

## RESEARCH ARTICLE

# Financial Burden of Cancer Drug Treatment in Lebanon

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### Abstract

**Background:** The Ministry of Public Health (MOPH) in Lebanon provides cancer drugs free of charge for uninsured patients who account for more than half the total case-load. Other categories of cancer care are subsidized under more stringent eligibility criteria. MOPH's large database offers an excellent opportunity to analyze the cost of cancer treatment in Lebanon. **Materials and Methods:** Using utilization and spending data accumulated at MOPH during 2008-2013, the cost to the public budget of cancer drugs was assessed per case and per drug type. **Results:** The average annual cost of cancer drugs was 6,475\$ per patient. Total cancer drug costs were highest for breast cancer, followed by chronic myeloid leukemia (CML), colorectal cancer, lung cancer, and Non-Hodgkin's lymphoma (NHL), which together represented 74% of total MOPH cancer drug expenditure. The annual average cancer drug cost per case was highest for CML (\$31,037), followed by NHL (\$11,566). Trastuzumab represented 26% and Imatinib 15% of total MOPH cancer drug expenditure over six years. **Conclusions:** Sustained increase in cancer drug cost threatens the sustainability of MOPH coverage, so crucial for socially vulnerable citizens. To enhance the bargaining position with pharmaceutical firms for drug cost containment in a small market like Lebanon, drug price comparisons with neighboring countries which have already obtained lower prices may succeed in lowering drug costs.

**Keywords:** Middle-East - middle income countries - antineoplastic drugs - health expenditures - equitable access

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### Introduction

In addition to its serious physical and emotional impact on patients and their families, cancer has a devastating economic cost at all levels. Losses related to cancer are the highest of all 15 leading causes of death worldwide, nearly 20% higher than those for heart diseases, the second leading cause of economic loss (ACS, 2010). The cost of cancer care is a key component of the heavy financial burden of healthcare. Cancer costs have been estimated to be as high as \$895 billion worldwide (ACS, 2008), and are expected to keep rising with the growth and aging of the population and with therapeutic advances (Yabroff et al., 2008). Similarly, the costs of cancer care in the United States (US) are projected to increase by 39% between 2010 and 2020 (Mariotto et al., 2011; Yabroff et al., 2011). In Lebanon, the cancer case-load has increased steadily since numbers were first documented in the 1960s, surpassing 9500 new patients in 2008 (incidence rate about 200 per 100,000) (NCR, 2008).

Six public funds in Lebanon cover almost half of the population. The other half is entitled to various levels of coverage provided by the Ministry of Public Health (MOPH) for hospital care and expensive treatments

such as cancer drugs. The diversity of financing have allowed a relative high levels of resilience in a health system exposed to episodic armed conflicts and political instability prevailing since the end of the civil wars (1975-1990). The MOPH-based dispensing of cancer drugs, as well as medication for several other serious diseases, is completely free of charge for citizens not covered by any of the other public funds. MOPH provides drugs based on a prescription which can be serviced on an in-patient or an out-patient basis in a private or public setting depending on patients' choice and that of their medical providers. Within the overall cost, the portion attributable to drugs has increased consistently, mirroring both the increase in numbers of cases under treatment and the introduction of state-of-the-art drugs. Cancer drugs include basic anti-neoplastic drugs, newer targeted therapies, hormonal therapies and supportive care drugs used to mitigate the cancer drugs adverse events.

The Lebanese MOPH has developed a strategy to decrease the GDP share of total health expenditures (THE) that reached 12.4% in 1998, by targeting specifically out-of-pocket (OOP) spending, estimated at 60% of THE (Ammar, 2003). MOPH succeeded in significantly reducing health spending while improving health

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indicators, through strengthening primary healthcare (PHC) and relying particularly on essential generic drugs (WHO, 2010). THE reached 7.2% of GDP and OOP declined to 37% of THE in 2012 (NHA, 2012). In comparison, 18% of the GDP in the USA is spent on healthcare (The Guardian, 2012), versus an average of around 9% in Europe (WB, 2015).

Despite efforts to periodically revisit the price structure of all drugs, spending on pharmaceuticals remains as high as 43% of THE, and represents a high burden on households, exceeding 50% of their spending on health (NCR, 2008). The exorbitant cost of newer cancer drugs may be limited both by appropriate rationalization of use and by paying lower prices. In 2013, cancer drugs represented 53% of the MOPH budget for drug procurement, surpassing 42 million. In order to control the steadily increasing trend in cost, a Drug Scientific Committee (DSC) was established to review medical files of patients requesting cancer drugs and to ensure treatment in conformity with the National Cancer Treatment Guidelines (NCTG). These Guidelines were first adopted in 2010 and updated most recently in 2012 (NCTG, 2012). Despite this control mechanism, MOPH spending on cancer drugs is bulging. In addition to improving rational use, MOPH has performed a detailed trend analysis of its expenditures, and details are presented in this paper. Estimates of the financial burden of cancer drugs are important for optimally allocating funds, including those needed for prevention and research.

## Materials and Methods

A desk review was conducted using MOPH data over a six-year period of activity (2008-2013). A total of 26,212 files from all adult patients diagnosed with cancer were included in the analysis regardless of age. Costs of medical, surgical and radiation services for cancer patients covered by MOPH were also compiled using patient tracking software and following an accrual accounting method for year 2013. Separate analyses were conducted for the five most expensive entities: breast cancer (ICD10 code C50), chronic myeloid leukemia (CML) (C42.1), colorectal cancer (C18-21), lung cancer (C33-34) and non-Hodgkin's lymphoma (NHL) (C82-83). The annual average cost of drugs per patient and per disease and the highest drug-specific costs were extracted. All costs were calculated in USD, to allow easy comparisons with worldwide costs. This secondary analysis was conducted with de-identified data to ensure protection of confidential information. Price reduction attempts, recently undertaken by MOPH, were described.

**Table 1. Cost of Cancer Drugs Dispensed Free-of-Charge by the MOPH (Accrual 2008-2013)**

	2008	2009	2010	2011	2012	2013	Total
Cost (in \$)	17,740,484	20,382,015	21,208,669	29,879,321	43,322,028	42,274,924	174,807,441
Number of patients	3,648	3,653	3,461	4,639	5,393	5,418	
Average drug costs per patient	4,863	5,580	6,128	6,441	8,033	7,803	
Average annual cost per patient (in \$)							6,475*

\*calculated over the 6 years

## Results

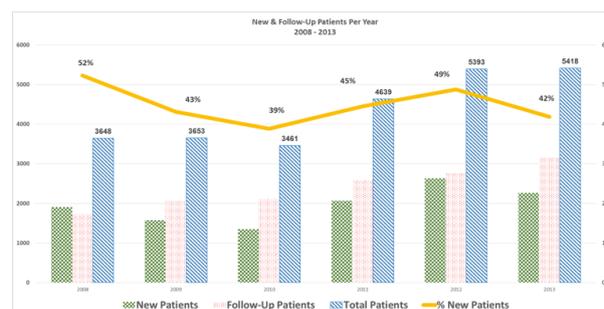
### Total financial burden of cancer drugs incurred by MOPH

Drugs are the most expensive item of expenditure incurred by MOPH in addressing cancer treatment for eligible citizens. In 2013 for example, \$26,940,639 were incurred for subsidizing hospitalization costs for eligible cancer patients, while \$2,451,721 were spent to subsidize radiotherapies. In contrast, \$42,274,924 was spent on cancer drugs alone, which represents 59% of all cancer costs for MOPH (data not shown in tables). The number of cancer patients receiving drugs from the MOPH increased from 3,648 in 2008 to 5,418 in 2013, with proportions of new cases added to the case-load varying from 40% to 50%, depending on the year (Figure 1). Spending on cancer drugs increased in parallel, reaching more than \$40 million in 2013, as shown in Table 1. Over the 6-year observation period, the total cost of cancer drugs incurred by MOPH alone reached \$174,807,441. The annual average drug cost per patient over the 6-year period was \$6,475, rising from \$4,863 in 2008 to \$7,803 in 2013.

### Drug costs by type of cancer

Five diseases account for 73% of the total MOPH spending on cancer drugs: breast cancer, CML, colorectal cancer, lung cancer and NHL. Yearly cancer drugs spending for each entity are shown in Figure 2.

The highest total spending incurred was from treating breast cancer (\$61 million), followed by CML (\$24 million), colorectal cancer (\$21 million), lung cancer (\$11 million) and NHL (\$11 million). However, these entities vary widely in numbers of beneficiaries. In any given year, the highest average number of beneficiaries was in breast cancer cases, followed by lung, colorectal, NHL and CML. Therefore, the annual average drug costs per case was highest for CML (about \$31,000), while the lowest was for breast (about \$6,000) and lung (about \$5,000).



**Figure 1. Numbers of Patients Obtaining Drugs Free-of-Charge from Public Drug Dispensing Centers (Lebanon 2008-2013)**

**Table 2. Costs of Drugs Provided by the Ministry of Public Health for the Top Most Expensive Cancer Types (Lebanon 2008-2013)**

Disease Entity	Total (USD)	Beneficiaries*	Annual Average Cost/Case	First Year** Average Cost
Breast cancer	60,751,641 (34.7%)	10,022	5,926	10,780
Chronic myeloid leukemia	23,678,232 (13.5%)	758	31,037	32,800
Colorectal cancer	21,115,036 (12%)	1,900	10,642	14,110
Lung cancer	11,397,019 (6.5%)	2,165	5,264	7,330
Non-Hodgkin's lymphoma	10,596,423 (6%)	914	11,566	18,750
Subtotal	127,538,351 (73%)	15,759	8,094	16,754
Total (all cancer types)	174,807,441 (100%)	26,212	6,689	NA

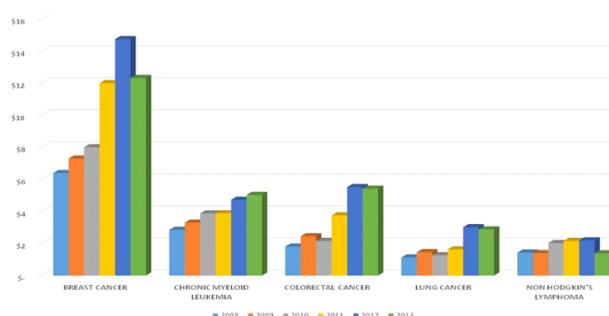
\*Active files per any given year, regardless of longitudinal duration of benefits per patient; \*\* First year of treatment following diagnosis calculated in 2012-2013; NA=Not Available for all types.

**Table 3. Most Expensive Drugs Dispensed Free-of-Charge to Cancer Patients by the Ministry of Public Health in Lebanon (2008-2013)**

Generic drug Name	Trade Name	MOH Approval	Total Cost \$	% of Spending	2008	2009	2010	2011	2012	2013
Trastuzumab	HERCEPTIN	Breast cancer	46,101,640	26%	3,851,492	4,399,293	5,056,622	9,460,112	12,311,165	11,022,958
Imatinib	GLIVEC	CML, GIST*	26,401,241	15%	4,099,426	4,162,437	4,607,717	3,861,915	4,918,962	4,750,782
Bevacizumab	AVASTIN	Colorectal cancer	21,673,326	12%	1,837,547	2,796,028	2,493,731	3,422,830	5,109,668	6,013,522
Rituximab	MABTHERA	NHL, CLL*	14,094,881	8%	1,691,071	1,765,325	2,456,840	2,591,315	3,100,181	2,490,149
Nilotinib	TASIGNA	CML	5,852,800	3%	98,849	533,784	500,835	1,112,051	1,643,482	1,963,799
Erlotinib	TARCEVA	Lung cancer	5,633,272	3%	483,554	718,304	975,133	746,037	1,176,721	1,533,523
Zoledronic acid	ZOMETA	Bone metastases	4,434,420	3%	640,435	803,509	679,375	843,635	645,772	821,694
Cetuximab	ERBITUX	CRC, Head & Neck cancer	4,333,524	2%	211,286	292,334	426,904	523,754	1,658,682	1,220,564
Pemetrexed	ALIMTA	Lung Cancer	3,785,668	2%	124,897	228,260	61,731	529,735	1,477,229	1,363,817
Capecitabine	XELODA	Breast Cancer, CRC	3,459,639	2%	358,301	462,514	432,761	575,076	838,894	792,092
Bortezomib	VELCADE	Multiple Myeloma	3,084,655	2%	31,616	130,679	46,370	309,836	1,320,489	1,245,665

GIST: Gastrointestinal stromal tumor CLL: Chronic Lymphocytic Lymphoma

Because higher cancer drugs costs are expected to be incurred during the initial year of treatment following diagnosis (Mariotto et al., 2011; Yabroff et al., 2011), compared to subsequent years, a sub-analysis was conducted using first year data available for 2012-2013. CML remained the most expensive entity for the annual average drug costs of first-year treatment, followed by NHL, colorectal, breast and lung cancer. The specific



**Figure 2. Annual Drug Costs (in Million USD) Incurred by the Public Budget of the Ministry of Public Health for the five Most Expensive Cancer Types (Lebanon 2008-2013)**

costs of drugs of the five most expensive diseases are detailed in Table 2.

#### Drug costs by type of drug

New, more advanced, but also more expensive treatments are continuously being developed and adopted as standards of care. In this analysis, targeted therapy drugs represent the majority of the total cost (see table 3). The highest amount is spent in procuring Trastuzumab (Herceptin®), approved by MOPH for the treatment of HER-2 positive breast cancer. This drug alone, indicated for 8% of MOPH's patients in 2013, represents 26% of the total cancer drug spending over six years. Imatinib (Glivec®), which is approved mainly for the treatment of CML (abl-bcr positive cases), was used for 3% of MOPH patients in 2013, and ranked second in total expenditures (15%). The third most costly drug, Bevacizumab (Avastin), which represents 12% of the total expenditures is approved for the treatment of colorectal cancer (CRC) with no positive RAS markers (5% of the patients in 2013). CRC patients with positive markers (2% of patients in 2013) receive an approved treatment

with Cexutumab. Costs of the 11 most expensive drugs in Lebanon are detailed in Table 3.

## Discussion

The free provision of cancer drugs by a government to a large non-contributing population is not common in low-to-middle income countries. This service, provided by MOPH since 1999, has become one of the most important components of the healthcare spending in Lebanon. Its initial aim was to prevent household impoverishment as a result of “catastrophic” spending on health. It represents a major step towards realizing equity in access to healthcare. Obtaining free latest-generation cancer drugs has become an acquired right which citizens would not easily forsake. Yet the high financial burden of pharmaceuticals, representing 43% of THE, at a time when the Lebanese economy is stagnating may jeopardize the continuity of this service, with highly undesirable social and health repercussions. It has become important to understand the parameters of the increased burden of cancer care, and to attempt to mitigate this increase for the sake of financial sustainability and equitable accessibility. The analysis provided in this paper has included costs of oncology drugs as well as those of supportive care, such as antiemetic drugs and hematopoietic growth factors but not those of palliative medications which are not provided through the MOPH drug procurement system.

The relentless increase in the cost of cancer drugs is not unique to Lebanon. It can be attributed partially to the increasing incidence of cancer worldwide (ACS, 2008), as well as to higher prices of new drugs (Kantarjian et al., 2013). Although overall spending on drugs in the US declined by 3.5% from 2011 to 2012, spending on oncology drugs continued to rise, with more money spent on cancer than on any other disease. According to a report from the Institute for Healthcare Informatics (IMS), the cost of cancer drugs increased globally to \$91 billion in 2013, with a compound annual growth rate of 5.4% over the previous five years (IMS, 2014). In Lebanon, the total spending on oncology drugs by the MOPH has witnessed a compound annual growth rate of 15.6% between 2008 and 2013. This discrepancy in annual spending growth may be variably explained. Differences in epidemiological profiles are important but are not sufficient considerations. There is evidence that the same drugs are priced differently in different countries, which indicates that a margin of price negotiation exists. For example, an annual treatment course with Imatinib (Glivec®), a drug responsible for 15% of total expenditure in Lebanon, was priced in the US at nearly \$30,000 when it was first released in 2001, and despite the rise in use, the price was not discounted but rather surged to \$92,000 by 2012. On the other hand, Europe drove a harder bargain with the manufacturer in what seems to be a free-for-all market, rather than a fair process of return on investment. Thus, the increase in the price of Imatinib in the US was double that reported in Europe (ECML, 2013). An annual treatment course with Imatinib for CML in Lebanon was \$41,000 in 2012, nearer to European figures when compared to \$92,000 in the US in the same year. However, Imatinib is now available in

generic form in several countries, which in time should ease the financial burden associated with this drug.

The increases in drug price for CML illustrates the risk of unsustainability facing the generous drug procurement policy in Lebanon. The MOPH has been struggling for years with the financial burden of cancer drugs, using different approaches to decrease their prices. As expected, revisiting the pricing structure has reached a limit where it becomes very difficult to compress profit margins any further. Public biddings have also had limited effects as a result of unfair competition. Many innovating industries have been pressuring policy-makers to purchase the original products despite the existence of lower-price generic competitors. Pressures are transmitted to politicians both from benefiting physicians and patients desiring early access to medicines.

The most successful approach for negotiation so far has been to draw comparisons of drug prices with neighboring countries to generate evidence for possible discounts. A Ministerial Decree to that effect was issued in 2005, requesting agents of the pharmaceutical industry in Lebanon to disclose the reduction of any export price in countries of comparison, within an interval set at 3 months since 2015. The application of this strategy has already led to a re-pricing of Bevacizumab (Avastin®), with an abrupt decrease in its total cost to MOPH by 46.5%. Similar decreases were obtained with Capecitabine (Xeloda®) (-40%) and Zoledronic acid (Zometa®) (-77.7%).

The current generous system of providing drugs for free to all eligible patients, by removing important financial barriers to accessibility enhances patient adherence to treatment. This is an important merit to be recognized, as evidence of the association between patient-reported non-adherence to prescribed medications and financial distress is already documented (Zullig et al., 2013). High costs can be financially devastating to patients and their families (Elkin and Bach, 2010). Some 62% of all personal bankruptcies in the US are estimated to result from medical expenses (Himmelstein et al., 2009). Nearly 10% of CML patients in the US fail to take life preserving prescribed drugs because of higher costs (ECML, 2013). Any change in the MOPH policy should carefully consider that discontinuation of treatment due to financial barriers would lead to a significant impact on survival.

The five most expensive cancer entities in Lebanon were breast cancer followed by CML, colorectal cancer, lung cancer and NHL. Of these, three are also among the five most diagnosed cancers: breast, lung and colon. Cancer-related healthcare expenditures in the US in 2010 showed that the highest drug costs were associated with breast cancer, followed by colorectal cancer, lymphoma, lung cancer, prostate and leukemia (Mariotto et al., 2011). In the European Union in 2009, the highest costs were also associated with breast cancer (13% of all cancer-related healthcare expenditures), undoubtedly reflecting the universal increase in the case-load of that disease. This was followed by colorectal, prostate, lung cancer and leukemia (Luengo-Fernandez et al., 2013). Hence, the relative distribution of the most expensive entities in Lebanon was largely similar to the rankings found elsewhere.

In conclusion, cancer treatment has become one of the

most important components of the healthcare system, both in clinical and financial terms, and is likely to become more critical in coming years. Internationally, spending on cancer medicines is expected to rise as a result of many factors: patients are using medicines on a more chronic basis as certain cancers become more manageable due to advances in treatment, more patients will require late-stage and second-line therapies, the number of cancer survivors is increasing, newer treatments are more frequently prescribed, and the cost of cancer medications is increasing (Elkin and Bach, 2010; Himmelstein and Woolhandler, 2012).

This analysis, the first to quantify the financial burden of cancer in Lebanon, provides evidence needed for cost-benefit analyses of cancer prevention measures such as public awareness campaigns and screening programs. However to effectively support policy-makers in allocating scarce resources, comparative economic evaluation analysis (e.g. cost-effectiveness analysis) must also be developed to estimate the differential costs and outcomes of several treatment modalities (Murray et al., 1994; Lee et al., 2009; Kantarjian et al., 2013).

Small markets countries such as Lebanon are in a particularly difficult position with regard to supporting and achieving successful bargains. Countries in similar situation may benefit from the experience of Lebanon in drug price reductions by putting in place regulations governing drug price comparisons.

There are some elements of hope in the future. Recent studies are showing that introducing improved, rather expensive, new chemotherapy drugs may lower the overall cancer care cost as a result of decreased need for hospitalization and radiotherapy (Newcomer et al., 2014). Furthermore, newer therapies such as vaccine-based immune therapy are being tested and should be markedly less expensive than current targeted therapy drugs. The MOPH should persevere in its efforts to promote utilization of good quality generic drugs, and to enhance market competitiveness as a way for significant savings. Non-chemotherapy drugs that substantially improve quality of life at acceptable cost should be encouraged, instead of stubborn insistence on further chemotherapy when the disease is already very advanced.

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