



Health Impact of Demographic Changes in the Gulf States

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Abstract

The Arabian Gulf consist of six states in the Middle East Asia with public health statistics and facilities that are somewhat comparable to those in developed nations. However, family-level indicators, traditional values and customs, religiosity, and religious practices are valued as societal strongholds. Thus, there is a tension between modern and traditional lifestyles, so complicating the theoretical explanations and models of transitions in health, epidemiology, and demography. This chapter reviews (i) population trends – size, distribution, growth, and structure – and (ii) transition in public health statistics, fertility and mortality, using the US Census International Database accessed in 2012 and 2015.

The rapidly falling fertility has reached replacement levels, with low overall mortality levels as well as age-specific mortality rates. Efforts to achieve such a demographic and public health scenario have led to transformations in

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socioeconomic and infrastructural resources, such as improved living conditions, which in turn hastened the transition of demographics, with respect to the size, structure, and distribution of the population. Both these processes – public health transition and demographic changes – are complementary with each other. Nevertheless, these changes need to be assessed with caution, by policy makers and program planners, in impacting national scenarios, and with impacts on the indigenous population.

Keywords

Population structure · Vital statistics · Arabian Gulf · Demographic transition · Epidemiology

Introduction

The Arabian Gulf is a distinctive region in terms of both geographic dimensions and population characteristics, which is spread over six independent states, Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates, and sharing a common language and lifestyles. All these states share common geography and religious beliefs and practices, and also oil wealth that has created economic equalities. These states are part of the League of Arab Nations, which serves to create internal peace and harmony within and between the 22 Arab countries (Fig. 1).

This Arabian Gulf region has rich petroleum reserves that facilitate fast growth of the population due to natural increases and immigration. This created a youth bulge – a rapidly growing youth population – but a complicated social change due to economic strains and wrenching political transformations (Khraif et al. 2016; Salam and Mouselhy 2013; Canning 2011; Yount and Sibai 2009; Saxena 2008; Roudi-Fahimi and Kent 2007; Tabutin and Schoumaker 2005; U.S. Department of Commerce 2003; Jacobson 1994). The region has resisted rapid demographic changes and promotes excellence in educational, health, and public utility infrastructure that is at par with developed countries. The region accommodates a large migrant worker population needed to services in all areas of need such as domestic services, commercial enterprises, etc. In some cases, the expatriate population exceeds the native population (Courbage 1995; ESCWA 2008; Salam et al. 2015).

The population of the Arabian Gulf, with a rapidly declining death rate and slowly declining birth rate, grew rapidly during the second half of the twentieth century, especially since the 1950s, and is projected to continue to grow in the future. However, a youth bulge resulting from immigration of adults due to increased pressure from the labor market – in education, housing, health, and other public services – influences family formation. But the adult population continues to decline resulting in corresponding increases in the proportion of elderly/aged persons, mostly due mainly to gains in life expectancy (Khraif et al. 2014; Asharaf and Alshekteria 2008; ESCWA 2002).

The demographic transition experiences of the Arabian Gulf states are comparable to that of other developed and developing countries. Although the transition has

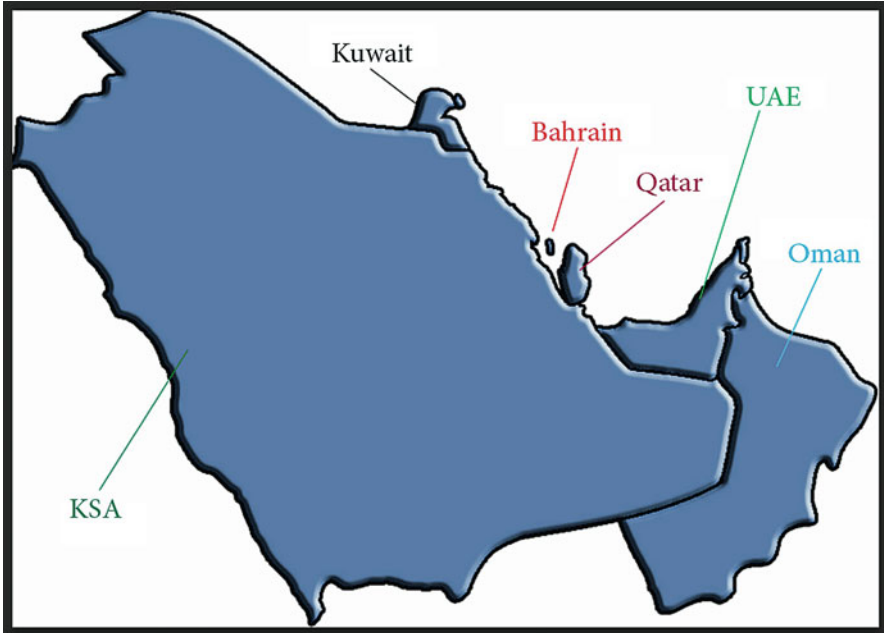


Fig. 1 Map of Arabian Gulf states. (Source of data: <https://apps.cndls.georgetown.edu/projects/borders/items/show/1100>)

a late onset as compared to other regions, it is faster than elsewhere (Pew Research Center 2009; Tabutin and Schoumaker 2005; Rashad 2000), due mainly to cultural factors combined with greater opportunities and improved economic conditions associated with family formation variables (Courbage 1995; Khraif et al. 2016).

This analysis of the Arabian Gulf (Gulf Coordination Council (GCC) states) examines the demographic changes leading to public health under resourceful economies starting in 1992. This chapter reviews (i) the population trends – size, distribution, growth, and structure – and (ii) the transition in public health statistics, fertility and mortality.

This review analyzes data extracted from the International Data Base (IDB) of US Census Bureau for various periods – 1992, 2002, 2012, and 2015 (accessed on June–July 2012 and April 2015). These databases offer a variety of demographic indicators, estimates, and projections with periodic revisions – birth, death, growth, migration, infant mortality, and life expectancy and population by age and sex. For the purpose of this chapter, demographic indicators are calculated using the following formulae:

- **Sex ratio**, the ratio of males to females in a given population, expressed as the number of males for every 100 females

$$\text{Sex Ratio} = \left(\frac{\text{number of males}}{\text{numbers of females}} \right) \times 100$$

- **Density of population**, the number of persons per square kilometer

$$Density = \left(\frac{\text{total population}}{\text{total area}} \right)$$

- **Age-specific sex ratio**, number of males in a given age per 100 females of the same age

$$Age\ Specific\ Sex\ Ratio = \left(\frac{\text{number of males at age } i}{\text{number of females at age } i} \right) \times 100$$

- **Sex ratio of broad age groups**, number of males in the broad age group per 100 females of the same age
- **Population growth**, the difference between population of two points
- **Population growth rate**, the exponential growth rate calculated by using the formula:

$$Growth\ Rate = \frac{1}{T} \times LN \left(\frac{P_2}{P_1} \right)$$

where

P_2 population of last census

P_1 population of previous census

LN natural logarithms

T intercensal period

- **Net migrants**, the difference between immigrants and emigrants
- **Natural increase**, difference between births and deaths
- **Population change**, sum of net migrants and natural increase
- **Proportion of population by broad physiological age group**, number of persons in the physiological age group to 100 persons in the total population
- **Proportion of population by 5 year age groups**, number of persons in the 5 year age group to 100 persons in the total population
- **Child-woman ratio**, number of children of age 0–4 years per 1000 women aged 15–49 years
- **Aged-child ratio**, number of persons aged 60 years and above per 100 children aged 0–14 years
- **Median age**, calculated by using the formula

$$Median\ Age = lmd + \left(\frac{\frac{n}{2} - Cfi}{fm} \right) \times x$$

where:

l lower limit of the median class

N total population

C_{fi} cumulative frequency of class preceding median class

f_m frequency of median class

X class interval

- **Age dependency ratio**, number of persons aged 60 years and above per 100 persons aged 15–59 years

Transitions in Public Health

Population growth impacts upon various aspects of daily life and which leads to improvements in education, housing, and health care. On the other hand, it influences demands and greater expectations. Such improvements depend largely on demographics – size, structure, and vital statistics (Jacobson 1994; Canning 2011; Khraif et al. 2016; Salam et al. 2015). In other words, population serves as the denominator of all public health programs and infrastructure. That is, all structures and systems, both in the public and private domains, depend largely on the population requirements, demands, and expectations (Khraif 2009a; Khraif et al. 2016).

Vital Statistics

Vital statistics relating to both fertility and mortality were considered for reviewing the impact of population growth: fertility indicators included crude birth rates, total fertility rates, and general reproduction rates, while mortality indicators included crude death rates, infant mortality rates, under 5 mortality rates, and expectation of life at birth (Table 1).

Fertility

Fertility rates in Arab countries are high. There was a declining trend commensurate with the pace of development and quality of life (Salam et al. 2015; Roudi-Fahimi and Kent 2007; Courbage 1999). For example, as the Arabian Gulf countries improved their social and economic conditions to reach a lifestyle similar to other modernized countries, fertility rates in these countries fell rapidly as understood from indicators such as crude birth rates (CBR), total fertility rates (TFR), and general reproduction rates. While a decline in CBR occurred from ~25 in 1992 to ~15 in 2012, the TFR decline was from ~4.0 in 1992 to ~2.5 in 2012. Both these declines have implications for public health in terms of maternal, neonatal, infant, and child health care. Moreover, fertility rates determine population age groups, which in turn influence the demand for public health services. That is, societies having high fertility rates emphasize maternal and child health, whereas those with declining fertility focus on adolescent and youth health, adult (reproductive) health, and geriatrics (Yount and Sibai 2009; Khraif 2001, 2009b). In short, emphasis on public health specialties depends largely on the demographic transition stages (Salam and Mouselhy 2013; Mathew et al. 2011; Saxena 2008; United Nations 2008).

Table 1 Changes in public health statistics with time (Source: U.S. Department of Commerce, International Database of US Census Bureau accessed in 2012 and 2015)

Indicators/year	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
CBR						
1992*	25.8	24.8	32.7	22.6	33.9	24.6
2002	19.5	20.9	24.5	17.3	24.6	16.3
2012	14.0	21.0	24.0	10.0	19.0	16.0
2015	13.7	19.9	24.4	9.8	18.5	15.4
TFR						
1992*	3.4	3.4	6.0	4.0	5.5	4.0
2002	2.4	2.6	3.5	2.8	3.5	2.5
2012	1.9	2.6	2.9	1.9	2.3	2.4
2015	1.8	2.5	2.9	1.9	2.1	2.4
GRR						
1992*	1.7	1.7	2.9	1.9	2.7	1.9
2002	1.2	1.3	1.7	1.4	1.7	1.2
2012	0.9	1.3	1.4	1.0	1.1	1.2
2015	0.9	1.2	1.4	0.9	1.0	1.2
CDR						
1992*	3.6	2.4	4.4	2.3	4.4	2.9
2002	3.0	2.1	3.7	2.0	3.6	2.3
2012	3.0	2.0	3.0	2.0	3.0	2.0
2015	2.7	2.2	3.4	1.5	3.3	2.0
IMR						
1992*						
Male	26.6	12.8	25.1	13.5	29.7	26.2
Female	19.4	10.5	23.3	13.2	22.8	18.6
Total	23.1	11.7	24.2	13.4	26.3	22.5
2002						
Male	17.2	10.6	20.5	8.9	24.7	18.6
Female	13.0	10.3	20.8	8.5	18.4	13.1
Total	15.1	10.5	20.1	8.7	21.6	15.9
2012						
Male	11.4	7.6	15.3	7.1	17.9	13.5
Female	8.9	8.2	14.6	6.5	13.2	9.6
Total	10.0	8.0	15.0	7.0	16.0	12.0
2015						
Male	10.4	7.1	13.9	6.6	16.2	12.4
Female	8.3	7.5	13.2	6.0	11.9	8.8
Total	9.4	7.3	13.6	6.3	14.1	10.6
U5MR						
1992*						
Male	32.1	15.9	33.7	21.0	35.3	31.4
Female	23.3	13.4	33.4	17.0	27.5	22.3

(continued)

Table 1 (continued)

Indicators/year	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
Total	27.8	14.7	33.5	19.1	31.5	26.9
2002						
Male	20.3	13.1	27.3	13.3	28.9	22.0
Female	15.5	12.6	27.9	10.8	21.6	15.5
Total	17.9	12.8	27.6	12.1	25.3	18.8
2012						
Male	13.4	9.5	19.5	9.7	20.8	15.8
Female	10.5	9.9	19.6	8.1	15.3	11.1
Total	12.0	9.0	20.0	9.0	18.0	14.0
2015						
Male	12.3	8.4	17.5	8.9	18.7	14.4
Female	9.8	9.0	17.5	7.4	13.8	10.2
Total	11.1	8.7	17.5	8.1	16.3	12.3
Life expectancy at birth						
1992*						
Male	70.0	72.2	68.3	72.2	68.9	69.7
Female	74.2	75.0	71.7	75.2	72.5	74.4
Total	72.1	73.5	70.0	73.7	70.7	72.0
2002						
Male	73.5	73.8	70.3	74.5	70.3	72.1
Female	77.4	76.5	73.7	77.9	73.9	77.1
Total	75.4	75.2	72.0	76.2	72.1	74.6
2012						
Male	76.2	76.1	72.6	76.1	72.4	74.1
Female	80.5	78.5	76.4	80.1	76.4	79.4
Total	78.3	77.3	74.5	78.1	74.4	76.7
2015						
Male	76.5	76.5	73.3	76.6	73.0	74.7
Female	81.0	79.2	77.2	80.7	77.2	80.0
Total	78.7	77.8	75.2	78.6	75.1	77.3

*Data of Oman for 1993

CBR crude birth rate, *TFR* total fertility rate, *GRR* gross reproductive rate, *CDR* crude birth rate, *UMR* under 5 mortality rate, *IMR* infant mortality rate

Mortality

Indicators of mortality reviewed here include crude death rate, infant mortality rate, under 5 mortality rate, and expectation of life at birth. All these indicators suggest low levels, indicating improved public health conditions and health status at a macro level. These rates match the desired levels set by the Millennium Development Goals (MDGs) of the UNDP (United Nations 2013a, b; WHO 2010) and indicate the rapid pace of achievement in reducing mortality rates in the region.

A low crude death rate (CDR) has been reported in all these countries since 1992 and shows an impressive decreasing trend, as shown by Shawky (2001). Among the

six countries, the two larger ones (Oman and Saudi Arabia) have higher but fast declining death rates (from 4.4 to 3.3 and 4.4 to 3.4 from 1992 to 2015) since 1992. The other states, which are smaller in terms of area and population, have lower levels of CDR since 1992 and also declining.

Infant mortality rates (IMR) remained low in all the GCC countries since 1992. They remain below 30 for both males and females. While Kuwait and Qatar recorded remarkably low rates, Saudi Arabia showed the highest rate, with Bahrain, Oman, and UAE having intermediate levels. The IMR declined to ~10 in Kuwait and Qatar, to ~15 in Bahrain and UAE, and to ~20 in Oman and Saudi Arabia. Such a declining trend continued to 2015 when it was less than 10 in Bahrain, Kuwait, and Qatar and below 15 in Oman, Saudi Arabia, and UAE.

Child mortality below the age of 5 years (U5MR) is higher than that in developed countries. Perhaps, the maternal and child health-care components influence under 5 mortality, especially with higher-order births and poor infant care practices. But there has been a rapid decline above 35 in 1992 (except Kuwait and Qatar reporting lower levels) to below 30 in Oman and Saudi Arabia and to below 20 in other countries in 2002, to below 20 in Oman and Saudi Arabia and below 15 in other countries in 2012, and then to below 15 in Oman and Saudi Arabia and below 10 in other countries by 2015. These declines mark excellent achievements of ambitious targets set by public health units to establish an internationally competitive health scenario in consonance with the changing population characteristics and living conditions (Khraif et al. 2016; Salam et al. 2015).

Expectation of life at birth is another indicator of health improvement and is high in the Gulf countries, which might have roots from cleanliness, dietary habits, activity profile, and lifestyles facilitated by infrastructure and quality of utilities (Khraif et al. 2014; Salam et al. 2015). All countries in GCC had a life expectancy above 70 years, for both males and females. There were gains in life expectancy of 2 years in each decade for both males and females. Throughout the period, Oman and Saudi Arabia registered lower levels of life expectancy, possibly due to their comparatively larger populations.

Changing Demographics

The Arabian Gulf population increased from 23,535,857 in 1992 to 43,148,976 in 2015. The population in the countries on this region experienced a higher increase in male population. Such a demographic phenomenon occurred due to immigration from Southeast Asian and African countries. Such employment-oriented immigrations on specific labor VISA neither with provisions for dependents or families nor with privileges of citizens influence the population age structures and thereby vital rates (Salam et al. 2014).

Still, with such clear demarcations of native and expatriate population, no specific data bifurcations for demographic analyses are hardly available. This creates misleading interpretations of natural growth, birth and death rates, migration rates, and vital rates due mainly to the absence of at-risk population of expatriate labor force, in the respective population. This leads to incorrect inferences due mainly to the

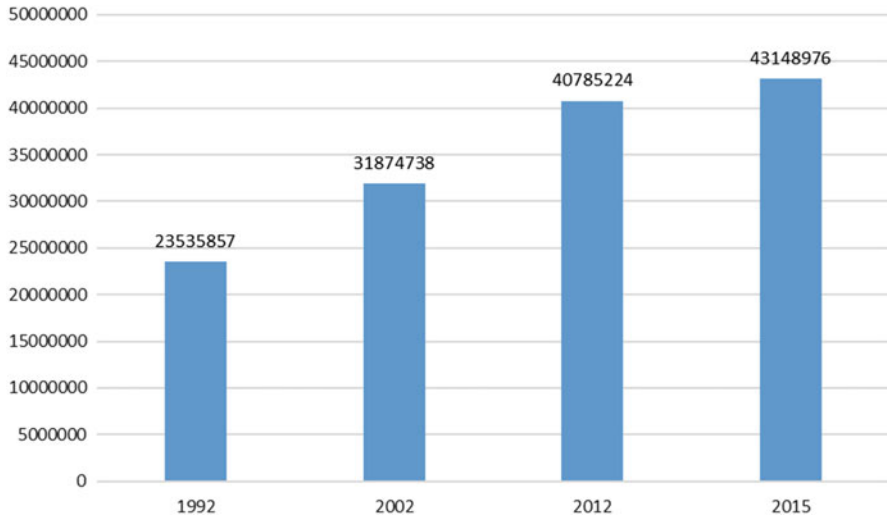


Fig. 2 Population change in the Arabian Gulf (1992–2015). (Source of data: International Database of US Census Bureau accessed in 2012 and 2015)

denominator (total population) to indicators of fertility, mortality, and related vital statistics (Fig. 2).

Population growth of the Arabian Gulf seems different from other regions due to labor-oriented immigration. These oil-rich countries drew manpower from Asian and African countries to meet their increasing demands – professional, service, commercial, and support levels. This phenomenon exaggerates population growth in these countries. However, population of this region grew from 23,535,857 (1992) to 31,874,738 (2002) to 40,785,224 (2012) and to 43,148,976 (2015) (Table 2). This registers a 35% increase in 1992–2002; 28% in 2002–2012; and 5.8% in 2012–2015: partially due to the labor importations. The overall increase during 1992–2012 was 73.3%. The Kingdom of Saudi Arabia had the highest number of people and which increased from 17,060,750 in 1992 to 22,274,039 in 2002 to 26,534,504 in 2012 and to 27,752,316 in 2015 reflecting percentage of increase of 30.6, 55.5, and 62.7, respectively. Moreover, variations in the rate of increase in these countries depend largely upon the labor policies and restrictions imposed upon expatriate employment, to boost employment of native population.

The population of the Arabian Gulf countries nearly doubled in the last 23 years (1992–2015), due to both natural increase and migrations, recording an increase of 19,613,119 persons. Of these 10,691,566 were added in Saudi Arabia whereas the rest 8,821,553 elsewhere. All those countries, except Bahrain, added more than one million persons. However, these additions to the population during 2002–2012 were higher than that of 1992–2002, except in Kuwait and in Saudi Arabia. Moreover, there were wide male-female differences in the increase, except in Oman. While the male population increased rapidly than that of females, Oman has retained a gender balance in immigrations.

Table 2 Population and its manifestations in the GCC countries

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE	Total
Population							
1992							
Male	308,668	788,581	1,177,938	305,635	9,543,505	1,367,343	13,491,670
Female	229,352	614,140	836,628	157,876	7,517,245	688,946	10,044,187
Total	538,020	1,402,721	2,014,566	463,511	17,060,750	2,056,289	23,535,857
2002							
Male	410,991	1,231,230	1,433,251	465,535	12,469,458	2,428,671	18,439,136
Female	303,840	852,075	1,107,827	237,852	9,804,581	1,129,427	13,435,602
Total	714,831	2,083,305	2,541,078	703,387	22,274,039	3,558,098	31,874,738
2012							
Male	756,746	1,555,502	1,695,541	1,496,609	14,516,106	3,650,063	23,670,567
Female	491,602	1,090,812	1,394,609	454,982	12,018,398	1,664,254	17,114,657
Total	1,248,348	2,646,314	3,090,150	1,951,591	26,534,504	5,314,317	40,785,224
2015							
Male	816,237	1,631,973	1,791,594	1,695,234	15,105,575	3,962,699	25,003,312
Female	530,376	1,156,561	499,583	499,583	12,646,741	1,817,061	18,145,664
Total	1,346,613	2,788,534	2,194,817	2,194,817	27,752,316	5,779,760	43,148,976
Population growth							
1992–2002							
Male	102,323	442,649	255,313	159,900	2,925,953	1,061,328	4,947,466
Female	74,488	237,935	271,199	79,976	2,287,336	440,481	3,391,415
Total	176,811	680,584	526,512	239,876	5,213,289	1,501,809	8,338,881
2003–2012							
Male	345,755	324,272	262,290	1,031,074	2,046,648	1,221,392	5,231,431
Female	187,762	238,737	286,782	217,130	2,213,817	534,827	3,679,055
Total	533,517	563,009	549,072	1,248,204	4,260,465	1,756,219	8,910,486
2013–2015							
Male	59,491	76,471	96,053	198,625	589,469	312,636	1,332,745
Female	38,774	65,749	100,733	44,601	628,343	152,807	1,031,007
Total	98,265	142,220	196,786	243,226	1,217,812	465,443	2,363,752
1992–2015							
Male	507,569	843,392	613,656	1,389,599	5,562,070	2,595,356	11,511,642
Female	301,024	542,421	658,714	341,707	5,129,496	1,128,115	8,101,477
Total	808,593	1,385,813	1,272,370	1,731,306	10,691,566	3,723,471	19,613,119
Growth rate							
1992–2002							
Male	2.86	4.46	1.96	4.21	2.67	5.74	3.12
Female	2.81	3.27	2.81	4.10	2.66	4.94	2.91
Total	2.84	3.96	2.32	4.17	2.67	5.48	3.03

(continued)

Table 2 (continued)

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE	Total
2003–2012							
Male	6.10	2.34	1.68	11.68	1.52	4.07	2.50
Female	4.81	2.47	2.30	6.49	2.04	3.88	2.42
Total	5.58	2.39	1.96	10.20	1.75	4.01	2.47
2013–2015							
Male	2.52	1.60	1.84	4.15	1.33	2.74	1.83
Female	2.53	1.95	2.32	3.12	1.70	2.93	1.95
Total	2.53	1.74	2.06	3.92	1.50	2.80	1.88
1992–2015							
Male	4.23	3.16	1.82	7.45	2.00	4.63	2.68
Female	3.64	2.75	2.52	5.01	2.26	4.22	2.57
Total	3.99	2.99	2.13	6.76	2.12	4.49	2.64
Area (sq. km)	760	17,818	309,500	11,586	2,149,690	83,600	25,729,542
Density							
1992	708	79	6	40	8	25	9
2002	941	117	8	61	10	43	12
2012	1,643	149	10	168	12	64	16
2015	1,772	157	11	189	13	69	17

Source of data: U.S. Department of Commerce, International Database of US Census Bureau accessed in 2012 and 2015

There were declines in growth rate in 2003–2012 as compared to 1992–2002, especially sensitive to females. This probably shows not only the declining natural increase but also the restrictions in labor importations. Except Oman, all other countries' male population grew faster. This might be due to the male selective labor immigrations. As far as the natives are concerned, there was no gender imbalance (Salam et al. 2014).

The Arabian Gulf extends to 2,572,954 square kilometers with Saudi Arabia having the largest geographical area: other states are located on its eastern and southeastern sides. All these countries have large uninhabited deserts. Thus, density of population remained low in these countries. For example, Saudi Arabia had a density of 13 persons per square kilometer. At the same time, there were small urbanized countries like Bahrain with higher densities (1772 persons per square kilometer). The population of all these countries are concentrated in the urban locations leaving the uninhabited deserts and rural areas. This reflects in overall density, but in reality, all the metropolitan cities (like Dubai, Abu Dhabi, Sharjah, Ras Al Khaimah, Muscat, Salalah, Kuwait City, Doha, Manama, Riyadh, Jeddah, etc.) and other urban agglomerations (Al Ain, Ajman, Dammam, Al-Khobar, etc.) have high population density.

Annual growth rates were higher in 1992–2002 but it reduced noticeably in 2002–2012. Higher growth rates prevailed in Qatar, UAE, and Bahrain. Countries like Saudi Arabia and Oman had low growth rates in 2002–2012 and 2012–2015.

Such a population growth has, apparently, occurred in two ways: (i) natural increase – number of births and deaths, and (ii) net migration – number of immigrants and emigrants. The overall contribution of natural increase and net migration adds up to the existing population, thus resulting in growth. As the Arabian Gulf have labor requirements for extraction of petroleum and in building human resources, they depended upon expert manpower from other countries, especially from America and Europe. Further, at secondary and support levels, these nations brought skilled labor from the South Asian and African countries. The resultant increase in population expanded the commercial and service activities, for which another set of foreigners were brought into the country. At the same time, the wide gap in fertility and mortality resulted in an expansion of native population. All these lead to a rapid increase in the population (Table 3).

During 1993–2002, the population of the Arabian Gulf increased by a total of 8,387,262 persons which were added more through natural increase (6,445,602 – 76.8%) than net migration (1,941,658 – 23.2%). These proportions vary between the countries, e.g., Qatar and UAE had more net migrants than natural increase, whereas Oman and Saudi Arabia had lesser migrants. On the other hand, the change in population was higher during 2003–2012, which is proportional to population size at that point in time. Of the increase of 8,888,372 persons in the decade, share of natural increase was 6,243,289 (70.2%), and migration was 2,645,083 (29.8%). Two of the countries – Oman and Saudi Arabia – have shown a negative net migration, perhaps due to no movement of the expatriate population outside of these countries. For example, there are many African and Asian expatriates living permanently in these countries, without traveling outside. Yearwise, an increase in the share of migration in population change has been observed, which reflects a rise in development and commercial activities demanding more migrants to uplift the socioeconomic life.

The three years (2013–2015) have not added many persons (2,343,286): 1,945,717 due to natural increase and 397,569 due to migration. During this period, three countries – Kuwait, Oman, and Saudi Arabia – showed a decline in net migration, which could be attributed to the massive localization of labor force, focusing employment of native population, through labor importation regulations. Both Kuwait and Saudi Arabia implemented various strategies to limit the expatriate labor force in many employment sectors such as private organizations, Internet and mobile phone shops and establishments, cosmetics and ladies' textiles, hypermarkets and supermarkets, etc. Such regulations implemented, actively, since 2010 shall have far-reaching effect on the population size and structure and thereby public health measures, in the coming decades.

Manifestations of Demographic Change

Population growth manifests into the structure, characteristics, and distribution, thereby impacting upon public health policies and programs through creation of agendas and targets. The Arabian Gulf region has a young population but with an adult boom. Their economically active population increased from its 55.9% in 1992

Table 3 Components of population change, the vital events (1993–2015)

States	Births	Deaths	Natural increase	Net migrants	Population change
1993–2002					
Bahrain	142,575	19,932	122,643	79,887	202,530
Kuwait	414,300	39,825	374,475	292,147	666,622
Oman	650,613	92,610	558,003	26,344	584,347
Qatar	109,715	11,871	97,844	150,369	248,212
Saudi Arabia	5,633,399	780,518	4,852,881	307,251	5,160,135
UAE	510,309	70,553	439,756	1,085,660	1,525,418
Total	7,460,911	1,015,309	6,445,602	1,941,658	8,387,260
2003–2012					
Bahrain	165,520	27,741	137,779	379,427	517,206
Kuwait	525,086	51,966	473,120	86,763	559,883
Oman	664,471	100,171	564,300	–10,244	554,056
Qatar	161,929	22,116	139,813	1,140,528	1,280,341
Saudi Arabia	5,143,434	844,930	4,298,504	–73,028	4,225,476
UAE	726,693	96,920	629,773	1,121,637	1,751,410
Total	7,387,133	1,143,844	6,243,289	2,645,083	8,888,372
2013–2015					
Bahrain	54,831	10,527	4,4304	53,604	97,908
Kuwait	166,637	17,771	148,866	–9,040	139,826
Oman	236,176	32,651	203,525	–4,344	199,181
Qatar	63,310	9,751	53,559	175,244	228,803
Saudi Arabia	1,539,374	272,643	1,266,731	–48,101	1,218,630
UAE	262,322	33,590	228,732	230,206	458,938
Total	2,322,650	3769,33	1,945,717	397,569	2,343,286
1992–2015					
Bahrain	362,926	58,200	304,726	512,918	817,644
Kuwait	1,106,023	109,562	996,461	369,870	1,366,331
Oman	1,551,260	225,432	1,325,828	11,756	1,337,584
Qatar	334,954	43,738	291,216	1,466,141	1,757,357
Saudi Arabia	12,316,207	1,898,091	10,418,116	186,122	10,604,238
UAE	1,499,324	201,063	1,298,261	2,437,503	3,735,764
Total	17,170,694	2,536,086	14,634,608	4,984,310	19,618,918

Source of data: U.S. Department of Commerce, International Database of US Census Bureau accessed in 2012 and 2015

to 62.8 in 2002 to 69.2 in 2012, perhaps due partly to fertility decline and to immigrant labor force. This increase was accompanied by a corresponding decrease in childhood population (from 40.5% in 1992 to 25.4% in 2015); a drastic decline attributed to the fertility transition coupled with age-specific labor immigration.

Nevertheless, this fertility decline has not started inflicting upon the aging population, which might be due to the wide adult population, including immigrants.

There is a marked change in broad age groups of population – children (less than 15 years), adults (aged 15–59 years), and old aged (60 years and above). Their percentages were 40.5, 55.9, and 3.6, respectively, in 1992 with marked differences between males and females. While the percentage of females were higher in childhood ages and lower during adult ages as compared to males, this imbalance might explain the paradox, demographic dilemma, created through immigrant labor force. Sex wise, the percentage distributions vary (Table 4). A higher percent of males are adult working ages making their percentage of children lower than usual. Surprisingly, more than 60% of the male population in the region are aged 15–59 years (the working age), especially higher in Qatar (75.9%) and UAE (76.1%).

The percentages of broad age groups changed to 33.6, 62.8, and 3.5, respectively, in 2002: a slight increase in adults with a corresponding decrease in children. Not only the fertility but also the immigration has, perhaps, played significant roles in this age structural change, which in turn influenced the age-sex structure. In this period, the percent of female children also shrink because of a widen adult age population. This could probably show the changing labor laws and expanding avenues for female expatriates. That is, countries have started attracting females to fulfill their requirements, in the service sectors especially education and health and also in certain commercial enterprises' administration, cash, sales, and marketing.

Furthermore, the percent of children shrink in 2012 to 26.6% with more adults (69.2%) and old aged (4.1%). These changes are equally observed in males and females. Noticeably higher percentage of adult males, nearly to 90%, have been reported in some countries: such statistics are worrisome to the social scientists and policy makers for social vigilance on safety and security. The trend continues till 2015 but has started influencing the percent of old aged. It might be due to population concerns and pressures toward native employment, labor regulations, and changing labor contracts of expatriates.

The 5-Year Age Groups

Usually, demographic analyses concentrate on 5-year age groups for explaining population with definite, equal intervals. A picturesque description of 5-year age structure is the population pyramid, the shape of which describes the developmental stage and the demographic transition, thereby facilitating formation of public health and medical intervention strategies. For example, the Arabian Gulf age pyramid was of an expansive shape in 1992 with a little variation in the percent of males of age between 20 and 45 years. That is, an effect of labor immigrations has started prior to this period. Changes in the pyramid along the periods (1992, 2002, 2012, 2015) are not vivid in this geographic region, which might be due to the immigrations that replace the working age population. There is an absolute size of working age population retained through labor importations. This keeps the age structure intact throughout the period. Therefore, only an examination of the native population shall reveal the dynamics of demographic transition and age structure (Fig. 3).

Table 4 Age-sex structure changes (1992–2015)

States	Children (below 15 years)			Adults (15–59 years)			Old aged (60+ years)		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
1992									
Bahrain	28.1	36.8	31.9	68.4	59.1	64.3	3.6	4.1	3.8
Kuwait	33.0	40.4	36.2	64.2	56.9	61.0	2.9	2.7	2.6
Oman	36.4	49.1	41.7	60.3	46.9	54.9	3.1	3.8	3.4
Qatar	22.4	40.9	28.6	75.9	57.1	69.5	1.9	2.0	2.0
Saudi Arabia	38.8	47.5	42.6	57.1	48.7	53.4	4.1	3.7	3.9
UAE	22.4	42.3	29.0	76.1	56.4	69.5	1.5	1.4	1.5
Total	36.0	46.5	40.5	60.4	49.9	55.9	3.6	3.6	3.6
2002									
Bahrain	24.1	31.4	27.3	72.2	63.6	68.6	3.6	4.9	4.2
Kuwait	24.0	32.2	27.4	73.4	64.9	69.9	2.5	3.0	2.7
Oman	33.2	41.0	36.6	63.2	55.1	59.6	3.7	4.1	3.8
Qatar	18.4	34.4	23.8	79.3	63.3	73.7	2.4	2.2	2.4
Saudi Arabia	33.2	40.2	36.2	63.1	55.9	59.8	3.7	3.9	3.9
UAE	16.6	34.2	22.2	81.7	64.4	76.3	1.7	1.5	1.6
Total	29.8	38.9	33.6	66.8	57.4	62.8	3.4	3.7	3.5
2012									
Bahrain	17.0	25.3	20.2	79.1	69.4	75.5	3.8	5.0	4.3
Kuwait	22.7	29.9	25.8	74.0	65.8	70.7	3.2	4.3	3.7
Oman	28.9	33.3	30.8	66.6	61.5	64.4	4.5	5.3	4.8
Qatar	8.3	26.5	12.6	90.0	71.2	85.6	1.6	2.5	1.7
Saudi Arabia	27.0	31.0	28.8	68.4	64.0	66.5	4.6	4.8	4.7
UAE	15.3	31.9	20.5	82.9	66.0	77.6	2.0	1.9	1.9
Total	23.5	30.9	26.6	72.6	64.5	69.2	3.8	4.5	4.1
2015									
Bahrain	16.3	24.3	19.5	79.1	70.1	75.5	4.6	5.6	5.0
Kuwait	22.5	29.3	25.3	74.0	65.7	70.5	3.5	5.0	4.1
Oman	28.4	32.4	30.2	66.9	62.1	64.7	4.7	5.5	5.1
Qatar	8.2	27.1	12.5	89.9	70.2	85.4	1.9	2.7	2.1
Saudi Arabia	25.5	28.9	27.1	69.5	65.6	67.8	5.0	5.4	5.2
UAE	15.6	32.4	20.9	82.4	65.5	77.0	2.1	2.1	2.1
Total	22.5	29.4	25.4	73.4	65.6	70.1	4.2	5.0	4.5

Source of data: U.S. Department of Commerce, International Database of US Census Bureau accessed in 2012 and 2015

Age pyramid showed some change, though little, in 2002 that there was some decline in percentage of children and subsequent years but a slight increase in the older ages. Age pyramid lost its expansive shape in 2012, shrinking at its base and expanding at subsequent ages. There was an expansion at the top of the age pyramid

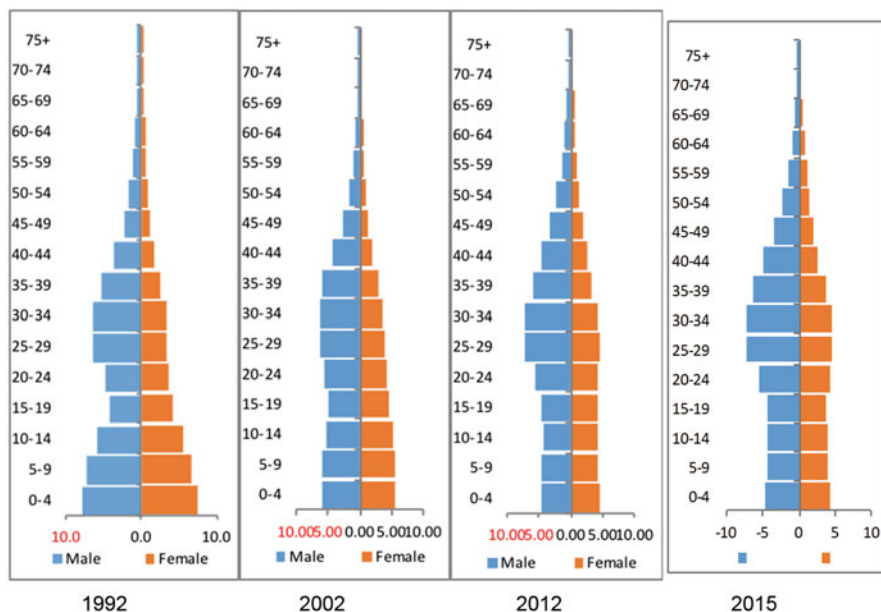


Fig. 3 Age structure of the Arabian Gulf. (Source of data: U.S. Department of Commerce, International Database of US Census Bureau accessed in 2012 and 2015)

as well (ageing of population). Age pyramids show an unexplained trend. It was due to the foreign labor force, majority of whom were of adult males. This complicates their pyramids for interpretations and understanding.

Sex Ratio

Sex ratio, defined as males per 100 females, appeared favoring males (138). Sex ratio kept on increasing but at a slower pace (Table 5). A faster increase was noted in Qatar from 194 in 1992 to 196 in 2002 to 329 in 2012 and in UAE from 199 to 215 to 219. But that of Oman declined during this period from 141 in 1992 to 129 in 2002 to 122 in 2012. The major reason behind this male excess in the population is employment-oriented immigration from South Asia and Africa.

Reflections of Age Composition

Age composition serves as guide to social policies and programs, influencing public health as most of them depend largely upon statistically derived indices of population characteristics (Table 6). These indices are calculated by taking population of specific age as the denominator.

Table 5 Sex ratio of population

States	0–14	15–59	60+	Total
1992				
Bahrain	103	156	114	135
Kuwait	105	145	137	128
Oman	104	181	111	141
Qatar	106	257	183	194
Saudi Arabia	104	149	136	127
UAE	105	269	200	199
Total	104	163	136	134
2002				
Bahrain	103	154	101	135
Kuwait	108	163	129	145
Oman	105	149	115	129
Qatar	104	245	202	196
Saudi Arabia	105	144	123	127
UAE	105	273	243	215
Total	105	160	127	137
2012				
Bahrain	103	175	117	154
Kuwait	108	160	108	143
Oman	105	132	105	122
Qatar	103	417	220	329
Saudi Arabia	105	129	112	121
UAE	105	275	225	219
Total	105	156	117	138
2015				
Bahrain	103	181	127	154
Kuwait	108	165	101	141
Oman	105	133	101	120
Qatar	103	463	232	339
Saudi Arabia	105	130	110	119
UAE	105	294	211	218
Total	105	161	115	138

Source of data: U.S. Department of Commerce, International Database of US Census Bureau accessed in 2012 and 2015

- (a) **Child - women ratio**, the number of children below 5 years of age per 1000 women of age 15–49 years was calculated separately for male and female children. This being an indirect indication of fertility shows a marked decline in the 1992–2002 period from 775.1 to 514.6. The decline during 2002–2012 was comparatively lower – from 514.6 to 369.8. This indicates not only of reductions in the number of children in the population leads to shrinking of age structures. A higher decline in the number of male than that of female

Table 6 Age-based indices for GCC population

GCC	Child woman ratio			Aged child ratio			Median age			Age dependency ratio		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
1992												
Bahrain	262.3	251.9	514.2	12.6	11.4	12.0	27.3	21.8	25.1	5.2	7.1	5.9
Kuwait	282.3	271.3	553.6	8.7	6.6	7.7	26.1	19.7	23.0	4.5	4.7	4.6
Oman	435.9	416.9	852.8	8.5	8.0	8.3	24.1	15.4	19.7	5.1	8.4	6.3
Qatar	315.1	297.7	612.8	8.7	5.0	6.9	31.1	20.6	28.6	2.6	3.6	2.8
Saudi Arabia	414.1	397.7	811.9	10.6	8.1	9.3	22.1	16.2	19.2	7.2	7.9	7.5
UAE	348.2	334.6	682.9	6.8	3.5	5.2	31.7	19.9	28.0	2.0	2.7	2.2
Total	395.5	379.6	775.1	10.1	7.7	8.9	24.2	16.8	20.7	6.0	7.2	6.4
2002												
Bahrain	197.2	191.9	389.1	15.3	15.7	15.5	29.6	25.2	27.8	5.1	7.8	6.1
Kuwait	213.6	199.6	413.3	10.6	8.9	9.8	28.4	24.7	27.4	3.5	4.4	3.8
Oman	288.0	274.4	562.5	11.1	10.1	10.6	23.4	18.8	21.3	5.9	7.5	6.5
Qatar	210.9	203.0	414.0	12.8	6.6	9.8	32.6	24.1	30.3	3.0	3.6	3.2
Saudi Arabia	275.8	264.9	540.7	11.6	9.9	10.8	23.7	19.4	21.8	6.1	7.1	6.5
UAE	210.4	201.8	412.3	10.4	4.5	7.5	31.7	23.6	29.6	2.1	2.4	2.2
Total	262.8	251.8	514.6	11.5	9.5	10.5	26.0	20.1	23.6	5.1	6.5	5.6
2012												
Bahrain	144.4	141.1	285.5	22.9	20.2	21.6	32.5	28.3	31.1	4.9	7.3	5.8
Kuwait	215.5	200.9	416.4	14.3	14.4	14.4	29.9	26.4	28.6	4.4	6.5	5.2
Oman	222.1	211.6	433.8	15.6	15.6	15.6	25.7	22.8	24.4	6.7	8.5	7.5
Qatar	161.5	157.2	318.7	19.9	9.3	14.7	33.2	27.8	32.2	1.8	3.5	2.2
Saudi Arabia	182.7	175.2	357.8	16.8	15.8	16.3	26.7	24.4	25.7	6.6	7.6	7.1
UAE	210.7	201.8	412.4	12.9	6.0	9.5	32.1	25.0	30.2	2.4	2.9	2.5
Total	188.9	180.8	369.8	16.4	14.7	15.5	28.7	24.6	27.1	5.3	7.0	6.0

2015

Bahrain	139.5	136.1	275.6	28.1	22.9	25.5	33.2	29.0	31.8	5.8	8.0	6.6
Kuwait	206.4	192.4	398.9	15.8	17.0	16.3	30.2	27.0	29.0	4.8	7.6	5.9
Oman	224.4	213.9	438.3	16.4	17.1	16.7	26.3	23.7	25.1	7.0	8.9	7.8
Qatar	162.5	158.6	321.1	22.6	10.0	16.4	33.9	27.9	32.8	2.1	3.9	2.4
Saudi Arabia	172.0	164.9	336.9	19.5	18.7	19.1	27.6	25.8	26.8	7.2	8.3	7.6
UAE	211.2	202.2	413.4	13.3	6.6	10.1	32.2	25.0	30.3	2.5	3.3	2.7
Total	181.1	173.3	354.4	18.6	17.0	17.8	29.4	25.8	28.0	5.7	7.6	6.5

Source of data: International Database of US Census Bureau accessed in 2012 and 2015

children was observed between the period of 1992–2002 and 2002–2012. There were unnoticed countrywide differentials. Within the countries, the child-woman ratio declined further from a high of 775.1 in 1992 to 514.6 in 2002 to a low of 369.8 in 2012, with an equal decline for both males and females. The child-woman ratio was found to be the lowest in Bahrain during all the periods followed by Kuwait, Qatar, and UAE in 1992; the order was UAE, Kuwait, and Qatar in 2002 and Qatar, Saudi Arabia, and UAE in 2012. Declines of both males and females were found to be equal during these periods.

- (b) **Aged-child ratio**, the number of persons aged 60 years and above to 100 children of age below 15 years indicates the two sides of the age structure – bottom and top. A visible increasing trend indicates that the number of people aged 60 years and above has increased over time. The 8.9% during 1992 increased to 10.5 in 2002 and 15.5 in 2012. There was a steady increase of this ratio between 1992–2002 and 2002–2012. It has increased to 17.8 in 2015. The change was higher among the females than males indicating that older males increased slower than older females, although with countrywide variations: Bahrain standing on one side while UAE on the other. The aged-child ratio was found to be lower but with a faster increase from a low of 8.9 in 1992 to 10.5 in 2002 to 15.5 in 2012. The highest ratio was noted in Bahrain over all the periods, which was followed by Saudi Arabia and Oman. Except UAE, all the countries had a higher ratio during 2012 with negligible male-female difference.
- (c) **Median age**, the average age of the population shows not only the fertility and mortality situation but also the population and development. Arabian Gulf countries' median age has raised from 20.7 years in 1992 to 23.6 years in 2002 to 27.1 in 2012 and to 28.0 in 2015. Males have higher median age than females, throughout the period in all the six countries. Qatar had the highest median age among the countries, during all the periods, followed by UAE.
- (d) **Age dependency ratio**, the percent of old aged (60 years and above) to the working age people (15–59 years) reflects the burden of social welfare and public benefit programs in a particular population. There was a higher ratio in the Arabian Gulf, which varied during the period: a decline in 1992–2002 but an increase in 2002–2012. Age dependency ratio was lower: it remained almost equal in all the three periods around 6.0. Saudi Arabia had the highest age dependency ratio, followed by Oman, for all the periods.

Conclusions and Implications

The Arabian Gulf countries (namely, Bahrain, Kuwait, Qatar, Oman, Saudi Arabia, and UAE) form the Gulf Cooperation Council and have a strong oil-based economy. They are the key decision-makers of the Arab nations and are widely accepted as employment providers for low-income Asian and African countries. Their strong rooted traditions, customs, and religious practices restrict acceptance of modern values and lifestyles. But with the increasing number of Western-educated and multi-cultured, technology-savvy people in the region (both natives and

immigrants), the values are changing toward an openness to modernization and modern lifestyle.

Such changes in values and lifestyles influenced the demographics and the values of children leading to declining fertility preferences and better control of infectious diseases. This effort to create to build a healthier generation results from utilizing technologies in education, health, and employment. In turn, it influences the size, structure, characteristics, and distribution of the population. As such, the fertility indicators suggest a rapidly declining trend, in these countries. Such, rapid declines in the demographic rates influenced not only the future of population dynamics but also have implications on health services planning and policies. That is, a rapid decline in demographic rates demanded changes in health priorities and also health services administration. For example, national health systems in the Arabian Gulf countries have started to address these demographic changes, especially of the public health sector that caters to the native population.

The region has historically attracted large numbers of foreign workers. But their huge numbers have exaggerated socioeconomic and demographic issues show inequities and imbalances in the distribution of resources and infrastructure. This is a dilemma faced not only by these countries but also by social scientists and demographers and their needs to be addressed in the coming censuses and national-level surveys.

The collection, compilation, derivation, and dissemination of statistical data in the Arabian Gulf need concerted efforts by national and international agencies, concerned research professionals, policy makers, and activists. In addition, there is a need to build reliable statistical data reflecting public health and demographics; this is needed for better management of social and health-care programs. Such efforts will help to bridge the gap between the population groups such as male-female, native-expatriate, Arab-non-Arab, salaried-business, urban-rural, etc.

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