Research Article

A comparative analysis of the health services indicators distribution in public hospitals: guide for nursing transformation plan in Saudi Arabia

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Abstract

Healthcare in Saudi Arabia (SA) is a national system in which the government provides free universal coverage through public health services to meet the increasing demand for healthcare due to population growth. Saudi Vision 2030 is a national transformation program that translates into a system-wide transformation involving expanding healthcare services focusing on value-based healthcare. This translates into a system-wide transformation involving expanding healthcare services focusing on value-based healthcare. This contributes to a series of developments in the health delivery systems fields and nursing services. This study aims to explore the four selected indicators of health services and to provide a plan for nursing transformation in SA. The study employs the data of 4 selected indicators and data of the total population extracted from the statistical yearbooks of the last five years (2017- 2021). Descriptive statistics, normality distribution using the Shapiro-Wilk test, and Homogeneity of variance applying Levene's test were employed. In the analysis of health distribution, the proportion between the total population as the independent factor and the total of health services as the dependent factor was conducted. The major total of the population was located in three main regions, with 66.3%. The spatial distribution of the selected health indicators was related to the population distribution in three main regions, with 43.7% of the hospitals, 51.6% of the hospital beds, 57.3% of the physicians, and 55.4% of the nurses. The abnormality of total population distribution with a p-value of 0.001 at the freedom degree of 13 was noticed. In addition, the analysis shows an abnormally distributed total of the selected health indicators with a p-value of 0.001-0.026 at a freedom degree of 13.

Keywords: health services indicators; health services distribution; population grow rate; health delivery systems; nursing services

Introduction

Healthcare in Saudi Arabia (SA) is a national healthcare system by providing universal healthcare coverage free of charge through public hospitals and primary care to meet the increasing demand for healthcare due to population growth. The Ministry of Health (MoH) is the authority that supervises preventive, curative, and rehabilitation health services. It provides health care for all members of society, from the advanced technology specialist through a broad base of general and specialist hospitals.[1] The MoH is also responsible for managing, planning, financing, and regulating the healthcare sector. The Ministry of Health's Health Program strives to enhance the availability of healthcare services by achieving widespread coverage and ensuring fair and inclusive distribution across different regions. It will employ and establish integrated healthcare systems by implementing and following the best evidence-based international standards that ensure the satisfaction of beneficiaries and cover all regions of SA.[2] In light of these circumstances, Saudi Vision 2030 represents a momentous and impactful transformation on a national scale. This results in a comprehensive change throughout the system, encompassing the growth of healthcare services and heightened effectiveness. The emphasis is placed on healthcare centered around value, leading to a sequence of advancements in health delivery systems, nursing, commerce, education, communication, science, and technology.[3,4]

The changes address increasing pressures on the Saudi healthcare system due to a growing population and elevated anticipations for enhanced healthcare for every citizen.[5] Transforming the healthcare system will demand a fundamental reconsideration of the responsibilities held by numerous healthcare professionals, including nurses.

Moreover, nurses today make up the backbone of health care. Nearly they are the largest of the healthcare workforce and deliver comprehensive patient care making a positive difference in patient care quality.[6] Dealing with the scarce supply of nurses necessitates a tailored approach based on data insights that consider the specific supply and demand dynamics of the country. It requires evidence-informed policy and resource allocation at national, sub-national, and organizational levels. The need for nurses is on the rise globally. Effective nursing workforce planning is essential to diminish health disparities and establish enduring healthcare systems.[7]

By 2030, SA will have to secure an extra 175,000 doctors, nurses, and other healthcare staff to address shortages and fulfill the healthcare needs of the population; this includes about 64,000 extra nurses.[8] With the escalating global deficiency in nursing personnel, SA might find itself in competition with other nations to attract the limited pool of foreign nurses. Developing and executing a nursing transformation strategy is crucial for enhancing and elevating the quality of patient care provided by nurses. The plan will empower nurses to optimize critical thinking and evidence-based nursing practice by delivering safe, effective care in a timely and efficient manner in all disciplines across healthcare[2] In SA, a few nursing programs and initiatives have already been developed to target necessary improvements in nursing transformation in practice are yet to be apprehended. The necessity for this change in emphasis has grown notably pressing, especially in relation to chronic illnesses, primary care involving care coordination and transitional care, the promotion of health and well-being, and the avoidance of unfavorable occurrences like hospital-acquired infections.[9] However, the count of advanced practice Saudi nurses remains exceedingly restricted, constituting less than an approximate 5% of the entire nursing workforce.[10]

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Systematic reviews of public hospital efficiency studies in the Gulf region and similar countries were limited.[11] The health services efficiency was evaluated in some Iranian public hospitals using Data Envelopment Analysis (DEA) approach,[12] analyzing the factors affecting the hospital's efficiency[13] and measuring the efficiency of general hospitals.[14] In the United Arab Emirates, the study used DEA approach to analyze the frontier efficiency of the hospitals. In the same context,[16] the public hospitals' efficiency in provincial markets in Turkey was studied. However,[17] analyzed the ambiguous relationship between efficiency, quality, and patient satisfaction in the public hospitals of Turkey.

Studies are generally scarce on assessing public hospital distribution in Saudi regions. This rarity is particularly acute in the context of Kingdom of Saudi Arabia (KSA).[18] The analysis discovered merely three studies conducted within the context of Saudi Arabia (KSA). One of these studies, titled "Measuring the Efficiency of Health Service Regions in KSA using DEA. The second was "a comparative study between 2014 and 2006," evaluated the effectiveness of healthcare services at the district level in SA.[19] In 2013, another examination of efficiency was carried out on 20 public hospitals managed by the private sector. The study revealed that 60% of the sampled hospitals had not attained the optimal efficiency score.[20] In addition, another study presented the efficiency evaluation of public hospitals in SA and application of DEA.[21] The study revealed that 75.8% of public hospitals were deemed technically inefficient. Smaller hospitals demonstrated greater efficiency compared to their larger counterparts, both medium-sized and large hospitals. Healthcare facilities situated in the central region exhibited higher levels of efficiency in comparison to hospitals located in different geographic areas. Examination of performance highlighted that excessive utilization of physician resources and inadequacy in health service provision were identified as primary reasons for inefficiency. The study's objective is to investigate the four chosen indicators within hospitals and devise a strategy for the transformation of nursing in SA.

Material and Methods

The study was carried out in a region of SA that is divided into 13 administrative provinces (Figure 1).
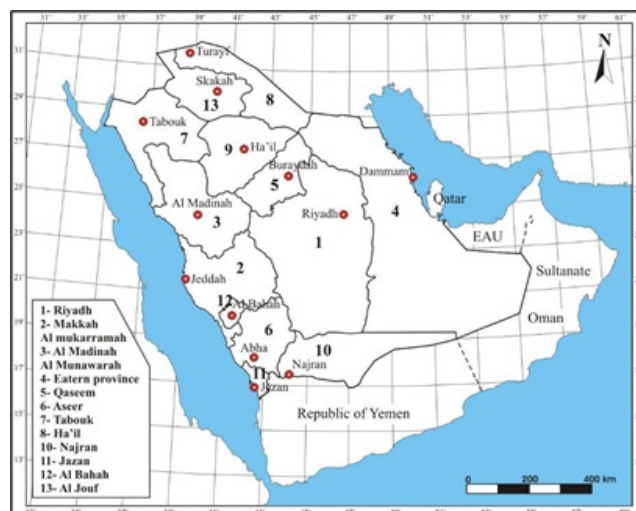

Figure I Geographic location of study area (Saudi Arabia).

Data collection

The author employ data on public hospitals number, hospital beds, physicians, and nurses collected from the Statistical Year Books for the period 2017-2021,[1] edited by the Ministry of Health (MoH).[1]. These data were available by region (Table 1).

The population information was gathered from the Statistical Year Books published between 2017 and 2021 by the General Authority of Statistics.[1] The total population in 2021 was estimated by the Geometric Growth Model and the population Census of 2010 and 2020 (Table 2).

Table I The distribution of the selected health indicators data

Year	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Region	**Hospitals number**					**Hospital Beds**				
Riyadh	49	49	49	49	49	8337	8337	8507	8507	8707
Makkah	38	39	39	39	39	8475	8425	8425	8425	8425
Al Madinah	19	19	20	20	20	2768	2768	3268	3268	3118
Qaseem	19	19	19	19	19	2859	2859	2909	2909	2909
Eastern Province	36	37	37	37	37	1855	6311	6411	6511	6511
Aseer	32	32	33	33	33	3500	3500	3600	3650	3650
Tabouk	12	12	12	12	12	1820	1820	1820	1820	1920
Ha'il	12	13	13	13	13	1290	1790	1855	1855	1940
Northern Borders.	10	10	10	11	11	1360	1360	1360	1360	1460
Jazan	21	21	21	21	21	2225	2225	2225	2225	2275
Najran	11	10	10	10	10	1330	1330	1300	1300	1300
Al Bahah	10	10	10	10	10	1165	1165	1165	1165	1295
Al Jouf	13	13	13	13	13	1420	1820	1820	1820	1820
Region	**Physicians**					**Nurses**				
Riyadh	6873	7261	8976	8601	12299	17659	13677	20354	18061	20585
Makkah	7542	8298	8998	8422	11876	16671	1307	16192	16201	65204
Al Madinah	2542	2633	2952	1027	4163	5850	5765	6073	6672	7992
Qaseem	2092	2212	2383	704	3564	4877	5215	5434	5642	6707
Eastern Province	5310	5268	5999	5890	8464	13038	12259	12240	13707	16673
Aseer	2792	2725	3081	3485	5503	5831	5264	5537	6462	8374

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Table 1 Continued...

Year	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Region	Physicians						Nurses			
Tabouk	1294	1378	1441	1390	2135	3301	3232	3073	3182	3972
Ha'il	866	1131	1297	1402	1967	2235	2629	2683	2998	3713
Northern Borders.	805	844	985	1006	1439	2238	2407	2447	2548	2876
Jazan	1693	1708	1930	1964	2971	4082	3736	3918	4624	5629
Najran	1027	1167	1263	1266	1720	2610	2627	2613	2935	3382
Al Bahah	934	933	992	986	1520	1761	1598	1671	1821	2257
Al Jouf	1134	1159	1298	1407	1937	3800	3766	3840	4237	4924

Table 2 Total growth population in SA

Region	2017	2018	2019	2020	2021
Riyadh	8216284	8446866	8660885	8872712	9115014
Makkah	8557766	8803545	9033491	8931968	9163526
Al Madinah	2132679	2188138	2239923	2291092	2349932
Qaseem	1423935	1455693	1488285	1520434	1554805
Eastern Province	4900325	5028753	5148598	5266998	5399828
Aseer	2211875	2261618	2308329	2683609	2775944
Tabouk	910030	930507	949612	968414	988144
Ha'il	699774	716021	731147	746046	762841
Northern Borders	365231	375310	383051	390656	398463
Jazan	1567547	1603659	1637361	1670569	1704646
Najran	582243	595705	608467	621040	633937
Al Bahah	476172	487108	497068	506866	517493
Al Jouf	508475	520737	531952	543010	554552

Data analysis

The data analysis is based on different methods. The author used SPSS23 software for data analysis and computing descriptive statistics. Shapiro-Wilk and Levene's tests were used for detecting the normality distribution Homogeneity of variance. The health services distributions were analyzed and evaluated using the proportion between the total population as the independent factor and the total health services (hospital number, hospital beds, physicians, and nurses) as the dependent factors. The mapping technique illustrated the results of the assessment.

Results

Population distribution

From Table 1, the mean ratio of total population distribution from 2017-2021 varies from 1.1% in the Northern borders to 25.5% Makkah of the total population in SA. The major total population was located in three main regions, with 66.3% of the total population (25.3% in Riyadh, 26.0% in Makkah, and 15.0% in Easternprovince). They are the capital city, the Holly capital, and the industrial capital, respectively (Figure 2). The Shapiro-Wilk test shows that the data distribution of the total population is abnormally distributed with a p-value of 0.001 at the freedom degree of 13.

Health services distribution

The total number of public hospitals increased from 282 in 2017 to 287 in 2021, with the inauguration of five new hospitals in Ha'il, Eastern Province during 2018, Aseer and Al Madinah during 2019, and Northern borders during 2020. From Table 3 and Figure 3, the spatial distribution of the selected health indicators was related to the population distribution and located in three main regions (Riyadh, Makkah, and Eastern province) with respectively, with 43.7% of the hospitals, 51.6% of the hospital beds, 57.3% of the physicians and 55.4% of the nurses. The Shapiro-Wilk test shows that the data distribution of the total selected health indicators is abnormally distributed with a p-value of 0.001-0.026 at a freedom degree of 13.
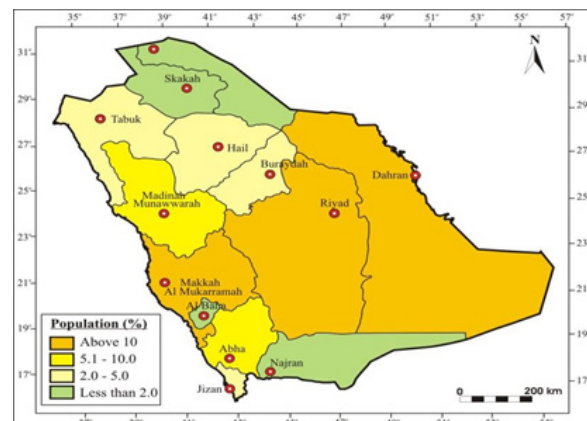

Figure 2 Spatial distribution of the proportional mean of the population over Saudi Arabia in 2017-2021.
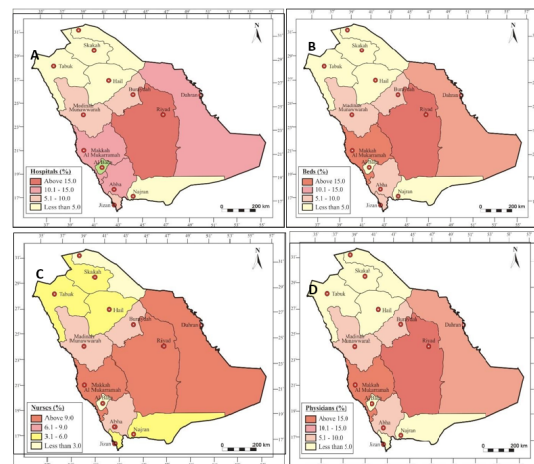

Figure 3 Spatial distribution of the mean rate of health services over Saudi Arabia in (2017-2021).

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Dire discrepancy between population and distribution of health services

During the last five years, the total population has increased from 32.6 million (2017) to 35.9 million (2021), with an annual growth rate of 2.1% (Table 4).

From Table 4, the selected health indicators increase with an annual average of 1 hospital, 1385 hospital beds, 4931 physicians, and 13667. The increase in the mentioned health indicators is related to the increase in the population, as indicated by the correlations (Table 5). Table 6 summarizes the distribution of the health indicators per 10000 population during the last five years.

Table 3 Proportional distribution of the health services by the regions

Year	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Region	Hospitals number					Hospital Beds				
Riyadh	17.4	17.3	17.1	17.1	17.1	21.7	19.1	19.0	19.0	19.2
Makkah	13.5	13.7	13.6	13.6	13.6	22.1	19.3	18.9	18.8	18.6
Al Madinah	6.7	6.7	7.0	7.0	7.0	7.2	6.3	7.3	7.3	6.9
Qaseem	6.7	6.7	6.6	6.6	6.6	7.4	6.5	6.5	6.5	6.4
Eastern Province	12.8	13.0	12.9	12.9	12.9	4.8	14.4	14.4	14.5	14.4
Aseer	11.3	11.3	11.5	11.5	11.5	9.1	8.0	8.1	8.1	8.1
Tabouk	4.3	4.2	4.2	4.2	4.2	4.7	4.2	4.1	4.1	4.2
Ha'il	4.3	4.6	4.5	4.5	4.5	3.4	4.1	4.2	4.1	4.3
Northern Borders.	3.5	3.5	3.5	3.8	3.8	3.5	3.1	3.0	3.0	3.2
Jazan	7.4	7.4	7.3	7.3	7.3	5.8	5.1	5.0	5.0	5.0
Najran	3.9	3.5	3.5	3.5	3.5	3.5	3.0	2.9	2.9	2.9
Al Bahah	3.5	3.5	3.5	3.5	3.5	3.0	2.7	2.6	2.6	2.9
Al Jouf	4.6	4.6	4.5	4.5	4.5	3.7	4.2	4.1	4.1	4.0
Region	Physicians					Nurses				
Riyadh	19.7	19.8	21.6	22.9	20.7	21.0	21.0	21.0	21.0	21.0
Makkah	21.6	22.6	21.6	22.4	19.9	19.9	19.9	19.9	19.9	19.9
Al Madinah	7.3	7.2	7.1	2.7	7.0	7.0	7.0	7.0	7.0	7.0
Qaseem	6.0	6.0	5.7	1.9	6.0	5.8	5.8	5.8	5.8	5.8
Eastern Province	15.2	14.3	14.4	15.7	14.2	15.5	15.5	15.5	15.5	15.5
Aseer	8.0	7.4	7.4	9.3	9.2	6.9	6.9	6.9	6.9	6.9
Tabouk	3.7	3.8	3.5	3.7	3.6	3.9	3.9	3.9	3.9	3.9
Ha'il	2.5	3.1	3.1	3.7	3.3	2.7	2.7	2.7	2.7	2.7
Northern Borders.	2.3	2.3	2.4	2.7	2.4	2.7	2.7	2.7	2.7	2.7
Jazan	4.9	4.7	4.6	5.2	5.0	4.9	4.9	4.9	4.9	4.9
Najran	2.9	3.2	3.0	3.4	2.9	3.1	3.1	3.1	3.1	3.1
Al Bahah	2.7	2.5	2.4	2.6	2.6	2.1	2.1	2.1	2.1	2.1
Al Jouf	3.2	3.2	3.1	3.7	3.3	4.5	4.5	4.5	4.5	4.5

Table 4 Total population and health indicators in the period

Health indicator	2017	2018	2019	2020	2021	A grow rate
Total Population	32554353	33415678	34220188	35015434	35921146	673359
Tot Hospitals	282	284	286	287	287	1
Hospital Beds	38404	43710	44665	44815	45330	1385
Physicians	34904	36717	41595	37550	59558	4931
Nurses	83953	63482	86075	89090	152288	13667

Table 5 Regression parameters between the total population and the health indicators in 2017-2021

Dependent variable	R^2	Sig.	df_1	df_2	Regression model
Hospital	0,930	0.000	3	61	Cubic
Hospital Beds	0.954	0.000	3	61	Cubic
Physicians	0.916	0.000	3	61	Cubic
Nurses	0.638	0.000	3	61	Exponential

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Table 6 Distribution of the health resources indicators (per 10000 population) by regions

Year	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Region		Hospitals number					Hospital Beds			
Riyadh	17	17	18	18	19	10	10	10	10	10
Makkah	23	23	23	23	23	10	10	9	9	9
Al Madinah	11	12	11	11	12	13	13	15	14	13
Qaseem	7	8	8	8	8	20	20	20	19	19
Eastern Province	14	14	14	14	15	4	13	12	12	12
Aseer	7	7	7	8	8	16	15	16	14	13
Tabouk	8	8	8	8	8	20	20	19	19	19
Ha'il	6	6	6	6	6	18	25	25	25	25
Northern Borders.	4	4	4	4	4	37	36	36	35	37
Jazan	7	8	8	8	8	14	14	14	13	13
Najran	5	6	6	6	6	23	22	21	21	21
Al Bahah	5	5	5	5	5	24	24	23	23	25
Al Jouf	4	4	4	4	4	28	35	34	34	33
Region		Physicians					Nurses			
Riyadh	8	9	10	10	13	21	16	24	20	23
Makkah	9	9	10	9	13	19	1	18	18	71
Al Madinah	12	12	13	4	18	27	26	27	29	34
Qaseem	15	15	16	5	23	34	36	37	37	43
Eastern Province	11	10	12	11	16	27	24	24	26	31
Aseer	13	12	13	13	20	26	23	24	24	30
Tabouk	14	15	15	14	22	36	35	32	33	40
Ha'il	12	16	18	19	26	32	37	37	40	49
Northern Borders.	22	22	26	26	36	61	64	64	65	72
Jazan	11	11	12	12	17	26	23	24	28	33
Najran	18	20	21	20	27	45	44	43	47	53
Al Bahah	20	19	20	19	29	37	33	34	36	44
Al Jouf	22	22	24	26	35	75	72	72	78	89

From Table 6 and Figure 4, the health resources of the selected indicators show the following distribution:

i. Every 10000-population served in Makkah, Riyadh, Eastern Province, and Al Madinah were served by 23, 18, 14, and 11 hospitals, respectively (Figure 4A). In four regions (Jazan, Qaseem, Tabouk, and Aseer), every 10000 population was served by eight hospitals. In five regions (Ha'il, Najran, Al Bahah, Northern borders, and Al Jouf), the indicator varies from 4 to 6 hospitals/10000 population.

ii. Every 10000-population served in Najran, Ha'il, Al Bahah, Al Jouf, and Northern borders was served by 22, 24, 24, 33, and 36 hospital beds, respectively (Figure 4B). In two regions (Qaseem and Tabouk), every 10000 population was served by 19 hospital beds. In five regions (Riyadh, Eastern Province, Al Madinah, Jazan, and Aseer), the indicator varies from 10 to 15 hospitals/10000 population. The hospital beds indicator is less than 10 in only the Makkah region.

iii. Every 10000 population were served in Najran, Al Bahah, Al Jouf, and Northen borders by 21, 22, 26, and 26 physicians, respectively (Figure 4C). In two regions (Tabouk and Ha'il), every 10000 population was served by 16 and 18 physicians, respectively. In five regions (Al Madinah, Eastern Province, Jazan, Aseer, and Qaseem), the indicator varies from 12 to 15 physicians/10000 population. The physicians' indicator does not exceed 10 in only Makkah and Riyadh hospitals.

iv. Every 10000 population served in Najran, Northern borders, and Al Jouf were served by 46, 65, and 77 nurses, respectively (Figure 4D). In three regions (Al Bahah, Qaseem, and Ha'il), every 10000 population was served by 37, 37, and 39 nurses. In six regions (Aseer, Makkah, Eastern Province, Jazan, Al Madinah, and Tabouk), the indicator varies from 26 to 35 physicians/10000 population. The nurses' indicator does not exceed 21 in only Riyadh hospitals.
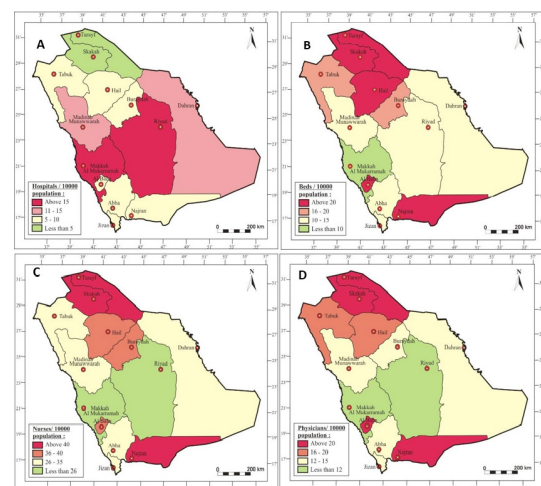

Figure 4 Spatial distributions of the health indicators per 10000 population over Saudi Arabia in 2021

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Discussion

The data distribution of the health indicators and the total population differs from the normal distribution. In the last five years, the total population has been located in three main regions: Riyadh, Makkah, and Eastern Province, with 66.8% of the total population. It has been observed that the distribution of health indicators is related to the population distribution in Makkah, Riyadh, and Eastern province, with 43.7% of the hospitals, 51.6% of the hospital beds, 57.3% of the physicians, and 55.4% of the nurses. The correlation between the allocations of health indicators per 10,000 people changes in an opposite manner compared to the population distribution. Smaller hospitals are situated in the northern, southern, and southwestern regions. The hospitals in the central region were better served in health indicators. Furthermore, the findings show that less than five hospitals, 10-15 hospital beds, less than 11 physicians, and 26-35 nurses serve 50.9%, 59.4%, 50.8%, and 62.3% of the total population in 2021.

Based on the difference in the distribution of the total population in the regions of the Kingdom, there is some linked variation in the distribution of the six indicators (number of hospitals, beds, doctors, nurses, pharmacies, and supportive health professionals. The development of health services at the level of the hospitals of the MoH remains in the medium term from 5 to 10 years that will affected by these discrepancies. Therefore, Vision 2030 may offer many future solutions to reconsider the diversity of the distribution of health services in the regions of the Kingdom in a more balanced manner at all levels. In addition, developing nursing services within the framework of Vision 2030 will help stabilize the serviced population in their regions without the need to move for treatment to hospitals in major cities. Implementing these strategies could potentially alleviate the demand for healthcare services in the Ministry of Health hospitals located in major urban areas. Furthermore, aside from the points mentioned, enhancing nursing services by fostering the growth of medical services delivered by allied medical teams could serve as a valuable means of support in provision.

A range of subspecialty nurses should be established to bridge the divide, encompassing disciplines such as wound care, hematology, pain management, palliative care, home healthcare, and more. Nonetheless, the count of advanced practice Saudi nurses remains constrained, constituting a fraction of the nursing workforce that is lower than an estimated 5%.[10] Establishing a more advanced nursing program is essential. Enhancing the dispersion of nursing staff through nursing transformation initiatives can broaden and heighten the incentives for delivering care in rural healthcare facilities. Offering inducements such as enhanced educational opportunities and career advancement, subsidies for housing, and addressing safety apprehensions can contribute to rendering rural areas more appealing to nurses. Another directive involves the introduction of Telenursing, which can aid in delivering healthcare and nursing assistance to distant communities, particularly for home-based care and the management of chronic illnesses.[22]

In SA, a few nursing programs and initiatives have already been developed to target necessary improvements in nursing transformation in practice are yet to be apprehended. The need for this shift in focus has become particularly urgent with respect to the selected indicators. With the spatial distribution differences between the total population and health indicators taken into account, it has become essential to reevaluate the planning of healthcare services within the MoH. This is aimed at balancing the growing healthcare demands across various regions in SA. Moreover, nurses at every tier have the potential to significantly contribute to the realization of the objectives set by Vision 2030 in enhancing the healthcare system. This can be achieved through the formulation of a transformation plan.

The evolving terrain of the healthcare system and the shifting demographics of the population necessitate a significant alteration in the system. This involves implementing more inventive nursing transformation initiatives that emphasize delivering care within the community instead of acute care settings. The objective is to establish a continuous care process, empower all healthcare practitioners to utilize their full education, training, and capabilities, and cultivate collaborative interactions among various healthcare disciplines.

Nurses possess the chance to take a pivotal role in reshaping the healthcare system, aiming to establish an environment that is more accessible, characterized by high quality, and centered around value for patients. This is contingent upon the system making the most of this potential. However, in such a situation, it will be necessary to eliminate the restrictions imposed by outdated policies, regulations, and cultural hindrances. This includes addressing issues related to the extent of responsibilities, with a particular focus on advanced practice registered nurses.

Conclusion

Evidently, a discrepancy exists in the spatial arrangement of the overall population and the chosen health indicators, which can potentially impact the efficiency of hospitals, both directly and indirectly. Reconsidering the spatial distribution is required to facilitate optimal use of health services capacity available in public. Diverse categories of subspecialty nurses and advanced practice nurses must be cultivated to bridge the divide in meeting the public's healthcare needs. Nurses at all levels can play a key role in achieving the goals of Vision 2030 for improving the healthcare system by developing a transformation plan.

Acknowledgments

None.

Conflicts of interest

The authors declare no conflicts of interest.

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