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Perspective

Demographic lag in Saudi Arabia explained

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Abstract: The demography of Saudi Arabia has been discussed many times but its conflict with the theories of transition and associated structural changes is unexplained. This research explains the demographic differentials stated as lag - real from theoretical – separately for the native and total population. This research developed demographic indicators revealing trends and patterns by adopting a secondary data analysis method, utilizing the General Authority for Statistics census data and other online data. The demographic transition of Saudi Arabia is in line with the theoretical contentions of pretransition and transition (early, mid, and late) stages but at definite time intervals. The absolute size, percentage change, and annual growth rate are explanatory for natives and are considered separately. Moreover, the structural population changes reveal transition stages from expansive to near expansive and constricting and stabilizing. Furthermore, broad age groups indicate rapid declines in the percentage of children, rapid increases in young adults, slow increases in older adults, and no changes in older persons. Even the sex ratio of natives is at par with other populations in transition (slightly above 100). Thus, it could be concluded that a demographic transition with structural changes as per theories: flawless growth rates with an expanding demographic dividend. At this juncture, the integration of migrants into society by endorsing family life and enabling social and demographic balance appears as imperative to improving the labor sector, productivity, and the image of the country in the international spheres for comparisons and benchmarking.

Keywords: demographic transition; age structure; broad age groups; median age; sex ratio

1. Introduction

Saudi Arabia, the largest country in the Arabian Peninsula, is going through changes in the demographics, not only in fertility but also in growth, transition, and distribution. and ageing (Alhamoudi and Salam, 2024; Babay, 2004; Bajaber, 2017; Collemore, 2003; Courbage, 1995; Fouad and Al-Bader, 1994; Khraif, 2007, 2001; Salam, 2023; Salam and Mini, 2024; Samman, 1985; Sufian, 1993). Still, contradictions of structure and growth lead to confusion of theoretical population and existing imbalances. Population growth was a concern having implications on age structure, immigrant proportion, and pressures on social sectors – education, labor force, and women employment (Al-Gabbani 2008; Collemore, 2003). Such a growth has reasons that the pronatalist policy banning the import of contraceptives and declaration of birth control in any form and under any circumstances as contrary to the faith of Islam, perhaps, led to a situation of high fertility (Rashad 2000; Winckler, 2023). As of now, Saudi Arabian demography characterizes an overwhelmingly young population with an increasing median age; high but declining birth rate; low death rate including infant mortality; and high life expectancy. There is a presence of a significant number of adult male foreigners, non-national labor force, living without

family provisions (Al-Gabbani, 2008; Alrouh et al., 2013; Forstenlechner and Rutledge, 2011; Salam and Mini, 2024). This complicates the national demography in terms of sex ratio, age distribution, and vital rates of fertility and mortality.

It is well known that demographic transition took place along with modernization and industrialization led to socio-economic and lifestyle advancements that transformed the population structure – age pyramid. As Notestein (1945) explained in the demographic transition theory, "a pretransitional population has an expansive age pyramid which constricts at the mid-transitional stage and turns to a cylindrical shape at the post-transitional stage". This illustrates secular shifts in fertility and mortality from high and sharply fluctuating to low and relatively stable levels (Canning, 2011; Lee and Reher, 2011). In other words, the pretransitional stage corresponding to a developmental scenario characterizes an expansive age pyramid – a higher percentage of children, a lesser percentage of working age, and a very low percentage of old age. It starts constricting while moving to the transitional stage and shrinks further in post-transitional stage. This theory explains an evolutionary process of growth and development of population from a rural-agrarian illiterate to an urban industrial literate society through stages of economic development and transformations (Kirk, 1996; Lee and Reher, 2011; Notestein, 1945). Such a stage-wise demarcation is less vivid in the case of Saudi Arabia, especially due to the replacements of aged and retired persons by an adult healthy working population of foreign nationality (Alhamoudi and Salam, 2024). Hence, lag (difference from theoretical definitions) was observed while demonstrating population characteristics like sex ratio, age-sex distribution, fertility, and mortality. These changes or biases occur due to the denominator, the total population.

With a healthy lifestyle and behaviors, death reduced and longevity increased, thereby, influencing livelihood options and values of children. This prompts reducing birth rates as a strategy to cope with social, economic, and cultural pressures affecting values. All these changes impact population structure and characteristics at par with industrialization, modernization, and lifestyle transformations (Lee and Reher, 2011). That is, demographic transition, as explained is a total of all changes in a society. As the theory explains, economic development and population growth are related to the progress from high to low birth and death rates parallel to societal changes from a rural agrarian illiterate to an urban industrial literate. Hence, such a population cycle theoretically depicted relates to economic development that begins with a fall in death rate and continues with a phase of rapid population growth leading to a decline in birth rate (Canning, 2011; Kirk, 1996; Notestein, 1945; Thompson, 1929). More than a law of population growth, demographic transition is a description of the evolutionary process, specifying changes in size and structure during industrialization and infrastructure development (Lee and Reher, 2011).

Life in Saudi Arabia gained a transformation as per theoretical presumptions but not the population structure, as demonstrated in many of the international publications, data sets, and illustrations. Most of them show a puzzling age pyramid, with no or little change over the period. For example, an overwhelmingly young population attributed to a higher birth rate under a lowered death rate improves life expectancy (Alhmoudi and Salam, 2024; PwC, 2023; Salam, 2023; Salam and Mini, 2024). However, the

resulting high sex ratio from immigrant population characteristics implies labor force demand-supply gap (Fouad and Al-Bader, 1994).

Important and recent developments in Saudi Arabian demography are reproductive health, urbanization, and regional development. Signs of fertility transition are evident through delays in marriage and resultant childbearing processes at par with shifts in educational attainment and contraception affecting birth spacing and thereby facilitating fertility transition through reproductive health interventions (Al-Abdulkareem and Ballal, 1998; Al-Nasser and Bamgboye, 1992; Hasbrouck et al., 2021; Khraif, 2001, 2009; Rashad, 2000). On the other hand, an increase in urbanization, since 1974, reached its heights through new townships, and zones of education, health, and economy as strategic options – cities and corridors of urban growth (Al-Khraif et al., 2016; Khraif, 1994, 2007; Salam et al., 2014).

In short, demographic developments in Saudi Arabia are in line with theoretical contentions prospectively. Still, there are lacunae in terms of certain direct indicator performances at the macro level – crude vital rates, proportion of population, sex ratio, and growth rates calculated for the entire population living in the country. This is often referred to as demographic lag or imbalance caused by the inclusion of an immigrant population comprising a higher proportion of adult males. Often, they are replaced on superannuation, thereby maintaining the age-sex structure intact without any changes. Such additions to the population depend largely upon creating a flexible labor force that is in demand. It is in this context of the changing demography of Saudi Arabia, that this empirical analysis was carried out to investigate the demographic lag, referred to as demographic imbalance. This was done by tracing population growth, fertility decline, and structural changes. In this process, available data were examined by classifying them into native and foreigner statuses to differentiate the indigenous population from immigrants.

2. Data and methods

Five censuses conducted (1974, 1992, 2004, 2010, and 2022) were published by the General Authority for Statistics, Saudi Arabia online at http://www.stats.gov.sa In addition to the description, data tables are presented on population by age, sex, residence, marital status, education, employment, and births and deaths with geographic and native-foreigner distribution. In addition, online data on births and deaths (year-wise since 1950) cited on https://www.macrotrends.net utilized to plot demographic transition. Data has been compiled and treated on MS Excel with demographic analysis techniques, as follows.

- Plotting demographic transition by using crude birth rate $CBR = \frac{Bi}{Pi} * 1000$ (where Bi stands for the number of births in a given year Pti stands for the total population at the same time and 1000 is the constant) and crude death rate $CDR = \frac{Di}{Pi} * 1000$ (where Di stands for the number of deaths in a given year Pti stands for the total population at the same time and 1000 is the constant), year-wise on a line graph. This paved the way for delineating stages: pretransition and transition (early, mid, and late) depending upon major trends and patterns.

- Plotting age pyramids by considering total population as denominator: both males and females totaling 100.0 percent. Males are assigned with negative values to be on the left side of the stack diagram whereas females are assigned with positive values to be on the right side. The native and total population graphs were presented separately for clarity and comparison. They are drawn separately for five periods (1974, 1992, 2004, 2010, and 2021).
- Calculation of annual growth rates (exponential method) $AGR = LN\ (\frac{Pt2}{Pt1})/N * 100$ [where LN stands for LAN; P_{t2} for Population at time 2; P_{t1} for Population at time 1; N for intercensal interval].
- Percentage distribution of population by broad age groups. Different from other demographic analyses classifying age groups in 0–14, 15–59, and 60+, this analysis adopted a different classification (0–14; 15–49; 50–64; and 65+) to reflect upon younger adults and older adults.
- Sex ratio, calculated as $SR = \frac{M}{F} * 100$ (where M stands for the number of males F stands for the number of females and 100 is the constant) for each five-year age group and broad age group, separately for natives and total for understanding differentials.
- Median age, calculated by using the formula $MA = l + \left(\frac{\frac{N}{2} - \sum fx}{fi}\right) * n$ [where l stands for lower limit of median class; N for total number of persons; *fx* for cumulative frequency above the median class; fi for frequency of median class; and *n* for class interval].

3. Results

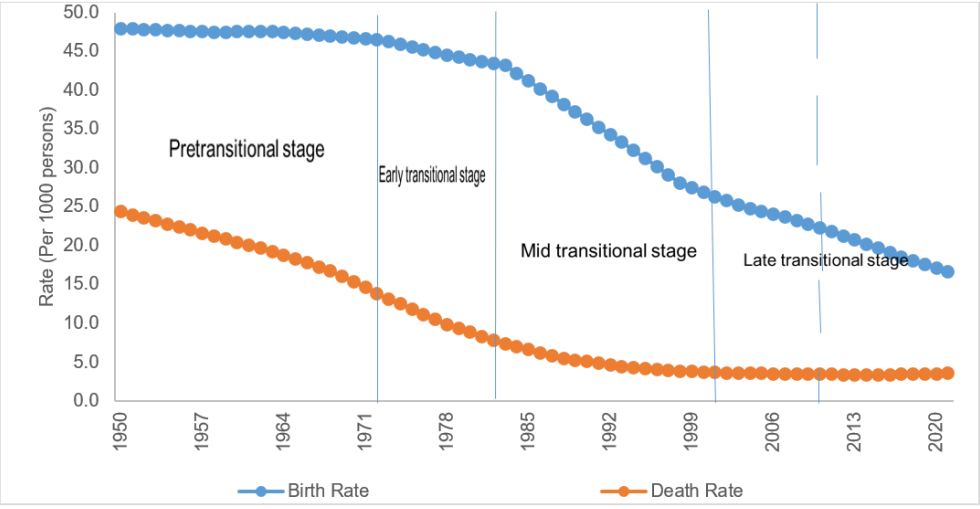

Figure 1. Demographic transition in Saudi Arabia.

Source: Saudi Arabia - Historical Birth Rate Data (https://www.macrotrends.net/countries/SAU/saudi-arabia/birth-rate) (https://www.macrotrends.net/countries/SAU/saudi-arabia/death-rate). Note: Caution is required as these figures are based on total population (natives and foreigners); most of the births and deaths of foreigners are recorded in their respective countries, and not in Saudi Arabia. But the denominator (mid-year population) might be inclusive of both native and expatriate population. While considering this factor, actual rates of birth and death shall be a little higher than the quoted ones, still the figure remains as such with the same gap between birth and death rates.

The results of the analyses explain the demographic lag in the country at the national level, for an overall picture. The given online data refers to the total population, from where the crude birth and death rates are calculated. As these rates considered the overall population at the denominator, values were slightly undermined due to the age-sex distribution of the foreign population (**Figure 1**). However, these trends could be taken as granted as a majority of vital events (births and deaths) of the foreign population take place outside the country, at their respective nations. In short, a large majority of births and deaths used in these calculations could, positively, be of the native population.

Four stages are delineated: first, the pretransitional stage till 1972 where the birth rate stood high at 50.0 and the death rate fell from about 20.0 to about 10.0. This stage, as stated, was a stage of the premodern baby boom era where the loss of human lives were high. This stage, characterized by low infrastructure, technology, and standards, was in tandem with the global situation. This period up to 1972 had a relatively higher population growth due to the lowered death and higher birth rates giving rise to a widened natural increase. The gap widened slowly due to a rapidly declining death rate under a static high birth rate. In the second stage, from 1972, a decline in the birth rate started, slowly and steadily with a higher decline in the death rate. Thus, the widened gap resulted in a relatively higher population growth. Considering this stage as an early transition, a relatively higher growth rate ended in 1982 due to a very faster birth rate decline. Subsequently, the third stage, a longer mid-transitional period, spanning from 1982 to 2000, had a smooth decline in birth rate, which maintained an already achieved low death rate, giving rise to moderate population growth. This stage was followed by a further decline in the birth rate as the growth of the population reached its lowest level. The fourth stage, the late transition stage, started in 2000 could be divided into two: a stage of rapid decline of fertility (2000–2010) and that of a less rapid decline (2010–2020). These demographic rates were a bit underestimated for the vital rates, more specific to the native population considering the total population in the denominator. Most of the births and deaths of foreign immigrant population in the country take place elsewhere outside. This situation is typical of a population having immigration.

Saudi Arabia with a population of 6,726,466 persons (1974) grew to 32,175,224 (2022) through transitions in birth and death, and thus structure and characteristics, Population grew slowly through decades, exponentially, to 16,948,388 (1992); 22,678,262 (2004); and 27,236,156 (2010), thereby witnessing 152.0%, 33.8%, and 20.1% increase, respectively (**Tables 1** and **2**). Such an increase was noted in the total population whereas its native share grew a bit different from 5,935,361 (1974) to 18,792,262 (2022) through 12,310,053 (1992); 16,527,340 (2004); 18,776,510 (2010) giving rise to 107.4%, 34.3%, 13.6%, and 0.1% increase, respectively.

Although the overall increase was surprisingly higher over the period, the native (indigenous) population, who were born, brought up, and residing with full family could be theoretically explained. It took 18 years for its first doubling and 30 years for tripling (12 years from the first doubling). Population increase was highest during 1974–1992, which came to a lower level, thereafter, reaching lowest levels (2010–2022). There were many factors explained as contributors to such a demographic transition. The native population of 1992 did not double in 2022: even after 30 years.

Annual growth rate, calculated exponentially, shows reductions from 5.0 to 1.4 from 1974–1992 to 2010–2022, in the case of the total population and from 3.9 to 0.1, in the case of natives.

Table 1. Increase in population, over the years. absolute size.

Census	**1974**	**1992**	**2004**	**2010**	**2022**
Native					
Male	3,048,082	6,215,793	8,287,370	9,575,257	9,434,131
Female	2,887,279	6,094,260	8,239,970	9,201,253	9,358,131
Total	5,935,361	12,310,053	16,527,340	18,776,510	18,792,262
Foreign					
Male	528,671	3,264,180	4,269,870	5,956,214	10,244,462
Female	262,434	1,374,155	1,881,052	2,503,432	3,138,498
Total	791,105	4,638,335	6,150,922	8,459,646	13,382,962
Total					
Male	3,576,753	9,479,973	12,557,240	15,531,471	19,678,595
Female	3,149,713	7,468,415	10,121,022	11,704,685	12,496,629
Total	6,726,466	16,948,388	22,678,262	27,236,156	32,175,224

Table 2. Increase in population, over the years. annual, exponential, growth rate and percentage change.

	Native			**Foreign**			**Total**		
Census	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Annual growth rate									
1974–1992	3.8	4.0	3.9	9.8	8.9	9.5	5.2	4.6	5.0
1992–2004	2.4	2.5	2.5	2.3	2.6	2.4	2.4	2.6	2.4
2004–2010	2.6	2.0	2.3	5.9	5.1	5.7	3.8	2.6	3.3
2010–2022	−0.1	0.1	0.0	1.5	1.9	3.8	2.2	0.5	1.4
Percentage change									
1974–1992	103.9	111.1	107.4	517.4	423.6	486.3	165.0	137.1	152.0
1992–2004	33.3	35.2	34.3	30.8	36.9	32.6	32.5	35.5	33.8
2004–2010	15.5	11.7	13.6	39.5	33.1	37.5	23.7	15.6	20.1
2016–2022	1.5	1.7	0.1	71.9	25.4	58.2	26.7	6.8	18.1

As seen in **Figure 1**, the demographic transition started in 1970, when the birth rate and death rate were high but started to fall. This corresponds to a pretransitional stage with low growth of population. While the total population age structure remained static with a high percentage of males in the adult ages, the native population underwent rapid changes: from expansive to constrictive shape (**Figure 2**). That is, an expansive shape during the pretransitional stage (1974); a changing shape indicating early transition stage (1992); and a constrictive shape illustrating mid (2004, 2010) and late transition stage (2022).

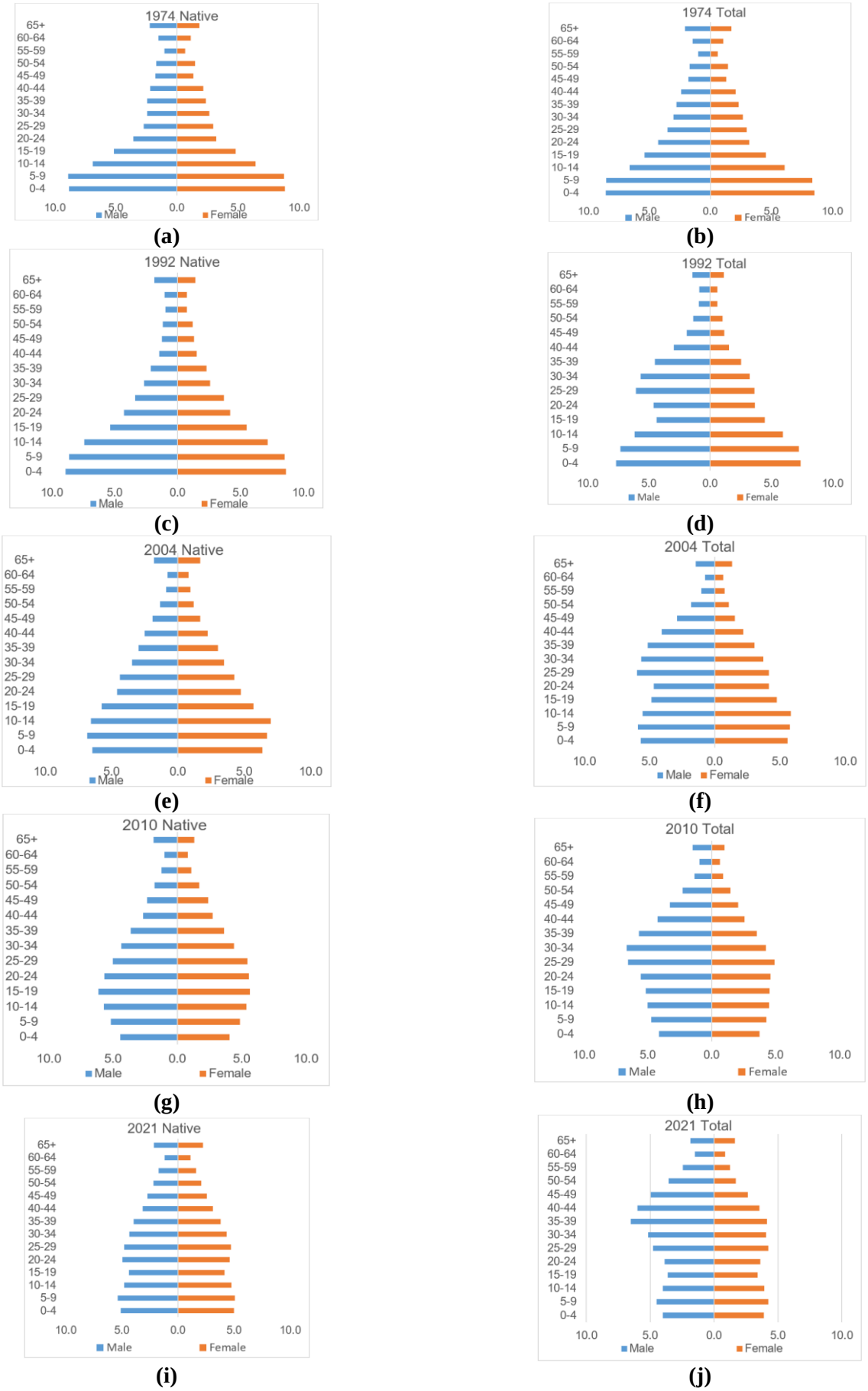

Figure 2. Age structural transformations as illustrated by age pyramids.

Here, observations confirming those of population growth were made such as theoretical native age structure and a different total age structure. The former one changed from its expansive shape of 1974 (corresponding to a pretransitional, underdeveloped period) to a changing, constricting (early transition) and constricted (mid transition) and thereafter a further shrinking towards a cylindrical shape (late transition). Such shifts are indicative of a demographic transition process, as theorized, impacting socioeconomic, infrastructural, developmental, and livelihood transformations. Thus, delineating stages. On the other hand, the foreign population brought to fill the demand-supply gap in the labor force has a different age, sex, educational, and health characteristics.

An analysis through broad age groups – children (0–14 years), young adults (15–49 years), older adults (50–64 years), and old aged (65 years and above) – forming various developmental cohorts – generations (**Table 3**). There were wide differentials between natives and the total population. There was a rapid decrease in childhood population from 48.7 percent (1974) to 34.8 percent (2022) with a rapid increase in young adults from 39.7% (1974) to 53.4% (2022), and a marginal increase in older adults from 7.5% (1974) to 8.4% (2022), in the native population. At the same time, the total childhood population trend showed a sharp decline from 46.7 percent (1974) to 24.5 percent (2022) with a steep increase in young adults from 42.3% (1974) to 63.4% (2022) and a small increase in older adults from 7.3% (1974) to 9.4% (2022). Such changes in age structural proportions influenced the median age, which increased from 15.7 years (1974) to 22.9 years (2022), in the case of natives and from 16.7 years (1974) to 29.5 years (2022), in the case of total.

Table 3. Population structure (percent distribution by broad age group).

Census	Native			Foreign			Total		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
1974									
0–14	48.0	49.4	48.7	24.8	44.4	31.3	44.6	49.0	46.7
15–49	39.4	40.1	39.7	68.4	46.9	61.3	43.7	40.7	42.3
50–64	8.2	6.7	7.5	5.2	6.1	5.5	7.8	6.7	7.3
65+	4.3	3.8	4.1	1.5	2.6	1.8	3.9	3.7	3.8
Median age	16.0	15.3	15.7	24.8	18.6	23.5	17.7	15.5	16.7
1992									
0–14	49.4	49.0	49.2	15.8	36.4	21.9	37.8	46.7	41.8
15–49	40.7	42.6	41.6	79.0	59.5	73.2	53.8	45.7	50.3
50–64	6.3	5.5	5.9	4.7	3.1	4.2	5.7	5.0	5.4
65+	3.7	2.9	3.3	0.6	1.0	0.7	2.6	2.5	2.6
Median age	15.3	15.4	15.4	31.3	25.1	30.1	22.6	16.6	19.7

Table 3. (*Continued*).

Census	Native			Foreign			Total		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
2004									
0–14	39.5	40.3	39.9	14.2	30.9	19.3	30.9	38.6	34.3
15–49	50.9	50.4	50.7	77.5	63.7	73.3	60.0	52.8	56.8
50–64	6.0	5.9	5.9	7.4	4.3	6.5	6.5	5.6	6.1
65+	3.6	3.4	3.5	0.8	1.1	0.9	2.6	3.0	2.8
Median age	19.6	19.2	19.4	33.2	26.2	31.4	25.9	15.4	23.4
2010									
0–14	30.0	29.1	29.6	15.2	29.2	19.4	24.3	29.1	26.4
15–49	58.5	60.8	59.6	75.5	64.1	72.2	65.0	61.5	63.5
50–64	7.9	7.4	7.6	8.4	5.5	7.5	8.1	7.0	7.6
65+	3.6	2.7	3.2	0.9	1.2	1.0	2.6	2.4	2.5
Median age	23.6	24.1	23.9	32.7	27.3	31.4	28.0	24.8	26.7
2022									
0–14	35.2	34.3	34.8	6.8	21.0	10.1	20.4	31.0	24.5
15–49	53.4	53.3	53.4	80.0	69.4	77.5	67.2	57.4	63.4
50–64	7.9	8.8	8.4	11.8	7.8	10.9	10.0	8.5	9.4
65+	3.4	3.6	3.5	1.4	1.8	1.5	2.4	3.1	2.7
Median age	22.6	23.4	22.9	35.1	45.7	34.4	31.2	26.0	29.5

Sex ratio, a well debated topic in the country, has gone through ups and downs while analyzed through age groups, across census years. However, the native sex ratio differed from that of the total. The native sex ratio varied between 101 (2004) and 106 (1974) whereas that of the total population varied between 114 (1974) and 133 (2010). As observed, the sex ratio of the native population was close to 100, which indicates a balance. On the other hand, the higher sex ratio of the total population would have resulted from the age-sex selective immigrant population. Still, their ratio varied: 114 (1974); 127 (1992); 124 (2004); 133 (2010): and 131 (2022). Corresponding sex ratios of the foreigner population 202; 238; 227; 238; and 204 respectively. While confirming theoretical sex ratios of the native population, foreigners were concerned demanding concerted policy dimensions (**Table 4**). Ups and downs of sex ratio by age observed in the native population too, but are in line with biological norms. Foreign population sex ratio by age follows a different pattern influencing total sex ratio.

Table 4. Sex ratio of population by years and age groups.

Age group	1974	1992	2004	2010	2021
Native					
0–4	100	103	101	109	102
5–9	102	101	101	106	106
10–14	107	103	94	106	101
15–19	107	98	101	109	106

Table 4. (*Continued*).

Age group	1974	1992	2004	2010	2021
Native					
20–24	111	102	97	102	108
25–29	92	91	103	92	102
30–34	92	102	99	99	99
35–39	102	93	99	100	104
40–44	102	97	110	97	102
45–49	130	95	113	99	106
50–54	112	97	111	105	105
55–59	157	127	95	112	108
60–64	135	137	94	124	105
65+	122	131	106	141	97
Total	106	102	101	104	103
0–14	103	103	99	107	103
15–49	104	97	102	100	103
50–64	129	117	102	111	106
65+	122	131	106	141	97
Total					
0–4	101	104	102	110	103
5–9	102	101	102	110	106
10–14	109	103	95	112	102
15–19	119	98	102	114	107
20–24	135	127	112	121	108
25–29	117	168	144	133	113
30–34	114	176	151	157	127
35–39	121	179	170	160	157
40–44	116	193	187	166	169
45–49	140	165	186	158	186
50–54	118	138	171	157	208
55–59	160	153	132	153	194
60–64	135	145	111	146	172
65+	121	131	110	145	114
Total	114	127	124	133	131
0–14	103	103	99	111	104
15–49	122	149	141	140	195
50–64	132	144	143	154	103
65+	121	131	110	145	114

4. Discussion

Saudi Arabian demography has been least discussed due to various reasons including dynamics of a high birth rate under a low death rate, the influx of immigrants with typical demographic characteristics, and lack of institutional arrangements and

limitations including sources of data at the national level (Al-Khraif et al., 2022; Alotaibi and Mikayilov, 2024; Khraif, 2007; Salam et al., 2014). Still, there are research analyses, explorations, appraisals, and critical comments at micro and macro levels. One of the crucial issues in demographic analyses at the national level is the variations in attributes from theoretical definitions, giving rise to a demographic lag or puzzle as Hamanaka (2017) and Sufian (1993) explained.

This issue has been addressed in this manuscript under two headings, demographic transition, and population size, growth, and structure. Trends in Saudi Arabia show a theoretically explained scenario depicting various stages from pretransition to transition involving early, mid, and late stages typical of demographic transition, as explained by Lee and Reher, 2011. The pretransition period extended up to 1972, the early years followed by the formation of Saudi Arabia in 1932.

So, the early years of life, growth, and development (formation of Saudi Arabia in 1932) in a pretransitional demographic stage corresponds to a socio-economic lifestyle similar to that of a premodern era (Canning, 2011; Reher, 2011). The prevalent higher levels of fertility were influenced by the increases in education, which affected age at marriage (Al-Mazrou et al., 1995; Al-Nasser and Bamgboye, 1992). Later Khraif (2001) elaborated on this fertility transition historically through various factors including education and age at marriage.

Such a stage-wise demonstration could be compared with the theory proposed by Thompson and Notestein in the early 1990s. As Courbage (1995) explained in the context of Arab demography, fertility decline was affected by the tradition of a less favorable position for transition at par with female education and infant mortality. This contention was affected as revealed by the recent and up-to-date demographics examined with a historical approach. Thus, further research emphasizing the causes and threats of fertility decline emerges as important to the public health (Mahasneh and Ebrahim, 2024). In the context of Saudi Arabia, there were population clusters with significant fertility decline, especially along increased levels of urbanization, social transformation, urban growth, and employment (Khraif, 2007, 2009).

As per theorists, each stage in demographic transition corresponds to an economic development level that reflects livelihood and lifestyle. A scenario of high mortality and morbidity shows a poor quality of livelihood and living infrastructure from where it moved to an improved morbidity-mortality showing a modern livelihood and infrastructure with bettered conditions. This leads to a low morbidity-mortality situation that reflects a high quality of infrastructure standards and healthier livelihood options.

Such changes resulting from progressive thoughts and changed values reduce birth rates as a strategy to cope with social, economic, and cultural changes. Consequently, all these changes impact population structure and characteristics depending upon the level of industrialization, modernization, and lifestyle transitions including reproductive health (Lee and Reher, 2011; Reher, 2011). That is, demographic transition, as explained, is a total of all changes in a given society. Demographic transition theory explains the relationship between economic development and population growth. Population progressing from high birth and death to low birth and death corresponds to progress from rural agrarian illiterate to an urban industrialized literate society.

Structural population changes explained as percentage distribution by age groups correspond to stages of demographic transition, as explained by Al-Gabbani (2008), in the Saudi Arabian context. The population structure demonstrated as age pyramids, transformed from a near expansive (1974) to various shapes of bulged adult age groups, with increasing median age (Al-Gabbani, 2008). These shapes are theoretically explained along the demographic transition. Theoretically, this bulged center moves upwards to higher age groups to old age slowly and steadily. But this change is hardly observed in Saudi Arabia. This is the lag, as Hamanaka (2017) and Sufian (1993), observed in Saudi Arabian demography. A close examination of demographic change reveals that immigration of adult male workforce without considering social demographics and family caused this lag or imbalance.

In comparison, the growth of the native population in the country is in order as explained by theories in transitioning population. Moreover, there are no male-female differences in the growth rate except during the 2004–2010 period. As seen elsewhere, with a prosperous economy, native preferences for public sector jobs increase and thus demand more foreigners to serve private sectors and other support services (Forstenlechner and Rutledge, 2011). So, the total population growth rate raises concerns, however, it is indicative of massive development, restructuring, and rebuilding of infrastructure and growth centers in the country. This population cycle depicted in the theory relates to economic development that begins with a fall in death rate, continues with a phase of rapid population growth, and concludes with a decline in birth rate (Canning, 2011; Notestein, 1945; Reher, 2011; Thompson, 1929).

This leads to sex differentials in the growth rate, which started bridging in the country with efforts of immigration authorities towards bridging gender balance in the labor force. This is a step, born out of demographics in consideration to improving gender equity and social equations paving the way for high-quality life in the country. It is also noted for the lowered growth rates and percentage increases of foreign population, in the country, over the period. It is the developmental processes including the petroleum sector that demand skilled and professional manpower from other countries. Males are preferred in these sectors for reasons of labor intensity, transportation, and frequent transfer-related flexibility. This complexity affects national demography too.

Such a practice is adopted to keep maximum flexibility in the labor force and labor-oriented movements, to reduce labor market rigidities, infrastructure costs, and remittance outflows, to increase productivity, but, definitely, at the cost of culture, values, norms, and language. The situation is improving slowly and steadily along Vision 2030 targets to bridge gaps between demographic differentials inculcating various sectors of the population into the mainstream of productivity and with economic freedom, opening avenues, avocations, and responsibilities (Al-Khraif et al., 2022; Forstenlechner and Rutledge, 2011; Khraif, 2007).

The proportion of working-age resulting from demographic transition over the dependent (children and old aged) gives rise to a demographic dividend in the country, as stated by Al-Khraif et al., (2022), This window of economic opportunity results from rapid changes in age structure along birth and death transformations. Similar observations were made from neighboring Arabian countries (Islam, 2020; Rivlin, 2021; Roudi-Fahimi and Kent, 2007). Males, in comparison with females, have not

differed noticeably in the native but did in the total population, where young adult males increased more than their female counterparts attributed to labor force transformation and requirements. Along with the demographic transition, there were concise steps of overall development – education, health, employment prospects, and infrastructure, thereby, paving the way for a second demographic transition, in the future, as outlined by Canning (2011), Hasbrouck et al. (2021) and Lesthange (2014).

An increasingly higher sex ratio has been reported, in the country as a whole, due to the male-majority foreign labor force, brought to fill the demand-supply gap, without family status. With such an industrial and commercial activity, life in Saudi Arabia gained a transformation as per the demographic transition theory presumptions, but not the population structure as demonstrated in many of the international publications, data sets, and illustrations. Most of them show an age pyramid with a confusing shape with no or little changes over the period: results of mixing indigenous (natural growth) with foreign population (immigration to build a flexible labor force as demanded). This confusion might be removed only with analyses with the exclusion of foreigners. Mixing up male-dominated economically active age groups with indigenous population misrepresents and biased interpretations.

As has been pointed out, there was ample evidence of change in nuptiality patterns influencing reproduction and fertility associated with socio-economic transitions and living arrangements in the era of an adult bulge having political significance (Al-Khraif et al., 2022; Hamanaka, 2017; Harkat and Driouchi, 2017; Mahboub et al., 2014; Rashad, 2000; Rivlin, 2021). Hence, family planning, maternal and infant health, human development, and quality health manpower arise as areas of focus in the coming decade (Al-Khraif et al., 2016; Alotaibi and Mikhayilov, 2024; Alrouh et al., 2013; Boutayeb and Serghini, 2006; Roudi-Fahimi et al., 2012). Therefore, measures in line with demographic theories and principles bridging the divide, gap, are essential to ensure demographic health and welfare in the country (**Figure 3**).

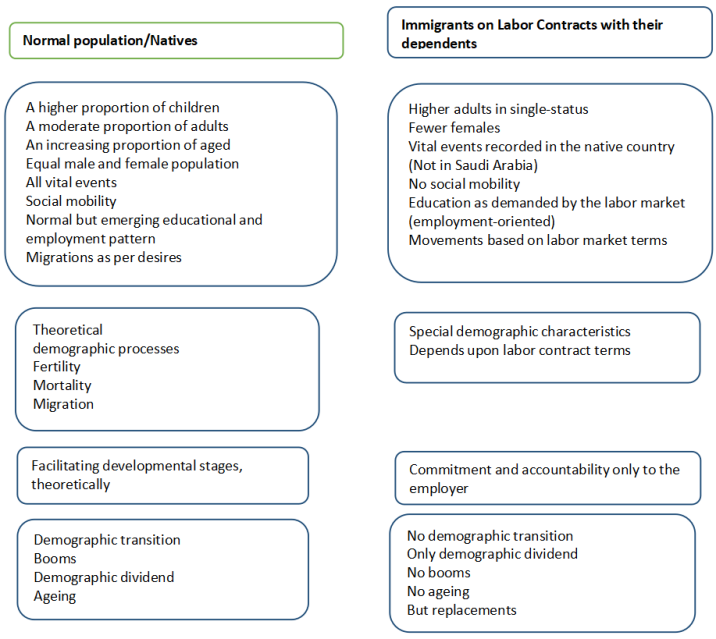

Figure 3. Theoretical frame extracted from the discussion.

Greater efforts in demographic imbalance could be addressed through creating public sector jobs enabling the ability of households and business owners to profit from labor imports creating economic models of growth, and addressing anxieties of nationals offering benefits to both national and non-nationals, equally (Forstenlechner and Rutledge, 2011). Besides, opening avenues and markets for female employment facilitates the creation of a balanced demography. Moreover, future trends of age distributional transformations leading to ageing population might also be addressed at par with international mandates and strategies (Abyad, 2021; Formosa, 2019; Saxena, 2017; Tabutin and Schoumaker, 2005).

Although, the demographic transition theory has been criticized for reasons of reflecting Western countries; being non-predictive, underrating technical innovations, non-explanatory, no time frame, and non-applicable to developing countries, it has explanatory importance linking development with population. Almost all populations or countries followed this path at varying speeds, timelines, or intensities. Even, the Saudi Arabian experience proves it as reflective with the stages of pretransition and transition (early, mid, and late) demonstrating population growth, industrialization, livelihoods, urbanization, and lifestyle changes in agreement with theory (Al-Khraif et al., 2022, 2020; Kirk, 1996). Growth and development of Saudi Arabia could be traced through the demographic transition. Even, reproductive behavior, health-seeking behavior, nutrition, and health status have a base in the demographic transition. It is important at this context to be cautious about changes in sexual behaviors, as seen in Western countries, including cohabitation, non-marital childbearing, homosexuality, and childlessness in the future (Notestein, 1953; Rosero-Bixby, 2001), as against traditions and values of Saudi Arabian society. The recommendations of Almarabta and Ridge (2021) on gerontological transformations are valuable in the Saudi Arabian context whereas those of Courbage (2021) are apprehensive.

5. Conclusions

The population of Saudi Arabia changed from a pretransitional (low birth and death) to a late transitional (low birth and death) stage through various stages including early and mid-transition. A close observation of demographic characteristics reveals changes as laid out in demographic transition theory. The population of Saudi Arabia comprises of natives (of a descent) and others (hired to fill labor demands on fixed term duration, mostly of working age males without family provisions). These foreigners stand different from residents due to their status as fixed-term contract employees and thus their vital events (fertility and mortality) are hardly recorded or registered in the country. Thus, this category of people while added to the demographic analyses complicates the scenario of age-sex structure, distribution, composition, and socio-economic characteristics like education, income, and health: revealing different demographics, as in any other migrant population groups. This is reflected in the sex ratio differentials too.

Native population passes through normal and low rates of growth: gradually constricting and changing age structures showing signs of stabilization. Here the proportion of children decreased with a corresponding increase in young adults. It slowly influenced the percentage of older adults but did not start changing the old aged

persons. It might take a few more years. Youth bulge to retirement boom to ageing sequence is expected. This is currently an era of the adult bulge (demographic dividend), and with increased life expectancy, soon will see a retirement boom. Demographics of Saudi Arabia have several implications for family life, demographic balance, and social and community life in the country. Thus, these social demographics are considered to integrate females into the labor force with policies. It could also be of importance to encouraging families of foreigners to live in the country, which will open new avenues for the employment of dependents and thus boost dividend and the economy. Hope, Vision 2030 is a move toward achieving these goals.

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