



The impact of socioeconomic crisis on cancer patient outcomes in Lebanon, 2018–2020

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Aim: The goal of this study was to assess the impact of economic and social crisis on access to cancer care in Lebanon. **Materials & methods:** A cancer Drug Access Program in Lebanon was launched, covering 80–90% of treatment costs. The program included three drugs for breast cancer, renal cancer, and lung cancer. A longitudinal follow-up of patients was conducted. The Multidimensional Poverty Measure (MPI) was used by year (2019 or 2021), i.e., before and after the onset of the economic crisis. **Results:** A total of 613 cancer patients were included in 50 hospitals. Mean patient age was 58.5 years (standard deviation = 12.3). The proportion of cancer types was 79.3% breast, 10.6% renal, and 7.3% lung cancer. Treatment with palbociclib (hazard ratio [HR]: 1.64; 95% confidence interval [CI]: 1.53–1.76, $p < 0.0004$), enrollment prior to 1 January 2019 (HR: 1.24; 95% CI: 1.07–1.44, $p = 0.004$), treatment at a hospital with fewer than five physicians (HR: 1.11; 95% CI: 1.00–1.23, $p = 0.04$), and lower 2019 MPI (HR: 1.69; 95% CI: 1.30–2.20) were significant predictive factors associated with survival. Higher governorate-level MPI was associated with increased mortality (adjusted rate ratio per 0.1-unit, HR: 2.88; 95% CI: 0.95–8.77, $p = 0.06$). **Conclusion:** Economic crises have negative impacts on health outcomes, and we identified a change in survival pre/post crisis onset. This study argues strongly for coordinated efforts to mitigate the negative effects of poverty on health.

Plain language summary: How did the economic crisis in Lebanon impact the health of patients treated for cancer between 2018 and 2020?

What is this article about? Since 2019, several events (an ongoing economic crisis, war in a neighboring country, severe wildfires, a massive explosion at a large port, the COVID-19 pandemic and political unrest) have negatively impacted Lebanon's economy and made it difficult for patients to receive care. This study identified factors that impacted survival for cancer patients who began treatment before the start of Lebanon's economic crisis in 2019 and those who started treatment once the crisis had begun.

What were the results? This study found that patients who began cancer treatment before the start of the 2019 crisis were more likely to survive than patients who started treatment in 2019 or 2020. Other factors associated with being more likely to survive were treatment with a specific drug for breast cancer, treatment at a hospital with fewer than five physicians, and lower levels of poverty in 2019.

What do the results mean? The results mean that factors unrelated to a cancer patients' disease – when they started treatment, staffing at the hospital where they were treated, and their poverty level – can impact how likely they are to survive. These findings add to other data that show how poverty can negatively impact health. They also suggest that reducing poverty is important for improving survival in patients with cancer.

Shareable abstract: New study results add to the body of evidence demonstrating that poverty and economic crises negatively impact cancer patients' survival. Mitigating poverty, especially in countries undergoing economic crises, such as Lebanon, is essential for improving cancer outcomes.

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The incidence of cancer in Lebanon doubled between 1968 and 2018 [1], but has remained stable over the more recent period of 2008–2015 [2]. Breast, colorectal, and lung cancer are the most common cancer in Lebanese patients [2,3] and the incidence of all three cancers is expected to increase significantly by 2025 [2]. The cost of cancer medications in Lebanon is also on the rise, with the average cost of cancer medication increasing more than 50% between 2008 and 2013 in response to the growing use of more expensive targeted cancer therapies [1]. The introduction of new immunotherapies resulted in an additional 20% increase between 2014 and 2016 [1].

Approximately half the Lebanese population lacks sufficient access to healthcare and insurance coverage and must pay out-of-pocket for some or all of their medical care [4]. Since 1999, the Lebanese Ministry of Public Health has provided free cancer medication to all Lebanese patients who lack health coverage [1]. Total spending by Ministry of Public Health on cancer medications in the 2014–2016 period was US\$140 million [1]. While government coverage of cancer medication for patients who lack formal health coverage is important for increasing access to life-saving therapy, this approach poses a significant financial burden to the Lebanese economy and does not address the needs of those patients who have insufficient coverage.

The start of the Syrian armed conflict in 2011 led to a years-long displacement of Syrian residents. By the end of 2019, Lebanon was home to 928,000 Syrian refugees [5], which placed a significant burden on national services [6]. Several other events in 2019 and 2020, including Lebanon's worst wildfire in 50 years, a revolutionary uprising against the government in response to a severe and ongoing economic crisis, the COVID-19 pandemic, and the massive explosion in the port of Beirut in 2020 that displaced 300,000 people and injured more than 7000 [7,8] resulted in a liquidity crisis that upended every aspect of the country's economy, including its healthcare system [9]. In 2019, the Lebanese government owed US\$1.3 billion to private hospitals [9]. While these hospitals comprise 82% of Lebanon's healthcare capacity, they had received no government funding in 2019 [9]. Medical supply companies struggled to import needed medical equipment, many nurses were working for half or no pay, medical institutions laid off employees, and doctors provided free services where they could [9,10]. As the economy collapsed, people within Lebanon began to forgo nonessential healthcare, and necessary care became unaffordable for many [9].

Several studies have already identified associations between economic crises and worse health outcomes, including increases in rates of mental health hospitalizations [11] and dissociative experiences (absorption and dissociative amnesia/depersonalization) [12]; risk of cancer [13], diagnosis of breast cancer at later stages [14] and excess cancer-related deaths [15]; all-cause and disease-specific mortality [16]; and social and mortality inequalities [17]. Austerity measures imposed in response to these crises have led to reductions in government healthcare spending while simultaneously increasing poverty, deregulation of healthcare services and out-of-pocket costs for patients. These changes in the healthcare landscape have been associated with deterioration of public health and with increased rates of mental health issues, self-reported unmet medical needs, substance abuse, epidemics, suicide, mortality and disparities in health outcomes [18–23].

In addition to broad effects on diverse health outcomes, economic crises have also had specific negative effects on cancer care and outcomes. The Lebanese economic crisis has increased the cost of bladder cancer care by 768% [24]. This increase included a 61% increase in payments by third-party payers and a 2.74% increase in patients' out-of-pocket expenses, which reduced overall third-party payers coverage to 17% of total bladder cancer costs. The burden of lung cancer increased after the onset of the Greek economic crisis in 2009, and the deprivation index was a significant predictor of increased risk of lung cancer mortality [25]. An analysis of unemployment rates during a period of economic recession found that increased rates of unemployment were associated with reductions in cancer diagnoses, cancer surgery and radiation therapy [26].

In addition to the effects of systemic economic crises, poverty at the individual level also impacts health outcomes. Since 2019, income poverty in Lebanon has increased due to decreased economic activity, political instability, inflation and currency depreciation [27]. Additionally, there is rising deprivation in areas beyond income, including healthcare, medicines, government services, education, employment, housing and assets. Recognizing that factors other than income poverty contribute to deprivation, the United Nations developed a Multidimensional Poverty Measure (MPI), which consists of 20 indicators across six dimensions (education, health, public utilities, housing, assets and property and employment and income) [27]. Households deprived in one or more dimensions are classified as living in multidimensional poverty, while those deprived in two or more dimensions are classified as living in extreme multidimensional poverty [27]. The multidimensional poverty level in Lebanon nearly doubled from 2019 (42% of the Lebanese population) to 2021 (82%), with 34% of the population living in extreme multidimensional

poverty in 2021. From 2019 to 2021 the percentage of households deprived of healthcare increased from 9% to 33% [27].

Despite the high rates of health deprivation following the onset of the Lebanese liquidity crisis, cancer patients participating in the 2018–2020 Access Program continued to have access to their cancer medications for the duration of the Program. Approximately 80% of medication costs for patients participating in the program were covered by Social Security and the remainder of the cost was discounted. The elimination of financial barriers to accessing these therapies enabled evaluation of other factors (patient, physician, social determinants of health, etc.) that impacted health outcomes for patients in the Access Program. The goal of this study was to assess the impact of economic and social crisis on access to treatment and mortality in cancer patients in Lebanon.

Materials & methods

Study setting & design

In 2018, a Drug Access Program for cancer was implemented in Lebanon by Axios International. Social security paid for 80–90% of treatment costs, and the remaining costs were discounted so that patients participating in the Program had minimal out of pocket expenses for their cancer medications. The three drugs included in the Program were palbociclib (for breast cancer), crizotinib (renal cancer) or sunitinib (lung cancer). Patients diagnosed with other cancers that could be treated on-label with one of the three medications also were eligible to participate.

As part of its evaluation of the Access Program, Axios International conducted an anonymized longitudinal analysis of patients enrolled in the program from 2018 to 2020 in Lebanon. Incident case patients enrolled in the program and newly treated with one of the three specified cancer medications were included. The manufacturer of these medications had no role in the study conception, design, analyses or drafting of the manuscript.

Study population

The study included participants who met the following criteria: ≥ 18 years of age at program enrollment, confirmed cancer diagnosis consistent with the study drugs' approved indications, initiation of treatment with palbociclib, crizotinib, or sunitinib and willingness to participate in the Access Program. The exclusion criteria were: < 18 years of age at time of enrollment, diagnosis not compatible with approved indications of study drugs, cancer therapy initiated prior to program initiation, and unwillingness to participate in the Access Program. Patients participating in the Program received medication and healthcare at multiple public and private hospitals in different cities throughout Lebanon.

Data collection

An Axios Program Manager collected patient data at the time of entry into the Drug Access Program and throughout patient treatment and prospective follow-up. All information from patient files was extracted anonymously from medical program reports, and no information was collected directly from patients. Data were collected for sex, age, cancer diagnosis, cancer drugs, status of the hospital where the patient was treated (public vs private; university vs nonuniversity hospital, urban vs rural location), number of physicians at the hospital, and cash flow facilitation for the patient. The time of program enrollment was collected and categorized as before 1 January 2019 or after 1 January 2019, and governorate MPI was collected and characterized as 2019 or 2021 (i.e., before and after the onset of the economic and social crises). For the purposes of the study, relevant data were accessed from 1 January 22 to 30 June 2022.

The collected data were evaluated in the context of the primary outcome of patient survival in patients who remained on their cancer medication compared with patients who stopped treatment due to major adverse events, lack of clinical response, therapeutic escape with disease progression or patient death. Because drug dispensing and administrative monitoring were systematically recorded by the Access Program, all study participants had a documented last contact (death, discontinuation or ongoing treatment), and none were lost to follow-up during the study period.

Clinical staging, tumor burden and comorbidity data were not collected routinely in the Program's dataset. Our analyses were adjusted for covariates available for all participants (sex, cancer type, enrollment period, governorate-level MPI and hospital staffing), and the findings of these analyses are interpreted as associations.

Multidimensional poverty index (MPI)

Multidimensional poverty was assessed using the World Bank's Multidimensional Poverty Measure [28]. MPI was stratified by the five governorates within Lebanon (Beirut, Bekaa, Mount Lebanon, North and South) and by year (2019 or 2021, i.e., before and after the onset of the economic crisis).

Statistical analyses

Descriptive statistics were computed for the characteristics of patients included in the Program and are calculated as mean and standard deviation (SD), median (M) and range (R) for quantitative variables, and as percentage for qualitative variables. Chi-square test was used for qualitative data comparisons; ANOVA test was used for quantitative comparisons.

Overall survival time was measured from Program enrollment to death from any cause. Patients for whom no death was recorded were censored at their last follow-up contact or Program exit to determine the cause of discontinuation (e.g., disease progression or adverse events). In a small number of cases, data for specific variables were not available for all patients. In these cases, the patients with missing data were not included in the analysis of the variable.

For interpretability, MPI effects were expressed per 0.1-unit increase, corresponding to the approximate differences observed between Lebanese governorates.

The Kaplan–Meier method was used to obtain the probability of overall survival. Statistical differences among the two groups (survivors and not survivors at end point) were tested using log-rank tests.

Multivariate Cox proportional-hazard model was fitted to identify predictive factors of survival. All variables tested in univariate analysis were included in the Cox models. Hazard-ratios (HRs) and 95% confidence intervals (CIs) were calculated for each variable. For all analyses, a significance level of ≤ 0.05 was used. Statistical analyses were performed using Excel Stat (Addinsoft). Model fit was summarized using the Akaike information criterion, and model discrimination was assessed using Harrell's C-statistic. These measures illustrate adequate Cox model fit and moderate discrimination.

A robustness analysis was conducted using the rate-based model with log-exposure offset (approximating a piecewise-exponential hazard), yielding effect estimates consistent in direction with the main analysis. Additionally, variance inflation factors (VIFs) were calculated for all covariates (enrollment period, cancer type, hospital staffing, governorate-level MPI, sex), and no problematic multicollinearity was detected (all VIFs < 2).

Results

A total of 613 patients were enrolled in the Program between January 2019 and December 2020. Of the 613 patients, 244 (39.8%) remained on treatment throughout the study, 87 (14.2%) died, and 282 (46.0%) discontinued treatment due to lack of clinical response or major adverse events. No patients were lost to follow-up. Baseline characteristics for patients, hospitals and governorate MPI are presented in Table 1. Mean patient age was 58.5 years (SD = 12.3) and the sex-ratio of males to females was 0.15. A total of 50 hospitals provided cancer care to patients in the Program, with a mean of 9.3 patients (SD = 4.2, R = 1–118) per hospital; 28 hospitals provided care to fewer than five patients enrolled in the program. A total of 86 physicians provided care to Program participants, with a mean of 19.1 patients (SD = 5.6, R = 1–50) per physician.

Cancer diagnosis and treatment are shown in Table 1. Mean treatment duration for patients who remained on their cancer medication for the duration of the study was 30.7 months (SD = 10.2) compared with 11.5 months (SD = 9.9) for patients who discontinued treatment ($p < 0.0004$).

The country-level and governorate-specific numerical MPI values, all of which increased from 2019 to 2021, are summarized in Table 1. The country-level increase in MPI on a percentage basis between 2019 and 2021 was 155.6%. Governorate-specific MPI increases on a percentage basis were Beirut, 120.0%; Bekaa: 100.0%; Mount Lebanon, 175.0%; North, 136.4%; and South 170.0%. MPI was significantly higher in urban hospitals compared with rural hospitals in 2019 (0.088 vs 0.0096, respectively, $p < 0.0004$) and was significantly lower in 2021 (0.229 vs 0.242, $p < 0.0006$). Each 0.1-unit increase in 2019 MPI was associated with an almost threefold higher mortality rate (adjusted HR: 2.88; 95% CI: 0.95–8.77; $p = 0.06$), underscoring the adverse impact of contextual deprivation on survival. Evaluation of the interaction between MPI and pre-/post-crisis enrollment found that the interaction term was not statistically significant, and the direction of the effect was consistent with the main effects.

Figure 1 shows the probability of survival according to time of Access Program enrollment (before vs after onset of the 2019 crisis). Survival probability was lower for patients enrolled after the start of the 2019 crisis who

Table 1. Baseline characteristics of patients by governorate, Lebanon, 2018–2020.

	Total (n = 613)	Beirut (n = 113)	Bekaa (n = 25)	Mount Lebanon (n = 373)	North (n = 52)	South (n = 50)	p-value
Patients characteristics							
Mean age (SD)	58.5 (12.3)	59.5 (12.2)	57.0 (11.7)	58.7 (12.5)	55.8 (12.8)	58.9 (±11.1)	0.45
Gender, %							
Female	87.3	90.3	92.0	87.1	88.5	78.0	0.25
Male	12.7	9.7	8.0	12.9	11.5	22.0	
Cancer diagnosis %							
Breast cancer	79.3	81.4	88.0	77.5	84.6	78.0	0.81
Renal cancer	10.6	10.6	8.0	11.3	5.8	12.0	
Lung cancer	7.3	6.2	4.0	8.6	35.8	4.0	
Other cancer	2.8	1.8	0.0	2.7	3.8	6.0	
Drug							
Palbociclib	79.3	81.4	88.0	77.5	84.6	78.0	0.76
Crizotinib	13.4	12.4	8.0	13.9	9.6	18.0	
Sunitinib	7.3	6.2	4.0	8.6	5.8	4.0	
Time of enrollment							
Before 1 Nov 2019	71.3	69.9	72.0	72.7	67.3	68.0	0.89
After 1 Nov 2019	28.7	30.1	28.0	27.3	32.7	32.0	
Cash-flow facilitation							
No	51.1	44.2	60.0	48.8	59.6	70.0	0.01
Yes	48.9	55.8	40.0	51.2	40.4	30.0	
Hospital characteristics							
Hospital status							
Public	70.5	78.8	72.0	71.0	48.1	70.0	0.003
Private	29.5	21.2	28.0	29.0	51.9	30.0	
University hospital							
University	69.3	78.8	72.0	71.0	48.1	56.0	0.0001
Nonuniversity	30.7	21.2	28.0	29.0	51.9	44.0	
Location status							
Urban	79.0	100.0	60.0	84.5	36.5	44.0	0.0001
Rural	21.0	0.0	40.0	15.5	63.5	56.0	
MD/hospital (SD), n	5.0 (2.0)	5.0 (2.0)	6.0 (1.0)	5.0 (2.0)	6.0 (4.0)	2.0 (1.0)	0.07
MD/hospital median, n							
≤5	58.1	62.8	36.0	58.2	40.4	76.0	0.001
>5	41.9	37.2	64.0	41.8	59.6	24.0	
Governorate MPI							
MPI (2019)	0.09	0.10	0.15	0.08	0.11	0.10	–
MPI (2021)	0.23	0.22	0.30	0.22	0.26	0.27	
Change in MPI 2019–2021	0.14	0.12	0.15	0.15	0.15	0.17	

MPI: Multidimensional Poverty Measure; MD: Medical doctor; Nov: November; SD: Standard deviation.

remained on treatment (survival without dropout), compared with patients enrolled prior to the crisis ($p = 0.06$). No significant differences in survival before versus after 2019 were found when stratifying results based on cancer type (breast cancer, $p = 0.22$; renal cancer, $p = 0.23$; lung cancer, $p = 0.33$) (Supplementary Figures 1–3).

Univariate analysis found that gender, type of cancer, prescribed drug, Program enrollment after the onset of the social crisis, fewer than five physicians per hospital, and MPI value in 2019 were significant predictive factors of survival (Table 2). In multivariate Cox proportional hazard model, prescribed drug, enrollment before the 2019 crisis, fewer than five physicians per hospital, and living in multidimensional poverty in 2019 were significantly associated with survival (Table 2).

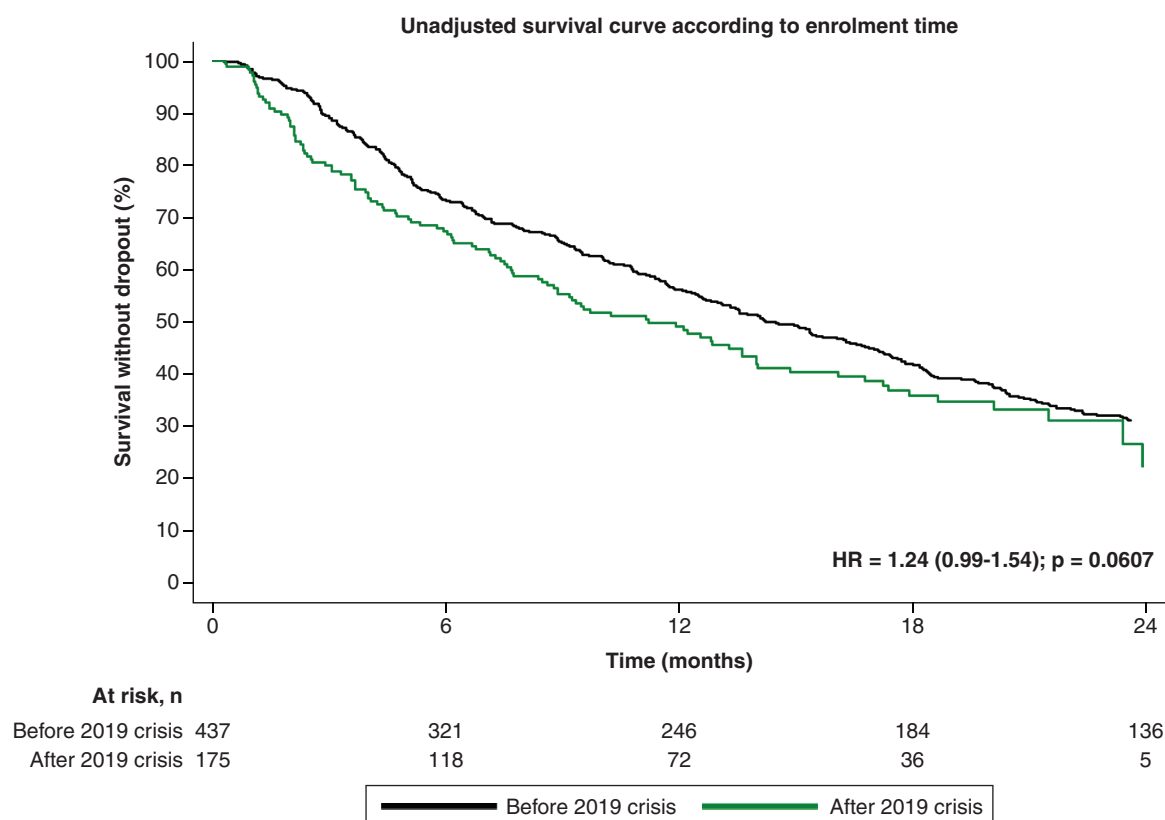


Figure 1. Probability of survival* according to time of Access Program enrollment, according the social-economic crisis (before vs after 2019).

*Stratified by cancer type (breast, renal, and lung cancer).

Discussion

The results of this study, which show a trend toward improved survival for patients enrolled in the Access Program prior to the onset of socioeconomic crisis, add to the body of data that associate economic crises with negative impacts on health outcomes. Even when hospital, physician and access to medication remained constant, our results continued to show an association between survival and pre-/post-crisis Program enrollment.

Multivariate analysis identified four factors associated with improved survival: treatment with palbociclib for breast cancer, enrollment in the Access Program prior to the liquidity crisis (1 January 2019), treatment at a hospital with fewer than five physicians, and lower 2019 MPI. The association of palbociclib treatment with improved survival is likely due to the fact that nearly all patients receiving palbociclib had breast cancer, which has better survival outcomes than lung or renal cancer. Interestingly, even though palbociclib, crizotinib and sunitinib were largely used in an indication-specific manner (for breast, renal and lung cancer, respectively). This analysis did not identify an association between breast cancer diagnosis and increased survival compared with other cancer types, even though the population of patients receiving palbociclib and those with breast cancer were largely identical.

In this study, physician, hospital and access to cancer medication remained constant before/after the onset of the crisis, while other aspects of patients' lives changed (displacement from area of care center, difficulty in traveling to appointments, increased stress, etc.). In this context, our finding that pre-crisis enrollment is associated with improved survival suggests that MPI factors have important impacts on survival.

A higher 2019 deprivation index was also associated with reduced survival. This suggests that reduced survival for patients enrolled in the program after the crisis began is likely associated with increased poverty. Poverty would be expected to negatively impact patients' ability to attend appointments, maintain proper nutrition and stress levels, all of which would likely have a negative impact on health outcomes. Four general services indicators of a proposed MPI for Lebanon (electricity, drinking water, sanitation and waste collection) [27] would all be expected to impact health outcomes for cancer patients participating in the Access Program even if their cancer therapy

Table 2. Predictors of survival without dropout: Cox proportional hazards model[†] (N = 613).

Patients characteristics	n	Univariate analysis		Multivariate analysis	
		HR (95% CI)	p-value	HR (95% CI)	p-value
Age	602	0.99 (0.98–1.00)		0.99 (0.98–1.01)	0.34
Gender					
Female	534	ref	0.01		
Male	78	1.59 (1.10–2.32)			
Cancer diagnosis					
Breast cancer	485	ref	<0.0004		
Renal cancer	65	1.64 (1.53–1.76)			
Lung cancer	45	1.42 (1.05–1.94)			
Other cancer	17	0.92 (0.48–1.76)			
Drug					
Palbociclib	485	ref	<0.0004	ref	<0.0004
Crizotinib	82	1.44 (1.24–1.67)		1.49 (1.22–1.83)	
Sunitinib	45	1.42 (1.04–1.95)		1.41 (1.01–1.97)	
Time of enrollment					
Before 1 Nov 2019	437	ref	0.002	ref	0.004
After 1 Nov 2019	175	1.24 (1.08–1.41)		1.24 (1.07–1.44)	
Cash-flow facilitation					
No	312	ref	0.40		
Yes	300	0.94 (0.83–1.08)			
Hospital characteristics					
Hospital status					
Public	431	ref	0.37		
Private	181	1.14 (0.86–1.49)			
University hospital					
University	424	ref	0.54		
Nonuniversity	188	1.11 (0.80–1.53)			
Location status					
Urban	483	ref	0.14		
Rural	129	1.09 (0.97–1.22)			
MD/hospital (SD),	612				
MD/hospital median, n		1.01 (0.99–1.03)	0.11		
≤5	355	ref	0.01	ref	0.04
>5	257	1.14 (1.03–1.26)		1.11 (1.00–1.23)	
MPI Governorate					
MPI (2019)	612	1.75 (1.42–2.16)	<0.0004	1.69 (1.30–2.20)	<0.0004
MPI (2021)	612	1.37 (0.96–1.97)	0.08		
Change in MPI 2019–2021	612	0.80 (0.40–1.62)	0.54		

[†] Stratified by cancer type (breast, renal, and lung cancer).

CI: Confidence interval; MD: Medical doctor; MPI: Multidimensional Poverty Measure; Nov: November; SD: standard deviation.

remained unaffected by the liquidity crisis. It should be noted that the affordability of the medication provided through the Access Program was not modified during this period, as drug costs were largely reimbursed. This further underscores the association of increased poverty with survival outcomes.

These findings add to the growing body of evidence underscoring the impact of economic crises and deprivation on health outcomes. Economic crises have been associated with increases in all-cause mortality as well as with specific health conditions, including respiratory infections, chronic liver disease, infant mortality, and suicide [16]. Government fiscal responses to economic crisis – including reductions in healthcare spending, increases in patients' co-payments, and deregulation of healthcare services – have been associated with deterioration of public health,

increased rates of mental health issues, substance abuse, epidemics, suicide, decreases in self-rated health and increased mortality in some age groups – especially by cancer, as found in our study [18–21].

The health-related impacts of economic crises and privation is not limited to low- and middle-income countries. Austerity measures implemented across the European Union following the economic downturn that began in 2008 (the ‘Great Recession’) resulted in an increase in disparities in all health outcomes in 2010, which likely were due to an increase in socioeconomic inequalities [22]. Self-reported unmet medical needs also increased in European countries that reduced their health expenditures during the Great Recession [23].

Our findings also underscore the limitations of using income-based poverty assessments, which would likely not have been informative in this study. This is because income wasn’t a factor in patients’ access to medication in the study and because income data in Lebanon are not reliable due to underreporting and tax evasion [29]. Similarly, a multivariate analysis of associations between multidimensional poverty, income poverty and youth depressive symptoms in Mexico, Colombia and South Africa found a significant association between multidimensional poverty and severity of depressive symptoms, but not between income and depressive symptoms [30].

The current study also found that treatment at a hospital with fewer than five physicians was associated with increased survival. This initially paradoxical association became less significant after adjustment and variable refinement, and should be interpreted cautiously. Possible explanations for this association include closer individualized care in smaller centers, differences in hospital case-mix or unmeasured contextual factors, such as urban–rural disparities in hospital burden and resources. These considerations highlight the need for cautious interpretation and underscore the importance of collecting more granular patient- and hospital-level data in future research. However, it should be noted that this finding is consistent with a trend observed in a prior study of patients in Egypt undergoing treatment for chronic bronchitis [31]. Reductions in mortality and 30-day readmission rates have also been reported for patients with heart failure treated at hospitals with more cardiologists or physicians per bed [32,33]. A lower bed number per medical staff has been associated with lower-than-expected mortality in acute care settings in England [34].

Outcomes for Lebanese patients with cancer are still a cause for concern given the ongoing nature of the liquidity crisis. Our results suggest that continued increases in MPI across Lebanon will have a correspondingly negative impact on survival for patients undergoing cancer therapy. They also suggest that improving socio-economic status may help to improve health outcomes and access to care and to reduce mortality. This previously has been demonstrated in an analysis of socioeconomic inequalities on cancer mortality in nine European countries during the Great Recession. This analysis found that, while disparities existed, they did not increase during the period of economic decline [35]. The authors suggest that this was due to the study being conducted in cities and metropolitan areas with strong public health components. This reinforces the importance of health system structure on the ability to mitigate adverse health outcomes during times of economic crises. Similarly, reducing out-of-pocket expenses and providing income replacement for the unemployed has been shown to mitigate loss of healthcare access during periods of recession [36].

Overall, our results align with the broader literature emphasizing the importance of absorbing shocks and sustaining essential services during crises on health system resilience [37–39]. The Lebanese experience illustrates how socioeconomic collapse can exacerbate existing inequities in cancer care, consistent with findings from other fragile and conflict-affected settings. These findings underscore the importance of embedding equity safeguards into crisis preparedness, including decentralization of oncology services and targeted financial protection.

Limitations

This study has several limitations. First, it included a relatively small study population that was followed for a limited period, and it was not powered to detect socio-demographic differences among patients. Significant differences were found despite the small sample size. Second, it focused on patient metrics, which do not provide insight into the impact of physician stress or hospital burden on survival of patients undergoing medical therapy for cancer. Third, it only evaluated a limited number of cancers and socioeconomic metrics, and it is possible that factors associated with survival in patients with other types of cancer or using different or additional socioeconomic assessments may differ from those identified here. Similarly, because data were retrospectively extracted from medical records, some clinical variables (e.g., disease stage and severity and comorbidities) may have been incompletely documented. Absence of these data could generate an information bias and/or confound the observed associations if these factors differed pre-/post 2019 or across governorates. However, survival status was systematically verified through the Program database, ensuring reliability of the main outcome.

The nonrandomized nature of the study also creates the opportunity for selection bias that could confound our results. We controlled for these potential biases by stratifying results by cancer type and conducting a robustness analysis. Another potential limitation is that MPI was assigned at the governorate level. This ecological measure may not reflect individual socioeconomic deprivation and could induce ecological bias. Additionally, our results identified an association between hospitals that had fewer physicians and improved survival, which is seemingly paradoxical. It should be noted that this analysis did not include several potentially confounding variables, such as hospital case mix, referral patterns and urban/rural context. Consequently, this finding could benefit from additional analysis and should not be over-interpreted.

Conclusion

Data from this study suggest that deprivation generated by an economic crisis has a negative impact on survival for patients treated for cancer in Lebanon. Our findings suggest that implementing specific health measures, (e.g., awareness campaigns, specific communication with patients designed to increase follow-up and decreasing poverty by improving relevant MPI indicators) may help alleviate the impact of economic crises on health outcomes. These results also highlight the potential impact of economic crisis on mortality in cancer patients and underscore the urgent need to evaluate and assess the health impacts of socioeconomic poverty in Lebanon and other countries with impoverished populations. This study and the growing body of evidence indicating that socioeconomic crisis leads to poor health outcomes, argue strongly for proactive and coordinated efforts to prevent – or respond rapidly and effectively – to these crises to mitigate the negative effects of poverty on health outcomes.

Mitigating socioeconomic barriers to oncology care during times of future crisis will require policies that prioritize decentralizing oncology services, supporting mobile outreach clinics and integrating social support such as transport vouchers and patient navigators. Protecting oncology drug budgets and linking access programs with social protection schemes could further enhance equity and resilience in cancer care during future crises.

Summary points

- Since 2019, several events (an ongoing economic crisis, war in a neighboring country, severe wildfires, a massive explosion at a large port, the COVID-19 pandemic and political unrest) have negatively impacted Lebanon's economy and made it difficult for patients to receive care.
- Several studies have already identified associations between economic crises and worse outcomes across a variety of health metrics, including specific negative effects on cancer care and outcomes.
- In addition to the effects of systemic economic crises, poverty at the individual level also impacts health outcomes. The multidimensional poverty level in Lebanon nearly doubled from 2019 to 2021, and the percentage of households deprived of healthcare over the same period grew from 9 to 33%.
- Cancer patients participating in a drug access program between 2018 and 2020 that eliminated financial barriers continued to have access to their cancer medications, which enabled the evaluation of other factors (patient, physician, social determinants of health, etc.) that impact health outcomes for cancer patients during periods of economic crisis.
- In this study we assessed the impact of economic and social crisis on access to care for cancer treatment in 613 cancer patients participating in the drug access program and identified factors that impacted survival for cancer patients who began treatment before the start of Lebanon's economic crisis in 2019 and those who started treatment once the crisis had begun.
- This study found that patients who began cancer treatment before the start of the 2019 crisis were more likely to survive than patients who started treatment in 2019 or 2020.
- Other factors associated with being more likely to survive were treatment with a specific drug for breast cancer, treatment at a hospital with fewer than five physicians, and lower levels of poverty in 2019.
- Study results show that deprivation generated by an economic crisis has a negative impact on survival for patients treated for cancer in Lebanon and the growing body of evidence indicating that socioeconomic crisis leads to poor health outcomes.
- Our findings underscore the critical need to rapidly respond to economic crises to reduce the negative impact of poverty on health outcomes.

Supplementary data

To view the supplementary data that accompany this paper please visit the journal website at: <https://becarispublishing.com/doi/epdf/10.57264/cer-2025-0099>

Author contributions

J Saba, A Sawzan, A Nofal, M Ammar, E Audureau and J Ladner were responsible for the study conception and design; M Rana, E Audureau, J Saba and J Ladner were responsible for the acquisition of data and data analysis; all authors critically reviewed and revised manuscript drafts; all authors have approved the final version of the manuscript for publication.

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The authors have no competing interests or relevant affiliations with any organization or entity with the subject matter or materials discussed in the manuscript. This includes employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties.

Writing disclosure

Under the direction of authors, S Seiler provided writing assistance for the manuscript.

Ethical conduct of research

The Ethical Committee of Rouen University Hospital (CERDE-HUJ) approved the research (no. E2021-74). Patients provided written informed consent to enroll in the Access Program; research written consent was not required for collection of patient data because information from patient files was collected anonymously from medical reports, without collection of personal, patient-identifying information.

Data sharing statement

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable and justified request.

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