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Trends in Fertility Rate in Iran from 2016 to 2022: A Provincial Analysis

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ABSTRACT

This study analyzes Iran's total fertility rate (TFR) dynamics from 2016-2017 (1395) to 2021-2022 (1400), using provincial-level data from Iran's Statistical Center. Nationally, TFR declined sharply: Iranian-specific fertility fell by 22.2% (from 2.12 to 1.65), while overall fertility (including migrants) decreased by 17.5% (from 2.11 to 1.74). Statistical analyses (ANOVA, Tukey HSD) confirmed significant annual declines ($p<0.001$), with the steepest drops between 1398-1399 for Iranian-specific rates (mean difference=0.489, $p=0.001$). Key findings reveal stark regional disparities: Sistan and Baluchestan maintained Iran's highest TFR (3.65 in 1395 to 3.48 in 1400), contrasting with Tehran (1.64 to 1.26) and Gilan (1.38 to 1.06). Urban provinces exhibited the most pronounced declines (e.g., Alborz: 1.01), while southeastern regions demonstrated resilience. Correlation analyses showed strong interannual consistency (Pearson's $r\geq0.964$, $p<0.001$). Drivers of demographic changes include urbanization, female education, and family planning access. Post-1397 trends reveal cultural and regional influences on women's workforce participation leading to sub-replacement fertility. The median age is projected to rise from 31.2 (1400) to 41.7 (1430), necessitating targeted policies.

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Introduction

The study of socio-economic factors affecting the total fertility rate (TFR) in Iran from 2002 to 2012 indicates that divorce and marriage rates have a notable impact, while urbanization and unemployment play a lesser role. Stable employment is essential for improving fertility rates, and its effects differ by gender. The connection between urbanization and TFR may also depend on education and family planning access, necessitating further exploration of the 2008 financial crisis's impact on these factors (1).

The decline in Iran's fertility rates from the mid-1980s to the late 1990s stemmed from various political, economic, cultural, and policy changes. Following the Islamic Revolution, the government initially promoted larger families, but by 1989, concerns about rapid population growth led to family planning initiatives offering contraceptives and education. These were well-received due to their integration into healthcare with support from religious leaders. Improvements in healthcare in rural areas and women's education influenced families' decisions to have fewer children, alongside altered perceptions of family size due to urbanization and economic strains (2).

Iran's family planning program, which began in the late 1980s and continued until the early 2000s, successfully reduced the fertility rate through innovative methods. The program integrated religious beliefs with family planning, earning public support. Key aspects included religious leader involvement, education by health workers about contraception, and government support in resources and legislation. By 2000, the fertility rate fell to 2.0 births per woman, with a contraceptive use rate

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of 74% (3).
The "Iranian Fertility Transition" from 1986 to 2000, documented by the 2000 Iran Demographic and Health Survey, showed a significant drop in fertility rates, mainly due to increased contraceptive use. This accounted for 61% of the decline, with changing marriage patterns contributing 31%. The study noted trends of younger women delaying childbirth while older women were stopping childbirth altogether (4).
Family planning research in Iran from 1975 to 2012 illustrates that education heavily influences attitudes towards family planning, with increasing attention on men's roles in fertility decisions. Surveys have dominated the research method, showing a clear link between education and improved knowledge and attitudes towards contraception. Women's employment impacts reproductive choices, and a decline in fertility across various demographics demonstrates family planning program success (5). However, there is a gap in research regarding men's contributions and the interplay of different factors, suggesting a need for balanced future studies and policies (6).
Analysis of fertility rates in Iran from 1966 to 2013 focused on the relationship between marriage and women's education. It found that marriage increases fertility, while higher education in women tends to reduce it. Factors such as unemployment, family planning initiatives, and economic policies were explored through descriptive and analytical methods across different provinces. The study suggested promoting marriage and reducing unemployment to increase fertility rates, aligning with existing research on the adverse effects of education on fertility (7).
To decrease the marriage age, it is important to address cultural issues, create job opportunities, ensure economic stability, and manage housing. Job security for women should be emphasized, along with comprehensive childcare and education services for future generations. Research is necessary to review intervention impacts, understand declining fertility trends, and address issues like divorce. Enhancing services in underprivileged areas is crucial for balanced growth, and long-term, evidence-based policies should be implemented, considering cultural and economic aspects (8).
The study conducted by Azmoude et al. assessed how socio-demographic and religious factors affect women's fertility rates in Torbat Heydarieh, Eastern Iran. It found that age, marriage age, and education level have significant effects, influenced by cultural aspects. Although it employed a reliable methodology with a tool for measuring religiosity, the cross-sectional design limited causal conclusions. Higher education correlated with lower fertility, while later marriages led to smaller families. No strong connections were found between fertility and employment status or income, while a positive correlation was identified between religiosity and fertility (9).

The TFR is influenced by a variety of factors categorized under the STEEPH framework. A review of literature analyzed over 9,000 studies, focusing on 220 relevant ones that highlighted trends of increasing and decreasing TFRs. Social influences, particularly education, were found to decrease TFR, while supportive government policies could raise it. The complexity of fertility issues suggests a need for diverse population policies, supported by strong governmental backing and economic stability. Health factors, including access to reproductive technology and infant mortality rates, also significantly impact fertility choices, emphasizing the necessity for tailored interventions (10).
The decline in Total Fertility Rate (TFR) in the Middle East and North Africa (MENA) region from 2000 to 2016 can be attributed to five main factors. These factors include improved healthcare, which has led to a reduction in infant and maternal deaths. Additionally, there have been cultural shifts, including the acceptance of Western ideas, economic pressures affecting decisions about childbearing, increased workforce participation by women, and higher levels of education, particularly among women. Political support for family planning and gender equality has also played a role in this decrease, indicating that policies should prioritize healthcare and education for sustainable population growth (11).
The present study is a comparative analysis of the population residing in Iran, including both immigrants and Iranians, in relation to the overall Iranian population. It examines population changes over the period from 2020 to 2025. The primary goal of this study is to demonstrate that the Iranian population is experiencing a greater decline compared to the total population of Iran, a trend influenced by immigration.

Methods

Literature Search Strategy

A comprehensive review of keywords related to the Iranian fertility rate and the fertility rate of migrated individuals in the country from 1395 to 1400 was conducted. Key terms such as fertility rate, Iran fertility rate, and Iranian fertility rate

were analyzed. This analysis involved searching online databases such as Google Scholar and Scopus to explore relevant scientific literature and resources about fertility rates in Iran.

Data Collection

The data examined included the fertility rate of Iranians and all individuals in Iran, which includes both Iranian citizens and migrants in the country, from 1395 (2016-2017) to 1400 (2021-2022). This information was sourced from the Statistical Center of Iran website at https://amar.org.ir/Portals/0/Statistics/Mizan_Barvari_Ostan_1396-1400-14030105112551.pdf.
The statistics and reports published by the Statistical Center of Iran (12, 13).

Statistical Analysis

In this study, we analyzed the fertility rate of Iranians and all individuals in Iran, including both Iranian citizens and migrants in the country, from 1395 (2016-2017) to 1400 (2021-2022). A descriptive study was initially conducted using data from the Iran Statistics Center. Subsequently, we explored the correlation and mean comparison among the fertility rates of Iranians and all individuals in Iran, which includes both Iranian citizens and migrants in the country, from 1395 (2016-2017) to 1400 (2021-2022). Statistical software SPSS v22 was used for these analyses. The Kolmogorov-Smirnov test was employed to assess data distribution, and the Pearson correlation test was used to examine relationships between the data. Finally, we used ANOVA and Multiple Comparisons Tukey HSD for mean comparison of fertility rates of provinces among study years from 1395 (2016-2017) to 1400 (2021-2022). We utilized Independent Samples T Test of the Fertility Rate of Iranians against the All of Iran fertility rate (14).

Result

Fertility Rate of Iranians

Iran's total fertility rate (TFR) significantly dropped from 2.12 in 1395 to 1.65 in 1400, marking a 22.2% decline over six years. This rate has stabilized at 1.65 for the past two years, reflecting a shift to sub-replacement fertility levels. In provincial comparisons, Sistan and Baluchestan had the highest TFR at 3.65 in 1395, later decreasing to 3.29 by 1400. South Khorasan maintained a resilient rate from 2.83 to 2.37, while Razavi Khorasan remained steady at 2.00.
Tehran and Isfahan experienced the sharpest declines, with Isfahan decreasing from 1.81 to 1.36 and Tehran from 1.64 to 1.26. Alborz saw a drastic decline to 1.01, highlighting urban saturation. The lowest fertility rates were recorded in Semnan (1.07), Gilan (1.06), and Mazandaran (1.10), with Qazvin (1.44) and Kermanshah (1.51) also showing sub-replacement trends.
In West Azerbaijan, the TFR fell from 2.31 to 1.89, while Kohgiluyeh and Boyerahmad experienced a steep drop from 2.38 to 1.60. In contrast, Golestan saw a slight increase from 1.99 to 2.04. The overall decline across all provinces indicates a national trend toward lower birth rates, with border provinces having higher rates than urban centers.
These trends signify important demographic shifts, suggesting an aging population and requiring new strategies to address economic sustainability and social changes. The statistics from Iran's Statistical Center highlight ongoing challenges and the urgent need for comprehensive planning to adapt to these demographic realities (Table 1 and Figure 1) (12).

The fertility rate in Iran

Between 1395 and 1400, Iran saw a significant decrease in its total fertility rate (TFR), dropping from 2.11 to 1.74, a decline of 17.5%. The most notable drop occurred from 1397 to 1398, where the rate fell from 1.97 to 1.77. This decrease is likely linked to economic sanctions and urbanization. Fertility rates varied regionally; for instance, West Azerbaijan had a high rate of 2.31 in 1395 but only fell slightly to 1.89 by 1400. In contrast, Sistan and Baluchestan started with a TFR of 3.65, decreasing to 3.48, while Gilan's rate dropped significantly from 1.38 to 1.06, indicating below-replacement levels.
High fertility in Sistan and Baluchestan reflects traditional social structures and low female education. Provinces like South Khorasan and Razavi Khorasan began at TFRs of 2.83 and 2.62, respectively, still above replacement levels. Gilan's low TFR continues its downward trend since 1397, raising concerns about demographic stability. Tehran's fertility also fluctuated from 1.68 to 1.43 amid economic pressures. Provinces like Kohgiluyeh and Boyerahmad, Ardabil, and Alborz showed significant declines, indicating shifting family structures, while West Azerbaijan and Khuzestan maintained more stable rates, likely due to stronger family ties and less urban migration.
There were strange anomalies, such as an unexpected increase in Sistan and Baluchestan's TFR in 1399, possibly linked to seasonal labor migration. Fars experienced a slight increase due to potential provincial pronatalist policies. A geographical divide is evident; northwest provinces have lower fertility rates compared to the southeast, with Caspian provinces having a TFR as low as 1.09 and eastern provinces around 2.95. This divide underscores regional inequalities, with areas like Sistan and Baluchestan having rates over three times those of Gilan.
Projections indicate a rising median age in Iran, from 31.2 in 1400 to 41.7 by 1430, further entrenching inequalities. Action to address regional fertility disparities through culturally appropriate family planning is necessary for sustainable growth. Overall, the data from 1395 to 1400

highlights shifting reproductive behaviors driven by socio-economic, cultural, and demographic changes, which necessitate targeted policy responses (Table 1 and Figure 1) (15).

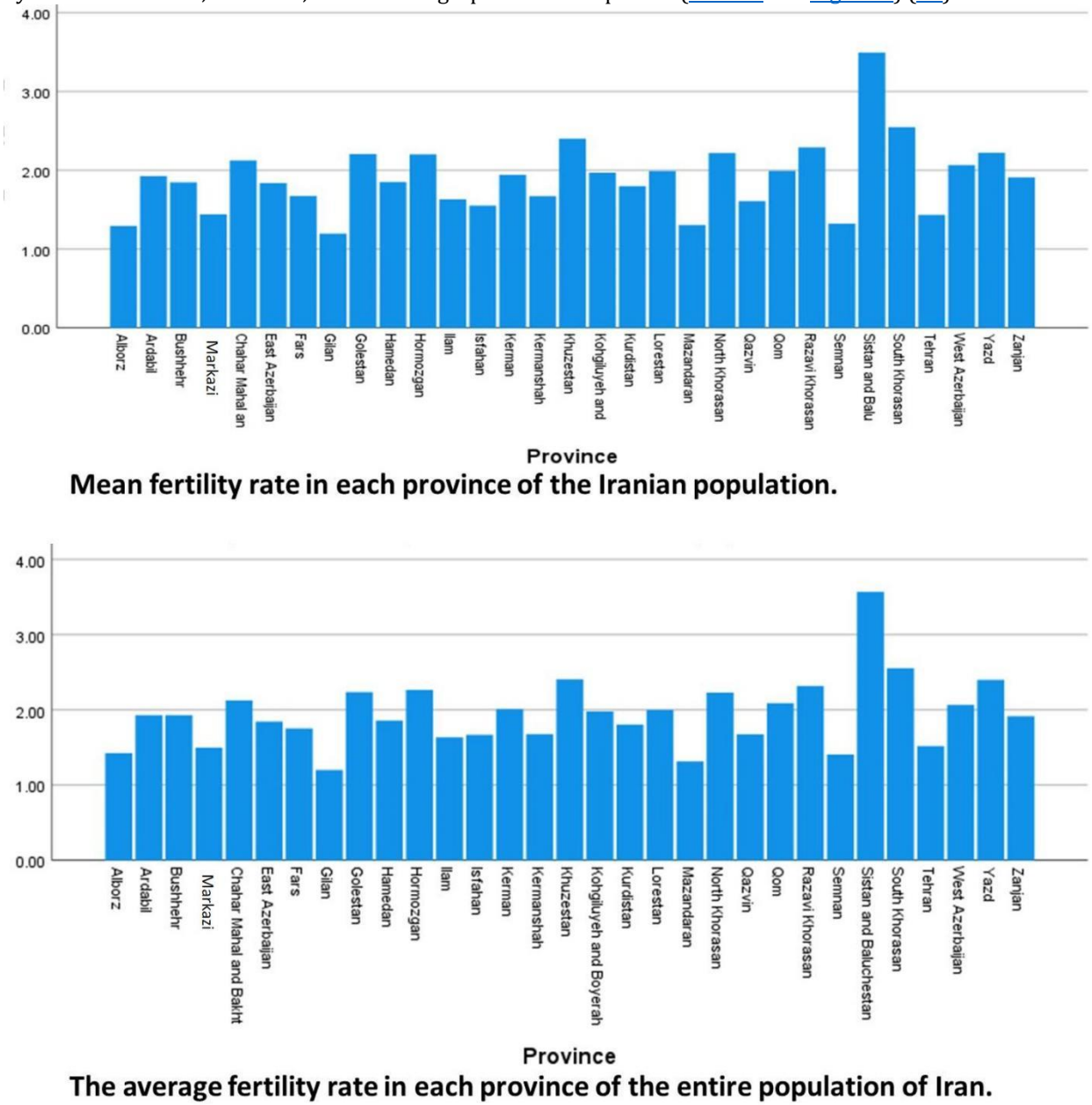

Figure 1. Mean fertility rate in each province of Iran from 2016 to 2022.

Table 1. The fertility rate of Iranians, compared to the entire population of Iran, varied in each province from 1395 to 1400. Data was sourced from the Iran Statistical Center.

	Total Fertility Rate of Iranians						The fertility rate in Iran					
Years	1395	1396	1397	1398	1399	1400	1395	1396	1397	1398	1399	1400
All of IRAN	2.12	2.09	1.95	1.74	1.65	1.65	2.11	2.07	1.97	1.77	1.71	1.74
East Azerbaijan	2.10	2.07	1.92	1.71	1.61	1.62	2.10	2.07	1.92	1.71	1.65	1.62
West Azerbaijan	2.31	2.25	2.12	1.94	1.89	1.89	2.31	2.24	2.12	1.93	1.91	1.89
Ardabil	2.20	2.15	2.05	1.83	1.68	1.65	2.20	2.15	2.05	1.82	1.73	1.64
Isfahan	1.81	1.77	1.64	1.41	1.32	1.36	1.88	1.86	1.74	1.52	1.49	1.52
Alborz	1.58	1.59	1.40	1.18	1.01	1.01	1.63	1.67	1.52	1.32	1.19	1.22
Ilam	1.79	1.81	1.74	1.54	1.45	1.46	1.79	1.81	1.73	1.53	1.50	1.45
Bushhehr	2.22	2.14	1.97	1.68	1.56	1.51	2.25	2.18	2.03	1.76	1.71	1.66
Tehran	1.64	1.64	1.51	1.33	1.23	1.26	1.68	1.70	1.60	1.44	1.27	1.43
Chahar Mahal and Bakhtiari	2.47	2.38	2.23	1.97	1.87	1.83	2.46	2.38	2.23	1.97	1.91	1.82
South Khorasan	2.83	2.76	2.58	2.41	2.34	2.37	2.83	2.75	2.59	2.41	2.36	2.39
Razavi Khorasan	2.64	2.59	2.40	2.12	2.00	2.00	2.62	2.60	2.42	2.15	2.06	2.05
North Khorasan	2.50	2.45	2.24	2.10	2.01	2.02	2.50	2.45	2.24	2.10	2.07	2.02
Khuzestan	2.55	2.62	2.56	2.29	2.16	2.23	2.54	2.61	2.56	2.29	2.21	2.23
Zanjan	2.15	2.14	1.99	1.79	1.69	1.70	2.15	2.14	1.99	1.79	1.73	1.70
Semnan	1.59	1.55	1.41	1.21	1.11	1.07	1.63	1.61	1.48	1.29	1.22	1.21
Sistan and Baluchestan	3.65	3.65	3.46	3.30	3.62	3.29	3.65	3.66	3.53	3.40	3.70	3.48
Fars	1.93	1.89	1.74	1.53	1.52	1.43	1.95	1.93	1.80	1.61	1.66	1.57
Qazvin	1.86	1.83	1.67	1.47	1.39	1.44	1.88	1.87	1.72	1.54	1.50	1.54
Qom	2.37	2.26	2.11	1.82	1.66	1.74	2.39	2.32	2.21	1.95	1.79	1.88
Kurdistan	2.01	2.01	1.87	1.66	1.59	1.66	2.01	2.01	1.87	1.66	1.62	1.66
Kerman	2.26	2.14	2.02	1.81	1.71	1.72	2.27	2.16	2.06	1.88	1.83	1.86
Kermanshah	1.89	1.86	1.71	1.55	1.51	1.51	1.89	1.86	1.71	1.55	1.55	1.51
Kohgiluyeh and Boyerahmad	2.38	2.22	2.11	1.81	1.70	1.60	2.38	2.22	2.12	1.81	1.74	1.61
Golestan	2.45	2.46	2.27	2.03	1.99	2.04	2.46	2.46	2.30	2.06	2.06	2.08
Gilan	1.38	1.35	1.26	1.10	1.03	1.06	1.38	1.35	1.26	1.10	1.06	1.06
Lorestan	2.26	2.18	2.08	1.87	1.80	1.76	2.26	2.18	2.08	1.87	1.85	1.76
Mazandaran	1.53	1.50	1.39	1.21	1.10	1.10	1.53	1.51	1.39	1.22	1.13	1.11
Markazi	1.74	1.68	1.51	1.28	1.23	1.21	1.76	1.72	1.56	1.34	1.33	1.29
Hormozgan	2.56	2.44	2.26	2.09	1.94	1.93	2.58	2.46	2.31	2.16	2.05	2.04
Hamedan	2.15	2.05	1.91	1.71	1.64	1.65	2.15	2.05	1.91	1.71	1.69	1.65
Yazd	2.63	2.55	2.32	2.01	1.90	1.93	2.69	2.67	2.47	2.20	2.15	2.22

Descriptive study

The descriptive statistics for the total fertility rate of Iranians from 1395 to 1400 indicate a declining trend, with the means decreasing from 2.1734 in 1395 to 1.6781 in 1400. The standard deviations remain stable, indicating low variability across the years. The Kolmogorov-Smirnov tests show normal distribution of data for fertility rate , with Asymp. Sig. values consistently above 0.05. Percentiles demonstrate a steady decline in fertility rates, with maximum values generally exceeding 3.5, while the minimum values reflect lower rates. In 1395, the 25th, 50th, and 75th percentiles were 1.8225, 2.1750, and 2.4650, respectively, with similar patterns observed in subsequent years. Overall, the data signify a gradual reduction in fertility rates among Iranians throughout the evaluated period, reflecting notable demographic changes in the population. This trend may have implications for future population dynamics and policies affecting family planning and reproductive health in Iran (Table 2).

Table 2. Results of Data Distribution and Descriptive Statistics

Variables	Year	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles			One-Sample Kolmogorov-Smirnov Test	
							25th	50th (Median)	75th	Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
Total Fertility Rate of	1395	32	2.1734	.45717	1.38	3.65	1.8225	2.1750	2.4650	0.516	0.953
	1396	32	2.1272	.45088	1.35	3.65	1.8150	2.1400	2.4250	0.582	0.887
	1397	32	1.9812	.43745	1.26	3.46	1.6800	1.9800	2.2375	0.556	0.916
	1398	32	1.7656	.43376	1.10	3.30	1.4850	1.7650	2.0000	0.64	0.807
	1399	32	1.6847	.48318	1.01	3.62	1.4050	1.6550	1.8975	0.886	0.412
	1400	32	1.6781	.44731	1.01	3.29	1.4325	1.6500	1.9200	0.653	0.787
The fertility rate in Iran	1395	32	2.1847	.45120	1.38	3.65	1.8800	2.1750	2.4600	0.416	0.995
	1396	32	2.1475	.44415	1.35	3.66	1.8600	2.1450	2.4325	0.594	0.872
	1397	32	2.0153	.43718	1.26	3.53	1.7225	2.0100	2.2375	0.531	0.941
	1398	32	1.8081	.43381	1.10	3.40	1.5325	1.7800	2.0375	0.591	0.876
	1399	32	1.7634	.47963	1.06	3.70	1.5000	1.7200	2.0150	0.771	0.591
	1400	32	1.7472	.45400	1.06	3.48	1.5125	1.6600	1.9875	0.716	0.685

Pearson Correlation Analysis of Iran and Iranian Fertility Rates from 1395 to 1400

The analysis of Iranian fertility rates from 1395 to 1400 in the Persian calendar shows strong correlations across these years. Most correlations are very high, with a peak of r = .999 between 1395 and 1396, and the lowest correlation of r = .964 between 1395 and 1400. All 66 pairwise correlations have significant p-values (.000), confirming their reliability. The sample size of N = 32 enhances the accuracy of the findings.

As time progresses, the strength of these correlations decreases slightly. For instance, adjacent years like 1399-1400 have very high correlations ($r \geq .984$), while correlations over five years still show significance at r = .964. This indicates that despite minor demographic changes, the overall fertility rate patterns remain stable and predictable.

The consistent mean correlation of r = .983 suggests that fertility rates are closely linked, which can help improve demographic forecasting and resource allocation for maternal and child healthcare. The analysis indicates that fertility rates are influenced by various external factors like economic conditions and education trends, which should be explored in future research. Policymakers can use these insights for planning and managing health services in response to demographic changes effectively (Table 3).

Table 3. Pearson Correlation Analysis of Iran and Iranian Fertility Rates from 1395 to 1400

	Variables		The fertility rate in Iran						Fertility Rate of Iranians.				
	Year		1400	1399	1398	1397	1396	1395	1400	1399	1398	1397	1396
Fertility Rate of Iranians.	1395	Pearson Correlation	.964**	.968**	.985**	.990**	.993**	.999**	.965**	.962**	.982**	.990**	.995**
		Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	32	32	32	32	32	32	32	32	32	32	32
	1396	Pearson Correlation	.978**	.980**	.993**	.996**	.997**	.993**	.980**	.975**	.991**	.997**	
		Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
		N	32	32	32	32	32	32	32	32	32	32	

1397	Pearson Correlation	.974**	.978**	.991**	.995**	.991**	.987**	.983**	.978**	.995**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	32	32	32	32	32	32	32	32	32
1398	Pearson Correlation	.978**	.984**	.992**	.987**	.983**	.978**	.993**	.990**	
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
	N	32	32	32	32	32	32	32	32	
1399	Pearson Correlation	.980**	.994**	.984**	.971**	.967**	.958**	.991**		
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
	N	32	32	32	32	32	32	32		
1400	Pearson Correlation	.984**	.983**	.985**	.975**	.971**	.961**			
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000			
	N	32	32	32	32	32	32			
1395	Pearson Correlation	.967**	.968**	.985**	.991**	.994**				
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000				
	N	32	32	32	32	32				
1396	Pearson Correlation	.981**	.978**	.993**	.997**					
	Sig. (2-tailed)	0.000	0.000	0.000	0.000					
	N	32	32	32	32					
1397	Pearson Correlation	.982**	.980**	.995**						
	Sig. (2-tailed)	0.000	0.000	0.000						
	N	32	32	32						
1398	Pearson Correlation	.992**	.991**							
	Sig. (2-tailed)	0.000	0.000							
	N	32	32							
1399	Pearson Correlation	.990**								
	Sig. (2-tailed)	0.000								
	N	32								

The fertility rate in Iran

Iranian Fertility Rate Comparison Among Studied Years 1395-1400

The analysis of Iranian fertility rates from 1395 to 1400 shows a significant decline, with rates dropping from 2.1752 to 1.6790, a 22.8% decrease over five years. This decline is statistically significant, with a notable drop occurring between 1398 and 1399. The mean difference during this period was 0.48935, indicating a key time of decline. Other reductions were observed between 1398-1400 and 1395-1398, with mean differences of 0.49613 and 0.40871, respectively. In terms of fertility clustering, the years 1399 and 1400 had a low fertility average of about 1.68, while 1395 and 1396 showed a higher average near 2.15. The years 1397 and 1398 served as a transitional phase. The data displayed consistency, with standard deviations between 0.44 and 0.49, indicating robust statistical validity for analysis. The decline in fertility rates suggests a significant demographic shift in Iran, likely influenced by external factors like economic changes or shifts in social practices. Researchers express concern that by 1402, the total fertility rate could fall below replacement levels. The study raises questions about the socioeconomic factors driving this decline, including urbanization, increased education for women, and delayed marriages (Tables 4, 5, 6).

Table 4. Iranian Fertility Rate Comparison Among Studied Years 1395-1400 (ANOVA)

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	7.661	5	1.532	7.262	.000
Within Groups	37.978	180	.211		
Total	45.639	185			

*. The mean difference is statistically significant at the 0.05 level.

Table 5. shows the comparison of Iranian fertility rates among the studied years 1395-1400 using multiple comparisons by Tukey HSD.

Multiple Comparisons by Tukey HSD (Dependent Variable: Fertility Rate)

(I) Years	*(J) Years*	*Mean Difference (I-J)*	*Std. Error*	*Sig.*	*95% Confidence Interval*	
					Lower Bound	*Upper Bound*
1395	*1396*	*0.04677*	*0.11667*	*0.999*	*-0.2893*	*0.3829*
	1397	*0.1929*	*0.11667*	*0.564*	*-0.1432*	*0.5290*
	1398	*.40871**	*0.11667*	*0.008*	*0.0726*	*0.7448*
	1399	*.48935**	*0.11667*	*0.001*	*0.1533*	*0.8254*
	1400	*.49613**	*0.11667*	*0.000*	*0.1600*	*0.8322*
1396	*1397*	*0.14613*	*0.11667*	*0.810*	*-0.1900*	*0.4822*
	1398	*.36194**	*0.11667*	*0.027*	*0.0258*	*0.6980*
	1399	*.44258**	*0.11667*	*0.003*	*0.1065*	*0.7787*
	1400	*.44935**	*0.11667*	*0.002*	*0.1133*	*0.7854*
1397	*1398*	*0.21581*	*0.11667*	*0.437*	*-0.1203*	*0.5519*
	1399	*0.29645*	*0.11667*	*0.118*	*-0.0396*	*0.6325*
	1400	*0.30323*	*0.11667*	*0.103*	*-0.0329*	*0.6393*
1398	*1399*	*0.08065*	*0.11667*	*0.983*	*-0.2554*	*0.4167*
	1400	*0.08742*	*0.11667*	*0.975*	*-0.2487*	*0.4235*
1399	*1400*	*0.00677*	*0.11667*	*1.000*	*-0.3293*	*0.3429*

**. The mean difference is statistically significant at the 0.05 level.*

Table 6. displays the Tukey HSD, showing the means for groups in homogeneous subsets. It uses the Harmonic Mean Sample Size of 31 for the Fertility Rate of Iranians.

Tukey HSD (Fertility Rate of Iranians)			
Years	N	Subset for alpha = 0.05	
		1	2
1400	31	1.6790	
1399	31	1.6858	
1398	31	1.7665	
1397	31	1.9823	1.9823
1396	31		2.1284
1395	31		2.1752
Sig.		.103	.564

Iran Fertility Rate Comparison Among Studied Years 1395-1400

The analysis of Iranian fertility rates from 1395 to 1400 in the Persian calendar shows significant changes over these years. ANOVA results indicate a notable variance in fertility rates, with a significant F value of 5.791 and a p-value less than 0.001. The mean fertility rates declined from 2.1871 in 1395 to 1.7474 in 1400, with a particularly significant drop to 1.8094 in 1398. Tukey HSD tests revealed significant differences in fertility rates, especially in 1398 compared to 1395 and 1396, indicating a robust decline. The fertility rates continued to decrease from 1399 to 1400, reflecting ongoing trends. A 12.4% drop in rates from 1397 to 1400 suggests behavioral changes influenced by socioeconomic policies. The analysis highlights two distinct fertility regimes before and after 1398, confirmed by a strong negative correlation in trends (Tables 7, 8, 9).

Table 7. Comparison of Fertility Rates in Iran Among Studied Years 1395-1400 (ANOVA)

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	6.062	5	1.212	5.791	.000
Within Groups	37.687	180	.209		
Total	43.750	185			

*. The mean difference is statistically significant at the 0.05 level.

Table 8. shows a comparison of Iran's fertility rate among the studied years 1395-1400 using the Tukey HSD method for multiple comparisons

Multiple Comparisons Tukey HSD (Dependent Variable: Fertility Rate)						
(I) Years	(J) Years	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1395	1396	0.0371	0.11622	1.0000	-0.2977	0.3719
	1397	0.17032	0.11622	0.6870	-0.1645	0.5051
	1398	.37774*	0.11622	0.0170	0.0429	0.7125
	1399	.42194*	0.11622	0.0050	0.0871	0.7567
	1400	.43968*	0.11622	0.0030	0.1049	0.7745
1396	1397	0.13323	0.11622	0.8610	-0.2016	0.4680
	1398	.34065*	0.11622	0.0440	0.0058	0.6754
	1399	.38484*	0.11622	0.0140	0.0500	0.7196
	1400	.40258*	0.11622	0.0090	0.0678	0.7374
1397	1398	0.20742	0.11622	0.4780	-0.1274	0.5422
	1399	0.25161	0.11622	0.2590	-0.0832	0.5864
	1400	0.26935	0.11622	0.1920	-0.0654	0.6042
1398	1399	0.04419	0.11622	0.9990	-0.2906	0.3790
	1400	0.06194	0.11622	0.9950	-0.2729	0.3967
1399	1400	0.01774	0.11622	1.0000	-0.3171	0.3525

*. The mean difference is statistically significant at the 0.05 level.

Table 9. displays the means for groups in homogeneous subsets using the Harmonic Mean Sample Size of 31 for the Fertility Rate in Iran.

Tukey HSD (Fertility Rate)			
Years	N	Subset for alpha = 0.05	
		1	2
1400	31	1.7474	
1399	31	1.7652	
1398	31	1.8094	
1397	31	2.0168	2.0168
1396	31		2.1500
1395	31		2.1871
Sig.		.192	.687

The Fertility Rate of Iranians Compared to the Rest of Iran

Levene's test confirms homogeneity of variances with F = 0.104 (p = .747), validating the t-test results. The independent samples t-test shows no statistically significant difference in Iranian fertility rates, with a test statistic of t (382) = -0.862 and p-value = .389. This indicates that the mean difference of -0.04266 is not significant. The 95% confidence interval of [-0.13995, 0.05464] crosses zero, supporting the lack of a meaningful difference between the groups being compared, such as demographic subgroups within Iran. The sample size (df = 382) is adequate for detecting effects, adding confidence to the null result. Effect size measures like Cohen's d would enhance the analysis. Summary statistics highlight that observed differences in fertility rates are negligible and not meaningful across the population (Table 10).

Table 10. Independent Samples T-Test: The Fertility Rate of Iranians Compared to the Rest of Iran

Levene's Test for Equality of Variances		t-test for Equality of Means						
F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
.104	.747	-.862	382	.389	-.04266	.04948	-.13995	.05464

Discussion

The total fertility rate (TFR) in Iran has significantly dropped from 2.12 in 1395 to 1.65 in 1400, marking a 22.2% decrease for Iranians and a 17.5% decrease overall. The most significant decline was observed between 1398 and 1399, with the largest national drop occurring from 1397 to 1398. Southeastern regions generally have higher fertility rates, while the northwest, including Gilan with a rate of 1.06, shows sub-replacement levels. Analysis from 2002 to 2022 highlights this decline, impacted by socio-economic, cultural, and policy factors, with TFR dropping below the replacement level of 2.1.

Regional differences are stark; provinces such as Sistan and Baluchestan have high fertility rates (3.65 to 3.29), whereas urban areas like Tehran (1.26), Alborz (1.01), and Gilan (1.06) exhibit critically low rates, significantly affected by urbanization, women's education, and economic pressures. Factors contributing to the decline include later marriages and increased female education, simultaneously influencing up to 31% of the decrease. Economic issues, particularly unemployment and sanctions during 2018-2019, intensified this decline, with job security impacting men and women differently. The effective family planning policies from 1989 to 2000, which raised contraceptive use to 74%, required further reinforcement after 2016 due to the decline in TFR.

Statistical tests, including ANOVA and Tukey HSD, confirmed the significance of yearly declines with $p<0.001$, particularly sharp declines between 2018-2019. No substantial variance was detected between "Iranian-only" and "national" TFRs, indicating a unified trend across the country. Several factors contribute to the decline in fertility rates. Economic issues such as sanctions and rising unemployment, particularly in Tehran, where TFR fell from 1.64 to 1.26, have impacted decisions on having children. Sociocultural changes, including increased female education, delayed marriages, and urbanization, also led to lower birth rates. Family planning initiatives introduced after 1989 played a vital role in improving access to contraceptives and reducing TFR (16).

Looking ahead, the median age in Iran is projected to rise significantly from 31.2 in 1400 to 41.7 by 1430, leading to an aging population. While eastern provinces may face demographic pressure, western regions could experience economic stagnation due to lower fertility (15).

To tackle these issues, targeted policies in areas with high TFR, such as Sistan and Baluchestan, are recommended, alongside initiatives to foster job security, particularly for women. There are gaps in research that need addressing, especially regarding men's roles in fertility decisions and the impact of climate on births and agriculture.

Understanding Iran's fertility trends involves recognizing historical programs from the late 1980s that greatly influenced reproductive decisions. Studies highlight the importance of marriage rates and women's education, indicating that stable employment can boost fertility but showing fewer effects from urbanization. Family planning efforts have been successful, serving as a model for other developing nations, reducing rates due to strategic contraceptive introduction and cultural consideration (1-5).

Limitations

This study primarily relies on publicly available statistical data, which may be subject to reporting biases or inconsistencies. The cross-sectional nature of the data limits the ability to establish causal relationships between socio-economic factors and fertility trends. Additionally, the analysis does not account for qualitative factors such as cultural attitudes towards family size or personal reproductive choices, which could influence fertility rates. Future research should incorporate longitudinal data and qualitative assessments to provide a more comprehensive understanding.

Policy Recommendations

To address the declining fertility rates in Iran, targeted regional policies are essential. In high-fertility areas like Sistan and Baluchestan, efforts should focus on expanding reproductive health education and family support services. In urban zones with critically low fertility, such as Tehran, Alborz, and Gilan, policies should aim to improve economic stability and provide incentives for childbearing, including financial support, childcare subsidies, and tax benefits for parental leave.

Conclusions

Challenges persist in managing perceptions about child-rearing and economic insecurity. Policymakers must adopt evidence-based strategies that take into account cultural and economic conditions affecting reproductive choices. Continuous research is crucial in addressing fertility trends and developing localized interventions suitable for Iran's unique

socio-economic climate.

Policy recommendations include implementing immediate regional interventions targeting high-fertility areas by expanding reproductive education. For low-fertility urban zones, providing financial incentives for childcare and tax benefits for parental leave is recommended. Additionally, economic measures like a "Family Economic Security Voucher" for low-income households with children under five are proposed, along with initiatives to provide financial support to young women.

Long-term strategies involve integrating fertility education into school curricula and reforming marriage laws to reduce the average marriage age. Establishing a national fertility observatory will facilitate real-time tracking of Total Fertility Rate (TFR) and enable predictive modeling for policy adjustments. Funding for studies on environmental influences on fertility is also crucial.

Ethical Considerations

As this is a review article, ethical approval is not applicable.

Informed Consent

Since this study does not involve sampling from individuals but rather presents and interprets publicly available data from the Statistical Center of Iran, informed consent was not required.

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Author Contributions

All work related to this study was conducted by Roohollah Yousefi.

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Conflict of Interest

There are no conflicts of interest in the current study.

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