

Cost-effectiveness analysis and sustainable innovation in healthcare: A review of cost transferability from the MENA region

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Abstract: Healthcare systems are constantly confronted with major challenges: deliver quality services and provide access to health technology innovations while keeping costs under budget constraints. Health expenditure is following a fastgrowing paste globally, and it is important that governments and healthcare providers rethink the health-services delivery to be more sustainable. Hence, comes the role of health economists, focusing their research on sustainability and innovation in healthcare and providing insights on how to make informed decisions under the umbrella of universal healthcare. An example of this is reusing primary data from other jurisdictions and adjusting it to local settings where costs are infrequently reported such as the Middle East and North Africa (MENA) region. The aim of this paper is to systematically review the methodology and reporting quality of economic evaluation publications using costs transferred from other jurisdictions to countries in MENA. The literature search was performed in PubMed and Web-of-Science. Full-text screening and data extraction were done in duplicates. Transferring costs is a novel practice within the region where Gulf countries are slightly leading in the number of transferred costs. There is a growing interest in the study of geographical transferability of scarcely available disease-related costs to support decisions about more effective and sustainable allocation of healthcare resources. However, more efforts are needed to consolidate best practices about the transferability of disease-related costs.

Keywords: Cost-transferability; MENA region; Healthcare system; Cost-effectiveness; Heath policy

1 Introduction

Innovation in healthcare is expected to enhance the quality-of-care delivery for patients and change the health services are provided. Its aim is to improve general population's health (Huter et al., 2016). healthcare innovation can be defined as “the application of a new medical knowledge”, usually a medical product, i.e., a new drug or medical technology (Johannesson et al., 2009).

It has been proven via research studies that the health of the general population has improved through the years as a result to the development of technologies used in healthcare industry. Along with these improvements, the cost of healthcare delivery has been growing exponentially and questions are increasingly asked about the added value of the expanding health innovations in relation to the cost of implementing these new technologies in the healthcare systems (Launois et al., 2014).

For a better management of healthcare resources, health economic evaluation has been established as a mechanism of making informed decisions regarding access to the newest health technologies on the market. Health economics is defined as “the comparative analysis of alternative courses of action in terms of their costs and consequences” (Drummond et al., 2015). Hence, health economic studies aim to compare both the costs and outcomes of two or more alternatives usually between an existing (standard procedure) and a new intervention. Health economics is the process of measuring the cost-effectiveness of a health technology as simply measuring the cost of an intervention is not sufficient to decide whether it is a good investment; for instance, a cheap intervention can be of a poor value for money if it has little or no health outcome (Franklin et al., 2020).

Healthcare decision-makers have been relying worldwide on health evaluation analysis when making future health policies and deciding on reimbursement and financing schemes. The Middle East and North Africa (MENA) region is no exception to this, where local governments have been soliciting health-economy experts to make informed decisions and have a sufficient use of health resources (Zrubka et al., 2020).

The MENA acronym refers to the countries geographically located between North Africa and Southwest Asia (Worldbank.org, 2022). For the purpose of this review, MENA region is defined to include the following 17 countries: Algeria- Bahrain- Egypt- Iraq- Jordan- Kuwait- Lebanon- Libya- Morocco- Oman- Palestine- Qatar- Saudi Arabia- Syria- Tunisia- the United Arab Emirates and Yemen. The region is following the lead of western world and is experiencing a steady growth in healthcare expenditure following the epidemiological shift and aging population along with the challenge of delivering quality universal health coverage (Zrubka et al., 2022).

However, health economists from the region are enduring a double threat due to the scarcity of available economic data which make conducting economic evaluations

less feasible and more time and resource consuming as disease-related costs are not always accessible and already published data is usually irrelevant and outdated. As a remedy to the economic data scarcity, geographical transferability of costs from one jurisdiction to another can be handy and help with establishing reliable Health economic evaluation results in such region (Goeree et al., 2007, 2002).

Transferability of cost economic results is defined as “the extent to which particular study findings can be applied to another setting or context.” (Kim et al., 2010). Another definition is introduced within the systematic review and transferability analysis of disease-related costs from the MENA region: “the extent to which costs are transferable” (Zrubka et al., 2022). In this paper, the relative error of prediction was used as a measure of transferability of economic evaluation results. Well-established guidelines and standards have been published on international level, i.e., ISPOR Good Research Practices Task Force Report on Transferability of Economic Evaluations Across Jurisdictions (Drummond et al., 2009). However, there have been few attempts of assessing cost transferability around the world and the MENA region is no exception to this either. A prior literature search of transferability practise from the region revealed that no prior research studies are available on the methodology of costs transferability nor does exist local MENA-region related best practice guidelines.

To approach this research gap, this review aims to identify economic evaluation literature using transferred costs from the region and to describe their methodology and reporting quality.

2 Methods

This paper is an extension of two previous reviews of health-related costs from the MENA region (Zrubka et al., 2022, 2020) and the search strategy was reproduced searching for hits published between January 2020 and May 2022. PubMed (www.ncbi.nlm.nih.gov) and Web of Science (www.webofscience.com) databases were searched in July 2022. Filters for full-text English-language papers were used. The included papers were: (1) full or partial economic evaluations, (2) published between 2000 and 2022 reporting, (3) disease-related costs in monetary units, (4) for local MENA populations, and (5) using costs from a foreign country transferred to one or more of the selected countries (Meriem Fgaier, 2022). No restrictions regarding the study perspective, the study disease, or the type of the health economic evaluations were applied.

Duplicates were removed and both title/abstract and full-text screenings were performed in parallel by two independent reviewers. All judgments about the studies' inclusion / exclusion decisions were also performed in duplicate. The disagreements were solved upon discussions and a third reviewer was involved when no agreement was reached.

The extracted data and its process are described with further details in the published research protocol (Meriem Fgaier, 2022). The following descriptive data on included studies (author(s)' names, publication year, number of transferred costs by publication, disease as reported in the study, the International Classification of Disease- 11th Revision: ICD-11 chapters, the study perspective, the study settings and the type of economic evaluation) and published transferred disease-related costs from the MENA region (the donor country, destination country, costing year of the analysis, costing year of the transferred cost, currencies of the donor and destination publications, level of aggregation, cost items as described in the article, costs denominators, costs type, and costs components) were retrieved.

Furthermore, the details on transferability methods applied by the authors were also extracted and quality check on the reporting quality of the original and transferred costs were performed according to the Fukuda classification on reporting transparency (Fukuda et al., 2011): Category A: All components of costs were described and data for both quantity and unit cost of resources were reported for each component. Category B: All components of costs were described and data for costs in each component were reported. Category C: All components of costs were described but data for costs in each component were not reported. And Category D: Only scope of costing was described but components of costs were not described.

Finally, the included studies quality was assessed using the 28 items of the Consolidated Health Economic Evaluation Reporting Standards CHEERS 2022 checklist (Husereau et al., 2022).

3 Results

3.1 Literature review

A total of 2061 hits were identified from the databases search, from which 54 duplicates were removed. 1807 studies were excluded after title and abstracts screening. Further 167 studies were excluded based on the inclusion and exclusion criteria after the full-text screening. 13 studies were finally included in this review as shown in the PRISMA flowchart. (See Figure 1)

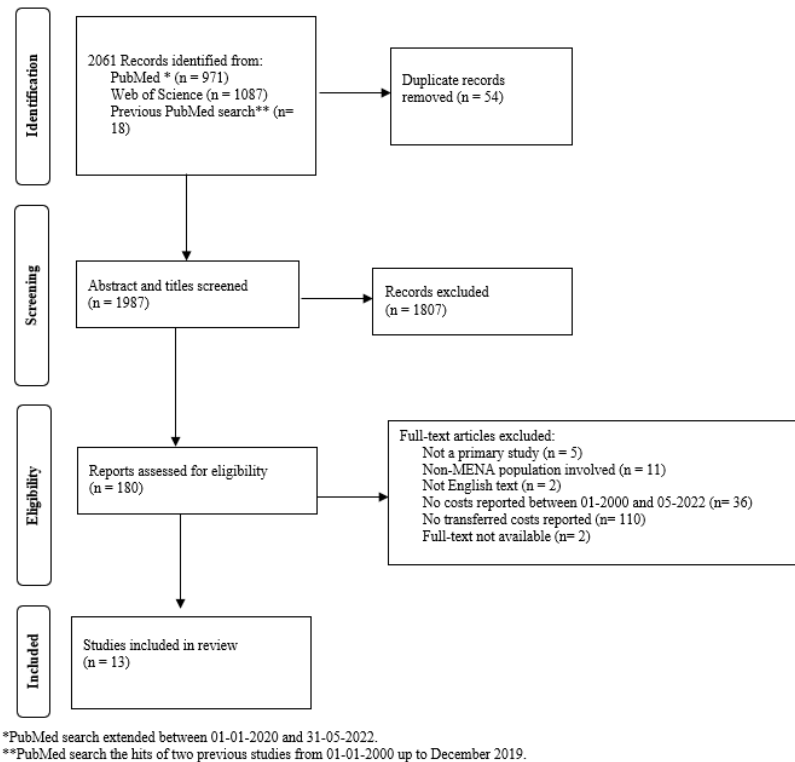


Figure 1
Literature search summary

3.2 Description of the included studies and extracted costs

A total of 104 transferred costs were extracted from the 13 identified studies from the MENA region; Most of the studies adopted the health system perspective and two studies didn't specify their perspective: (Boutayeb et al., 2014, 2013). Included diseases were Cancer (Abdul-Khalek et al., 2020): the study estimated the economic burden of cancer care for Syrian refugees in Lebanon and Jordan), Rotavirus infection related diarrhoea, Severe Aortic Stenosis, Tuberculosis Infection, Non-Valvular Atrial Fibrillation, Diabetes, Cervical cancer, and Hepatitis A. One study (Finkelstein et al., 2021) reported transferred costs for multiple diseases namely: Coronary disease, Stroke, Type 2 Diabetes, Breast cancer, COPD, and Asthma. Another study (Alsaeed et al., 2019) didn't specify the disease: the study population was mechanically ventilated elderly patients in a tertiary hospital in Bahrain.

Out of the 104 extracted costs, ¼ were originally transferred from the United Kingdom (n=26). Only 2.9% were originally from a MENA country: United Arab Emirates.

¼ of the costs' origin was multiple countries (n= 26, 2 studies: -Finkelstein et al., 2021 and -Abdul-Khalek et al., 2020). Also, it was not possible to differentiate the original country of 9.6% of the costs (n =10) as the authors only reported in the methodology section that transferred costs were originally taken from available literature (referring to two studies from Canada (2018) and France (2020) without specifying further details on which cost was transferred from which study (Carapinha et al., 2022).

As for the destination countries of the transferred costs, most of them, were transferred to Saudi Arabia (41.4%, n= 43) and for 14.4% of them (n= 15), the destination country was not specified; Boutayeb et al., 2013 and Boutayeb et al., 2014: both studies were conducted on Arab region countries, the estimated costs were reported as an average cost for three groups of Arab countries without further details (Group 1 (Bahrain, Kuwait, Lebanon, Libya, Oman, Qatar, Saudi Arabia, UAE); Group 2 (Algeria, Egypt, Iraq, Jordan, Morocco, Syria, Tunisia); Group 3 (Comoros, Djibouti, Mauritania, Somalia, Sudan, Yemen)).

The currency for the original and destination costs was mainly USD, respectively 30.8% (n=32) and 59.7% (n= 62). The costing years of the original costs were as follows: 1990 (n=1), 2002 (n=4), 2004 (n= 4), 2008 (n=5), 2009 (n=12), 2010 (n= 26), 2011 (n= 3), 2012 (n=3), 2014 (n= 15), 2017 (n=4) and 2018 (n= 4). It was not possible to differentiate the currency of the original costs for Carapinha et al., 2022 (n= 10) and both Boutayeb et al., 2013 and Boutayeb et al., 2014 didn't specify the original costs' currency (n= 15). The costing years of the transferred costs were as follows: 2008 (n= 5), 2011 (n= 1), 2013 (n= 41), 2015 (n= 4), 2017 (n= 17), 2018 (n= 6), 2019 (n= 20) and 2021 (n= 10).

Most of the transferred costs were direct healthcare (n= 65) and the cost type was not specified in 28 of the cases (See table 1).

Table1. Description of included papers and extracted costs

<i>Author, publication year</i>	<i>ICD chapter</i>	<i>Study perspective</i>	<i>Type of economic evaluation</i>	<i>Currency of original/transferred costs</i>	<i>Costs type (n)</i>
Abdul-Khalek, 2020	II Neoplasms	Patient	CDA	Euro/Euro	Direct HC (n=12)
Debellut, 2020	I Certain infectious or parasitic diseases	Societal and health system	CEA	USD/USD	Not specified (n=2)
Finkelstein, 2021	Multiple*	Health system	CDA	Int\$, AED, Euro/Int\$	Direct HC (n=20)
Al Saeed, 2021	Not Specified**	Healthcare institution	COI	USD/USD	Total (n=4)
Carapinha, 2022	XI Diseases of the circulatory system	Health system	BIA	Not Specified*** / SAR	Direct HC (n=10)
Bastos, 2020	I Certain infectious or parasitic diseases	Health system	CCA	PPP\$/USD	Direct HC (n=4)
Hersi, 2019	XI Diseases of the circulatory system	Health system	CEA	GBP/USD	Not specified (n=26)
Boutayeb, 2013	V Endocrine, nutritional or metabolic diseases	Not specified	COI	Not specified/Not specified	Indirect HC (n=6)
Boutayeb, 2014	V Endocrine, nutritional or metabolic diseases	Not Specified	COI	Not specified/Not specified	Direct HC (n=9)
Al Awaidey, 2009	I Certain infectious or parasitic diseases	Health system	CDA	USD/USD	Direct HC (n=5)
AlBedah, 2014	VI Mental, behavioural, or neurodevelopmental disorders	Health system	COI	USD/USD	Total (n=1)
Gamaoun, 2018	II Neoplasms	Health system	CMA	USD/USD	Direct HC (n=1)
Hayajnah, 2018	I Certain infectious or parasitic diseases	Societal	CEA	USD/USD	Direct HC (n=4)

Finkelstein, 2021: Seven major noncommunicable diseases: Coronary disease, Stroke, Type 2 Diabetes, Breast cancer, COPD, Asthma; **Al Saeed, 2021: Study population is mechanically ventilated elderly patients in a tertiary hospital in Bahrain; *Carapinha, 2022 (DOI: 10.1080/13696998.2021.2020569): It was not possible to differentiate the original costs currency. The authors only reported in the methodology section that transferred costs were originally taken from available literature (referring two studies from Canada (2018) and France (2020) without specifying further details on the which cost was transferred from which study).*

3.3 Methodology of transferred costs

When transferring the costs, time adjustments (n= 71) were mostly used by authors, followed by currency adjustments (n= 38), then economic adjustments (n= 51), and cost-Type adjustments were the least used (n= 68).

Only 5/13 papers justified the transferability methods. Various justifications of transferability methods were used by the authors; Boutayeb et al., 2013 and Boutayeb et al., 2014 assumed that the costs are similar for different countries in the same income group. – (Hayajneh et al., 2018) used costs from economically similarly situated countries- (Carapinha et al., 2022) used (Hersi et al., 2019) to justify applied methodology when transferring costs to Saudi Arabia context – and both (Al Awaidy et al., 2009) and (Bastos et al., 2020) reported WHO-CHOICE tool as a justification for their transferability approach. (See table 2)

Table2. Transferability methodology used by authors: Adjustments type, applied transferability methods justification, and Donor countries selection criteria

Author, publication year (n)	Adjustment type	Justification of transferability method	Donor/ Destination countries	Donor country selection criteria
<i>Abdul-Khalek, 2020 (n=12)</i>	Time adjustment Economic adjustment	No reference	Multiple → Jordan Multiple → Lebanon	Data availability from WHO- OECD- EUROSTAT
<i>Debellut, 2020 (n=2)</i>	Time adjustment	No reference	NS → Palestine	No reference
<i>Finkelstein, 2021 (n=20)</i>	Time adjustment Currency adjustment Economic adjustment Cost-type adjustment	No reference	Multiple → Bahrain Multiple → Oman UAE → Kuwait UAE → Qatar UAE → KSA Germany → Kuwait Germany → Qatar Germany → KSA	No reference
<i>Al Saeed, 2021 (n=4)</i>	Currency adjustment	No reference	USA → Bahrain	No reference
<i>Carapinha, 2022* (n=10)</i>	Currency adjustment Economic adjustment Cost-type adjustment	Hersi, 2019	NS (Canada or France) → KSA	No reference
<i>Bastos, 2020 (n=4)</i>	Time adjustment Currency adjustment Cost-type adjustment	No reference	Canada → KSA	No reference
<i>Hersi, 2019 (n=26)</i>	Time adjustment Cost-type adjustment	No reference	UK → KSA	No reference

Boutayeb, 2013** (n=6)	Economic adjustment	Assuming that the costs are similar for different countries in the same income group	NS → NS	Same income group
Boutayeb, 2014** (n=9)	Cost-type adjustment	Assuming that the costs are similar for different countries in the same income group	NS → NS	Same income group
Al Awaidey, 2009 (n=5)	Time adjustment	WHO-CHOICE Tool	NS → Oman	No reference
AlBedah, 2014 (n=1)	Time adjustment	No reference	USA → KSA	No reference
Gamaoun, 2018 (n=1)	Time adjustment	No reference	NS → Tunisia	No reference
Hayajnah, 2018 (n=4)	No adjustments	Similarly, economically situated countries	Argentina → Jordan	Economic similarity

* Carapinha, 2022 (DOI: 10.1080/13696998.2021.2020569): It was not possible to differentiate the original costs original country. The authors only reported in the methodology section that transferred costs were originally taken from available literature (referring two studies from Canada (2018) and France (2020) without specifying further details on the which cost was transferred from which study).; ** Boutayeb, 2013 and Boutayeb, 2014: both studies were conducted on Arab countries, the estimated costs were reported as an average cost for three groups of Arab countries without further details (Group 1 (Bahrain, Kuwait, Lebanon, Libya, Oman, Qatar, Saudi Arabia, UAE); Group 2 (Algeria, Egypt, Iraq, Jordan, Morocco, Syria, Tunisia); Group 3 (Comoros, Djibouti, Mauritania, Somalia, Sudan, Yemen))

3.4 Quality assesement

As summarized in table 3, authors reported sensitivity analysis for 63.5% of the transferred costs (n= 66) and justified the transferability methods for around one third of the cases (n=35- 33.6%).

Fukuda classification for transferred costs was as follows: B= 23.1% (n=24), C= 11.5% (n= 12), and D= 65.4% (n= 68). Only 4 studies out of 13 included had a ‘high’ CHEERS score (score => 20/28): (2): studies from KSA, (1): Palestine and (1): Jordan)

Table 3. Summary of quality assesement of included papers and transferred cost

<i>Author, publication year</i>	<i>Fukuda classification of transferred cost</i>	<i>Sensitivity analysis</i>	<i>CHEERS score</i>	<i>Number of costs</i>
<i>Abdul-Khalek, 2020</i>	C	No	15/28	N =12
<i>Debellut, 2020</i>	D	Yes	22/28	N =2
<i>Finkelstein, 2021</i>	D	Yes	11/28	N =20
<i>Al Saeed, 2021</i>	D	No	14/28	N =4
<i>Carapinha, 2022</i>	D	Yes	24/28	N =10
<i>Bastos, 2020</i>	D	Yes	18/28	N =4
<i>Hersi, 2019</i>	D	Yes	25/28	N =26
<i>Boutayeb, 2013</i>	B	No	6/28	N =6
<i>Boutayeb, 2014</i>	B	No	14/28	N =9
<i>Al Awaidy, 2009</i>	B	No	18/28	N =5
<i>AlBedah, 2014</i>	D	No	11/28	N =1
<i>Gamaoun, 2018</i>	D	No	18/28	N =1
<i>Hayajnah, 2018</i>	B	Yes	22/28	N= 4

4 Discussion

The findings from this study show that there is a growing interest in costs transferability and that the practise has started recently in the region; as only one study was published in 2009, all other identified transferability papers were published through the last decade (between 2013 and 2021). This is in consistence with findings from a systematic review and a transferability analysis of disease-related costs from the region; The review reported that an increase of publication activity after 2012 (Zrubka et al., 2022). The same paper concluded that most costs were published from Saudi Arabia which confirms the noticed lead of Gulf countries in general and Saudi Arabia in particular on transferability attempts with around 41.4% of the identified costs being transferred to Saudi Arabia settings (Oman 11.5%; Bahrain 10.6%; Kuwait and Qatar 1.9%).

Despite the available literature on international guidelines of cost transferability methodology proposing best practises, factors of transferability (Welte et al., 2004), numerous adjustment methods (Grieve et al., 2005; Perrier et al., 2014; Sculpher et al., 2004), and reporting guidelines (Drummond et al., 2009, 2005; Husereau et al., 2022), no standard approach was used in all studies when reporting the results of

economic evaluation analysis and multiple adjustment techniques were reported by the authors when transferring the costs.

To the best of our knowledge, our study is the first systematic review of economic evaluation studies using transferred costs from the region. Previous systematic reviews were conducted on health economic research such as Zrubka et al., 2022 review of health-related costs for the entire MENA region up to 2019 (n = 105) and Elsharkawy et al. (Elsharkawy et al., 2018) including the entire WHO Eastern Mediterranean Region (n = 624). The latter papers systematically reviewed health economic studies from the region, where our study focused thoroughly on health economic transferability studies. Our review is the first to highlight the literature gap on cost transferability research in the region and contributes to portrait a thorough picture of the transferability methodology used by MENA authors and the quality of the transferred costs from the MENA countries.

Conclusions

Transferability is a novel practice within the region where Gulf countries are slightly leading with the number of transferred costs. There is a growing interest in applying geographical transferability of disease-related costs to overcome scarcity issues and obtain more effective and sustainable healthcare. However, more efforts are needed for solid cost-transferability results and future focus on researching cost transferability within MENA countries remains important.

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