Fertility Levels and Intentions in New South Wales

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Executive Summary

The purpose of this report is to collate evidence which can be used to inform future fertility assumptions used in the New South Wales (NSW) Population, Household and Dwelling Projections and to evaluate the assumptions used in the current projections. These projections play a vital role in informing planning and policy development across all NSW Government Agencies.

Following a long period of decline, the annual Total Fertility Rate (TFR) for NSW recovered significantly from 1.77 births per woman in 2001 to reach 2.05 in 2008 before falling back to 1.93 in 2012. Women in NSW have been having children at later ages, and 30-34 has become the most usual age range for giving birth.

These trends in annual fertility should be viewed in the context of changes to the cumulative numbers of children women have had over their lifetimes. Prior to 2007 the average numbers of children women had had over their lifetime decreased for women across the 25 to 50 age range. Since 2007 the trend towards smaller average numbers of children by age 40 appears to have halted, and, whilst the trend towards a smaller average number by age 30 has continued, the rate of decline has become progressively more gradual. The increases in birth rates between 2001 and 2008 were largely due to increased numbers of first and second births, and should therefore be seen as part of a "catch-up effect": past decreases in fertility rates were exaggerated by the effects of fertility postponement, and after 2001 a replacement of previously postponed births helped to push the TFR back up.

In NSW birth rates tend to be lowest in the major cities and highest in the remote and very remote areas. The pattern of fertility change over time has differed between geographical subregions of the State. In Sydney, and especially the higher socioeconomic status areas in the Sydney's inner, northern, and eastern suburbs, a "catch-up effect" for previously postponed births may explain the increases in annual fertility rates. Fertility trends in regional NSW, especially in the remote or very remote areas, have been more volatile, with larger than average increases in fertility between 2003 and 2008 being followed by larger than average decreases after 2009.

The fertility levels of overseas-born women in NSW have fallen slightly below those for the Australia-born. Of the larger migrant groups only the Lebanon-born have a greater average completed family size than the Australia-born. The most numerous overseas-born group among women of reproductive age, the China-born, have the significantly smaller than average family sizes, as do the Hong Kong-born. Recently arrived overseas migrants have much lower than average numbers of children. Interstate movers to or from NSW tend to have smaller than average numbers of children.

Over the 2002-2012 the average intended completed family size for NSW women in the 18 to 44 years age group remained fairly consistently at around 2.2 children per woman. This consistency points towards there being little change in completed family sizes of NSW women in the near future.

Far from being internationally unique in seeing its birth rate rise over the pre-2008 period, the fertility trends for NSW are broadly similar to those for a range of other More Developed Countries. Fertility assumptions for national population projections in countries with a similar level of fertility have typically assumed there will be little change in fertility levels in the future. The emergent pattern of virtually constant cohort fertility in NSW has also been observed in the UK, where the official projections assume such a pattern will continue.

In view of the relatively stable levels of completed cohort fertility and intended family sizes for NSW in recent years, relatively little change in completed cohort fertility should be expected. A small increase in annual fertility rates, concentrated among women in their 30s, should be expected over the next 10-15 years due to a "catch-up effect" as the women now aged 25 to 30 compensate for the slightly smaller numbers of children they have had so far, relative to the numbers preceding cohorts have had, by having slightly larger numbers of children later in life.

The NSW State Government's current projections assume there will be a gradual rise in NSW's TFR from 1.955 in 2011 to 1.972 in 2041 and a small future increase in the proportionate contribution to the fertility rate of women aged over 30. These are reasonable assumptions in the light of the fertility levels of the last five years and the prospect of a "catch-up effect" leading to further small increases in fertility among women aged over 30.

The advent of more extensive demographic databases in which data from different censuses are linked has the potential to significantly enhance the formulation of fertility assumptions for population projections. Appendix B suggests a method which could be adopted to leverage the potential value of such data.

Introduction

This report was commissioned by the Centre for Demography, Policy and Research in the New South Wales Department of Planning and Environment to collate evidence which can be used to inform future fertility assumptions used in the New South Wales (NSW) Population, Household and Dwelling Projections and to evaluate the assumptions used in the current projections. These projections play an important role in supporting planning and policy development across all NSW Government Agencies. A Cabinet decision in 2013 requires that all policy decisions must refer to the population evidence and population implications. Consequently projections of future population have a vital role to play in informing planning which can better provide the jobs, homes, infrastructure and services required in the coming decades.

Fertility trends are a critically important determinant of the changing size, composition and geographical location of population. The preparation of population projections requires carefully considered assumptions about future fertility, along with assumptions for future mortality, international migration and internal migration, to be made. Consideration of recent trends in fertility levels at the state level, at sub-state levels, and for population subgroups, such as international migrants, and the likely future direction of these trends, is integral to the evidence-based assessment of prospective future trends.

This report assesses the evidence for NSW on fertility trends and expressed intentions regarding future completed family sizes. It discusses the prospects for future fertility, evaluates the fertility assumptions used in the current New South Wales State Government's population projections, and offers suggestions to assist the formulation of future projection assumptions. Such projections will strengthen the evidence base for short, medium and longer term planning by NSW Government agencies responsible for infrastructure and services.

Section 2 of the report describes the trends in fertility in NSW. Section 3 focuses on future fertility intentions. The assumptions on future fertility levels used the NSW State Government population projections and in similar national-level projections for Australia and overseas are described in Section 4. Section 5 discusses the prospects for fertility levels in NSW, and provides a brief evaluation of the assumptions used in the NSW State Government's projections. Data quality issues and the technical formulation of a projection method are presented in the Appendices.

Trends in Fertility Levels in New South Wales

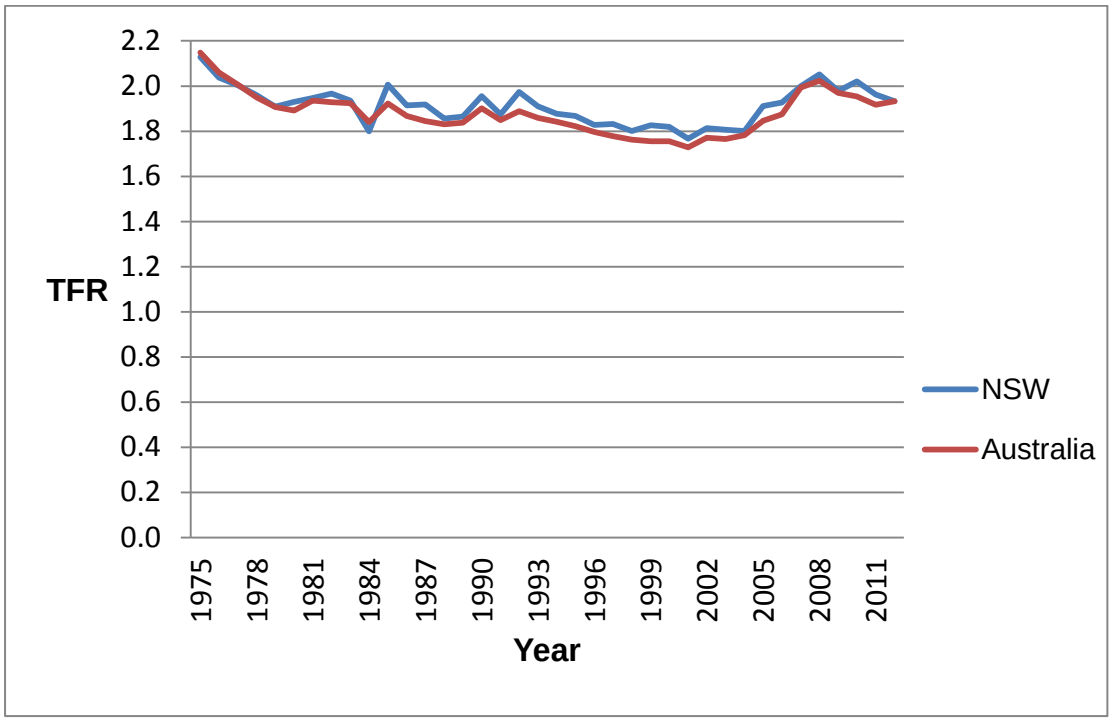
Trends in Annual Fertility

In 2012 NSW had a Total Fertility Rate (TFR) of 1.93 births per woman[1]. The average TFR over the 2008-2012 period was 1.99 births per woman. In recent decades the TFR for NSW has generally been slightly higher than Australia's (ABS 2013a, Figure 1). Of the various states and major territories only the Northern Territory, Tasmania and Queensland had higher fertility than NSW in 2012. The trend for NSW's TFR has closely mirrored that for Australia as a whole (Figure 1). During the 1970s both in NSW and in Australia the TFR decreased significantly. This decline reflected the combined effects of both a move towards smaller completed family sizes and a temporary effect of postponing births to later ages (Carmichael and McDonald 2003). Underlying factors include the more widespread use of more effective contraception, easier access to abortion, a reduced prevalence of marriage among women of reproductive age, and changing aspirations and roles in families and society of women (Carmichael 1998). In the 1980s NSW's TFR fluctuated between 1.8 and 2.0 births per woman. The TFR for NSW fell gradually during the 1990s to reach an all-time low of 1.77 births per woman in 2001. It then recovered significantly to reach 2.05 in 2008 before falling back to 1.93 in 2012 (Figure 1).

Over the period since 1975 there has been a general trend towards having children at later ages. The mean age of women at childbearing for NSW increased from 25.8 years in 1975 to 30.7 years in 2012, and the percentage contributed to the TFR by women aged 30 and above more than doubled from 25.5 per cent in 1975 to 56.6 per cent in 2012 (Figure 2). Some of the increase in the TFR, described in the previous section, is attributable to a compensation for the previous postponement of births (Parr 2011).

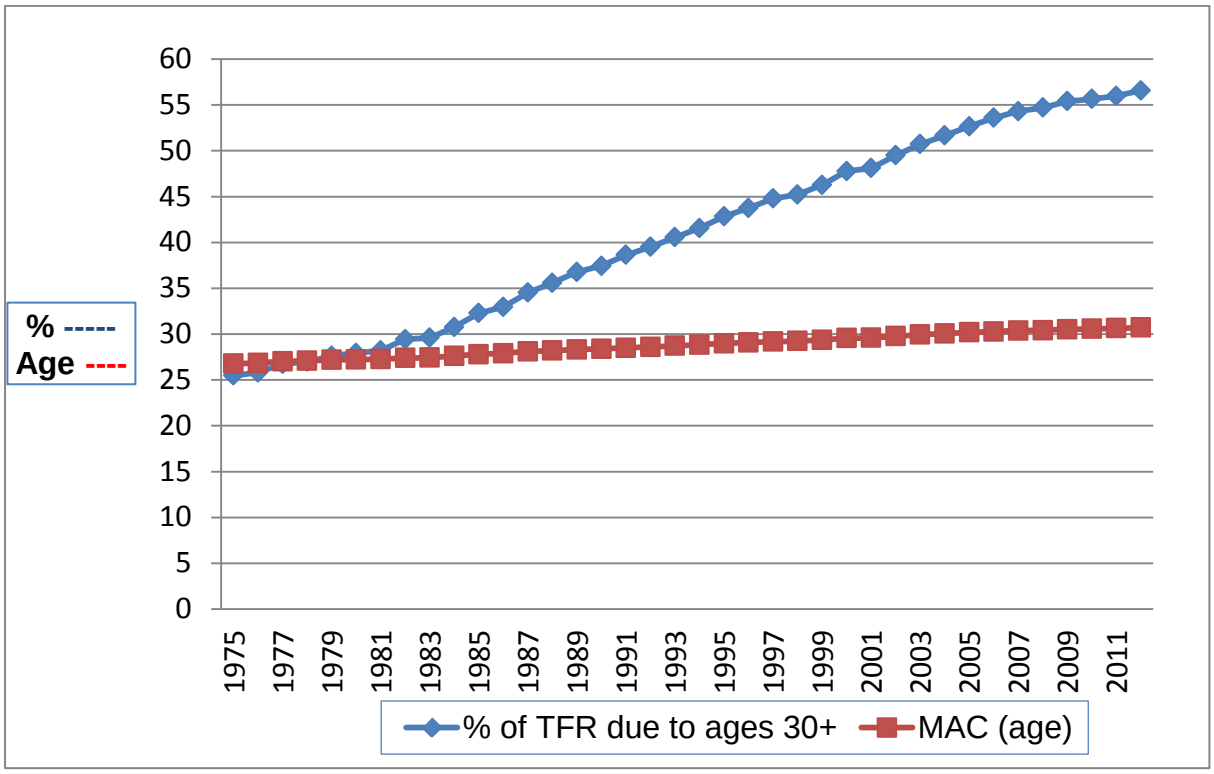
[1] *The Total Fertility Rate (TFR) simulates the average number of children women would have over their lifetime if at each age they were to experience the fertility rate for that age group for a specified time period (usually a calendar year). It thus provides a level for the age-specific patterns of fertility in particular time periods for the populations in particular geographical locations and for population subgroups.*

Figure 1: Total Fertility Rates (TFR) for NSW and for Australia 1975-2012



Sources: ABS (2008) and (2013a)

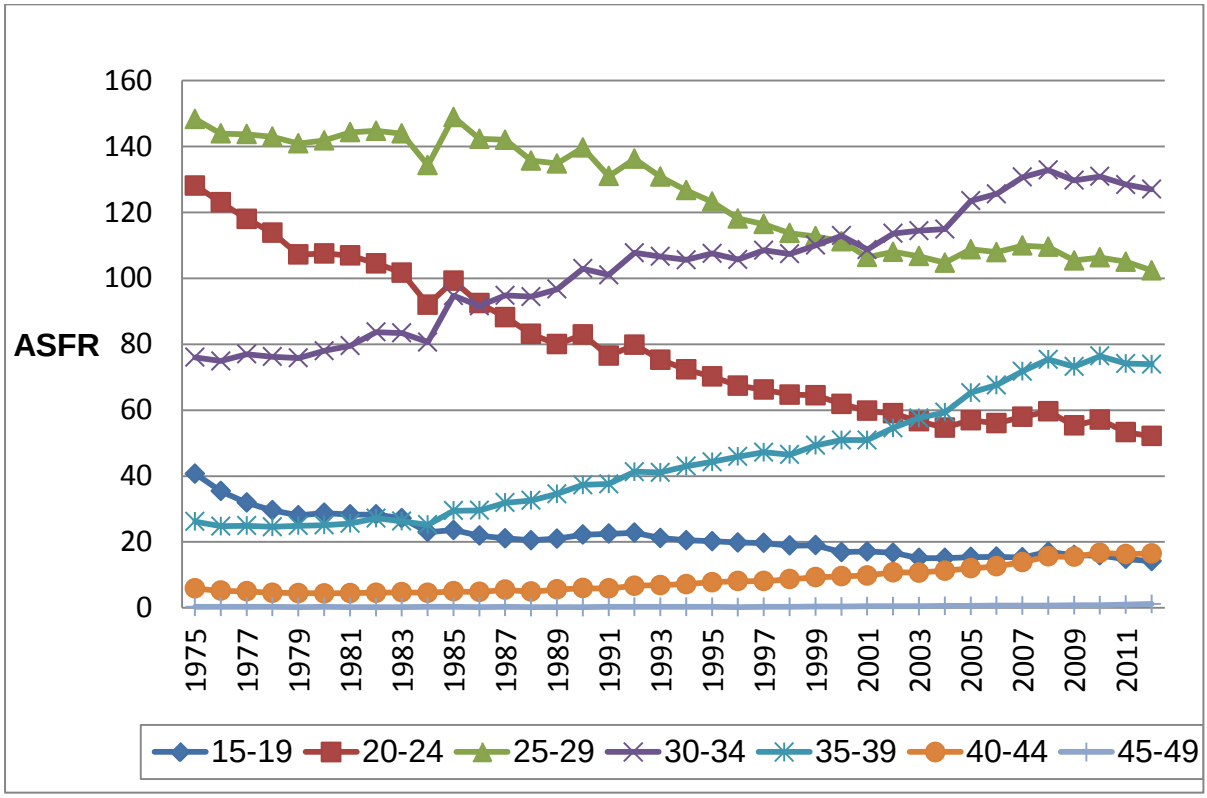
Figure 2: Mean Age of Mothers at Childbearing (MAC) and Percentage of Total Fertility Due to Women Aged 30 and Above for NSW 1975-2012



Sources: ABS (2008) and (2013a)

As is the case nationally, in NSW women aged 30-34 years currently have the highest age-specific fertility rate (ASFR), followed by women aged 25-29 years (ABS 2013a). Figure 3 shows that ASFRs have generally fallen over time for women aged under 30 and increased for women aged over 30. However the downwards trends for fertility rates for women aged 20-24 and 25-29 temporarily halted and even reversed very slightly between 2004 and 2008, before resuming their downwards trends over the 2008-2012 period. Since 2008 a small reduction has also been evident in the fertility rate of women aged 30-34, whilst the previously upwards trends in fertility for fertility among women aged 35-39 and 40-44 appear to have halted.

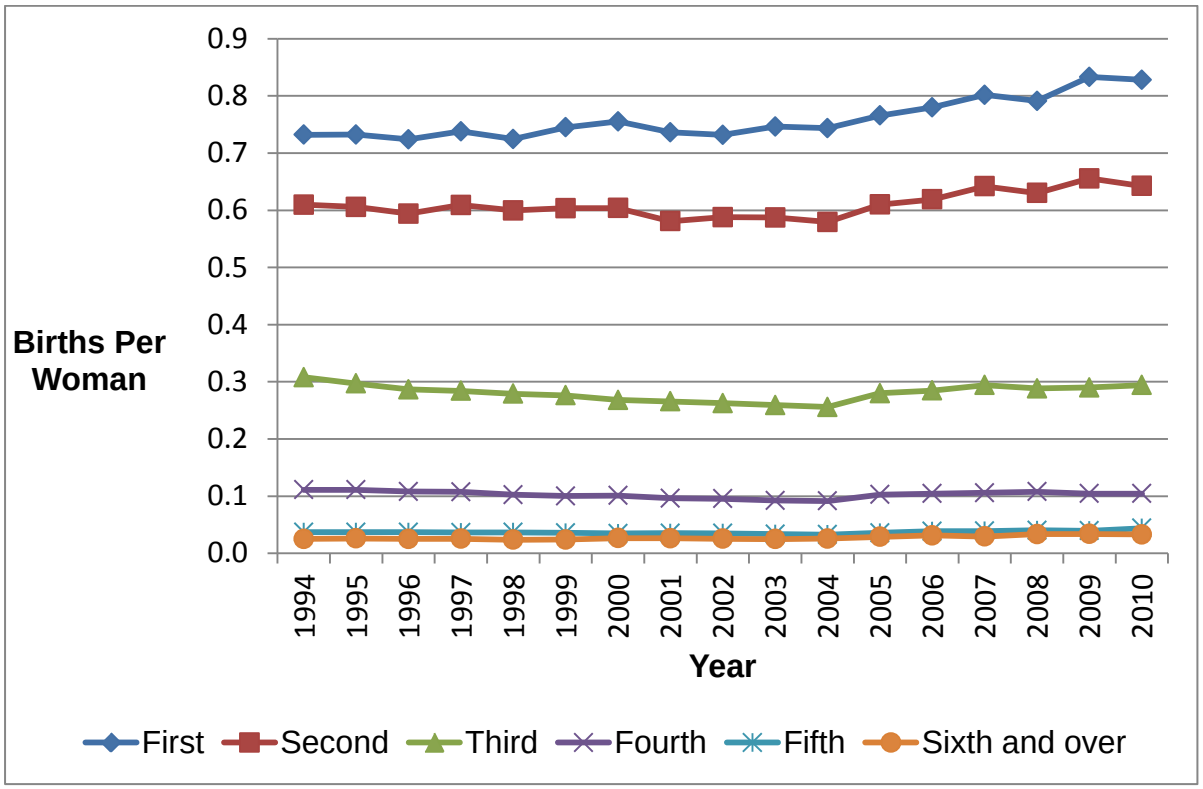
Figure 3: Age-Specific Fertility Rates (ASFR) for NSW 1975-2012



Sources: ABS (2008) and (2013a)

Between 1994 and 2002 there was a move towards smaller family sizes fertility rates in NSW, with fertility rates for third and higher order births declining gradually, while those for first and second births remained steady (Figure 4). The recovery in the TFR between the early 2000s and 2008 was mainly due to increased numbers of women who previously either not had any children had just one child giving birth to their first or second child: very little was due to progression to family sizes of three or more. Between 2002 and 2009 the first birth rate increased steadily, and from 2004 the second birth rate also began to increase (Figure 4). There was also a very small increase in the third birth rate between 2004 and 2006.

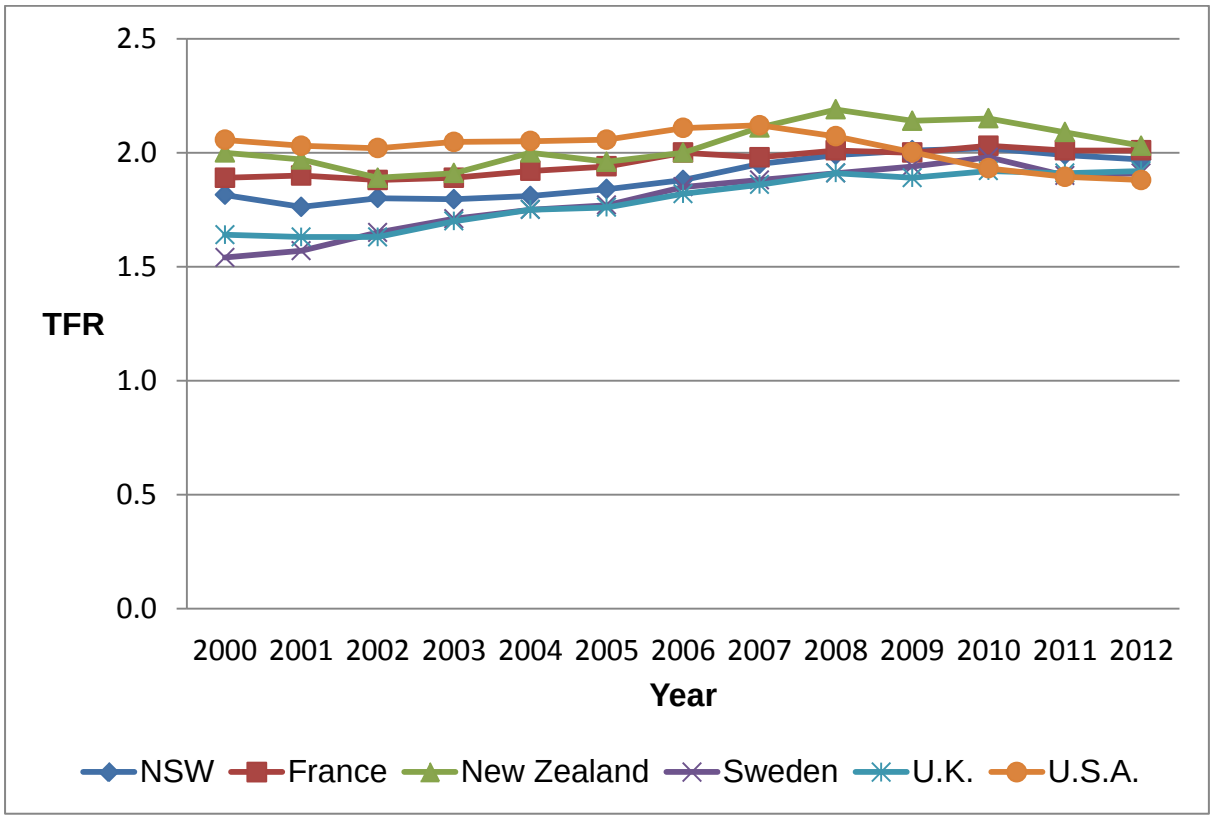
Figure 4: Fertility Rates by Birth Order for NSW 1994-2010



Source: NSW Midwives Data Collection

Far from being internationally unique, the trend, shared by both Australia and NSW, of an increasing TFR over the period up to 2008 has also been evident in many other more developed countries (Parr 2012; Figure 5). Parr and Guest's (2011) analysis of Australia's national fertility trends between 2002 and 2007 suggests the rise in fertility rates over that period could be attributed mostly to of combination of demographic changes, most notably a replacement of previously postponed births (a "catch-up effect"), and to the prevailing strength of the economy. They found "the effect of the range of changes to family benefits which coincided with the Baby Bonus has most probably been minor", a finding which is consistent with the international literature on the effects of such family benefits (Gauthier 2007). The post-2008 fall in Australia's TFR awaits thorough analysis. Parr (2011) has speculated the decrease may be linked to economic uncertainly following the Global Financial Crisis (GFC).

Figure 5: Total Fertility Rates (TFR) for NSW, France, New Zealand, Sweden, UK and USA 2000-2012



Sources: Eurostat (2014a), Statistics NZ (2012) and US Department of Health and Human Services (2012 a, b).

Trends in Cohort Fertility

2011 census data show the mean number of children ever born for NSW women who have reached the end of their childbearing ages (aged 45-49) is 1.96. Thus the current TFR for NSW is very close to the average completed family size. The most usual number of children among women aged 45-49 is two (in 2011 38.1 per cent had two children) (Table 1). Just over a fifth of the women in this age group have three children, 15.5 per cent are childless, and just under one in seven have one child. Between 2006 and 2011 the percentages of women aged 45 to 49 who were childless or had just one or two children increased and the percentages with family sizes of three or more decreased. Over this period the mean number of children ever born decreased for all the five years wide age groups between 15 and 49. The percentage of women who are childless increased for all these age groups, and the percentage with three or more children decreased. The trend towards later ages for first birth is evident from the decreases in the percentages of women aged below 30 with one child and the increases above age 30. The percentage with two children decreased for all ages below 40 (Table 1).

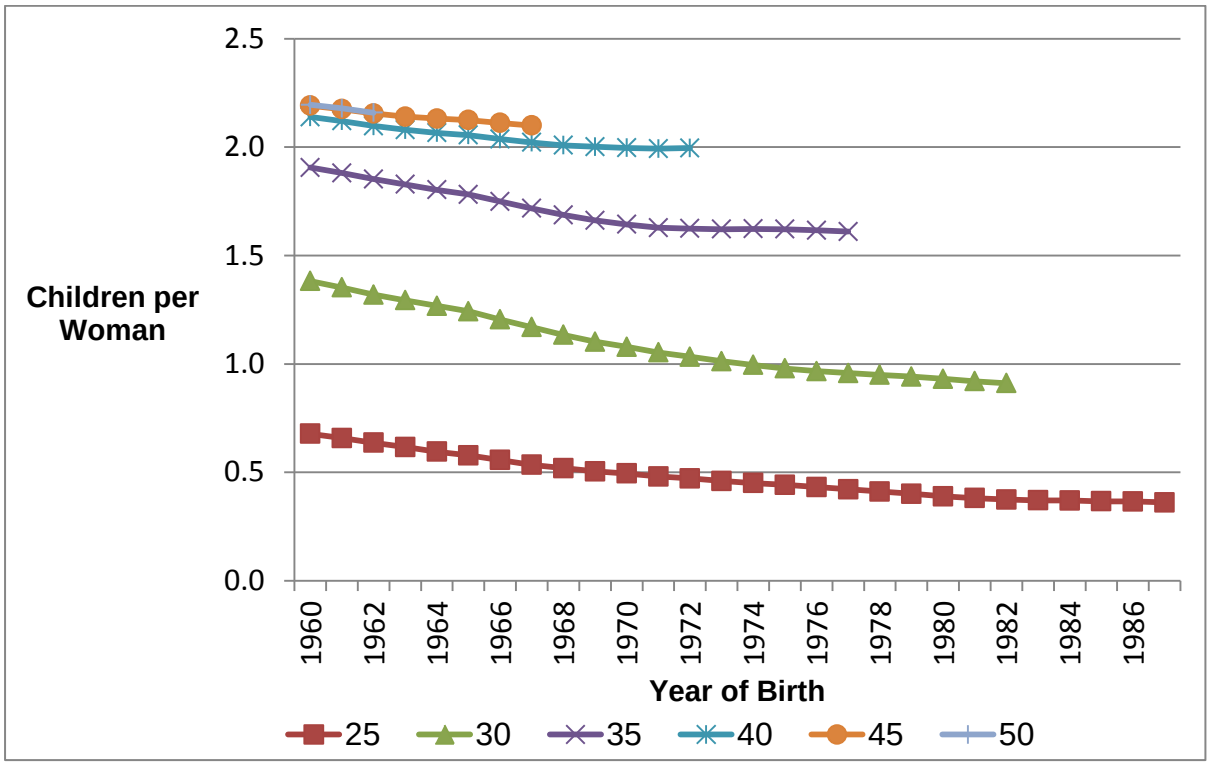
Table 1: Percentage of Women by Number of Children Ever Born and Age for NSW 2006 and 2011

Age	Percentage with Number of Children							
2011	0	1	2	3	4	5	6+	Total
15-19	98.1	1.5	0.2	0.1	0.0	0.0	0.0	100.0
20-24	87.0	8.4	3.5	0.8	0.2	0.0	0.0	100.0
25-29	66.6	16.5	11.2	4.0	1.1	0.3	0.2	100.0
30-34	39.2	21.6	24.3	10.1	3.3	1.0	0.6	100.0
35-39	21.9	17.0	35.4	17.3	5.7	1.7	1.1	100.0
40-44	16.7	14.5	38.0	20.3	7.0	2.1	1.4	100.0
45-49	15.5	13.8	38.1	21.3	7.6	2.2	1.4	100.0
2006								
15-19	97.8	1.8	0.3	0.1	0.0	0.0	0.0	100.0
20-24	85.7	9.1	3.9	0.9	0.2	0.0	0.0	100.0
25-29	63.4	17.2	12.8	4.7	1.3	0.4	0.2	100.0
30-34	36.8	20.7	26.5	11.1	3.4	1.0	0.5	100.0
35-39	21.3	16.2	35.6	18.1	6.0	1.7	1.0	100.0
40-44	16.0	13.7	37.9	21.3	7.6	2.2	1.3	100.0
45-49	14.6	12.8	37.1	22.9	8.7	2.5	1.4	100.0

Sources: ABS 2006 and 2011 Census Data

The cumulative fertility to age 50 for the cohort who reached that age at the end of 2011 (2.18) was higher than the mean number of children ever born shown by the census. One reason for this would be that newly-arrived international migrants arrive with smaller than average numbers of children than those already resident. Figure 6 shows that, whilst cumulative fertility rates to age 45 and to age 50 have fallen slightly in recent years, cumulative fertility rates to ages 35 and age 40 have become more or less constant in recent years. This could signal an end to the long-term trend towards smaller average family sizes. Cumulative fertility rates to ages 25 and 30 have continued to fall, reflecting lower fertility rates to these ages. However the rates of reduction have become very gradual (Figure 6).

Figure 6: Cumulative Fertility to Selected Ages for NSW Years of Birth 1960-1987



Sources: ABS (2008) and ABS (2013a)

The cohort data in this subsection show the fluctuating trends for annual the TFRs and ASFRs, shown in the previous subsection, should be viewed in the context of women having had generally declining average numbers of children by the mid reproductive ages (e.g. 25 and 30), albeit at a slowing rate of decrease, whilst the long-term trend towards smaller average numbers of children by age 40 has halted. The increase in NSW's TFR between 2003 and 2008 thus should be viewed in the context of a "catch-up effect". Projections of future fertility should allow for further small "catch-up effects" as the cohorts of women currently aged under 40 have higher proportions of their children at later ages compared to their predecessors.

Geographical Variation in Fertility

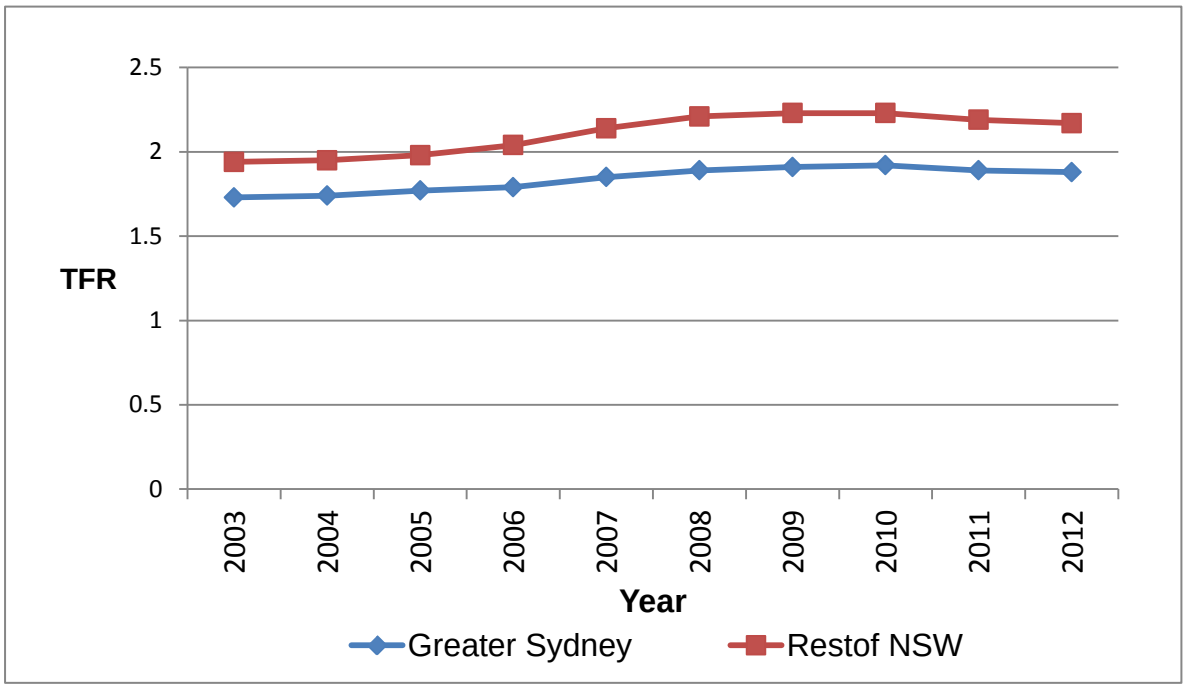
As is the case nationally, within NSW birth rates tend to be lowest in the major cities and highest in the remote and very remote areas (Figures 7 and 8). Fertility is lower in Sydney than in the Hunter and Illawarra regions (Figure 9). The lower fertility rate in Sydney is linked to its larger percentage of women of childbearing age who are unmarried, the larger student population and higher levels of female education, the smaller share of Sydney's population who are Indigenous Australians, and the larger share of the population who were born overseas (Carmichael and McDonald 2003).

Within Sydney the TFR is lowest in the City and Inner South, Inner West, Eastern Suburbs and North Sydney and Hornsby Statistical Area Level 4s (SA4s), and highest in Blacktown, the Outer South-

West, and on the Central Coast (ABS 2013a). The lower fertility rates across inner Sydney would be linked to the higher percentages of the population who are unmarried, the larger student populations, higher percentages of women who are in professional occupations, and the unsuitability of the dwelling stock for families with larger numbers of children, whilst the higher fertility on Sydney's outer fringe and on the Central Coast would reflect the inflows of couple families seeking larger and more affordable housing to these areas.

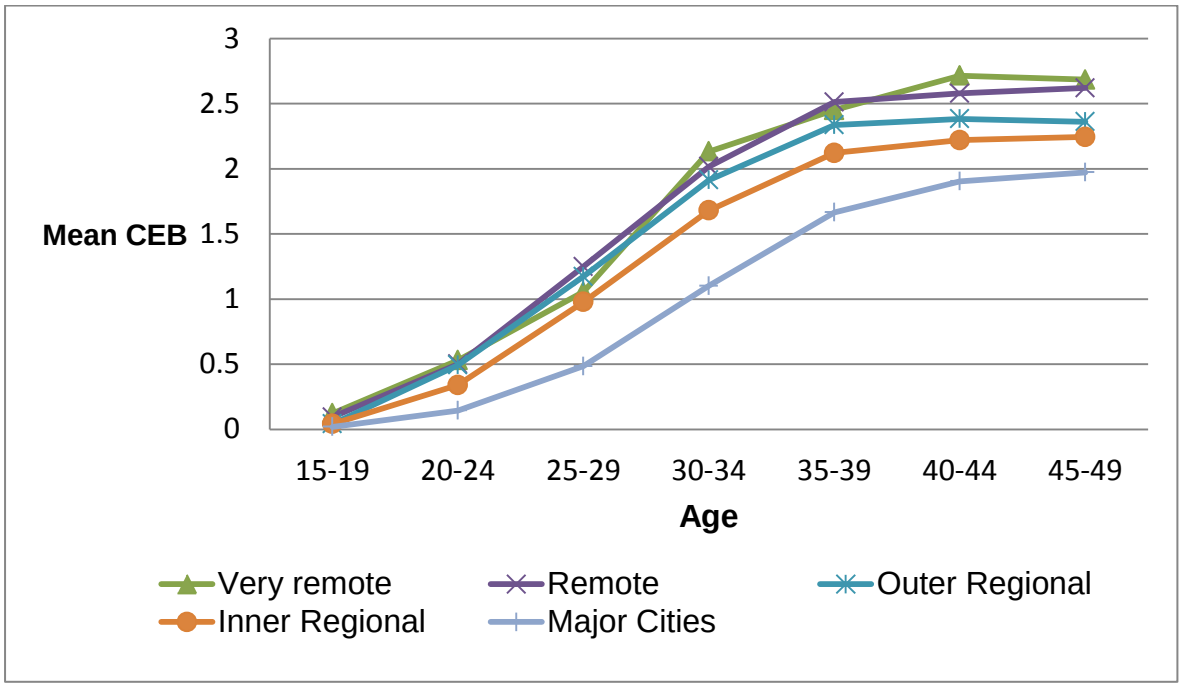
The gap between the TFRs of Sydney and the rest of NSW widened somewhat between 2003 and 2008, and then narrowed marginally after 2008 (Figure 7). The increase in fertility over the 2003-2008 period was greatest in very remote areas of the state (Figure 10). A post-2009 reduction in fertility occurred across all the classifications of remoteness. However the reductions in the remote and very remote areas were significantly larger than the reduction in Sydney.

Figure 7: Total Fertility Rates (TFR) for Greater Sydney and Rest of NSW 2003-12



Source: ABS (2013a)

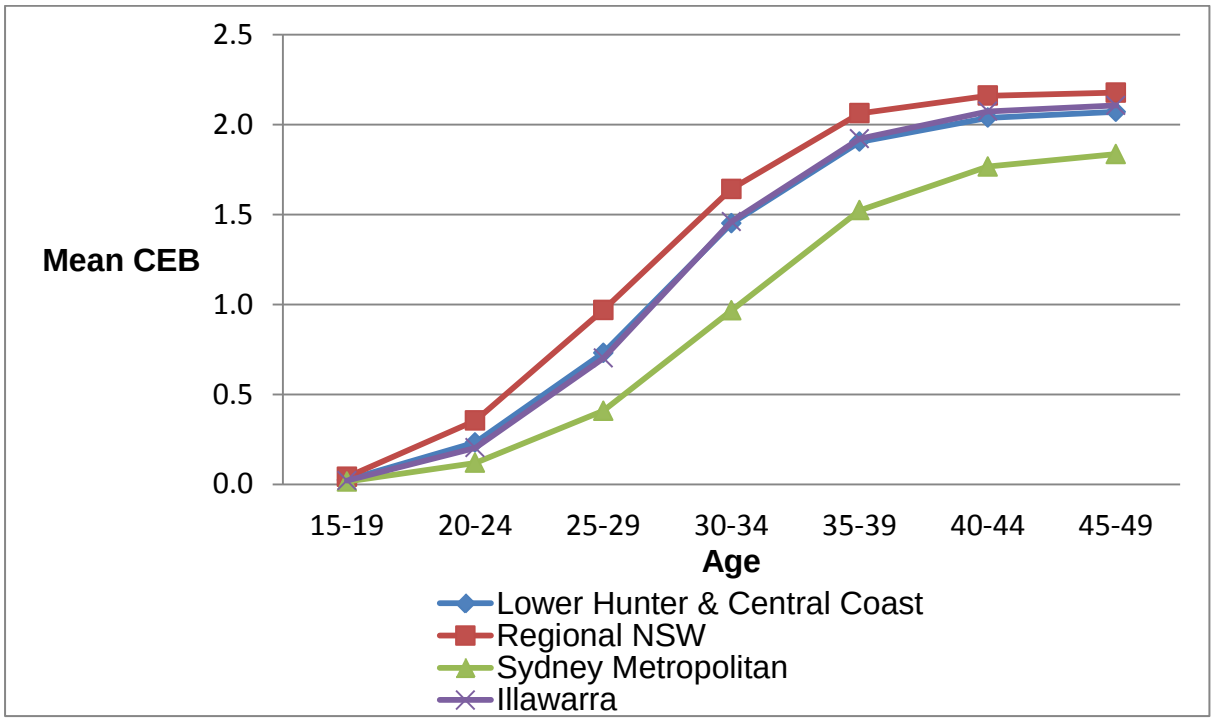
Figure 8: Mean Number of Children Ever Born (CEB) by Age and Remoteness of Region for NSW 2011



Source: ABS 2011 Census Data

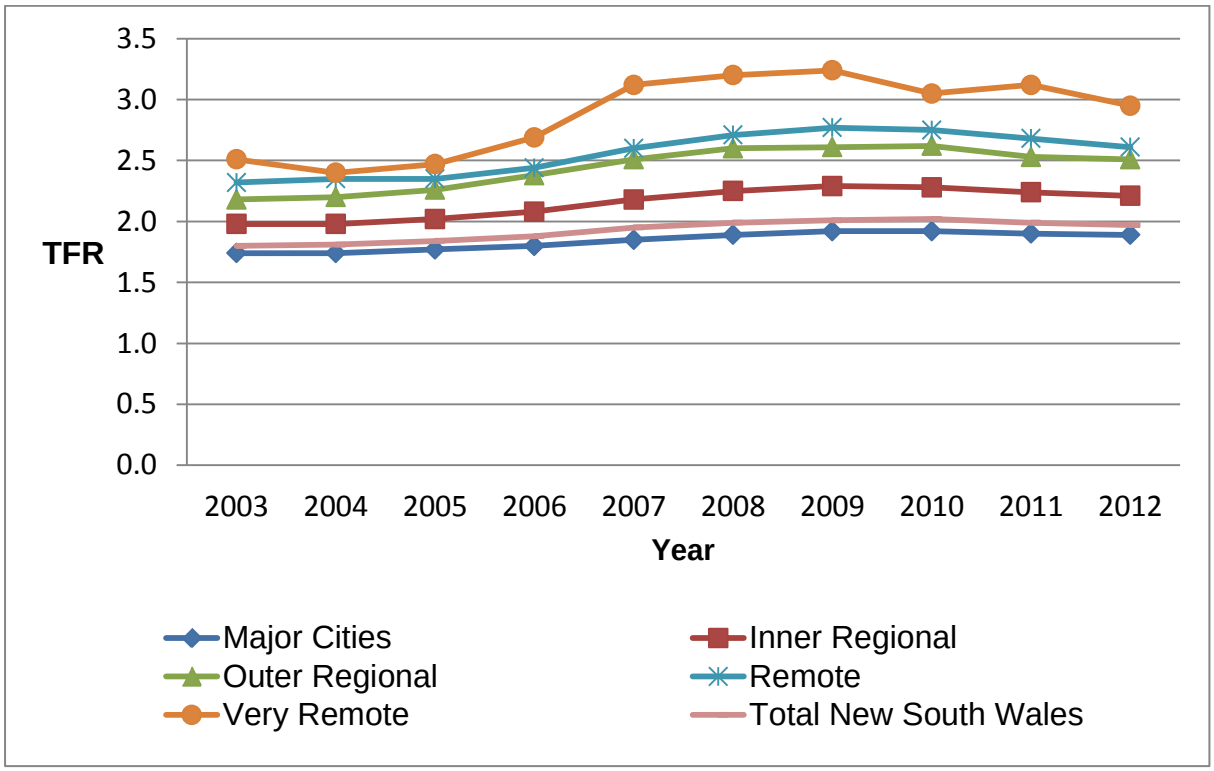
The pattern of change in fertility by age has varied considerably between urban, rural and remote areas of NSW. Over the period between 2003 and 2008 fertility rates increased across most age groups in the remote or very remote areas, with the greatest increase occurring among women aged 20 to 24. Post 2008, however there have been decreases in fertility in these areas for all ages under 35. In contrast, in the major cities there was a consistent pattern of declining fertility for all ages under 30 and increasing fertility for all ages over 30 throughout the 2003-2012 period. This reflects an ongoing trend towards childbearing at older ages in the major cities.

Figure 9: Mean Number of Children Ever Born (CEB) by Age and Region for NSW 2011



Source: ABS 2011 Census Data

Figure 10: Total Fertility Rate (TFR) by Remoteness of Area for NSW 2003-2012



Source: ABS (2013a)

Over the 2003-2008 period the TFR increased in all the SA4s in Sydney[2]. The greatest increases occurred in the Inner West, Eastern Suburbs, North Sydney and Hornsby, and Central Coast SA4s. The greater increases in fertility rates in the inner city and higher socioeconomic status areas of Sydney may be linked a greater "catch-up effect" of women who previously had no children having their first and second births. There was a general pattern across Sydney of decreasing birth rates for women aged under 25 years and increasing rates for women aged over 30 across all areas of Sydney. The pattern of increasing and increasingly later ages for fertility in the relatively affluent areas continued post 2008, albeit at a slower rate. Over this period in Sydney's outer suburbs fertility rates generally decreased slightly. In these areas fertility continued to decline below the age of 25. In some outer suburban areas and on the Central Coast there were significant post-2008 falls in fertility in the main childbearing ages (25 to 34). However fertility rates continued to increase for women aged over 35.

Increases in fertility were also evident in all the SA4s in non-metropolitan NSW between 2003 and 2008. The largest increases in fertility statewide over this period were in the Far West and Orana and Mid-North Coast SA4s, and were the product of increases in fertility rates across all the female reproductive age groups. In the more urbanised areas of non-metropolitan NSW, the Illawarra and Newcastle and Lake Macquarie, and also in the Southern Highlands and Shoalhaven area fertility rates decreased for women aged under 25 and increased for women over 25.

In contrast, between 2008 and 2012 most of the non-metropolitan SA4s in NSW experienced either static or slightly lower TFRs, with all these areas, except the Mid-North Coast and the Southern Highlands and Shoalhaven, experiencing reductions in fertility below age 30, and most experiencing continued increases on fertility for women aged over 30 (ABS 2013a).

The patterns described in this subsection show a lack of uniformity in the geographical patterns of fertility change in NSW in recent years. In Sydney, and especially the higher socioeconomic status areas in the Sydney's inner, northern and eastern suburbs, a "catch-up effect" for previously postponed births would appear a plausible explanation for the increase in annual fertility rates. Projections of fertility should therefore consider the potential for further catch-up effects. Fertility trends in regional NSW, especially in the remote or very remote areas, have been more volatile and further analysis of the correlates of these trends is needed to assist the formulation of projections.

[2] *The data presented by ABS for SA4s are averages for the three years period ending in the reference year (ABS 2013a).*

The Fertility of International Migrants to NSW

In 2011 the percentage of the population of NSW who were born overseas (31.4 per cent) was significantly above the national figure. As is the case nationally, in NSW the UK is the leading overseas country of birth, followed by China, New Zealand and India (Table 2). Seven of the ten largest overseas country of birth groups in NSW's population are for Asian countries. For women in the main reproductive ages (aged 15 to 49) the percentage who were born overseas is even higher (34.3). China is the leading overseas country of birth for women in this age group, ahead of the UK, New Zealand and India. International migrants to NSW, especially the most recent arrivals, have significantly higher levels of education than the existing residents of NSW, reflecting the emphasis which has been placed on selection on the basis of skills and education in recent years.

Table 2: Leading Countries of Birth for Total Population and For Females Aged 15-49 Years for NSW 2011

Birthplace	% of Total Population	Birthplace	% of 15-49 Female Population
Australia	68.6	Australia	65.7
UK	4.0	China[1]	3.5
China[1]	2.3	UK	3.0
New Zealand	1.7	New Zealand	2.0
India	1.4	India	1.9
Vietnam	1.0	Philippines	1.5
Philippines	1.0	Vietnam	1.5
Lebanon	0.8	Korea (South)	1.0
Korea (South)	0.6	Lebanon	0.9
South Africa	0.6	South Africa	0.7
Hong Kong	0.6	Hong Kong	0.7

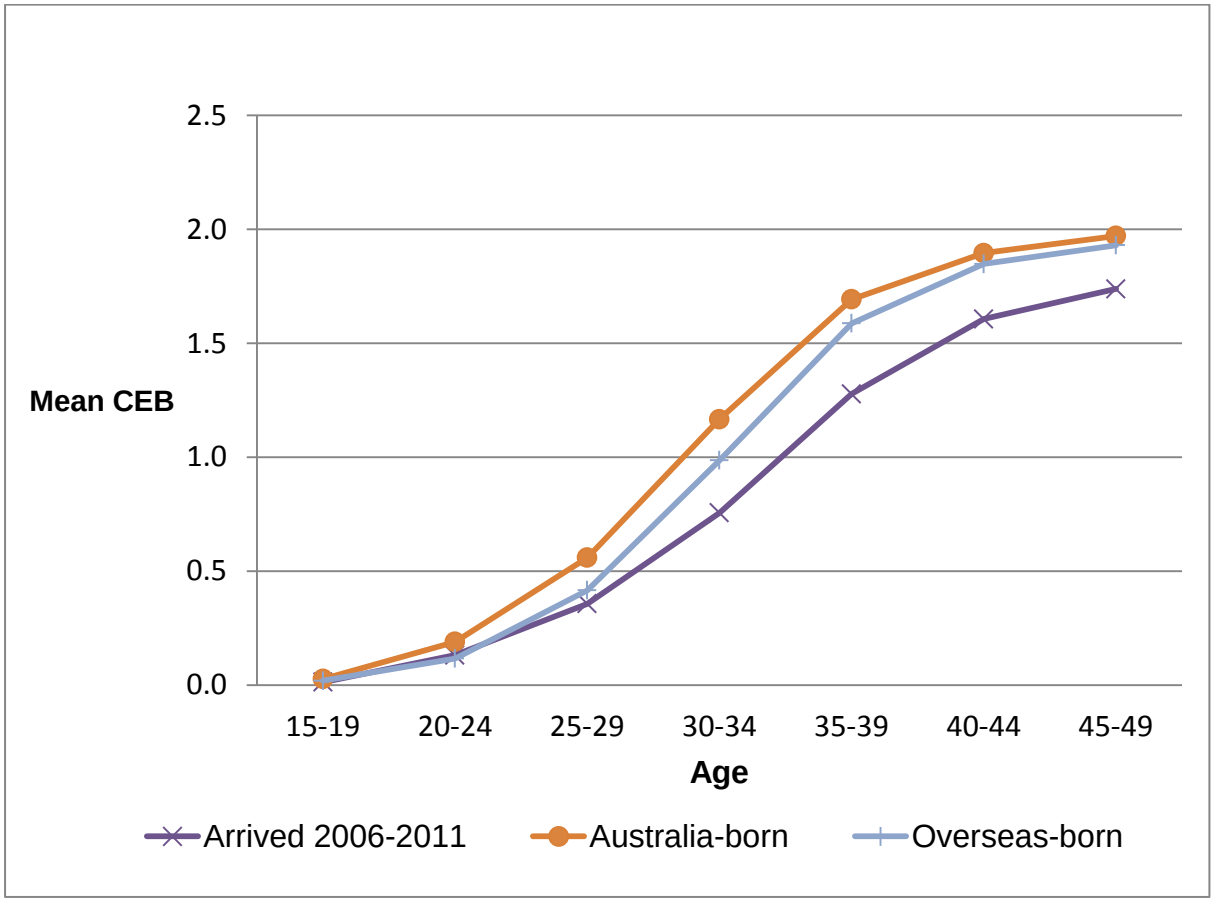
Notes: 1. Excludes Taiwan and SARs

Source: ABS 2011 Census Data

As is the case nationally, the fertility levels of all overseas-born women in NSW have fallen slightly below those for the Australia-born (ABS 2013a, Figure 11). For women aged 45 to 49 the mean number of children ever born for the overseas born is 1.93 compared to 1.97 for the Australia-born. The gap is even wider at younger ages. For example for women aged 30-34 the mean number of children ever born is 0.99 for the overseas-born compared to 1.17 for the Australia-born. The wider gaps in the younger ages reflect a general pattern of later ages for childbearing among the overseas-

born compared to the Australia-born. The pattern of migrants having lower fertility than the native-born in Australia and NSW contrasts with a general pattern across the more developed countries of migrants having above average fertility (Sobotka 2008). The lower fertility rates of Australia's migrants would be linked to the higher percentages that are selected on the basis of skills and education, and the relatively high percentage of students and other temporary movers in the overseas-born population.

Figure 11: Mean Numbers of Children Ever Born (CEB) by Age for Australia-born, Overseas-born, and Post-2006 Arrivals from Overseas for NSW 2011

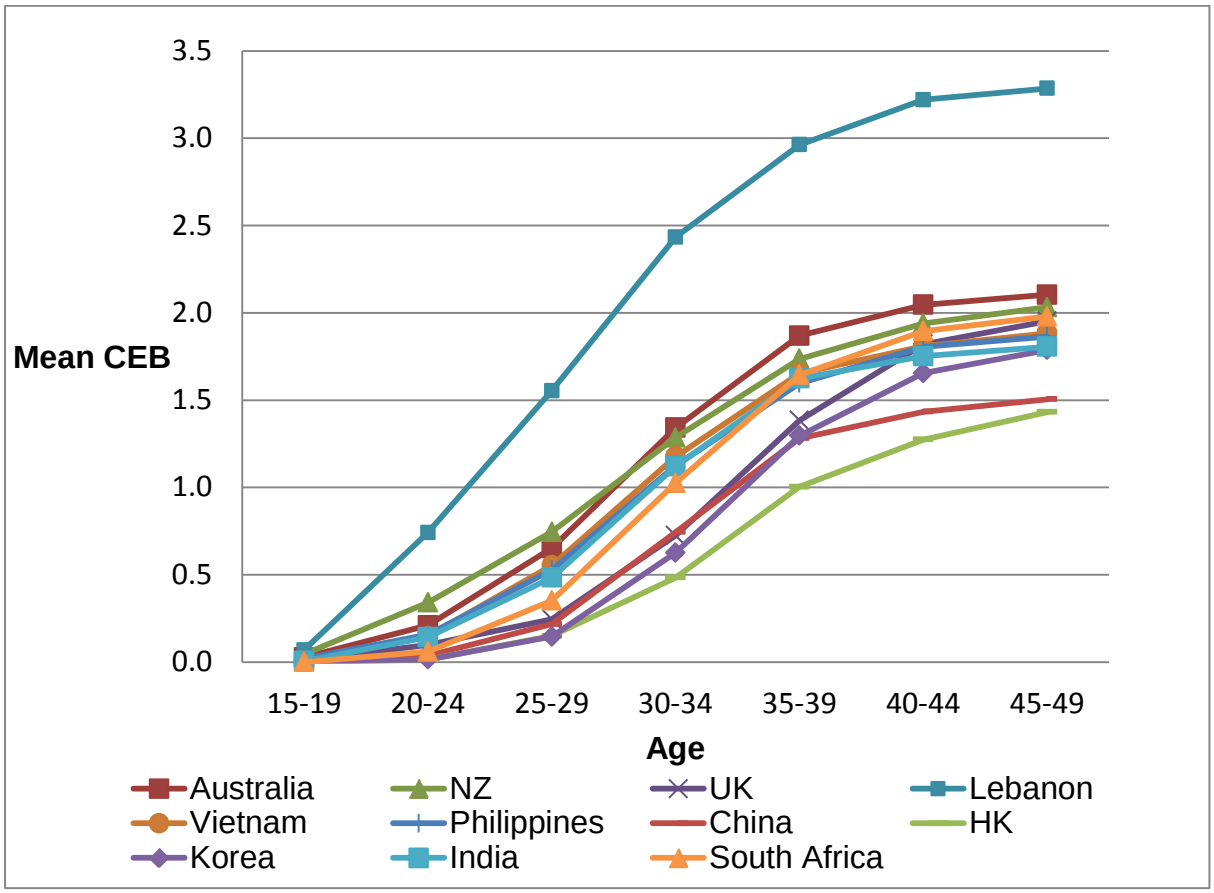


Source: ABS 2011 Census Data

The fertility levels of the overseas-born in NSW vary by the number of years since the first arrival in Australia. The numbers of children of recently arrived migrants are much lower than those of migrants who have been in Australia for longer and those of the Australia-born (Figure 11). Women who arrived from overseas before 1995 have higher average numbers of children than the Australia-born above the age of 35. The very low fertility levels of very recently-arrived overseas-born women aged 15 to 24 would be affected by very low fertility among the significant numbers of international students in these ages.

Fertility levels vary considerably between the larger country of birth groups in NSW's population. Women who were born in the Lebanon have by far the highest fertility levels, and are the only one of the ten largest overseas country of birth groups to have a mean completed family size above that for the Australia-born (Figure 12). For women aged 45 to 49 years the mean number of children ever born for Lebanon-born (3.3) is over one-and-a-half times the state average. Women from the main English-speaking countries have slightly greater than average numbers of children. Women who were born in China (1.5 for women aged 45 to 49) and Hong Kong (1.4) have the smallest average numbers of children, a pattern which reflects the high proportions of women from these birthplaces who have one child families (Parr 2007).

Figure 12: Mean Numbers of Children Ever Born (CEB) by Age for Leading Countries of Birth for NSW 2011



Source: ABS 2011 Census Data

The lower TFR and smaller completed family size of the overseas-born compared to the Australia-born suggest that, if anything, higher migration and a growing overseas-born percentage of the female reproductive age population would exert a slight downwards pressure on the fertility rate. However further analysis of the variation in migrant birth rates by the length of time in Australia is needed to establish whether partial "catch-up effects" are evident over some sections of the

migrant's period of residency. Projections of fertility will need to consider the coherence between the assumptions for fertility and international migration.

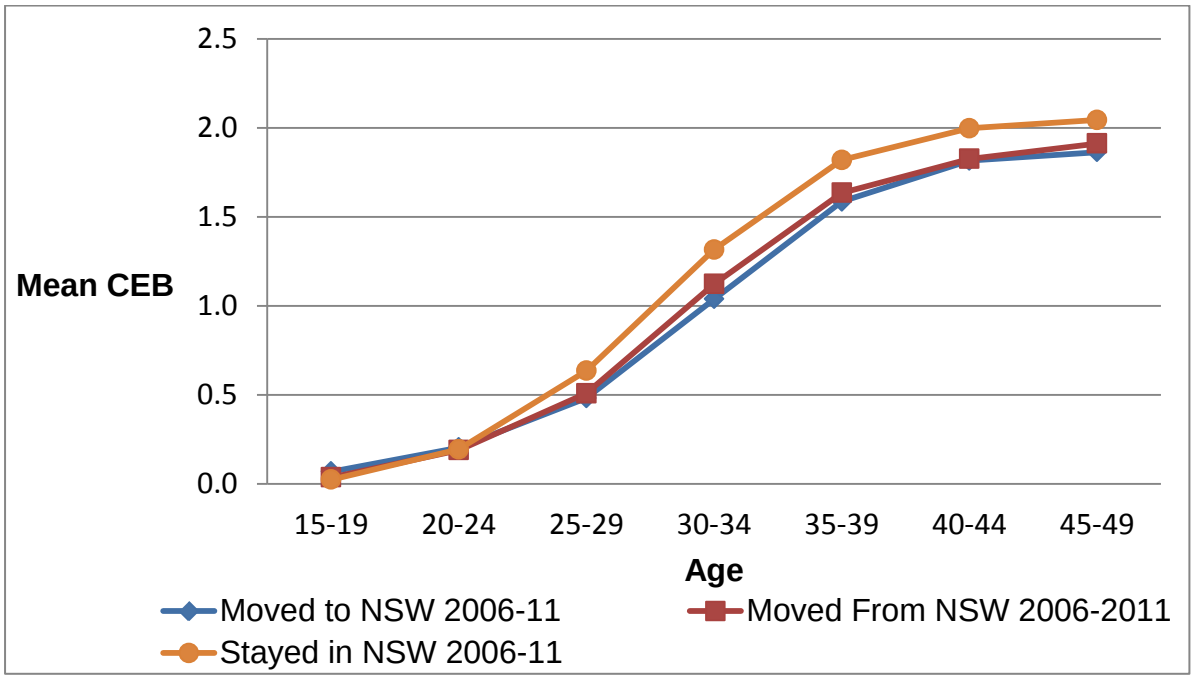
The Fertility of Interstate Migrants To and From NSW

Women who recently moved interstate to or from NSW have smaller numbers of children than those who remain in NSW (Figure 13). This may be related to their higher levels of education relative to those who stay put in NSW, to smaller family sizes making it easier to move, or to childbearing being postponed by the prospective need to move. Women who moved to NSW from other states or territories in the year before the 2011 census had slightly smaller numbers of children ever born than those who moved from NSW to another state or territory, and, therefore, the net loss from NSW to the other states and territories in recent years has very slightly reduced NSW's average family size. The gap between the family sizes of in and out movers is widest among those aged between 30 and 39. For those under age 25 the numbers of children of the interstate in-movers are very slightly higher than those of the interstate out-movers (Figure 13).

As well as their having smaller than average numbers of children ever born, women who moved interstate to NSW or from NSW in the year before the 2011 census also had lower birth rates in the period immediately before the interstate move, as shown by the modified child-to-woman ratios in Figure 14. The interstate out-movers had lower pre-move fertility than the interstate in-movers.

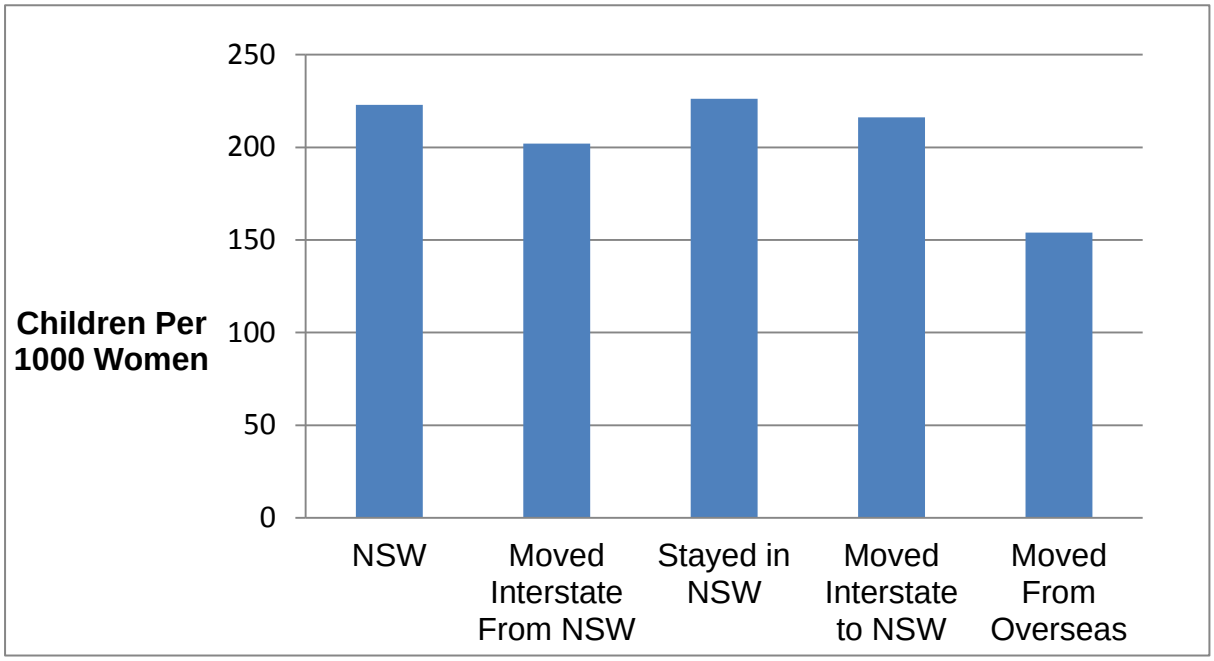
Since fertility rates vary according to the number of children a woman has previously had, the smaller than average numbers of children ever born of interstate movers to and from NSW may influence annual birth rates. The net loss of people to the other states and territories which NSW has experienced may have slightly reduced its annual fertility rates, because any "catch-up effect" involving a compensation over the latter part of the female reproductive period by the interstate movers for their smaller than average numbers of children prior to and shortly after the move will occur in the state or territory of their destination and not in NSW.

Figure 13: Mean Number of Children Ever Born (CEB) by Age in 2011 for Interstate Movers To and From NSW Between 2006 and 2011 and for Those Who Stayed in NSW



Source: ABS 2011 Census Data

Figure 14: Modified Child-Woman Ratios* for Movers To and From NSW in Year Before 2011 and Stayers in NSW 2011



Note: *Number of Children Aged 1-4 per 1000 Women Aged 15-49

Source: ABS 2011 Census Data

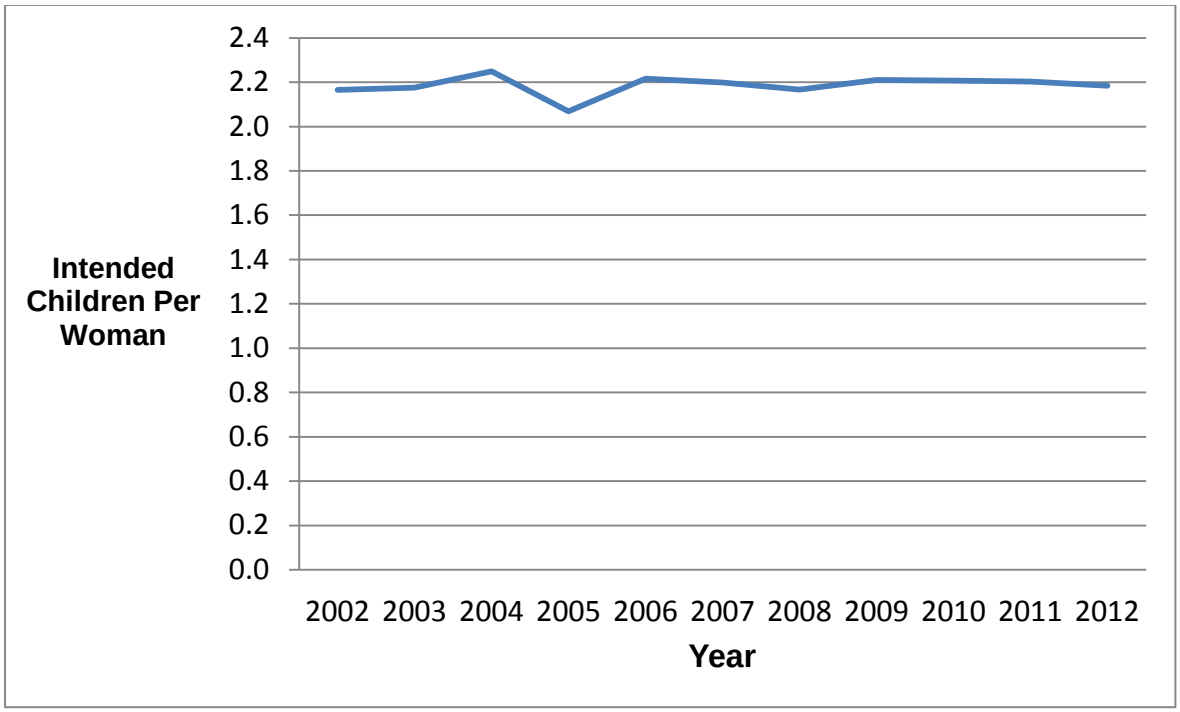
Intended Family Sizes in NSW

According to the HILDA data, in 2012 the average completed family size NSW women aged 18 to 44 intend to have is 2.2 (see Appendix A for specification of the measurement). This number is almost identical to the average number of children of NSW women aged 45 to 49 have over the period from 2002 to 2012, according to the HILDA survey sample, and the average cumulative fertility for the most recent cohorts reaching age 50, but is higher than both the mean number of children ever born for NSW women in this age group shown by the census and the TFRs for all recent years.

Over the 2002-2012 the average intended completed family size for NSW women in the 18 to 44 years age group remained fairly consistently at around 2.2 children per woman (Figure 15)[3]. The average intended family sizes across the 2002-12 period varied only slightly with age, being slightly lower for women aged between 25 and 34 than for women at the two ends of the reproductive age range, and was fairly stable for the same cohorts over time (Figure 16)[4].

The mean scores for a woman's perceived likelihood of having another child remained more or less constant over the 2002-12 period for women aged under 25, but increased for women aged 25-29 and, less so, for women aged 30-34 (Figure 17). These trends are likely to have been affected by the trend towards postponing having children to later in life; the average numbers of children these women have had has generally reduced over time.

Figure 15: Mean Intended Family Size for Women Aged 18 to 44 for NSW 2002-12

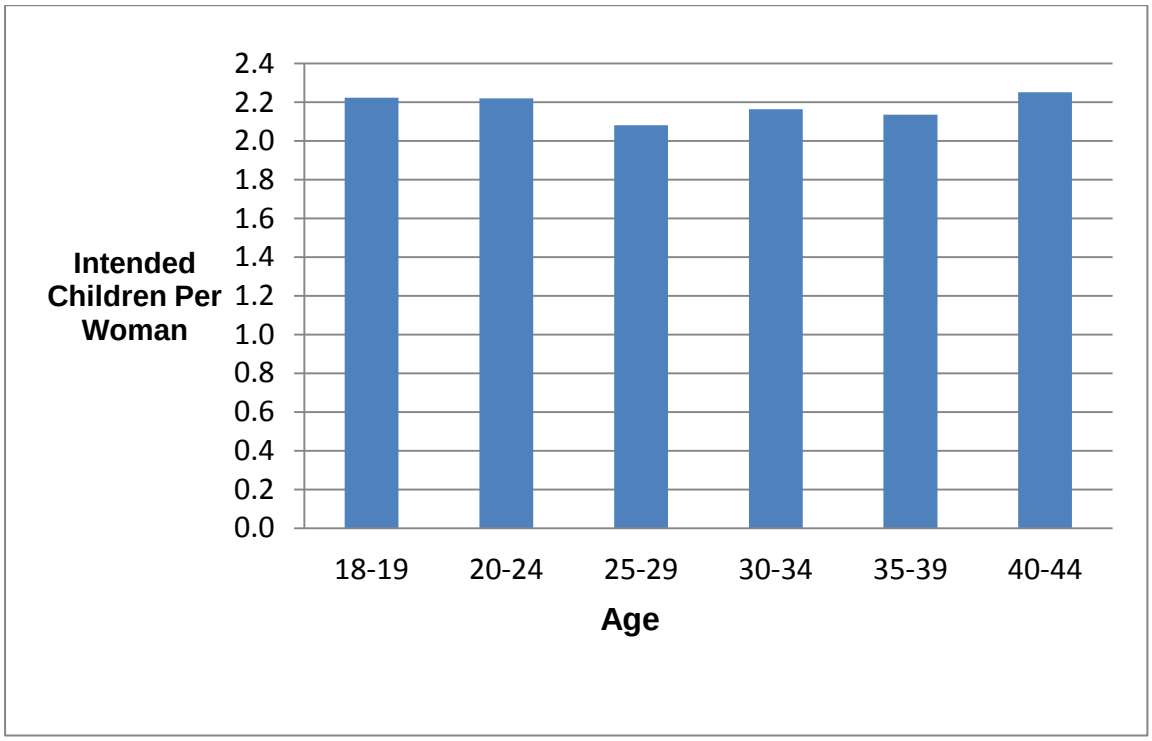


[3] *In Wave 5 (2005) the mean intended completed family size according to the standardised measure was slightly lower at 2.1.*

[4] *For the 1977-82 birth cohort of women the intended family size in 2007 (2.1) was slightly less than in both 2002 and 2012 (2.2).*

Source: HILDA Waves 2-12 Data

Figure 16: Mean Intended Completed Family Size by Age for NSW 2012

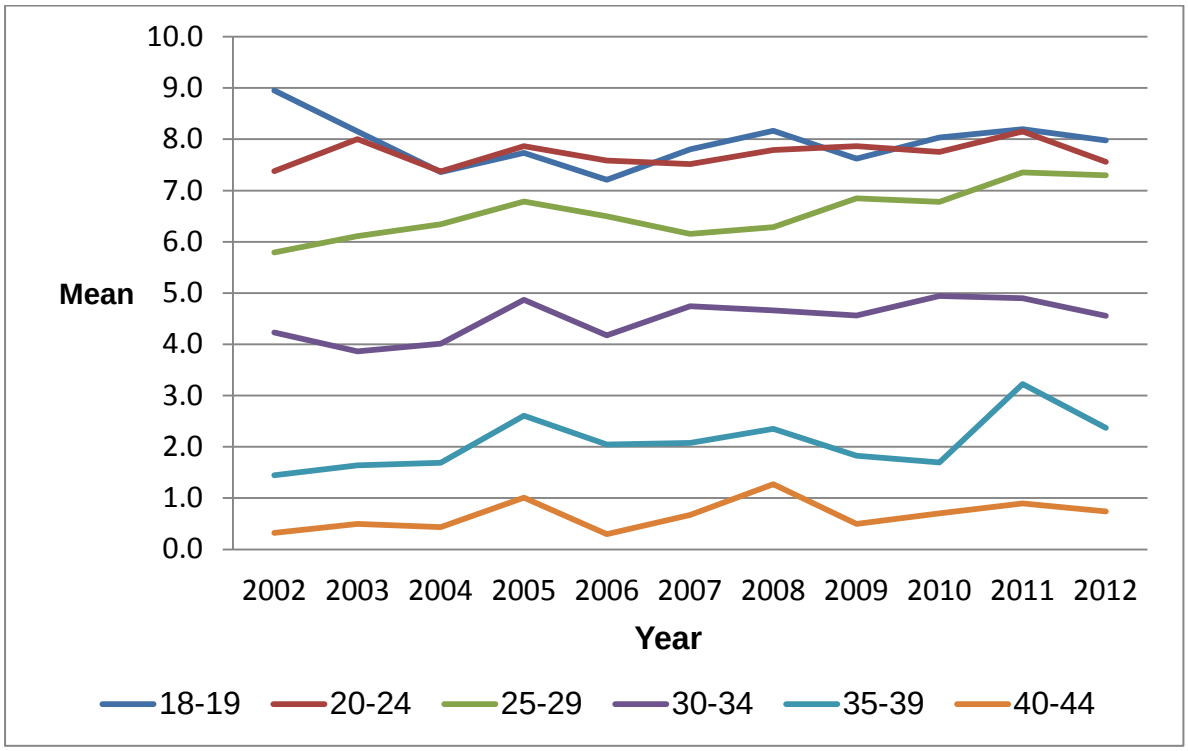


Source: HILDA Wave 12 Data

The numerical values of future fertility intentions should be treated with a degree of caution. Typically the realised fertility level undershoots the previously-stated intention (Ní Bhrolcháin and Beaujouan 2011). Toulemon and Testa (2005) argue that measurements of fertility intentions are poor predictors of future fertility. Their study found that the actual realisation of children by women over a five years period differed considerably from their stated intentions at the start of the period. Moreover the significant variation in degrees of undecidedness among the respondents, some of which may be due to "wait-and-see" attitudes, is not reflected by the calculations of "intended family size" (Toulemon and Testa 2005; Ni Bhrolcháin and Beaujouan 2011). Sampling variation and other non-sampling-related sources of error (e.g. the undersampling of recently-arrived migrants) in the HILDA data provide some further reasons for caution in interpreting the fertility intentions data.

The stability of the intended family sizes of NSW women, shown by this section, suggests there will be little change in their completed family sizes in the near future. The emerging trend of successive cohorts achieving roughly constant average numbers of children towards the end of the female reproductive period, shown in the subsection on cohort fertility, might therefore be expected to continue in the future. Thus the formulation of projections of annual fertility rates should be coherent with the maintenance of a constant average completed family size.

Figure 17: Mean Rating by Women of Their Likelihood of Having a Child/More Children in the Future by Age for NSW 2002-12



Source: HILDA Waves 2-12 Data

Fertility Assumptions for Population Projections

There has been a broad similarity between the recent fertility trend for NSW with the fertility trends for Australia, other English-speaking countries and for some European countries (Figure 5). This section describes the formulation of fertility assumptions for the NSW State Government projections and the formulations which have been used for a range of comparable populations.

The NSW State Government Fertility Assumptions

In its most recent projections the NSW State Government assumed a gradual rise in NSW's TFR from 1.955 in 2011 to 1.972 in 2041 (NSW 2013). The projections assume the age profile of women having children will grow slightly older on average. The ratios of projected TFRs for substate regions to the overall NSW TFR are assumed to remain constant, and thus all substate regions are projected to experience a gradually rising TFR. For the Sydney metropolitan area, where fertility is lower and later than for the state as a whole, this implies a small rise in the assumed TFR from 1.853 in 2011 to 1.871 in 2041. Fertility is assumed to continue to be higher and younger outside of metropolitan Sydney and highest of all in the North-West and North-East of the state.

The Australian Bureau of Statistics Fertility Assumptions

The "Medium" variant fertility assumption for the most recent (2012-based) ABS population projections assumes the TFR will fall gradually to 1.8 births per woman in 2026 and remain constant thereafter. The "High" and the "Low" variant series assume the TFR will change to 2.0 and 1.6 respectively by 2026 (ABS 2013b). The age profile of mothers is assumed to continue to grow older until 2026. Parr (2013a) argues that the highest of the three fertility scenarios appears the most plausible.

The ABS assumes that the ratios between state and territory TFRs and the national TFR will remain constant at the 2009-11 levels. Thus under the "Medium" variant series the TFR for NSW is assumed to fall to 1.79 in 2026, and under the "High" and the "Low" variants the assumed TFRs for 2026 are 1.99 and 1.59 respectively (ABS 2013b).

Fertility Assumptions Used in Selected Other More Developed Countries

United Kingdom

Before 2002 the United Kingdom had a lower TFR than Australia. However between 2002 and 2008 the United Kingdom's TFR increased more rapidly than Australia's, and between 2009 and 2012 both countries have experienced more or less constant fertility at around 1.9 births per woman (Figure 5). The completed family size of women aged 45 to 49 in the UK is somewhat below that for Australia, a legacy of the lower past fertility.

The most recent (2012-based) projections for the United Kingdom are driven by assumptions about completed family sizes for the constituent countries of the UK (UKNS 2013). For England and Wales the assumed long-run completed family size is 1.90, for Scotland 1.75 and for Northern Ireland 2.0. This implies almost no change in the TFR for the UK over the period from 2012-2037.

United States

The fertility assumption for US Census Bureau's most recent (2012-based) national projections involves applying projected age-specific fertility rates for five major race and Hispanic origin subdivisions of the population to projected numbers in each race and Hispanic origin category (US Census Bureau 2013). The projection assumes all ASFRs for all race and Hispanic origin categories will converge gradually to reach the average ASFR on the non-Hispanic white group for the period 1989-2009 in 2100. The national TFR is thus projected to decrease very gradually from 2.0 in 2012 to 1.91 in 2060.

The method used is more demanding both computationally and in terms of the requirements for data inputs than those used by ABS, UKNS and the NSW State Government. It also is arbitrary in its assumption of convergence in fertility and the time frame over which this will occur. The value of

such a method is potentially greater when ethically defined subgroups are: 1) substantial in the proportions of the childbearing age population they are expected to comprise in the future, and 2) expected to differ significantly in their patterns of growth, and 3) expected to have patterns of fertility levels or change which differ significantly. The data on birth registrations in NSW allows identification of the country of birth of the parents and of whether the parents are Indigenous Australians. However in view of the small difference between the fertility of overseas-born Australians and the Australia-born and the small percentage of the population of NSW who are Indigenous Australians neither disaggregation by birthplace nor disaggregation by indigeneity would appear warranted in view of the substantial additional computational requirements for such projections.

European Union

The TFR for the European Union (27 countries combined) declined to 1.46 in 2002 and then recovered to 1.59 in 2009, with a degree of convergence between the TFRs of various member states. The Eurostat (2014b) population projections assume a modest overall increase in the TFR between 2013 and 2022 and a continuation of the narrowing of the differences between countries, with projected changes in the TFR ranging between a decrease of 0.02 for Iceland and an increase of 0.15 in Hungary. The larger increases are generally for East European countries which currently are experiencing very low fertility, and the smaller changes in fertility are assumed are generally for Northern or Western European countries which currently have relatively high fertility.

Which Overseas Fertility Projections Offer the Best Model for NSW?

The emergence of a more or less constant completed family size towards the end of the female reproductive ages in NSW is broadly similar to the pattern for the constituent countries if the UK (UKNS 2013). Projected annual fertility rates which are coherent with constant cohort completed fertility, as adopted for the UK projections, are similarly justifiable. In the case of NSW, however, a small future compensation for the reduced fertility realised over the younger half of the female reproductive period would be needed to ensure coherence with the recent completed fertility levels.

The Prospects for Future Fertility Levels in NSW

Over the five years to 2012 the TFR for NSW fluctuated between 1.93 and 2.05 (ABS 2013a). In recent years the long-established trend towards women having smaller numbers of children over their lifetime appears to have come to an end. The average cumulative number of children women have had by age 40 has stabilised (Section 2), and the average family sizes NSW women who are of childbearing age indicate they will have over their lifetimes, shown by the HILDA data, have changed remarkably little over the last ten years (Section 3). This pattern is consistent with there being little

change in completed cohort fertility in the near future. The average cumulative numbers of children which women aged 30 have had have continued to fall, but the rate of decrease has become very gradual. In theory further slight increases in fertility rates among women in their 30s (resulting in women currently aged 25 to 30 having roughly 0.1child per woman more between ages 30 and 40 than those currently aged 40 did) would be needed if the women now aged 25 to 30 are to achieve the same average family size of those currently aged 40. However a "catch-up effect" of this magnitude may not be realised in full.

Minor fluctuations in fertility rates linked to the state of the economy should be expected, as is apparent from the contrasting trajectories for some birth rates before and after the onset of the GFC (Parr 2013a). Since the birth rates of the overseas-born are slightly below those of the Australia-born, a growth in the migrant population of childbearing age may exert a slight downwards pressure on the fertility rate (Section 2). Very slightly lower birth rates might be expected under larger net interstate losses than under smaller net losses (Section 2). Another potential influence on birth rates is the Federal Government's intended introduction of a more generous Paid Parental Leave Scheme, which should help to make children more readily affordable for many parents. However the international evidence on the effects of parental leave on fertility is mixed with some studies find small fertility-increasing effects of more generous parental or maternity leave and others finding no statistically significant effects at all (Gauthier 2007, Parr 2013b).

All things considered, the evidence points to the likelihood of there being relatively little change to NSW's average TFR in the near future. An increase in the TFR appears to be more likely than a decrease, in view of the small "catch-up effect", involving increases in fertility rates for women aged between 30 and 39, which should be anticipated, and the intended introduction of a more generous Paid Parental Leave scheme.

The fertility trends for subregions of NSW have been inconsistent (Section 2). In Sydney, especially the higher socioeconomic status areas in the Sydney's inner, northern and eastern suburbs, a "catch-up effect" for previously postponed births would appear a plausible explanation for the increase in annual fertility rates in recent years. Projections of future fertility for Sydney and the other major cities should incorporate assessments of the potential for further catch-up effects. Fertility trends in regional NSW, especially in the remote and the very remote areas, have been more volatile and their future direction is more uncertain,

The advent of more extensive demographic databases, in particular the prospective linkage of data from different censuses and between census and registration data, has the potential to significantly enhance the formulation of fertility assumptions for population projections. Appendix B suggests a method which could be adopted to leverage the potential of such linked databases and which could

incorporate “tempo effects” and the effects of other changes in the demographic composition of the population, both at the state level and at the regional level, into the projection of fertility in the near future. The method could also assist the formulation of assumptions for future fertility which are coherent with the assumed levels of international and internal migration.

The NSW State Government’s most recent projections adopted a fertility assumption in which there is a gradual rise in NSW’s TFR from 1.955 in 2011 to 1.972 in 2041 and a small future increase in the proportionate contribution to the fertility rate of women aged over 30 (NSW 2013). These assumptions are reasonable in the light of the fertility levels of the last five years and the prospect of a “catch-up effect” leading to further small increases in fertility among women aged over 30, and are more plausible than the assumed decrease in the TFR to 1.8 adopted by ABS for its “Medium” variant projection. The fertility assumptions for national population projections in countries with a similar level of fertility to NSW’s have typically assumed there will be little change in fertility levels in the near future (Section 4).

Acknowledgements

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Appendix A: Data Sources and Quality Issues

Period Fertility Data

The Total fertility rates (TFRs) and age-specific fertility rates (ASFRs) in this report have been sourced from ABS publications, and were calculated by dividing counts of registered births based on the place of usual residence of the mother to estimated resident populations (ERP). The counts of registered births may be incomplete due to the late registration of some births. The ABS has acknowledged that a systems processing error resulted in under coverage of births in NSW in the past (ABS 2013a). However this has since been corrected and does not affect the data presented in this report. The accuracy of TFRs and ASFRs will also be affected by the accuracy of the ERP denominators.

The data on fertility rates by birth order were supplied to the authors by the NSW Department of Planning and Environment and reflect the division of numbers of births by birth order and age from the NSW Midwives Data Collection by ERPs.

Cohort Fertility

The mean numbers of children ever born presented in this report are from the 2011 population census and have been sourced using the ABS Tablebuilder online tool. For small numbers of women the reported numbers of children ever born are implausibly high (e.g. 30 or more children). However

these observations have been retained in the data. Small overestimations of the true underlying mean numbers of children ever born are therefore plausible, especially for females in the younger reproductive ages.

Cumulative fertility rates are the sum of a cohort's age-specific fertility rates for ages below a specified age. These were calculated using age-specific fertility rates sources from ABS publications, and are subject to the same sources of measurement error discussed above for total fertility rates.

Fertility Intentions Data

The fertility intentions data presented in this report were sourced from The Household, Income and Labour Dynamics in Australia (HILDA) survey. HILDA is nationwide longitudinal survey of the household population of Australia. Wave 1 was conducted in 2001 and subsequent waves on an annual basis. The most recent Wave for which data are available is Wave 12. Remote areas of the country were not sampled (Wooden and Watson 2007). A multistage cluster sample design was used, and 13,969 men and women from 7,682 households and 488 census collection districts, which were stratified by state or territory, and metropolitan or non-metropolitan, were successfully interviewed for Wave 1.

To date every wave of the HILDA survey has included a question on how many children women (and men) have, and for those aged 18 to 44 years has asked them to place on a scale from 1 to 10 how definite they feel they would like to have [a child / more children] in the future and to place on a scale from 1 to 10 how likely they feel it is they will have [a child / more children] in the future. The various waves of the HILDA survey invariably have included a further question on how many more children they intend to have. In most waves this question was only asked to those who rated their likelihood of having [a child / more children] in the future at 6 or more. However Waves 5, 8 and 11, which each administered a special module of questions on family formation, posed this question to all women in the relevant age range, regardless of their perceived likelihood of having children. The order of the questions in these waves also differed from the usual pattern.

In Section 3, the intended completed family sizes for Waves 2-12 of HILDA (2002-2012) have been calculated by adding the number of additional children which is intended to the number of children each individual currently has for all those who placed their likelihood of having future children at 6 or above, and assumes a value of zero for those who placed their likelihood of having future children at 5 or below. For the purposes of comparability, "standardised" measures have been created for Waves 5, 8 and 11, replacing the recorded intended family future numbers of children for those who rated their likelihood of having future children at 5 or below with zero. Data from Wave 1 of HILDA have been excluded because of a lack of comparability with the data from subsequent waves.

Appendix B: A Method for Projecting Fertility

The Australian Bureau of Statistics has initialised a project which aims to enhance the value of census data by linking individual records from the 2006 and 2011 Australian censuses (ABS 2013c). This appendix presents a method which could potentially leverage the such linked census data to assist the formulation of fertility assumptions for population projections.

Both the 2006 and 2011 censuses included questions to women asking the number of children they have ever given birth to. Assuming the linked records include information on the numbers of children ever born for the same woman for both 2006 and 2011, the proposed method is as follows;

1. Calculate the number of children born between 2006 and 2011 CB (2006-11) = CEB (2011) - CEB (2006).
2. Calculate Mean CB (2006-11) by CEB in 2006 and Age in 2006 for each of the following groups:
    a. Women who were resident in NSW both in 2006 and five years before the 2006 census;
    b. Women who were resident in another state or territory five years before the 2006 census and resident in NSW in 2006; and
    c. Women who were resident overseas five years before the 2006 census and resident in NSW in 2006.

Further disaggregation by other variables (e.g. highest education levels) could also be considered. Parallel calculations can also be performed for geographical subdivisions of NSW

3. If it is reasonable to assume fertility rates by parity (CEB) and age and for groups (i)-(iii) described above will be the same over the period 2011-16 as in 2006-11, then numbers of children born over the 2011-16 can be projected by applying the means for CB (2006-2011) to the census-based estimates of these numbers in the population in 2011 (for NSW and for its geographical subdivisions).

Thus known changes between 2006 and 2011 in the composition of the population by age, parity (CEB), place of residence five years prior to the census, and other relevant variables can be factored into the projection of future fertility. In the event of changes in fertility rates in any of the aforementioned population subgroups being anticipated, judicious adjustments to the assumed fertility rates for the relevant subgroups should be made.

4. For the resident population in 2006 estimate probabilities of transitions between the parity (CEB) and age (and other relevant variable) categories between 2006 and 2011 using the linked census records.

For example estimate the proportion of women aged 20-24 and with zero children in 2006 who are aged 25-29 with zero children in 2011, the proportion of women aged 20-24 and with zero children in 2006 who are aged 25-29 with one child in 2011, and the proportion of women aged 20-24 and with zero children in 2006 who are aged 25-29 with two children in 2011 etc. using the linked census data.

5. If it is reasonable to assume transition probabilities by parity (CEB) and age (and other relevant variables) will be the same over the period 2011-16 as for the period 2006-11, then applying such propensities to the 2011 distribution of the population by these variables and adding assumption-based numbers of internal (interstate) in-movers and overseas migrants by parity (CEB) and age (and other relevant variables) in 2016 will generate a projection of the population by parity (CEB), age, (and other variables) in 2016.

Appropriate adjustments to the transition probabilities will need to be made if the assumed patterns of overseas and internal (interstate) outmigration and mortality for 2011-16 differ significantly from those which applied in 2006-11.

6. Iteratively repeat steps 3)-5) using the iteratively updated projected population by parity (CEB) and age (and other relevant variables) for 2016, then 2021, 2026 etc.

Thus under the proposed method projected fertility levels both for the state and for geographical subdivisions would be coherent with known and anticipated future changes in the distribution of cohorts of women by parity (and other relevant variables) and with assumed levels of overseas and internal migration. The long-term viability of the method will require ongoing linkage of census records and the inclusion of a question on children ever born in each future census.

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