
# IMMIGRANT FERTILITY IN AUSTRALIA: ITS RELATIONSHIP TO POPULATION GROWTH

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# Abstract

The Australian population is growing at a rapid pace, yet it is unclear what exactly is causing this growth. Australia is known to be a country that experiences high levels of immigration, yet immigrant fertility has been overlooked with regard to its potential impact on population growth. There has been insufficient research conducted on the fertility patterns of immigrant women in Australia in recent years. Many of the immigrant women entering Australia come from high fertility countries with higher total fertility rates than Australia. Therefore, there is reason to be concerned with the lack of understanding of the fertility patterns of these immigrant women. Australia is already facing challenges in accurately predicting immigration flows - which have been identified as the leading cause of its population growth. Australia cannot afford to remain ill-informed on the fertility patterns of immigrants, as they are associated to future socioeconomic development and planning.

This study made use of data captured for 278 respondents in the 2016 Australian National Census data to run various binary logistic regressions, and in doing so found that when looking at the region of birth of women in Australia, Europe was identified to be a region of origin that statistically produced women who are more likely to have above replacement fertility patterns. It was also found that fertility amongst women in Australia is most likely to be above replacement fertility in the Southern states of Australia, where the majority of the immigrant population resides. Women in Australia who identify as Buddhist were found to be statistically more likely to have fertility outcomes that are above replacement fertility compared to women of other religious beliefs. We can therefore conclude, that, although limited, immigration does have a positive impact fertility levels in Australia.

# Chapter 1: Introduction

## Background

Australia stands out among the world's developed nations in terms of the sustained pace of its population growth (Birrell & Betts, 2017). Australia's current population is estimated at 25.09 million people, up by more than 4 million people since 2011, and is set to reach 37.6 million by 2050 (Birrell & Betts, 2017). Australia's population is following population ageing trends seen in the developed world, and is also one of the most urbanised countries in the world with 85% of the population residing in urban areas (Worldometers, 2019).

Despite Australia being categorised as a higher income country, there is no evidence of population decline that is usually associated with high levels of income (Hugo, 2010). Population growth in Australia is, on average, five times higher than in other high income countries similar to Australia, and one third higher than low income countries (Hugo, 2010). In 2018, Australia's population grew by 1.63%, which is 0.56% more than the global average of 1.07%. Overall, the Australian population is currently growing by one person every 86 seconds (Letts, 2018).

Immigration currently accounts for nearly 80% of Australia's total population growth annually, and has had a historical impact which has led to 28% of the total Australian population today being born overseas (Phillips & Simon-Davies, 2014). This is the highest proportion of foreign-born population of any other country in the world by 8% (Ng & Metz, 2015). The Australian Permanent Migration Program currently caps the number of permanent immigrants entering Australia at +-200 000 people per year, but there are many other ways of entering Australia through a variety of temporary visa categories (Temple & McDonald, 2018). There are no caps on the amount of temporary visa's Australia issues to students, working holiday makers and

business professionals, and these visas are valid for up to 4 years at a time. Recent research suggests that 70% of business visa holders and 30% of student visa holders go on to become permanent residents of Australia (Ware, 2016).

## Problem Statement

Australia has not been able to accurately predict short term population changes, therefore, there is reason to be believe that projections for 2050 may also be lacking in accuracy. Between 2000 and 2010 Australia experienced an enormous increase in immigration rates that failed to be predicted by any demographic forecasts (Wilson, 2017). The 2007 *Intergenerational Report 2* projected that Australia's population in 2050 would be 28.5 million, and three years later the *Intergenerational Report 3* (2010) revised this figure to 35.9 million (Nelson, 2010).

One of the chief concerns about immigrants in Australia is that they are believed to be the leading cause of excess strain on already undersupplied public infrastructure which has been unable to keep up with population growth (Ware, 2016). Over the last decade, 77% of Australia's population growth has taken place in Sydney, Melbourne and Brisbane - with Melbourne's population growing by more than 2 000 people per week (McDonald, 2018). In Sydney and Melbourne the immigrant population makes up 40% of the total population (Birrell & Betts, 2017). In both Sydney and Melbourne the demand for family housing is 64% and 54% higher than supply respectively, which has led many to believe that the skyrocketing housing prices in Australia are caused by immigration led population growth (Birrell & Betts, 2017).

Over and above high immigration rates, Australia has a below replacement total fertility rate that has fluctuated between 1.7 and 2 births per woman for the last 42 years, and is currently sitting at 1.81 (McDonald, 2018). Although this is below replacement fertility it still leads to population

growth due to Australia's ageing population living longer, which results in births outnumbering deaths. McDonald (2018) states that a large portion of the Australian female population is of reproductive age which is leading to population growth via natural increase. Birrell and Betts (2017) attribute the large number of females of reproductive age in the Australian population to immigration. It is worth noting that of the top ten immigrant origin countries to Australia, only two have lower total fertility rates than Australia, with the average among the top ten being 2.36 – this is above replacement fertility (Liddy, 2018). If immigrant women from these countries maintain the fertility patterns of their origin countries, the resulting outcome will be additional population growth attributed to births from immigrant women populations. If Australia is unable to accurately forecast general immigration trends, it is unlikely that they will be able to predict the fertility patterns of the immigrant women in question, and accurately plan for the associated population growth as it is unclear what factors may be associated with immigrant fertility in Australia.

Continued rapid population growth without adequate planning and investment in infrastructure will place stress on public services such as public transport, hospitals and schools. The need for increased public resources in Australia is clear (Fincher, 2011). These public resource needs are made more urgent through high levels of immigration and rates of natural increase which are leading to intensified population growth.

## Justification

There has been insufficient attention given to immigrant fertility patterns in Australia (Abbasi-Shavazi & McDonald, 2000). Migrants make up over 30 per cent of the Australian population yet migrant related research is severely underfunded (Renzaho et al., 2016). There is a vital need to know the extent that fertility, and specifically immigrant fertility, leads to population growth

in Australia in order to effectively plan and allocate resources to future population cohorts such as youth, parents and elderly people. If the needs of future populations are inadequately met, Australia runs the risk of economic decline through the possible shortcomings of social development programs such as the Housing and Affordability Fund and the Living in Harmony Program (McGuirk & Argent, 2011).

The size of a country's population has a direct influence on a countries potential economic output (Nelson, 2010). Australia will need to know what the demographic composition of its future population is so that it may plan for how many jobs will be needed to cater for future employment needs (Nelson, 2010). Effective planning will also allow Australia to forecast its future economic potential. This research is important as it will contribute to the understanding of Australia's future demographic composition, making it useful when analysing policies and programmes pertaining to immigration, urban development, housing, education, healthcare, energy production and consumption, social infrastructure, and the allocation of resources. These include policies and programs such as the Australian Migration Program and the National Energy Productivity Plan. The Council of Australian Governments, in relation to strategic policy goals for Australian cities, is committed to finding ways to ensure that Australian cities are well equipped and suited to face future challenges associated with population growth (Hu, 2015).

This research may also be of value to the origin countries of Australian immigrants as most migrants entering Australia enter through the Skilled Migration Program. Evidence suggests that the education levels of migrants entering Australia are higher than that of the general population (McDonald et al., 2016). Therefore, origin countries may be able to quantify the extent of brain drain as well as the loss of future human capital through immigrant fertility. Origin countries will

be able to use this information to formulate policies and programs to minimise the loss of skilled populations, and their children, through emigration.

The magnitude of the impact that climate change will have in Australia over the coming decades is uncertain, but what is certain is that the areas in which Australia's major cities are located are already receiving less rainfall year-on-year (McGuirk & Argent, 2011). With the national population expected to grow by at least 14 million people by 2050, and most of that growth taking place in these major cities, there is a need to research the impact of this growth on the natural environment (Rutherfurd & Finlayson, 2011).

## Research Question and Sub-Questions

**Main Research Question:**

What are the levels and factors associated with immigrant fertility in Australia?

**Sub-Questions:**

1. How do the fertility rates of women born in Australia compare to those born outside of Australia?
2. What are the demographic, socioeconomic and migration status factors associated with fertility among females in Australia?

## Research Objective and Sub-Objectives

**Main Objectives:**

To identify the levels and factors associated with immigrant fertility and its implications on population growth in Australia.

**Sub-Objectives:**

1. Identify and compare the Total Fertility Rates (TFR) of Australian women and immigrant women in Australia.
2. Formulate a better understanding of the demographic, socioeconomic and migration status factors associated with fertility among females in Australia.

# Chapter 2: Literature

## Literature Review

A defining feature of the Australian immigration system is that it is a sophisticated and closely managed operation with its own ministry and representative in cabinet entirely focused on immigration issues (Hugo, 2014). Despite this high level of organization, Australia has not had an official population policy since the 1970's, and focuses rather on the fine tuning of its various immigration programmes and streams such as the Skilled Migration Program that is currently capped at +-200 000 permanent migrants per year (Allen, 2018). There has been an ongoing demand for an official immigration policy to be adopted that takes into account issues surrounding gender equality, healthcare, education, the natural environment and sustainability (Allen, 2018). The primary focus of the current migration program is an assessment of Australia's labour force requirements, which leads to a preference for the intake of highly skilled migrants who are able to fill any labour gaps in short skilled areas of the economy (Temple & McDonald, 2018). Despite this cap on incoming migrants, the population of Australia grows by around 350 000 people every year when natural increase is factored in. This is more than any other developed country that actively encourages immigration, such as Canada or New Zealand (Birrell, 2015). Projections of future population growth from the Australian Bureau of Statistics indicate that there will be no decrease in the amount of skilled migrants entering the country in the future as their low-population growth estimates take into account a net migration gain of 200 000 migrants per year (Hugo, 2014).

McDonald (2018) argues that immigration levels in Australia assist in moderating the speed of population ageing and influence population distribution in a positive and sustainable way.

Currently, 13% of Australia's population is over the age of 65 with this number expected to increase to 30% (Harding et al., 2011). This means that immigration will not stop population ageing, but McDonald (2018) argues it will help curb the speed at which it is taking place. Bradatan (n.d) notes that these levels of high immigration, while delaying population ageing, do not increase fertility levels within a population. While Birrell (2010) agrees with the idea that high levels of immigration will slow down the population ageing, he argues that this will be at the expense of catering for a larger population who will also eventually age and require another wave of high immigration to take care of them, which is not a sustainable cycle.

In regards to the economic impact of high levels of immigration in Australia, the International Monetary Fund (IMF) estimates that sustained levels of immigration will lead to a 0.5 to 1 percent addition of annual growth for the 30 years between 2020 and 2050 (Nguyen & Wang, 2019). This too is in relation to high levels of immigration offsetting population ageing. Smyth (2018) notes that since Australia's last recession in 1991 Australia's GDP has grown by an average of 3.2 percent annually, half of which is attributed to population growth. The economic benefit of immigrants does not only lie in its ability to offset population ageing, but also in the ability of immigrants to help economies innovate through their different viewpoints and ideas (Wright et al., 2016). Nelson (2010) argues that although this may be true, there are many countries with smaller populations than Australia that are not experiencing such high levels of immigration yet have higher GDP per capita levels than Australia. These countries, such as Singapore and Switzerland, focus on improving the productivity of their existing workforce and innovation on technologies that require minimal human oversight.

Alan Tudge, Australia's Multicultural Affairs Minister, charged with overseeing population and city infrastructure, has proposed that greater effort should be made to settle immigrants in

regional areas rather than the already overpopulated cities of Melbourne, Sydney and Brisbane (Allen, 2018). Alan Tudge has also noted that not only are these cities overpopulated as it stands, but many immigrants are not able to effectively communicate in English, which leads to a slowdown in integration (Allen, 2018). This slowdown in integration coupled with overpopulation in Australia's major cities has led to 72% of the Australian population answering 'no' when asked if Australia needed more people (Betts, 2010). Of the 28 percent who responded 'yes' to the above question, most were born overseas, but interestingly this preference for growth is not passed on to their children who were born in Australia (Betts, 2010). Australia has not been a historically nationalist country, but in recent years there has been an observed rise in the levels of nationalism in Australia linked to growing concerns over globalization and high levels of immigration (Fozdar et al., 2015).

Only 40 percent of population growth in Australia is attributed to natural increase, the remaining 60 percent is due to immigration (Pietsch, 2013). Data from the 2016 National Census states that one third of Australia's population is born overseas and is therefore an immigrant (Kamp et al., 2017). The age structure of the immigrant population does however show a large portion of the population in the elderly age cohorts due to an influx of immigrants in the 1960's who are now elderly (Massey & Parr, 2012). This links to Birrell's (2010) argument that immigration is not sustainable solution to population ageing as the immigrants themselves eventually add to the elderly population. From 1981 to 2015 the highest growing age group in Australia was the 65+ cohort with growth of 137.5 percent compared to the slowest growing age cohort, 0-20 year olds, which grew by a mere 17.5 per cent (Kidman, 2016). The median age of migrants however sits between 20-24 years (McDonald et al., 2016), part of the 20-39 year old age group that grew

40.4 percent from 1981 to 2015, still less than a third of the growth experienced by the 65+ age group.

Globally, the flow of migrants has shifted from being predominantly male dominated phenomenon to a more equal distribution, and in some cases it is even skewed towards female migration, with certain countries experiencing a rise in the share of female immigration to 70 percent of total in-migrations (Ortensi, 2015). Little attention has been given to this phenomenon, as well as the reproductive behaviour of these women after their migration (Ortensi, 2015). Another shift in classical migration patterns in Australia specifically, is that for the first time in its history, Australia is receiving more immigrants from Asia than it is from Europe (Smyth, 2018). As of 2010, China, India and other East Asian countries have been providing the majority of immigrants to Australia (Phillips & Simon-Davies, 2014). The total proportion of permanent immigrants from East Asia in 2014 (four years after it took over as the largest supplier of immigrants to Australia) was 69.6 percent (Hugo, 2014). In an article posted to the Australian Broadcasting Corporations news website in 2018 (Liddy, 2018), the top ten origin countries for immigrants in Australia were India, China, United Kingdom, Philippines, Iraq, Syria, New Zealand, Pakistan, Vietnam, and South Africa for the time period 2016 to 2017.

The most obvious difference between the Australian born population and the immigrant population within Australia is their level of education. Immigrant education levels are substantially higher than those of native Australians (Massey & Parr, 2012). An example of this would be that 41.46 percent of scientists in Australia are foreign born while 33.3 percent of the overall population is foreign born (Stark et al., 2017). Australian employers are encouraged to sponsor the employment of skilled foreign workers as long as they can provide evidence that the skillset required in the position is not available within the Australian population (Hugo, 2014).

The Australian government does not assess the validity of the characteristics or skills required by the employer when an employer requests to sponsor a foreign-born individual. There is also no limit to the amount of skilled work visa sponsorships an Australian employer may provide to foreign workers (Birrell, 2015). Likewise, the number of working holiday maker visa's is uncapped, and in 2012 there were 2 490 231 working holiday visa's issued (Birrell, 2015).

Total Fertility Rates in Australia have been below replacement fertility since 1976, but due to the relatively young age structure of the Australian population caused by immigration, births outnumber deaths and there is still a positive amount of natural increase (Birrell & Betts, 2017). Although not quite replacement fertility, TFR rates did rise to 1.93 in 2008 – 2009 which was unexpected in projections made prior to 2008 (Bell et al., 2011). A larger than expected younger population due to immigration has led to a larger than expected number of women of reproductive age living in Australia. This is serving to ensure that births outnumber deaths (Birrell & Betts, 2017; Wilson, 2017). Birrell (2015) argues that in the same way immigrant populations age and contribute to eventual population ageing, these women will age out of their reproductive years and TFR will fall unless immigration rates are sustained.

Across the world TFR is lower in cities than it is in regional areas. This holds true in Australia where TFR in the cities is 1.82 while TFR in regional areas is above replacement fertility, at 2.33, but averages back down to 1.83 across Australia due to high levels of urbanization (Gray & Evans, 2018; Wilson, 2017). Australia's immigrant population is much more likely to reside in urban areas and capital cities, and therefore have fertility rates lower than in regional areas (Gray & Evans, 2018). The average TFR for the top ten immigrant origin countries to Australia is 2.36, just 0.03 higher than in regional Australia (Liddy, 2018), but Abbasi-Shavazi and McDonald (2000) argue that migration is not a random process and one can therefore not assume that the

fertility norms of the origin country will be reproduced in the destination country. Migrants ae often selected due to their educational attainments and professional skillset, both of which are linked to lower fertility outcomes globally (Abbasi-Shavazi & McDonald, 2000; Bonner, 2015).

As a developed country that has followed the stages of the demographic transition, Australian women experience below replacement fertility levels which can be attributed to, amongst other things, higher levels of education (Abbasi-Shavazi & McDonald, 2000). This is in line with findings that distal forces such as development result in developed countries experience low fertility rates, and least developed countries experience higher fertility rates (Morgan & Rackin, 2010). Women in OECD countries such as Australia are reporting that they are experiencing fertility rates even lower than their desired number of children (Martin, 2020). The distal determinants for women in developed countries having fewer children are abundant, as too are the distal determinants for immigrant women having more children. Some of these include the idea that having children is an act of social integration and that children are a way of linking oneself to a social network and gaining social approval (Martin, 2020). Another distal determinant for immigrant women having higher rates of fertility than local women is that immigrant women in developed countries often originate from least developed countries where traditional attitudes towards childbearing are still observed (Guzzo et al., 2017). These attitudes include beliefs around women and their responsibility to bear children, as well as a lack of knowledge around the use of contraception (Guzzo et al., 2017). In the United States, this manifests in immigrant women having higher rates of unintended pregnancies (Morgan & Rackin, 2010)

Migrants have been known to postpone fertility due to the stress and uncertainty of immigration (Bradatan, n.d.). Other studies, however, suggest that the fertility outcomes of immigrants

increase after migration and only conform to the TFR of the destination country in the second generation (Milewski & Neels, 2012). Bonner (2015) argues too that, on average, immigrant women have 1.69 children in Australia compared to 1.58 children for those women born in Australia. Bonner (2015) also argues against Bradatan's (n.d) finding that migrants postpone fertility, and instead states that the type of migrants entering Australia are skilled and therefore economically stable, which increases the likelihood of having children. The argument has also been put forth that there is a shift towards quality of children rather than quantity, and that families are now more likely than ever before to have fewer children that they will invest heavily in rather than spreading resources across multiple children (Mayer & Riphahn, 2000). What has been found to be contradictory to this argument is that higher income families also have more resources to spread over more children and thus 'quality' children are affordable thus they may still have more children (Bonner, 2015). This is evident in Australia, a high GDP per capita country where only 5.3 percent of the Holton et al. (2016) study population stated that they did not want children, 4.7 percent stated that they wanted 1 child, 48.3 percent wanted two children, and 41.6 percent of respondents wanted more than two children (Holton et al., 2016).

In 1998 the Australian Bureau of Statistics population forecast predicted that Australia's population would reach 25 million people by the year 2051 (Smyth, 2018). In reality, the Australian population surpassed 25 million people by the end of 2019. No forecast, even as recent as the 2000's, was able to predict the speed at which the Australian population has grown (Nelson, 2010). This inability to accurately predict population growth is a major concern for city planners and those charged with resource allocation. These individuals are reliant on this information, which is currently unable to predict a decade ahead yet plans need to be made for five decades ahead (Nelson, 2010). There has also been a trend in which different sectors of the

Australian population rely on, and create, projections to suit their interests. Such an example would be property developers who argue high population growth is more likely in order to ensure that demand for housing rises (Bell et al., 2011). Experts in the public and private sector often argue for projections that are 25 to 30 percent higher than those made by academics - there is no uniformity (Bell et al., 2011).

The largest criticism made about immigrants in Australia is that they are causing increased strain on already insufficient public services in cities that are already overpopulated (Ware, 2016). Planning and infrastructure development in Australia is seen to constantly be falling behind demand, with many citizens believing that the Australian government is purposefully ignoring the need for increased services caused by immigration (Allen, 2018; McDonald, 2018; Smyth, 2018). Melbourne, for example, has a population of 4 to 6 year old children with working parents that is expected to reach 70 000 in 2027, up from 40 000 in 2006. This means that there is a need for nearly double the number of classrooms. Still in Melbourne, the population of 70+ year olds is expected double to 191 000 people over the same timeframe meaning that services required in old age also need to double (Harding et al., 2011). Over and above civic resources such as schools and hospitals, there is a growing need for social resources such as community centres and places of worship to accommodate immigrants of a variety of social backgrounds (Fincher, 2011). In 2011, McGuirk and Argent reported that the infrastructure backlog at the time was reported at a cost of A$300 billion, or A$13 287 for every individual living in Australia at the time. The longer these demands are not tended to, the higher the cost will rise due to overuse and wear-and-tear on strained infrastructure (Parr, 2018).

Affordable housing in Australia's cities is becoming increasingly less accessible and affordable (McGuirk & Argent, 2011). Land values have now risen to levels that are on par with the most

expensive cities in the world, with the median cost of houses in Sydney and Melbourne sitting above A$1 million (Stilwell, 2017). As a result of skyrocketing housing prices in Australian cities many families and first time house buyers are priced completely out of the market, and are forced to enter the rental market, and possibly never own a home (Birrell & Betts, 2017). Kidman (2016) argues that even if immigration were to stop today, the excess demand caused by population growth thus far will keep leading to an increase in housing prices till at least 2050. A housing alternative that would ease the market in Melbourne, for example, would be to build two million high density living spaces that require fewer resources to construct and take up a smaller amount of space than the traditional Australian home. The problem with this solution is that Australian's are accustomed to large living spaces, and many immigrants are also drawn to the idea of living in large homes (Fincher, 2011; Ting et al., 2018).

Population growth has had a positive impact on the Australian economy due to increased demand for housing causing an increase in investment into property development that has spilled over into the financial sector and strengthened insurance and real estate sectors of the economy (Ting et al., 2018). These increases in housing demand have been the main reason for the strong economic performance of states such as New South Wales and Victoria in recent years (Ting et al., 2018). Not only has this helped Australia go 27 years without a recession, but is predicted to add an additional 12% growth to GDP between 2013 and 2053, compared to if immigration were to end today (McDonald, 2018; Smyth, 2018).

Alan Tudge's proposal to divert immigrants into regional areas may be seen as a valid attempt to counter overpopulation and infrastructure strain on cities, but it would also help to insure a more even distribution of Australia's population (Harding et al., 2011). Working age populations in regional towns are ageing and population growth in these areas is not sufficient to offset the

impact of population ageing. The two fastest growing inland towns in Australia register a combined total population growth of 2 000 people a year, while Melbourne alone registers 2 000 people a week (McDonald, 2018). In Lidcombe, a regional town with a higher than average proportion of immigrant residents, there has been 'new life' breathed into the town, but unfortunately this has come with an increase in property prices that now make the town unaffordable to new immigrant families (Obeng-Odoom & Jang, 2016).

Medium population projections suggest that by 2026 the majority of urban centres water needs in Australia will grow by 42% from 2011 (McGuirk & Argent, 2011). Although Australia is known to be the driest country on earth by hydrological measure, it is actually the wettest country by run-off per capita. This water however does not run-off into areas of the country that are densely populated (Rutherfurd & Finlayson, 2011). Around 90% of Australia's population is found in the South Eastern portion of the country which has experienced continuous annual decline in rainfall, while a mere 3.7 percent of the population resides in the North Western portion of the country where a tropical climate with increasing annual rainfall is found (Hugo, 2014; Rutherfurd & Finlayson, 2011). Agriculture is Australia's largest consumer of water with a 50 to 70 percent usage share that fluctuates seasonally while households and industry make use of the remaining 30 – 50 percent (Rutherfurd & Finlayson, 2011). The water consumed by agriculture is enough to feed the entire population of Australia, plus 40 million people around the world due to the exporting of Australian food products which has led many to argue that Australia would be able to sustain a much larger population (Rutherfurd & Finlayson, 2011).

Australian Prime Minister Tony Abbott declared that the Australian population is growing in an unsustainable and out of control manner (Ware, 2016). Hugo (2010) is also a believer that population growth is unsustainable, especially in the context of human consumption and the

strain it has on the natural environment. During the nineteenth century, Australia's natural resource were severely degraded due to industrialization when the population was only a fraction of the size it is today (Hugo, 2010). Australians are accustomed to living in large spaces with outdoor areas and leisure spaces all of which increase per capita consumption (Ting et al., 2018). Skilled migrants are usually younger people with high earning potential that have a strong tendency to have higher consumption patterns and larger carbon footprints (Ting et al., 2018). Sydney is the largest greenhouse gas emitter in Australia even though they have the highest proportion of inhabitants using alternative transport methods at 36% (Hu, 2015). The average resident in Sydney also uses over 100 000 more litres of water than the average Australian per annum. When looking at immigrants, a study was conducted studying the ecological footprint of China born immigrants. It was found that China born immigrants ecological footprint grew from 20.9 gha to 69.8 gha during their time in Australia. For comparison, a native born Australian has an average ecological footprint of 67.4 gha, showing that immigrants are more likely to have higher ecological footprints in the long run (Ting et al., 2018). Ultimately, academics agree that Australia is unable to adequately manage population growth and that a more sustainable and moderate position should be taken on migration policy (Fincher, 2011).

Through this review of the literature it is apparent that there is a gap in the current knowledge of immigrant fertility levels in Australia with regards to whether these levels contribute to population growth or not.

## Theoretical Framework

Assimilation theory suggests that the fertility norms of a migrant women will mirror the fertility norms of women in the destination country (Bradatan, n.d.). Assimilation theory, in

acknowledging the economic aspect of migration, theorises that a migrant woman's earning potential is most likely far higher in a destination country than in their origin country and therefore an adjustment in fertility aspirations is made in favour of economic security (Mayer & Riphahn, 2000). In the case of Australia, where most migrants enter through the career focused skilled migrant stream, assimilation theory would argue that immigrant fertility should be equal to or lower than that of the native population (Mayer & Riphahn, 2000).

It has been observed that fertility outcomes in developed countries are lower than those in developing countries due to a higher level of contraceptive usage (Bongaarts, 1978). Many of the top ten origin countries for immigrants in Australia are developing countries such as India, Iraq and China (Liddy, 2018). Although this study is unable to measure the proximate determinants of fertility theorized by Bongaarts (1978), we are able to use his theory as a base in which fertility is the eventual outcome. While unable to measure proximate determinants of fertility, the study does measure distal determinants of fertility such as those outlined in Figure 1, including education and labour force participation. These distal forces are important as they are the forces that are most likely to experience change when migrating compared to proximate determinants of fertility. This study will also be able to observe possible decreases in fertility outcomes for immigrants migrating to Australia from developing countries which would support Assimilation Theory as well as Bongaarts proximate determinants of fertility. There have not been any recent studies on the impact of assimilation theory on immigrant fertility in Australia (Wilson, 2017). Bonner (2015) does however argue that there exists evidence which suggests that immigrant fertility patterns amongst immigrants in Australia do vary, and that assimilation theory may not be accurate in explaining these patterns. Ultimately, immigrant women or families in Australia face two sets of fertility norms that will impact on their fertility outcomes – that of the origin

country and that of the destination country, while native Australians will only be impacted by one (Bonner, 2015).

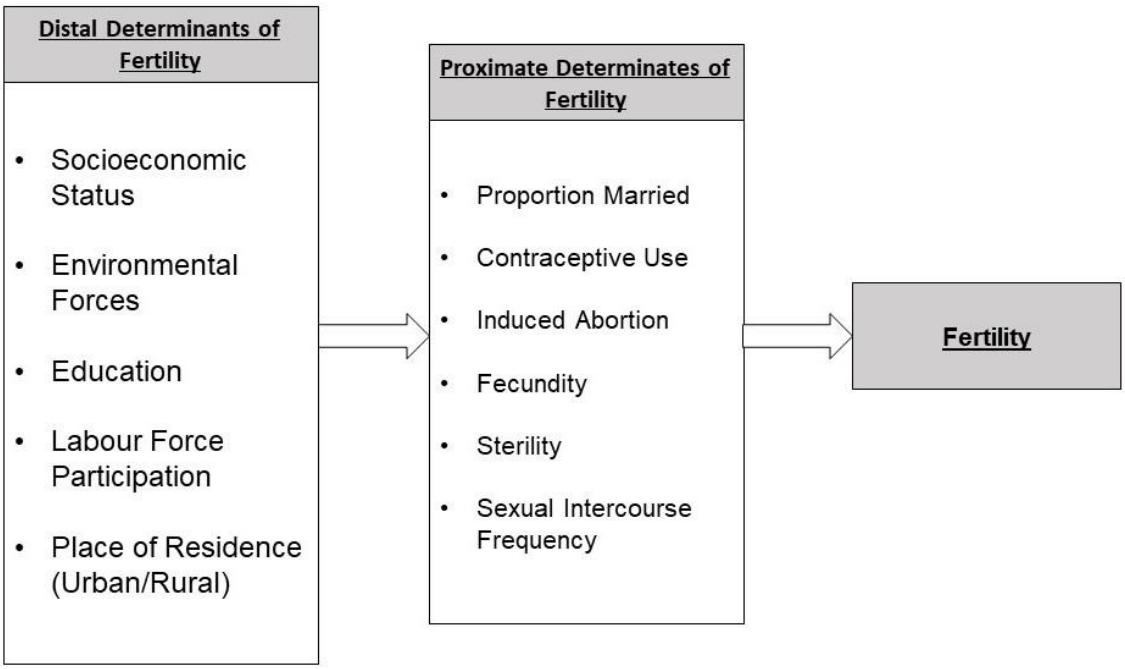



*Figure 1 - Bongaarts Proximate Determinants of Fertility (1978)*

## Conceptual Framework

This study aims to determine the fertility patterns of immigrant women in Australia in comparison to non-immigrant women. The outcome is fertility and the control factors (indirect determinants) are adopted from the Bongaarts framework in *Figure 1*. To measure fertility, the study will examine Children Ever Born (CEB) for females in Australia between the ages of 15-49 (reproductive age). An example of how this will work is that a female will then be grouped by their region of birth. Either they are born in Australia and are therefore not an immigrant, or they are born in another country and are considered an immigrant in the scope of the study. By grouping these women by region of birth we are also able to determine the population sizes of

women from different origin regions, as well as their fertility outcomes compared to other cohorts.

Once the woman is categorized by region of birth, the study will look at the indirect determinants of fertility for immigrant and non-immigrant women. This is done in order to determine if there are any specific indirect determinants of fertility that play a significant role in the assimilation process. Once fertility outcomes are measured and the impact of indirect determinants of fertility are calculated, the results for immigrant and non-immigrant women can be compared to determine if fertility rates have assimilated or not.

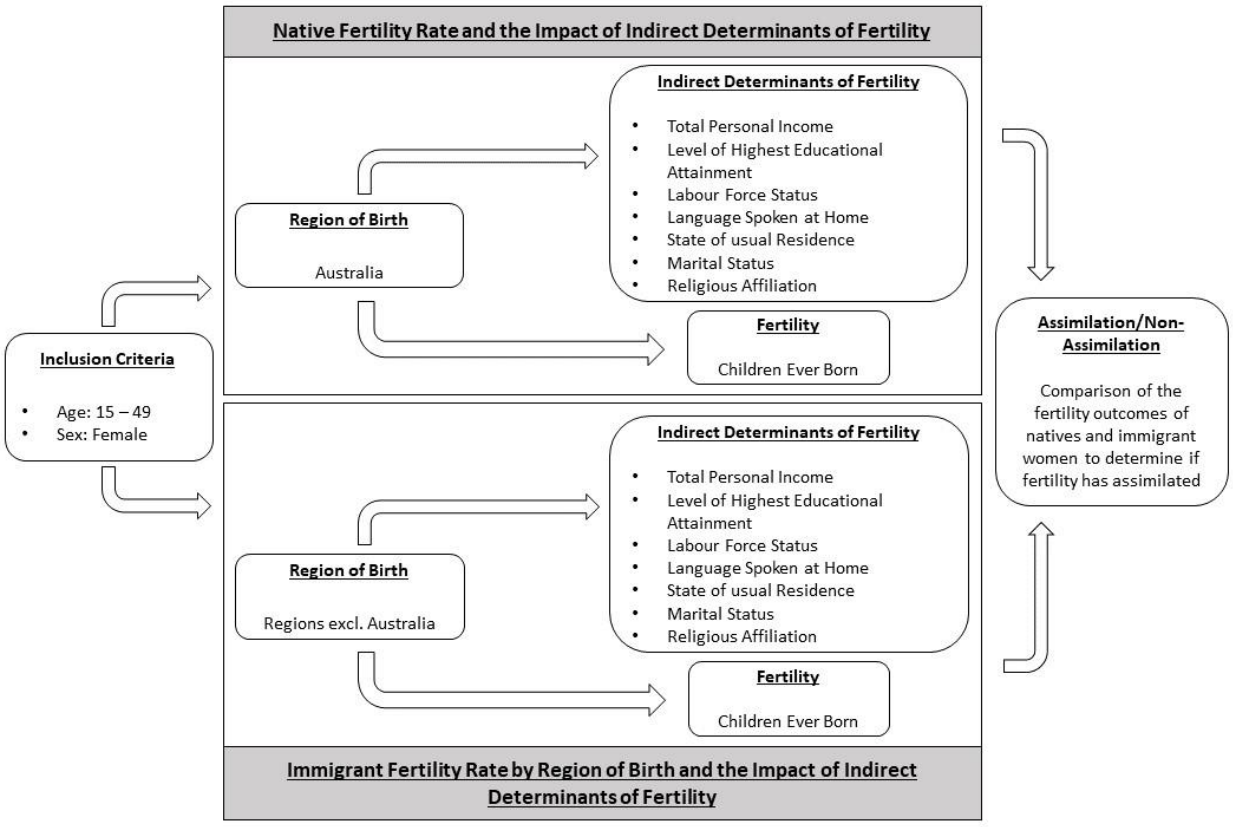



*Figure 2 - Conceptual Framework: Assimilation Theory suggests that immigrant women in Australia are likely to adopt similar fertility patterns to their native-born counterparts*

# Chapter 3: Methodology

## Study Setting

Australia is located in the Southern hemisphere and enjoys high levels of economic development, human development, and civil rights. It is situated on the smallest continent in the world but is the sixth largest country in the world in terms of its physical size. Although it is one of the largest countries in the world, it currently has the 54th largest population in the world, spread throughout its six states.

## Study Design

The study has a positivist design and makes use of a deductive, cross-sectional, approach that will investigate the population of Australia at one moment in time – that moment being in 2016 when Australia's last national census took place. The research is explorative in its design as immigrant fertility in Australia is an understudied phenomenon (Abbasi-Shavazi & McDonald, 2000). Quantitative research methods have been employed to derive statistical outputs that are used to discuss the differences between immigrant and non-immigrant fertility in Australia.

## Data Source

The study made use of the 2016 Australian National Census data. The data was accessed via the Australian Bureau of Statistics website on the 24th of July 2019 (Australian Bureau of Statistics, 2019). The information collected by the 2016 Australian National Census pertains to dwelling records, family records and individual person records. These records are used to gain clearer insight into the demographic composition of the Australian population at the time of enumeration. The data is unweighted as the study makes use of the 5% Detailed Microdata Test

File which is available on the Australian Bureau of Statistics website (Australian Bureau of Statistics, 2019). Weighting variables are only available for data sets starting at the full 5% sample which was not accessible for this study. The main implication of being unable to make use of the full 5% Detailed Microdata Sample is that the validity of the study is weakened due to the sample size being analysed shrinking.

## Study Population and Sample Size

The total 2016 Census population size is 23 301 892 individuals, and the publicly available *5% Detailed Microdata Test File* size is made up of 10 000 individuals. After recoding the data to fit the parameters of the study, such as excluding males and only including females between the ages of 15 to 49 with valid responses, the sample size is left at 278 female individuals between the ages of 15 and 49 who were born both in, and outside of Australia. The foremost reason for the drastic shrinkage in sample size is that the study only looks at women of reproductive age. Large amounts of NA values were also present in each variable included in the study for which respondents did not provide a valid response. These NA values included responses in which the respondent did not know the answer to the question posed, refused to answer, or the question was not valid in their circumstance. These NA values were dropped. In total, this resulted in 97.22% of individuals in the original dataset being excluded from the study population. Although this is a drastic reduction in dataset size from the original census sample, the 2016 Census contained the most relevant variables to this study for the entire population of Australia. No other datasets were deemed to be a suitable alternative.

## Questionnaire Design

The 2016 Australian National Census was conducted on Tuesday the 9th of August 2016. The census made use of a self-enumerated questionnaire comprising of 51 questions pertaining to persons, and an extra 9 questions pertaining to the household (.id Consulting, 2019). The census was also available for completion online, which is how most Australian's completed the questionnaire. All of the variables included in the inferential analysis of this paper have been extracted from this questionnaire.

## Study Variables

The tables and information laid out below outline and describe how the variables employed in the study were recoded. For further information on how the variables were originally coded please refer to *Appendix A* on page 51.

**Dependent Variable**

The dependent variable in this study is Number of Children Ever Born (CEB). It has been coded as binary to resemble below replacement fertility, and above replacement fertility within a binary logistic regression analysis. Replacement fertility is 2.00 children. Therefore, any fertility outcome of 2 children or less is considered below replacement fertility, and any fertility outcome above 2 children is considered above replacement fertility. The minimum value of CEB before the recode was 0, and the maximum value was 12. This has been done so that the analysis is able to distinguish between fertility patterns related to growth (above replacement fertility) and those that do not (below replacement fertility). Thought has been given to a linear regression analysis as well as a multinomial regression analysis, but due to the smaller frequencies of CEB in these

potential models, they were scrapped. The outcomes of these models can be found in *Appendix B* on page 54.

*Table 1 - Recode of the Dependent Variable: Number of Children Ever Born*

| Children Ever Born | |
|---|---|
| **Code** | **Description** |
| 0 | 0 to 2 children (below replacement fertility) |
| 1 | 3 or more children (above replacement fertility) |

**Independent Variables**

Age has been recoded from individual year identifiers to 10-year age cohorts with the last cohort, 44 to 49 years, being a 5-year cohort. When age is coded in traditional 5-year cohorts it results in false significance outputs in the regression analysis as the frequency distributions are too small, therefore the age cohorts were adjusted to 10-year intervals. Region of Birth was recoded from individual country identifiers to continental identifiers. The continents were then grouped into larger geographical regions to provide higher frequencies for the regression analyses. The America's were excluded from the study as they accounted for only 3 observations. Highest Educational Attainment was originally coded in single year identifiers. The variable has been recoded into larger groupings, and those respondents reporting to have no education have been excluded from the sample as there were only 2 individuals reporting to have no education. Grouping these two individuals together with those who obtained a secondary education would cause the category to be too broadly defined.

Total Personal Income was originally coded as weekly income which was then converted to annual income by multiplying the given values by 52. The computed figures were then grouped together into larger cohorts as seen in *Table 2*. Labour Force Status was initially coded with

regard to employment status. The variable has been recoded as a binary identifier of the respondent's participation in the work force. This is because there were a large number of respondents who identified themselves as not part of the labour force, and much smaller groupings of respondents in the various employed outcomes. State of Enumeration (Usual Residence) was initially coded into the 8 individual states in Australia. Due to some of these states having smaller populations, and therefore smaller frequencies in the sample, they were grouped into Northern States and Southern States. The Northern States include Western Australia, Northern Territory and Queensland. The Southern States include South Australia, New South Wales, Australian Capital Territory, Victoria, and Tasmania.

The only change in coding to Registered Marital Status was to group Widowed, Separated and Divorced respondents into one group as the frequencies for these groups individually were much smaller than Never Married and Married, and needed to be grouped together in order for the regression model to have a sufficient frequency of counts. Language Spoken at Home was recoded into three broad categories as the individual category frequencies we too small for the regression analyses, even when grouped continentally. African, European and Middle Eastern languages were grouped together despite their differences to allow for Asian and Oceanic languages to be grouped together and English to be grouped on its own. This was done because, in recent years, the majority of immigrants in Australia are originate from the Asian continent and therefore the decision was taken to avoid diluting this cohort with languages from Europe, Africa and the Middle East – countries with fewer immigrant populations entering Australia in recent years.

Religious Affiliation was recoded by grouping Christian Faiths together, and then all other religious beliefs together as 'Other Religions'. This was done because Australia is a majority

Christian country, and individually the separate Christian faith cohorts do not have large enough frequencies for input into the regression model. Respondents stating that they were Atheists were grouped with those who responded as Not Religious. Buddhists were then removed from the 'Other Religions' grouping as they caused this grouping to be statistically significant in the regression analyses. Buddhism is statistically significant on its own and has a high enough frequency to be coded as a single group.

*Table 2 - List of Recoded Independent Variables*

| Code | Description |
|---|---|
| **Age Cohort** | |
| 1524 | 15 to 24 years old |
| 2534 | 25 to 34 years old |
| 3544 | 35 to 44 years old |
| 4449 | 44 to 49 years old |
| **Region of Birth** | |
| 1 | Australia |
| 2 | Asia and Oceania |
| 3 | Europe |
| 4 | The Middle East and Africa |
| **Highest Educational Attainment** | |
| 1 | Secondary Education |
| 2 | Certificate |
| 3 | Tertiary Education |
| **Total Personal Income Per Annum (Australian Dollars)** | |
| 1 | Negative income to A$25 999 |
| 2 | A$26 000 to A$51 999 |
| 3 | A$52 000 or more |
| **Labour Force Status** | |
| 1 | Working |
| 2 | Not Working |
| **State of Enumeration (Usual Residence)** | |
| 1 | Northern States |
| 2 | Southern States |
| **Registered Marital Status** | |

| | |
|---|---|
| 1 | Never Married |
| 2 | Widowed, Separated or Divorced |
| 3 | Married |
| **Language Spoken at Home** | |
| 1 | English |
| 2 | European, Middle Eastern and African Languages |
| 3 | Asian and Oceanic Languages |
| **Religious Affiliation** | |
| 1 | Christian Faiths |
| 2 | Buddhism |
| 3 | Other Religions |
| 4 | Not Religious |

## Hypothesis

**H0 –** Immigrant fertility is not higher than non-immigrant fertility in Australia and it is therefore not an attributing factor of increased population growth and does not have a significant impact on socioeconomic development in Australia.

**H1 –** Immigrant fertility is higher than non-immigrant fertility in Australia and is thus an attributing factor of increased population growth which has an impact on socioeconomic development.

## Ethical issues

There are no ethical issues regarding the use of the 2016 Australian National Census data as all the identities of the participants within the census sample have been rendered anonymous by the Australian Bureau of Statistics. The microdata employed in this study is openly available to the general public without the obligation of adhering to any terms and conditions that need to be

agreed to before being allowed to access to the data. The University of the Witwatersrand ethics waiver number for this study is WDEMG2019/07/06.

## Data Analysis

The data analysis for this study has been conducted using Stata statistical software, as well as Microsoft Excel. The majority of the analysis took place in Stata, and Microsoft Excel served as an additional resource for greater graphical representation of the data, as it is better suited for this function. The data analysis starts off with a table of univariate results across all the study variables.

### Objective 1

A correlation matrix of the study variables has been carried out to determine if any issues around multicollinearity exist within the data. To identify the demographic characteristics and fertility levels of immigrant and non-immigrant females living in Australia, Total Fertility Rates (TFR) for women of reproductive age in Australia have been provided in cohorts defined by region of birth. These results have been cross tabulated for ease of comparison. The remaining predictor variables have been included in the table, being cross tabulated with the binary TFR outcome of below or above TFR. The formula for Total Fertility Rate can be seen below, where ASFR is Age Specific Fertility Rate. It is important to note that TFR is not calculated in this paper, but rather provided by the Australian Bureau of Statistics, and that the formula for ASFR outlined here is correct, but cannot be calculated with the recoded census data as we have 10-year cohorts rather than 5- year cohorts.

*Equation 1 – Formula for Total Fertility Rate (TFR)*

$$TFR = \frac{sum\ of\ ASFR \times 5}{1000}$$

*Equation 2 – Formula for Age Specific Fertility Rate (ASFR)*

$$ASFR = \frac{Number\ of\ Births\ to\ Women\ in\ Cohort\ x}{Number\ of\ Women\ in\ Cohort\ x} \times 1000$$

Total Fertility Rate is calculated with the formula above. To do this, the Age-Specific Fertility Rates of women in a specific population are added together and then multiplied by 5 before being divided by 1 000. The TFR value gives us an indication of how many children a woman can expect to have if she passes through all her reproductive years conforming to the ASFR of the population. These results have been tabulated as well as presented in stacked bar charts.

**Objective 2**

A Binary Logistic Regression was conducted to determine the likelihood of immigrant women in Australia experiencing above replacement level fertility outcomes when compared to Australian born women. The results have been presented as regression output tables. The dependent variable is Children Ever Born, coded as binary in order to differentiate between below and above replacement fertility. The control variables are the independent variables outlined and described within the *Study Variables* section of this chapter. This regression analysis serves to determine the relationship between migration status and the independent control variables in determining a woman's fertility outcomes in Australia. A Binary Logistic Regression has been identified as the best suited regression model for this analysis as it outputs an odds ratio. In the scope of this study, the odds ratio provides insight to whether a particular woman belonging to a certain variable category in the regression model is likely to experience above replacement

fertility rates. In practice this would result in a hypothetical finding such as 'English speaking women have a larger odds ratio than Asian language speaking women, with a value of *x*, and therefore are *x* times more likely to experience above replacement fertility rates. This has allowed for a comparison between the various cohorts of women in the study, and how the indirect determinants of fertility impact on their fertility outcomes. The formula for the Binary Logistic Regression is shown on the next page in *Equation 3*.

*Equation 3 - Formula for the Binary Logistic Regression Model*

$$log\left(\frac{p(X)}{1-p(X)}\right) = \beta_0 + \beta_1 X$$

## Study Limitations

This study focuses on the indirect determinants of fertility and therefore disregards proximate determinants such as fecundity, sterility, abortion, contraception usage, and frequency of intercourse. There are many temporary visa holders in Australia, who, while being enumerated in the 2016 Australian census as an immigrant, born outside of Australia, may be less likely to have children as they are only planning on staying in Australia for a short time. More importantly, their children will most likely leave Australia with them when they leave, and therefore not contribute to immigrant fertility led population growth.

While the study does discuss the impact of population growth on development, it does not provide any statistical measures of how population growth impacts development, but rather works off of the assumptions and findings of other authors. Due to financial and time constraints the study does not use a larger sample size of the 2016 Australian National Census. The Australian Bureau of Statistics quoted A$2 000 for access to the 5% sample of the microdata which, financially, does not fit into the scope of this Masters study. This has also led to the data

being unweighted as there is no weighting variable available for this sample, which raises concerns of reliability and generalization. Upon request, the Australian Bureau of Statistics declined to share a methodology that could be employed to calculate a weighting variable for the dataset used in this study.

By grouping many variables together that would otherwise not be similar, such as in the case of language spoken at home, the study will mask some finer variations within the results. However, this has been done to ensure that the n-value for each variable is high enough to insert into the regression model. Since the study aims to provide aggregate level results the differences within these characteristics requires mention but will not hamper the objectives of the study.

# Chapter 4: Results

The results chapter of this study starts off with a univariate table (*Table 3*) outlining the demographic profile of the respondents within the dataset. Before moving on to the bivariate and multivariate results of the analysis.

*Table 3 – Unweighted Univariate Frequencies and Percentage Distributions of the Variables Included in the study*

| Sex | Frequency | Percentage |
|---|---|---|
| Female | 278 | 100.00 |
| **Age Cohort** | | |
| 15 to 24 years old | 75 | 26.98 |
| 25 to 34 years old | 94 | 33.81 |
| 35 to 44 years old | 77 | 27.70 |
| 45 to 49 years old | 32 | 11.51 |
| **Region of Birth** | | |
| Australia | 120 | 43.17 |
| Asia and Oceania | 114 | 41.01 |
| Europe | 27 | 9.71 |
| The Middle East and Africa | 17 | 6.12 |
| **Highest Educational Attainment** | | |
| Secondary Education | 119 | 42.81 |
| Certificate | 41 | 14.75 |
| Tertiary Education | 118 | 42.45 |
| **Total Personal Income Per Annum (Australian Dollars)** | | |
| Negative Income to A$25 999 | 131 | 47.12 |
| A$26 000 to A$51 999 | 71 | 25.54 |
| A$52 000 or more | 76 | 27.34 |
| **Labour Force Status** | | |
| Working | 139 | 50.00 |
| Not Working | 139 | 50.00 |
| **State of Enumeration (Usual Residence)** | | |
| Northern States | 81 | 29.14 |
| Southern States | 197 | 70.86 |
| **Registered Marital Status** | | |
| Never Married | 88 | 31.65 |
| Widowed, Separated or Divorced | 34 | 12.23 |
| Married | 156 | 56.12 |

| | | |
|---|---|---|
| **Language Spoken at Home** | | |
| English | 142 | 51.08 |
| European, Middle Eastern and African Languages | 39 | 14.03 |
| Asian and Oceanic Languages | 97 | 34.89 |
| **Religious Affiliation** | | |
| Christian Faiths | 109 | 39.21 |
| Buddhism | 20 | 7.19 |
| Other Religions | 32 | 11.51 |
| Not Religious | 117 | 42.09 |
| **Children Ever Born** | | |
| 0 to 2 Children | 230 | 82.73 |
| 3 or more Children | 48 | 17.27 |
| **Total** | **278** | **100.00** |

All 278 respondents in the sample are females aged between 15 and 49 years of age, with the majority of the sample aged between 25 and 34 years old (33.81%). In the entire sample 43.17% of females were born in Australia, while the second most frequent region of birth is Asia and Oceania with 41.01% of the sample being born there. All of the respondents have at least a secondary education, with just as many respondents reporting having a tertiary education. Regarding income, 47.12% of the sample earn below A$25 999 per annum, while exactly half of the sample is active in the labour force, and the other half is not. The overwhelming majority (70.86%) of respondents live in the Southern States of the country: South Australia, New South Wales, Victoria, Tasmania, and the Australian Capital Territory. When looking at marital status, 56.12% of respondents are married, and nearly half (48.92%) of respondents reported not speaking English at home. The majority of the sample is not religious (42.09%), while 39.21% of respondents believe in a Christian faith. The vast majority of respondents have below replacement fertility, while only 17.27% of respondents reported having above replacement fertility with 3 or more children.

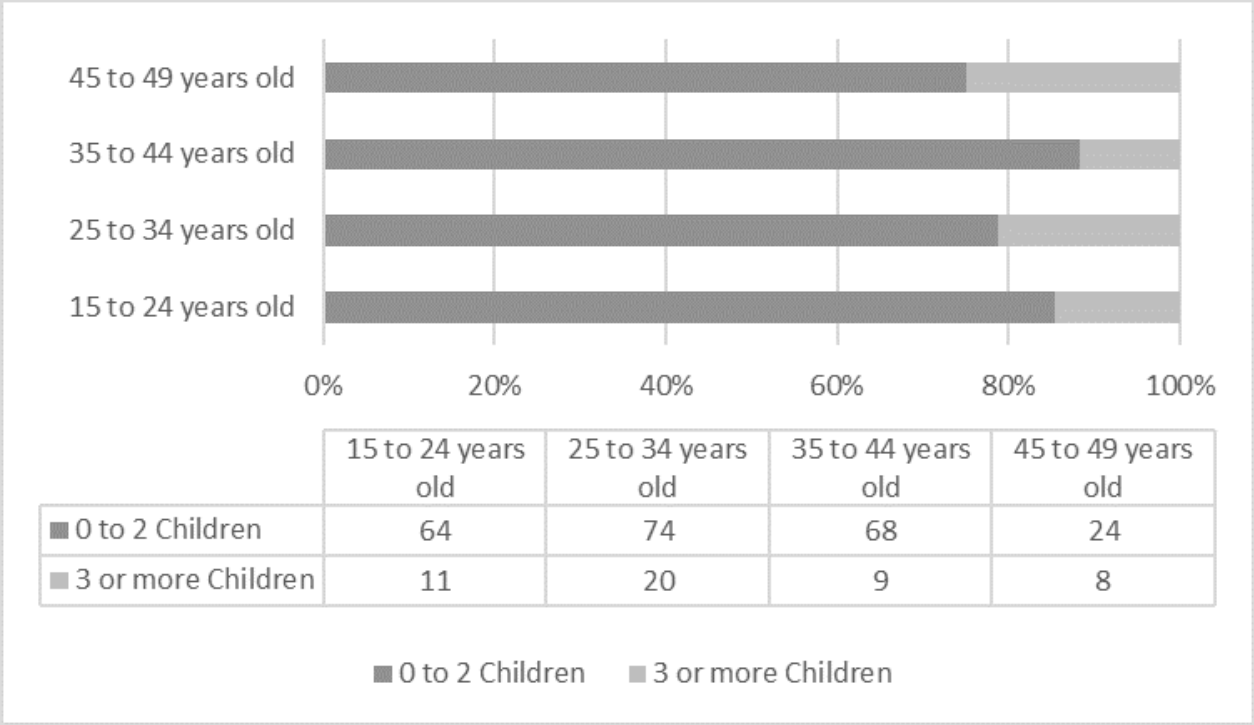
## Bivariate Analysis

The correlation matrix in *Table 4* on the next page shows the correlations between the independent variables of the study. The strongest correlation is found between Region of Birth and Labour Force Status, at -0.156. This slight negative relationship between these two variables can be categorized as weak and we can therefore conclude that there are no issues of multicollinearity among the independent variables in the study. When adding the dependent variable to the correlation matrix (Children Ever Born), the strongest correlation remains -0.156 between Region of Birth and Labour Force Status. We can therefore conclude that there will be no issues related to multicollinearity in the regression analysis.

*Table 4 – Unweighted Correlation Matrix of the Independent Variables in the Study*

| | Region of Birth | Language Spoken at Home | Highest Educational Attainment | Labour Force Status | Total Personal Income | Religious Affiliation | Registered Marital Status | Age | State of Enumeration |
|---|---|---|---|---|---|---|---|---|---|
| Region of Birth | 1.000 | -0.044 | -0.001 | -0.156 | -0.049 | 0.001 | -0.087 | 0.004 | 0.072 |
| Language Spoken at Home | -0.044 | 1.000 | 0.080 | 0.051 | -0.014 | 0.096 | -0.035 | 0.027 | -0.018 |
| Highest Educational Attainment | -0.001 | 0.080 | 1.000 | 0.027 | 0.050 | -0.058 | -0.021 | 0.037 | -0.037 |
| Labour Force Status | -0.156 | 0.051 | 0.027 | 1.000 | 0.021 | 0.003 | -0.080 | -0.066 | 0.087 |
| Total Personal Income | -0.049 | -0.014 | 0.050 | 0.021 | 1.000 | 0.035 | 0.045 | -0.035 | 0.038 |
| Religious Affiliation | 0.001 | 0.096 | -0.058 | 0.003 | 0.035 | 1.000 | 0.016 | -0.080 | -0.042 |
| Registered Marital Status | -0.087 | -0.035 | -0.021 | -0.080 | 0.045 | 0.016 | 1.000 | -0.062 | 0.060 |
| Age | 0.004 | 0.027 | 0.037 | -0.066 | -0.035 | -0.080 | -0.062 | 1.000 | -0.055 |
| State of Enumeration | 0.072 | -0.018 | -0.037 | 0.087 | 0.038 | -0.042 | 0.060 | -0.055 | 1.000 |

*Figure 3* shows that the age cohort of women aged 45 to 49 has the highest proportion of above replacement fertility outcomes at 25%, followed by women aged 25 to 34 years old at 18.80%. The chart suggests that there is a drop in above replacement fertility for the generation of women aged 35 to 44 years old, for which only 6.12% of women have experienced above replacement fertility rates.




| | 15 to 24 years old | 25 to 34 years old | 35 to 44 years old | 45 to 49 years old |
|---|---|---|---|---|
| 0 to 2 Children | 64 | 74 | 68 | 24 |
| 3 or more Children | 11 | 20 | 9 | 8 |

*Figure 3 - 100% Stacked Bar Chart Showing the Relationship Between Age and Children Ever Born (Unweighted)*

Of all the regions of birth included in the study, Australia is seen to have the lowest proportion of women with 3 or more children (13.33%), while women born in Europe have the highest proportion at 29.36%. Women born in Asia and Oceania have a slightly higher proportion of their population that has 3 or more children compared to women born in the Middle East and Africa. 15.97% of women reporting to have a secondary education have 3 or more children

which is a lower percentage than women who are more educated. The fertility outcomes of women in different income brackets is similar, with a 0.66% range between the minimum and maximum percentage distribution of women with 3 or more children across the variable. Women earning below A$26 000 per annum represent a slightly higher proportion of the population who have 3 or more children compared to those who earn above A$26 000 per annum. The fertility outcomes of those who are working and those who are not working, in reference to labour force participation, are identical: 17.27% of the female population has 3 or more children.

There is a noticeable difference in fertility outcomes between women in the Northern and Southern states. In the Northern States, 9.88% of women have 3 or more children, while 2.48% of women in the Southern states have 3 or more children. When looking at Registered Marital Status in relation to Children Ever Born, we see that married women are more likely to have 3 or more children (19.87%) compared to women who are widowed, separated or divorced (17.65%). We also see that women who have never been married are the least likely to have 3 or more children (12.50%). Women who speak Asian and Oceanic languages at home register higher percentages of 3 or more children (18.56%), while those who speak Middle Eastern and African languages register the smallest percentage of above replacement fertility outcomes at 15.38%. Buddhist women register the highest proportion of women with 3 or more children (35%) while those following Christian faiths register the lowest proportion of women who have 3 or more children (14.68%).

*Table 5* on the next page gives the frequencies and percentages of Children Ever Born outcomes for the outlined independent variables in the study. The mean percentage across independent variables for the category ‘0-2 Children’ is 82.65%, while the mean percentage for the category ‘3+ Children’ is 17.35% of respondents. These mean percentages are in line with the frequencies

of the Children Ever Born variable in *Table 3*, which highlights that for the entire sample population, 82.73% of respondents have 1 to 2 children, ad 17.27% have three or more children. Although it was not possible to weight the sample, this shows that CEB is evenly captured throughout the independent variables in the study.

*Table 5 – Unweighted Crosstabulation of Frequency and Percentage Distributions Between the Dependent Variable (Children Ever Born) and the Independent Variables of the Study*

| Variable | Number of Children Ever Born | |
|---|---|---|
| **Region of Birth** | **0-2 Children (Freq. / %)** | **3+ Children (Freq. / %)** |
| Australia | 104 / 86.67% | 16 / 13.33% |
| Asia and Oceania | 93 / 81.58% | 21 / 18.42% |
| Europe | 19 / 70.37% | 8 / 29.63% |
| The Middle East and Africa | 14 / 82.35% | 3 / 17.65% |
| **Highest Educational Attainment** | | |
| Secondary Education | 100 / 84.03% | 19 / 15.97% |
| Certificate | 33 / 80.49% | 8 / 19.51% |
| Tertiary Education | 97 / 82.20% | 21 / 17.80% |
| **Total Personal Income Per Annum (Australian Dollars)** | | |
| Negative Income to A$25 999 | 108 / 82.44% | 23 / 17.56% |
| A$26 000 to A$51 999 | 59 / 83.10% | 12 / 16.90% |
| A$52 000 or more | 63 / 82.89% | 13 / 17.11% |
| **Labour Force Status** | | |
| Working | 115 / 82.73% | 24 / 17.27% |
| Not Working | 115 / 82.73% | 24 / 17.27% |
| **State of Enumeration (Usual Residence)** | | |
| Northern States | 73 / 90.12% | 8 / 9.88% |
| Southern States | 157 / 97.52% | 4 / 2.48% |
| **Registered Marital Status** | | |
| Never Married | 77 / 87.50% | 11 / 12.50% |
| Widowed, Separated or Divorced | 28 / 82.35% | 6 / 17.65% |
| Married | 125 / 80.13% | 31 / 19.87% |
| **Language Spoken at Home** | | |
| English | 118 / 83.10% | 24 / 16.90 |
| European, Middle Eastern and African Languages | 33 / 84.62% | 6 / 15.38% |
| Asian and Oceanic Languages | 79 / 81.44% | 18 / 18.56% |
| **Religious Affiliation** | | |
| Christian Faiths | 93 / 85.32% | 16 / 14.68 |
| Buddhism | 13 / 65.00% | 7 / 35.00% |
| Other Religions | 26 / 81.25% | 6 / 18.75% |
| Not Religious | 98 / 83.76% | 19 / 16.24% |

## Total Fertility Rates

*Table 6* has been derived from the birth statistics data for Australia by birth country of parent in 2017. This is the latest birth data released by the Australian Bureau of Statistics. The data was accessed on November 21st 2019 via the Australian Bureau of Statistics website (Australian Bureau of Statistics, 2018). In the table we can see that New Zealand, North Africa and the Middle East, Southern and Central Asia, and Sub-Saharan Africa all have TFR's higher than Australia. We are also able to see that only New Zealand, North Africa and the Middle East, and Sub-Saharan Africa have TFR's greater than replacement fertility. Combined these three regions make up 6.63% of the total population of reproductive women in Australia.

*Table 6 - Total Fertility Rates for Australia in 2017*

| Region of Birth | Estimated Female Population Aged 15 to 49 | Percentage of Total Female Population Aged 15 to 49 | Number of Births | Total Fertility Rate |
|---|---|---|---|---|
| Australia | 3 959 596 | 67.78 | 197 720 | 1.76 |
| Total Fertility Rates Higher Than Australia | | | | |
| New Zealand | 153 062 | 2.62 | 9 367 | 2.14 |
| North Africa and the Middle East | 118 334 | 2.03 | 9 505 | 2.58 |
| Southern and Central Asia | 309 565 | 5.30 | 26 358 | 1.90 |
| Sub-Saharan Africa | 115 518 | 1.98 | 6 850 | 2.01 |
| Sub-Total | 696 479 | 11.92 | 52 080 | |
| Total Fertility Rates Lower Than Australia | | | | |
| North-West Europe | 260 220 | 4.45 | 12 613 | 1.69 |
| Southern and Eastern Europe | 99 634 | 1.71 | 5 126 | 1.54 |
| South-East Asia | 350 942 | 6.01 | 17 232 | 1.52 |
| North-East Asia | 365 112 | 6.25 | 16 236 | 1.27 |
| America's | 110 148 | 1.89 | 5 287 | 1.28 |
| Sub Total | 1 186 056 | 20.30 | 56 494 | |
| Total | **5 842 131** | **100.00** | **306 294** | **1.75** |

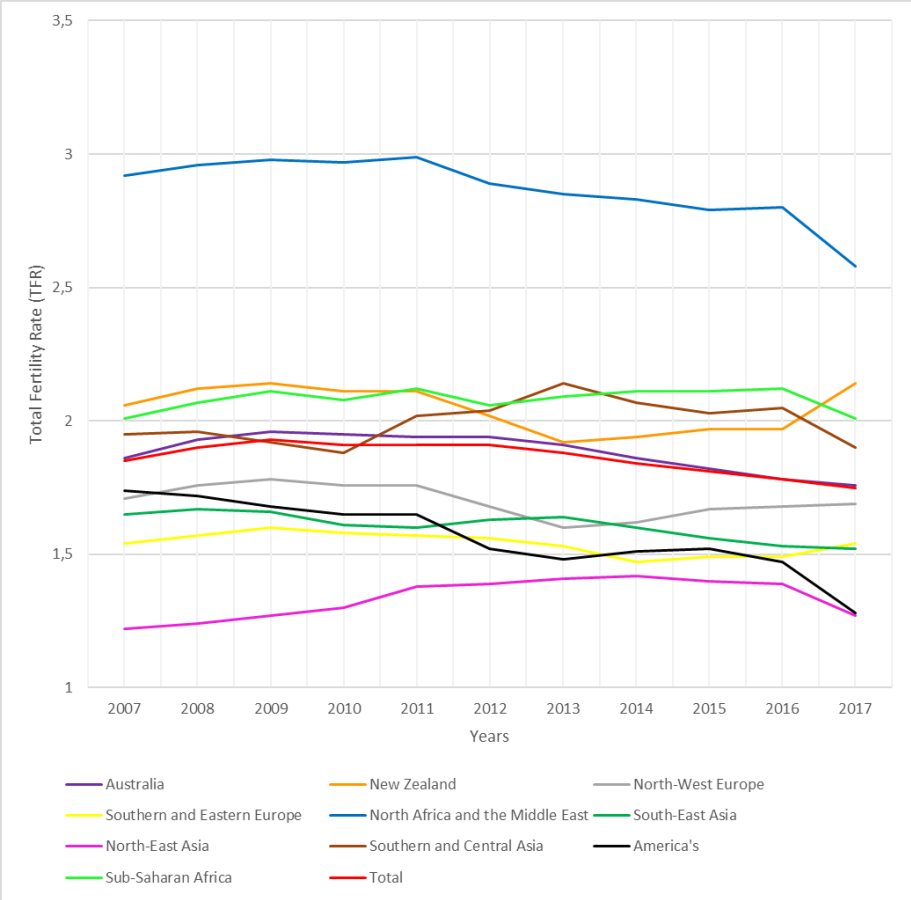



*Figure 4 - Total Fertility Rates (TFR) in Australia by Region of Birth 2007 to 2017 (Australian Bureau of Statistics, 2018)*

*Figure 4* shows TFR in Australia by region of birth from 2007 through to 2017. The line chart was created using the same data set as *Table 6* above, but for the years 2007 through to 2017. Overall, there has been a downward trend of TFR in Australia over this time period. The only two regions experiencing growth in TFR are New Zealand and Southern and Eastern Europe. Similarly, there are only two regions which have experienced sustained above replacement level fertility TFR over the past 11 years, namely Sub-Saharan Africa and North Africa and the Middle East. Between 2012 and 2016 New Zealand's TFR dropped to below replacement fertility but is currently above replacement fertility. Between 2011 and 2017 Southern and Central Asia's TFR was above replacement fertility but has since dropped to below replacement fertility.

## Multivariate Results

The unadjusted binary logistic regression model below in *Table 7* displays the outputs for the regression analysis where Region of Birth is the only independent predictor variable. In this model we can see that women in Australia between the ages of 15 and 49 who were born in Europe are 2.737 times more likely to have 3 or more children compared to women of the same age who were born in Australia. This result is significant at the 95% confidence interval with a p-value of 0.044.

*Table 7 - Unadjusted Binary Logistic Model for Which Children Ever Born is the Dependent Variable and Region of Birth is the Main Independent Predictor Variable (Unweighted)*

| **Children Ever Born** | **Odds Ratio** | **Std. Err.** | **z** | **P>\|z\|** | **[95% Conf. Interval]** | |
|---|---|---|---|---|---|---|
| **Region of Birth (Reference: Australia)** | | | | | | |
| Asia and Oceania | 1.468 | 0.530 | 1.06 | 0.288 | 0.723 | 2.979 |
| Europe | 2.737 | 1.368 | 2.01 | **0.044*** | 1.028 | 7.288 |
| The Middle East and Africa | 1.393 | 0.962 | 0.48 | 0.631 | 0.360 | 5.392 |
| _cons | 0.154 | 0.041 | -6.97 | 0.000 | 0.091 | 0.260 |

In the adjusted binary logistic regression model on the next page in *Table 8*, we can see that there are four statistically significant results at the 95 percent confidence interval. Women between the ages of 15 and 49 in Australia who were born in Europe are 5.122 times more likely to have 3 or more children compared to women of the same age born in Australia. Buddhist women between the ages of 15 and 49 in Australia are 5.748 times more likely to have 3 or more children compared to women in the same age who follow Christian faiths. Married women of the same age range are 2.924 times more likely to have 3 or more children compared to women who have never been married. Lastly, women who reside in the Southern States of Australia are 2.438 times more likely to have 3 or more children compared to those who reside in the Northern States.

*Table 8 - Adjusted Binary Logistic Regression Model with All of the Independent Predictor Variable Categories (Unweighted)*

| | | | | | | |
|---|---|---|---|---|---|---|
| Iteration 0: log likelihood = -127.90278<br>Iteration 1: log likelihood = -115.78657<br>Iteration 2: log likelihood = -114.51649<br>Iteration 3: log likelihood = -114.51095<br>Iteration 4: log likelihood = -114.51095 | | | | | | |
| **Logistic Regression**<br><br>Log likelihood = -114.51095 | | | Number of obs = 278<br>LR chi2(19) = 26.78<br>Prob > chi2 = 0.1098<br>Pseudo R2 = 0.1047 | | | |
| **Children Ever Born** | **Odds Ratio** | **Std. Err.** | **z** | **P>\|z\|** | **[95% Conf. Interval]** | |
| **Region of Birth (reference: Australia)** | | | | | | |
| Asia and Oceania | 1.791 | 0.702 | 1.49 | 0.137 | 0.831 | 3.860 |
| Europe | 5.122 | 2.891 | 2.89 | **0.004*** | 1.694 | 15.486 |
| The Middle East and Africa | 1.496 | 1.096 | 0.55 | 0.582 | 0.356 | 6.287 |
| **Language Spoken at Home (Reference: English)** | | | | | | |
| European, Middle Eastern and African Languages | 0.562 | 0.315 | -1.03 | 0.303 | 0.188 | 1.683 |
| Asian and Oceanic Languages | 1.204 | 0.452 | 0.49 | 0.622 | 0.577 | 2.513 |
| **Highest Educational Attainment (Reference: Secondary Education)** | | | | | | |
| Certificate | 1.712 | 0.867 | 1.06 | 0.289 | 0.634 | 4.622 |
| Tertiary Education | 1.373 | 0.515 | 0.84 | 0.398 | 0.658 | 2.862 |
| **Labour Force Status (Reference: Working)** | | | | | | |
| Not Working | 1.013 | 0.356 | 0.04 | 0.970 | 0.509 | 2.019 |
| **Total Personal Income Per Annum (Australian Dollars) (Reference: Negative Income to A$25 999)** | | | | | | |
| A$26 000 to A$51 999 | 1.008 | 0.425 | 0.02 | 0.985 | 0.441 | 2.302 |
| A$52 000 or more | 0.825 | 0.343 | -0.46 | 0.642 | 0.365 | 1.861 |
| **Religious Affiliation (Reference: Christian Faiths)** | | | | | | |
| Buddhism | 5.748 | 3.493 | 2.88 | **0.004*** | 1.747 | 18.917 |
| Other Religions | 1.430 | 0.814 | 0.63 | 0.530 | 0.468 | 4.366 |
| Not Religious | 1.312 | 0.519 | 0.69 | 0.492 | 0.604 | 2.849 |
| **Registered Marital Status (Reference: Never Married)** | | | | | | |
| Widowed, Separated or Divorced | 2.624 | 1.639 | 1.54 | 0.122 | 0.772 | 8.923 |
| Married | 2.924 | 1.301 | 2.41 | **0.016*** | 1.222 | 6.994 |
| **Age Cohort (Reference: 15 to 24 years old)** | | | | | | |
| 25 to 34 years old | 1.761 | 0.776 | 1.28 | 0.199 | 0.742 | 4.176 |
| 35 to 44 years old | 0.764 | 0.391 | -0.53 | 0.599 | 0.281 | 2.082 |
| 45 to 49 years old | 2.800 | 1.609 | 1.79 | 0.073 | 0.908 | 8.637 |
| **State of Enumeration (Reference: Northern States)** | | | | | | |
| Southern States | 2.438 | 1.081 | 2.01 | **0.044*** | 1.023 | 5.812 |
| cons_ | .0139284 | 0.012 | -4.97 | 0.000 | 0.003 | 0.075 |

# Chapter 5: Discussion

For many in Australia, immigrant populations are seen as a source of strain on already struggling public infrastructure. This concern has been magnified by the Australian government's apparent inability to provide accurate population projections for the future (Ware, 2016; Wilson, 2017). The objective of the analysis undertaken in this study was to identify the levels of immigrant fertility in Australia and compare them to those of Australian born women. By doing this while controlling for socioeconomic factors, we were able to begin to build a clearer image of the dynamics of immigrant fertility patterns that possibly lead to population growth in Australia. As stated previously by Renzaho et al. (2016), one third of the Australian population was born overseas yet research focused on immigrant populations is severely underfunded and therefore understudied. The findings presented in this study will work to build on to the current knowledge in the field of immigrant fertility in Australia.

Total Fertility Rates in Australia for the period 2007 to 2017 have been below replacement fertility for the majority of the Australian population. Women of reproductive age born in Australia have experienced sustained TFR outcomes below replacement fertility, while those born in North Africa and the Middle East, Sub-Saharan Africa, Southern and Central Asia, and New Zealand have been found to experience sustained levels of above replacement fertility during the same period. Women originating from these four regions represent 11.92% of the total Australian population aged 15 to 49 in 2017, and one third of the female immigrant population in the same age cohort. Both the adjusted and unadjusted binary logistic regression models found that women of reproductive ages born in Europe had a higher likelihood of experiencing above replacement fertility outcomes compared to women of the same age group born in Australia. The odds ratio for the unadjusted logistic regression model is 2.737 (173.7%), while the odds ratio for

the adjusted model is 5.122 (412.2%). The significance of our finding that women originating from Europe experience higher fertility rates than those who do not in both regression models is important for several reasons. Firstly, it goes to show that although some of our control variables registered significant results of their own, they were ultimately not able to change the outcome of the results and significance outputs associated with region of birth. This brings to mind questions around how important these control variables such as income, education, and marital status are when determining immigrant fertility patterns. Our literature review would suggest that these are all important factors, yet our results have shown that these ideas warrant further investigation into their validity.

The analysis of TFR for 2007 to 2017 provides contradictory results to those of the binary logistic regression models. The analysis of TFR in *Table 6* and *Figure 4* show that women born in Europe have experienced lower TFR outcomes than women born in Australia for the entire ten-year time period. Both the adjusted and unadjusted binary logistic regression models produced results that indicate women who were born in Northern Africa and the Middle East, Sub-Saharan Africa, New Zealand, and Southern and Central Asia are less likely to have above replacement fertility outcomes compared to women born in Australia. An explanation for this discrepancy may be that historically, the majority of immigrants entering into Australia originated in Europe (Smyth, 2018). Only since 2010 have the majority of immigrants entering into Australia come from other regions, mainly Asia. Although the age cohort 45 to 49 years old is not statistically significant in either regression model, it does have a near significant p-value of 0.073 in the adjusted model, with an odds ratio of 2.800 (180%). This introduces the possibility that the adjusted regression model is finding that women born in Europe are more likely to have had above replacement fertility outcomes in the past, which, historically this was the case, and

that these women are now aged between 45 and 49 years old. However, a more realistic explanation would centre around the sample size of the data used in the analysis of TFR compared to the regression analysis. The TFR analysis looks at the entire population of women between the ages of 15 and 49 in Australia between 2007 and 2017 (3 959 596 women in 2017). The regression analysis has a sample size of only 278 observations. Regression analyses may be viewed as a more reliable and empirically valid statistical test when compared to bivariate descriptive statistics, but in the context of understanding TFR outcomes of women in Australia, the bivariate analysis in this study is more insightful purely due to its larger sample size. This deduction would be in line with previous research which concluded that immigrant women have higher average TFR (1.69) outcomes than Australian women (1.58) (Bonner, 2015).

Australia is a majority Christian country, however, in the adjusted binary logistic regression model in *Table 8*, we see that women of reproductive age in Australia who identify their religious belief to be Buddhist are 474.8% more likely to have 3 or more children when compared to women who identify as Christian. Along with women of European origin having a higher likelihood of having 3 or more children, this is the most statistically significant result in the study, with a p-value of 0.004. When we look at the frequencies of religion to CEB in *Table 5*, we see that 35% of Buddhist respondents have 3 or more children – the highest of any control variable sub-cohort in the study. It is a well-known fact that religion is an associated variable of fertility (Bongaarts, 1978), which is why it was included as a control variable in this study. None of the literature reviewed in this paper, or any other literature reviewed when pursuing an explanation for this result, included any discussion on Buddhist fertility outcomes in Australia and their relationship with the fertility outcomes of other religious groups in Australia.

The theoretical framework employed in this study was derived from assimilation theory (Bonner, 2015; Bradatan, n.d.; Mayer & Riphahn, 2000) as well as Bongaarts (1978) proximate determinants of fertility framework. This theoretical framework has been appropriate in understanding the fertility dynamics of immigrant women in Australia. The study began by stating the fact that of the top ten origin countries for immigrants (by number of immigrants entering Australia) only two had lower TFR values than Australia (Liddy, 2018). The average TFR among these countries is 2.36 while TFR in Australia, in 2017, was 1.75 (Liddy, 2018). The statistical analysis of TFR from 2007 till 2017 showed that two thirds of immigrant women had lower than replacement level TFR. Both binary logistic regression analyses too showed that most women born overseas have below replacement fertility TFR. We can therefore acknowledge that, based on the analyses in this study, assimilation theory is applicable to Australian immigrant fertility as a whole.

# Chapter 6: Conclusion and Recommendations

## Conclusion

This study provides some initial evidence that immigrant women living in Australia may be assimilating to Australian fertility norms. The Australian government and research communities should, however, continue to focus their resources on better understanding the main causes of population growth in Australia as it seems that immigrant fertility may play only a small factor in this phenomenon. Whatever the reasons for population growth in Australia may ultimately be, the research focus can then be driven towards providing more accurate population projections for the future so that policies and programmes can mould around as accurate a prediction as possible. It is important to note that one third of immigrant women of reproductive age in Australia are expected to experience TFR outcomes that are higher than their Australian counterparts, but these women constitute a tenth of the total number of reproductive age women in Australia. A mere tenth of women aged 15 to 49 in Australia are most likely not responsible for the booming population in Australia that has government agencies revising future population estimates by millions of people every few years.

What is worrisome then is that whatever phenomenon is causing the Australian population to grow at such a rapid rate is not fully known. This study aimed to investigate the relationship between immigrant fertility and population growth in Australia but is unable to conclusively prove that any relationship is present. Rather, this study concludes that further research needs to be conducted to provide definitive answers, and to do this there needs to be more data made available by the Australian government.

## Strengths and Limitations

The main strength of this study was that it looked at the Australian population as a whole instead of looking at specific communities or geographic locations that may not be representative of the entire country. This was possible through making use of the 2016 Australian census data. Although this data, in theory, affords us an opportunity to look at the entire population, the available microdata sample made available by the Australian Bureau of statistics represented a mere 0.04% of the entire population of Australia. The dependent and independent variables included in the data were appropriate for the regression analyses, but this was still a significantly smaller data set compared to the data used to analyse TFR from 2007 to 2017, which constituted a 100% sample of the population of women aged 15 to 49 in this time period. This discrepancy in sample sizes in the two analyses led to discrepancies in the results garnered. These differences can be seen as a strength of the study in that they force our attention to further investigations in the future that may not have been identified if only one or the other dataset and analysis was employed in this study.

## Recommendations

Further research needs to be conducted which makes use of a larger, more representative sample of the Australian population when carrying out regression analyses. This will allow for an improved understanding of the discrepancies present in this study due to the immensely different sample sizes of the datasets used (2016 Census vs TFR data). There should be an increase in the amount of future research into migrant fertility as it is clear to see that it is a multifaceted phenomenon with few clear answers, yet underappreciated immigration phenomena have the ability to cause major developmental issues such as overcrowding and poor welfare planning in the future if we fail to understand them.

This future research should take note of, and explore, the fertility patterns of different religious groups in Australia as a surprise outcome of this study was that Buddhists in Australia are far more likely to have 3 or more children compared to any cohort or sub cohort of any other variable included in the study. The fertility patterns of Buddhist immigrants, or Buddhists in general, in Australia have not been mentioned in any of the literature reviewed in this study.

The research approach recommended would factor in the demographic profile of new immigrants into Australia in the past 10 years, rather than labelling anyone born outside of Australia as an immigrant. This would result in a clearer understanding of contemporary fertility patterns as it is too late to worry about the fertility patterns of previous generations of immigrants when thousands of new immigrants are entering into Australia every week.

Australia has to develop an even clearer understanding as to what sort of immigrants it is trying to attract with its Skilled Migration Program over and above these immigrants possessing valuable skills in particular sectors of the economy. The reality is that the immigrants that are attracted to Australia through the Skilled Migration Program may or may not have children while they are in Australia due to a mirage of socioeconomic and cultural factors. If they choose to have children, it is vital to gain a better understanding of how many children they would be likely to have and why this would be the case. Australia needs to be able to provide services and infrastructure for future populations and therefore needs to be able to accurately project future population sizes and demographic compositions. If, on the other hand, these skilled immigrants are not likely to have children then the state will have to plan for who will run the economy when the population ages, or will more immigrants need to be brought in to the country, and the dependency ratio for the elderly increase?

These are questions that policy makers in Australia need to be asking themselves rather than focusing on the short-term economic gains associated with the valuable skills that these immigrants possess. Knowing that immigrant populations from Sub-Saharan Africa, North Africa and the Middle East are growing, and knowing that the majority of the countries in these regions are lower income countries compared to Australia, plans can be made to accommodate these immigrants and their children. Constructing an improved understanding of this information will impact government programs such as the Housing and Affordability Fund, as future research can be conducted with a focus on better awareness of immigrants who are likely to have 3 or more children and their ability to house themselves. The Living in Harmony Program too has the ability to be impacted by this, and future research, as it is becoming clearer which immigrant populations are growing through natural increase. This makes it possible to tailor make programs specifically targeted at allowing other demographic groups in Australia to understand what the future population of Australia may look like, and what cultures, beliefs and languages may be prevalent in Australia one day.

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# Appendices

## Appendix A: Study Variables Before Recode

*Table 8 – Study Variables Description and Coding Before Recode*

| Variable Code & Description | Coding |
|---|---|
| **Code:** SEXP<br>**Description:** Sex | 1 – Male<br>2 – Female |
| **Code:** AGEP<br>**Description:** Age of persons | 0 – 0 years<br>1 – 1 years<br>2 – 2 years<br>3 – 3 years<br>…<br>111 – 111 years<br>112 – 112 years |
| **Code:** BPLP<br>**Description:** Country of Birth of Person | **Coded:** 1000 – 99999<br>251 options |
| **Code:** HEAP<br>**Description:** Level of Highest Educational Attainment | 1 – Inadequately described<br>100 - Postgraduate Degree Level, nfd<br>110 - Doctoral Degree Level, nfd<br>111 - Higher Doctorate<br>114 - Professional Specialist Qualification, Doctoral Level<br>120 - Master Degree Level, nfd<br>200 - Graduate Diploma and Graduate Certificate Level, nfd<br>211 - Graduate Diploma<br>221 - Graduate Certificate<br>310 - Bachelor Degree Level, nfd<br>400 - Advanced Diploma and Diploma Level, nfd<br>411 - Advanced Diploma<br>413 - Associate Degree<br>421 - Diploma<br>510 - Certificate III & IV Level, nfd<br>511 - Certificate IV<br>514 - Certificate III<br>611 - Year 12<br>613 - Year 11<br>621 - Year 10<br>720 - Certificate I & II Level, nfd |

| | |
|---|---|
| | 721 - Certificate II<br>724 - Certificate I<br>811 - Year 9<br>812 - Year 8 or below<br>998 - No educational attainment<br>9997 - Not stated<br>9998 - Not applicable<br>9999 - Overseas visitor |
| **Code:** INCP<br>**Description:** Total Personal Income (Weekly) | 1 – Negative income<br>2 – Nil income<br>3 – $1-$149 ($1-$7,799)<br>4 – $150-$299 ($7,800-$15,599)<br>5 – $300-$399 ($15,600-$20,799)<br>6 – $400-$499 ($20,800-$25,999)<br>7 – $500-$649 ($26,000-$33,799)<br>8 – $650-$799 ($33,800-$41,599)<br>9 – $800-$999 ($41,600-$51,999)<br>10 – $1,000-$1,249 ($52,000-$64,999)<br>11 – $1,250-$1,499 ($65,000-$77,999)<br>12 – $1,500-$1,749 ($78,000-$90,999)<br>13 – $1,750-$1,999 ($91,000-$103,999)<br>14 – $2,000-$2,999 ($104,000-$155,999)<br>15 – $3,000 or more ($156,000 or more)<br>997 – Not stated<br>998 – Not applicable<br>999 – Overseas visitor |
| **Code:** LFSP<br>**Description:** Labour Force Status | 1 – Employed, worked full time<br>2 – Employed, worked part time<br>3 – Employed, away from work<br>4 – Unemployed, looking for full-time work<br>5 – Unemployed, looking for part-time work<br>6 – Not in the labour force<br>97 – Not stated<br>98 – Not applicable<br>99 – Overseas visitor |
| **Code:** STATE_UR<br>**Description:** State of Usual Residence | 1 – New South wales<br>2 – Victoria<br>3 – Queensland<br>4 – South Australia<br>5 – Western Australia |

| | |
|---|---|
| | 6 – Tasmania<br>7 – Northern Territory<br>8 – Australian Capital Territory<br>99 – Other Territories |
| **Code:** MSTP<br>**Description:** Registered Marital Status | 1 – Never married<br>2 – Widowed<br>3 – Divorced<br>4 – Separated<br>5 – Married<br>98 – Not applicable |
| **Code:** LANP<br>**Description:** Language Spoken at Home | **Coded:** 1100 – 99997<br>356 options |
| **Code:** RELP<br>**Description:** Religious Affiliation | **Coded:** 1011 – 99998<br>143 options |
| **Code:** TISP<br>**Description:** Number of Children Ever Born | 0 – None<br>1 – One child<br>2 – Two children<br>3 – Three children<br>…<br>29 – Twenty-nine children<br>30 – Thirty or more children<br>997 – Not stated<br>998 – Not applicable<br>999 – Overseas visitor |

## Appendix B: Alternative Regression Models

*Table 9 - Adjusted Binary Logistic Regression Model Including All of the Independent Predictor Variables (Unweighted)*

Iteration 0: log likelihood = -127.90278
Iteration 1: log likelihood = -123.25781
Iteration 2: log likelihood = -123.09391
Iteration 3: log likelihood = -123.09343
Iteration 4: log likelihood = -123.09343

**Logistic Regression**

Log likelihood = -123.09343

Number of obs = 278
LR chi2(9) = 9.62
Prob > chi2 = 0.3822
Pseudo R2 = 0.0376

| **Children Ever Born** | **Odds Ratio** | **Std. Err.** | **z** | **P>\|z\|** | **[95% Conf. Interval]** | |
|---|---|---|---|---|---|---|
| Region of Birth | 1.308 | 0.236 | 1.49 | 0.136 | 0.919 | 1.862 |
| Language Spoken at Home | 1.060 | 0.191 | 0.32 | 0.747 | 0.744 | 1.510 |
| Highest Educational Attainment | 1.079 | 0.190 | 0.43 | 0.667 | 0.764 | 1.524 |
| Labour Force Status | 1.053 | 0.350 | 0.16 | 0.876 | 0.549 | 2.022 |
| Total Personal Income Per Annum (Australian Dollars) | 0.973 | 0.188 | -0.14 | 0.887 | 0.667 | 1.420 |
| Religious Affiliation | 1.028 | 0.123 | 0.23 | 0.821 | 0.812 | 1.300 |
| Registered Marital Status | 1.334 | 0.255 | 1.52 | 0.129 | 0.919 | 1.937 |
| Age | 1.000 | 0.000 | 0.60 | 0.546 | 1.000 | 1.000 |
| State of Enumeration (Usual Residence) | 2.234 | 0.937 | 1.92 | 0.055 | 0.982 | 5.084 |
| cons_ | 0.008 | 0.011 | -3.46 | 0.001 | 0.001 | 0.125 |

*Table 10 – Linear Regression Model where CEB is coded as 0 = 0 Children, 1 = 1 Child, 2 = 2 Children … 10 = 10 Children*

| Source | SS | df | MS | Number of obs = 285<br>F (38, 246) = 1.27<br>Prob > F = 0.1489<br>Adj R-squared = 0.0343<br>Root MSE = 1.4524 | |
|---|---|---|---|---|---|
| Model | 101.460 | 38 | 2.670 | | |
| Residual | 518.947 | 246 | 2.110 | | |
| Total | 620.407 | 284 | 2.185 | | |
| **Children Ever Born** | **Coef.** | **Std. Err.** | **t** | **P>\|t\|** | **[95% Conf. Interval]** |
| **Region of Birth (Reference: Australia)** | | | | | |
| Asia and Oceania | 0.308 | 0.199 | 1.55 | 0.123 | -0.085 0.701 |
| Europe | 0.757 | 0.330 | 2.29 | 0.023* | 0.107 1.407 |
| Africa and the Middle East | 0.774 | 0.395 | 1.96 | 0.051 | -0.005 1.552 |
| The Americas | 0.225 | 0.885 | 0.25 | 0.800 | -1.520 1.969 |
| **Language Spoken at Home (Reference: English)** | | | | | |
| European Languages | -0.523 | 0.349 | -1.50 | 0.135 | -1.210 0.164 |
| Middle East & African Languages | -0.169 | 0.404 | -0.42 | 0.677 | -0.964 0.627 |
| Asian & Oceanic Languages | 0.117 | 0.200 | 0.59 | 0.558 | -0.277 0.511 |
| **Highest Educational Attainment (Reference: No Education)** | | | | | |
| Secondary Education | -0.415 | 0.768 | -0.54 | 0.589 | -1.928 1.097 |
| Certificate | -0.061 | 0.797 | -0.08 | 0.939 | -1.632 1.509 |
| Tertiary Education | -0.243 | 0.772 | -0.31 | 0.753 | -1.763 1.277 |
| **Labour Force Status (Reference: Employed)** | | | | | |
| Unemployed | -0.547 | 0.452 | -1.21 | 0.227 | -1.437 0.343 |
| Not Working | 0.024 | 0.188 | 0.13 | 0.900 | -0.346 0.393 |
| **Total Personal Income Per Annum (Australian Dollars) (Reference: Negative Income to A$25 999)** | | | | | |
| A$26 000 to A$51 999 | 0.188 | 0.223 | 0.84 | 0.401 | -0.252 0.628 |
| A$52 000 to A$103 999 | -0.256 | 0.239 | -1.07 | 0.286 | -0.728 0.216 |
| A$104 000 or more | -0.474 | 0.388 | -1.22 | 0.223 | -1.238 0.290 |
| **Religious Affiliation (Reference: Christian Faiths)** | | | | | |
| Buddhism | 1.22 | 0.358 | 3.41 | 0.001* | 0.515 1.926 |
| Hinduism | -0.349 | 0.484 | -0.72 | 0.471 | -1.302 0.604 |
| Islam | -0.566 | 0.550 | -1.03 | 0.305 | -1.649 0.518 |
| Judaism | -0.363 | 0.740 | -0.49 | 0.625 | -1.821 1.096 |
| Other Religions | 0.359 | 0.551 | 0.65 | 0.515 | -0.726 1.445 |
| No Religion | 0.070 | 0.202 | 0.35 | 0.728 | -0.327 0.467 |
| **Registered Marital Status (Reference: Never Married)** | | | | | |
| Widowed | 0.189 | 0.412 | 0.46 | 0.648 | -0.624 0.854 |
| Divorced | 0.155 | 0.424 | 0.37 | 0.715 | -0.679 0.989 |
| Separated | 0.531 | 0.919 | 0.58 | 0.564 | -1.280 2.342 |
| Married | 0.421 | 0.206 | 2.05 | 0.042* | 0.016 0.826 |
| **Age Cohort (Reference: 15 to 19 years old)** | | | | | |
| 20 to 24 years old | 0.119 | 0.373 | 0.32 | 0.750 | -0.616 0.854 |
| 25 to 29 years old | 0.250 | 0.371 | 0.67 | 0.502 | -0.481 0.979 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 30 to 34 years old | 0.043 | 0.368 | 0.12 | 0.907 | -0.682 | 0.769 |
| 35 to 39 years old | -0.102 | 0.373 | -0.27 | 0.785 | -0.836 | 0.632 |
| 40 to 44 years old | -0.094 | 0.411 | -0.23 | 0.819 | -0.905 | 0.716 |
| 45 to 49 years old | 0.618 | 0.404 | 1.53 | 0.128 | -0.179 | 1.414 |
| **State of Enumeration (Reference: New South Wales)** | | | | | | |
| Victoria | -0.529 | 0.235 | -2.25 | 0.025* | -0.991 | -0.067 |
| Queensland | -0.668 | 0.280 | -2.39 | 0.018* | -1.220 | -0.116 |
| South Australia | -0.626 | 0.434 | -1.44 | 0.151 | -1.481 | 0.229 |
| Western Australia | -0.453 | 0.321 | -1.41 | 0.160 | -1.086 | 0.180 |
| Tasmania | -1.107 | 1.096 | -1.01 | 0.313 | -3.266 | 1.051 |
| Northern Territory | 0.411 | 1.593 | 0.26 | 0.797 | -2.726 | 3.548 |
| Australian Capital Territory | -0.519 | 0.697 | -0.74 | 0.457 | -1.892 | 0.854 |
| _cons | 1.473 | 0.885 | 1.66 | 0.097 | -0.271 | 3.216 |

*Table 11 – Multinomial Logistic Regression Model where CEB is coded as 1 = No Children, 2 = 1 to 2 Children, and 3 = 3 or more Children*

| | | | | | | |
|---|---|---|---|---|---|---|
| Iteration 0: log likelihood = -291.53666<br>Iteration 1: log likelihood = -283.94561<br>Iteration 2: log likelihood = -283.73289<br>Iteration 3: log likelihood = -283.73242<br>Iteration 4: log likelihood = -283.73242 | | | | | | |
| **Multinomial Logistic Regression**<br><br><br>Log likelihood = -283.73242 | | | Number of obs. = 285<br>LR chi2(18) = 15.61<br>Prob > chi2 = 0.6199<br>Pseudo R2 = 0.0268 | | | |
| **Children Ever Born** | **Coef.** | **Std. Err.** | **z** | **P>\|z\|** | **[95% Conf. Interval]** | |
| **1 (No Children)** | | | | | | |
| **Region of Birth** | -0.992 | 0.070 | -1.41 | -0.237 | -0.237 | 0.038 |
| **Language Spoken at Home** | 0.061 | 0.098 | 0.62 | -0.132 | -0.132 | 0.253 |
| **Highest Educational Attainment** | -0.056 | 0.144 | -0.39 | -0.338 | -0.338 | 0.225 |
| **Labour Force Status** | -0.162 | 0.141 | -1.15 | -0.438 | -0.438 | 0.114 |
| **Total Personal Income Per Annum (Australian Dollars)** | 0.118 | 0.141 | 0.84 | -0.158 | -0.158 | 0.394 |
| **Religious Affiliation** | -0.007 | 0.049 | -0.14 | 0.890 | -0.103 | 0.089 |
| **Registered Marital Status** | -0.028 | 0.073 | -0.38 | 0.706 | -0.172 | 0.116 |
| **Age Cohort** | 0.000 | 0.000 | 0.32 | 0.752 | -0.000 | 0.000 |
| **State of Enumeration** | -0.032 | 0.087 | -0.37 | 0.714 | -0.203 | 0.139 |
| **_cons** | 0.085 | 0.897 | 0.10 | 0.924 | -1.672 | 1.842 |
| **2 (1 to 2 Children) (Base Outcome)** | | | | | | |
| **3 (3 or more Children)** | | | | | | |
| **Region of Birth** | 0.069 | 0.086 | 0.80 | 0.422 | -0.100 | 0.240 |
| **Language Spoken at Home** | 0.086 | 0.122 | 0.70 | 0.483 | -0.154 | 0.325 |
| **Highest Educational Attainment** | -0.033 | 0.177 | -0.19 | 0.852 | -0.381 | 0.315 |
| **Labour Force Status** | -0.075 | 0.174 | -0.43 | 0.667 | -0.416 | 0.266 |
| **Total Personal Income Per Annum (Australian Dollars)** | -0.072 | 0.180 | -0.40 | 0.687 | -0.425 | 0.280 |
| **Religious Affiliation** | 0.030 | 0.061 | 0.50 | 0.615 | -0.088 | 0.149 |
| **Registered Marital Status** | 0.132 | 0.095 | 1.39 | 0.164 | -0.054 | 0.318 |
| **Age Cohort** | 0.000 | 0.000 | 0.53 | 0.594 | -0.000 | 0.000 |
| **State of Enumeration** | -0.324 | 0.135 | -2.40 | 0.016* | -0.588 | -0.059 |
| **_cons** | -1.197 | 1.13 | -1.06 | 0.289 | -3.410 | 1.016 |