



The Burden of Disease for Cardiovascular and Psychiatric Disorders in the Population Covered by an Insurance Fund of the Islamic Republic of Iran

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Abstract

Background: In the twentieth century, more than at any time before, we need accurate information about deaths, injuries, and illnesses to create policies and make the right decisions.

Objectives: The purpose of this study was to estimate the burden of disease for cardiovascular and mental disorders in the population covered by an insurance fund in the Islamic Republic of Iran.

Methods: This cross-sectional study was conducted using mortality and morbidity data recorded by an insurance fund. Using statistical models and standards recommended by the World Health Organization, the number of years lost due to premature death (YLL), the number of years of life lived with disability (YLD), and, finally, the number of disability-adjusted life years (DALY) for the two major diseases in the country (cardiovascular diseases and mental disorders) were calculated over 6 years (from 2012 to 2017). In addition, the direct costs incurred to the organizational health system from these two diseases were reported.

Results: Overall, during the 6-year study period, 6775 years of life were lost due to cardiovascular diseases in both genders. This index was 3953 years in women and 2823 years in men. Additionally, 1368 years were lost due to mental disorders. This index was 571 years for women and 798 years for men. Moreover, the direct total cost over these 6 years was more than 28.1 billion Rials for cardiovascular diseases and 14 billion Rials for psychiatric disorders. In both cases, the trend of costs was increasing, but the slope was higher for cardiovascular diseases.

Conclusions: The trend of changes in the DALY index for cardiovascular diseases was increasing, but it was decreasing for psychiatric disorders. The design of health interventions, especially through preventive aspects focusing on the major risk factors for cardiovascular diseases, should be considered in policymakers' agendas.

Keywords: Burden of Disease, Cardiovascular Disease, Mental Disorders

1. Background

Since the global epidemiological transition from communicable diseases, which mostly had high mortality rates, to non-communicable diseases, which still have relatively high mortality rates but also impose high morbidity rates, the old epidemiological indices were not sufficient. This resulted in the announcement of a new index, namely, the burden of disease in 1990. In this index, health losses are calculated in disability-adjusted life years (DALY), a concise measure of

population health that aggregates information about premature mortality, expressed as years of life lost (YLL), with data about non-fatal health losses attributable to time lived in states worse than complete health, expressed as years lived with disability (YLD) (1).

This index was used to calculate the projections of mortality and burden of disease by cause forward to 2000, 2010, and 2020 under three different scenarios (2). These estimations have been extensively used and continue to be quoted by World Health Organization

(WHO) programs to provide a viewpoint on probable trends in global health (3). It has been reported that in all scenarios, there is a dramatic shift from communicable, maternal, perinatal, and nutritional causes to non-communicable disease causes, and from younger ages to older ones (2). Besides, it is estimated that the proportion of deaths due to non-communicable diseases will rise from 59 percent in 2002 to 69 percent in 2030 (2). On the other hand, the three leading causes of the burden of disease in 2030 are projected to include HIV/AIDS, unipolar depressive disorders, and ischemic heart disease (2).

Non-communicable diseases (NCDs) annually kill over 35 million people worldwide. They are responsible for nearly two-thirds of the world's deaths. Moreover, for the first time in human history, more than 80% of NCD-related deaths are in low- and middle-income countries (4).

Cardiovascular diseases are the main cause of mortality around the world. More than 75% of cardiovascular deaths occur in low- and middle-income countries. Considering that the prevalence is much higher in the 35 - 64 age group (i.e., the productive individuals), the costs will dramatically increase (5). In 2015, more than 46% of deaths were caused by cardiovascular diseases in Iran (6). With the increasing prevalence of risk factors for cardiovascular diseases, more emphasis should be placed on health policy, priority setting, and preventing cardiovascular disease deaths (5, 7, 8).

Recent reports show that, based on DALYs per 100,000 population, the rank of cardiovascular diseases in Iran has risen from 4th in 1990 to 1st in 2017, and the rank of mental disorders has risen from 7th in 1990 to 2nd in 2017 (9).

World Health Organization encourages countries continually to calculate the burden of diseases at the national level as the best guideline for taking policy in the health system. However, very few reports are now available for estimating the national burden of diseases in Iran (10-13). Besides, some other aspects have been well highlighted, such as the Adjustment of baccalaureate nursing curriculum with the burden of diseases in Iran (14), the effectiveness of adolescents' immunization against hepatitis B on the burden of the disease in Iran (15), and even in the scientometrics domain, such as the relation between Iranian Medical Science Research in the Scopus Database and the burden of disease in Iran (16) and comparisons with other countries (17). We did not find any study that focused on a specific population covered by a special institution. It seems that the importance of evaluating the burden of

disease for health decision-makers in these institutions is neglected.

2. Objectives

To provide accurate information, this study aimed to estimate the burden of disease for cardiovascular and psychiatric disorders covered by an insurance fund.

3. Methods

This cross-sectional study was performed at Aja University of Medical Sciences in 2018 - 2019. The information for calculating YLL, YLD, and DALY was obtained from an insurance fund of the Islamic Republic of Iran. All the populations (i.e., census method) covered by this organization were included during 2012 - 2017, comprising 605,302 individuals across the country. The inclusion criteria were individuals who were under the coverage of that insurance fund during the study period and were hospitalized due to cardiovascular diseases or mental disorders.

Two diseases were investigated due to their highest disease burden in national and global estimates: (1) Cardiovascular diseases; and (2) mental disorders. These were extracted based on the international classification of diseases, 10th revision (ICD-10th revision).

To compute years lived with disability for a particular health outcome in a given population, the number of people living with that outcome is multiplied by a disability weight that represents the magnitude of health loss associated with the outcome. Disability weights are measured on a scale from 0 to 1, with 0 implying a state that is equivalent to full health and 1 a state equivalent to death. In this study, based on previous reports, the disability weight was considered as 0.323 and 0.600 for cardiovascular diseases and mental disorders, respectively.

We used the standardized template of WHO in Excel Software (version 2017) for calculations, which considers a standard discount rate of 0.03 and standard age weights of 0.04 (13, 18-20). It is highly recommended not to change these standards so that the results can be compared among various countries (21). The findings were represented as YLD, YLL, and DALY separately for cardiovascular diseases and mental disorders. These indices were also stratified and reported based on each study year (i.e., 2012 to 2017), age groups (i.e., 0 - 4, 5 - 14, 15 - 29, 30 - 44, 45 - 59, 60 - 69, 70 & higher), and gender (i.e., male, female). Additionally, the direct costs of these two diseases were obtained and reported.

4. Results

Overall, 605,302 individuals were covered by this specific insurance fund of the Islamic Republic of Iran. A total of 6,775 DALYs (3,953 in females and 2,823 in males) were lost due to cardiovascular diseases, which consisted of 5,691 YLLs (84%) and 1,084 YLDs (16%). On the other hand, 1,368 DALYs (571 years in females and 798 in males) were lost due to mental disorders, which consisted of 1,208 YLLs (88%) and 161 YLDs (12%).

As [Table 1](#) shows, the highest YLLs were observed in the 60 - 69 age group for cardiovascular diseases and the 5 - 14 age group for mental disorders. As [Table 2](#) shows, the highest YLDs were observed in the 60 - 69 age group for cardiovascular diseases and the > 70 age group for mental disorders. Finally, the highest YLDs were observed in the 60-69 age group for cardiovascular diseases and the 5 - 14 age group for mental disorders ([Table 3](#)).

The trend of the three indices based on gender is demonstrated in [Figures 1](#) and [2](#). The trends of YLL and YLD are both increasing for cardiovascular diseases, while YLL is decreasing for mental disorders and YLD shows an increasing-decreasing pattern. Overall, DALY exhibits a slightly increasing slope for cardiovascular diseases and a slightly decreasing slope for mental disorders.

The direct cost of cardiovascular diseases and mental disorders was also calculated. As [Table 4](#) shows, more than 28.1 billion Rials were spent on cardiovascular diseases and 14 billion Rials on mental disorders. The trend in costs was increasing for both diseases.

5. Discussion

This study showed that in the two studied diseases, YLL was much higher than YLD (i.e., 7 times higher in cardiovascular diseases and 10 times higher in mental disorders). Over the 6-year study period, more than 6,775 years were lost due to cardiovascular diseases (3,953 in females and 2,823 in males). Additionally, 1,368 years were lost due to mental disorders (571 years in females and 798 in males). The trend of DALY was increasing in cardiovascular diseases but decreasing in mental disorders. These two diseases imposed more than 42 billion Rials of direct costs on the organizational health system.

As previously stated, there are very few studies about the burden of diseases in Iran. The first national study in Iran on the burden of disease was published in 2008. This study reported that 62% of DALYs were due to YLLs and 38% were due to YLDs ([10](#)). However, in our study, more than 84% and 88% of DALYs were due to YLLs in cardiovascular and mental disorders, respectively. [Naghavi et al. \(10\)](#) reported that in 2008, the top-ranked

burden of disease was unintentional injuries in males, with nearly 2.8 million years of DALY, while mental disorders ranked highest in females, with nearly 1.2 million years of DALY. Although the authors stated that there was considerable variation in the burden of diseases among provinces, the top three causes of DALY (unintentional injuries, mental disorders, and cardiovascular diseases) were consistent across all six studied provinces.

The estimated DALY due to all diseases and injuries in Iranian children aged 0 - 14 years was 2,981,919 years (1,330,175 years in females and 1,651,744 years in males) in 2003 ([12](#)). Of these reported values, 56% were due to premature death (YLL), 44% to disability (YLD), 37% to perinatal diseases and delivery complications, 30% to external causes (injuries), and 7% to congenital diseases. In our study, we could not focus on children due to the very low incidence of the two studied diseases in this age group. However, similar to the previous report by [Motlagh et al. \(12\)](#), even though we did not restrict the age group, YLL dominated YLD in our study and had a greater impact on DALY. This finding explains that DALY closely follows the pattern of YLL more prominently than YLD.

As mentioned before, there is a very scarce body of evidence investigating the burden of disease in Iran. One such study is a report by [Abolhasani et al.](#), who estimated the DALY of osteoporosis to be 36,026 years in 2002 in Iran ([11](#)). To the best of our knowledge, this is the first study to evaluate the burden of two major diseases in a specific population covered by an insurance fund in Iran and even in the Middle East.

The burden of disease has also been utilized in educational and research contexts. In educational aspects, [Aeen et al.](#) reported that the proportion of credit hours in the nursing curriculum assigned to psychiatric, cardiovascular, respiratory, gastrointestinal, and sensory disorders, as well as intentional and unintentional accidents, nutritional deficiencies, and congenital anomalies, was less than the proportion of the burden of diseases as DALYs related to these diseases. Conversely, this proportion exceeded the optimum level for infectious diseases, maternal and antenatal problems, endocrine, genitourinary, and dermatologic diseases, and was at an optimum level only for musculoskeletal disorders and malignant neoplasms. The authors recommended a more precise revision of the baccalaureate nursing curriculum considering the above-mentioned diseases ([14](#)).

In research aspects, the relation between Iranian medical science research in the Scopus database and the burden of disease has been studied in Iran ([16](#)). It was

Table 1. Years of Life Lost Due to Premature Death Due to Cardiovascular Diseases and Mental Disorders Based on Different Age Groups

Age Groups	Cardiovascular Diseases						Mental Disorders					
	2012	2013	2014	2015	2016	2017	2012	2013	2014	2015	2016	2017
0 - 4	-	-	-	60.200	90.535	-	-	-	-	-	-	-
5 - 14	-	-	-	-	-	59.763	117.152	263.234	117.837	29.614	57.859	-
15 - 29	-	-	-	-	-	-	85.839	28.613	-	84.725	85.019	56.406
30 - 44	49.853	49.853	49.853	117.923	522.110	99.705	-	-	-	-	-	-
45 - 59	133.146	92.301	57.343	55.381	133.146	129.802	-	-	-	-	-	-
60 - 69	376.680	525.197	415.697	401.187	504.693	609.919	-	-	-	-	12.331	12.331
70 and higher	339.304	153.874	63.359	175.028	298.855	126.947	87.917	56.877	58.155	15.520	31.040	7.760

Table 2. Years of Life Lost Due to Disability Because of Cardiovascular Diseases and Mental Disorders Based on Different Age Groups

Age Groups	Cardiovascular Diseases						Mental Disorders					
	2012	2013	2014	2015	2016	2017	2012	2013	2014	2015	2016	2017
0 - 4	-	-	-	-	-	-	-	-	-	-	-	-
5 - 14	-	-	-	-	-	-	-	-	-	-	-	-
15 - 29	-	-	-	-	0.001	-	0.006	0.010	0.014	0.010	0.008	0.018
30 - 44	0.019	0.008	0.003	0.002	0.017	0.023	0.006	0.006	0.012	0.006	0.008	0.004
45 - 59	0.001	0.001	0.007	0.006	0.013	0.003	0.006	0.002	-	-	-	0.004
60 - 69	80.925	103.249	122.783	97.668	122.783	133.945	-	5.184	31.102	5.184	-	10.367
70 and higher	43.492	55.489	64.488	121.477	67.487	70.486	8.358	25.073	11.143	22.287	22.287	19.501

Table 3. Disability-Adjusted Life Years Because of Cardiovascular Diseases and Mental Disorders Based on Different Age Groups

Age Groups	Cardiovascular Diseases						Mental Disorders					
	2012	2013	2014	2015	2016	2017	2012	2013	2014	2015	2016	2017
0 - 4	-	-	-	60.200	90.535	-	-	-	-	-	-	-
5 - 14	-	-	-	-	-	59.763	117.152	263.234	117.837	29.614	57.859	-
15 - 29	-	-	-	-	0.001	-	85.845	28.623	0.014	84.736	85.027	56.424
30 - 44	49.871	49.860	49.856	117.925	522.127	99.728	0.006	0.006	0.012	0.006	0.008	0.004
45 - 59	133.147	92.303	57.349	55.386	133.159	129.806	0.006	0.002	-	-	-	0.004
60 - 69	457.605	28.446	538.480	498.855	627.476	743.865	-	5.184	31.102	5.184	12.331	22.698
70 and higher	382.795	209.364	127.846	96.504	366.342	197.433	96.275	81.949	69.298	37.807	53.327	27.261

shown that among 2,824 articles published in Scopus-indexed journals from 2010 - 2014, depression disorders and addiction had the highest (1,530 records) and lowest (62 records) numbers of publications, respectively. Additionally, major depressive disorders were found to have the greatest h-index, while the highest percentage of scientific productions with at least one citation was associated with addiction. Interestingly, a positive direct correlation was found between YLL ($r = 0.8$, $P = 0.2$), YLD ($r = 0.2$, $P = 0.8$), and mortality rate ($r = 0.9$, $P = 0.205$) with scientific productions. This could be promising in national aspects; however, the validity of institutional judgments about these results cannot be guaranteed.

We believe the scientific production of each institution or even province should be aligned with the health issues (measurable by the burden of disease) in that location. Researchers should be guided and empowered to follow institutional research priorities. A more recent study on publication outputs showed that Iran's rank has improved from 16th (in 1996) to 11th (in 2017) in cardiology and from 15th (in 1996) to 12th (in 2017) in psychiatry (17).

Similar to our study, a trend analysis showed a decreasing level of psychiatric hospitalization during 2010 - 2016 in the northeast of Iran (22). It is suggested that focusing on mood disorders (as the most common

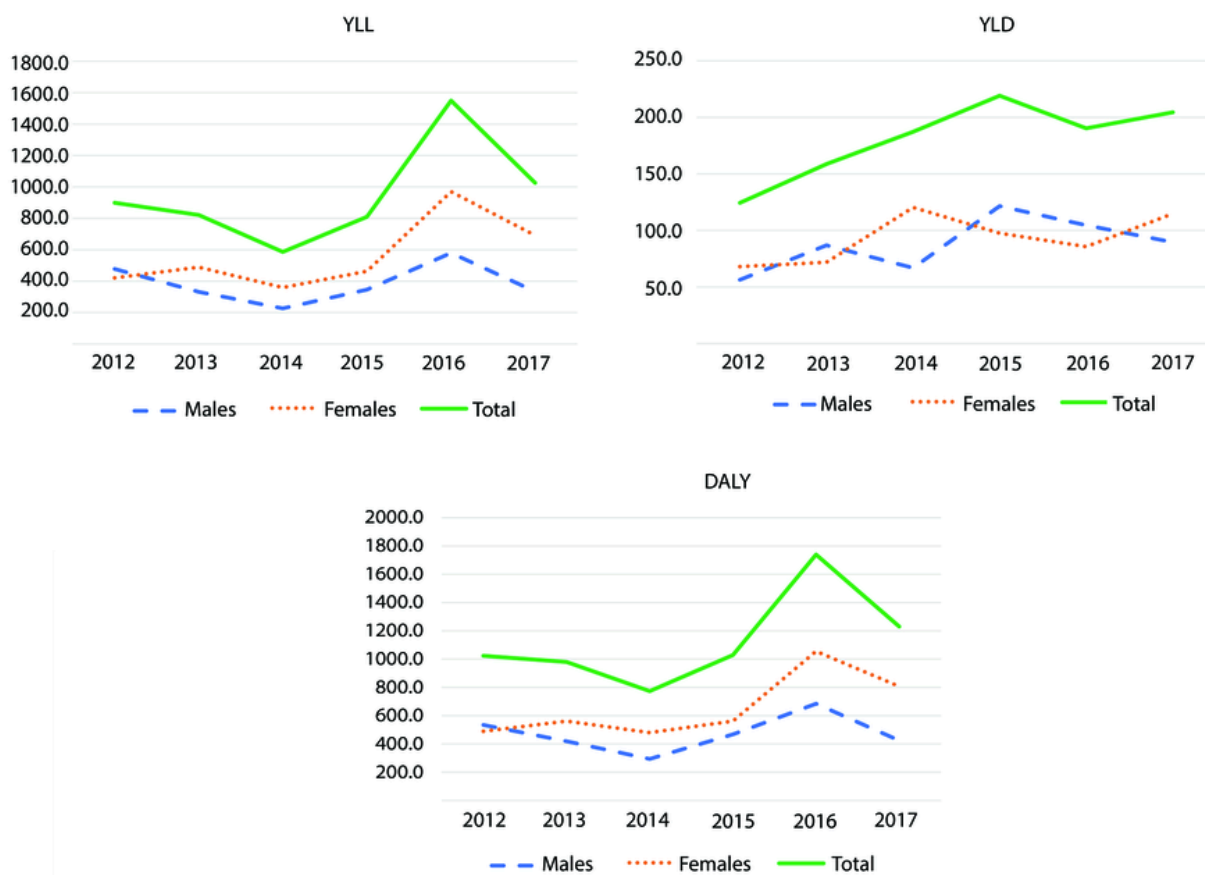


Figure 1. Years of life lost due to premature death (YLL), years of life lived with disability (YLD), and disability-adjusted life years (DALY) due to cardiovascular diseases in the study population based on genders (2012 - 2017)

cause of admission) and designing targeted interventions for high-risk groups (e.g., married unemployed men) can increase the effectiveness of interventions (22), especially for patients with suicide ideation, which has been found to be a more important predictor of suicide attempts compared to suicide planning (23). In this context, one of the main contributing factors is coping style. A considerable body of evidence shows that suicide attempters (24) and self-immolation patients (25) mostly use emotive coping strategies, while patients with intentional poisoning predominantly use avoidance and dreamlike coping mechanisms (26). This highlights the importance of targeted interventions to educate individuals on proper coping styles, particularly in high-risk groups.

In monetary aspects, Raghfar et al. evaluated the economic costs of coronary heart disease in Iran in 2014.

They found that coronary heart diseases imposed an economic burden of 4,715 to 4,908 billion dollars (210,037,860,000,000 - 201,778,425,000,000 Rials). Additionally, the medical costs and the costs of lost productivity due to premature death were calculated as 3.572 billion USD (152,863,740,000,000 Rials) and 933 million USD (39,927,735,000,000 Rials), respectively. The major part of medical costs was related to angioplasty costs (47%) (27).

In our study, we only calculated the “direct cost” of cardiovascular diseases, which amounted to more than 28 billion Rials. It should be noted that we focused solely on individuals covered by this insurance fund, which explains the vast differences in costs. However, it was revealed that the direct cost due to cardiovascular diseases is more than twice that of mental disorders.

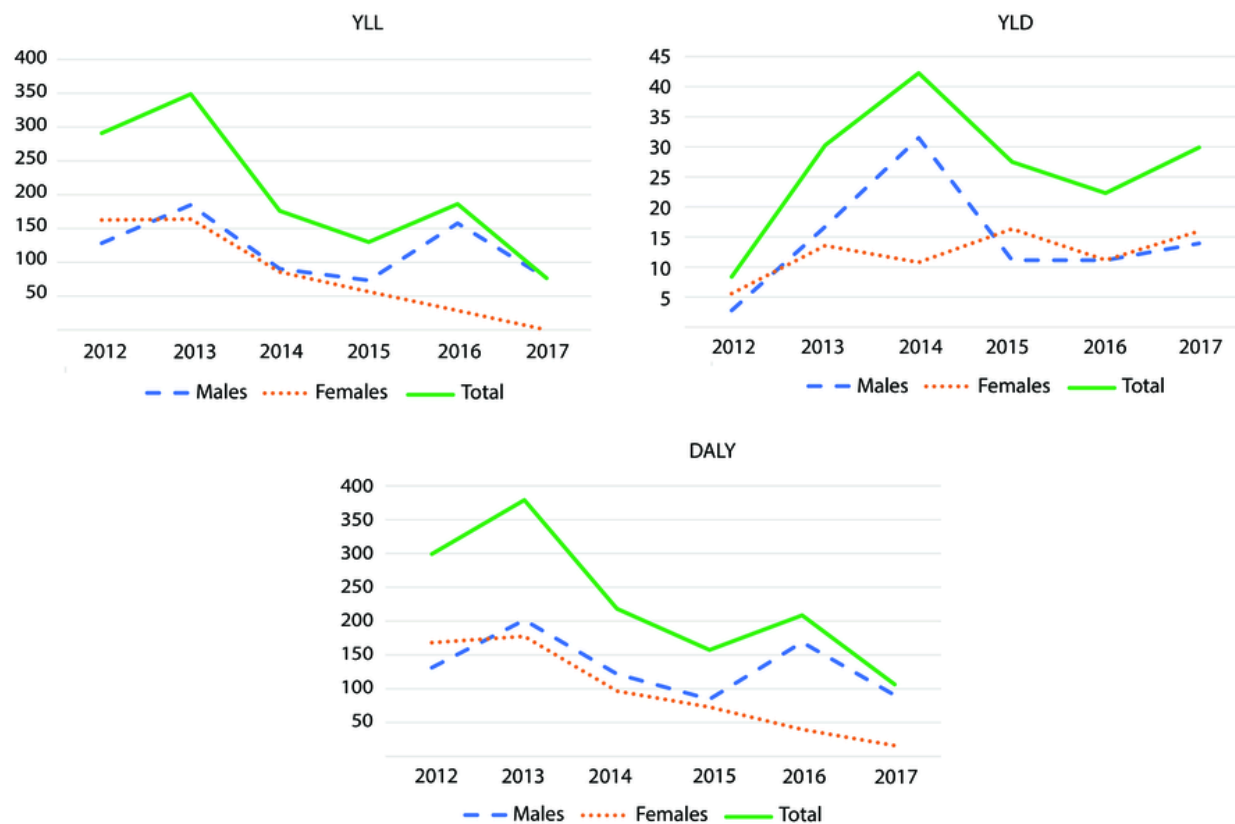


Figure 2. Years of life lost due to premature death (YLL), years of life lived with disability (YLD), and disability-adjusted life years (DALY) due to mental disorders in the study population based on genders (2012 - 2017)

Table 4. Direct Cost (Rials) of Cardiovascular Diseases and Mental Disorders

Year	Mental Disorders	Cardiovascular Diseases
2012	824,766,644	2,149,017,553
2013	778,780,449	2,272,305,371
2014	1,710,554,050	2,548,691,990
2015	2,657,387,977	5,358,952,915
2016	3,354,103,836	7,962,309,165
2017	4,696,239,336	7,821,240,306
Total	14,021,832,292	28,112,517,300

The overall estimation is that the more advanced a country is with a higher income, the more non-communicable diseases constitute a major part of the causes of mortality and morbidity (28). For instance, by 2030, diabetes is projected to be the fourth leading cause of death in developed countries, the sixth in middle-income countries, and the ninth in developing

countries. Although diabetes ranks as the fifth leading cause of DALY in developed countries, it holds the tenth rank in middle-income countries and is not among the top ten causes in developing countries. However, the economic conditions of countries within each group can influence this concept.

There is a broad consensus that burden of disease indices are among the most solid and reliable pieces of evidence for health policymakers, health program management, health system research, and resource allocation (29-31).

5.1. Limitations

This study was not without limitations. The information required to conduct this study was extracted from data provided by a specific insurance fund. As a result, the analysis was based solely on data from hospitalized patients. Considering the necessity of hospitalization for the treatment of cardiovascular diseases and mental disorders, a reasonable estimate of the incidence of these diseases in the population under study can help ensure access to hospital services for all patients. Furthermore, all hospitals serving the specific population under the insurance fund were included in the study. The limitations of this study largely stem from the constraints of the data sources. Despite these limitations, the effort to estimate the burden of disease is justifiable, as even a less-than-perfect image is better than having no image at all. Relying on existing available data sources allows for an approximation of the burden of disease and highlights deficiencies and resource constraints. It is worth noting that, based on online searches, no similar study was found either in our country or our region that evaluates cardiovascular disease and mental disorders in such a specific population. This underscores the importance of this effort in filling a critical gap in the evidence base.

We suggest that preventive measures be implemented within this organization to address and mitigate major risk factors, at least for the two studied diseases. Additionally, we recommend that further studies evaluate other prevalent disorders within their population to provide a more comprehensive understanding of the disease burden.

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Footnotes

Authors' Contribution: Study concept and design: M. K. R., N. M. M., and S. Z.; Acquisition of data: M. K. R. and S. Z.; Analysis and interpretation of data: M. K. R., N. M. M., and S. Z.; Drafting of the manuscript: M. K. R.; Critical

revision of the manuscript for important intellectual content: M. K. R., N. M. M., and S. Z.; Statistical analysis: M. K. R.; Administrative, technical, and material support: N. M. M. and S. Z.; Study supervision: N. M. M. and S. Z.

Conflict of Interests Statement: The authors declared that they have no conflict of interest.

Data Availability: The dataset presented in the study is available on request from the corresponding author during submission or after its publication. The data are not publicly available due to privacy policy.

Ethical Approval: This project was approved by AJA University of Medical Sciences (ID: 91000254). This study is approved under the ethical approval code of [IR.AJAUMS.REC.1398.219](https://doi.org/10.1371/journal.pmed.0030442).

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References

- World Health Organization. *Health statistics and information systems*. 2020, [cited 1 January 2020]. Available from: <https://www.who.int/health-topics/universal-health-coverage/health-statistics-and-information-systems>.
- Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. *PLoS Med*. 2006;**3**(11): e442. [PubMed ID: 17132052]. [PubMed Central ID: PMC1664601]. <https://doi.org/10.1371/journal.pmed.0030442>.
- World Health Organization. *The atlas of heart disease and stroke*/Judith Mackay and George Mensah; with Shanthi Mendis and Kurt Greenland. Geneva: World Health Organization; 2004. Available from: <https://iris.who.int/handle/10665/43007>.
- World Health Organization. *Preventing chronic diseases: a vital investment: WHO global report*. Geneva: World Health Organization; 2005. Available from: <https://iris.who.int/handle/10665/43314>.
- Engelgau M, Rosenhouse S, El-Saharty S, Mahal A. The economic effect of noncommunicable diseases on households and nations: a review of existing evidence. *J Health Commun*. 2011;**16** Suppl 2:75-81. [PubMed ID: 21916715]. <https://doi.org/10.1080/10810730.2011.601394>.
- Forouzanfar MH, Sepanlou SG, Shahrzaz S, Dicker D, Naghavi P, Pourmalek F, et al. Evaluating causes of death and morbidity in Iran, global burden of diseases, injuries, and risk factors study 2010. *Arch Iran Med*. 2014;**17**(5):304-20. [PubMed ID: 24784860].
- Mawdoodi S, Khadem-Rezaiyan M, Belyani S, Alinezhad-Namaghi M. The Cardiovascular Mortality Risk Factors in the Northeast of Iran: A Four-Year Cohort Study. *J Nutr Fast Health*. 2023;**11**(2):104-12. <https://doi.org/10.22038/jnfh.2023.69911.1426>.
- Najaf Najafi M, Abdollahi Moghaddam A, Hosseini ZS, Khadem-Rezaiyan M. Acute Coronary Syndrome in Mashhad, Northeastern of Iran: Report of a Decade. *Multidiscip Cardio Annal*. 2022;**13**(2): e115916. <https://doi.org/10.5812/mca-115916>.
- Institute for Health Metrics and Evaluation. *GBD Compare*. 2018, [cited 12 December 2019]. Available from: <https://vizhub.healthdata.org/gbd-compare/>.
- Naghavi M, Abolhassani F, Pourmalek F, Jafari N, Moradi Lakeh M, Eshrati B, et al. [The Burden of Disease and Injury in Iran in the Year

- 2003]. *Iran J Epidemiol*. 2008;**4**(1):1-19. FA.
11. Abolhasani F, Mohammadi M, Soltani A. [Burden of Osteoporosis in Iran]. *J Reprod Infertil*. 2005;**6**(1):25-36. FA.
 12. Motlagh ME, Kazemeini H, Jafari N, Delavar B, Kabir MJ, Goodarzi K. [The Burden of Diseases in Children Aged 0-14 Years in Iran]. *Intern Med Today*. 2009;**15**(3):77-84. FA. <https://doi.org/10.22038/jnfh.2021.58924.1342>.
 13. Khadem-Rezaian M, Saberi-Karimian M, Kamel Khodabandeh A, Safarian-Bana H, Farkhani EM, Gholian M, et al. Estimating the Years of Life Lost and Mortality Caused By COVID-19 in Mashhad, the Second-Largest City in Iran. *J Nutr Fast Health*. 2022;**10**(1):60-4. <https://doi.org/10.22038/jnfh.2021.58924.1342>.
 14. Aeen F, Heravi M, Ahmadi F, Tootoonchi M. [Baccalaureate Nursing Curriculum: Its Adjustment With Burden Of Diseases As "Disability Adjusted Life Years" In Iran]. *Iran J Med Educ*. 2006;**6**(2):8-16. FA.
 15. Forouzanfar H, Mohammad K, Majdzade SR, Malekzadeh R, Abolhasani F, Mohamadnejad M. [Effectiveness of adolescents' immunization against hepatitis B on burden of the disease in Iran]. *Hakim Res J*. 2006;**9**(2):1-11. FA.
 16. Foroughi Z, Siamian H. [The Relation between Iranian Medical Science Research in Scopus Database and Burden of Disease in Iran]. *J Mazandaran Univ Med Sci*. 2016;**25**(132):177-85. FA.
 17. Beglari Beglar E, Khadem-Rezaian M, Moeini Nodeh M, Jarahi L. [Comparing the Scientific Production in the Field of Biomedicine in Iran and Other Countries]. *Journal of Modern Medical Information Sciences*. 2024;**10**(2):164-83. FA. <https://doi.org/10.32598/jmis.10.2.4>.
 18. Mathers CD, Lopez AD, Salomon JA, Ezzati M. *National Burden of Disease Studies: A Practical Guide*. Geneva: World Health Organization; 2001.
 19. Murray CJ, Lopez AD; World Health Organization; World Bank; Harvard School of Public Health. *The Global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020: summary*. Geneva: World Health Organization; 1996. Available from: <https://iris.who.int/handle/10665/41864>.
 20. Stouthard MEA, Essink-Bot ML, Bonsel GJ; Dutch Disability Weights (DDW) Group. Methodology. Disability weights for diseases: a modified protocol and results for a Western European region. *Eur J Public Health*. 2000;**10**(1):24-30. <https://doi.org/10.1093/eurpub/10.1.24>.
 21. Eshrati B, HasanZadeh J, Mohammadbeigi A. [Calculation of population attributable burden of excess weight and obesity to non-contagious diseases in Markazi province of Iran]. *Koomesh*. 2010;**11**(2). e152269. FA.
 22. Khatibi Moghaddam H, Moharreri F, Rahmani Fard A, Khadem Rezaian M. Epidemiology of psychiatric disorders: The situation of Mashhad city during 2010-2016. *J Fundam Mental Health*. 2017;**19**(6):607-12. <https://doi.org/10.22038/jfmh.2017.9557>.
 23. Khajedaluae M, Khadem-Rezaian M, Jarahi L, Khatibi-Moghadam H, Faridpak A. Suicidal continuum (ideation, planning, attempting) in an Islamic country; which should be focused on? *J Inj Violence Res*. 2021;**13**(1):47-54. <https://doi.org/10.5249/jivr.v13i1.1556>.
 24. Khajedaluae M, Khatibi Moghadam H, Goldani F, Nojar A, Khadem-Rezaian M. Coping strategies in suicide attempters. *J Fundam Mental Health*. 2021;**23**(5):317-22.
 25. Ahmadzade AM, Ahmadabadi A, Tavousi SH, Khadem-Rezaian M. [Main Coping Style of Self-Immolation Patients]. *Avicenna J Clin Med*. 2024;**30**(4):225-32. FA. <https://doi.org/10.32592/ajcm.30.4.225>.
 26. Parhizgar K, Dadpour B, Khadem-Rezaian M. [Comparison of coping mechanisms in patients with intentional poisoning with the control group]. *Med J Mashhad Univ Med Sci*. 2024;**67**(1):1-15. FA. <https://doi.org/10.22038/mjms.2024.71388.4239>.
 27. Raghfar H, Sargazi N, Mehraban S, Akbarzadeh MA, Vaez Mahdavi MR, Vahdati Manesh Z. [The Economic Burden of Coronary Heart Disease in Iran: A Bottom-up Approach in 2014]. *J Ardabil Univ Med Sci*. 2018;**18**(3):341-56. FA. <https://doi.org/10.29252/jarums.18.3.341>.
 28. Mathers CD, Fat DM, Inoue M, Rao C, Lopez AD. Counting the dead and what they died from: an assessment of the global status of cause of death data. *Bull World Health Organ*. 2005;**83**(3):171-7. [PubMed ID: 15798840]. [PubMed Central ID: PMC2624200].
 29. GBD 2015 DALYs and HALE Collaborators. Global, regional, and national disability-adjusted life-years (DALYs) for 315 diseases and injuries and healthy life expectancy (HALE), 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet*. 2016;**388**(10053):1603-58. [PubMed ID: 27733283]. [PubMed Central ID: PMC5388857]. [https://doi.org/10.1016/S0140-6736\(16\)31460-X](https://doi.org/10.1016/S0140-6736(16)31460-X).
 30. GBD 2016 Causes of Death Collaborators. Global, regional, and national age-sex specific mortality for 264 causes of death, 1980-2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet*. 2017;**390**(10100):1151-210. [PubMed ID: 28919116]. [PubMed Central ID: PMC5605883]. [https://doi.org/10.1016/S0140-6736\(17\)32152-9](https://doi.org/10.1016/S0140-6736(17)32152-9).
 31. GBD 2016 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet*. 2017;**390**(10100):1211-59. [PubMed ID: 28919117]. [PubMed Central ID: PMC5605509]. [https://doi.org/10.1016/S0140-6736\(17\)32154-2](https://doi.org/10.1016/S0140-6736(17)32154-2).