The Changing Demography of Saudi Arabia

The Changing Demography of Saudi Arabia

By

Asharaf Abdul Salam and Mini T.C.

Cambridge
Scholars
Publishing

The Changing Demography of Saudi Arabia

By Asharaf Abdul Salam and Mini T.C.

This book first published 2024

Cambridge Scholars Publishing

Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN (10): 1-5275-7198-X
ISBN (13): 978-1-5275-7198-3

Saudi Arabia has a long history but a short one as a Kingdom, where demographic progress is marked as resulting from multidimensional multi-sectorial development enabling a high quality of life rather than coerced family planning or control. Efforts to build a competitive economy and living standards enlightened the need for infrastructure to maintain low levels of morbidity and mortality. In contrast, an absence of population pressure combined with socio-religious traditions, customs, and practices favoring a pronatalist policy encouraged the fertility preferences of people. This book, an empirical and analytical demonstration of resource-intensive Saudi Arabian demography, traces a journey from an agrarian to a modern society, demarcating stages of transition—demographic, socioeconomic, developmental, epidemiologic, and health. Although delayed theoretically, the multifaceted development and progress achieved assures a credible and sustainable demography to fit into Saudi Arabia's ambitious journey.

CONTENTS

PREFACE

This humble contribution was conceptualized through working with the demography of Saudi Arabia for an extended period by the first author. Apart from Saudi Arabian demography, he has dwelled on the demography of Libya and other Arab countries through teaching and research. An alumnus of the International Institute for Population Sciences, India, and the International Institute on Aging, Malta, he has developed his flair to compete as an Arab demographer/population studies professional. By then, Cambridge Scholars Publishing had expressed their interest in publishing this research as a book. It aims to review, revise, and edit chapters. The first author invited the second author, an alumna of the International Institute for Population Sciences, India, as a co-author.

Saudi demography has been discussed on various occasions by demographers, social scientists, medical and public health professionals, and others. Most of those discussions were based on local-level dynamics and small sample surveys. Besides, professors, students, and researchers made efforts at the macro level of national demographic analyses: most of them were in Arabic and so not published at international levels. This limits the scope of wide understanding of Saudi Arabian demography and the deserved attention. In short, the vague picture available internationally on Saudi Arabian demography was confusing.

This book compiled data from various sources—censuses, demographic surveys, the International Data Base of the US Census Bureau, the Ministry of Health Statistics, and many other online sources. The compiled data have been analyzed exhaustively with demographic analysis techniques to reach rates, ratios, proportions, and descriptions. As the data used in this analysis are not known to the general academic purviews, they are quoted or cited at various places and tables in absolute numbers. It gives academicians the opportunity to recalculate and correct the authors to an extent.

The main analyses were merged into three chapters (3, 4, and 5). Chapter 3 is more of a basic analysis showing absolute population sizes, increasing trends, growth rates, and pressures based on density, with male-female and native-foreigner differentials. Regional distribution of the population was

explored for developmental regions, administrative areas, governorates, and future cities to the extent permissible with the data. Further, sex ratio, age-sex distribution, and age pyramids are demonstrated to show the imbalances, discrepancies, and conflicts in Saudi Arabian demography: most of them are explained along the immigration process based on the demand-supply gap in the labor force. However, the demographic characteristics of the native population align with theories and theoretical explanations. Particularly, there is a trend of age-based indices and population pyramid—from expansive to constrictive and cylindrical—depicting rapid improvements toward stabilization and population aging.

Chapter 4, conceptualized differently, covers all the components of importance in demographic change under three headings—conventional determinants, secondary agents, and tertiary agents. The first section includes fertility, mortality, and migration: the first two give rise to the natural increase of the indigenous population, whereas the third one adds the foreign population. Although delayed, Saudi Arabia is passing through a rapid fertility transition as revealed by various indicators—total fertility rate, crude birth rate, age-specific fertility rate, general fertility rate, general marital fertility rate, general reproduction rate, children ever born, and parity. Nuptiality patterns, age at marriage, and contraception have a direct link with fertility: transition in all these indicators operates especially to facilitate fertility decline in the country. Mortality assessed through crude death rate, age- specific death rate, infant mortality rate, and under-five mortality rate reveals an already established mortality decline in the country. This is a lag in demography, as explained earlier, but is not true while analyzing the native population separately from the total.

Moreover, life expectation at birth and various ages and causes of death register progress similar to other populations in transition. The migration component shows frequent in-migration from one locality to another in the country, an exodus of the immigrant population increasing rapidly despite labor reforms and regulations, thus increasing net migration. It is expected to show a different trend soon, in line with the socio-political transformations in the country.

The second and third sections of Chapter 4 demonstrate the demographic transition process with delineated stages of pretransition and transition (early, middle, and late) stages, similar to any other population, leading to a range of wide to narrow population increase. This process takes place in tandem with socio-economic transformations leading to commercial developments, industrialization, sectoral change in employment, and thus

livelihoods, standards, and quality of life. That is, the demography of Saudi Arabia emerged along with developments in other sectors determining living arrangements and related dimensions. A profound improvement in literacy and education, labor force participation, and sectoral distribution as characteristics recorded over time. Together with these changes are improvements in living arrangements—housing and basic infrastructure of water, power, and sewage. These developments together influenced the social structure and community variables facilitating demographic progress.

Chapter 5 is about demographic prospects in Saudi Arabia in the coming decades, under the current trends of transition in demography and allied sectors discussed above, coupled with reforms in labor laws and immigration to utilize demographic dividend—the indigenous native human resources. Competence in building a country of world-class infrastructure and quality of life, as visualized in Vision 2030, recognizes challenges of equitable distribution of population across the geographic areas fostered by living arrangements, livelihood options, basic amenities, and educational, health, transport, and public utility services. Overall, a scenario of demographic, epidemiologic, and health transition would result in Saudi Arabia with its rapidly increasing retired and aging population. Systems and networks can be refurbished to meet the growing needs and challenges of the population in the coming decades.

Chapter 6 summarizes chapter by chapter and concludes. In sum, Saudi Arabian demography is characterized by an already established low death rate (total, infant, and children), an increasing life expectancy, and a rapidly declining fertility rate. Such a transition is facilitated by improvements in socio-economic dimensions, marital and reproductive behaviors, governmental facilities, and expansion of educational, health, and public utility services. Still, a lacuna or lag in demography was reported due mainly to the complicated age-sex distribution of the foreign population brought to fill the demand-supply gap in the labor force. Not only in the foreign population but also in the native population, female shortages are observed: the native sex ratio is explained as biological and environmental, whereas sex bias in foreign and thus total population could be attributed to recruitment and immigration to suit labor requirements and to create flexibility in human resources. The resultant male excess in the total population influences the age-sex structure, age-based indices, and the age pyramid. There are regional geographic variations, too. All these changes on the demographic front are attributed to changing processes influencing natural increases such as fertility and mortality and additions

caused by migration patterns. While these factors are not sufficient enough to explain Saudi Arabian demography, there are other contributors such as secondary agents (education and labor force changes) and tertiary agents (sectoral changes, labor force composition, and age patterns apart from improved living arrangements, standards, and quality of life). Thus, the population is progressing toward stabilization with a progressive outlook and credentials where epidemiological and health transition, aging and geriatrics form the future scenario. The analysis of such a scenario gives rise to conclusions on structural differences in native and foreign populations' redistribution efforts, delineated demographic transition stages, determinants (conventional, secondary, and tertiary), and credibility to sustain the transition to lead to progressive lives with standards and quality.

At the outset, the authors acknowledge that institutions, organizations, and individuals contributed to instilling vigor and enthusiasm behind this work. Of them, the International Institute for Population Sciences has a major role—its mission. The first author acknowledges the International Institute on Aging and the University of Malta for developing his interest in Arabian demography and aging. He has been highly influenced by his current employer, the King Saud University Center for Population Studies and his previous employer, the Faculty of Public Health of Garyounis University in Libya. Thanks are due to all those in these institutions for imparting academic wisdom and intellectual thinking. There are many influencing personalities at various levels, all deserving special mention. The second author, employed at CMR University, India, has a laborious and diligent academic journey to acknowledge. Thanks to Ms. Elanor Harris for professional language editing services.

We dedicate this book to the growing importance of Vision 2030 to build a vibrant society.

Asharaf Abdul Salam
Mini T.C.

TABLES

FIGURES

CHAPTER I

INTRODUCTION

Saudi Arabia is determined to build a thriving society to fulfill dreams, hopes, and ambitions through the provision of quality opportunities for education, training, employment, health, housing, and entertainment (Saudi Arabia, 2016). Since its formation in 1931, many things have changed through evolving, improving, updating, and auditing. Most importantly, the population has evolved through stages with its style of living, livelihood, and quality. These changes, the basics, could be narrated theoretically and linked to changes in other sectors such as education, health, industry, the economy, housing, and basic infrastructure and, thereby, epidemiological and health transitions. This period also witnessed many developments in the consolidation and dissemination of population data, both through censuses and surveys of various types—national, regional, and local. Such attempts have seamlessly reflected the paths explained by theorists but with a time lag in comparison with Western developed countries, which is attributed to various factors of religiosity and socio-economic development.

An overwhelmingly young population having a higher birth rate but a lower death rate, lower infant mortality, and higher life expectancy are characteristics of Saudi Arabia, where the birth rate is declining rapidly along with sharp changes in social and economic sectors (Hamanaka, 2017; Salam and Mouselhy, 2012; Al-Mazrou et al., 1995; Al-Nasser and Bambgboye, 1992; Courbage, 1995). These changes include number of children born, polygamous and consanguineous marriages, women's roles in household decision-making, delay in marriages, educational progress, and contraception altogether, leading to population stabilization, redistribution, and aging (Salam, 2023[1], 2013[1]; Al-Gabbani, 2008; United Nations, 2006; Khraif, 2001, 2009; Makki, 1986). Almughairy (2019) expressed his opinion of embarking on the planning process with efforts to align the interests of national, regional, and local agencies to find common links and interdependencies between programs and policies in regional development.

Despite the religious traditions and societal barriers, educational progress along with Western living experiences encouraged women to enter into the labor force, thereby changing attitudes to starting a family, leading to limiting and controlling fertility through contraception (Al-Khraif et al., 2016, 2017). During this transition, there was a lag reported due mainly to a faster decline in mortality in comparison with that of fertility, different from theoretical demographic dynamics, which is explained as due to immigration effects affecting sex ratio, age-sex distribution, the dependency ratio, regional distribution, urban share, and housing conditions (Salam, 2023[1]; Khraif et al., 2019[1]; Freedman, 1995; Jacobson, 1994; Sufian, 1993). The slow fertility decline of the past has gained momentum recently and thus falls rapidly following the theoretical path, similar to the neighboring Arabian Gulf countries (Salam, 2019, 2013[1]). Salam et al. (2015) and Khraif et al. (2016, 2019[2]) consider this change as the fastest ever witnessed, promising a stabilization with improved quality of life, urbanization, and infrastructure. Thus, demography seeks importance in the Arab region, specifically Saudi Arabia, for its ability to adapt and respond to the inevitable social and political demands (Tabutin, 2007). As Bongaarts (2009) rightly pointed out, population change and its accompanying age-structural transformations have multiple consequences for society, the economy, and the environment.

Such a fast transition results in a rapid increase in the aging population reflecting various demographics, including the child-woman ratio, aged-child ratio, median age, and age dependency ratio, demanding concerted population and public health policies and programs with fine-tuned social welfare, economic security, and health-delivery mechanisms (Mirkin, 2010; Khraif et al., 2015; Asharaf and Mouselhy, 2013; Karlin et al., 2016; Al-Shammari et al., 2000). Coupled with these demographics is the change in living arrangements toward modern apartment-based, nuclear housing replacing traditional houses suitable for generations to live together with filial responsibilities, thus increasing demands for affordable housing, home ownership, and life satisfaction as essential components during post-retirement life (Al-Dosary, 2005; Al-Khraif et al., 2018, 2019[3]; Salam et al., 2014; United Nations, 2009). Filial care and co-residence are determined, to a large extent, by age, sex, cultural background, number of children, educational level, and presence of domestic helpers, apart from marital status and family income (Shah et al., 2011). Jarallah and Al-Shammari (1999), from research on socio-demographic and socio-medical determinants of health perception among older people in Saudi Arabia, stressed the importance of families in the medical and social care of older people. Halsall and Cook (2017) argued for the creation of new policy

initiatives to support older people in the region by redefining health and social care services toward a community-based, locally applicable mode through social policies. In contrast, Sibai et al. (2017) advocated an integrated and holistic model of healthcare, policies and program incentives for aging in place, at home care, and knowledge production.

Such preferences, coupled with labor market transitions, expose urbanization to attracting in-migrants and immigrants, leading to an improved focus on urban living conditions: one such example from the country is the future city program that led to a city ranking exercise (Al-Khraif et al., 2022[1], 2019[1]). Coupled with this are measures to revamp the economy through improved labor force participation with the active participation of the indigenous native population and utilization of the demographic dividend. However, its impact is slow and steady; it might take a few decades to see the real worth of the movement (Salam, 2022[1]). Courbage (1999) points out the obstacles such as the pro-natalist policy, re-Islamization, bureaucracy, and traditional structures that are undergoing modernization, the homogenization of attitudes, and Westernized lifestyles such as available contraceptives. In short, it is the change in the demography of individuals living longer, marrying later, and having fewer children that influence fertility through nuptiality (Rashad and Osman, 2000; Salam, 2013[1]; Al-Khraif et al., 2020; El-Haddad, 2003). Mahboub et al. (2014) note the factors affecting fertility among the native women of Saudi Arabia as age, the age gap between children, age at first pregnancy, body mass index, age at marriage, husband's age, and duration of marriage. Rashad (2000) remarked that policies and measures to reduce the emphasis on women's roles in motherhood and to improve resources and opportunities available to women complement concerns with a reduction in population size.

Along with this fertility transition, there was a decline in child mortality in Saudi Arabia and other Arabian Gulf countries from resource allocation and investment in health systems and other sectors like water, sanitation, hygiene, nutrition, and lifestyle (Salam and Al-Khraif, 2020). Consequently, there is an uplifted self-perceived health in the country, expressing improved systems of administration, management, programs, budgets, and targets in the health system—a net result of chronic diseases, injuries, and periodic medical examinations (Salam, 2022). Besides, there are changing attitudes by women toward thinning body shapes resulting from exposure to fashion magazines and television channels (Musaiger, 2014).

On the other hand, mortality levels have already been recorded as low in the country for the last two decades. Communicable diseases have been replaced by lifestyle diseases, characterizing injuries and neoplasms as major causes of death: remedial strategies include healthy lifestyles and road safety (Chaabna et al., 2018).

Demographic issues are many in the population, not limited to those above, but include the foreign population leading to a biased sex ratio, age distribution, complicated structure and characteristics, consanguineous marriages, misleading vital rates due to the biased denominator, female issues, and issues of immigrants, labor force, and shanti towns (Babay, 2004; Al-Turki, 2011; Collymore, 2003; Al-Nahedh, 1999; Al-Husain and Al-Bunyan, 1997; Al-Mazrou et al., 1995, 1997; Winckler, 1997; Sufian, 1993; Joshi et al., 2011; Vlieger, 2012; Khraif, 2000; Khraif et al., 2018; Silvey, 2004[1&2]; Salam, 2023[2]; Aldosari, 2017; Garawi et al., 2015). All such issues, in turn, impact standards of life, social characteristics, and the workforce, where Vision 2030 explores options to build a high-quality lifestyle with increased involvement of the indigenous population in all sectors, including healthcare (Maben et al., 2010).

Apart from the political issues, demographics, including gender issues in Saudi Arabia, have a profound impact on creating an impression at international levels: a challenge facing the Arabian Gulf countries for which information to explore demographic issues is imperative in addition to changing the structural position of women and men (Baroudi, 2004; Salam, 2023[2&3]; Khraif, 2009; Garawi et al., 2015). Such impacts have importance due to the custodianship of two holy mosques that millions visit as pilgrims throughout the year, especially during Hajj season, demanding mutual trust, equitable partnership, and collaborations extending beyond national and regional borders to balance national sovereignty, ethics, and priorities (Memish et al., 2003[1&2]). As against the apprehensions, communicable diseases are rarely reported from those holy places during Hajj and Umrah due to the efforts of public health and pandemic intervention strategies (Khan et al., 2010). In short, the Arab population, in general, expects strong state-citizen relationships, responsive and accountable institutions, and cooperation to lead a dignified life with quality (El-Zein et al., 2014).

Context of this analysis

Demography/population studies did not receive the desired attention in this region, especially Saudi Arabia, due to many reasons, including low population pressure, less importance given to information-based programs and plans, slow realization of demographics, and the importance of denominator-based administrative approaches. Times change, so the academics and disciplines recognize this lacuna in administration and management, thereby promoting the demographic discipline through various other disciplines of health sciences, medicine, and social sciences. One of the independent approaches is the Center for Population Studies, established at King Saud University. There are many pieces of research carried out by this center, including population growth, the geographic distribution of population, fertility behavior, contraception, population aging, components and challenges of demographic change, public health concerns, migration, demographic dividend, family demography, demographic lag, labor market, and male-female differences. This book is a consolidated approach to research carried out from the center by the first author.

Aims, research questions, and objectives

This analysis was done to contribute an information base for Saudi Arabia, especially the denominator (with population as the base), which supports immensely varied social, economic, and welfare strategies and policies. In the time of Vision 2030, such an attempt sheds light on various target achievements, thereby facilitating progress. Specifically, this research attempts to answer the following questions.

- What type of demographic growth has Saudi Arabia witnessed?
- What makes Saudi Arabian demography different from other theoretically explained ones?
- How are the geographic divisions comparable in terms of balance and equity in population distribution and structural characteristics?
- Does the country follow any standards in native-foreign population ratio, or is it purely incidental, depending upon requirements?
- How can the country explain its male dominance or missing females, both in the native and foreign populations?
- Can massive urbanization and city development benefit in the long term?
- What are the explanations for such a delayed demographic transition?

- Can this transition be justified along various agents of change, traditionally defined, and others (secondary and tertiary)?
- What made the progress in mortality precede that of fertility?
- Will this transition be sustained for a long time or finish soon?

Based on the aims and questions, the following objectives are set for operational purposes:

- Appraise the number of population, absolutely, and their percentage increases, annual growth rate, and density.
- Calculate various indicators for males/females and native/total separately for possible interpretations of demographic change.
- Explain changes across developmental regions and administrative areas.
- Look into urbanization and city development.
- Investigate sex ratio differentials.
- Calculate age-sex distribution for broad age groups and five-year age groups.
- Compare various age-related indices over the period, for males/females and native/total, separately.
- Present structural changes in population pictorially.
- Plot demographic transition.
- Conceptualize demographic transition as an effect of a combination of factors—secondary and tertiary factors in addition to the traditionally explained ones.
- Examine in detail fertility, mortality, and migration trends through the calculation of rates, ratios, and indices.
- Examine trends of education, labor force participation by sectors, and housing infrastructure as drivers of the transition.
- Recapitulate the future demography of Saudi Arabia.

Hypotheses

There are many controversies about demographic changes in Saudi Arabia. As stated, they are attributed to religiously endorsed pronatalist policies, reluctance to adopt birth control strategies, and the less favorable position of changing traditions and customs. But a close look at the trends and patterns clarifies that demographic changes are observed: slowly during the initial period but rapidly recently moving steadily toward stabilization. The rapid pace of current demographic change demands systems, methods,

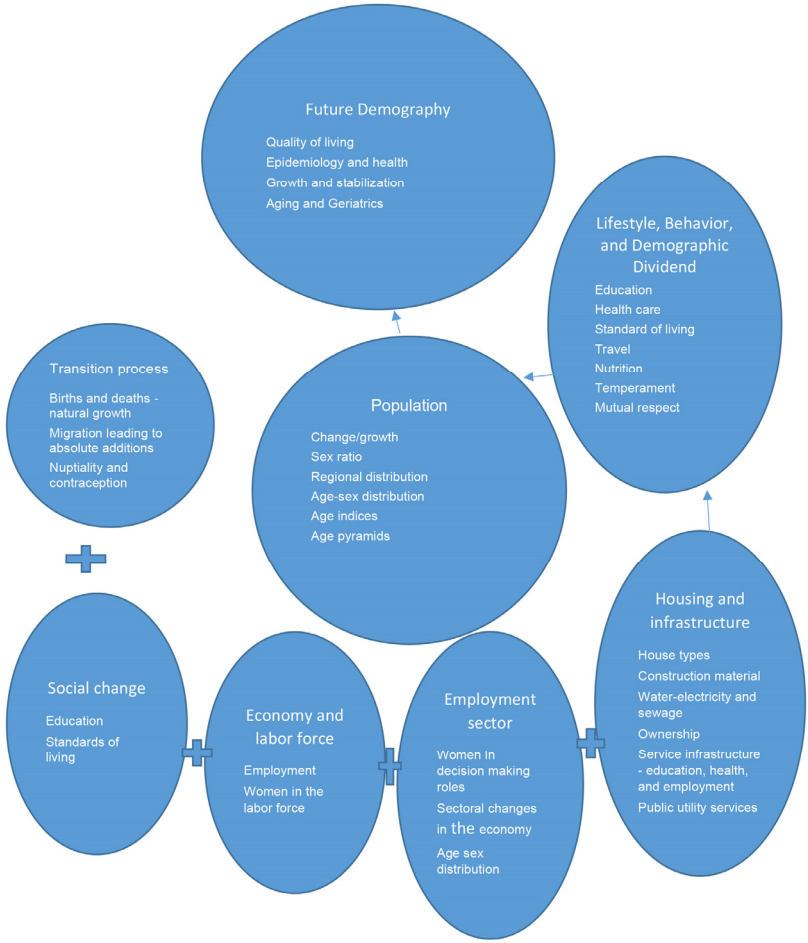
programs, strategies, and investments at the same pace to sustain the desired quality of life. Although delayed, this transition in demography is more systematic, leading to newer theoretical conceptualizations born out of religious, cultural, and traditional outlooks.

Framework

Saudi Arabia follows a demographic path different from an already established one characterized by a slow pace, long delays, an exodus of the immigrant population, fewer than expected changes in core demographic dimensions, and rapid changes in proximate background indicators laying a strong foundation for a quality life: thus a different type of demographic transition is inevitable but seems like a well-planned one. This transition, beyond the decline in mortality and fertility, is attractive for transition in allied sectors—education, the economy, life expectancy, health status, and living arrangements (Fig.1.1). These push factors rapidly developed to act as agents and catalysts of change in existing scenarios of life from a slow-paced traditional agrarian one to a fast-paced commercial and industrial economy with the right mix of service sectors. Such a transition lays the foundation for a sustained future with an everlasting impression not only on demographics but also on various other sectors, reflecting quality of life and standards of living.

It is conceptualized that sustainable demography could be established by creating an environment fostered through dimensions of social (education and living standards), economic and labor force (employment and women in the labor force), employment sector (sectoral changes, years of employment, and age-sex structure), and housing and infrastructure (house type, construction material, water, electricity, sewers, ownership, service infrastructure, education, health and employment, and public utility services). All these ingredients lead to the creation of a lifestyle that is relevant, accepted, and cultural, thereby determining behavior, outlook, and utilization of the demographic dividend. These interconnections and denominations are the determinants of population characteristics (change/growth, sex ratio, regional distribution, age-sex distribution, aging indices, and pyramids). With this type of demographic transition, the future demography of the country would comprise quality living, epidemiological and health transition, growth, stabilization, and an aging population.

Figure 1.1. Conceptual Framework used to organize chapters and analyses



The scheme of this book

This book, *The Changing Demography of Saudi Arabia,* is organized into six chapters. The first one explains, with the support of literature, the background of demographic change in the country. The second chapter presents the methods, data, and analyses with the formulas and equations used in the calculations, as well as a brief explanation of the sources of the

data. The third chapter demonstrates the population change in the country, absolute size, increases, growth rate, percentage, sex ratio, age-based indices and age structure (both broad age groups and five-year age groups), by sex for the nation, developmental region, administrative areas, and future cities for natives, foreigners, and total. Chapter four was crafted with caution to demonstrate demographic change by explaining three sets of dimensions—conventional, secondary, and tertiary. The first section of this chapter covers fertility, mortality, and migration, highlighting various processes and changes over time.

In contrast, the second section sheds light on components of secondary importance (proximate variables) to population change, and the third section deals with the indirect agents of change. Dimensions considered in these three sections are interlinked: change in one might change the other. While those in the first section have a direct bearing on demographic change, those in the second have a facilitating effect, and those in the third are reinforcing factors. Chapter five explains the future demography of the country, emphasizing quality of life dimensions and the transition in epidemiology and health leading to health system reforms. The prospects of the population are estimated, along with aging as a future challenge. The sixth chapter is a summary and conclusion. There is a bibliography at the end. As all the data are presented in the text, no annexures or appendixes are included.

CHAPTER II

DATA AND ANALYSIS TECHNIQUES

As stated earlier, demographic data on Saudi Arabia are too sparse to depend on solely. Thus, different sources are explored. Major data are drawn from the General Authority for Statistics, the official government agency responsible for censuses and surveys. There are censuses and demographic surveys carried out by this agency, both following a uniform methodology. While censuses show full coverage, surveys were based on scientific interpolations. As this is the locally available country-based source, they are more reliable. The Ministry of Health, Saudi Arabia data has also been used, especially for clarity concerning morbidity and mortality. Additionally, the sources include international sources such as IDB of the US Census Bureau and other online sources.

This book has three analytical chapters: population change, agents of change, and future demographic prospects. Data used in each chapter by their source and analysis techniques are detailed here. Population change in Saudi Arabia was demonstrated by using census data from the 1974, 1992, 2004, and 2010 censuses, 2016/2017 demographic surveys, and 2021 estimates.

Apart from the absolute numbers, the following formulas are used for calculations;

Percentage increase (PI) = $\frac{\mathrm{Pt2}-\mathrm{Pt1}}{\mathrm{Pt1}} * 100$ [P_{t1} is the population at point 1, and P_{t2} is the population at point 2]

Annual growth rate (AGN) = $(LN(\frac{Pt2}{Pt1})/N) * 100$

Density = $\frac{Pt}{Area(KM\ sq.)}$ [P_t is the population at time t]

Sex Ratio = $\left(\frac{Pm}{Pf}\right) * 100$ [P_m is the number of males, and P_f is the number of females]

Aged-child ratio = $(P60+)/(P<10)*100$ [P is the population]

Child-woman ratio = $\left(\frac{Pt(0-4)}{Pf(15-49)}\right)*1000$ [Pt is the total population, and Pf is the female population]

Age dependency ratio = $\left(\frac{P(60+)}{P(15-59)}\right)*100$

Total dependency ratio =$\left(\frac{P((0-14)+60+)}{P(15-59)}\right)*100$

Median age = $l+(\frac{\frac{N}{2}-\sum fx}{fi})*N$

Age pyramids were drawn by calculating the percentage of males and females together, totaling 100.

Agents of population change are divided into three sections, namely, conventional determinants, secondary agents, and tertiary agents. In this section, the following formulas are used for the calculation.

Total fertility rate (TFR) = $\sum\left(\frac{Births\ at\ an\ age\ group}{women\ of\ the\ age\ group}\right)*i$

Crude birth rate (CBR) = $(Bt/Pt)*1000$ [B_t is the births at time t and P_t is the population at time t]

General fertility rate (GFR) $=(Bt/Ptw)*1000$ [B_t is the births at time t and P_w is the female population at time t]

General marital fertility rate (GMFR) $=$ = $(Bt/Ptwem)*1000$ [B_t is the births at time t and P_{wem} is the married woman at time t]

General reproductive rate (GRR) = = $(Bt/Ptw15-49)*1000$ [B_t is births at time t and $P_{tw15\text{-}49t}$ is women aged 15-49 years at time t]

Children ever born (CEB)=$(Pc/Pwem)*1000$

[Pc $s\ number\ of\ children\ and\ Pwem\ is\ number\ of\ married\ women$]

Age-specific fertility rate = $\left(\frac{Births\ at\ an\ age\ group}{women\ of\ the\ age\ group}\right)*i$

Crude marriage rate = $\left(\frac{PCm}{Pt}\right) * 100$

General marriage rate = $\left(\frac{PCm}{P15+}\right) * 100$

Crude divorce rate = $\left(\frac{Pdiv}{Pt}\right) * 100$

General divorce rate = $\left(\frac{Pdiv}{P15+}\right) * 100$

Crude widowed rate = $\left(\frac{Pwd}{Pt}\right) * 100$

General widowed rate = $\left(\frac{Pdiv}{P15+}\right) * 100$

Crude never-married rate = $\left(\frac{Pnm}{Pt}\right) * 100$

General never-married rate = $\left(\frac{Pnm}{P15+}\right) * 100$

Couple protection rate (CPR) = $\left(\frac{(0.5*Pm)+(0.4*Tm)+(0.1*Om)}{PWem}\right) * 100$ [P_m is a permanent method, T_m is a temporary method, O_m is other methods, and P_{Wem} is married women]

Crude death rate (CDR) $= \frac{Dt}{Pt} * 1000$ [D_t is the number of deaths at time t and P_t is the population at that time]

Infant mortality rate (IMR) = $\frac{Dti}{Bl} * 1000$ [Dti is the number of infant deaths at time t, and B_l is the number of live births at that time]

Under-five mortality rate (U5MR) $= Dc < 5t/Bl * 1000$ [$D_{c<5t}$ is the number of children who died before reaching five years at time t and B_l is the number of live births at that time]

Age-specific death rate = Da/Pta*1000 [D_a is the number of deaths at a specific age, and P_{ta} is the population of the same age at that time]

Expectation of life at birth (life expectancy) refers to the number of years a newborn is expected to live under the present conditions