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2022 NSW Population, Household, and Implied Dwelling Demand Projections

Technical Methods Paper

April 2022

Acknowledgement of Country

The Department of Planning and Environment acknowledges that it stands on Aboriginal land. We acknowledge the Traditional Custodians of the land and we show our respect for Elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

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More information

Information about the 2022 NSW Population, Household and Implied Dwelling Demand Projections are available on the NSW Department of Planning and Environment website: www.planning.nsw.gov.au/population

For more information, please contact the Population Insights Team via email: Population.Futures@planning.nsw.gov.au

Acknowledgements

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Reference and citation

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Contents

Introduction

This report details the technical requirements of the 2022 NSW Population, Household and Implied Dwelling Projections. It is aimed at users needing an in-depth explanation of how the models have been built to deliver the projections.

There are three parts to this report. Part A details the geographic levels used for the models and describes the building bricks used to allow data to be reaggregated to build different geographies. Part B describes the methods for the Population Projections and Part C the methods for the Household and Implied Dwelling Demand Projections.

Parts B and C follow the same format with sections on:

- The method of projection
- The projection base year and the data used in the base year
- Setting assumptions
- Outputs

All projections are for financial years, that is populations in any year are for the population as at 30 June of that year.

The projection models detailed in this report run in the programming language, Python. Pre- and post-processing of the data run in R, another programming language optimised for statistical analysis and data visualisation. This report does not detail the code used to prepare the projections, but it does describe the solutions for the iterative model needed to generate population and household projections.

Part A: Geographic levels

Geographic structure

The model is set up as a multi-regional model. A multi-regional model allows for NSW to be used as the state constraint, nested large regions to take account of broad geographic differences and nested smaller geographies under that.

There are four key scales for the model's current implementation:

1. NSW and Rest of Australia
2. Large regions of the state (based on the Australian Statistical Geography Standard, the ASGS, called Projection Regions)
3. Statistical Area 2 (SA2)[1]
4. Building bricks – used to disaggregate data from SA2s to build non-ASGS boundaries

Figure 1 illustrates the structure of the projection models used. All sub-state geographic areas nest within larger geographic areas (e.g., SA2s nest within regions, regions nest within the state). The system is both top down and bottom up. The top-down constraints mean projections constrain to the higher geography by age, sex and every demographic component. The bottom-up approach reflects the use of assumptions specific to each SA2.

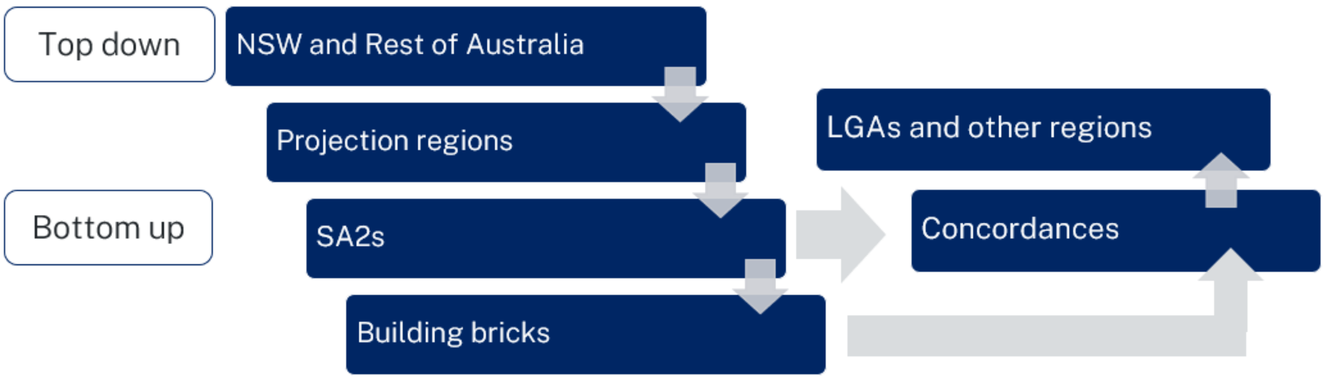

Figure 1: Geographic structure of the NSW Population and Household Projections

In practice, this dual approach means a model is run for NSW and Rest of Australia, using assumptions for these areas, and the output results for the state provide the "Top" for the top-down constraints.

The next step is to run the projection model for projection regions, using assumptions for these areas that are consistent with the NSW level, but vary according to region based on the input

[1] Where SA2s have very small populations the model uses Collapsed SA2s. These are referred to as SA2s throughout this paper for consistency with the ASGS.

data. This step is unconstrained but the results from this run are adjusted to agree with the cohort components from the Top.

In practice, this means the NSW data are not broken down by an assumed *a priori* distribution to the projection regions. Rather, the data are broken down according to the results of a full Projection Region model alongside migration assumptions constrained to the higher level. These outputs are then our final “Middle”.

The same method used for projection regions is then repeated for all SA2s within each Projection Region.

To summarise, the geographic structure informs the population projections in the following ways:

a. NSW cohort component model
b. NSW cohort components are distributed (top down) on the basis of a Projection Region cohort component model (bottom up)
c. Projection Region cohort components are distributed (top down) on the basis of the SA2 cohort component model (bottom up) (and see also Part B, Setting Assumptions and the impact of the Housing Unit Method).

The building bricks are used to disaggregate data from the SA2s to build non-ASGS boundaries. These include, but are not limited to:

- Local Government Areas (LGAs)
- DPE Planning Regions
- Functional Economic Regions
- Local Health Districts

Implications for the projections

The top-down and bottom-up approach means that iterative modelling is needed to ensure the top-down and bottom-up approaches align. As described in Part B in the section, “Setting assumptions”, the use of multiple geographies alongside the projection of demographic events has led to the development of novel modelling solutions by re-specifying the iteration as a root-finding problem.

Within Greater Sydney (the Greater Sydney region) further iteration is needed because population change and migration cohort components are redistributed on the basis of the distribution of the growth of a Dwelling Led Population measure (bottom up) (see Section B, Setting assumptions section).

Using the ASGS boundaries (for the projection regions and SA2s) ensures that the model has the best available data, in the same geographic structure that it is made available by the Australian Bureau of Statistics (ABS).

Collapsed Statistical Area 2

Where SA2s have very small populations the model uses Collapsed SA2s (CSA2s). The affected SA2s and the new names are shown in Table 1, and a breakdown of the population in the component parts of each CSA2 is shown in Appendix A.

Collapsed Statistical Area 2 Name	Component Statistical Area 2 Names
Austral - Greendale - Badgerys Creek	Austral – Greendale, Badgerys Creek
Blackheath - Megalong Valley - Blue Mountains	Blackheath - Megalong Valley, Blue Mountains – North, Blue Mountains - South
Botany - Airport - Industrial	Banksmeadow, Botany, Port Botany Industrial, Sydney Airport
Bradbury - Wedderburn - Holsworthy Military Area	Bradbury – Wedderburn, Holsworthy Military Area
Cooma Region - Deua - Wadbilliga	Cooma Region, Deua - Wadbilliga
Greystanes - Pemulwuy - Smithfield Industrial	Greystanes – Pemulwuy, Smithfield Industrial
Guildford West - Merrylands West - Yennora Industrial	Guildford West - Merrylands West, Yennora Industrial
Heathcote - Waterfall - Royal National Park	Heathcote – Waterfall, Royal National Park
Helensburgh - Illawarra Catchment Reserve	Helensburgh, Illawarra Catchment Reserve
Horsley Park - Kemps Creek - Wetherill Park Industrial	Horsley Park - Kemps Creek, Wetherill Park Industrial
Lidcombe - Rookwood Cemetery	Lidcombe, Rookwood Cemetery
Paddington - Moore Park - Centennial Park	Centennial Park, Paddington - Moore Park
Port Kembla - Warrawong - Port Kembla Industrial	Port Kembla – Warrawong, Port Kembla Industrial
Seven Hills - Toongabbie - Prospect Reservoir	Prospect Reservoir, Seven Hills - Toongabbie
Singleton region - Wollangambe - Wollemi	Singleton Region, Wollangambe - Wollemi
Stockton - Fullerton Cove - Newcastle Port - Kooragang	Newcastle Port – Kooragang, Stockton - Fullerton Cove
Ulladulla region - Ettrema - Sassafras - Budawang	Ettrema - Sassafras – Budawang, Ulladulla Region

Table 1: List of Collapsed SA2s used for the 2022 NSW Population, Household, and Implied Dwelling Demand Projections

Part B: Population Projections

Method of Projection

Cohort-component modelling

At all geographic levels cohort component models are used to project the population by single year of age and proceed forward in time in single year intervals. The 'cohort-component' element of the model means that population is broken up by birth cohort (single year of age in the jump off year), and each cohort is subjected to the various demographic components of change (births, deaths and various forms of migration) giving us the projected size of each cohort.

Figure 2 shows the calculations for the cohort-component model in an age-time diagram known as a Lexis diagram.[2] Age increases up the vertical axis; time progresses along the horizontal axis. Population stocks (denoted *P*) are shown by the thick black lines while the period-cohort space occupied by the demographic components of change is depicted by the grey parallelogram. The diagram shows the female (subscript *f*) birth cohort born in the 2014-15 financial year being projected from 30 June 2016 to 30 June 2017. Inward migration is shown as adding to the population, while deaths and outward migration subtract from the population. The cohort is aged 1 (subscript *1*) in mid-2016 and ages to age 2 (subscript *2*) by mid-2017.

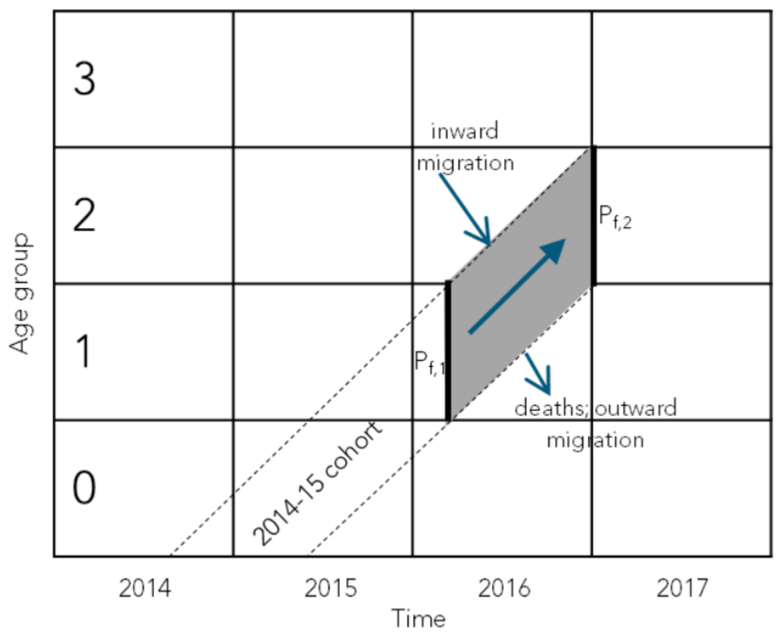

Figure 2: Illustration of the cohort component model.

[2] For a description of these diagrams see https://link.springer.com/chapter/10.1007/978-3-319-64820-0_2 or https://www.demographic-research.org/Volumes/Vol4/3/4-3.pdf

Accounting framework

The accounting approach involves projecting the population by adding all the increments (i.e. additions to the population such as births and in-migration) and subtracting all the decrements (i.e. variables removed from the population, such as deaths and out-migration) to the population over a period of time. The majority of population projection models employ a movement accounts framework, even though it is not always stated explicitly.

The modelling for the NSW population projections employs a typical approach to the projection of demographic components of change in a movement accounting framework. Most demographic events are projected as:

Equation 1:

event = demographic rate (likelihood of an event happening) × person-years at risk.

The only exception is overseas immigration, which is input directly as immigration numbers because we can't define a population at risk for who arrives in Australia from anywhere else in the world[3].

For all demographic events, an iterative calculation scheme is used because the number of person-years at risk is estimated as the mean of the start-of-interval and end-of-interval populations. The latter is initially unknown and is updated by the computer program in successive iterations until there is minimal change between iterations.

What is new in this model is that this historic problem has been rearranged to be a classic root finding problem, for which there are many off-the-shelf solutions. Iteration is then only required for ensuring the top-down and bottom-up approaches align.

Accounting equations

Population accounting equations comprise the heart of the projection model. For all period-cohorts except newly-born infants the State accounting equation is:

Equation 2:

$$\boldsymbol{P^{st}_{s,a}(t+1) = P^{st}_{s,a}(t) - D^{st}_{s,pc} - IOM^{st}_{s,pc} - E^{st}_{s,pc} + IIM^{st}_{s,pc} + I^{st}_{s,pc}}.$$

Where: *P* = population, *D* = deaths, *IOM* = interstate out migration, *E* = emigration (overseas out migration), *IIM* = interstate in migration, *I* = immigration (overseas in-migration).

[3] This would be a substantial undertaking. It would require both contemporary demographic profiles for all the 150+ countries from which migrants have arrived and stated country of destination at point of departure, also cut by age and sex of departee. Even Australian Boarder Force don't collect this form of information on departing Australians.

For newly-born infants the “initial” population comprises the number of births (*B* = births) that occur during the projection interval:

Equation 3:

$$P_{s,0}^{st}(t+1) = B_{s}^{st} - D_{s,b}^{st} - IOM_{s,b}^{st} - E_{s,b}^{st} + IIM_{s,b}^{st} + I_{s,b}^{st}$$

This basic equation is used for Projection Regions and SA2s with the addition of intra-state migration (movement in and out of an area from within NSW). For all period-cohorts except newly-born infants the region accounting equation is:

Equation 4:

$$P_{s,a}^{st}(t+1) = P_{s,a}^{st}(t) - D_{s,pc}^{st} - IOM_{s,pc}^{st} - E_{s,pc}^{st} - ROM_{s,pc}^{st} + IIM_{s,pc}^{st} + I_{s,pc}^{st} + RIM_{s,pc}^{st}.$$

Where: *ROM* = intrastate out migration, *RIM* = intrastate in migration and all other parameters as per Equation 2.

The same additions are made for the populations made up of newly-born infants (Equation 3).

Base year

The base year for the 2022 NSW population projections is 2020, using the latest available estimated resident population (ERP) by age and sex for all regions as the starting point. These data are publicly available from the ABS, in *Regional population by age and sex* (published 27 August 2021). All assumptions are set from the 2020 base. When the model was run, public data for the components of change were available from 2016-2020 and these have been provided in output tables; this provides consistency with data provided in previous projection series and allows comparison with ABS data since the 2016 Census .

Setting assumptions

A key feature of the population projection model is that projection assumptions are divided into *summary indicators* and more detailed *age-specific rates* or values. For example, age-specific fertility rates are prepared as Total Fertility Rates (the summary indicator) and proportionate age-specific fertility rates (pf_a). These proportionate rates sum over all so-called fertile age groups (15-49) to exactly 1. This approach enables users to adjust TFR assumptions relatively easily without having to change all age-specific fertility rates. Very large changes in TFRs would probably require some changes to the age-specific rates, but for modest TFR changes this approach is sufficient.

A similar approach is applied to age-specific death rates (ASDRs). Mortality assumptions are set in terms of life expectancy at birth (the summary indicator) while ASDRs relating to that life expectancy value are obtained from a national mortality surface. This enables users to adjust life expectancy at birth assumptions without having to prepare a whole new set of ASDRs for every geographical area.

For migration, the summary indicator consists of an annual net number and age-specific rates (or numbers in the case of immigration). Preliminary in- and out-migration are projected by applying rates to populations-at-risk and are proportionally adjusted to ensure they are consistent with the net migration assumption.

Assumptions for the 2022 NSW Population Projections are shown in Appendix B.

Assumptions about Greater Sydney distribution

For Greater Sydney, additional assumptions are made for the distribution of new population growth.

As outlined in Section A, the geographic structure of the projection model informs the population projections in the following ways:

a. NSW cohort component model
b. NSW cohort components are distributed (top down) on the basis of a Projection Region cohort component model (bottom up)
c. Projection Region cohort components are distributed (top down) on the basis of the SA2 cohort component model (bottom up)

The Housing Unit Method

The Housing Unit Method allows for new housing supply to influence population movement, meaning projections take account of greenfield or infill developments that we know are taking place. For the Greater Sydney Region the projection model this means an independent measure of population change is used for the subregions within the Greater Sydney Projection Regions. This is called "Dwelling Led Population" (or more importantly, the "Change in the Dwelling Led Population"). We then redistribute growth within the subregions of each (Greater Sydney) Projection Region based on the distribution of Change in the Dwelling Led Population. This redistributed growth then alters the migration flows for these subregions, such that the cohort components of the Projection Regions are preserved but the pattern of growth-distribution matches the Dwelling Led Population. The assumptions for this dwelling-led growth are based on the Sydney Housing Supply Forecast, which takes account of developments which are known about through development applications, rezoning of land, information on known developments from local government and from industry.

This approach is known as the Housing Unit Method, and is other jurisdictions in Australia, as well as agencies in New York City and the City of London.

Assumptions for different geographic scales

Assumptions are set for the population drivers based on analysis of historical data, insight and advice from academic and industry demography experts, data and evidence from key data agencies (ABS, Commonwealth Government's Centre for Population, Australian Institute of Health and Welfare). The breakdown of deaths at the oldest ages (85-100+ years) was informed by the Human Mortality Database (Shkolnikov et al., 2022).

The setting of assumptions at the state level are important in the following ways:

- Net overseas migration (NOM) (and in and out movements) across all geographic scales must sum to the assumed NOM for NSW
- Net interstate migration (NIM) across all geographic scales must sum to the assumed NIM for NSW (so in movements equal out movements)
- Net intrastate migration (NRM) across all geographic scales must sum to zero for NSW
- Total fertility rates (TFR) are set for all sub-state areas, but they change in the same direction as the TFR for NSW, and the sub-state-to-NSW relationship is held the same throughout the projection period. For example, an assumption of declining fertility for NSW will be the same in all areas. In areas with a higher TFR than the state TFR at baseline, the TFR is assumed to remain higher than the state TFR throughout the projection period.
- Life expectancy at birth (e_0), like TFRs are set for all sub-state areas and all life expectancies change in the same direction as e_0 for NSW, and the sub-state-to-NSW relationship is held the same throughout the projection period.

Assumptions for the Projection Regions used in the 2022 NSW Population Projections are shown in Appendix B.

Additional adjustments

In addition to the use of patterns from historic population mobility, migration assumptions were also confronted against known policy or physical changes through discussions with regional experts. This approach allows migration to be adjusted where capacity is available for growth, or conversely where new areas of development are underway.

Particular attention is paid to small and declining populations with negative net migration, especially in cases where the amount of net migration loss is substantial relative to population size. In extreme circumstances, these small area populations can 'run out' of people in some age groups and the projection model will abort. For these types of areas, the net migration assumptions were determined using migration rates.

Adjustments are also made in those areas where there are non-private dwellings that impact the age-sex profile of an area, e.g., same-sex boarding schools or prisons. These places typically have a consistent age-profile over time driven by in- and out-migration to attend the non-private dwelling. In these areas, manual adjustment of age-specific migration propensities is needed.

Outputs

The population projection model provides outputs by sex, single year of age and single year for the projection horizon. This gives the model flexibility in preparing outputs for non-standard age groups such as school age or university students.

Standard outputs are for sex and five-year age groups to 85 years and older, and for all geographic scales.

Part C: Household and Implied Dwelling Projections

Method of Projection

DPE's household projection model uses the sequential propensity household model,[4] created to match ABS living arrangement and household classifications. It starts with a projected population of persons by age group and, in a series of steps, divides the population up into two living arrangement types (namely population in private dwellings and population in non-private dwellings). The final set of living arrangement types can then be organised into household types, and the number of households by type calculated. The division into just two living arrangement types in each step simplifies the projection of living arrangement propensities because only the propensities for living arrangement type A need to be prepared; the propensities for those in living arrangement B are simply 1 minus the propensities for A.

The model (for 2022) is static, which means model flows between different living arrangement types are not explicit. Dynamic models can be explored after results from 2021 Census are available because they are permissible under the new software.

Figure 3 overleaf summarises the sequence of calculations. In Step 1, the projected population by age group (but not sex) is divided into those living in private households and those in non-private dwellings (NPDs). Then, in Step 2, the population aged 15+ is separated out from children and divided up into those who are living with a partner (partnered) and those who are not (single). Then the single and partnered populations are divided into those with children under 15, and those without (Step 3). And the process continues until all the living arrangement types needed to calculate the number of persons living in each of the ABS household types have been computed.

[4] Wilson, T. (2013) https://www.demographic-research.org/volumes/vol28/24/default.htm

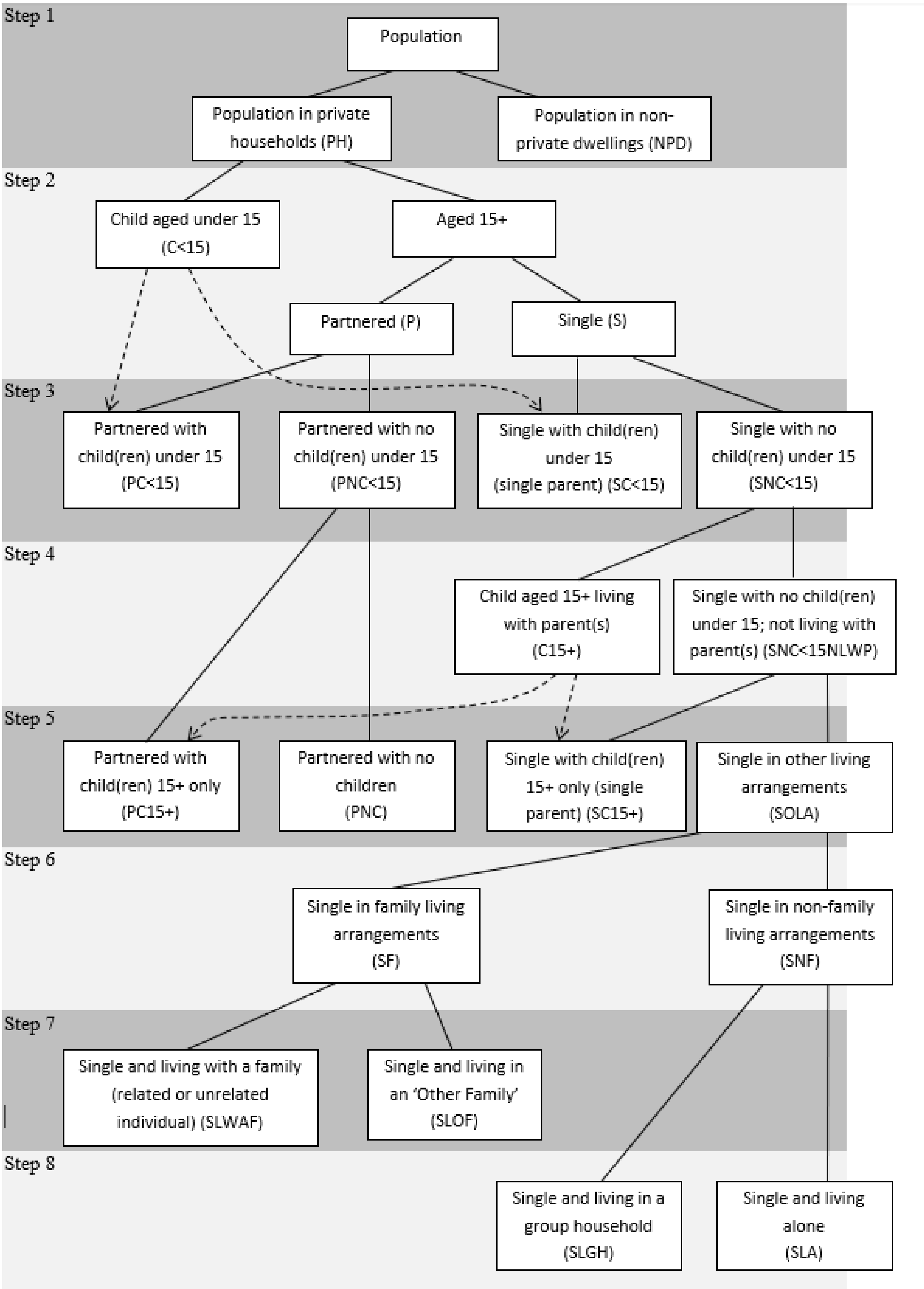

Figure 3: Outline of the sequential propensity household model. Source: Wilson (2013)

The method follows the steps outlined in Figure 3. The number of adult representatives in each household type are summed together as a final step. Table 1 lists the living arrangements of adults that typify each household type. For those in family households, the number of adult representatives is multiplied by a proportion living in single family household or the proportion living in multiple-family households. For example, the number of adult representatives in 'single-family Couple family with children household' consist of the number of adults 'Partnered with child(ren) under 15 plus those Partnered with child(ren) 15+ only' multiplied by the proportion in a single-family household (typically around 0.95).

Household type	Household representatives
Family households	
Single-family households	
Couple family with children	Partnered with child(ren) under 15 Partnered with child(ren) 15+ only
Couple without children	Partnered with no children
Single parent	Single parent with child(ren) under 15 Single parent with child(ren) 15+ only
Other Family	Single and living in an Other Family
Multiple-family households	
Multiple-family	*Any of the above living arrangements*
Non-family households	
Lone person	Single and living alone
Group	Single and living in a group household

Table 1: Household types and living arrangements of household representatives

The final step is to calculate the number of households, derived by dividing the number of adult household representatives by the average number of representatives per household (Table 2).

Household representatives	Average no. of representatives per household
Family households	
Single-family households	
Couple family with children	2
Couple without children	2
Single parent	1
Other Family	Empirically determined
Multiple-family households	
Multiple-family	Empirically determined
Non-family households	
Lone person	1
Group	Empirically determined

Table 2: Household types and average number of adult household representatives

The household projections form the basis of the implied dwelling projections. The projected number of implied dwellings is based on the number of households and the proportion of dwellings unoccupied at the time of the 2016 Census. It is calculated as:

Equation 4: $Dw(t) = \frac{H(t)}{occ(t)}$

Where *Dw* refers to the implied number of dwellings likely to be needed by the projected households, *H* households, and *occ* the proportion of private dwellings occupied by households.

The sequential propensity household model steps are followed for all geographic scales, with Projection Regions and SA2s constrained to ensure that the population by living arrangement and number of households by type sum across regions to equal the State projections of those variables.

Base year

For the base year, we use the same population base as the population projections. Living arrangement propensities are applied to the 2020 population to calculate households, and the same process is used to backfill from 2016 to 2019.

Setting assumptions

The assumptions for the household projections are based on 2016 Census living arrangement data by 5-year age group, calculated from persons at home on Census night. These data are used to prepare living arrangement propensities; these measures are also adjusted for Census undercount and to ensure they align with 2016 ERP before propensities are derived.

These assumptions are held constant throughout the projection period.

Outputs

The household and implied dwelling projection model provides outputs by number of households by household type, and the total number of implied dwelling demand for those households.

In addition to these measures, measures of population by age and residency for each region are available – whether a person is living in a private dwelling or whether they are living in a non-private dwelling such as a boarding school, a prison, nurses' quarters etc.

End pages

List of acronyms

Acronym	Meaning
ABS	Australian Bureau of Statistics
ASGS	Australian Statistical Geography Standard – defined by the ABS
DPE	Department of Planning and Environment
ERP	Estimated Resident Population
LGA	Local Government Area
NPD	Non-Private Dwellings
SA2	Statistical Area 2

Appendix A: Collapsed SA2s used in 2022 NSW Projections

Collapsed SA2	SA2 Name (2016)	ERP as at 30 June 2020	SA2 share of Collapsed SA2 ERP
Austral - Greendale - Badgerys Creek	Austral - Greendale	9,950	0.99
Austral - Greendale - Badgerys Creek	Badgerys Creek	62	0.01
Blackheath - Megalong Valley - Blue Mountains	Blackheath - Megalong Valley	5,844	1.00
Blackheath - Megalong Valley - Blue Mountains	Blue Mountains - North	13	0.00
Blackheath - Megalong Valley - Blue Mountains	Blue Mountains - South	4	0.00
Botany - Airport - Industrial	Banksmeadow	226	0.02
Botany - Airport - Industrial	Botany	13,364	0.98
Botany - Airport - Industrial	Port Botany Industrial	7	0.00
Botany - Airport - Industrial	Sydney Airport	67	0.00
Bradbury - Wedderburn - Holsworthy Military Area	Bradbury - Wedderburn	20,138	1.00
Bradbury - Wedderburn - Holsworthy Military Area	Holsworthy Military Area	0	0.00
Cooma Region - Deua - Wadbilliga	Cooma Region	3,459	0.99
Cooma Region - Deua - Wadbilliga	Deua - Wadbilliga	25	0.01
Greystanes - Pemulwuy - Smithfield Industrial	Greystanes - Pemulwuy	28,559	1.00
Greystanes - Pemulwuy - Smithfield Industrial	Smithfield Industrial	11	0.00
Guildford West - Merrylands West - Yennora Industrial	Guildford West - Merrylands West	22,863	1.00

Collapsed SA2	SA2 Name (2016)	ERP as at 30 June 2020	SA2 share of Collapsed SA2 ERP
Guildford West - Merrylands West - Yennora Industrial	Yennora Industrial	14	0.00
Heathcote - Waterfall - Royal National Park	Heathcote - Waterfall	6,701	1.00
Heathcote - Waterfall - Royal National Park	Royal National Park	28	0.00
Helensburgh - Illawarra Catchment Reserve	Helensburgh	9,356	1.00
Helensburgh - Illawarra Catchment Reserve	Illawarra Catchment Reserve	5	0.00
Horsley Park - Kemps Creek - Wetherill Park Industrial	Horsley Park - Kemps Creek	4,684	0.99
Horsley Park - Kemps Creek - Wetherill Park Industrial	Wetherill Park Industrial	36	0.01
Lidcombe - Rookwood Cemetery	Lidcombe	23,268	1.00
Lidcombe - Rookwood Cemetery	Rookwood Cemetery	3	0.00
Paddington - Moore Park - Centennial Park	Centennial Park	3	0.00
Paddington - Moore Park - Centennial Park	Paddington - Moore Park	16,976	1.00
Port Kembla - Warrawong - Port Kembla Industrial	Port Kembla - Warrawong	10,068	1.00
Port Kembla - Warrawong - Port Kembla Industrial	Port Kembla Industrial	11	0.00
Seven Hills - Toongabbie - Prospect Reservoir	Prospect Reservoir	44	0.00
Seven Hills - Toongabbie - Prospect Reservoir	Seven Hills - Toongabbie	26,031	1.00

Collapsed SA2	SA2 Name (2016)	ERP as at 30 June 2020	SA2 share of Collapsed SA2 ERP
Singelton region - Wollangambe - Wollemi	Singleton Region	5,222	1.00
Singelton region - Wollangambe - Wollemi	Wollangambe - Wollemi	0	0.00
Stockton - Fullerton Cove - Newcastle Port - Kooragang	Newcastle Port - Kooragang	17	0.00
Stockton - Fullerton Cove - Newcastle Port - Kooragang	Stockton - Fullerton Cove	8,839	1.00
Ulladulla region - Ettrema - Sassafras - Budawang	Ettrema - Sassafras - Budawang	52	0.01
Ulladulla region - Ettrema - Sassafras - Budawang	Ulladulla Region	5,589	0.99

Appendix B: Assumptions for 2022 NSW Population Projections

Historical Data

	2007	200	2009	2010	2011	2012	2013	2014	2015	2016
TFR	1.999	2.052	1.978	2.020	1.963	1.930	1.938	1.723	1.857	1.820
e0F	83.9	84.3	84.1	84.2	84.2	84.3	84.4	84.6	84.6	84.6
e0M	79.2	79.5	79.6	79.8	79.9	80.0	80.2	80.4	80.4	80.3
NIM	-	-	-	-9,438	-	-	-	-6,857	-6,639	-11,349
NOM	73,570	87,390	86,740	57,150	51,680	57,230	66,760	66,990	70,310	80,010

Projection Assumptions

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	203	203	203	2036	2037	203	2039	2040	2041
TFR	1.761	1.711	1.709	1.672	1.622	1.590	1.669	1.704	1.701	1.691	1.676	1.660	1.648	1.641	1.637	1.633	1.633	1.633	1.633	1.633	1.633	1.633	1.633	1.633	1.633
e0F	85.8	85.8	85.8	85.8	85.8	86.6	86.6	86.6	86.6	86.6	87.4	87.4	87.4	87.4	87.4	88.2	88.2	88.2	88.2	88.2	88.9	88.9	88.9	88.9	88.9
e0M	81.8	81.8	81.8	81.8	81.8	82.9	82.9	82.9	82.9	82.9	84.0	84.0	84.0	84.0	84.0	85.0	85.0	85.0	85.0	85.0	86.0	86.0	86.0	86.0	86.0
NIM	-15,161	-21,672	-	-	-	-9,900	-9,900	-11,083	-12,267	-	-	-15,817	-	-	-	-	-	-	-	-	-	-	-	-	-
NOM	105,502	90,650	84,543	54,923	-29,040	-23,268	3,053	31,527	65,860	67,452	69,030	70,594	72,143	73,679	75,200	75,200	75,200	75,200	75,200	75,200	75,200	75,200	75,200	75,200	75,200

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