The influence of social, demographic and economic factors on fertility trends in Gulf Cooperation Council countries

A longitudinal time trend analysis-1980-2021

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ABSTRACT

الأهداف: تحليل اتجاهات معدل الخصوبة في دول مجلس التعاون الخليجي وارتباطها بالعوامل الاجتماعية والاقتصادية حتى يتمكن صناع السياسات من استخدام نتائج الدراسة لخطط الرعاية الصحية المستقبلية.

المنهجية: تم اختيار إجمالي السكان، ومعدل الوفيات الخام، ومتوسط العمر المتوقع، ومعدل معرفة القراءة والكتابة، ومؤشر التنمية البشرية (HDI)، وتوظيف الإناث، ومعدل البطالة، والتحضر، والناتج المحلي الإجمالي (GDP) للفرد والتضخم كمتنبئات محتملة لاتجاهات معدل الخصوبة الإجمالي. تم جمع البيانات لدراسة العبء العالمي للمرض 2021 وقواعد البيانات الرسمية الأخرى مثل البنك الدولي وبرنامج الأمم المتحدة الإنمائي وعالمنا في البيانات لدول مجلس التعاون الخليجي الستة. تم حساب المتوسط مع الانحراف المعياري والنسبة المئوية للتغير لتقييم اتجاهات معدل الخصوبة الإجمالي وجميع المتغيرات الأخرى من 1980-2021.

النتائج: انخفض معدل الخصوبة في جميع الدول الـ 6 في عام 2021 مقارنة بعام 1980. وسجل أعلى انخفاض في دولة الإمارات العربية المتحدة (75.5%)، بينما كان أدنى انخفاض في الكويت (60.9%). وفي الفترة من 1980 إلى 2021، زاد إجمالي عدد السكان، ومتوسط العمر المتوقع، ومؤشر التنمية البشرية، ومعدل معرفة القراءة والكتابة، والناتج المحلي الإجمالي، والتوسع الحضري، والقوى العاملة النسائية في جميع دول مجلس التعاون الخليجي. ارتبط إجمالي السكان، ومتوسط العمر المتوقع، والتحضر، والقوى العاملة النسائية، والناتج المحلي الإجمالي، ومؤشر التنمية البشرية بشكل سلبي ومعنوي مع معدل الخصوبة الإجمالي (p<0.01). وأظهر معدل معرفة القراءة والكتابة وجود علاقة سلبية وهامة مع معدل الخصوبة الإجمالي في البحرين والكويت والمملكة العربية السعودية وقطر.

الخلاصة: إن معدل الخصوبة الإجمالي آخذ في الانخفاض في دول مجلس التعاون الخليجي. وتشمل الأسباب المعقولة الميل إلى تأجيل الزواج وارتفاع تكاليف المعيشة. تحتاج هذه الاتجاهات والارتباطات إلى تقييمها من قبل صانعي السياسات حتى يتمكنوا من تحديد المجالات ذات الأولوية للتدخلات، وتخصيص الموارد وصياغة الخطط التنموية وفقًا لذلك لضمان التقدم الاستراتيجي للمنطقة.

Objectives: To analyze the fertility rate trends in the GCC countries and their association with socioeconomic factors so that policymakers may use the study findings for future healthcare plans.

Methods: Total population, crude death rate, life expectancy, literacy rate, human development index (HDI), female employment, unemployment rate, urbanisation, gross domestic product (GDP) per capita and inflation were chosen as possible predictors of TFR trends. The data were collected for the Global Burden of Disease 2021 study and other official databases such as the World Bank, the United Nations Development Program and Our World in Data for the 6 Gulf Cooperation Council (GCC) countries. Mean with standard deviation and percentage change was calculated to assess trends of TFR and all other variables from 1980-2021.

Results: The fertility rate declined in all 6 countries in 2021 compared to 1980. The highest decline was found in the United Arab Emirates (75.5%), while the lowest was in Kuwait (60.9%). From 1980-2021, total population, life expectancy, HDI, literacy rate, GDP, urbanisation, and female labor force increased in all GCC countries. The total population, life expectancy, urbanisation, female labor force, GDP and HDI were negatively and significantly correlated with TFR ($p<0.01$). The literacy rate showed a negative and significant correlation with TFR in Bahrain, Kuwait, Saudi Arabia, and Qatar.

Conclusion: The TFR is declining in GCC countries. The plausible causes include the inclination towards postponement of marriages and excessive costs of living. These trends and associations need to be evaluated by policymakers so that they identify priority areas for interventions, allocate resources and formulate developmental plans accordingly to ensure strategic progress of the region.

Keywords: GCC region, total fertility rate, sociodemographic, economic, health policies

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Demographic information about nations is a vital tool utilized to measure and predict population models and sizes and regulate the resources and needs of a specific country or region. The Global Burden of Disease (GBD) 2021 study, revealed that despite the world population almost doubling in the last 5 decades, the global fertility rate has drastically declined to an all-time low.[1] According to the study, the global fertility rate, defined as the number of children born to a woman who was to live to the end of her childbearing years and bear children by age-specific fertility rates of the specified year, has fallen from 4.84 births per woman in 1950 to 2.23 births per woman in 2021, a figure considered to be below the replacement rate.[1,2] Along with mortality rates, total fertility rate (TFR) is an important indicator of population growth rate; understanding these trends is vital for the economic and social development of the countries.[3]

The implications of reduced TFR can have both positive and negative impacts.[4,5] On one hand, some argue that declining fertility rates have beneficial social, economic, and environmental effects, helping to maintain sustainable societies and not exceed the available resources.[6] There is also an improvement in labor force participation, particularly for females, and increased spending on each child's welfare and education as the number of children per family decreases.[7] However, lower fertility rates, coupled with increased life expectancies worldwide, will eventually decline the working force population. At the same time, an increased ageing population will result in social, health, economic and political consequences.[5] The aged individuals require more healthcare, but because of fewer working individuals will support them, the health and social welfare costs will increase. Also, the shrinking workforce will limit technological advancements and innovations. Moreover, different TFRs between countries promote immigration from high TFR countries to lower TFR countries, resulting in political and social friction.[5,8]

In this study, we focus on the Gulf Cooperation Council (GCC) region which includes 6 countries; Bahrain, Kuwait, Oman, Qatar, Saudi Arabia (SA),

and the United Arab Emirates (UAE). The region has undergone remarkable economic, industrial, and social growth in the past few decades due to oil and gas revenues, which have immensely improved the quality of life and health outcomes such as these countries' mortality rates and life expectancy. However, TFR has been steadily declining in the entire GCC region at the same time. In 1950, the TFR was 6.15, 5.21, 7.48, 7.04, 6.84, and 7.14 for Bahrain, Kuwait, Oman, Qatar, SA, and UAE, respectively. However, in 2021, it was reduced to 1.71, 1.13, 2.48, 1.95, 1.44 and 1.90, respectively. Moreover, if the situation remains unchanged, then by 2100, in 13 countries globally, including Saudi Arabia, the TFR is expected to fall below one child per female.[1] This decline has raised alarms for everyone, especially policymakers, making it crucial for us to study the factors that influence the reduced TFR. Despite extensive literature on declining fertility rates, evidence remains scarce regarding possible factors influencing this phenomenon, especially in the GCC region. Therefore, this study aims to explore the impact of various demographic, social and economic factors including total population, crude death rate, life expectancy, literacy rate, female employment, unemployment rate, urbanization, gross domestic product (GDP) per capita and inflation with the total fertility rate in the 6 GCC countries between the period 1980 to 2021. This study is significant as it will provide policymakers with insights regarding the factors behind fertility rates and enable them to formulate effective and sustainable healthcare, family planning, and regional economic policies.

Methods. This longitudinal time trend analysis study was performed in the Department of Physiology, College of Medicine, King Saud University, Riyadh, Kingdom of Saudi Arabia. The main focus of the study is the trends in the total fertility rates of the GCC countries, including Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and UAE, as well as the relationship with various demographic, social, and economic factors. In this study, data were collected for the Global Burden of Disease 2021 study, the World Bank, Our World in Data, and the United Nations Development Program.[1,9-19] The data were complete for almost every variable except literacy rate (data was missing for multiple years for all countries). Moreover, unemployment and female labor force data were available from 1991 onwards, and the human development index (HDI) was available from 1990 onwards for all countries. The variables included for each factor are mentioned (Table 1 & Figure 1), along with the specific source for each dataset.

Table 1 - The demographic, social, and economic factors.

Demographic Factors	Source / References
Total fertility rate (TFR) births per woman	World Bank Database[9]
Total population	World Bank Database[10]
Life Expectancy at Birth (years)	World Bank Database[11]
Crude death rate (CDR) (per 1000)	Our World in Data[12]
Social factors	
Human development index (HDI)	United Nations Development Program[13]
Literacy rate (%)	Our World in Data[14]
Female Labor Force (%)	World Bank Database[15]
Unemployment (% of the total labor force)	World Bank Database[16]
Economic factors	
Gross domestic product (GDP) (US Dollars)	World Bank Database[17]
Inflation, consumer prices (annual %)	World Bank Database[18]
Urbanization (%)	World Bank Database[19]
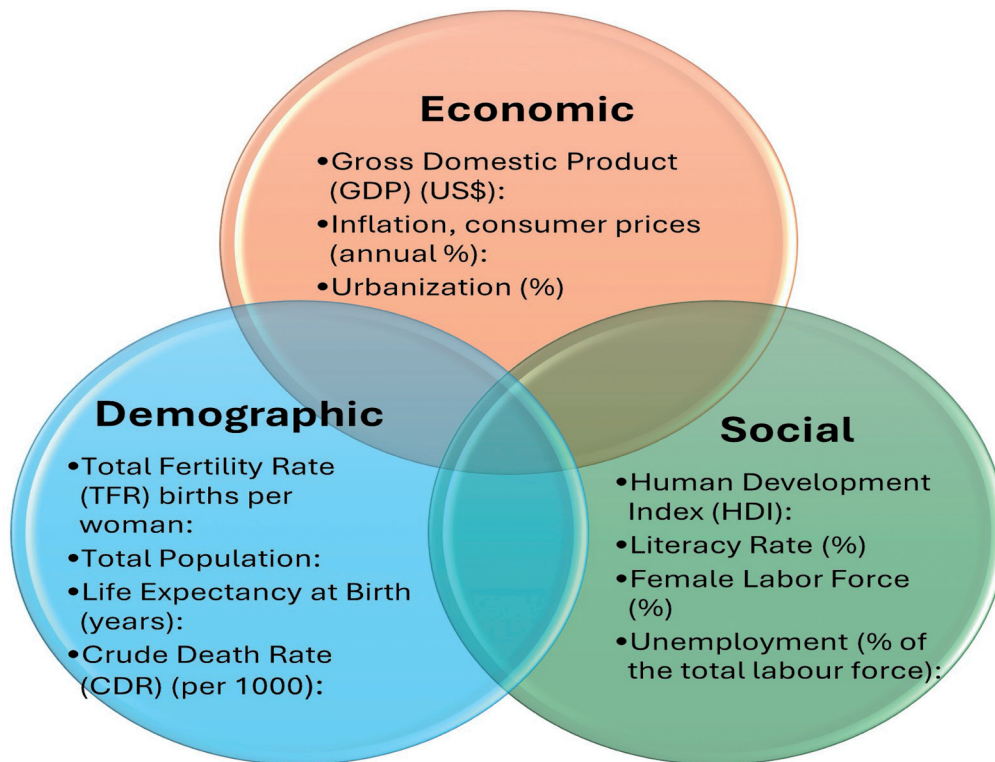
Figure 1 - Summary of the demographic, social, and economic factors.

Statistical analysis. We first reported descriptive analysis for our data. Since all variables were continuous, we calculated the mean and standard deviation for two time periods of 20 years, 1980-2000 and 2001-2021, for a short-period trend analysis. This was followed by a % change of the total 40-year period from 1980 to 2021 to get an overall picture of the change within the focused 40 years. We calculated the percentage change for each variable using the formula % change = [(final-initial)/initial] *100. Since our data was not normally distributed, we opted for Spearman's rank correlation coefficient test to observe the direction and the significance of the correlation between fertility rate (our dependent variable) and the various social, demographic, and economic factors (our independent variables). We also plotted graphs to show the general trend for all variables for each country. All analyses were done using IBM SPSS version 29 and Excel.

Results. *Socioeconomic Factors and TFR Trends in the GCC region from 1980-2021.* **Table 2** summarises the trends for all 6 GCC countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and UAE) from 1980-2021 for all the variables in the form of mean and standard deviation for 2-time-frames (1980 to 2000 and 2001 to 2021) followed by % change for all 40 years. The fertility rate declined in 6 countries in 2021 compared to 1980. The highest decline was in UAE, 75.5%, while the lowest was in Kuwait, 60.9%. From 2001 to 2021, the average number of children were 2.22, 2.34, 2.98, 2.21, 2.94, and 1.84 per woman in Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and UAE, respectively. In comparison, previously, during 1980-2000, the mean number of children per woman for the same countries were 3.73, 3.69, 6.39, 4.21, 5.78, and 4.34, respectively, which was much higher than the current situation. **Figure 2** shows the TFR trends for all 5 countries for 4 decades (**Table 2**).

The social, demographic, and economic trends are summarized in **Table 2** and visualized in **Figure 3**. For the demographic variables, Saudi Arabia had the highest average number of people in the GCC region which was 29,560,402 ±4,741,773. However, the most significant population increase was seen in Qatar (868.9%), with UAE closely following behind (823.5%) in 2021 compared to 1980. Kuwait showed the least increase by 186.5%. Life expectancy increased in all countries, with Bahrain, Kuwait, Qatar, and UAE having an average life expectancy of 78 years, while Saudi Arabia and Oman had an average of 76 years from 2001-2021. Crude death decreased throughout the GCC region, with the most significant decline in Saudi Arabia at 65.5% and Kuwait at 64.5%. In 1980-2000, Saudi had an average of 5.23 deaths per 1000 people while Kuwait's mean was 5.5 deaths per 1000 people, but the situation in both countries improved to an average of 2.73 and 2.68 deaths per 1000 people, respectively, in 2001-2021.

The trends in social factors have also improved in these 4 decades. The human development index (HDI) mean was high for all 6 countries from 2001 to 2021, with the UAE coming on top with an average of 0.85. The rest of the countries followed closely behind. Unemployment, measured as the percentage of the total labor force, was compared between the 2 time periods for each country. In 2001-2021, compared to 1980-2000, the unemployment average increased in Bahrain, Kuwait, and UAE while it decreased in Oman, Qatar, and Saudi Arabia. Qatar nearly halved from a 0.87 average in 1980-2000 to a 0.44 mean in 2001-2021. The female labor force % though, in comparison, increased in all 6 GCC countries from 1980 to 2021, as seen by the means in **Table 2**. As for literacy rate, many missing values were present; however, the mean percent from 2001-2021 for all countries was high: 89.4%, 94.9%, 89.9%, 95%, 92.6% and 95.31% for Bahrain, Kuwait, Oman, Qatar, SA, and UAE, respectively.

The primary economic variable, GDP per capita, increased in all the countries. From 2001 to 2021, Qatar had the highest GDP average of US Dollars 63374.19. However, the highest increase from 1980 to 2021 was seen in Oman, where a rise of 231.8% was seen, while the lowest growth of just 3.1% was observed in the UAE. Inflation, measured by the consumer prices index, declined in all the countries. Bahrain reported the most considerable reduction of 115%, while Saudi Arabia showed the least decline, at 29.6%. Finally, urbanization has increased in all countries. In 2001-2021, the average number of people living in urban areas was 88.8%, 100%, 77.8%, 98.3%, 82.3%, and 84.3% in Bahrain, Kuwait, Oman, Qatar, SA, and UAE, respectively. The most significant increase in urbanization was seen in Oman (83%) from 1980 to 2021.

Correlation Between TFR and various socio-economic factors. Spearmen correlation was carried out to analyze the association between TFR and the other variables for each country. The results are summarized in Table 3, showing the correlation magnitude, direction, and significance in the form of its *p*-value.

The fertility rate with total population and life expectancy showed a negative significant correlation, while the crude death rate was positively and significantly correlated to TFR for all GCC countries. Social variables were more varied. Literacy rate was negatively associated with TFR in all countries, but this observation was only significant in Bahrain, Kuwait, SA, and Qatar. Unemployment yielded a negative and significant correlation in Bahrain, Kuwait, and the UAE, but it showed a significant positive correlation in Oman and Qatar. Human development index and female labor force showed a negative and significant correlation trend in the GCC region, meaning when HDI and labor force were improved, TFR showed a decline. Gross domestic product and urbanization showed a negative correlation trend in all the countries. Inflation showed a positive and considerable influence on TFR in Qatar and UAE.

Amongst all the variables, most of which shared a negative or inverse correlation with TFR, Crude Death Rate showed a positive correlation with TFR in all countries, whereas inflation and unemployment showed mostly a positive correlation too. The strongest magnitude of correlation was observed with the literacy

Table 2 - Summary of descriptive analysis of total fertility rate and sociodemographic variables.

Variables	Country	Mean±Standard deviation		Percentage change
		1980- 2000	2001-2021	1980 to 2021
Total fertility rate (births per woman)	Bahrain	3.73 ±0.65	2.22±0.30	-62.28%
	Kuwait	3.69 ±0.88	2.34±0.23	-60.86%
	Oman	6.39 ± 1.46	2.98±0.26	-67.60%
	Qatar	4.21±0.74	2.21±0.44	-67.33
	Saudi Arabia	5.78±1.02	2.94±0.422	-66.22%
	UAE	4.34±1.05	1.83±0.42	-75.45%
Total population	Bahrain	525646 ±109421	1174661±261470	303.55%
	Kuwait	1771250± 211077	3199362±883259	184.50%
	Oman	1753902±453972	3407556±901898	344.29%
	Qatar	444746±104992	1785051±785418	868.91%
	Saudi Arabia	15907586±3612621	29560402±4741773	253.44%
	UAE	1969123±686977	7248666±2258096	823.54%
Crude death rate (per 1000)	Bahrain	3.17 ± 0.35	2.15±0.22	-35.48%
	Kuwait	5.50 ± 2.38	2.68±0.44	-64.53%
	Oman	2.47±0.32	1.45±0.45	-59.65%
	Qatar	2.38±0.46	2.01±0.38	-17.18%
	Saudi Arabia	5.23±1.48	2.73±0.30	-65.49%
	UAE	2.84±0.46	1.31±0.41	-52.11%
Life expectancy (years)	Bahrain	72.95±1.29	78.33±1.33	11.20%
	Kuwait	74.22±1.89	78.14±1.20	11.84%
	Oman	68.71±3.94	75.72±1.76	20.01%
	Qatar	73.38±1.31	78.31±1.94	11.96%
	Saudi Arabia	68.47±2.99	75.71±1.37	22.71%
	UAE	71.68±1.51	77.95±1.51	14.86%
Literacy rate (%)	Bahrain	76.88±10.08	89.42±4.07	--
	Kuwait	73.47±5.51	94.90±1.20	--
	Oman	--	89.86±5.79	--
	Qatar	79.45±5.39	95.04±2.77	--
	Saudi Arabia	75.09±6.03	92.55±6.59	--
	UAE	--	95.31±4.58	--
Unemployment (% of the total labor force)	Bahrain	1.14±0.08	1.19±0.17	--
	Kuwait	0.76±0.08	1.97±0.65	--
	Oman	4.28±0.09	3.61±0.91	--
	Qatar	0.87±0.00	0.44±0.31	--
	Saudi Arabia	5.96±1.15	5.76±0.56	--
	UAE	1.92±.19	2.62±0.58	--
Urbanization (%)	Bahrain	87.73±0.79	88.81±0.40	4.09%
	Kuwait	97.74±1.02	99.99±0.02	5.51%
	Oman	63.64±8.43	77.75±5.45	83.01%
	Qatar	92.71±2.51	98.28±0.91	11.09%
	Saudi Arabia	75.21±4.33	82.30±1.37	28.31%
	UAE	79.45±0.74	84.26±2.07	8.16%
Labor force – females (%)	Bahrain	31.88 ±2.02	41.54±2.61	--
	Kuwait	42.76 ± 1.33	47.36±1.70	--
	Oman	22.95±0.59	27.39±2.46	--
	Qatar	46.87±1.05	52.51±4.97	--
	Saudi Arabia	15.13±0.80	20.80±4.44	--
	UAE	31.55±1.30	44.78±7.74	--

NB: "Unemployment (%)," "Literacy rate," "Labor force – females (%)' and "Human development index" have unavailable/missing data from 1980 -1990 and therefore data for the 40-year percent change from 1980 to 2021 could not be calculated. The literacy rate for Oman had no data available before 2003, and for United Arab Emirates (UAE), only one value was available from 1980-2000; therefore, no mean was calculated for 1980-2000 for both countries. USD: United States Dollars

Table 2 - Summary of descriptive analysis of total fertility rate and sociodemographic variables (Continuation).

| Variables | Country | Mean±Standard deviation | | Percentage change |
		1980- 2000	2001-2021	1980 to 2021
GDP per capita	Bahrain	8933.25±1202.39	21344.66±4492.20	216.84%
(current USD)	Kuwait	13679.24±3339.13	35251.04±10901.49	68.61%
	Oman	6348.25±792.68	17451.38±5348.95	231.84%
	Qatar	18595.82±4867.35	63374.19±21315.62	136.93%
	Saudi Arabia	8876.70±3136.82	18138.50±5537.25	50.31%
	UAE	29162.98±6505.06	40582.13±5628.26	3.11%
Inflation	Bahrain	1.69±3.50	1.57±1.64	-115.79%
	Kuwait	3.53±3.82	2.87±1.68	-50.72%
	Oman	1.60±4.28	2.07±2.93	-85.00%
	Qatar	3.37±2.25	3.22±5.24	-66.18%
	Saudi Arabia	0.64±2.33	2.43±2.74	-29.55%
	UAE	4.20±2.42	3.20±3.79	-98.02%
Human development	Bahrain	0.74±0.02	0.83±0.04	--
index (HDI)	Kuwait	0.74±0.04	0.81±0.02	--
	Oman	0.70±0.00	0.79±0.04	--
	Qatar	0.78±0.01	0.84±0.02	--
	Saudi Arabia	0.72±0.01	0.81±0.04	--
	UAE	0.75±0.02	0.85±0.05	--

NB: "Unemployment (%)," "Literacy rate," "Labor force – females (%)' and "Human development index" have unavailable/missing data from 1980 -1990 and therefore data for the 40-year percent change from 1980 to 2021 could not be calculated. The literacy rate for Oman had no data available before 2003, and for United Arab Emirates (UAE), only one value was available from 1980-2000; therefore, no mean was calculated for 1980-2000 for both countries. USD: United States Dollars
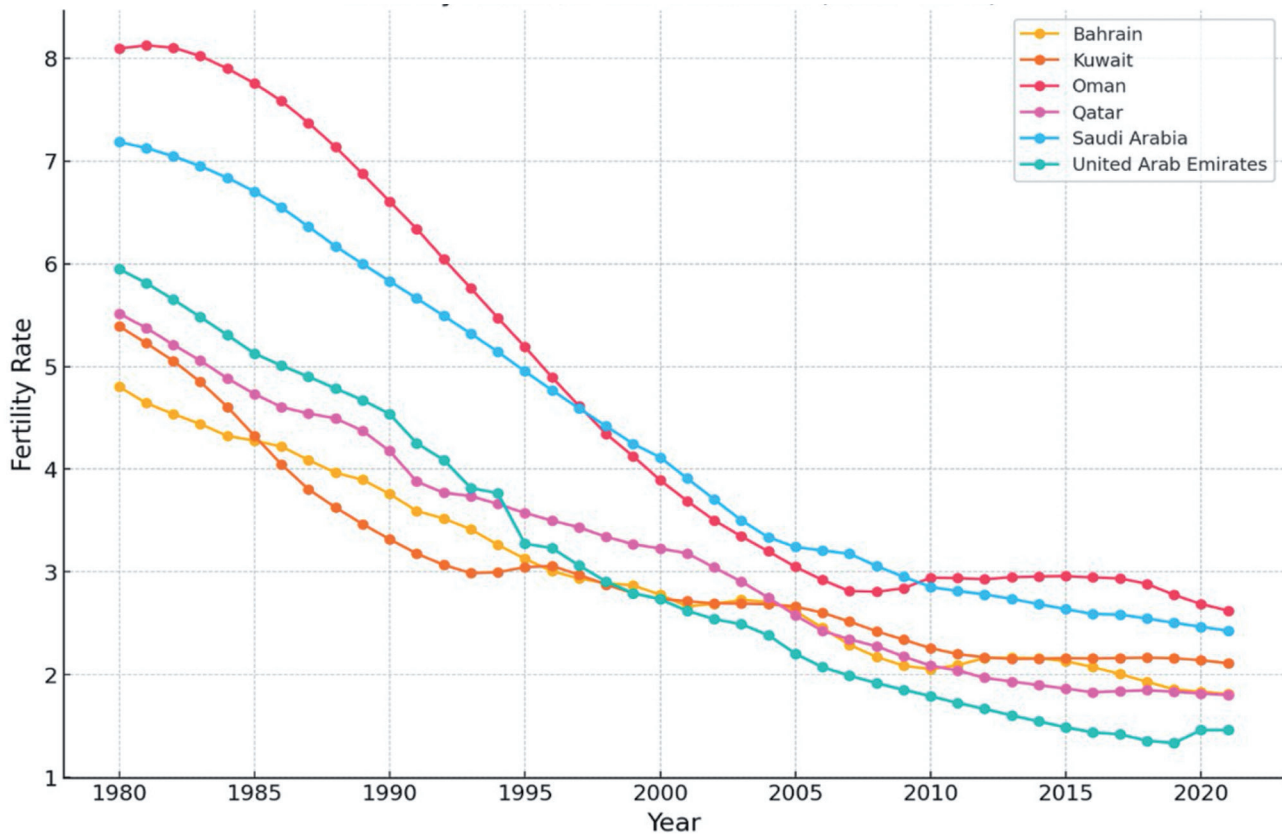
Figure 2 - Total fertility rate from 1980-2021 for Gulf Cooperation Council countries.
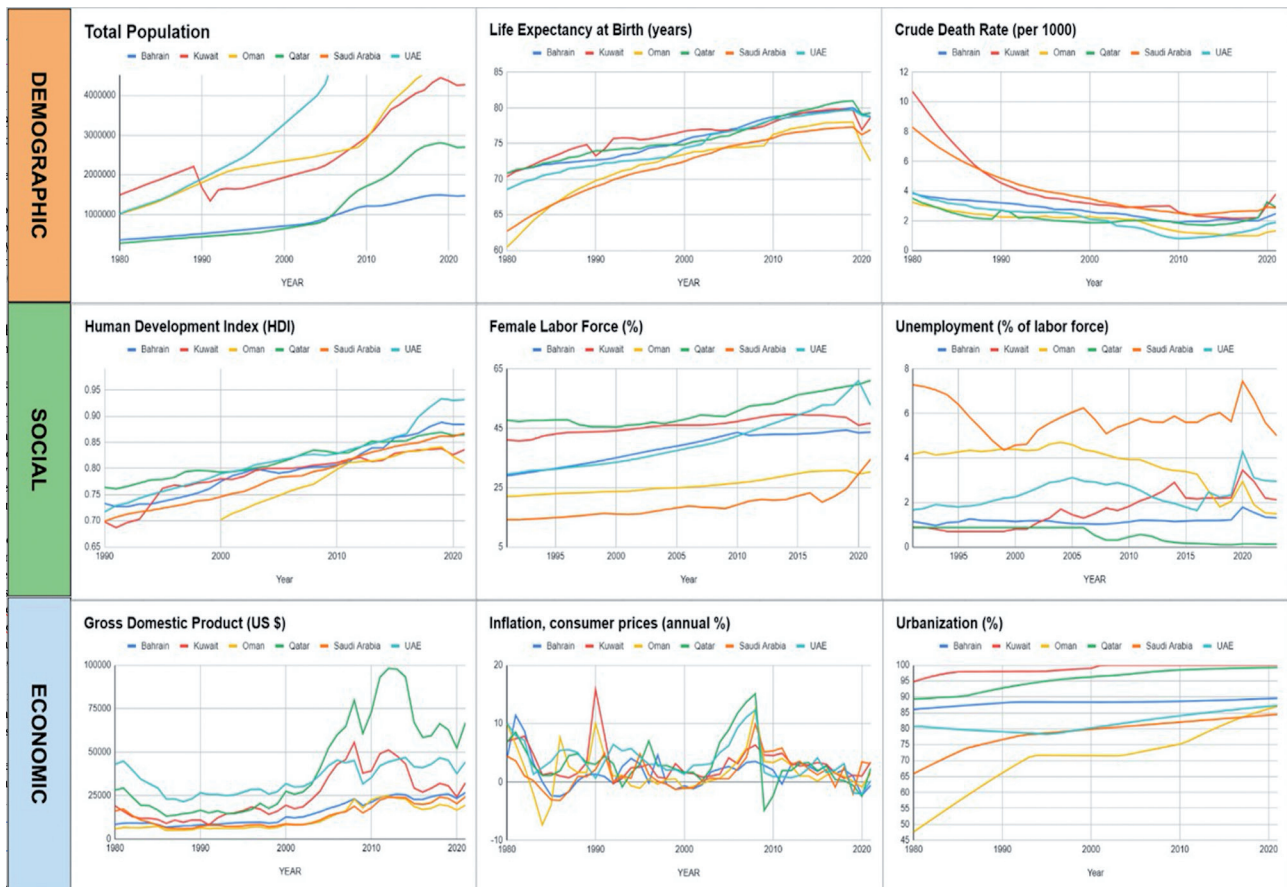
Figure 3 - Total fertility rate from 1980-2021 for Gulf Cooperation Council countries.

rate against TFR in all countries with values nearing -1.00. These results are summarized in Table 3.

Discussion. Over the past several decades, the social and economic structure in the GCC countries has been tremendously reshaped. This region consists of 6 high-income countries that have the largest oil reserves. The revenues generated from this oil export have been heavily invested in infrastructure development, health improvement, and educational programs.[20] In the meantime, however, there has been an alarming decline in fertility rates, which can offset the population structure for the upcoming generations.[1] To address the decline in TFR, it is paramount for governments to understand the various social, economic, and demographic factors that could be the root causes. This study delves into these possible influencing factors, and the results show that total population, life expectancy, HDI, literacy, female labor force and urbanization improved over the last four decades in Bahrain, Kuwait, Oman, Qatar, SA, and UAE, which were negatively correlated with TFR.

Among the people of GCC countries, there has been a change in the perception and attitude regarding early marriages and traditional values about child-bearing.[20,21] Due to technological advancements and globalization, the adoption of the Western ideology of smaller families has become prevalent. However, it is crucial to note that many other factors can be attributed to this change, such as those mentioned in the GBD study as wealth, education, and sociocultural behaviors and practices.[1]

Another factor relevant to the declining TFR in the GCC region is an improved literacy rate. Access to education has been immensely enhanced, and most of the population, particularly females, are more inclined towards higher education.[21] Moreover, the workforce in GCC countries has been dominated by skilled foreign laborers. However, to promote more national workforce participation recently, governments have provided countless incentives for individuals to get highly trained and knowledgeable to compete effectively with foreign laborers.[21-23] They have also increased job opportunities, especially for females.[23] While beneficial

Table 3 - The correlation between fertility rates and sociodemographic variables.

Country	TFR rate x Variable	Correlation coefficient	2-tailed significance level
Bahrain	TFR x Total population	-0.989**	<0.001
	TFR x Crude death rate	0.932**	<0.001
	TFR x Life expectancy	-0.973**	<0.001
	TFR x Literacy rate	-1.000**	<0.001
	TFR x Unemployment	-0.434**	0.012
	TFR x Urbanization (%)	-0.944**	<0.001
	TFR x Labor force - Female	-0.980**	<0.001
	TFR x GDP per capita	-0.909**	<0.001
	TFR x Inflation	0.054	0.736
	TFR x Human development index (HDI)	-0.964**	<0.001
Kuwait	TFR x Total population	-0.864**	<0.001
	TFR x Crude death rate	0.897**	<0.001
	TFR x Life expectancy	-0.957**	<0.001
	TFR x Literacy rate	-0.956**	<0.001
	TFR x Unemployment	-0.934**	<0.001
	TFR x Urbanization (%)	-0.943**	<0.001
	TFR x Labor force - Female	-0.921**	<0.001
	TFR x GDP per capita	-0.811**	<0.001
	TFR x Inflation	0.075	0.639
	TFR x HDI	-0.953**	<0.001
Oman	TFR x Total population	-0.951**	<0.001
	TFR x Crude death rate	0.905**	<0.001
	TFR x Life Expectancy	-0.895**	<0.001
	TFR x Literacy rate	-0.371	0.468
	TFR x Unemployment	0.526**	0.002
	TFR x Urbanization (%)	-0.928**	<0.001
	TFR x Labor force - Female	-0.861**	<0.001
	TFR x GDP per capita	-0.826**	<0.001
	TFR x Inflation	-0.064	0.688
	TFR x HDI	-0.543**	0.009
Qatar	TFR x Total population	-0.996**	<0.001
	TFR x Crude death rate	0.568**	<0.001
	TFR x Life expectancy	-0.987**	<0.001
	TFR x Literacy rate	-1.000**	<0.001
	TFR x Unemployment	0.909**	<0.001
	TFR x Urbanization (%)	-0.999**	<0.001
	TFR x Labor force - Female	-0.829**	<0.001
	TFR x GDP per capita	-0.775**	<0.001
	TFR x Inflation	0.306*	0.049
	TFR x HDI	-0.982**	<0.001

A negative/inverse correlation indicates the increase in one variable with a decrease in the other variable. A positive correlation indicates an increase/decrease of both variables in the same direction. **Correlation significant at p=0.01 (2-tailed), *at 0.05 level (2-tailed).

for the countries' development, one possible downside was the resulting reduced interest of the youth in early marriages and family formations to prioritize work and career opportunities.

Another possible factor is the inclination towards small family sizes. Living costs have risen globally mainly due to economic development, rapid urbanization, and higher living standards.[24] The childcare, child education, housing, food, and other expenditures have skyrocketed, probably causing a preference for fewer children per family. Additionally, due to rising

costs or just a personal desire, there are generally more households now where both parents work. Therefore, they have increased responsibility outside of the house, resulting in them having fewer children.

Total fertility rate is declining in many parts of the world with some regions being more affected than others.[1] If action is not taken urgently, the GCC countries might have to rely more heavily on immigration than they already do, especially from high TFR countries, to sustain the shrinking population. This might result in the nationals becoming minorities within their own

Table 3 - The correlation between fertility rates and sociodemographic variables (Continuation).

Country	TFR rate x Variable	Correlation coefficient	2-tailed significance level
Saudi Arabia	TFR x Total population	-1.000**	<0.001
	TFR x Crude death rate	0.927**	<0.001
	TFR x Life Expectancy	-0.992**	<0.001
	TFR x Literacy rate	-1.000**	<0.001
	TFR x Unemployment	0.004	0.983
	TFR x Urbanization (%)	-1.000**	<0.001
	TFR x Labor Force - Female	-0.979**	<0.001
	TFR x GDP per capita	-0.715**	<0.001
	TFR x Inflation	-0.291	0.062
	TFR x Human development index (HDI)	-1.000**	<0.001
United Arab Emirates	TFR x Total population	-0.996**	<0.001
	TFR x Crude death rate	0.908**	<0.001
	TFR x Life expectancy	-0.997**	<0.001
	TFR x Literacy rate	-0.800	0.200
	TFR x Unemployment	-0.361*	0.046
	TFR x Urbanization (%)	-0.792**	<0.001
	TFR x Labor force - Female	-0.993**	<0.001
	TFR x GDP per capita	-0.605**	<0.001
	TFR x Inflation	0.462**	0.002
	TFR x HDI	-0.994**	<0.001

A negative/inverse correlation indicates the increase in one variable with a decrease in the other variable. A positive correlation indicates an increase/decrease of both variables in the same direction. **Correlation significant at p=0.01 (2-tailed), *at 0.05 level (2-tailed).

countries. Effective policies aimed at increasing fertility rates should be implemented. Obstacles that impede working parents from having more children should be removed. Governments should provide incentives such as better parental leave and covered childcare, including children's education and healthcare. Understanding the root causes is critical to take appropriate action before TFR goes below the replacement level. Also, investing in more evidence-based research to examine distinct factors that could influence fertility is crucial.

Strengths and limitations. Our study limitations include not considering other factors, such as cultural (like personal beliefs about marriage and parenting) or political (such as government policies for family planning), that could influence TFR. We also did not consider other social, economic, and demographic factors, such as correlation with female education specifically. There were also limitations regarding data availability, as there were missing values for some variables. The strength of our study lies in the uniqueness of the topic, as the existing literature on factors influencing TFR is scarce specifically in the GCC region. However, using well-known databases such as the GBD study and World Bank has strengthened our study.

In conclusion, the TFR declined in all 6 countries in 2021 compared to 1980. The highest decline was found in the United Arab Emirates (UAE) while the lowest was in Kuwait. From 1980-2021, the total population, life expectancy, HDI, literacy rate, GDP, urbanization, and female labor force increased in all GCC countries. Moreover, total population, life expectancy, urbanization, female labor force, GDP and HDI were negatively and significantly correlated with TFR. The literacy rate showed a negative and significant correlation with TFR in Bahrain, Kuwait, Saudi Arabia, and Qatar. The potential causes include the inclination towards postponement of marriages and inflated costs of living and children has potentially had a direct impact on social, economic, and demographic factors. This study provides valuable insights into the shifting landscape of fertility trends in the GCC countries. The results of this study may guide healthcare professionals, researchers, and policymakers in the GCC countries to identify priority areas for interventions, allocate resources, and evaluate the impact of health policies and programmes. Additionally, these insights can guide the development of targeted strategies as per the needs of GCC nations.

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