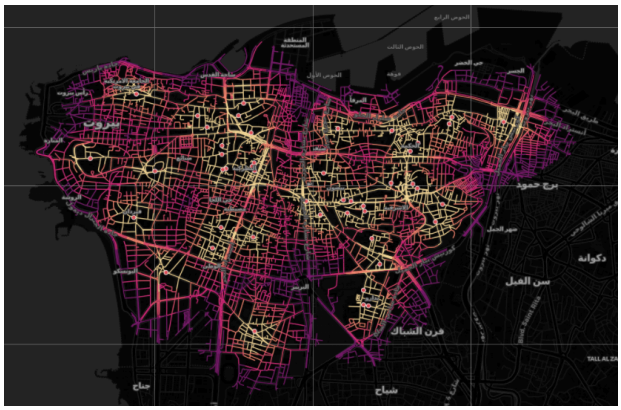
Whilst this is an ideal in city-building, it is often not achieved in reality. Understanding how facilities are spread across the city is indispensable to fair and just policy-making. This is because asymmetric distribution across the city has been shown to offer dissimilar opportunities and impose disproportionate costs to certain demographic groups (i.e., those vulnerable). As a result, poor accessibility is often attributed to maintaining urban poverty by hindering upward mobility. With this, decreased accessibility imposes additional barriers to urban opportunities to those already disadvantaged by increasing the distance and cost of travel, in addition to the opportunity costs of time spent travelling. It contributes to socioeconomic ghettoisation within the city, which may lead to exacerbating issues of socioeconomic and demographic segregation.

Our study considers two dimensions of resident access to facilities: first, their physical distribution, and, second, a measure of these facilities to attract residents to specific locations across Beirut. This former considers schools and hospitals; and, the latter analysis considers only hospitals given the limited data available. In this review, equity should be considered to alleviate potential issues of a ‘poverty of access’. Policy-makers need to be able to appraise the potential and realised costs incurred by all demographic groups; and, identify areas of mitigation to prevent further socioeconomic disparities due to locations. Certainly, the many issues that arise from poor accessibility may be considered systemic and self-fortifying.

In Beirut, how accessibility levels may change over time with the growth and rebuilding of the city need to be considered if equitable change is to be realised. Certainly, leaving this important urban dimension unmonitored may have long-lasting financial and socioeconomic implications both for its people and administration.

In understanding accessibility in Beirut, we consider the number of people that are able to walk to any school or hospital in the city. Our analysis, at this level, assumes that all facilities included are equal in their capacity and attractiveness to the general population. The results show two highly disparate scenes. The spatial distribution of both facility types show two distinct patterns in that schools appear to be more evenly spread throughout the greater municipal area. In contrast, hospitals in Beirut are predominantly located in two regions. First, four hospitals are found in just the Ras Beyrouth and Minet el-Hosn area, whereas Mazraa, Moussaytbeh, Achrafieh, Romeil, and Medawar each have one hospital within their municipal boundary. The distribution of these facilities have two very tangible implications on the people of Beirut. The analysis conducted estimates an average walking time of 6.79 minutes to a school in Beirut; however, reaching an institutional medical centre in the city would require an average of 16.8

minutes. Visualising the data elucidates the findings more clearly. In Figure X, where the spatial distribution of hospitals are shown, a clear divide in accessibility is seen between the northwest and the arc from east to south Beirut.



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Considering these gaps in accessibility, we can then consider the cost of residential locations with respect to the availability of both these facilities. In almost all municipal neighbourhoods of Beirut, an average of approximately 85% of all residents are able to reach a school by foot within an acceptable time frame of 10 minutes. In the neighbourhoods of Zoukak el-Blatt, Saifeh, Remeil, Minet el-Hosn, Marfaa, and Bachoura, our analysis shows that all residents possess this same level of access. However, the same cannot be said for their access to medical centres, where an average of 17% of the population is able to access hospital facilities within the same time threshold. Moreover, in the same areas of Zoukak el-Blatt, Saifeh, Bachour, and Marfaa, 0% of the population fall within the same measure of accessibility.

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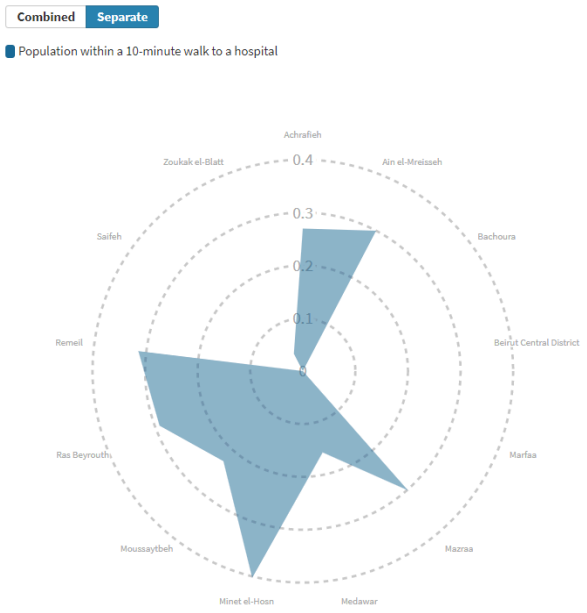
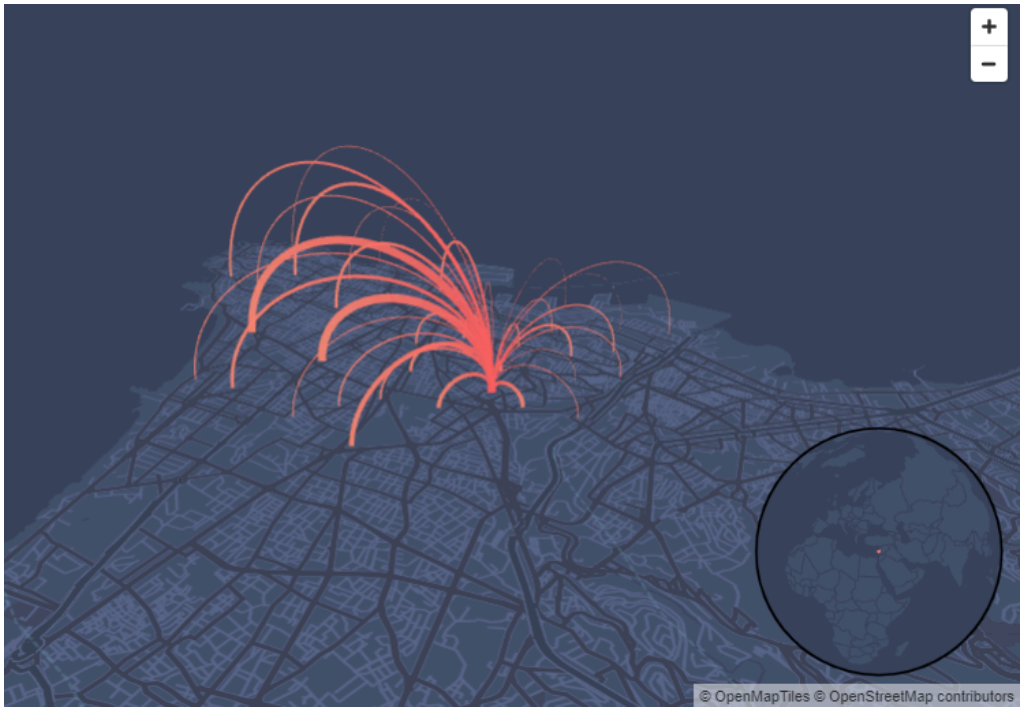


In view of this poor access to hospitals, our analysis then aimed to understand how location of higher capacity hospitals that have a higher capacity (as proxied by their annual number of visitors) influence movement in Beirut. The findings here may help inform where underserved areas may be located by the proportion of residents required to travel large distances to reach a particular hospital. Our findings show that Hotel Dieu de France, AUB Medical Centre, and Lebanese Hospital Geitoui account for over 60% of all movement to hospitals in Beirut. These facilities lie in Minet el-Hosn, Achrafieh, and Medawar



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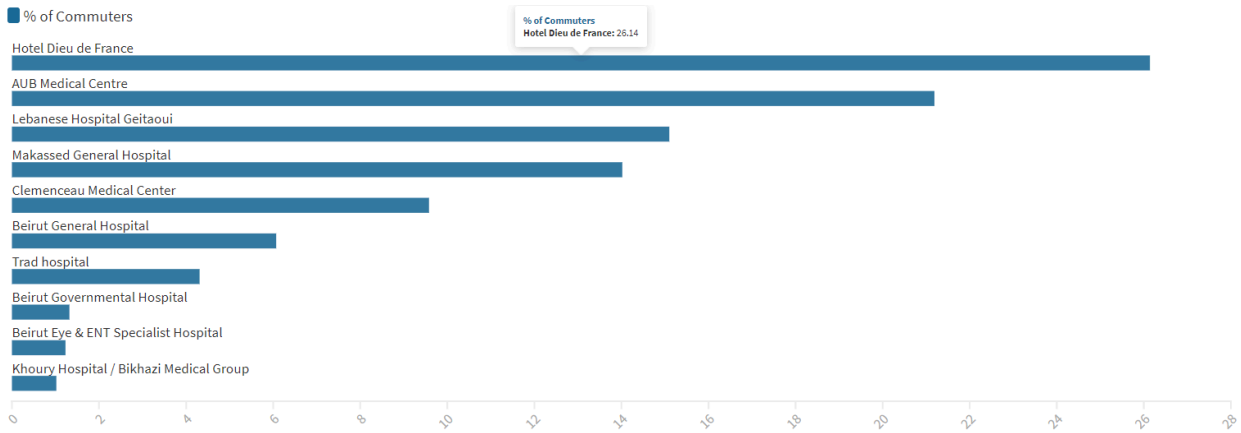


Key Findings:

-

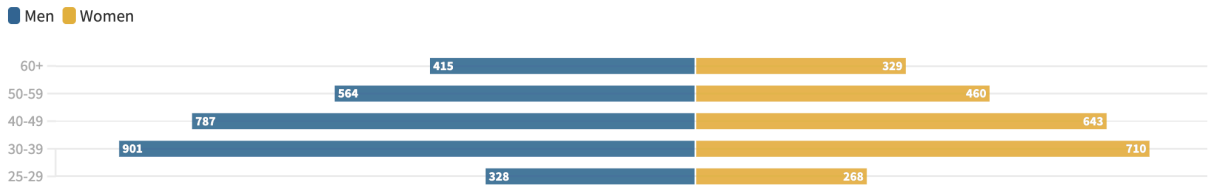
- *The results of the isochrone mapping highlight two very disparate attributes. Assuming that all facilities included within this study are equal, the model suggests an average walking time of 6.79 minutes to school across the wider Beirut.*
- *This comes in contrast to access to hospitals, where an average walking time of 16.8 minutes was estimated.*
- *Visualising the data elucidates the findings more clearly. In Figure X, where the spatial distribution of hospitals are shown, a clear divide in accessibility is seen between the northwest and the arc from east to south Beirut.*
- *The findings suggest that a large proportion of Beirut's population may suffer from a lack of access to hospital services just by virtue of their spatial distribution*
- *The findings are corroborated when population data is included. The figures below show that 5 neighbourhoods (Zoukak el-Blatt, Saifeh, Bachoura, Beirut CBD, Mazraa) do not hold any residents that are able to access any hospital services within a 10-minute walk. In contrast, 6 neighbourhoods in Beirut (Marfaa, Beirut CBD, Bachoura, Zoukak el-Blatt, Saifeh, Remeil, Minet el-Hosn) where all residents are able to reach school facilities within a 10-minute walking distance.*

SEIA Data Explorer

Segments of the socioeconomic impact assessment (SEIA) dataset were used for the multidimensional vulnerability index analysis, which was aimed to help identify where compounded vulnerabilities exist to enable targeted and prioritized relief, recovery, and reform program design, using the leave no one behind value system.

To further enable that process, the results from the SEIA are presented below through interactive graphs that can be filtered to the neighborhood level. Users can explore the data to understand Beirut level insights; they can also use the neighborhood filter to understand how the results change when considering individual neighborhoods.

Age & Gender



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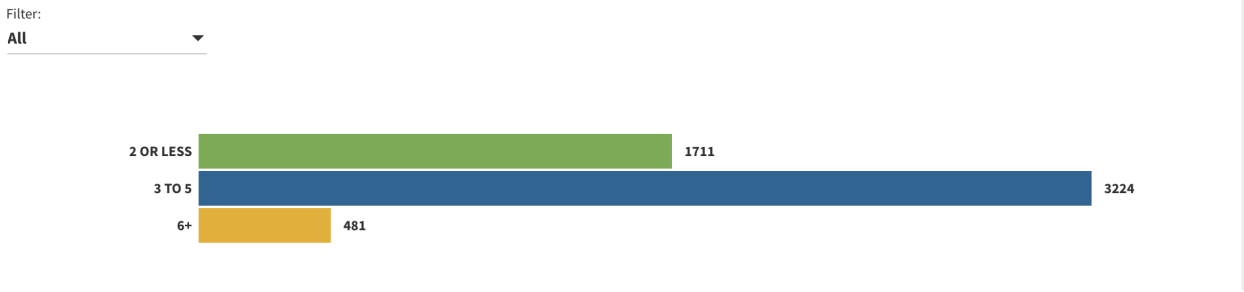
Note: gender and age are less relevant because respondents were asked to respond on behalf of household

Household Size



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Nationality

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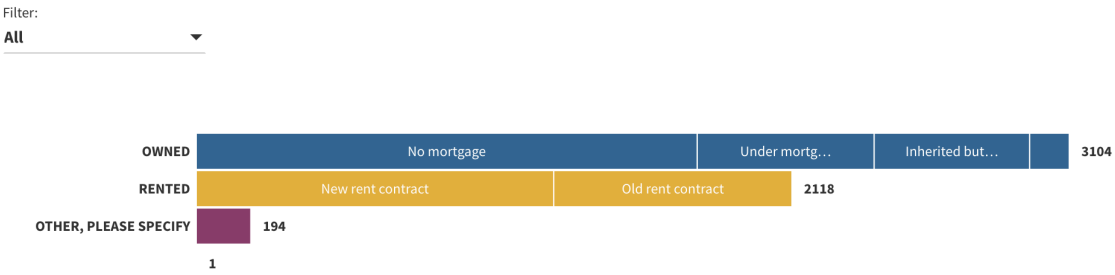
Owned / Rented



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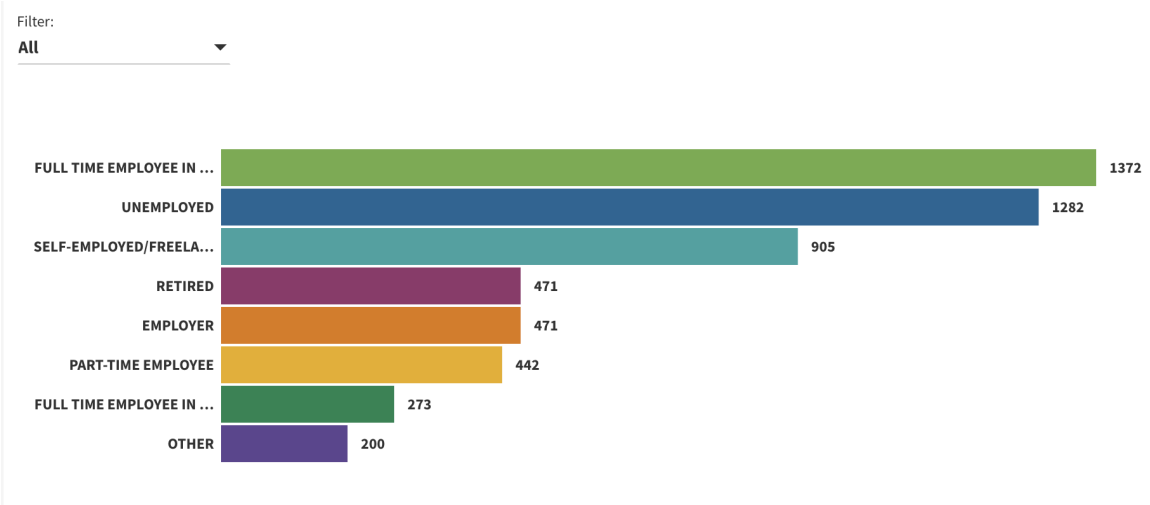
Work status of main income earner



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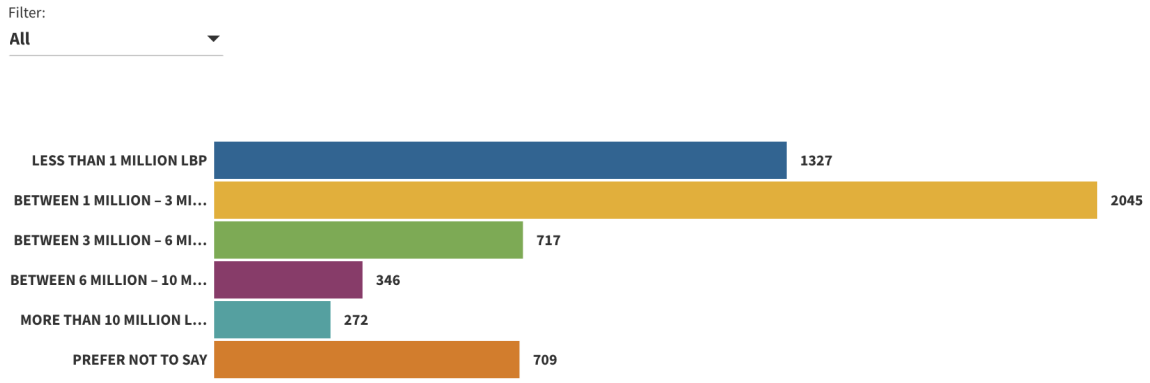
HH income pre explosion



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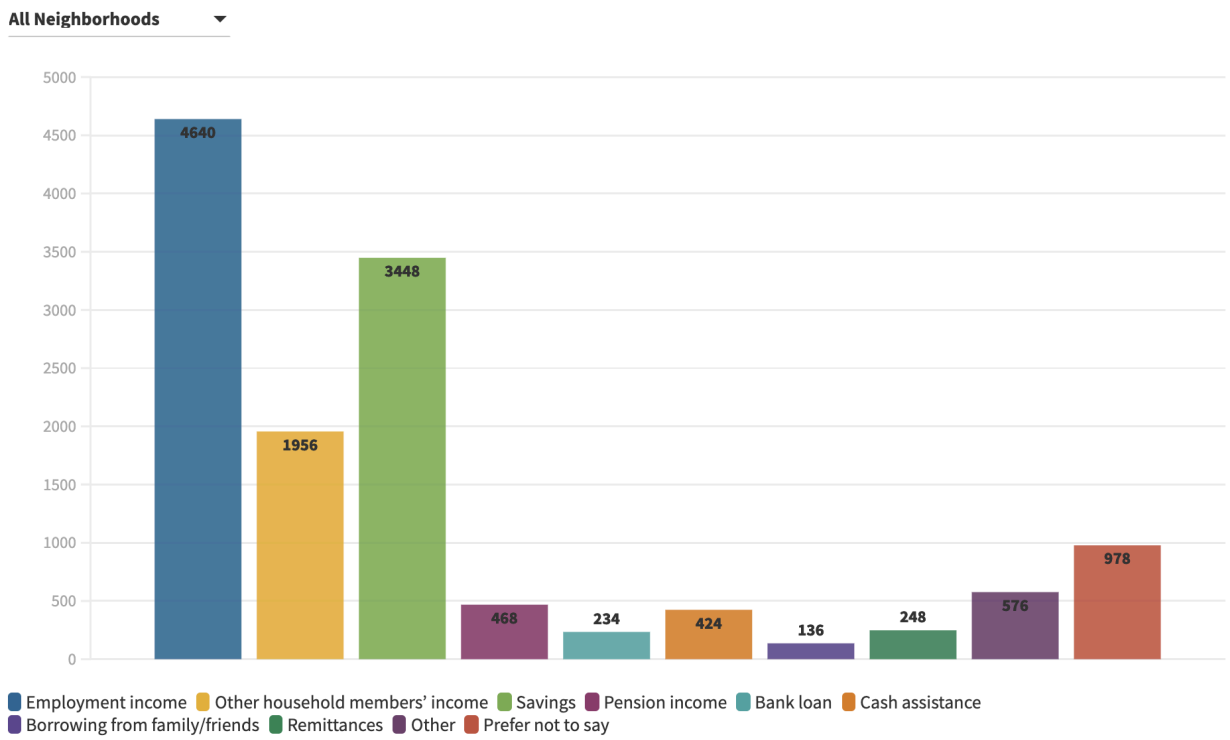
Covering expenses via



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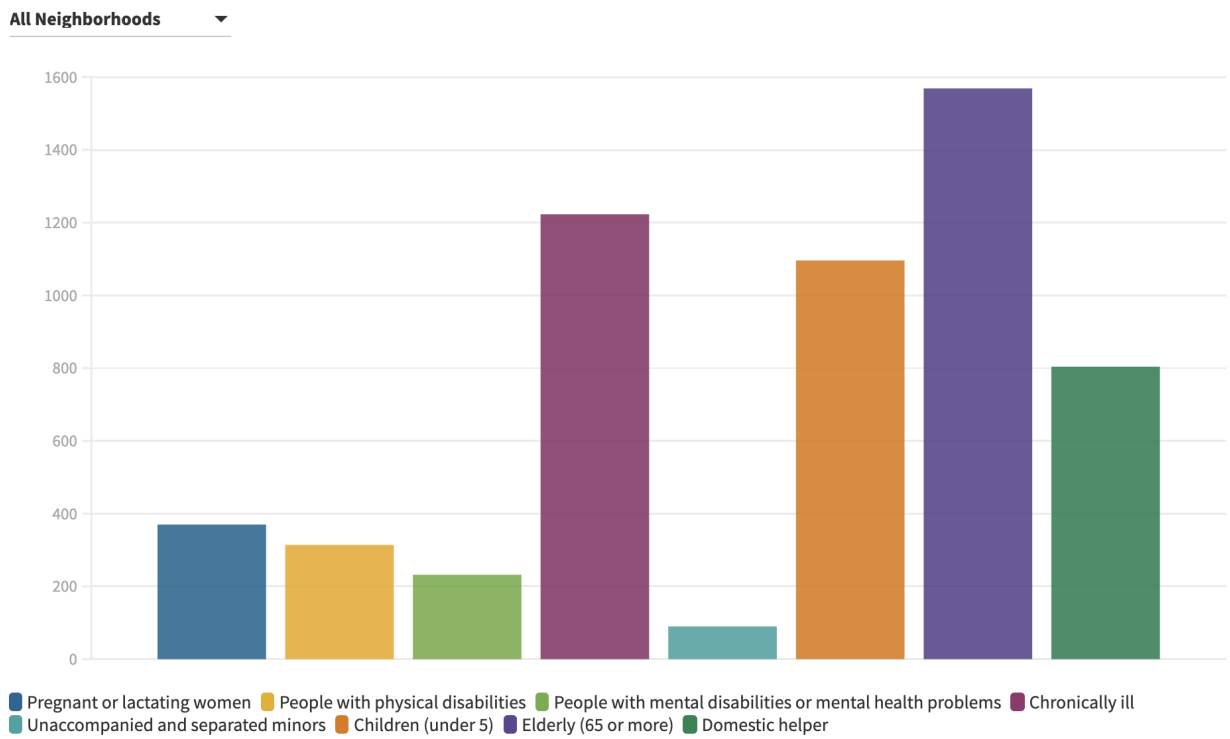
Vulnerable groups (multiple choice)



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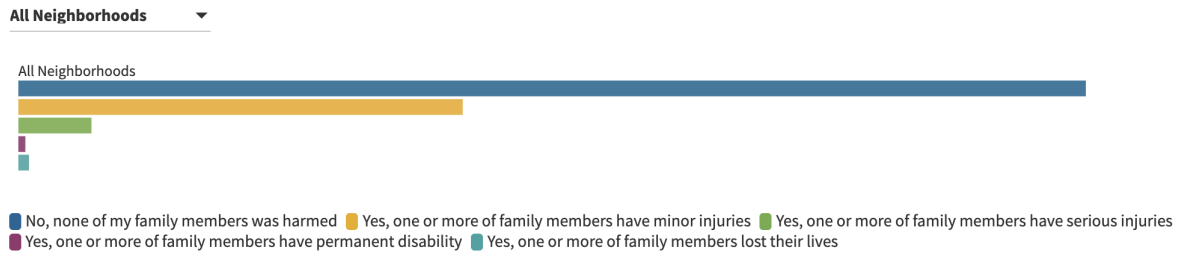
Impact of Blast

Injuries (multiple choice)



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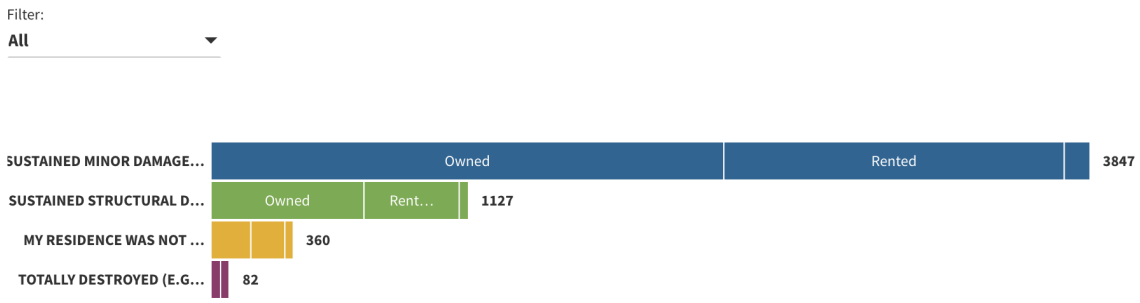
Physical damage



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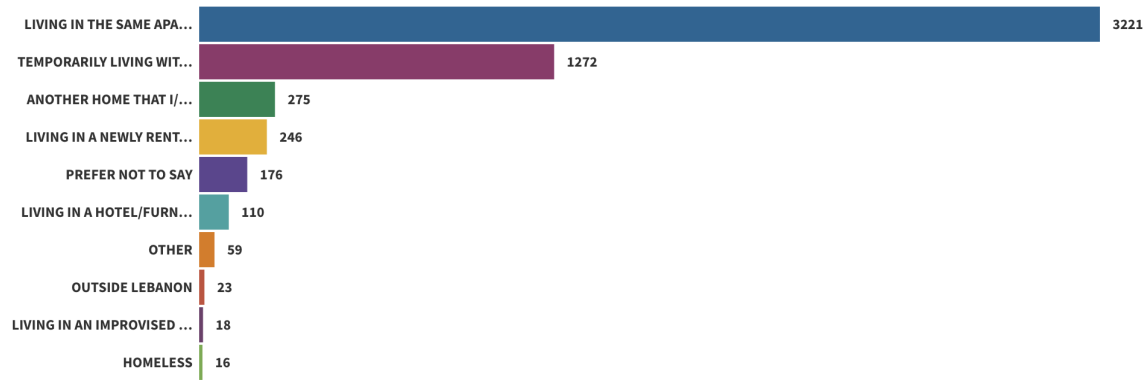
Living since explosion - location

Filter:
All

https://public.flourish.studio/visualisation/5028369/

Living since explosion - type

Filter:
All



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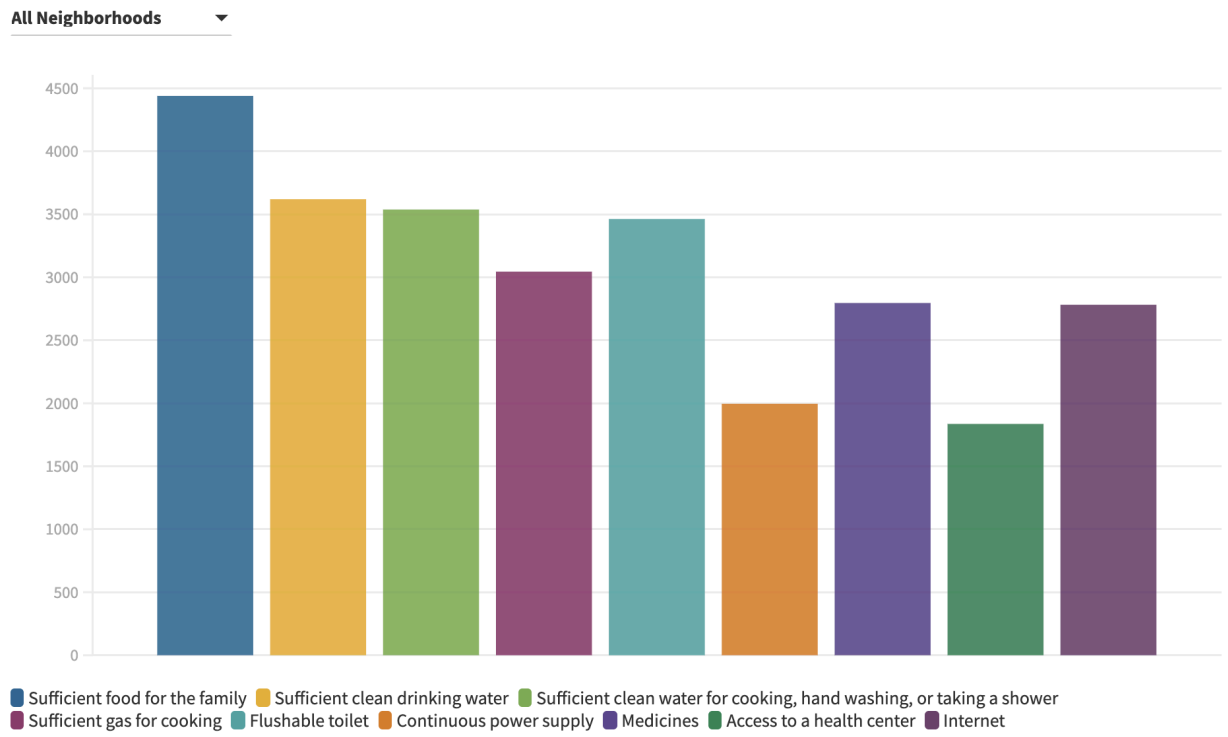
Access to basic needs



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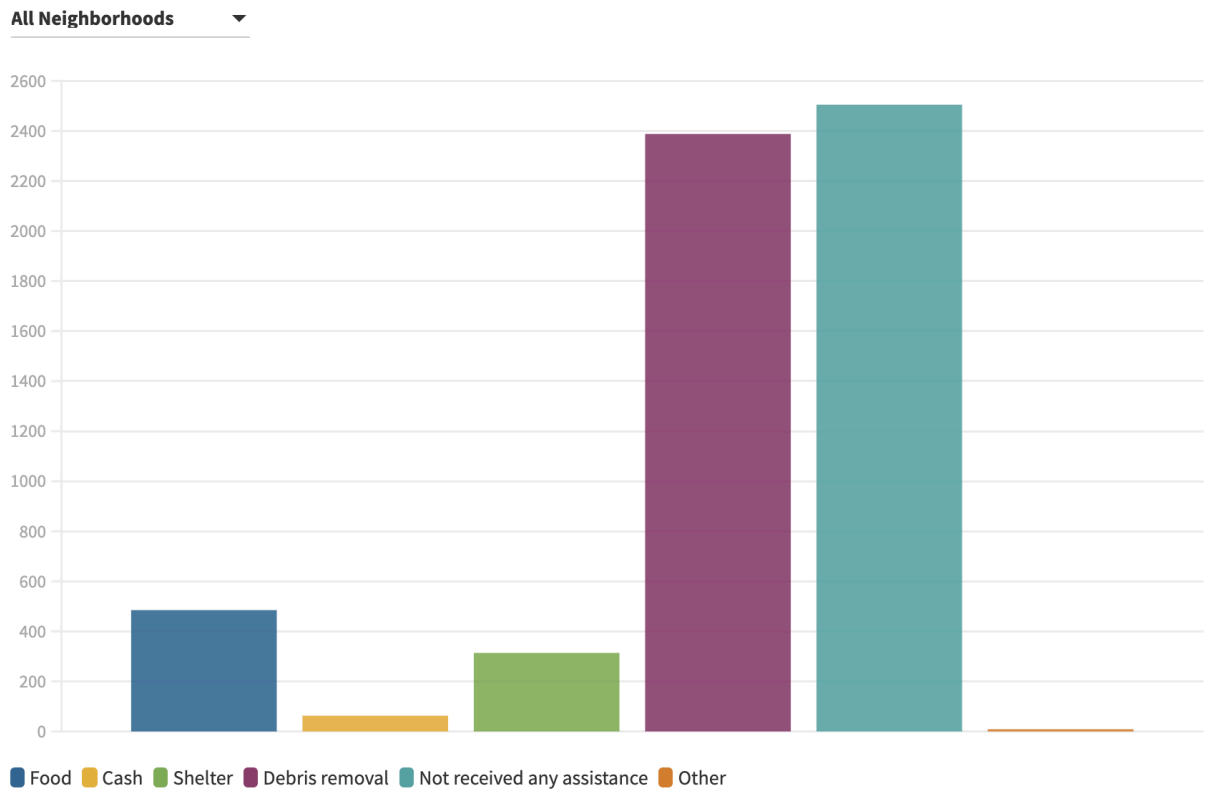
<script src="https://public.flourish.studio/resources/embed.js"></script>

Assistance received - type



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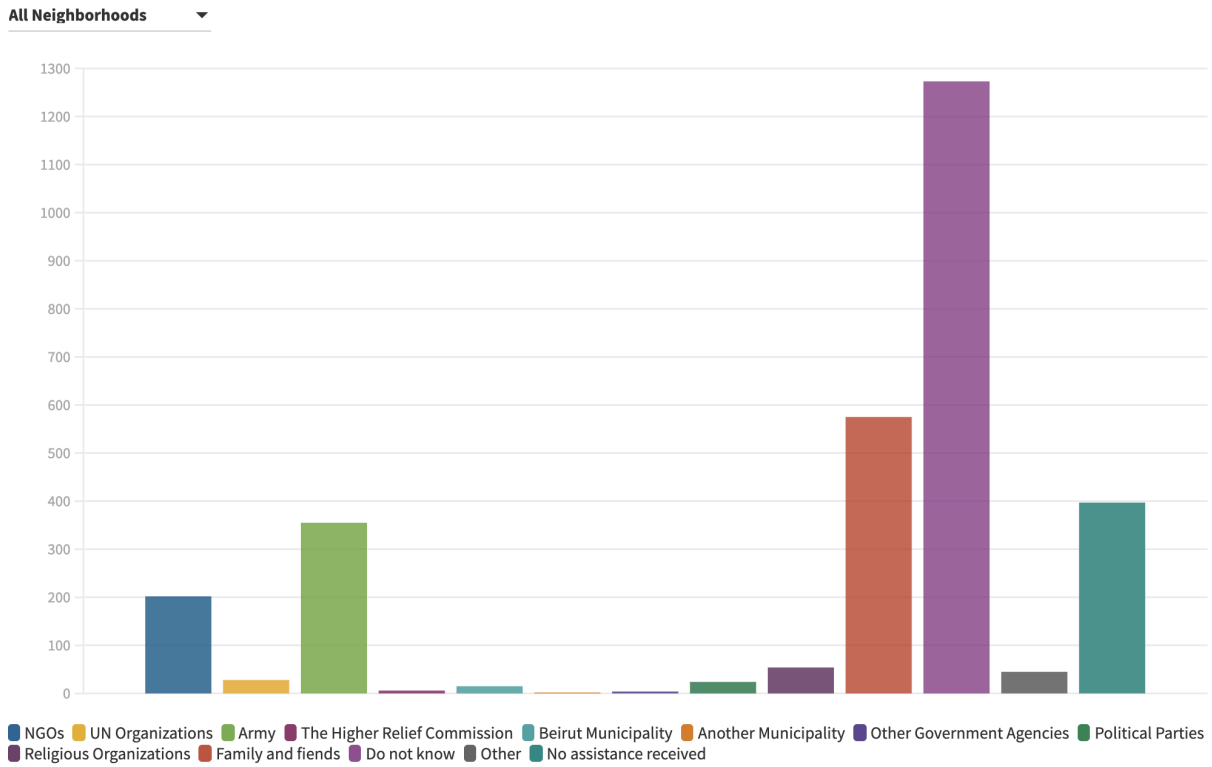
Assistance received - source



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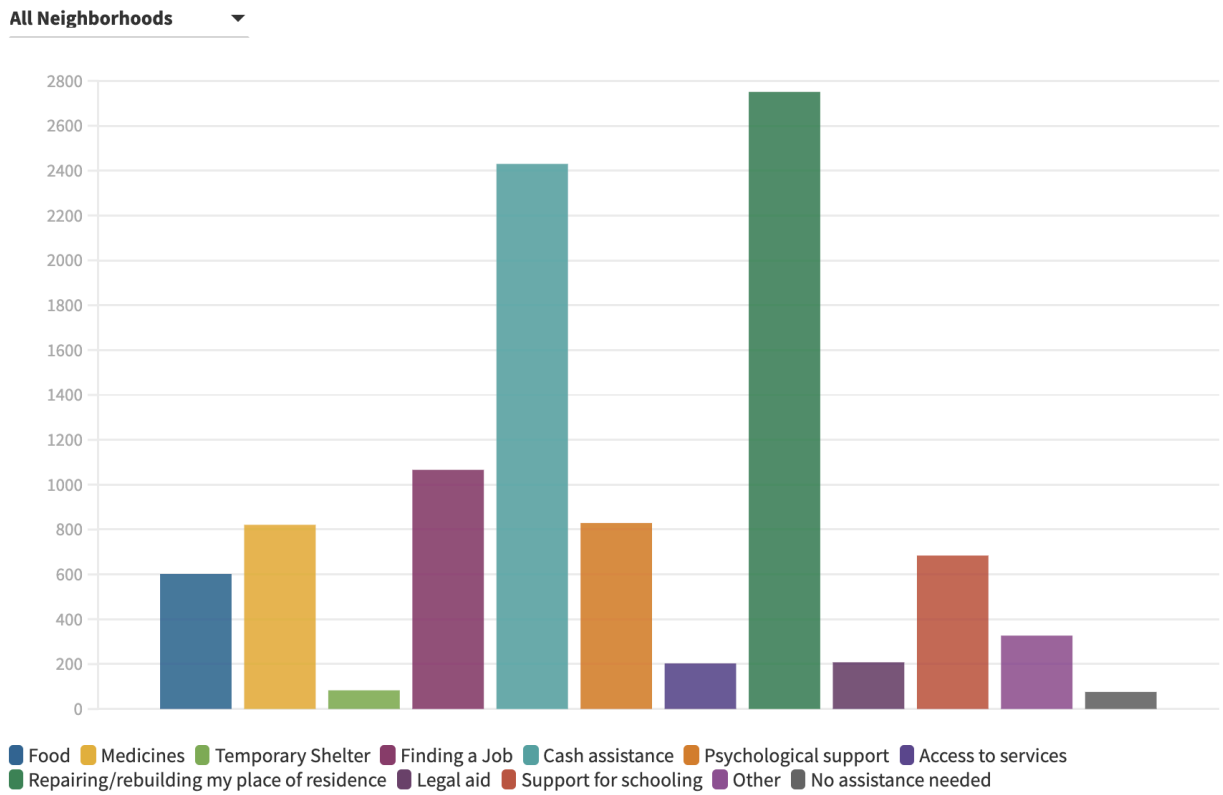
Assistance needed



https://public.flourish.studio/visualisation/5173825/

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** remind that this reflects a snapshot in time and not the most current needs

Neighborhood Insights

The previous SEIA Data Explorer section allows users to explore the data, question by question, across all neighborhoods. In this section, we present a different tool that allows users to dive into the data for the neighborhoods that have sufficient data.

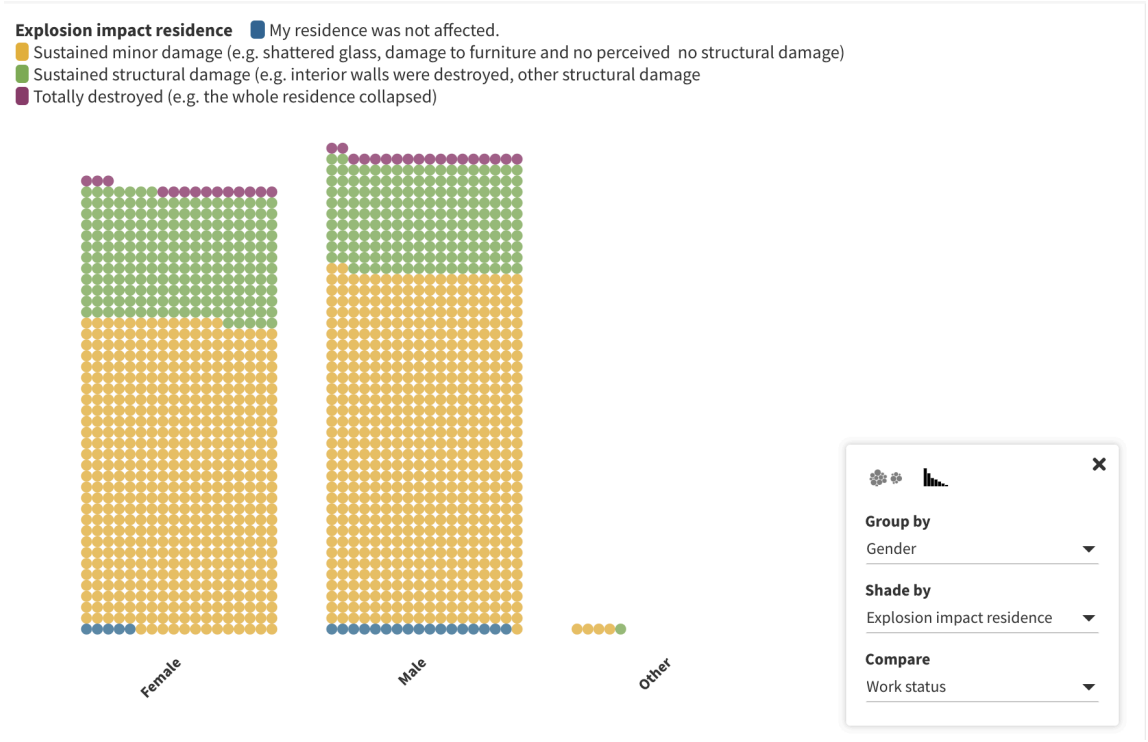
Achrafieh

As one of the most populous and largest neighborhoods in Beirut, Achrafieh is home to a wide range of groups. As compared to the Beirut average, a higher proportion of households earn greater than 10 million LBP, however 52% of households earn less than 3 million LBP illustrating the diversity of socioeconomic groups that live in Achrafieh.

In terms of absolute numbers of respondents, **there are 4x as many households that earn less than 3 million LBP in Achrafieh when compared to Medawar.** This illustrates that while the neighborhood perspective offers valuable information, the aggregating information can hide essential insights. See section on What defines a neighborhood for further detail.

To help counteract the effect of aggregation, the survey results for Achrafieh are presented below in an interactive exploratory tool, where each household is represented by a single point. You can slice and dice the result by using the group by, shade by, and compare by function.

Interactive data explorer



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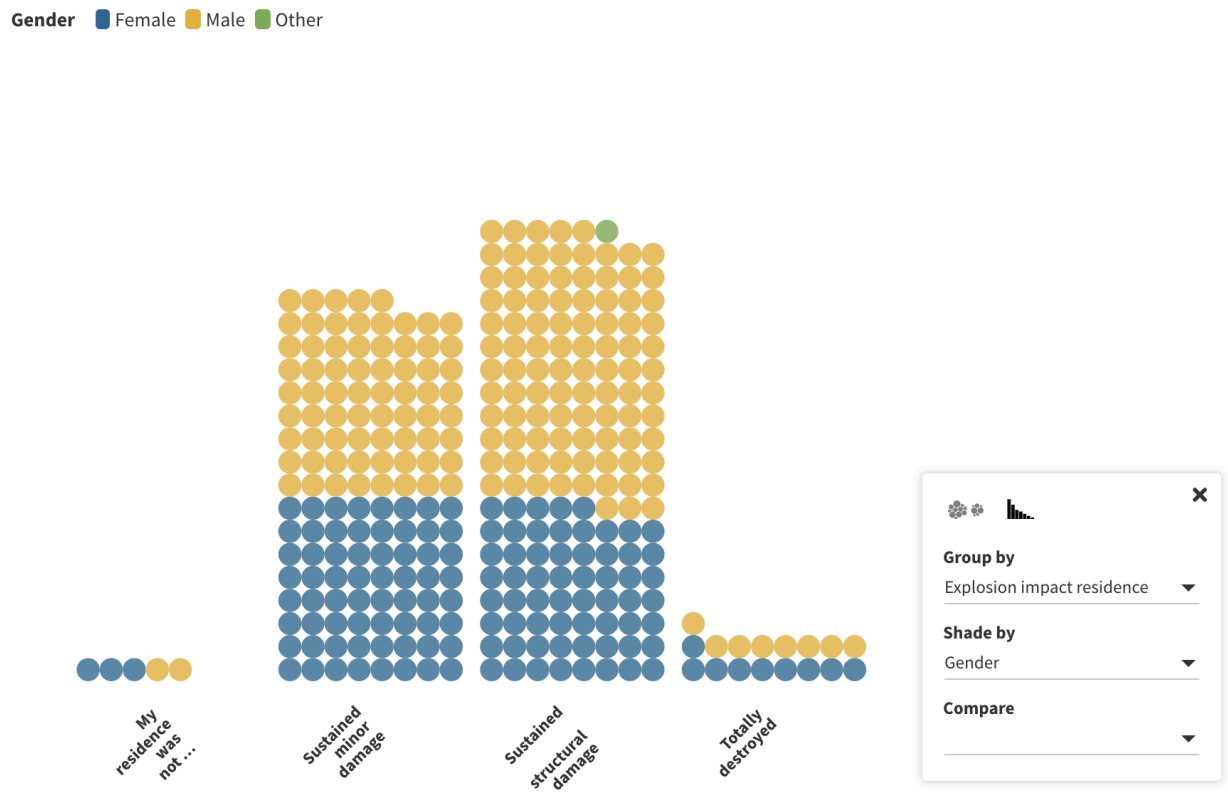
Key findings

- **52% of respondents earn less than 3 million LBP while 8% earn more than 10 million LBP.** This illustrates the socioeconomic range within Achrafieh.
- **4x the number of households earn less than 3 million LBP in Achrafieh when compared to Medawar.** Although the average resident in Medawar earns less than the average resident in Achrafieh, the high population of Achrafieh results in a high number of low income residents.
- **30% of households have an elderly inhabitant.**
- **Only 7% of households were not affected by the blast.** 71% sustained minor damage, 21% sustained structural damage, and 2% of homes were totally destroyed.

Medawar

As a neighborhood close to the blast site, households and businesses in Medawar were significantly impacted by the blast. As a historically deprived neighborhood, households in Medawar experience several levels of compounded vulnerabilities that make them more susceptible to shocks, such as the blast.

The interactive exploratory tool displays each household as a single point. Explore the results by using the group by, shade by, and compare by functions. Hover over a point to see the full profile for that household.



https://public.flourish.studio/visualisation/5267549/
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Key findings

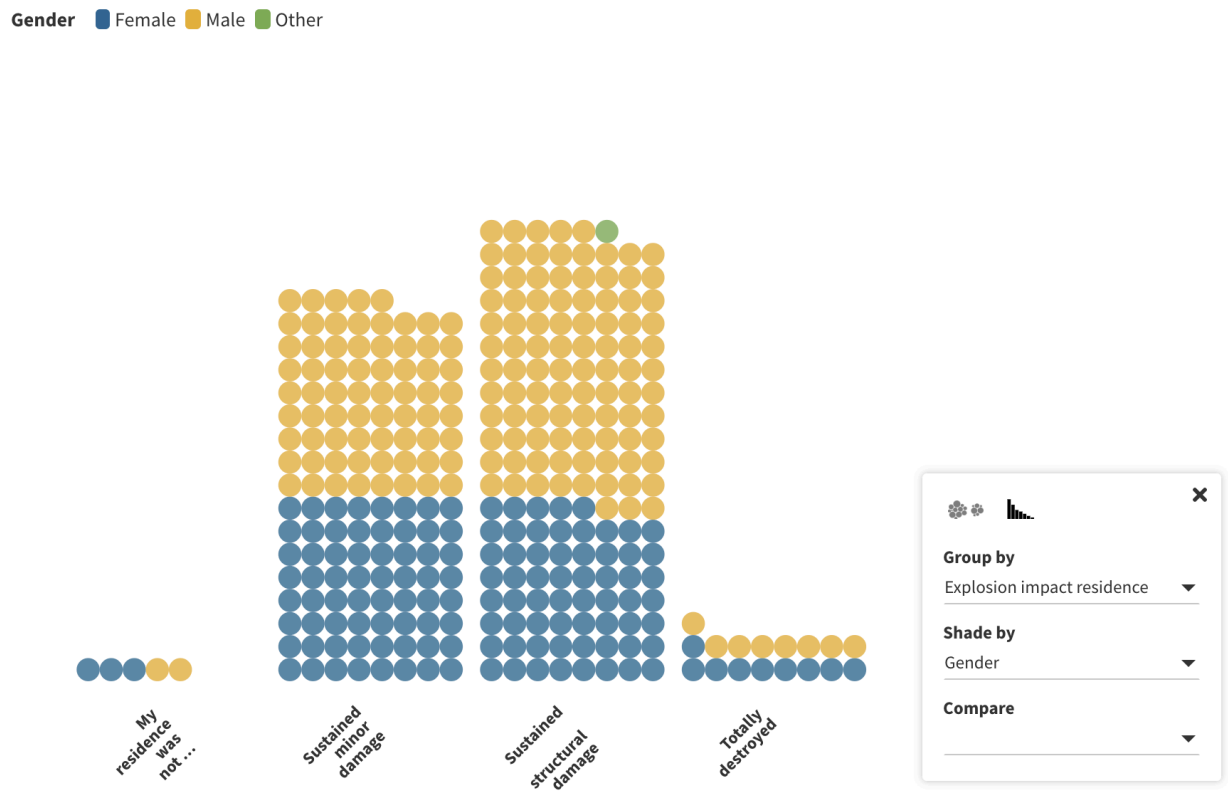
- **30% of households in Medawar are under old rent contracts,** compared to 16% for Beirut as a whole**.** As described in the LNOB report, many families remained in structurally unsound homes out of fear of losing their old rent contracts.

- **The main income earner for over half of households are either unemployed, retired, or freelancing.** Without a secure, continuous income stream, families are likely to face increasing vulnerability to shocks as cost of living continues to rise while their purchasing ability continues to drop.
- **62% of households make less than 3 million LBP per month**. As a neighborhood that was heavily impacted by the blast, families faced undue cost burdens to recover and rehabilitate their homes.

Bachoura

As the neighborhood with the second highest multidimensional vulnerability score and given its proximity to the blast site, Bachoura was significantly impacted by the explosion. Only 1% of households did not sustain physical damage. Considering the existing compounded vulnerabilities, such levels of structural damage would be debilitating for families in Bachoura.

The interactive exploratory tool displays each household as a single point. Explore the results by using the group by, shade by, and compare by functions. Hover over a point to see the full profile for that household.



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Key findings

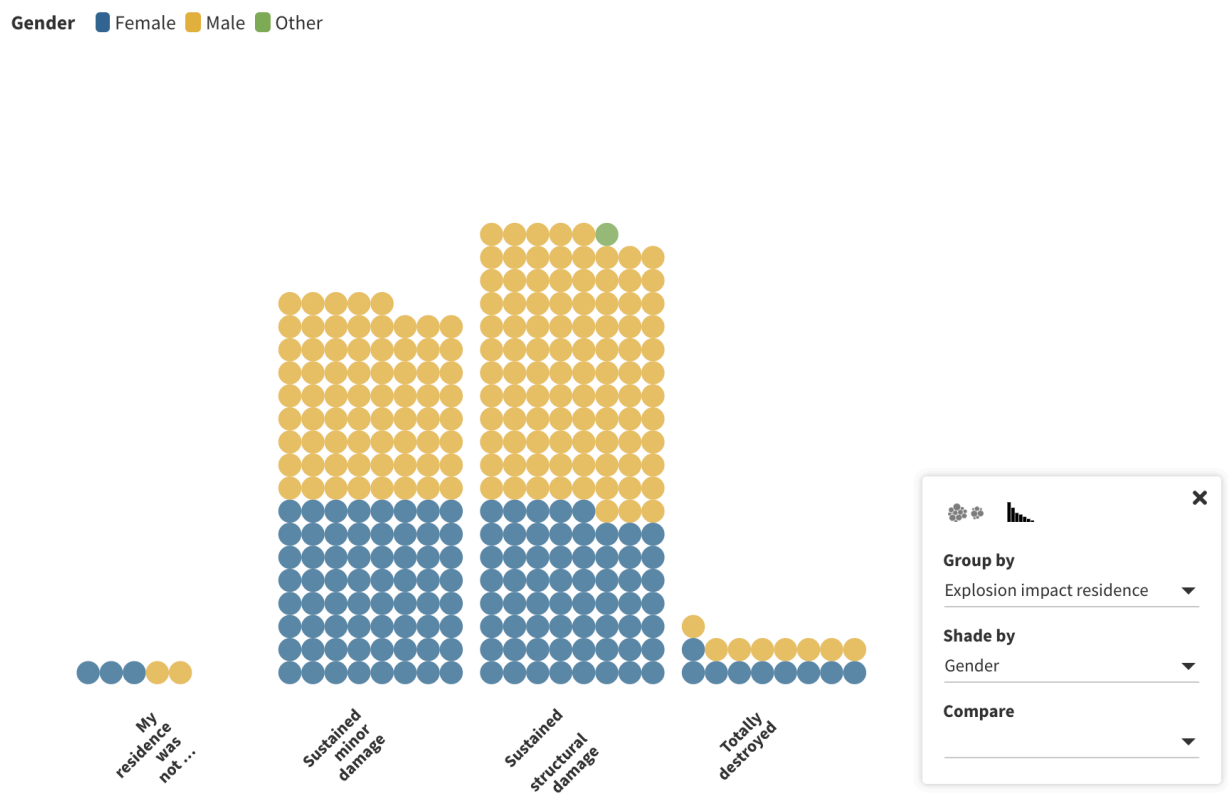
- **81% of households make less than 3 million LBP per month**, which is broken down into 47% earning 1-3 million LBP per month, and 34% earning less than 1 million LBP.
- **Only 1% of households did not sustain physical damage from the explosion**. 87% sustained minor damage and 12% experienced structural damage (e.g. broken walls)

- **35% of families had a member who experienced injuries as a result of the blast**. 3% sustained serious injuries, permanent disabilities, or lost their lives.

Zoukak el-Blatt

Although Zoukak el-Blatt is of approximately the same size as Saifeh, but has a population of 19,000 while Saifeh has 6,000 inhabitants. The population density of Zoukak el-Blatt indicates a higher level of vulnerability, which the MVI analysis indeed confirms as it has the third highest MVI score in Beirut.

The interactive exploratory tool displays each household as a single point. Explore the results by using the group by, shade by, and compare by functions. Hover over a point to see the full profile for that household.



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Key findings

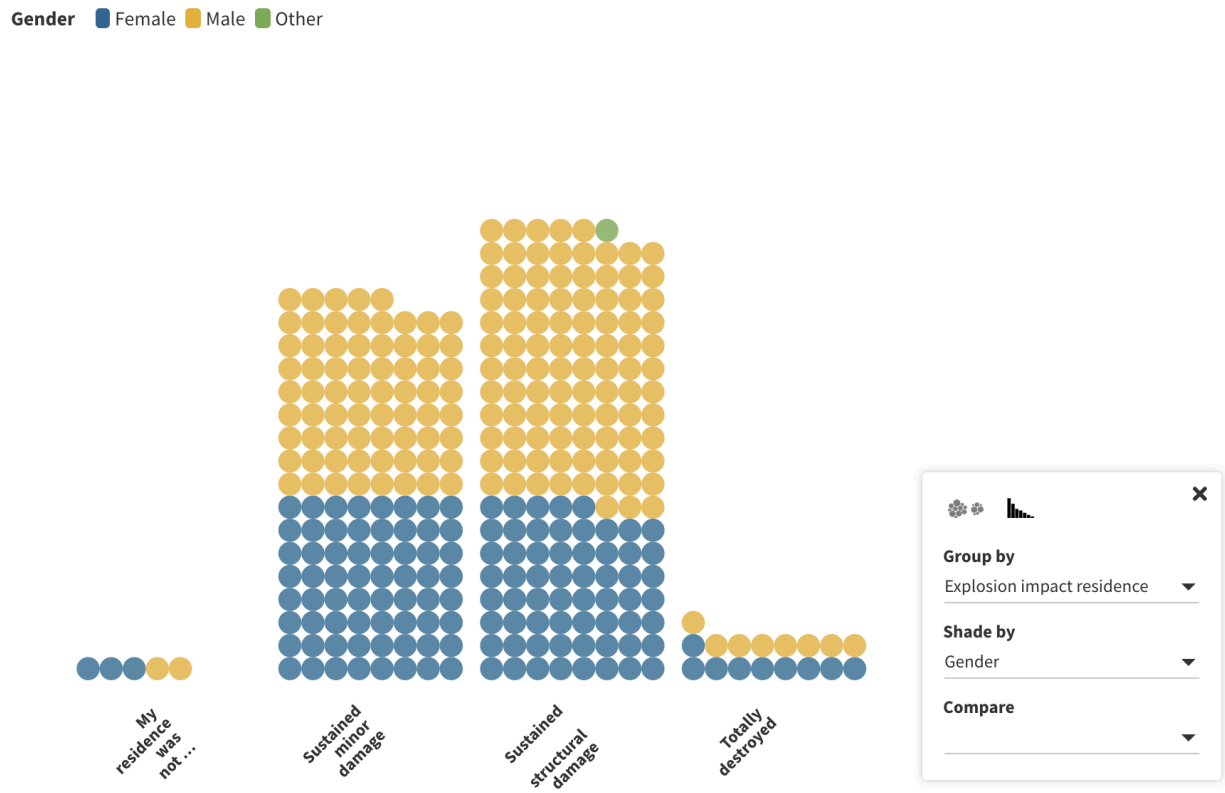
- **1 / 3 households have a family member that sustained minor or major injuries.**
- **77% of household main earners have a total monthly income less than 3 million LBP.** 33% earn less than 1 million LBP.

- **25% need support finding a job**. Unemployment is pervasive across neighborhoods, but is exasperated further by increased difficulty in finding employment, especially with the concurrent COVID and economic crises.
- **16% of respondents in Zoukak el-Blatt request psychological support**. Expectedly, the explosion likely led to PTSD and triggered past associated traumas for families, many of whom likely lived through decades of war and turmoil in the past. Mental illness or disability is a critical vulnerability that, especially when compounded, can cause or sustain other vulnerabilities.

Remeil

Gemmayze and Mar Mkhael, two areas in Remeil, were heavily hit by the blast and became the focal point for recovery efforts across a range of organizations. As a historical neighborhood that has been undergoing gentrification over the past couple of decades, a wide range of inhabitants and businesses exist in Remeil. Protected by old rent contracts, many families have remained in their homes for generations while other apartments are now occupied by a younger crowd, often in short term rentals. In terms of businesses, the hippest restaurants in town co-exist next to old industrial family owned businesses. The diversity of the neighborhood indicates a diversity of vulnerabilities, which should be kept in mind as recovery programs are designed.

The interactive tool allows the diversity of Remeil to be explored as it displays each household as a single point. Explore the results by using the group by, shade by, and compare by functions. Hover over a point to see the full profile for that household.



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Key findings

- **Almost half of households in Remeil need cash assistance,** while only 1% received any cash aid. Such data must be used to prevent a mismatch between family needs and type of interventions offered.
- **37% of households have an elderly member,** compared to 29% across Beirut. As described in the LNOB report, the currency crisis has wiped away savings for many elderly people who also often lack social security and employment opportunities, making them particularly vulnerable to shock.
- **41% of households sustained structural damage or complete destruction as a result of the explosion**. The remaining 59% of homes experienced shattered glass and minor damage. None of the households were unaffected.

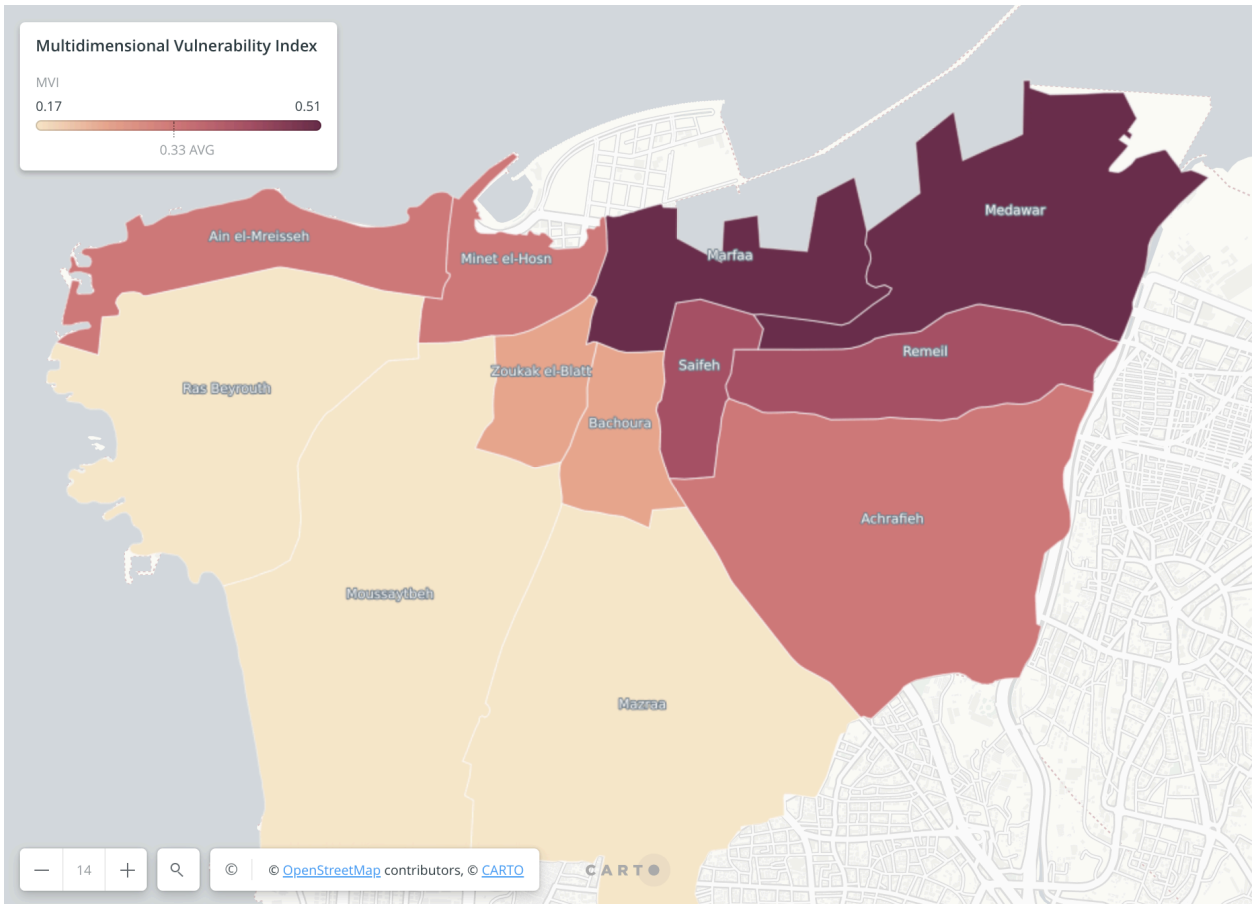
MSMEs | Vulnerability & Accessibility

Beirut Insights

Designing Relief, Recovery, and Reform programs after a disaster requires an understanding of **where** the most vulnerable and the most impacted households and businesses exist in order to prioritize aid. In this section, vulnerability is assessed from the micro, small, and medium sized enterprise (MSME) perspective.

To answer the question of **which** MSMEs are most vulnerable and **where** they exist within the city, we use the multidimensional vulnerability index to assess intersectional vulnerabilities at the MSME level, and then aggregate to the neighborhood level. The dataset used from the socio-economic impact assessment that was conducted after the blast.

Multidimensional Vulnerability Index Neighborhood Scores



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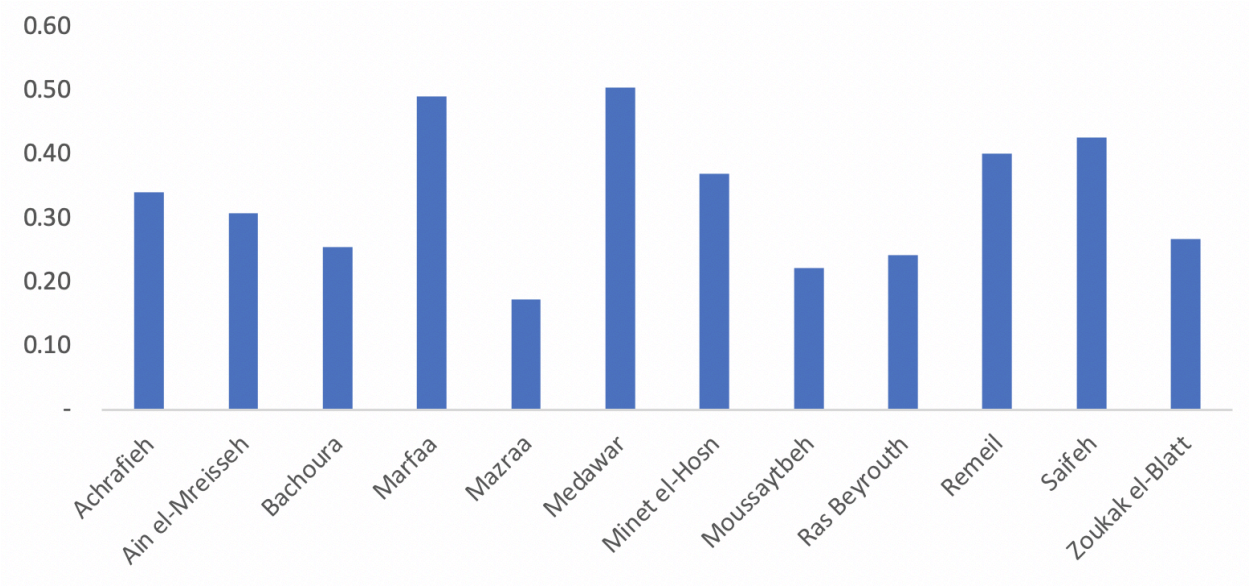


Figure X. Multidimensional vulnerability MSME scores for Beirut neighborhoods

As two historically deprived neighborhoods that also happen to be close to the blast site, Marfaa and Medawar have the highest MSME MVI score indicating a high level of deprivation and significant blast impact among businesses in those areas. Achrafieh and Saifeh are also near the blast site, but have a low MVI score despite having a high portion of businesses that are vulnerable (see Table X below). The intensity of vulnerability, which is a measure of the portion of indicators that the average MSME experiences deprivation, is lower for businesses in those Achrafieh and Saifeh so although there are a high portion of vulnerable MSMEs, the overall score is relatively low.

Considering MVI score is useful as a summary measure, however it is also important to consider its two components, namely percentage of vulnerable MSMEs in the neighborhood and average intensity of vulnerability for vulnerable MSMEs, in addition to the size of the neighborhood. Recall from the "What defines a neighborhood" section, the official Beirut neighborhoods that are used for this study do not have equal population distribution; e.g. Achrafieh has a population of 83,000 while Medawar has a population of 11,000. Assuming that the number of MSMEs is somewhat proportional to the population, the lower percentage of

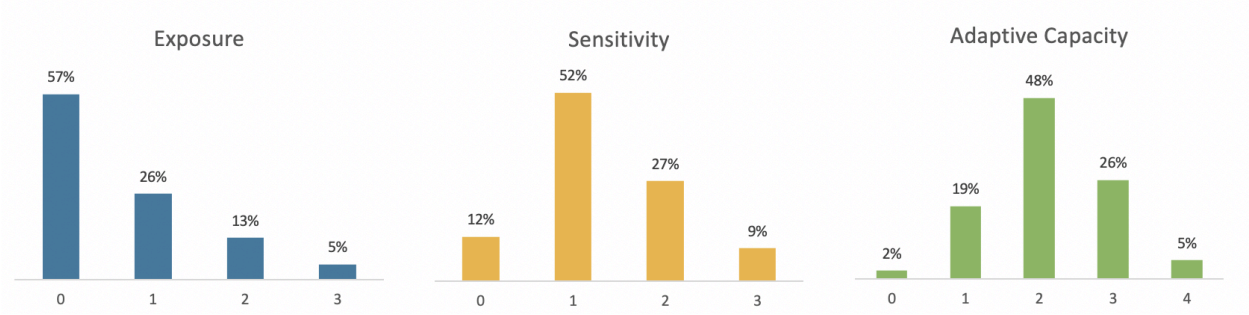
vulnerable MSMEs for Achrafieh actually refers to a higher number of vulnerable MSMEs than Medawar because of Achrafieh's larger population size. The Leave No One Behind value system stipulates that the most vulnerable must be supported first; prioritizing the most vulnerable neighborhoods is one way to begin to achieve this goal, however finding the most vulnerable families across all neighborhoods would be a less efficient, but potentially more impactful way to help the most vulnerable first.

See the MVI methodology section for further detail on the indicator weightings and the computation process and the "What defines a neighborhood" section for further discussion on the impact of neighborhood boundaries.

Neighborhood	**MVI score**	**Percentage of Vulnerable MSMEs**	**Intensity of Vulnerability**	***Sample size***
Achrafieh	0.34	68%	51%	*1540*
Ain el-Mreisseh	0.31	58%	53%	*46*
Bachoura	0.25	58%	44%	*234*
Marfaa	0.49	84%	58%	*58*
Mazraa	0.17	36%	48%	*564*
Medawar	0.51	86%	59%	*313*
Minet el-Hosn	0.37	71%	52%	*52*
Moussaytbeh	0.22	49%	45%	*388*
Ras Beyrouth	0.24	53%	46%	*170*
Remeil	0.40	75%	53%	*620*
Saifeh	0.43	78%	55%	*97*
Zoukak el-Blatt	0.27	56%	48%	*277*

Table X. Multidimensional vulnerability score, proportion of vulnerable MSMEs, and intensity of vulnerability at the neighborhood level

Exposure, Sensitivity, Adaptive Capacity



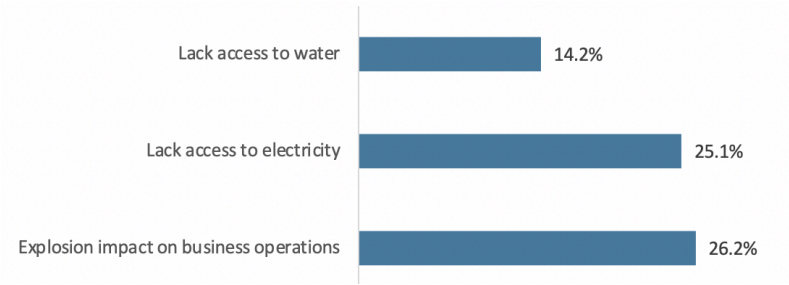
The multidimensional vulnerability index for MSMEs is a composite of indicators on exposure, sensitivity, and adaptive capacity. While the overall score is useful to understand which neighborhoods have the highest levels of multidimensional vulnerability, the breakdown of the scores across the components allows us to understand what deprivations are driving the vulnerability.

The above figures show a frequency distribution of the proportion of indicators, per dimension. For example, under the exposure dimension, 57% of MSMEs are not deprived across any of the indicators, while 26% are deprived in 1 / 3 of the exposure indicators.

The distributions across the three indicators show that households tend to be more deprived in the sensitivity dimension and the adaptive capacity dimension, when compared to the exposure dimension. In terms of overall multidimensional vulnerability, on average across all neighborhoods, the exposure dimension accounts for 22% of the MVI score, while the sensitivity dimension accounts for 38%, and the adaptive capacity dimension accounts for 40% of the score. This suggests that the main deprivations faced by households in Beirut, in order of impact, are related to adaptive capacity, sensitivity, and then finally exposure.

Exposure

While the results indicate that the exposure dimension contributes the least to overall multidimensional vulnerability, there are still significant vulnerabilities that are evident when considering the sub-dimension indicators.

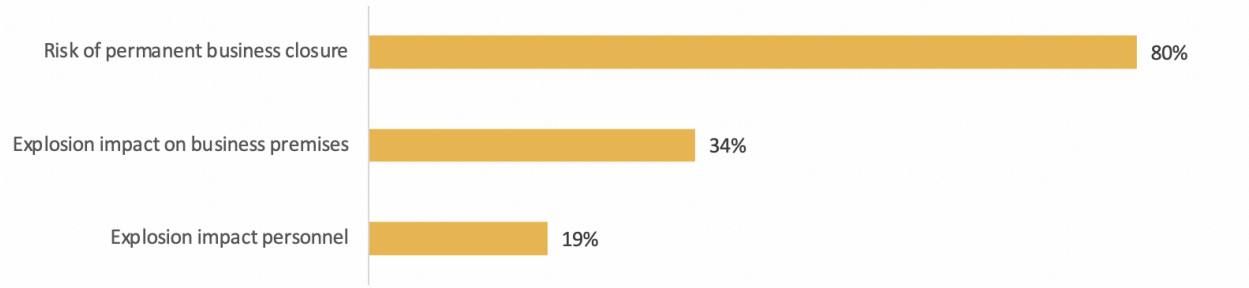


Key findings

- **The port explosion impacted the operations of more than a quarter of businesses.** The impact faced by businesses range from reliance on the port for import or export to damaged premises or relocation of clientele.
- **25% of MSMEs lack access to electricity.** While power supply issues have existed for many years in Lebanon, the impact of this vulnerability is intensified when coupled with other vulnerabilities. For example, businesses facing reduced revenue from sales and increased costs due to repairs may be unable to afford private electricity supply.

Sensitivity

The sensitivity dimension of the MVI measures how much of an impact a disaster could or did have on businesses. Existing vulnerabilities make a business more sensitive to a shock, which could be the August 4th explosion, but could also be the currency crisis or the COVID crisis. These shocks could cause deprivations and could make businesses increasingly vulnerable to shocks. The higher the number of deprivations across indicators, the more multidimensionally vulnerable a business is to shocks.

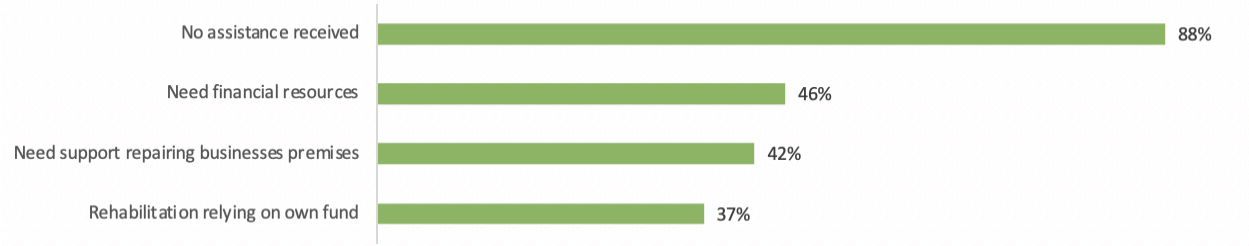


Key findings

- **80% of businesses are closed or face risk of permanent business closure.** The compounded vulnerabilities businesses faced pre-explosion led to an overall level of vulnerability that made businesses very susceptible to shocks like the Beirut explosion.
- **The explosion caused physical damage to one in three businesses**. Premises damage causes further vulnerabilities for MSMEs because they likely have to bear the cost of repair, while potentially losing sales from an inability to operate fully.

Adaptive Capacity

Finally, adaptive capacity assesses the ability of businesses to recover from a shock. This is measured by understanding the extent of assistance received by businesses, which is an indicator of their support networks, and the level of support they require.



Key findings

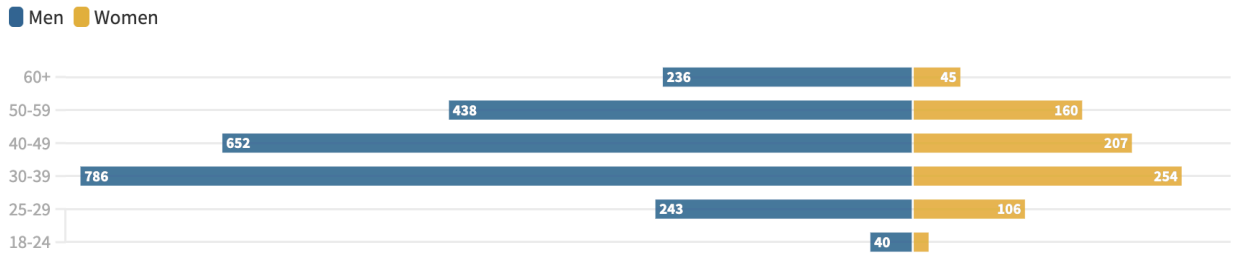
- **Within weeks of the explosion, 88% of businesses did not receive any assistance.** Over time, this figure likely changed as aid was mobilized, however it is still significant to note that the vast majority of businesses did not receive any assistance in the most critical time period.
- **Approximately half of MSMEs require financial resources for working capital and raw materials**. Requiring financial support for operational functional of businesses indicates that MSMEs do not have sufficient revenue flow to sustain their typical business models.
- **More than one third of MSMEs are rehabilitating their businesses by relying on their own funds**.

MSME SEIA Data Explorer

Segments of the socioeconomic impact assessment (SEIA) dataset were used for the multidimensional vulnerability index analysis, which was aimed to help identify where compounded vulnerabilities exist to enable targeted and prioritized relief, recovery, and reform program design, using the leave no one behind value system.

To further enable that process, the results from the SEIA are presented below through interactive graphs that can be filtered to the neighborhood level. Users can explore the data to understand Beirut level insights; they can also use the neighborhood filter to understand how the results change when considering individual neighborhoods.

Age & Gender



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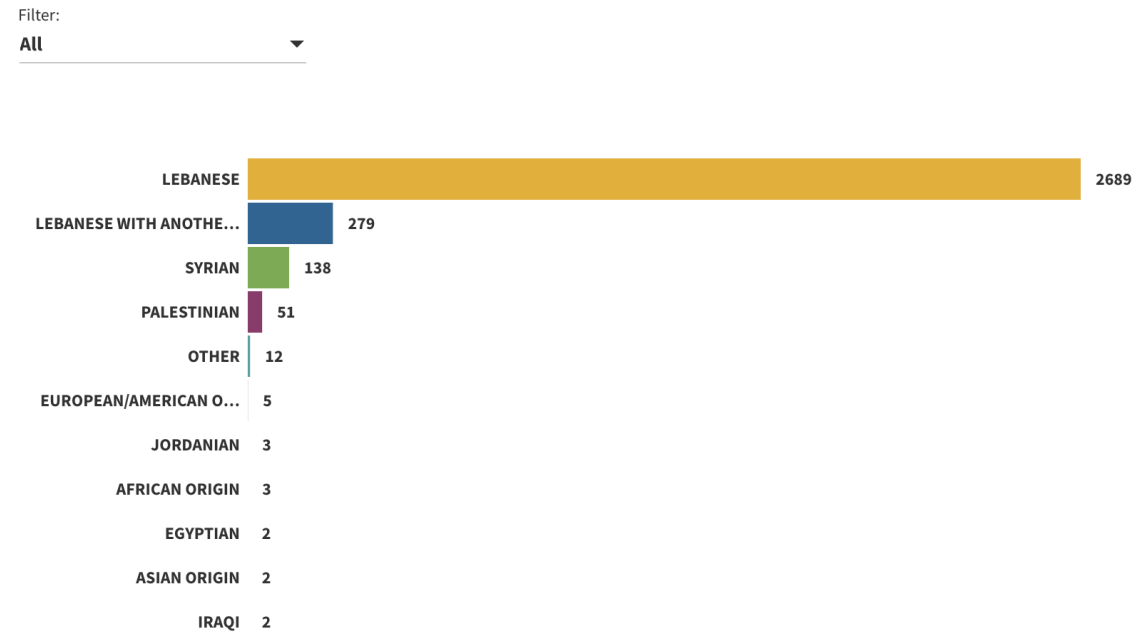
Nationality



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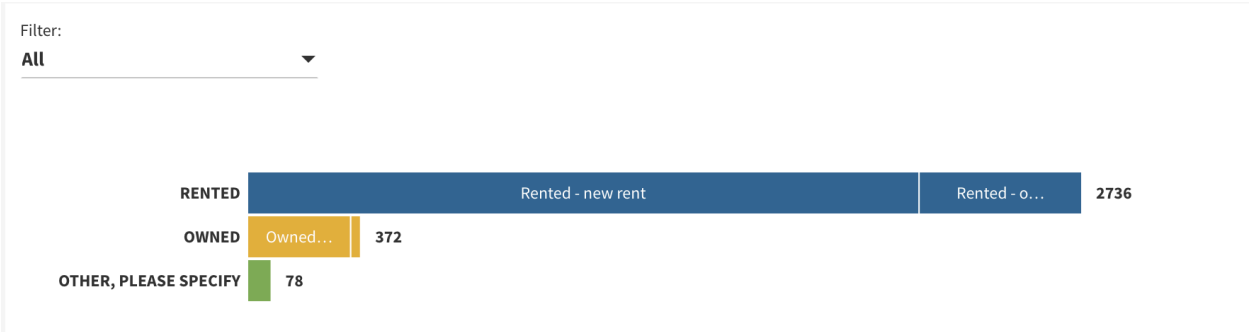
Owned / Rented



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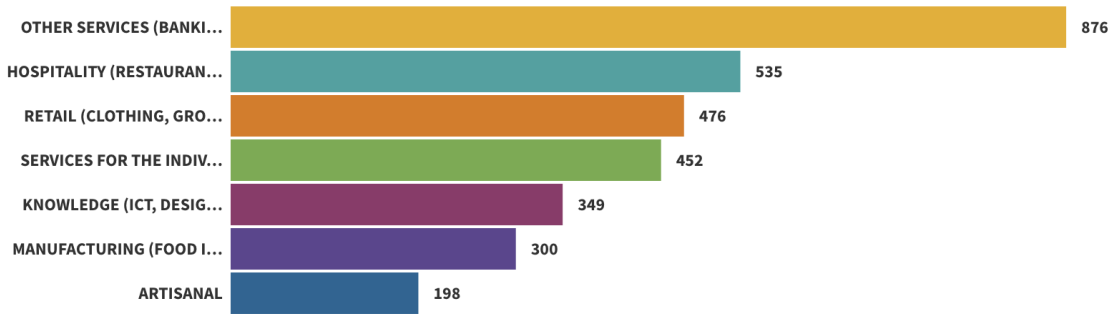
Sector

Filter:
All



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Main market for business

Filter:
All

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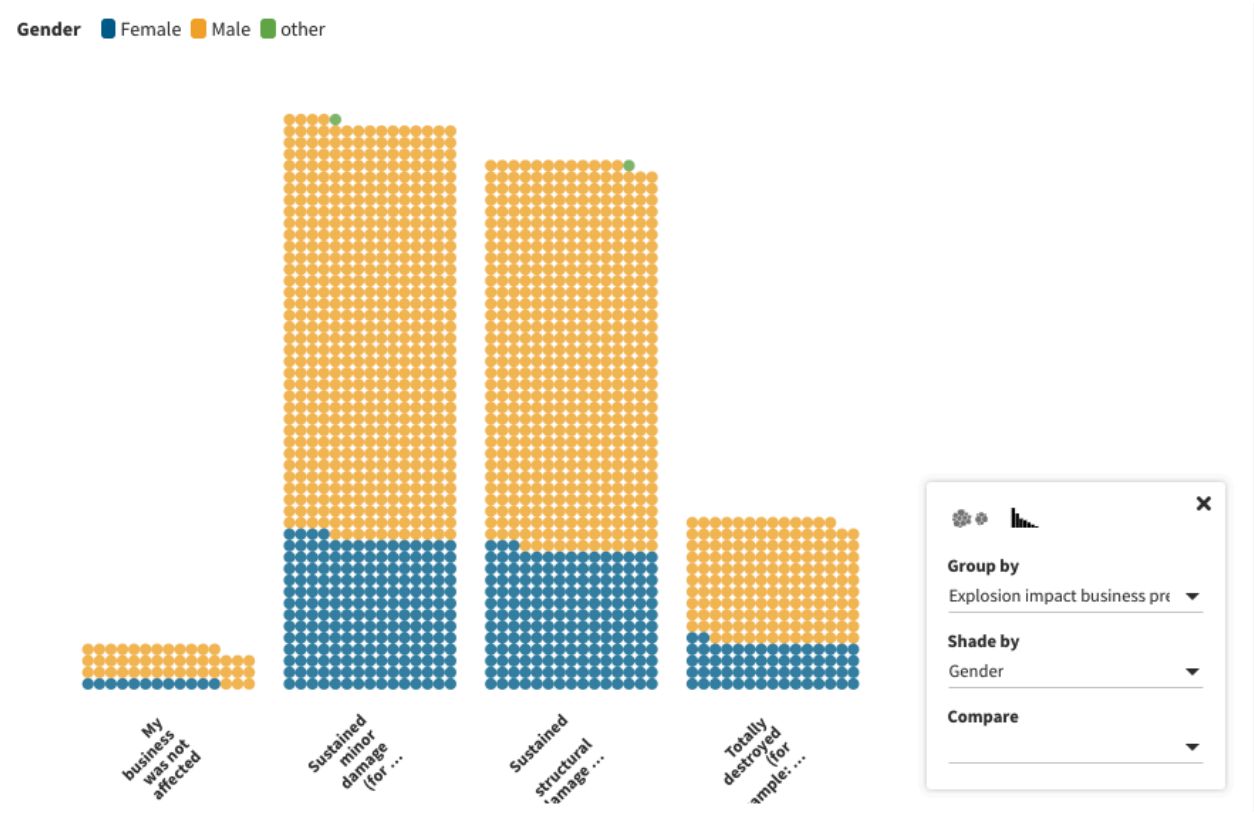
Impacted Neighborhoods

The previous SEIA Data Explorer section allows users to explore the data, question by question, across all neighborhoods. In this section, we present a different tool that allows users to dive into the data for the neighborhoods most affected by the blast. Due to reduced overall sample size for the MSME survey, when compared to the households survey, the data for the most impacted neighborhoods are aggregated rather than each neighborhood presented as a separate section. The neighborhoods are: Achrafieh, Bachoura, Beirut Central District, Marfaa, Medawar, Minet el-Hosn, Remeil, Saifeh, and Zoukak el-Blatt, which represent 1,708 of the survey responses, 54% of overall responses.

The interactive exploratory tool displays each household as a single point. Explore the results by using the group by, shade by, and compare by functions. Hover over a point to see the full profile for that business.



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Key findings

- **97% of businesses in the areas closest to the blast sustained some level of damage.**
- **More than half of businesses experienced major structural damage or were totally destroyed**. One third of those businesses estimate direct and indirect losses to be between $10,000 and $50,000. Another third expect losses to be between $50,000 and $1,000,000. Finally about 15% of businesses that suffered major damage or total destruction expect losses to be over $1,000,000.
- **Only 17% of MSMEs expect to receive rehabilitation support from the government**, but 37% expect to receive some support from UN agencies and NGOs. This indicates a low level of confidence in the government, and some level of hope to be supported by NGOs. However, in terms of adaptive capacity, businesses generally seem to not seem to expect support for the recovery process.

Methodology

Multidimensional Vulnerability Index

- MVI framework designed based on research and HDR 2020
- MVI framework that we used based on SEIA data availability
    - Call to action: data on education, data on networks & social cohesion

Link to LNOB

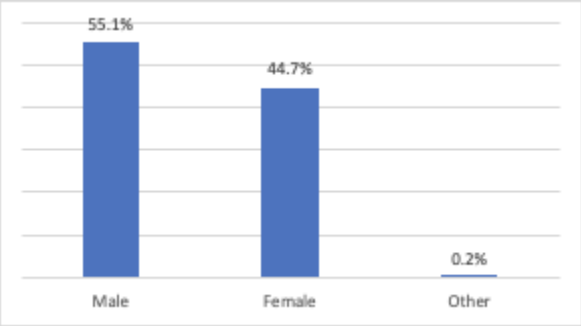
- Data driven
- Vulnerabilities
- Dwellers vs households
- Accountability
- Barriers to return
- People centered and intersectional Vulnerability

“community-based recovery is not only about physical reconstruction but about addressing “the injustices and vulnerabilities that existed before the blast in order to build a stronger community, brought together by multiple social ties, local economic activities and cultural heritage.””

“UNDP’s 2018 discussion paper to understand who is being left behind and why: (i) discrimination, (ii) geography, (iii) socio-economic status, (iv) governance, and (v) vulnerability to shocks.” - UNDP, What does it mean to leave no one behind? A UNDP discussion paper and framework for implementation, Discussion Paper, July 2018

SEIA

- Survey design
- Dissemination via facebook
- Sampling method
- Note: age and gender aren't used becaused asked people to respond on behalf of household



Population Analysis

In order to understand the impact of the blast, up to date population figures are required. In absence of a census, we used Facebook Data for Good World Population dataset, which is generated in collaboration with Center for International Earth Science Information Network (CIESIN). The population figures are available at the country level, at the sub-regional level, and, most importantly, at the neighborhood level.

The dataset provided the population density for the whole of Lebanon in a gridded format. This was processed into usable data points, which were then overlaid against the boundaries of municipal Beirut. These data points were first aggregated against municipal Beirut's official administrative boundaries. These points were also calculated against boundaries derived from the natural clusters of neighbourhoods found within the city to juxtapose the population distribution

Urban Morphology

The urban morphology aims to understand how neighbourhoods in Beirut are structured. To derive these neighbourhoods, the city's road network was taken into consideration. Here, open source data from OpenStreetMap was used to allow reproducibility of the results. Areas that contain a high density of road intersections within a specified distance were considered as individual neighbourhoods. This allows the city to be divided into a way that may be considered more true to Beirutis' lived- experience.

Accessibility Analysis

With the understanding of Beirut's population distribution, we look at how equitable essential urban facilities are distributed within the city. In particular, the ease of reach to health and education facilities are taken into account with respect to the average time required for Beirutis to walk to any given facility. The proportion of Beirutis required to walk more than 10 minutes to a hospital or school was taken to better understand the equity of distribution of these facilities. Subsequently, a spatial interaction model was formulated to understand the movement of populations within the city to take into account the size (and, therefore, attractiveness) of different hospitals. This model allows to estimate areas within Beirut that attract the most commuters, with the highest flows considered more accessible.

Leave No One Behind

The LNOB presents the results of a qualitative study consisting of desk reviews and field observations, which included interviews with inhabitants and discussions with local and international NGOs.

Key vulnerabilities identified in the report:

- **Unemployment** - 32% of the Lebanese workforce is jobless (May 2020)
- **Income status**- 86% of households in Greater Beirut rely on less than $1.33 per day
- **Insecure tenancy contracts** - Tenants often remain in structurally unsound homes due to fear of losing old rent contracts, while some landlords evicted tenants out of fear of not receiving aid
- **Risk of no or little compensation** - Unlikely insurance compensation is leaving many owners unable to pay for repairs
- **Affordability of necessities** - Devaluation of the currency coupled with constrained supply of building materials exacerbates people's inability to afford rehabilitation and living expenses
- **Insecure housing options** - Crowding, which could exacerbate COVID risks and has been shown to increase gender based violence
- **Access to support networks** - Households without access to support networks, such as migrant groups or refugees, have fewer options
- **Gender** - Lebanon ranks 145 / 153 in the WEF Gender Equality Index, a score that is likely to deteriorate as women are more likely to be unemployed, lack social protection, have no legal residence or adequate shelter, making them less resilient to shocks
- **Legal status** - Livelihoods of migrants and refugees have significantly deteriorated in recent months; for example, the Karantina public hospital, one of the few health care institutions that accepted these groups, was destroyed from the blast
- **Youth and children** - Up to 100,000 children were directly affected by the blast, compounding existing traumas and vulnerabilities caused by the parallel economic and health crises
- Future proofing talent and economy
- **Elderly** - The currency devaluation has slashed savings while the lack of social security and reduced employability have left many elderly individuals without financial means or support
- **LGBTIQ+** - The neighborhoods closest to the blast also has some of the safest spaces for the LGBTIQ+ community, many of whom were displaced as a result of the explosion
- **People with physical or mental disabilities**
- **People with mental illness and PTSDs**

Glossary

Road clustering
Urban morphology