The economic burden of cancer care for Syrian refugees: a population-based modelling study

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Summary

Background **Cancer represents a substantial health burden for refugees and host countries. However, no reliable data on the costs of cancer care for refugees are available, which limits the planning of official development assistance in humanitarian settings. We aimed to model the direct costs of cancer care among Syrian refugee populations residing in Jordan, Lebanon, and Turkey.**

Methods **In this population-based modelling study, direct cost per capita and per incident case for cancer care were estimated using generalised linear models, informed by a representative dataset of cancer costs drawn from 27 EU countries. A range of regression specifications were tested, in which cancer costs were modelled using different independent variables: gross domestic product (GDP) per capita, crude or age-standardised incidence, crude or age-standardised mortality, and total host country population size. Models were compared using the Akaike information criterion. Total cancer care costs for Syrian refugees in Jordan, Lebanon, and Turkey were calculated by multiplying the estimated direct cancer care costs (per capita) by the total number of Syrian refugees, or by multiplying the estimated direct cancer costs (per incident case [crude or age-standardised]) by the number of incident cancer cases in Syrian refugee populations. All costs are expressed in 2017 euros (€).**

Findings **Total cancer care costs for all 4·74 million Syrian refugees in Jordan, Lebanon, and Turkey in 2017 were estimated to be €140·23 million using the cost per capita approach, €79·02 million using the age-standardised incidence approach, and €33·68 million using the crude incidence approach. Under the lowest estimation, and with GDP and total country population as model predictors, the financial burden of cancer care was highest for Turkey (€25·18 million), followed by Lebanon (€6·40 million), and then Jordan (€2·09 million).**

Interpretation **Cancer among the Syrian refugee population represents a substantial financial burden for host countries and humanitarian agencies, such as the UN Refugee Agency. New ways to provide financial assistance need to be found and must be coupled with clear, prioritised pathways and models of care for refugees with cancer.**

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See **Comment** page 604

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For the **Arabic translation of the abstract** see **Online** for appendix 1

For the **Turkish translation of the abstract** see **Online** for appendix 2

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Introduction

In 2017, the UN Refugee Agency (UNHCR) recorded 68·5 million people of concern worldwide,[1] including 25·4 million refugees, 40·0 million internally displaced persons, and 3·1 million people seeking asylum. The combined number of refugees and internally displaced persons—65·4 million—has more than doubled since 2010 and almost tripled since 2000.[2] Refugees represent a highly vulnerable population; they require specific support, and a major responsibility is placed on the international community and host countries to meet their needs.

Non-communicable diseases (NCDs) represent a substantial burden, in both refugee and host communities, that requires humanitarian support. However, the traditional humanitarian and refugee health response has focused on the provision of health-care services to address communicable diseases.[3] The millions of refugees and internally displaced persons moving in and out of war zones through the Middle East, Asia, and Europe illustrate the need to refocus the health response on NCDs. Among NCDs, cancer represents a particular challenge.[4] Not only is it a leading cause of mortality, but the trajectory of care for many types of cancer requires a robust health system that can deliver and coordinate a wide range of services, such as screening programmes, diagnostic services, palliation, or treatment with surgery, radiotherapy, or chemotherapy.[5]

The growing prevalence of NCDs, especially in low-income and middle-income countries, is characteristic of the so-called epidemiological transition.[6] The proportion of deaths that were due to NCDs in people aged 30–70 years in Syria was 22% in 2016, and similar proportions were reported for Jordan, Lebanon, and Turkey.[7] The international humanitarian global health communities have been slow to acknowledge and address the rapid increase in NCDs that has accompanied the arrival into host countries of millions of refugees

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See Online for appendix 3

Research in context

Evidence before this study

The Syrian conflict has led to millions of individuals leaving the country as refugees. The impact of this refugee crisis on non-communicable diseases, such as cancer, is unknown. Although major efforts have been made to fund the health sector by the UN Refugee Agency (UNHCR) and partner non-governmental organisations (NGOs), no analyses of the costs of delivering cancer care have been done.

To identify studies reporting on the costs of cancer care in Syrian refugee host countries, we did a literature search of MEDLINE, Embase, and Global Health (all via Ovid) for articles published between Jan 1, 2012, and July 1, 2019, without language restrictions, to identify national estimates of direct costs for cancer care in Jordan, Lebanon, and Turkey. We searched for articles related to cancer ("cancer" or carcinom*" or oncolog*" or tumor*" or "neoplasm*") and costs ("cost" or "economic" or "financ*" or "budget*" or "price*" or "pay*" or "reimburse*") in the three host countries by searching the title, abstract, and keyword fields. We identified no cost-of-illness studies and less than 20 articles that focused on either specific cancer types or sites or on the cost of specific resources (eg, drugs). Previous cancer cost estimates were not directly comparable across the three countries, and they were insufficient to aggregate into the average cost per cancer case or per capita.

Added value of this study

To our knowledge, this is the first study to estimate the cost of cancer treatment for Syrian refugees in Jordan, Lebanon, and Turkey. We have estimated these costs using a model based on gross domestic product and total national population size. We used different approaches to estimate costs: an approach that did not include the incidence of cancer in host countries (cost per capita), and two approaches that adjusted for cancer incidence and estimated costs per incident cancer case (either crude or age-standardised). The findings provide supporting information for planning the cost requirements for funding for cancer care, a disease with complex treatment pathways, by UNHCR and partner NGOs for Syrian refugees.

Implications of all the available evidence

Our findings inform the dialogue between national governments, humanitarian actors, and donors on reducing cancer burden among refugees. The estimates of this study are important for decision making when planning funding for health care of refugees, and they contribute to the wider political economy evidence base on cancer care for refugees, internally displaced persons, and other vulnerable groups. Our estimated costs represent 11·0% of the total funding requested for the health sector by UNHCR and partner NGOs.

from Syria.[8] This delay has resulted in a care gap for NCDs that has only begun to be addressed in the past 5 years.[9] Much of this focus has been on cardiovascular diseases, hypertension, or diseases with severe and immediate outcomes if management is disrupted, such as provision of insulin for type 1 diabetes or dialysis for kidney disease.[9–11] Cancer care, however, remains an acutely neglected part of the NCD refugee health response because of the financial costs involved and the health service capacity that is needed to provide adequate care.

UN agencies such as WHO and UNHCR provide leadership for refugee health, but strategic plans have only estimated aggregate costs for the health sector, and allocation of resources to cancer services is not clearly delineated. In addition, host nations often struggle to provide adequate cancer services for refugees, partially due to the additional fiscal and health-care resource strains put on health systems in nations with refugee populations.[12] However, in several countries neighbouring Syria, the arrival of refugees has uncovered poorly developed pre-existing services and inadequate health system financing mechanisms, such as low health insurance coverage of local host populations and high out-of-pocket payments.[13,14] For example, in Lebanon, only 42% of the Lebanese population are covered by public health insurance, and out-of-pocket payments represent 32% of total health expenditure; in Turkey, however, more than 90% of the population has public insurance and out-of-pocket expenditure represents 16% of health expenditure (appendix 3 p 3).

Provision of cancer care for refugees in the Middle East and North Africa region has been particularly challenging due to rising costs of care globally and the scarcity of effective cancer control plans in host countries.[15] In addition, the quality of epidemiological, service-use, treatment effectiveness, and cost data from local ministries of health is low, and access to UNHCR health registers is restricted. Cancer registration for Syrian refugees has been advocated to support international aid requests,[16] but the process of cancer registration among refugees is not well established. Cancer registration among Syrian refugees fluctuates according to changes in funding for the registries in Jordan[17] and other registries across the Middle East and North Africa region.[18] In Lebanon, Syrian refugee cancer cases stopped being registered at the national cancer registry in 2015; thus, registered cancer cases might not be representative of the actual number of cases.[19]

For 246 approved cancer cases among refugees across Syria and Jordan, the mean expenditure approved per application was US$4626 (range $412–21 188) in 2011, and $3501 ($289–18 873) in 2012,[20] but these costs encompass only half of the cancer care funding requests submitted to the UNHCR exceptional care committees. Given the scarcity of reliable data in the region, inadequate support for cancer care among refugees, and the fiscal and resource burden it presents for individuals and host communities, generating estimates of the financial resources required to provide adequate care could help inform humanitarian resource planning and allocation.

We present an econometric analysis of the financial burden of Syrian refugees with cancer currently residing in Jordan, Lebanon, and Turkey. We aim to fill some of the existing information gaps and inform the ongoing dialogue among national governments, humanitarian actors, and donors towards decisive, coordinated action to reduce the cancer burden among refugees. Our approach could contribute to the wider political economy evidence base on cancer care for refugees, internally displaced persons, and other vulnerable groups.

Methods

Analysis framework

With use of a population-based model, we estimated the direct costs of treating all cancers per annum among 4·74 million Syrian refugees residing in Jordan, Lebanon, and Turkey as of 2017.[21] Cancer was defined here using the WHO International Classification of Diseases, tenth revision, codes C00–97. The cost of treatment was defined as the cost of direct services provided by the respective national health system, specifically the cost of drugs and the use of four categories of health service: community services, outpatient visits, emergency room visits, and days spent as an inpatient (eg, diagnostics, surgery, and radiotherapy). Total costs were calculated using three approaches as the product of the estimated cancer care cost (per capita, per incident cancer case [crude], or per incident cancer case [age-standardised]) and the total number of Syrian refugees or Syrian incident cancer cases, as appropriate, then summed across the three countries. Crude incident cancer cases reflected the incidence under the country's respective age distribution, whereas the age-standardised incident cases had been standardised to a world standard population. All costs are expressed in 2017 euros (€). Prices were adjusted for inflation from 2009 to the most recent annual rate available (year-end 2017).[22]

Data sources

Given the poor availability of data to estimate cancer treatment costs for Syrian refugees, we made a pragmatic decision to use the validated cost dataset for cancer care in 27 EU countries (hereafter referred to as the EU cancer dataset or EU cancer cost analysis)[23] to estimate the average cost per capita and per incident case for Syrian refugees in Jordan, Lebanon, and Turkey (appendix 3 p 4). The EU cancer cost analysis was based on data from several sources, including WHO, the Organisation for Economic Co-operation and Development, the Statistical Office of the European Communities (EUROSTAT), national ministries of health, and statistical institutes.

The six dependent variables derived from the EU cancer dataset were: number or frequency of health-care contacts (per 1000 population); cost per capita (drugs plus services); cost per capita (services); cost per capita (drugs); cost per incident case (crude); and cost per incident case (age-standardised; appendix 3 p 4). The original cost per capita (drugs plus services) variable was split into its two constituent parts on the basis of evidence that the costs of drugs are potentially highly variable, and are affected by the markets, regulation practices, and other factors.[24,25] We included the number of health-care contacts based on the hypothesis that there was a positive correlation between the frequency of service use and the burden of cancer within a given population.

The cost per incident case was used to adjust costs at the final calculation stage and reflected the burden of cancer via the incidence of a given target population. This strategy was considered particularly necessary because there is a marked difference in cancer incidence between the EU and the Middle East and North Africa countries under study. Three data sources were used to calculate this cost (appendix 3 p 7): the total cost for cancer services at the national level (appendix 3 p 4);[23] national population figures (appendix 3 p 5);[26] and national cancer incidence data (appendix 3 p 6).[27] The crude and age-standardised incidences in this study refer to the reported incidence data for the year 2017.

Six predictors of cancer care costs were selected on the basis of positive associations identified in the EU cancer cost analysis: gross domestic product (GDP) per capita, total country population size, crude incidence, age-standardised incidence, crude mortality, and age-standardised mortality (appendix 3 p 8). Other health system financing variables, such as total health expenditure and public expenditure per capita, are correlated with GDP per capita,[28] and as such were omitted. We also considered using the density of radiotherapy equipment as a predictor of cost, but EUROSTAT data are reported from 2015 onwards (versus the reference year of 2009 in the EU cancer cost analysis) and data were missing for seven countries; therefore, it was excluded.[23]

Estimation of cancer costs

First, using regression diagnostic techniques, we tested for outliers within the EU cancer dataset with use of residual and standardised residual versus fitted value plots. We tested for a normal distribution of residuals using a normal Q-Q plot and tested for influential observations (ie, countries or other observations that, when introduced into the model, induce significant changes to the model coefficients or regression line) using Cook's distance plot. Using generalised linear models, single variable and multivariable regression models were constructed to predict average costs of cancer care in the EU cancer dataset, using cost per capita and cost per incident case approaches. We used a variety of distributions (normal, inverse Gaussian, gamma) and compared the different models using the log and square-root links. The regression specifications with the best predictive performance were used to estimate costs of cancer care per capita and per incident case in Jordan, Lebanon, and Turkey in 2009, in euros, as per the EU cancer dataset, and later adjusted for inflation.[22] These estimates were then multiplied by the corresponding number of individuals from the Syrian population (ie, the number of Syrian refugees in each host country), and crude or age-standardised incidence in the Syrian population (which is expected to be the same in Syrian refugees), to estimate total cancer care costs among Syrian refugees in each country. When performing the out-of-sample predictions for cancer care costs in Jordan, Lebanon, and Turkey (ie, when values for some predictors [eg, GDP] were not in the range of values used for building the models in the EU cancer dataset), predictors were those of the host country.

Analyses were done using R statistical package version 3.6.0. Model goodness-of-fit was measured using residual deviance (by χ^2 test) and regression models were compared using the Akaike information criterion, whereby models with a lower Akaike information criterion were considered to have a better fit. Given the small size of our dataset (<30 data points), we sought to prevent overfitting by specifying parsimonious models with up to two predictors.

Independent variables were tested in the final models in terms of both statistical and practical significance. Statistical significance was calculated at an α level of 0·05.

Role of the funding source

The funder of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data and had final responsibility for the decision to submit for publication.

Results

To understand the validity of our models we did a series of analyses to look at the distribution of variables. The distribution of most dependent variables was right-skewed (ie, not normally distributed), with drug cost per capita closer to normal distribution than other variables (appendix 3 p 10). Among the independent variables, the crude and age-standardised incidence and mortality variables were normally distributed; however, GDP per capita and total population were right-skewed (appendix 3 p 10). Therefore, for prediction purposes, log-transformed GDP and log-transformed total population size values were included in the models.

For each of the dependent variables, associations were tested with six independent variables. The economic variable GDP per capita showed a strong positive correlation with all dependent variables containing a cost component (appendix 3 pp 11–13). An association was also noted between epidemiological variables (incidence and mortality) and the different types of costs, particularly for age-standardised mortality and age-standardised incidence. The dependent variable cost per capita (drugs plus services) showed stronger associations with almost all independent variables than did either of the component costs (drugs or services) when analysed in isolation (appendix 3 pp 11–14). All independent variables showed weak associations with the dependent variable health-care contacts (data not shown); therefore, it was excluded from additional models.

All cost variables were strongly correlated with each other (correlation coefficients 0·80–0·98), with the exception of the correlation between drug cost and service cost (0·68; appendix 3 p 14). Independent variables (incidence, mortality, GDP per capita, and country population size) generally showed weaker correlations with each other than did the cost variables (appendix 3 p 14).

Based on the associations between costs and independent variables, three costs were selected (cost per capita [drugs plus services], cost per incident case [crude], and cost per incident case [age-standardised]) to be modelled with the four independent variables that showed higher levels of association: log GDP, log population size, age-standardised incidence, and age-standardised mortality.

After examining regression diagnostics in the EU dataset (Cook's distance plot for outliers, Q-Q plots for normality in response distribution, and plot of deviance residuals *vs* fitted values for linearity), Luxembourg and Greece were identified as outliers and excluded from the cost per capita and cost per incident case models, respectively.

All models tested the association between the three selected costs and four independent variables (models 1–15; appendix 3 pp 15–17). The model for cost per capita (model 8) and the model for both cost per incident case (crude) and cost per incident case (age-standardised; model 5) had the lowest Akaike information criterion across the three dependent variables. Adding more variables did not appear to bring additional gains and risked overfitting the models (data not shown). The final step of the modelling process adjusted the three estimated costs for either the population size or the cancer incidence of the refugee population, and for inflation of prices.

For regression models that included country GDP and total population size as predictors in Jordan, Lebanon, and Turkey, we estimated the total cost per capita using model 8, and the total cost per incident case (crude) and total cost per incident case (age-standardised) using model 5 (table). The per capita model resulted in a total cost of €140·23 million for the Syrian refugee population in the three host countries. This estimate does not take into account the cancer incidence in Syrian refugees, which was lower than that in the European countries studied. For practical reasons that outweigh the theoretical limitations, and because incidence is more

	Number of Syrian refugees*	Incident cases (crude)	Incident cases (age-standardised)	Average costs, €†			Total costs, €†		
				Cost per capita	Cost per incident case (crude)	Cost per incident case (age-standardised)	Total cost per country (per capita method)	Total cost for cancer cases (crude incidence method)	Total cost for cancer cases (age-standardised incidence method)
Jordan	661 114	682	965	1·4	2779	4367	1 041 710	2 094 721	4 657 732
Lebanon	1 001 051	1033	1461	19·2	5608	8910	21 348 457	6 401 953	14 385 792
Turkey	3 079 914	3178	4494	34·6	7169	12 075	117 835 418	25 179 655	59 973 338
Total	4 742 079	4893	6920	..	..	..	140 225 585	33 676 329	79 016 862

Regression dataset excludes Luxembourg as an outlier in the cost per capita model, and Greece in the cost per incident case models. Gross domestic product and total population are predictors in all models. The incidence per 100 000 population (crude or age-standardised) can be calculated by dividing the incident cases by the Syrian refugee population size and multiplying by 100 000. *Since June 7, 2017 (except in Lebanon, where official registration was halted in May, 2015). †From 2009 to 2016 (most recent annual rate available); a conversion factor of 1·105102 was used to adjust for inflation of prices during this period.

***Table:* Estimated costs for cancer-specific health-care services in the Syrian refugee population in Jordan, Lebanon, and Turkey for 2017**

representative than the whole population size (ie, the per capita method) of the actual burden among cancer cases, we also report costs using the cost per incident case (crude or age-standardised) approach. The estimated total cost using the per incident case (age-standardised) method was €79·02 million, and using the per incident case (crude) method was €33·68 million. The age-standardised estimate of €79·02 million translates to a cost of €11 417 per age-standardised incident case when considering a total of 6920 incident cases estimated in the three hosting countries. For the crude incident cases, which represent the actual cancer cost burden (reflecting the current age structure of the Syrian population), the estimated annual cost for providing cancer-specific care to the 4·74 million Syrian refugees in Jordan, Lebanon, and Turkey was €33·68 million, comprising costs of €2·09 million in Jordan, €6·40 million in Lebanon, and €25·18 million in Turkey (table).

Discussion

In this study, we used two models to estimate the costs of cancer care for Syrian refugees residing in Jordan, Lebanon, and Turkey. The model that used cost per capita estimated a total cost of €140·23 million for the Syrian refugee population in the three host countries. The model that used cost per incident case estimated a total cost of €33·68 million using crude incidence and €79·02 million using age-standardised incidence. We modelled the costs of cancer treatment in patients treated comprehensively and according to context-specific clinical guidelines applied to the refugee population in the Middle East and North Africa region using global and EU datasets. The estimated costs of care were for Syrian refugees residing in Jordan, Lebanon, and Turkey in particular, but they can be used to reflect on the needs of the wider refugee population.

The positive correlation between cancer-related costs and the GDP of the country was expected, having been identified in the EU cancer cost analysis[23] and other analyses.[29] The correlation remains when health costs are expressed relative to at least one indicator of the burden of cancer in a population, such as cancer incidence or population size. Moreover, cancer costs in high-income countries currently focus on expensive technologies and highly specialised services.[30] Our model was adjusted for both GDP and the total population size, and resulted in estimated costs that were lower than most high-income countries in Europe. The use of age-standardised incidence allowed for the control of differing demographic profiles across samples and is considered a preferable method for corroboration purposes, because a dataset derived from one global region (the EU) is being used to estimate costs for a population in another region. The substantially higher cost per incident case (age-standardised) than cost per incident case (crude) can be attributed to the fact that the refugee Syrian population, and the Syrian population in general, is young, with more than 50% of the population distribution between 15 and 64 years of age, which differs from the world standard population.[21,31]

The global refugee situation poses an enormous challenge to fragile health systems, and requires upscaling of the knowledge base and skills of health-care providers to respond to the needs of individuals, and must be addressed in the context of broader humanitarian and political issues.[32] Access to cancer services for refugees varies in Jordan, Lebanon, and Turkey. The settlement of most Syrian refugees outside of camps[33] highlights the need to integrate cancer care into the existing health systems, and increase national capacities to provide cancer care to both nationals and refugees.[34,35] Additional care for refugees, if integrated into such systems, would require changes and upscaling of capacities and resources. In Jordan for example, availability and accessibility to opioids for the general population are interrupted, and information on diagnosis and prognosis is commonly concealed from patients.[36]

Although specific details of cancer services in Jordan, Lebanon, and Turkey are not known (and are therefore difficult to corroborate), poor cancer outcomes due to low cancer-related health spending is a plausible interpretation of previous findings, considering the associations that have been identified between cancer outcomes and the availability of cancer services.[37,38] The weak association between health-care contacts and explanatory variables could be explained by the frequency of health service use being affected by different health-care-seeking behaviours and different levels of accessibility of services in host countries; alternatively, the method applied in the EU cancer cost analysis to measure health-care contacts might not be representative of the actual use of services for cancer-specific support in Jordan, Lebanon, and Turkey.

In the context of humanitarian funding for the Middle East and North Africa region, the estimated overall cost of €33·68 million (approximately $38 million) across the three host countries would constitute 11·0% of the annual budget of $345 million requested for Syrian refugees in 2017 for Jordan, Lebanon, and Turkey. In reference to what is actually funded, this represents 20·3% of the $187 million of funding for the health sector in 2017 for Syrian refugees in the same countries.[39] Although a comprehensive analysis of cancer costs in the three Middle East and North Africa countries is unavailable, previous studies have estimated specific costs for patients with cancer, and results are similar to our estimates for unit costs. For example, the direct medical cost for treating colorectal cancer in Jordan was $10 114 per patient in 2014 (equivalent to €7625).[40] This amount is slightly higher than our finding of €4367 per incident case (age-standardised), although our estimate is not specific to colorectal cancer. For Syrian refugees in Jordan, the total cancer costs incurred at one centre were $11·4 million (€9·7 million) over 8 years (2011–18),[17] which is higher than our estimate of $4·66 million at this centre. In Lebanon, drug costs were $6475 per patient, as an average of expenditure during the years 2008–2013.[41] When comparing the cost per incident case (age-standardised) between Middle East and North Africa and EU countries, estimated costs for Lebanon and Turkey were close to those in Latvia and Romania (appendix 3 p 4), whereas the cost for Jordan was lower, and close to that for Bulgaria; therefore, for all three host countries, the estimated costs for cancer care among Syrian refugees were among the lowest amounts spent by countries providing cancer care through their health systems. Countries such as Bulgaria and Slovenia had similar costs of €124 million and €145 million, respectively, but the cancer incidence in these countries was higher (appendix 3 p 4).

A limitation of this study was the sample selected for analysis, which included only refugees and might not be representative of the wider population of persons of concern, as defined by the UNHCR. With use of estimates of the number of persons of concern from the literature, an increase in the generated estimate would be expected. The cost estimates used to predict cancer costs were transferred from European datasets, where reported incidence is much higher than in the Middle East and North Africa region, resulting in high cost per capita estimates. Because of substantial variations in care provision between cancer services in each country and across countries, individual-level resource use data could be collected and used in future studies to ensure that more accurate cost data are calculated, rather than estimated with average costs. Additionally, the types of cost estimated might not represent the necessary funds for cancer control programmes or systems, but instead represent the patient-centred costs; as such, they ignore the costs of capital investments needed to provide the necessary services. From this perspective, our results are underestimates. The European cancer cost dataset does not distinguish between cancer stages, and therefore our estimates do not account for the proportion of cases diagnosed at each stage in each country. Although evidence suggests that costs of care increase with stage at diagnosis, for example in breast cancer,[42] there are differences across cancer types in terms of selecting the cost predictors in the regression models.[43] We adopted a pragmatic approach aligned with the European cancer cost analysis, given the scarce evidence on country-level predictors of cancer care costs, particularly in low-income and middle-income countries. Further research should prioritise improving the performance of cross-country cancer cost models to improve the accuracy of such estimates when local data are not yet available.

When considering funding for cancer care among refugees in wider international efforts to support cancer care, efforts are disorganised and inadequately funded.[16] Previous work from Iraq showed that of 164 refugees diagnosed with a primary cancer, 79 (48%) had attempted resettlement, indicating possible treatment insecurity and a lack of supportive cancer care.[44] However, cancer among Syrian refugees has remained largely unaddressed in the humanitarian response, mostly because of UNHCR financial constraints.[17] Evidence from the Global Burden of Disease Study described cancer control in the Eastern Mediterranean region as having deficits in prevention, detection, diagnostics, treatment, and palliation.[5] Refugee cancer care is inefficient when taking into account the pre-existing vulnerability of the host populations in Jordan, Lebanon, and Turkey.

Our results provide an initial indication of the magnitude of the cancer burden among Syrian refugees and can inform the regional multi-stakeholder dialogue on coordinating action plans, scaling up existing initiatives, and investing in infrastructure and data systems. Funding for cancer needs to go beyond current UNHCR financing mechanisms; sustainable, inclusive, and comprehensive financing mechanisms under the universal health coverage umbrella are necessary to account for the health needs of refugee populations and host communities, building on the political commitment taken by the governments of Jordan, Lebanon, and Turkey towards universal health coverage. Evidence from countries with privatised health-care systems, such as India, show that low health insurance coverage for patients with cancer leads to catastrophic health expenditures and families falling into poverty.[45] The Iraq and India case studies indicate that refugees travelling to different countries seeking cancer care in particular can accelerate financial catastrophe because of additional costs associated with travel and mobility. Context-specific treatment protocols and guaranteed access and continuity of treatment will be crucial for improving models of cancer care in conflict-affected regions.[46] The use of resource-stratified guidelines could help to ensure better access to, higher quality of, and fewer disparities in cancer care.[16]

Contributors

RAA-K, PG, FS, AG, and RS conceptualised and designed the study. RAA-K, AG, and RS analysed and interpreted the data. RAA-K, PG, FS, AG, AA, and RS wrote the first draft. All authors reviewed and commented on drafts of the paper.

Declaration of interests

We declare no competing interests.

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