

# Prevalence and Economic Burden of Dementia in The Arab World

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## Research Article

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# Abstract

## Background

In 2021 an estimated 55 million people were living with dementia globally, and this number is predicted to increase to 78 million by the end of this decade. As an irreversible, progressive condition, dementia poses a serious economic challenge to health systems worldwide. There is also an indirect economic burden on the informal carers and families looking after individuals living with dementia. Due to the scarcity of updated estimates about the cost of dementia in the Arab world, this article aims to calculate this economic burden for the year 2020.

## Methods

Using the data relevant to the Arab countries, we estimated the number of individuals above 50 living with dementia in Arab countries. We calculated the direct cost of dementia, considering the cost per individual with dementia for the resources used to treat dementia related to the Gross Domestic Product per capita. We also calculated the indirect cost of dementia, defined as the cost of using the caregiver's time.

## Results

The total direct cost of dementia in the region was estimated at \$16,462.5 million for those over 50 and \$15,463.8 million for those over 60. In the calculations for indirect cost, we considered the best-case scenario (1.6 hours per day of caregiver support with activities of daily living) and the worst-case scenario (3.7 hours per day). For those above the age of 50, the indirect cost was \$2,699.2 million for the best-case scenario and \$6,241.9 million for the worst-case scenario. For those above the age of 60, the indirect cost was \$2,502.1 million for the best-case scenario and \$5,786.0 million for the worst-case scenario.

## Conclusions

Our findings show that with the demographic changes occurring in the Arab world, dementia will represent a greater challenge, and the burden of the condition is predicted to increase. The results of this study are important for the allocation of resources and the financing of care for both patients and their caregivers. Further studies investigating the efficient use of resources and the cost-effectiveness of interventions in the region are highly recommended.

## Background

Dementia is a clinical condition caused by neurodegeneration and results in cognitive decline and a reduced capacity for independent living [1]. Individuals with dementia suffer from a range of symptoms including anxiety, irritability, low mood, hallucinations, delusions, and sleep disorders [2]. Alzheimer's disease is the most common type of dementia and accounts for around 60% of cases [3, 4].

Globally, it is estimated that around 55 million people were living with dementia in 2021 and that this number is predicted to increase to 78 million in 2030 [5]. This increase could be attributed to the growth of the total population along with a rise in life expectancy. A reduced fertility rate has also contributed to the demographic

shift towards an aging population. It is predicted that between 2015 and 2050, the number of older people is expected to increase by 56% in higher-income countries, 138%-185% in middle-income countries and 239% in low-income countries [6]. Due to these changes in population dynamics, it is also predicted that the Arab world will have an increase in the prevalence of dementia.

The costs of dementia are important to estimate since the condition incurs an economic burden on health care systems and caregivers. Thus, the economic burden includes the direct costs (the cost of healthcare utilization) and the indirect costs (the cost of informal care or of caregivers providing support to dementia patients). Wimo et al. reported the worldwide cost of dementia in 2009 as \$422 billion, with \$142 billion (34%) spent on informal care [7]. A recent study followed a similar methodology to estimate the cost of dementia in the Arab world for the year 2009 [8]. The study found the total cost of dementia to range between \$4.2 billion (with \$1.9 billion for informal care) and \$6.7 billion (with \$4.4 billion for informal care). The findings also showed that dementia costs accounted for more than 0.75% of the total Gross Domestic Product (GDP) in Mauritania, Iraq and Egypt, whereas, for the Gulf Cooperation Council, the economic burden was estimated at less than 0.25% of the GDP. In 2015, the worldwide total cost of dementia was estimated at \$818 billion [6]. Although this report also included a regional estimate for North Africa / Middle East (\$16.7 billion total cost of dementia), this cost does not represent the Arab region due to the inclusion of two countries with relatively large population size in the calculations (Turkey and Iran). This calculation had also not included some African-based Arab countries. Due to the lack of more updated estimates about the cost of dementia in the Arab world, this article aims to calculate this economic burden for the year 2020 using the same methodology as Wimo and colleagues [7].

## Methods

The model used to calculate the costs has been derived from other studies [7, 9–11]. This starts with estimating the number of individuals living with dementia in the country above the age of 50 and 60. We used the data published on the United Nations' website that described the distribution of population, age-band, and gender in all countries. We extracted the data relevant to the Arab countries [12].

Table 1 depicts the dementia prevalence estimates according to age-bands and across gender [13], which we used to calculate the number of individuals who have dementia in individual Arab countries.

Table 1  
Global dementia prevalence estimates  
according to age bands and across gender.

<b>Dementia prevalence per 10000</b>		
Age band	Males	Female
50–59	12	33
60–69	153	195
70–79	431	554
80–89	1202	1611
90–99	2464	3879
100+	5455	6694

Note: This table depicts the dementia prevalence estimates according to age bands and across gender [13], which we used to calculate the number of individuals who have dementia in individual Arab countries.

First, we calculated the direct cost of dementia. We considered the cost per patient for the resources used to treat dementia related to the GDP per capita based on purchasing power parity (PPP). From previous studies with the same purpose, the direct cost of dementia per person with the condition was estimated to be around 86.0% of the GDP per capita (PPP based) [9]. Hence, data about the GDP per capita (PPP based) was obtained from the most recent World Bank estimates [14]. The total direct cost was then calculated with the following equation: [direct cost in each country = number of individuals with dementia \* GDP per capita (PPP based) \* 0.860]. It is to be noted that the value of 0.86 had been previously estimated at 0.436, and this had been increased due to the following reasons: (i) potential increase in the cost of some services; (ii) new services and the possible increase in service use, and (iii) more up-to-date cost of illness research studies [7, 11]. This resulted in an amount in United States Dollars (USD). It is to be taken into consideration that the following countries had other sources of information for estimating the GDP per capita: Syria [15] in addition to Somalia, and Yemen [16].

We also calculated the indirect cost of dementia, defined as the cost of using the caregiver's time. First, it was considered that around 90% of people with dementia are living in the community in the Arab countries. This was in accordance with a similar study where this was estimated to be 90% for less developed countries (LDCs) [9]. Although not all Arab countries are LDCs, there are still cultural traditions in the Arab world where people with dementia are often cared for by an informal caregiver (usually a spouse or offspring) within their own household.

From previous calculations with the same objective, two estimations were made with regard to the hours per day that caregivers spend on informal care. These estimates were deduced from studies across different countries where the best-case scenario was 1.6 hours per day while the worst case was 3.7 hours per day [9]. Next, a cost was attributed to each hour spent according to the average hourly wage in each country (average hourly wage = average monthly wage / 160). If no data on average monthly wage was found, this was extrapolated from another country with a similar GDP per capita (PPP based). Hence, the best scenario for the

cost of informal care was: 1.6 hours/day \* average hourly wage (USD/hour) \* the number of people with dementia \* 0.9. For the worst-case scenario of the indirect cost, the 1.6 hours/day was replaced with 3.7 hours/day. It is to be noted that the hourly wage of a retired caregiver was considered equivalent to the hourly wage of a caregiver of working age, and although this is not ideal, this strategy is still in accordance with previous research about the burden of dementia [9].

## Results

Table 2 shows the prevalence of dementia in the Arab world in the population over 50 and 60 years of age. Figure 1 shows the prevalence of dementia in those aged over 60 years on the map of the Arab world.

Table 2  
Prevalence of dementia in the Arab world in  
populations over 50 and 60 years of age.

Country	Aged 50+	Aged 60+
Algeria	2.61	4.64
Bahrain	1.42	3.2
Comoros	1.84	3.64
Djibouti	2.03	3.92
Egypt	2.25	4.08
Iraq	1.98	4.1
Jordan	2	4.18
Kuwait	1.04	2.65
Lebanon	2.56	4.66
Libya	1.93	4.26
Mauritania	1.92	3.82
Morocco	2.37	4.07
Oman	1.79	4.08
Qatar	0.95	2.72
Saudi Arabia	1.53	3.65
Somalia	1.98	3.74
Palestine	1.97	3.99
Sudan	2.1	4.01
Syria	2.22	4.16
Tunisia	2.6	4.5
United Arab Emirates	0.94	2.59
Yemen	1.98	3.77
The Arab World	2.15	4.10

Supplementary tables (S1 and S2) depict the total population and dementia figures for the countries belonging to the Arab world. The highest estimate of those living with dementia above the age of 50 and 60 was in Egypt (386,002; 367,432), Algeria (227,596; 218,523) and Morocco (203,740; 194,973). The total direct cost of dementia in the region was estimated at \$16,462.5 million (range: \$5.1 – \$4,183.5 million) for those above 50 and \$15,463.8 million (range: \$4.8 – \$3,982.2 million) for those over 60 years of age. Table 3 shows an estimate of the number of individuals in Arab countries living with dementia and the direct costs attributed to dementia.

Table 3  
The number of individuals with dementia in Arab countries and direct costs.

	<b>GDP Per Capita, PPP [17]</b>	<b>Number of Individuals with Dementia (50+)</b>	<b>Direct Costs for 50 + age group (c)</b>  (in million USD)	<b>Number of Individuals with Dementia (60+)</b>	<b>Direct Costs for 60 + age group (c)</b>  (in million USD)
Algeria	11,320	227,596	2,215.7	218,523	2,127.4
Bahrain	43,740	3,717	139.8	3,413	128.4
Comoros	3,152	1,874	5.1	1,754	4.8
Djibouti	5,780	3,305	16.4	3,121	15.5
Egypt	12,602	386,002	4,183.5	367,432	3,982.2
Iraq	9,503	95,525	780.7	89,469	731.2
Jordan	10,351	29,877	266.0	28,058	249.8
Kuwait	47,289	10,062	409.2	8,834	359.3
Lebanon	12,114	39,858	415.2	38,279	398.8
Libya	10,842	23,596	220.0	22,022	205.3
Mauritania	5,388	10,418	48.3	9,764	45.2
Morocco	7,296	203,740	1,278.4	194,973	1,223.4
Oman	28,541	10,919	268.0	10,259	251.8
Palestine	5,688	11,813	57.8	11,091	54.3
Qatar	89,935	3,975	307.4	3,508	271.3
Saudi Arabia	46,742	92,125	3,703.3	85,172	3,423.8
Somalia (a)	916	30,477	24.0	28,699	22.6
Sudan	4,244	113,070	412.7	106,870	390.0
Syria (b)	2,794	64,894	155.9	61,608	148.0
Tunisia	10,819	80,507	749.1	77,342	719.6
United Arab Emirates	66,747	12,290	705.5	10,739	616.4
Yemen (b)	1,973	59,274	100.6	55,796	94.7
The Arab world	14,042	1,514,914	16,462.6	1,436,726	15,463.8

a: GDP per capita, PPP [16]

b: GDP per capita, PPP [15]

c: direct cost = number of individuals with dementia x (86.0% x GDP/capita)

In the calculations for indirect cost, we considered the best-case scenario (1.6 hours per day of caregiver support with activities of daily living) and the worst-case scenario (3.7 hours per day). For those above the age of 50, the indirect cost was \$2,699.2 million for the best-case scenario and \$6,241.9 million for the worst-case scenario. For those above the age of 60, the indirect cost was \$2,502.1 million for the best-case scenario and \$5,786.0 million for the worst-case scenario. The two scenarios of the indirect cost also resulted in a best-case and worst-case scenario for the total cost of dementia (i.e. the sum of the direct and indirect costs). For those above the age of 50, the total cost was \$19,161.7 million in the best-case scenario and \$22,704.4 million in the worst-case scenario. For those above the age of 60, the total cost was \$17,965.9 million in the best-case scenario and \$21,249.9 million in the worst-case scenario. Table 4 shows estimates of average monthly wages and the number of individuals with dementia living in the community. Table 5 depicts the estimated costs of informal care for the best-case and worst-case scenarios.



	Average Monthly Wage	Monthly Wage Estimate Reference	Number of Individuals With Dementia (50+)	Individuals Living In Community for 50+ (90%)	Number of Individuals With Dementia (60+)	Individuals Living In Community for 60+ (90%)
Algeria	304.5	g	227,596	204,836	218,523	196,671
Bahrain	3,772	d	3,717	3,345	3,413	3,072
Comoros	107.5	h	1,874	1,687	1,754	1,579
Djibouti	137	i	3,305	2,975	3,121	2,809
Egypt	155	c	386,002	347,402	367,432	330,689
Iraq	454	c	95,525	85,973	89,469	80,522
Jordan	454	c	29,877	26,889	28,058	25,252
Kuwait	3,873	d	10,062	9,056	8,834	7,951
Lebanon	304.5	g	39,858	35,872	38,279	34,451
Libya	304.5	g	23,596	21,236	22,022	19,820
Mauritania	137	i	10,418	9,376	9,764	8,788
Morocco	155	f	203,740	183,366	194,973	175,476
Oman	2,243	d	10,919	9,827	10,259	9,233
Qatar	4,786	e	3,975	3,578	3,508	3,157
Saudi Arabia	3,873	d	92,125	82,913	85,172	76,655
Somalia (a)	107.5	h	30,477	27,429	28,699	25,829
Palestine	137	i	11,813	10,632	11,091	9,982
Sudan	137	i	113,070	101,763	106,870	96,183
Syria (b)	107.5	h	64,894	58,405	61,608	55,447
Tunisia	304.5	g	80,507	72,456	77,342	69,608
United Arab Emirates	5,783	d	12,290	11,061	10,739	9,665
Yemen (a)	107.5	h	59,274	53,347	55,796	50,216
The Arab World	480	Weighted average	1,514,914	1,363,424	1,436,726	1,293,055

a: GDP per capita, PPP [16]
b: GDP per capita, PPP is estimated from 2015 [15]
c: Average monthly wage estimates from International Labour Organization [29]
d: For the following GCC countries (Bahrain, Kuwait, Oman, Saudi Arabia, and the United Arab Emirates): the monthly wage was estimated from Organisation for Economic Co-operation and Development (OECD) countries with similar GDP per capita [30].
e: The monthly wage was estimated from Luxembourg and Singapore ILO estimate [29]
f: The monthly wage was estimated from Egypt's ILO estimate[29]
g: The monthly wage was estimated from the average of Egypt and Jordan ILO estimates [29]
h: The monthly wage for countries with GDP per capita range of 900–4000 was estimated from Gambia and Mali ILO estimates [29]
i: The monthly wage for countries with GDP per capita range of 4001–7000 was estimated from Kenya ILO estimates [29]
NA: Not applicable

Table 5

The estimated indirect cost of informal dementia care for the best-case and worst-case scenarios.

	For those 50+				For those 60+			
	Informal Care (1.6 h/day) in million USD	Direct and Indirect Costs (best case)	Informal Care (3.7 h/day) in million USD	Direct and Indirect Costs (worst case)	Informal Care (1.6 h/day) in million USD	Direct and Indirect Costs (best case)	Informal Care (3.7 h/day) in million USD	Direct and Indirect Costs (worst case)
Algeria	227.7	2,443.4	526.5	2,742.2	218.6	2,345.9	505.5	2,632.8
Bahrain	46.1	185.9	106.5	246.3	42.3	170.7	97.8	226.2
Comoros	0.7	5.7	1.5	6.6	0.6	5.4	1.4	6.2
Djibouti	1.5	17.9	3.4	19.9	1.4	16.9	3.2	18.8
Egypt	196.5	4,380.0	454.5	4,638.0	187.1	4,169.3	432.6	4,414.9
Iraq	142.5	923.2	329.5	1,110.2	133.4	864.6	308.6	1,039.8
Jordan	44.6	310.5	103.0	369.0	41.8	291.6	96.8	346.5
Kuwait	128.0	537.2	296.0	705.2	112.4	471.7	259.9	619.2
Lebanon	39.9	455.1	92.2	507.4	38.3	437.1	88.5	487.3
Libya	23.6	243.6	54.6	274.6	22.0	227.4	50.9	256.3
Mauritania	4.7	53.0	10.8	59.1	4.4	49.6	10.2	55.4
Morocco	103.7	1,382.2	239.9	1,518.3	99.3	1,322.7	229.6	1,453.0
Oman	80.5	348.5	186.0	454.1	75.6	327.4	174.8	426.6
Qatar	62.5	369.9	144.5	452.0	55.2	326.5	127.5	398.9
Saudi Arabia	1,172.1	4,875.4	2,710.5	6,413.7	1,083.6	4,507.4	2,505.9	5,929.7
Somalia	10.8	34.8	24.9	48.9	10.1	32.7	23.4	46.0
Palestine	5.3	63.1	12.3	70.1	5.0	59.2	11.5	65.8
Sudan	50.9	463.6	117.7	530.3	48.1	438.1	111.2	501.3
Syria	22.9	178.8	53.0	208.9	21.8	169.8	50.3	198.3
Tunisia	80.5	829.6	186.2	935.3	77.4	797.0	178.9	898.5
United Arab Emirates	233.5	938.9	539.9	1,245.4	204.0	820.5	471.8	1,088.2
Yemen	20.9	121.5	48.4	149.0	19.7	114.4	45.6	140.2

	For those 50+			For those 60+				
The Arab World	2,699.4	19,161.8	6,241.8	22,704.5	2,502.1	17,965.9	5,785.9	21,249.9

Legend: The table shows the indirect costs in USD for the best and worst-case scenarios of caregiver time spent each day. The table also shows the total cost of dementia for each country, i.e. the sum of the direct and indirect costs of the two scenarios.

For the percent that the total cost makes from the GDP for those above 50, the results for the worst-case scenario show that this percent was greater or equal to 2.0% for Tunisia and Sudan, while this was less than 0.5% for the United Arab Emirates (UAE) and Qatar.

Figure 2 shows the percentage that total costs represent from the total GDP of each country studied. The most recent World Bank data was used as a source of information about each country's total GDP [17].

## Discussion

This study found an economic burden of dementia for those 50 years and above amounting to a total of 19.161 billion USD in the best-case scenario and 22.704 billion USD in the worst-case scenario for the year 2020. It is important to note that these costs are estimates rather than precise calculations. Using a comparable methodology [7, 9–11], the cost estimates for the year 2009 in the Arab region were 4.212 billion USD for the best-case scenario and 6.707 billion USD for the worst-case scenario [8]. This significant increase in the economic burden of dementia is due to several reasons. Demographic changes have occurred where, for example, the total population above the age of 60 in 2020 was about 2.5 times the population above 60 in 2009 (due to ageing and increases in total population). The correlation between GDP per capita and direct cost also changed from 43.6–86.0% [11]. Lastly, we also found an increase in the average GDP per capita estimate for the region when calculated so that the average is weighted according to the population of each country.

Even though the World Alzheimer Report 2015 had estimated the cost of dementia at 16.7 billion USD for the Middle East and North Africa, a different methodology was applied [6]. This cost had also included Turkey and Iran, where both of these countries had populations estimated at around 78.5 million each [6]. Also, the report had not provided country-specific estimates. This is important due to variations in country income groups across the region. Countries from the Gulf are considered high-income countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates) while the other Arab countries belong to either the middle-income or low-income groups [18].

For 2020, the international cost of dementia had been estimated at 1.71 trillion USD [19]. Thus, the costs in the Arab region (for those 50 and above) are around 1.1% (in the best-case scenario) to 1.3% (in the worst-case scenario) of that, and this is reflective of individuals with dementia in the region also constituting about 3–4% of all those with dementia internationally [1]. Yet, compared to other types of health conditions, the economic burden of dementia is significant. We extrapolated data to compare the direct cost of dementia to the direct cost of diabetes in the region [20]. Our findings showed that the direct cost of dementia in the Arab region is estimated at around 0.8–0.9 times the direct cost of diabetes.

One of the limitations of this study was considering global data about prevalence rate to be the same across all of the Arab countries. We had found four studies from the Arab world estimating the prevalence of dementia from community samples (in Egypt, Iraq and Lebanon) where data had been collected after 2010. In Egypt, a study from one city found 4% among those above 60, while another from a governorate found 5% for the same age group [21, 22]. In Iraq, a study from Baghdad estimated the prevalence rate in the community at 5% above the age of 60 [23]. In Lebanon, a population-based study from two governorates had a prevalence rate of 7.5% for the age group above 65 years [24]. Hence, there is a scarcity of research about this estimate from the Arab region and the results of the community studies often do not account for those in nursing homes yet were mostly within the range of global estimates. The scarcity of research about dementia has been indicated in a study where El-Masri and colleagues collected data from PubMed about the number of studies related to neurodegenerative diseases between 2005 and 2019. The results showed that Arab countries had contributed to only about 0.8% of all publications worldwide related to neurodegenerative disorders (1,311 studies from a total of 169,330) [25]. Research centers in the Arab world have recently started increasing their research productivity on dementia [25]. Some of the challenges that the Arab region has encountered include less funding compared to other types of diseases (such as cancer, cardiovascular diseases and diabetes) and scarcity of specialized institutions [8]. Other challenges relate to the healthcare research infrastructure in the Arab region overall, economic or political instability in some of the countries, potential bureaucratic or regulatory hurdles, and a lack of standardizing neuro-psychometric research instruments in the region [8, 26].

Our research also has similar limitations implied in previous international studies that have followed this methodology [7, 9, 10]. First, the association between GDP per capita and healthcare expenditure is assumed to also apply to expenditure for the condition of dementia in specific. Second, this correlation is mostly based on studies from developed countries. It is hypothesized that the percentage of GDP per capita expenditure for the condition increases with an increase in a country's income. However, this is not applied here. Also, even though this is an economic evaluation, there is no indication about the quality of care provided and the indirect costs resulting from pre-mature retirement or mortality. The estimated number of hours that caregivers have spent in care is also mostly from Western studies, even though there is evidence that some Asian cultures (India, Korea) have similar estimates. Lastly, the hourly wage of a retired individual was considered to be equivalent to that of a working-age individual. Although this is also considered in similar types of research, this could have created a minor overestimate of indirect costs.

We found that indirect costs account for almost 20% of the total economic burden. In the Arab world, due to societal norms, the family members are mostly responsible for caring for patients with dementia. Placing a person with dementia in a care home is still considered taboo, and in some cases, the stigma exists even if the patient requires complete nursing care [27]. Some countries in the region with a high burden have introduced homecare where the caregiver is supported with specialized social service and healthcare teams to provide better quality care for patients [8].

## Conclusions

Despite these limitations, the results of this study are important for the allocation of resources and the financing of care for both patients and their caregivers. The findings show that with the demographic changes occurring in the Arab world, dementia will represent a greater challenge, and the burden of the condition is

predicted to increase. Studies investigating the efficient use of resources and the cost-effectiveness of interventions in the region are highly recommended. Primary prevention can create cost savings, thus the significance of investing in early interventions and improving the availability and quality of care. Early diagnosis of the condition is important. Cardio-vascular disease risk factors (smoking, physical inactivity, hypertension, and diabetes) are also risk factors for dementia [1, 28]. Hence, efforts to integrate this condition within primary care are also recommended to ensure early monitoring and treatment.

## **Abbreviations**

UAE-United Arab Emirates

GDP-Gross Domestic Product

PPP-Purchasing Power Parity

USD-United States Dollars

OECD-Organisation for Economic Co-operation and Development

LDCs-Less Developed Countries

ILO-International Labour Organization

IMF-International Monetary Fund

CIA-Central Intelligence Agency

## **Declarations**

### **Ethics approval and consent to participate**

Not applicable

### **Consent for Publication**

Not applicable

### **Availability of data and materials**

The datasets used and analyzed during the current study are available on reasonable request.

### **Competing interests**

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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## Authors' Contributions

Tareq Qassem: Conceptualization, Methodology, Writing-Original draft preparation, Supervision. Lynn Itani: Data curation, Writing- Original draft preparation, Supervision, Conceptualization. Hamed Al-Sinawi: Conceptualization, Data curation, Writing-Original draft preparation. Dania Al-Ayyat: Methodology, Data analysis. Syed Fahad Javaid: Data analysis, Writing- Reviewing and Editing.

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## References

1. Prince M, Bryce R, Albanese E, Wimo A, Ribeiro W, Ferri CP. The global prevalence of dementia: a systematic review and metaanalysis. *Alzheimer's Dement.* 2013 Jan;9(1):63–75.e2.
2. Cerejeira J, Lagarto L, Mukaetova-Ladinska EB. Behavioral and Psychological Symptoms of Dementia. *Front Neur.* 2012;3. Available from: <http://journal.frontiersin.org/article/10.3389/fneur.2012.00073/abstract>. Accessed 15 May 2022.
3. Lobo A, Launer LJ, Fratiglioni L, Andersen K, Di Carlo A, Breteler MM, et al. Prevalence of dementia and major subtypes in Europe: A collaborative study of population-based cohorts. *Neurologic Diseases in the Elderly Research Group. Neurology.* 2000;54(11 Suppl 5):S4-9.
4. Qiu C, Kivipelto M, von Strauss E. Epidemiology of Alzheimer's disease: occurrence, determinants, and strategies toward intervention. *Dialogues Clin Neurosci.* 2009;11(2):111–28.
5. Gauthier S, Rosa-Neto P, Morais J, Webster C. *World Alzheimer Report 2021: Journey through the diagnosis of dementia.* London, England: Alzheimer's Disease International; 2021 Sep. p. 314. Available from: <https://www.alzint.org/resource/world-alzheimer-report-2021/>. Accessed 12 May 2022.
6. Wimo A, Ali GC, Guerchet M, Prince M, Prina M, Wu Y. *World Alzheimer Report 2015: The global impact of dementia: An analysis of prevalence, incidence, cost and trends.* London, England. Alzheimer's Disease International; 2015 Oct. p. 87. Available from: <https://www.alzint.org/u/WorldAlzheimerReport2015.pdf>. Accessed 12 May 2022.
7. Wimo A, Winblad B, Jönsson L. The worldwide societal costs of dementia: Estimates for 2009. *Alzheimer's & Dementia.* 2010 Mar;6(2):98–103
8. Al Sinawi H, Qassem T, Al Harrasi A Al. Dementia in the Arab World. *Middle East Journal of Age and Ageing.* 2018 Jul;15(2):25–25.
9. Wimo A, Jonsson L, Winblad B. An Estimate of the Worldwide Prevalence and Direct Costs of Dementia in 2003. *Dement Geriatr Cogn Disord.* 2006;21(3):175–81.
10. Wimo A, Winblad B, Jönsson L. An estimate of the total worldwide societal costs of dementia in 2005. *Alzheimer's & Dementia.* 2007 Apr;3(2):81–91.
11. Wimo A, Guerchet M, Ali G, Wu Y, Prina AM, Winblad B, et al. The worldwide costs of dementia 2015 and comparisons with 2010. *Alzheimer's & Dementia.* 2017 Jan;13(1):1–7.

12. UNdata | record view | Population by age, sex and urban/rural residence. Available from: <http://data.un.org/Data.aspx?d=POP&f=tableCode%3a22>. Accessed 13 May 2022.
13. Cao Q, Tan CC, Xu W, Hu H, Cao XP, Dong Q, et al. The Prevalence of Dementia: A Systematic Review and Meta-Analysis. Zhu LQ, editor. JAD. 2020 Feb 4;73(3):1157–66.
14. World Bank. GDP per capita, PPP. World Bank Open Data. 2020. Available from: <https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD>. Accessed 15 May 2022.
15. Central Intelligence Agency. Country Comparisons - Real GDP (purchasing power parity). The World Factbook. Central Intelligence Agency; 2020. Available from: <https://www.cia.gov/the-world-factbook/field/real-gdp-purchasing-power-parity/country-comparison>. Accessed 15 May 2022.
16. International Monetary Fund. World Economic Outlook. 2021. <https://www.imf.org/en/Publications/WEO/weo-database/2021/April/select-country-group>. Accessed 12 May 2022.
17. World Bank. GDP. World Bank Open Data. 2020. <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD>. Accessed 12 May 2022.
18. World Bank. Country and Lending Groups. 2021. <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>. Accessed 12 May 2022.
19. Xu J, Zhang Y, Qiu C, Cheng F. Global and regional economic costs of dementia: a systematic review. The Lancet. 2017;390 S1:S47.
20. International Diabetes Federation. IDF Diabetes Atlas. 2019. <https://diabetesatlas.org/atlas/ninth-edition/>. Accessed 12 May 2022
21. El-Tallawy HN, Farghly WM, Badry R, Rageh TA, Shehata GA, Hakeem M NA, et al. Prevalence of dementia in Al-Quseir city, Red Sea Governorate, Egypt [published correction appears in Clin Interv Aging. 2014;9:129]. Clinical Interventions in Aging. 2014 Dec;9:9–14.
22. Khedr E, Fawi G, Abbas MAA, Mohammed TA, El-Fetoh NA, Al Attar G, et al. Prevalence of mild cognitive impairment and dementia among the elderly population of Qena Governorate, Upper Egypt: a community-based study. Journal of Alzheimer's disease. 2015;45(1):117–26.
23. Ibrahim AA, Al-Lami F, Al-Rudainy R, Khader YS. Mental Disorders Among Elderly People in Baghdad, Iraq, 2017. Inquiry. 2019 May;56:0046958019845960–0046958019845960.
24. Phung KTT, Chaaya M, Prince M, Atweh S, El Asmar K, Karam G, et al. Dementia prevalence, care arrangement, and access to care in Lebanon: A pilot study. Alzheimer's & dementia. 2017 Dec;13(12):1317–26.
25. El-Masri J, Dankar R, El Masri D, Chanbour H, El Hage S, Salameh P. The Arab Countries' Contribution to the Research of Neurodegenerative Disorders. Cureus. 2021 Aug;13(8):e17589–e17589.
26. Javaid SF, Al-Zahmi A, Abbas M. Carer Empowerment Is Key to Reduce Dementia Care Inequalities in the Middle East. International journal of environmental research and public health. 2021 Apr;18(8):4378–4378.
27. Feinberg L, Reinhard SC, Houser A, Choula R. Valuing the Invaluable: 2011 Update - The Growing Contributions and Costs of Family Caregiving. Washington, DC: AARP Public Policy Institute; 2011.

28. El-Metwally A, Toivola P, Al-Rashidi M, Nooruddin S, Jawed M, Alkanhal R, et al. Epidemiology of Alzheimer's Disease and Dementia in Arab Countries: A Systematic Review. Behavioural neurology. 2019;2019:3935943–3935943.
29. International Labour Organization. Mean nominal monthly earnings of employees by sex and occupation. 2021. [https://ilostat.ilo.org/data/https://www.ilo.org/shinyapps/bulkexplorer50/?lang=en&segment=indicator&id=EAR\\_4MTH\\_SEX\\_OCU\\_CUR\\_NB\\_A](https://ilostat.ilo.org/data/https://www.ilo.org/shinyapps/bulkexplorer50/?lang=en&segment=indicator&id=EAR_4MTH_SEX_OCU_CUR_NB_A). Accessed 12 May 2022.
30. Organisation for Economic Co-operation and Development. Average annual wages. OECD.Stat. 2022. [https://stats.oecd.org/Index.aspx?DataSetCode=AV\\_AN\\_WAGE](https://stats.oecd.org/Index.aspx?DataSetCode=AV_AN_WAGE). Accessed 12 May 2022.

## Figures

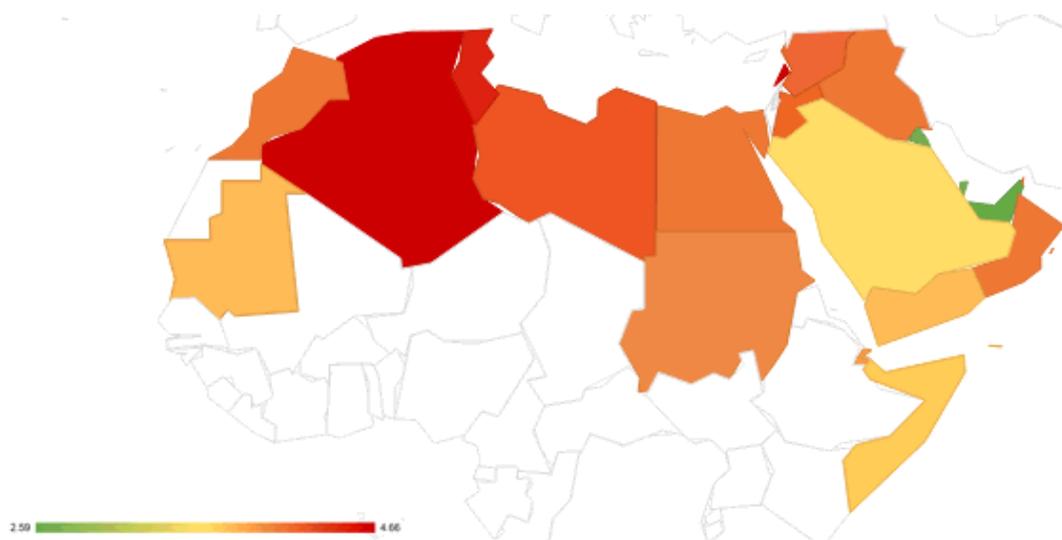
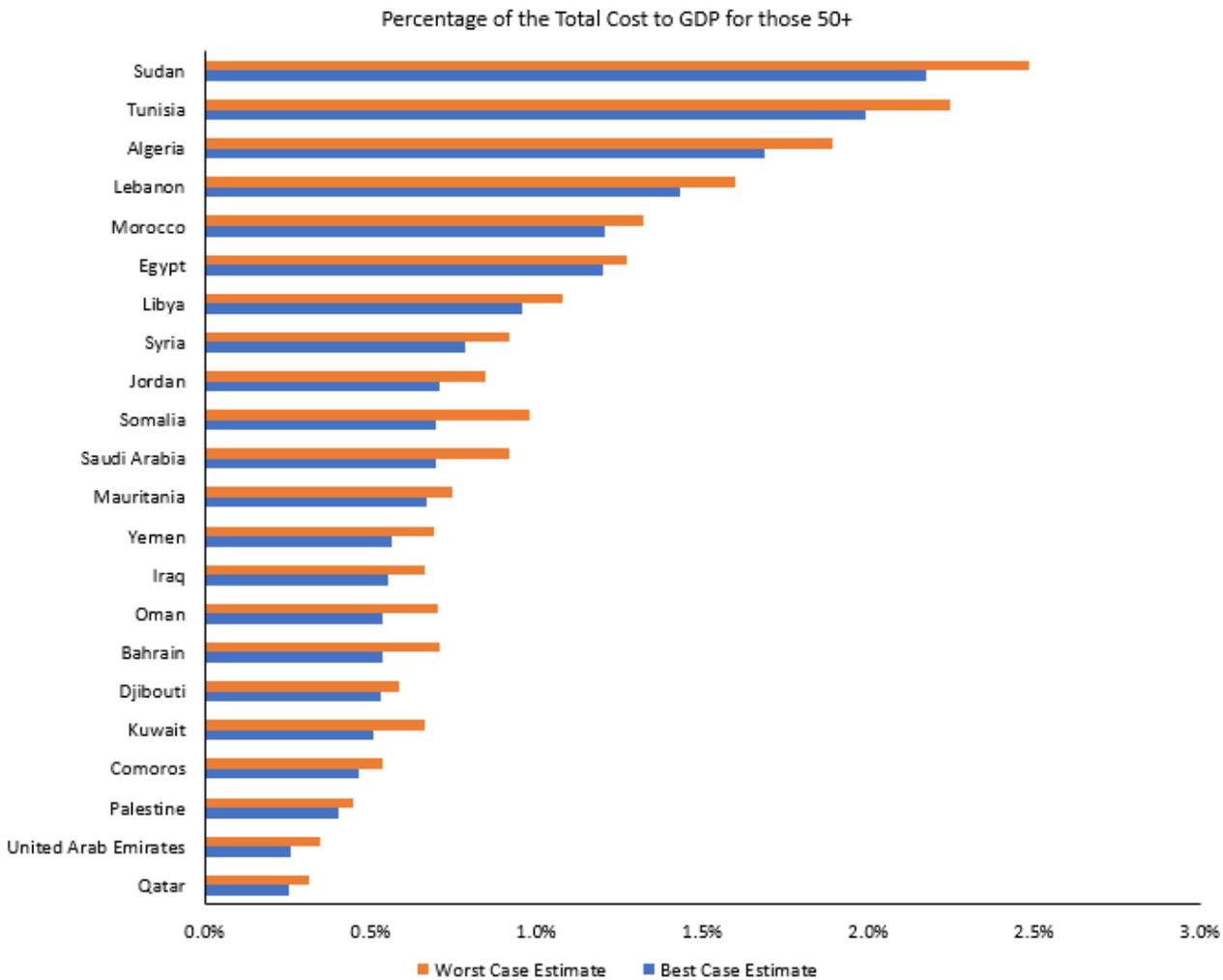


Figure 1

Prevalence of dementia in the Arab world.



**Figure 2**

The total cost of dementia for the population over the age of 50 years.

## Supplementary Files

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