

Inpatient service utilization in Iran: A longitudinal study

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Abstract

Background and aim

Health care utilization according to the real needs of the population is crucial to realization of universal health coverage. Access to health care as one of the intermediate goals of the health system has been a key consideration for policymakers. The purpose of the present research was to examine the state of inpatient service utilization in Iran.

Methods

This descriptive-analytical study uses a longitudinal design. National data obtained from the Ministry of Health and the Statistical Center of Iran for the period 2012–2017 were used to calculate hospital beds per capita and inpatient admission per capita. Data were analyzed in SPSS, and ArcGIS for Power BI was used for visualization.

Findings

The inpatient admission rate across the country increased by 32% from 2012 to 2017. Over the same period, hospital beds per capita increased by 15.7% from 1.34 to 1.55 per 1,000 people, and inpatient admission per capita increased by 23.9% from 113.6 to 140.8 per 1,000 people. There are wide variations between provinces in inpatient admission per capita. Yazd Province and Kohgiluyeh and Boyer-Ahmad Province had the highest and lowest inpatient admission per capita with 248 and 101 per 1,000 people, respectively.

Conclusion

Access to hospital beds nationwide has a significant effect on inpatient service utilization. policymakers should consider demographic, epidemiological, and socioeconomic factors when determining the health needs of various regions of the country and distribute resources accordingly.

Introduction

Achieving universal health coverage (UHC) is the goal of all health systems worldwide. According to the World Health Organization (WHO), UHC is about ensuring that all people have access to the health care they need without suffering financial hardship [1]. However, the demand for healthcare has been rising due to advances in medicine, introduction of new medical technologies, changing disease patterns, increasing public awareness, and changes in socioeconomic conditions. One of the most important prerequisites for achieving UHC is the ability to respond to this growing demand, which depends on various factors such as the availability of resources in the health system [2].

As the backbone of every health system, hospitals account for about half of the resources in the health sector and play a significant role in provision of health care services [3]. In addition to the disease and

doctor's diagnosis, hospital admissions are driven by other factors such as the patient's socioeconomic status, age, marital status, occupation, education, number of children, and type of insurance as well as accessibility of the hospital and advanced treatments and managers' economic incentives [4]. Hospital beds are the primary unit of analysis in assessing healthcare capacity in a region as the most costly hospital resource and a key factor in access to health care [5]. The possibility of successful diagnosis and treatment improves as patients' access to hospital beds, specialized care, health workforce, and efficient facilities and equipment increases. Improving the efficiency of hospital services by reducing costs and capitalizing on existing capacities is critical to realization of UHC [6].

The population's age structure is another important factor that affects the provision of health care services by hospitals. The growing population aged 60 years and over as a result of increased life expectancy and sustained low fertility has significantly increased hospital care utilization worldwide [7]. This, coupled with improvements in living conditions and health indicators, has led to a significant demographic transition. According to projections, the world's elderly population will grow by 3.5 times the total population growth in the 5-year period between 2025 and 2030 alone [8]. Iran has also experienced significant changes in population in less than half a century with an increase in fertility rate, with the age group 30–35 years having the highest share in the country's population pyramid. This age group will enter older age groups in about three decades and, by 2055, the age group 60 years and over will represent the highest population ratio in the country [9].

As disease patterns change, so does the utilization of health care services provided by hospitals. According to the report by WHO, noncommunicable diseases (NCDs) such as cancer, ischemic heart disease, and cerebrovascular diseases and accidents will be the leading causes of death by 2030, and the share of infectious diseases such as diarrhea, respiratory diseases, HIV/AIDS, malaria, and tuberculosis will gradually decrease [10]. In Iran, projections for 2025 show that the highest increase in the country's burden of disease compared to two decades earlier will be in noncommunicable diseases, accidents, and HIV/AIDS, respectively. Therefore, it is expected that years of healthy life lost in the next few years will be mostly caused by NCDs. Accordingly, it is expected that the scope and emphasis of health programs will be affected by population growth and the characteristics of the population that uses them. The rate of population growth affects long-range planning of community health care facilities. These programs should be adapted to changes in age composition, changes in population density, and aging of the population [11]. Moreover, measuring hospital service utilization is an important step in managing the growing demand for healthcare. Therefore, the present investigates the trend of inpatient service utilization in the provinces of Iran over the period 2012–2017.

Materials And Methods

A descriptive-analytical study with a longitudinal design was conducted on archival data related to hospital performance indicators in Iran over the period 2012-2017. Data related to staffed hospital beds and inpatient admission rate across the country were obtained from the Ministry of Health and the Statistical Center of Iran. The research variables included the number of hospital beds, the number of

inpatient admissions, and population of all the provinces. Moreover, inpatient admission per capita (number of inpatient admissions per 1,000 people) and hospital beds per capita (number of beds per 1,000 people) were calculated. Data were analyzed in SPSS, and Power BI for ArcGIS was used for visualization. Ethical considerations and objectivity were observed through data collection, analysis, and dissemination of the findings.

Findings

The population of Iran in 2012 was 76,040,000, which increased by 6.6% to 81,069,000 in 2017. On average, the population increased by about 1.3% annually over this period. There were 125,853 hospital beds in the country in 2017, having increased by 23% compared to 2012. Over this period, the number of hospital beds increased by 4.6% annually. The number of inpatient admissions increased by 32% between 2012 and 2017. This indicates an increase in hospital admissions by about 6.4% annually. The number of hospital beds per capita increased by 15.7% from 1.34 per 1,000 people in 2012 to 1.55 per 1,000 people in 2017. Over the same period, inpatient admission per capita increased by 23.9% from 113.6 per 1,000 people to 140.8 per 1,000 people (Table 1).

Changes in the percentage of the population admitted to hospitals (inpatient admission rate) over the period 2012-2017 vary in different provinces of Iran. They range from 52.17% increase in Ardabil Province to about 50% decrease in Markazi Province. In Ardabil, Zanjan, and East Azerbaijan provinces, inpatient admission rate increased by more than 50%. In about one fourth of the provinces (8), inpatient admission rates increased by about 30 to 50%. Bushehr, Golestan, Gilan, Sistan and Baluchestan, Alborz, Kurdistan, Lorestan, and Kohgiluyeh and Boyer-Ahmad belong to this group. In more than half of the provinces (18), inpatient admission rate increased by 10 to 30%. The smallest change was observed in Yazd with a 9.8% increase. The only province where inpatient admission rate decreased within the studied period was Markazi with a 50% decrease (Table 2). Overall, Table 2 shows that inpatient admission rate increases with the number of hospital beds 1,000 people.

In 2012, 2 provinces (6.4%) had more than 200 inpatient admissions per 1,000 people (Markazi and Yazd). There were also 120-200 inpatient admissions per 1,000 people in 5 provinces (16.1%), including Semnan, Chaharmahal and Bakhtiari, Fars, Tehran, Isfahan, and Hamedan. In 10 provinces (32.2%), the number of inpatient admissions per 1,000 people was less than 100. In 2017, Yazd had more than 200 inpatient admissions per 1,000 people. Moreover, 11 provinces had 140-200 inpatient admissions per 1,000 people (35.5%), including Chaharmahal and Bakhtiari, Semnan, Tehran, Golestan, Isfahan, South Khorasan, Fars, Hamedan, Kermanshah, Zanjan, and Ilam. In this year, no province had an inpatient stay of less than 100 per 1,000 people (Figure 1).

In Figure 2, the number of beds per 1,000 people and the number of inpatient admissions per 1,000 for 2017 are plotted on the X and Y axis, respectively. The national average is indicated by the point where the two dotted lines intersect. As shown in this scatterplot, there is a clear heterogeneity between the provinces. For example, Golestan and Kohgiluyeh and Boyer-Ahmad almost have an equal number of hospital beds per capita (about 1.4), but inpatient admission per capita of Golestan is 50% higher than

that of Kohgiluyeh and Boyer-Ahmad. Similarly, Markazi and Alborz have similar inpatient admission per capita (about 110), but hospital beds per capita is 50% higher in Markazi than Alborz. Inpatient admission and hospital beds per capita are less than the national average in 15 provinces (48%), including Sistan and Baluchestan, Alborz, Hormozgan, West Azerbaijan, Lorestan, Kohgiluyeh and Boyer-Ahmad, Qom, North Khorasan, Razavi Khorasan, Markazi, Kerman, Ardabil, Ilam, Qazvin, and Gilan. In two provinces, i.e. Golestan and Kermanshah, inpatient admission per capita is higher than the national average, but hospital beds per capita are less than the national average. In 9 provinces, i.e. Yazd, Semnan, Tehran, South Khorasan, Hamedan, Fars, Zanjan, Chaharmahal and Bakhtiari, and Isfahan, inpatient admission per capita and hospital beds per capita are higher than the national average. East Azerbaijan, Mazandaran, Kurdistan, and Khuzestan have more hospital beds per capita, but a lower inpatient admission rate than the national average. In general, provinces with a higher number of hospital beds per capita tend to have a higher inpatient admission rate.

Discussion

The purpose of the present research was to investigate the trend of inpatient service utilization in Iran between 2012 and 2017. The results showed that over this period, the number of hospital beds and inpatient admissions increased by 23% and 32%, respectively, even though the population of the country increased only by 6.6%. Hospital beds per capita increased by 15.7% to 1.55 per 1,000 people and inpatient admissions per capita increased by 24% to 141 per 1,000 people.

Health care utilization refers to the use of health care services to prevent or treat diseases, maintain health and well-being, and/or to obtain information about health status and prognosis [12]. Inpatient service utilization varies in different parts of the world. Inpatient admissions per capita in OECD countries has decreased by 7% in the last two decades from 167 to 154 inpatient admissions per 1,000 people. Among European countries, Germany and Austria had the highest inpatient admission rate in 2017 (about 250 inpatient admissions per 1,000 people), while Portugal and Spain had the lowest inpatient admission rate with 109 and 114 admissions per 1,000 people, respectively. Over the last two decades, average inpatient admission rate in the UK has been 133. Russia is among the countries with a relatively high inpatient admission rate. In Russia, there were 216 inpatient admissions per 1,000 people in 2000, which increased by 3% to 224 in 2018. Inpatient admission rate in China has increased dramatically over the last two decades, from 29 to 172 inpatient admissions per 1,000 people between 2000 and 2018, respectively. In Turkey, Inpatient admission rate has almost doubled in the last two decades, increasing from 77 to 165 inpatient admissions per 1,000 people between 2000 and 2018, respectively [13]. The results of a longitudinal study in Brazil from 2000 to 2015 showed that while inpatient admission and length of hospital stay have been declining since 2000, direct health care costs have increased [14].

Figure 3 provides the inpatient admission rate in Iran, Turkey, and the OECD average. Since 2012, inpatient admission rate has been almost constant in OECD countries, slightly fluctuating around 160. The same is observed in Turkey, where the average inpatient admission rate has been about 165.

The need for healthcare services is one of the major determinants of health care utilization, and any judgement about the efficiency of a health system should consider utilization patterns in groups with the greatest need. However, there are other factors besides the need for care that affect health care utilization. The results of a systematic review of health care utilization between 1970 and 1999 identified several factors. Children, pregnant women, and the elderly utilized more health care services. Also, health care utilization was significantly higher in low-income and low-education groups. The results indicated that, depending on the type of health system, poorer communities may not receive adequate care [15]. The results of a study in Brazil showed that income is strongly associated with health care utilization [16]. Another study in Greece showed that low income, poor health, and limited education are associated with greater health care utilization. The results of this study indicated that insurance coverage is positively associated with hospital care utilization [17].

Access is one of the intermediate goals of a health system. It consists of three dimensions: availability (physical access), affordability (financial access), and acceptability (cultural access). Therefore, health systems must have plans for providing all dimensions of access. Availability deals with physical access to health care facilities and whether health services available in the right place and at the right time. In the discussions of affordability of services, the main strategy is to provide insurance coverage to the population in order to reduce out-of-pocket payments and increase households' ability to pay. Acceptability of services depends largely on the literacy and cultural characteristics of individuals and communities.

Insurance coverage increases the utilization of health care services. The insured use 50% more medical services and have 5-15% higher mortality rate than those without insurance [18]. A study on healthcare utilization in Iran in 2015 compared insured and uninsured groups and showed that referrals for specialist outpatient services were lower in all uninsured groups. Referrals were almost twice as high in insured groups than uninsured groups. According to this study, insurance coverage plays a key role in referral to medical centers [19]. Similarly, Freeman et al. showed that increased insurance coverage increases health care utilization and improves health outcomes in target groups [20].

The results of the present research showed that inpatient service utilization varies in different provinces of Iran. A number of studies have examined the state of health care utilization and its determinants in various provinces of the country. Moravati et al. studied the elderly population of Yazd Province in 2018 and showed that women and housewives used more outpatient services than other demographics. Marital status, supplementary insurance, and education level were some of the identified determinants of outpatient care utilization. The most common cause of outpatient care utilization in the elderly was cardiovascular diseases [21]. A study conducted in Kerman Province in 2013 showed that insurance status, economic status of households, education level of the head of the household, and presence of a person over 65 years or under 12 years in the household were important determinants of health care utilization. Health care utilization decreased from the poorest to the richest groups. This was attributed to the positive correlation between good health and higher income [22]. A similar study in Lorestan Province examined health care utilization in the elderly in 2017. The results showed that there is a health care

utilization is significantly associated with income, family structure, literacy, place of residence, employment status, number of children, insurance status, and health self-assessment [23]. Similarly, Ebadifard Azar et al.'s study on inpatient and outpatient service utilization in Isfahan Province in 2009 showed that it is significantly associated with demographic characteristics such as age, occupation, education, number of children, household income, type of insurance, and place of residence [24]. From the results of these and other studies, it can be concluded that the specific burden of diseases and demographic characteristics of each region should be taken into consideration when planning and allocating health resources.

Health care facilities should be used in such a way that waste is minimized and no direct or indirect costs are imposed on the population. Rising health care costs hinder the achievement of an equitable and sustainable health system. Studies have shown that many inpatient admissions are unnecessary and without sufficient clinical justification [25]. Unnecessary hospitalization of patients reduces hospital efficiency and imposes a significant financial burden on the health system. In addition, unnecessary admissions and hospital stays increase the costs incurred by patients and exposes them to hospital-acquired infections [26, 27]. Patient dissatisfaction, increased number of complaints, unavailability of hospital beds, and wasted hospital resources are other consequences of unnecessary hospital stays, which must be avoided.

Patients must be admitted to the hospital when specialist staff and appropriate technologies are available for treatment of patients given their clinical condition. The need for continuous care and impossibility of outpatient treatment are characteristics of necessary hospital admissions. Unnecessary admission occurs when patients who can be treated with outpatient care are hospitalized. In this case, the occupied hospital beds are referred to as "blocked beds" [28]. In terms of length of hospital stay, the situation varies from country to country. The average length of stay (ALOS) in OECD countries was 7.8 days in 2016 (minimum 4 days in Turkey and maximum 16.3 days in Japan) [29]. ALOS in Iranian hospitals in 2017 was 3.6 days. The results of a systematic review of unnecessary stays in Iranian hospitals showed that the average length of unnecessary hospital stays was 4.2 days. It must be noted that this index was shorter in Iran than other countries [28]. A 2006 study of the teaching hospitals of Tehran University of Medical Sciences showed that about 23% of hospital admissions were unnecessary [30]. Another study of public hospitals in Tehran in 2013 found that 16.2% of hospital admissions were unnecessary [25].

Unnecessary hospital stays can be reduced in various ways, including through continuous monitoring of the need to stay, analysis of reasons for keeping patients in the hospital longer than average, payment to hospitals based on diagnosis-related groups (DRGs), establishing a daycare ward, and assigning a nurse or physician as the liaison for patient discharge. Strategies for reducing unnecessary hospital stays can be implemented at the macro and micro levels. At the macro level, the Ministry of Health and health insurance organizations can increase hospital efficiency through expansion of primary health care, tariff reform, and hospital payment system reform (especially avoiding case-based payment systems). Using an Appropriateness Evaluation Protocol (AEP) is another strategy for reducing unnecessary hospital

stays, which allows for determining the necessity of admission and hospitalization based on a set of objective criteria [28]. Hospitals and other health care providers have limited capacity for admission and treatment of patients. Therefore, allocation of resources in relation to the health needs of the population is critical to achieving universal health coverage. New methods of service delivery such as ambulatory surgery centers and daycare centers are on the rise. For example, the number of ambulatory surgery centers in the US more than doubled between 1990 and 1998 [31].

One of the most important variables in social planning is the size and characteristics of the population and its changes over time. The age structure of a population is especially important in health care planning, since individual abilities and needs change with age [32]. WHO estimates that the population aged 60 or over will more than double in the next 30 years. Changing the age structure of a population requires readiness and radical social changes. As the population ages, people's health needs become more complex and the likelihood of developing multiple chronic conditions increases. However, health care services are often organized around diagnosis and treatment of acute illnesses, and the continuity, consistency, and coordination of care are undermined with an increasingly aging population [33].

Another characteristic of the Iran's population is the continuous decline in fertility, which is projected to fall below the replacement level, resulting in population decline and its associated problems. According to UN projections, if the growth pattern continues, the country's population will reach 93 million by 2050 with an old-age dependency ratio of 32.1%. According to the 2016 census, the old-age dependency ratio in Iran was 6.1% [34]. With increasing life expectancy and changes in population structure, Iran's population has been aging rapidly. Epidemiological transition due to population aging has become a major concern worldwide. As assessment of the burden and cost of chronic diseases in 23 countries, including Iran, showed without intervention to prevent chronic diseases, cardiovascular disease, stroke and diabetes, a major portion of the resources of these countries will be spent on managing these diseases. While most deaths from these diseases are preventable, only two percent are prevented each year [35].

Conclusion

Providing access to health care according to the health needs, demographic changes, and epidemiology of a country requires detailed studies of local needs and conditions. Measuring and analyzing inpatient care utilization allows for more effective use of the limited resources of the health system. The results of this study showed that the supply (hospital beds per capita) and demand (inpatient admissions per capita) of hospital services in Iran is increasing. Under these circumstances, it is a high priority to develop policies for needs-based supply and utilization of health care services. Moreover, managing the demand for health care and shaping health-seeking behaviors are crucial to controlling the increasing costs of the health sector and efficiently allocating limited resources within the health system.

Abbreviations

Not applicable

Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Conflict of interests

The authors declare that they have no competing interests

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Authors' contributions

AM and HD designed the study. MA and HD analyzed the data. AM interpreted the data. MA and HD drafted the manuscript. AM revised the manuscript. All authors have read and approved the final manuscript.

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Tables

Table 1. Changes in the number of beds and inpatient admissions between 2012 and 2017

Inpatient per 1000 people	Bed per 1000 people	Inpatient	Bed	Population	Year
113.59	1.35	8,637,422	102,298	76,040,000	2012
113.82	1.38	8,757,798	106,475	76,941,000	2013
124.38	1.42	9,684,039	110,217	77,857,000	2014
131.21	1.44	10,336,426	113,384	78,775,000	2015
136.24	1.49	10,889,502	118,894	79,926,000	2016
140.85	1.55	11,418,199	125,853	81,069,000	2017

Table 2. Hospital beds per capita and inpatient admission per capita in the provinces of Iran in 2012 and 2017

Province	Bed per 1000 people			Inpatient per 1000 people		
	2012	2017	Change (%)	2012	2017	Change (%)
Alborz	0.69	0.98	42.26	75.91	106.55	40.36
Ardabil	1.14	1.47	29.15	86.95	132.3	52.17
Azerbaijan, West	1.41	1.62	14.93	113.14	134.69	19.04
Azerbaijan, West	1.23	1.28	4.17	116.5	134.09	15.1
Bushehr	0.86	1.08	25.71	68.56	102.81	49.96
Chahar Mahaal and Bakhtiari	1.37	1.59	15.63	158.89	194.44	22.38
Fars	1.42	1.68	18.26	128.85	151.49	17.58
Gilan	1.16	1.43	22.96	88.75	128.02	44.25
Golestan	1.11	1.43	28.38	105.12	155.02	47.46
Hamadan	1.41	1.67	18.67	123.52	150.36	21.72
Hormozgan	0.98	1.16	18.86	107.99	126.15	16.81
Ilam	1.12	1.49	33.86	101.72	127.3	25.15
Isfahan	1.39	1.56	12	123.84	154.2	24.52
Kerman	1.15	1.39	20.41	101.37	124.71	23.03
Kermanshah	1.26	1.43	13.47	115.41	149.14	29.33
Khorasan, North	0.96	1.48	54.07	92.89	117.55	26.54
Khorasan, Razavi	1.34	1.41	5.01	119.56	136.52	14.18
Khorasan, South	1.03	1.83	76.55	102.25	154.04	50.64
Kohgiluyeh and Boyer-Ahmad	1.1	1.37	24.88	76.93	101.32	31.72
Kordestan	1.2	1.51	26.32	97.93	129.57	32.3
Kuzestan	1.5	1.55	3.25	118.61	131.08	10.51
Lorestan	1.04	1.32	26.52	89.94	115.91	31.38
Markazi	1.25	1.48	18.26	248.39	122.07	-50.86
Mazandaran	1.38	1.54	11.12	116.84	136.61	16.92
Qazvin	1.34	1.46	8.97	109.63	130.12	18.7
Qom	1.14	1.39	22.06	103.55	123.72	19.48
Semnan	2.02	2.08	3.13	163.27	180.62	10.63

Sistan and Baluchestan	0.85	0.93	9.44	78.03	111.02	42.29
Tehran	1.77	2.02	13.9	128.65	161.85	25.8
Yazd	2.39	2.41	0.74	213.32	234.3	9.84
Zanjan	1.12	1.67	49.39	94.98	143.21	50.78

Figures

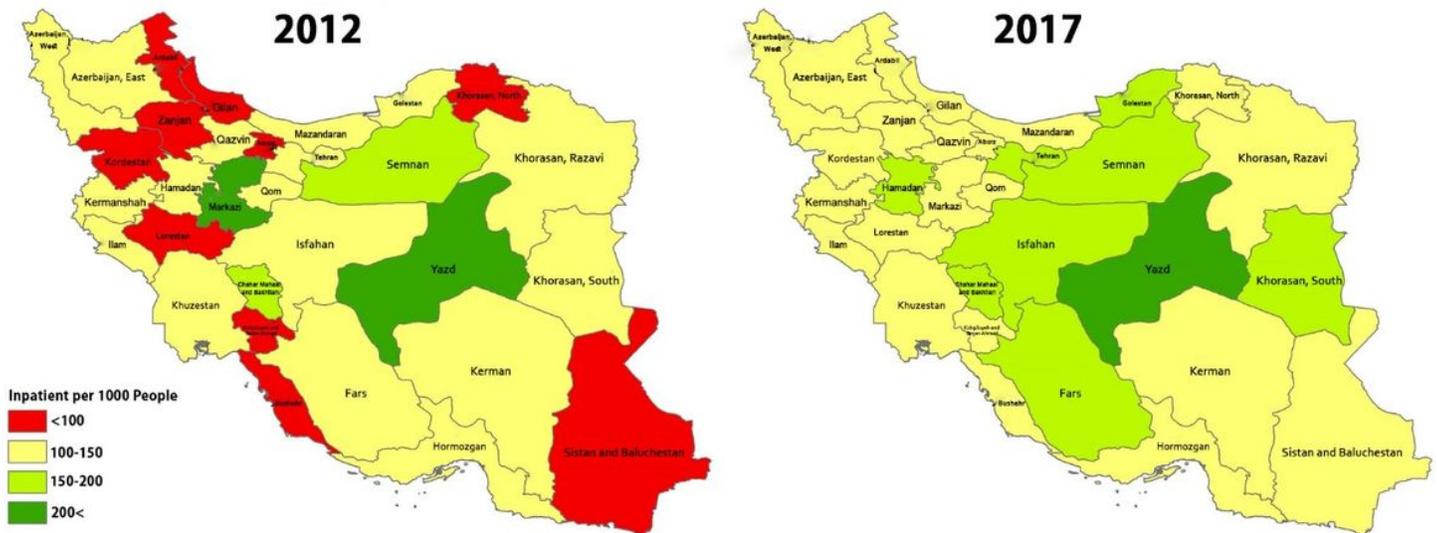


Figure 1

Country map of inpatient admissions per capita in 2012 and 2017. Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.

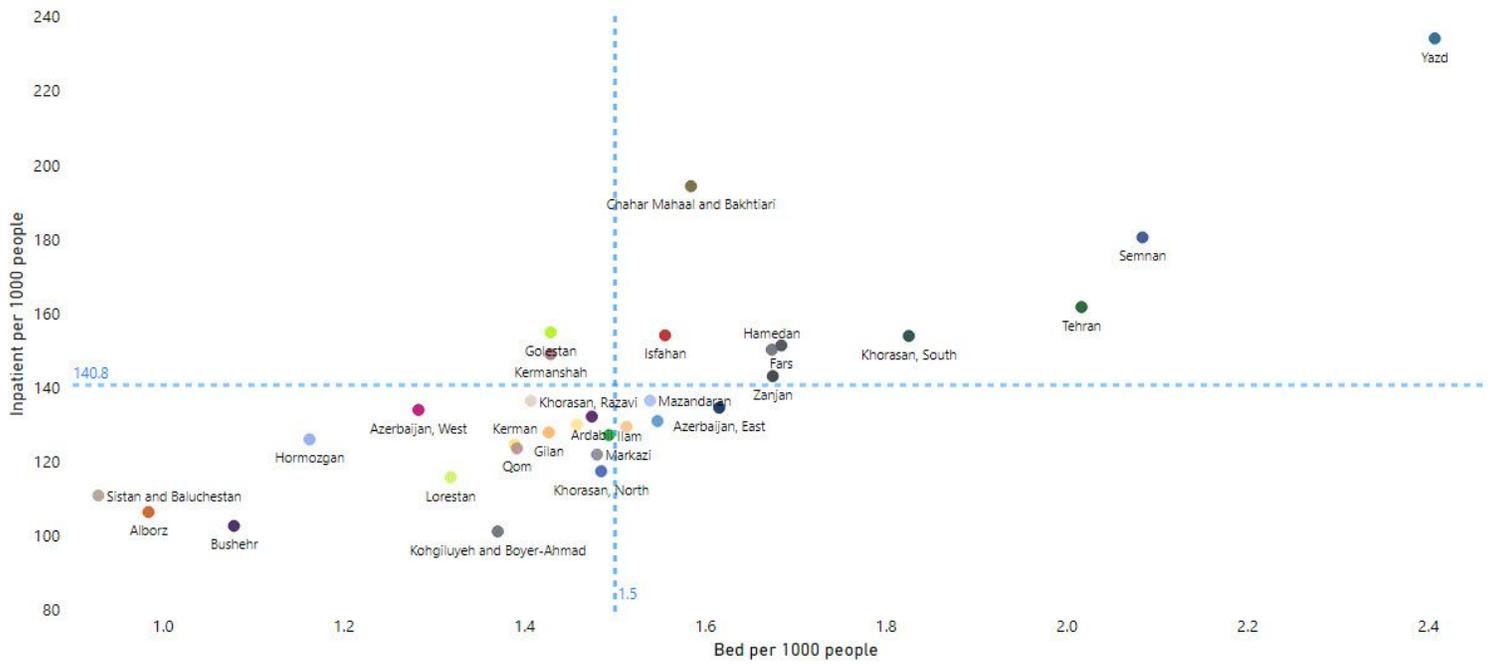


Figure 2

Hospital beds per capita and inpatient per capita in provinces of Iran in 2017.

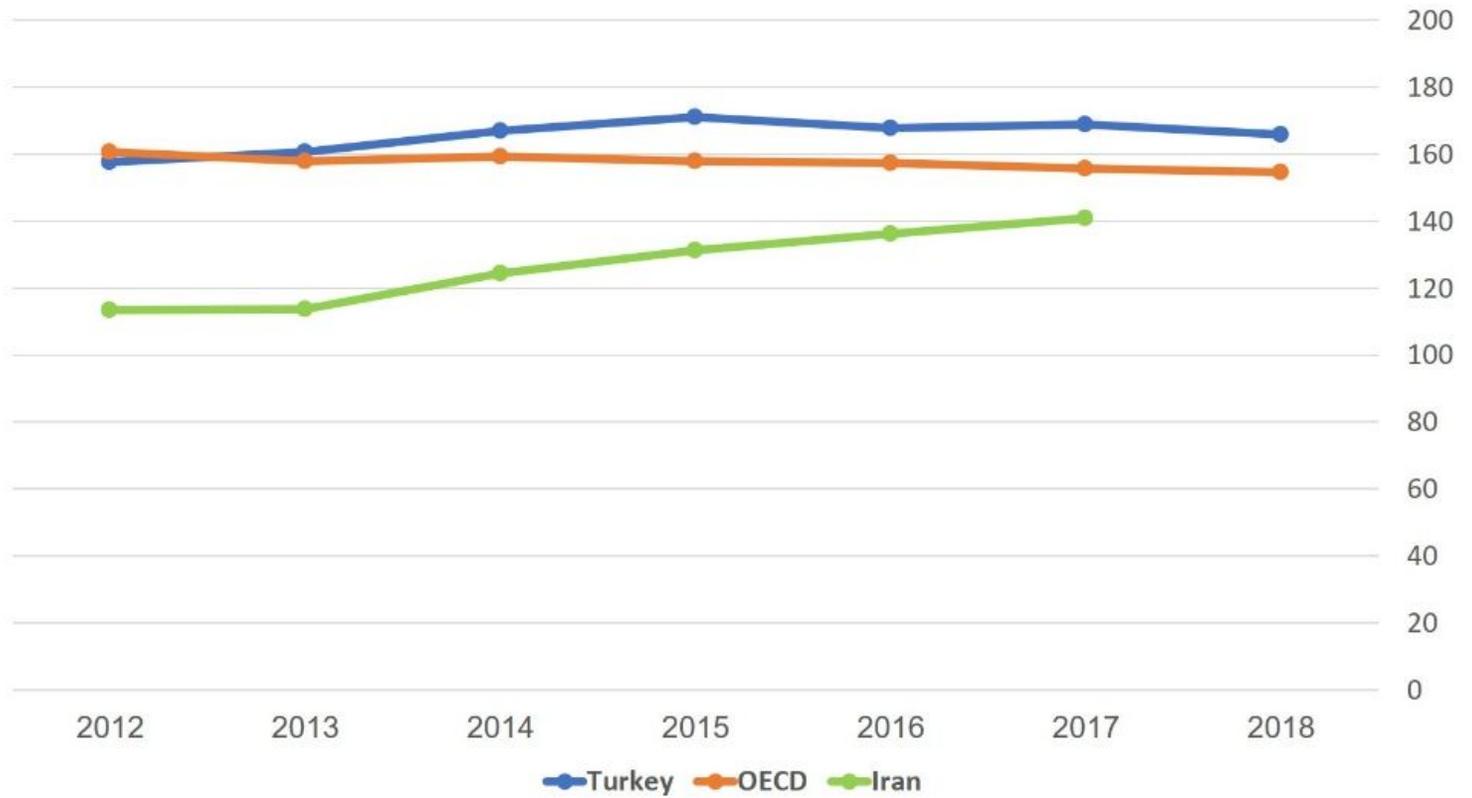


Figure 3

Trend of inpatient admissions per capita in Iran, Turkey, and OECD countries.