



Northern  
Territory  
Government

# Northern Territory Population Projections

Northern Territory 2010-40

Northern Territory Statistical Reporting Regions

2010, 2015, 2020, 2025

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Website address [www.nt.gov.au/ntt](http://www.nt.gov.au/ntt)

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## Introduction

This report provides an overview of the Northern Territory Population Projections, 2011 including the process of development and results. Population projections outlined in this report were developed using the NTPOP model. A summary of the projection results is included in this report but for the complete set of projected population numbers, users should refer to the electronic Excel spreadsheets available through the Northern Territory Treasury (Treasury) website at [http://www.nt.gov.au/ntt/economics/nt\\_population.shtml](http://www.nt.gov.au/ntt/economics/nt_population.shtml).

These projections provide an update to the Northern Territory Population Projections, 2009 to incorporate updated data and assumptions. They were developed in collaboration with The Northern Institute at Charles Darwin University (CDU).

The projections are based on Australian Bureau of Statistics' (ABS) estimated resident populations (ERPs), with the jump-off population (2010) based on the latest published data from the ABS. This report includes information on two sets of population projections:

- residents of the whole of the Northern Territory from 2010 to 2040, disaggregated by individual year of age, sex and Indigenous status; and
- residents of each of the Northern Territory statistical reporting regions<sup>1</sup> Darwin region (Darwin City, Palmerston and Litchfield), rest of Darwin (Finniss, Bathurst-Melville and Alligator), Katherine, East Arnhem, Barkly and Alice Springs – see Appendix 2 for map reference). These projections are made available for 2010, 2015, 2020 and 2025 disaggregated by five-year age groups, sex and Indigenous status.

The NTPOP model also produces population projections for the geographic regions of Australia and 'rest of Australia'. Depending on the objectives of their work, users may need to use ABS projections for an Australia level total.

Population projections will be reviewed and updated regularly for any significant revisions such as amendments to ABS figures and changes to parameters based on any emerging research. Every five years, following release of the latest ABS Census results, a major review will be conducted and all inputs will be revised based on new Census data.

Population projections are formulated using the cohort-component method and values reflect the consequence of applying certain assumptions about the future direction and levels of fertility, mortality and migration. Therefore, projections should not be interpreted as accurate forecasts or predictions but rather an indication of population change over time, given a set of assumptions. All population projections should be used with caution. In particular, the regional projections have more limitations than the Territory total projections because the base input data is less accurate for smaller geographic areas, and the migration flows become more complex at lower geographic levels as intra-regional as well as interstate and international migration to the Territory needs to be taken into account.

<sup>1</sup> Northern Territory Government approved boundaries for whole of government statistical purposes.

## Output on the Website

The detailed projection results are available through the Treasury website, [http://www.nt.gov.au/ntt/economics/nt\\_population.shtml](http://www.nt.gov.au/ntt/economics/nt_population.shtml). A mathematical description of the projection model NTPOP is also provided on the website (Wilson, T, *Mathematical details of the NTPOP projection model*, School for Social and Policy Research, Charles Darwin University, Darwin).

Projection outputs for two scenarios are available on the website – *NTG baseline projections*; and *high migration*. The differences between these scenarios are discussed later.

There are three standard output Excel files for each scenario including:

- NTPOP summary, 2011
- NTPOP single-year age, 2011
- NTPOP 5-year age, 2011

### Version Control

If updates are produced within the same year, files will be annotated v2, v3, etc., for example, NTPOP summary NTG 11v2.

If an update is provided in a subsequent year, the file names will be changed to reflect the year. For example, NTPOP single-year age NTG 12.

### Content of the Output Files

The summary spreadsheet contains:

- projection totals (no age or sex breakdowns) for each population sub-group (Table 1) for each year of the projection period to 2040;
- projection totals (no age or sex breakdown) for each population subgroup, every five years (2010, 2015, 2020, 2025) for the regions;
- average annual growth rates;
- summary population accounts (start population, growth components, end population);
- growth indices;
- sex ratios; and
- median ages for the Territory-wide projections.

The single year of age projections spreadsheet contains projected numbers for each population subgroup for each year of the projection period by sex and individual year of age, from 0 to 100 years and over. The single year of age spreadsheet is not available for the regions.

The five-year age groups spreadsheet contains projected numbers for each population subgroup for each year of the projection period by sex and five-year age groups, 0-4 years up to 100 years and over, and to 85 years and over for the regions.

Table 1: Population Subgroups, NTPOP Projections Model <sup>1,2</sup>

	Indigenous			Non-Indigenous			All persons		
	sex	sya	5ya	sex	sya	5ya	sex	sya	5ya
Territory	✓	✓	✓	✓	✓	✓	✓	✓	✓
Rest of Australia	✓	✓	✓	✓	✓	✓	✓	✓	✓
Australia	✓	✓	✓	✓	✓	✓	✓	✓	✓
Regions (six)	✓	x	✓	✓	x	✓	✓	x	✓

1 sya = single year of age; 5ya = five-year age.

2 Five year age groups up to 100+ for the Territory and Australia and to 85+ for the regions.

## Guidelines for Northern Territory Government Agencies

## How to Use these Projections

Population projections should not be interpreted as accurate forecasts or predictions. Projections are the result of applying certain assumptions about the future direction and levels of fertility, mortality and migration, to a base population, in this case 2010 population estimates (see Taylor, 2011 – ‘The Forecasting of Remote Area Populations’ in the book *Demography at the Edge: Remote Human Populations in Developed Nations* for a discussion of these issues in the context of places like the Northern Territory).

Users of these projections should exercise caution when using these projections for decision making. The following guidelines are not intended to be fully prescriptive, and agency staff is encouraged to contact Treasury with any questions regarding the appropriate use of projections. In general, Northern Territory Government (NTG) agencies should use the projections for:

- work relating to internal Territory issues; and
- work that will be used in official documents circulated to other agencies.

By default, NTG agencies should use the NTG baseline projections scenario since the output numbers are the official Territory projections. In some cases, it will be necessary to use another projection series, for example where state projections are required or where growth in the short-term future is more important than the long-term future growth, such as the impact of major projects on short-term population growth.

## Uncertainty in Projections

Population projections are not predictions of the future size and composition of the Territory’s population. Rather, they are calculations of what the population will be at future times given specific assumptions about the components of population growth between the base year for the projections and any future year. The degree to which projections coincide with actual future growth will ultimately depend on the extent to which the assumptions about future growth turn out to be correct.

The accuracy of the projections also depends on the accuracy of the initial population estimates used as the foundation for the projections. These population projections are based on the revised intercensal ABS ERPs for the Territory and Australia derived by adding births, deaths and migration estimates to final 2006 ERPs derived from the 2006 Census. These estimates themselves have uncertainty attached to them that must also be factored in when users are considering the likely accuracy of future projections.

Following the release of the 2011 Census in 2013, intercensal ERPs from 2006 to 2011 will be rebased to align with the release of 2011 ERP’s.

Estimates of the relative standard errors of final ABS 2006 ERP’s are about 2.3 per cent for the total Territory (and national) Indigenous population, 1.6 per cent for the Territory’s total population and 0.2 per cent for the whole Australian population. While the level of uncertainty is not high for Australia, it is not insignificant for the Territory and Indigenous populations in general. Relative standard errors increase as population group size decreases. Thus, relative standard errors for the base 2006 ERP’s for the Territory’s statistical

reporting regions can be much higher than the Territory-wide estimates (for example, of the order of 10 per cent for some smaller regions). Similarly, the uncertainty of the sizes of specific age groups is much greater than total estimates.

In addition, ABS population estimates are also subject to intercensal error, estimated at 1.4 per cent for the Territory for the 2001-06 intercensal period. The intercensal error reflects errors in the population estimates of any of the components of population change since the previous Census (an error which compounds over the intercensal quarters). Users should consider all sources of uncertainty when using these projections.

## Overview of Territory Population Growth

Population growth in the Territory is significantly more volatile than Australian population growth, largely reflecting the impact of major projects on the Territory's interstate and overseas migration. Nationally, population growth is influenced by changing fertility and mortality patterns over time and changes to Commonwealth policy on the migration intake program and visa applications. Population growth is also influenced by living conditions and employment opportunities in Australia compared with those abroad.

Over the long term, the Territory's population growth has been predominately driven by natural increase (births less deaths). The contribution of natural increase to the Territory's annual population growth is about double that of the national percentage contribution.

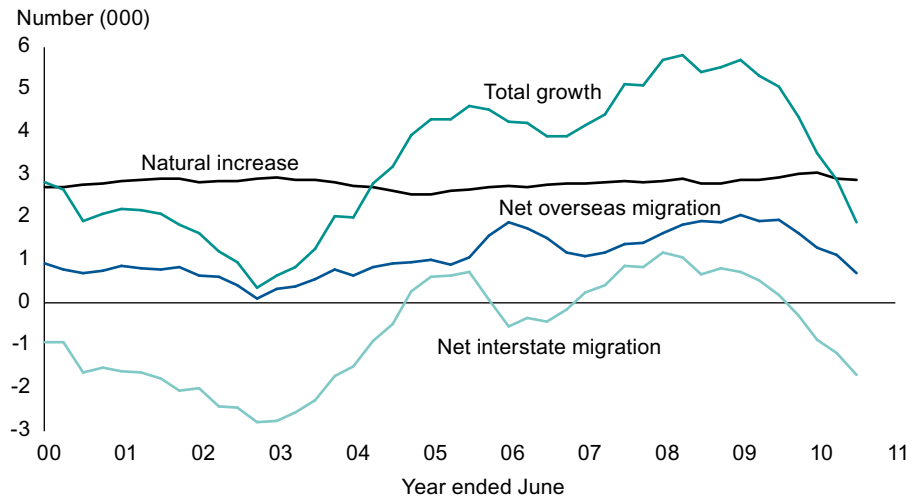
The Territory's fertility rate is influenced by the age distribution of non-Indigenous women, which favours the child-bearing ages by comparison with other jurisdictions. As at June 2006, 58 per cent of non-Indigenous women in the Territory were aged 15 to 49 years, compared with 49 per cent nationally. High fertility rates among Territory Indigenous women also influences the Territory's fertility rate. Territorians have a lower life expectancy than people in other jurisdictions, reflecting high mortality rates in the Territory's Indigenous population, largely the result of a high prevalence and early onset of chronic disease. Non-Indigenous life expectancy is also lower than those in other jurisdictions, the higher proportion of the population in the younger age groups, who typically partake in more risky behaviours. Despite a lower life expectancy, the Territory's population experiences a relatively low crude death rate (deaths per 1000 persons) because of its young age profile.

Net overseas migration is a relatively stable positive contributor to the Territory's annual population growth. Net overseas migration has increased in recent years, reflecting increased labour demand as a result of the resources boom and skills shortages, particularly for trades and technical workers and specialists in the mining sector. Net overseas migration in the Territory, is largely driven by demand for labour for major projects and is also heavily influenced by changes to Commonwealth migration intake policies.

Significant fluctuations in the Territory's annual population growth rate are largely due to variations in interstate migration (Chart 1). The Territory experiences very large interstate flows of people both into and out of the Territory, with about 7 per cent of the Territory's population going interstate each year. The net annual figure is volatile and has fluctuated from negative 2800 to positive 1700 through the last 20 years. However, interstate migration in the Territory has typically been a detractor from growth, with positive interstate migration occurring for short periods of time, in response to increased labour demand during the construction phase of major projects.

Although high rates of natural increase drive growth in both the Territory's Indigenous and non-Indigenous populations, variation in the Territory's annual population growth rates is largely a consequence of the non-Indigenous population, through interstate and, to a lesser extent, overseas migration. The Territory's Indigenous population, while highly mobile, typically moves intrastate and experiences significantly lower rates of net interstate and overseas migration. As a consequence, population growth of the Indigenous population is significantly more stable and almost exclusively a consequence of natural increase.

Chart 1: Components of Northern Territory Population Growth, 2000 to 2010



Source: ABS. Cat. No. 3101.0

## NTPOP Population Projections Model

### Development

The Northern Territory population projections were developed in response to a long-standing need within the NTG to better understand the drivers of, and likely future trends for the Indigenous and non-Indigenous Territory populations. Although the ABS produces a range of projections series after each Census (for Australia, the states and territories, and the capital city/balance of state level), these projections do not take into account the different growth patterns in the Indigenous and non-Indigenous populations. This is a significant issue for the Territory, with the Indigenous population accounting for 30 per cent of the population.

In addition, population denominators underpin important socio-economic rates and performance indicators. As such, population-specific denominators are required in order to properly plan for the very different and separate needs of the Indigenous and non-Indigenous populations. In addition, NTG agencies have a need for sub-Territory level projections, which the ABS projections do not provide.

The process of developing population projections was approved by the NTG in December 2007. Cabinet approved the development process, noted the development of the Northern Territory Treasury Northern Territory Population Projections methodology in collaboration with CDU, and approved a requirement for agencies to use the NTG projections unless another approach was warranted and could be justified. Cabinet also endorsed the process for annual reviews to be conducted on population projections and updated where necessary, with a major review and re-release of population projections conducted every five years following the release of the Census.

Figure 1

### Principles for Developing Northern Territory Population Projection Assumptions

- » The underlying assumptions for the parameter values of the projections model are to be based on statistical evidence.
- » Evidence will consist of information on and analyses of past trends and likely future trends in relation to fertility, mortality and migration.
- » All NTG agencies may put forward their views on the assumptions but evidence must be supplied in order to receive support for them.
- » Information about future possibilities may also be put forward, however policy-based assumptions which conflict with statistical evidence will not be considered for incorporation into the model.
- » Deviation from past trends may be built into the model. However, the rationale for such deviation must be soundly based.
- » There will be a process of review, annually at the most frequent and at least five yearly, allowing for change to the assumptions as new information comes to light.

**Method** The NTPOP projection model is a cohort-component growth model. The cohort-component method is the most common method used for demographic projections. The method adjusts a base population for births, deaths and migration, to arrive at a population one year into the future. The process continues for the extent of the projection horizon. However, it should be noted that the cohort-component method may not be the most suitable method for all projections including small area projections such as remote Territory towns. In this instance the drivers of population growth are exogenous to the determinants and assumptions used in the cohort-component method. Therefore, alternative methods and data sources need to be utilised to develop population projections at this geographic level.

A short technical summary of the model is provided in Appendix 1 of this report. The mathematical details of the model are available from the Treasury website.

**Output** Treasury produces two output scenarios; the official NTG baseline projections scenario and a high migration scenario. The NTG baseline projections scenario provides the official NTG population projections and uses parameter values that are based on recent to medium-term averages and trends.

The high migration scenario uses different assumptions about migration. The high migration scenario is based on migration trends experienced over the past five years, which represents a period of strong population growth for the Territory. More information on each of these scenarios is presented below, and the parameters for each are presented in Figure 2.

The NTPOP model also has the capacity to run other user-defined scenarios if users need to explore other population futures that incorporate different parameter values for the growth components. Users wishing to explore different scenarios should discuss their needs with Treasury. Treasury will also be exploring options to develop small area projections, which are outside the scope of this model.

## Northern Territory Government Projections

### Baseline Scenario

The NTG projections baseline scenario uses input parameters based on recent to medium-term historical averages and trends and assumes that these trends will continue into the future. In the initial years of the model, Northern Territory Budget forecasts are used to determine the parameters to capture expected short-term volatility in the estimates before reverting to the long-run average. Territory Budget forecasts are used in the initial years of the projection horizon to incorporate the latest known information to inform the interstate and overseas migration assumptions.

### High Migration Scenario

The high migration scenario is similar to the NTG baseline projections scenario. All parameters except net interstate migration are set at the same levels as for the NTG baseline projections scenario. Net interstate migration is set at 500 persons per annum and held constant for the life of the model.

Due to its magnitude and volatility, interstate migration is the most challenging growth component of the model to set, and its assumed parameter values can have a profound effect on the projection results. The high migration scenario is intended to be illustrative of the population outcomes that continued positive net interstate migration might produce.

Figure 2

**Summary of Assumptions and Parameters for The Projections Used in the Projections Model NTPOP**

Growth Component	Parameter
<b>Fertility<sup>1,2</sup></b>	<b>Total Fertility Rate (TFR)</b>
Territory Indigenous mothers	TFR 2.45 in 2009-10 decreasing to 2.32 in 2039-40
Territory non-Indigenous mothers	TFR 2.08 in 2009-10 increasing to 2.14 in 2039-40
<b>Mortality<sup>1,2</sup></b>	<b>Life Expectancy:</b>
Territory Indigenous males	62.4 years in 2009-10 increasing to 71.1 years in 2039-40
Territory Indigenous females	70.1 years in 2009-10 increasing to 78.8 years in 2039-40
Territory non-Indigenous males	76.6 years in 2009-10 increasing to 80.2 years in 2039-40
Territory non-Indigenous females	81.9 years in 2009-10 increasing to 84.5 years in 2039-40
<b>NTG PROJECTIONS BASELINE SCENARIO<sup>2</sup></b>	
<b>Interstate migration</b>	<b>Net interstate migration</b>
Territory Indigenous	-13 held constant for life of the model
Territory non-Indigenous	-1900 in 2010-11 to -600 in 2011-12 then -643 held constant thereafter
<b>Overseas migration</b>	<b>Net overseas migration</b>
Territory Indigenous	Zero net migration assumed
Territory non-Indigenous	1292 in 2010-11 to 1166 in 2011-12 and 1073 in 2012-13 then held constant at 1153 thereafter
<b>HIGH MIGRATION SCENARIO<sup>2</sup></b>	
<b>Interstate migration</b>	<b>Net interstate migration</b>
Territory Indigenous	-13 held constant for life of the model
Territory non-Indigenous	-1900 in 2010-11 to -600 in 2011-12 then 500 held constant thereafter

1 Unless otherwise stated these parameters also apply to the *short-term variable* and *high migration* scenarios.

2 Regional projections: fertility and mortality are the same as for Territory total; migration varies between the regions and is based on movement between Censuses.

## Overview of Results

Please see [http://www.nt.gov.au/ntt/economics/nt\\_population.shtml](http://www.nt.gov.au/ntt/economics/nt_population.shtml) for the complete set of projection numbers, available in Excel spreadsheets.

### Projected Population growth

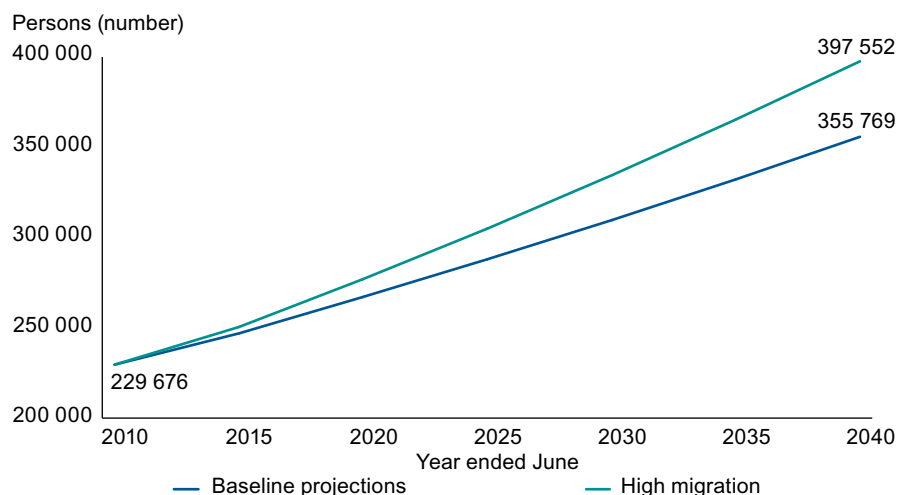
Table 2 shows the Territory's population is projected to grow to 310 000 by 2030 and to 356 000 by 2040 under the NTG baseline projections scenario assumptions. The Territory's Indigenous population is projected to increase to 94 000 by 2030 and to increase to nearly 110 000 by 2040. The higher migration assumptions of the high migration scenario would see the Territory's population grow by an additional 42 000 people to 398 000 in 2040, reflecting higher migration assumptions for the non-Indigenous population. Chart 2 compares the results for the two scenarios.

Table 2: Territory Population Estimates and Projections, All Scenarios, 2010 to 2040

Scenario	2010	2015	2020	2025	2030	2035	2040
	No.	No.	No.	No.	No.	No.	No.
<b>Territory total</b>							
Baseline	229 676	247 155	267 077	287 923	309 477	331 964	355 769
High migration	229 676	250 717	277 145	305 125	334 338	364 998	397 552
<b>Territory Indigenous</b>							
Baseline	68 661	74 566	80 778	87 236	94 018	101 190	108 874
High migration	68 661	74 573	80 838	87 402	94 353	101 773	109 817
<b>Territory non-Indigenous</b>							
Baseline	161 015	172 589	186 299	200 687	215 459	230 774	246 895
High migration	161 015	176 143	196 308	217 723	239 985	263 225	287 735

Source: Northern Territory Population Projections, 2011

Chart 2: Territory Population Estimates and Projections, All Scenarios, 2010 to 2040



Source: Northern Territory Population Projections, 2011

Under the baseline scenario, the Territory's population is projected to grow at an average growth rate of 1.5 per cent per annum over the life of the projections, compared to the high migration scenario (1.9 per cent) (Table 3). The Indigenous population is projected to grow by 1.5 per cent per annum, with little variation in the high migration scenario (1.6 per cent per annum). The growth in the Indigenous population is almost exclusively the result of natural increase. The moderation of growth is due to expected declining fertility rates, with the fertility rate for Indigenous mothers projected to decline from 2.45 to 2.32 births per woman. In addition, a very small amount

of additional growth in the Indigenous population would occur through increasing transmission of Indigenous status to children of mixed unions, that is, non-Indigenous mothers and Indigenous fathers and vice versa.

The Territory's non-Indigenous population is projected to grow by 1.4 per cent per annum on average over the life of the projections; under the high migration scenario growth would increase to 2.0 per cent per annum. This variation reflects the influence of migration on the growth of the non-Indigenous population.

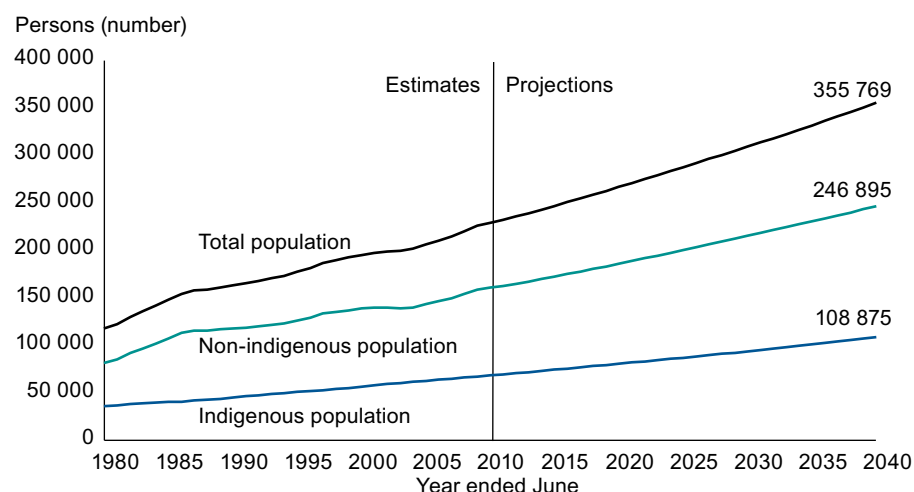
Table 3: Territory Average Annual Population Growth Rates, Five-Year Periods, All Scenarios

Scenario	2010-15	2015-20	2020-25	2025-30	2030-35	2035-40	Average annual growth 2010-2040
	%	%	%	%	%	%	%
<b>Territory total</b>							
Baseline	1.5	1.6	1.5	1.5	1.4	1.4	1.5
High migration	1.8	2.0	1.9	1.8	1.8	1.7	1.8
<b>Territory Indigenous</b>							
Baseline	1.7	1.6	1.5	1.5	1.5	1.5	1.5
High migration	1.7	1.6	1.6	1.5	1.5	1.5	1.6
<b>Territory non-Indigenous</b>							
Baseline	1.4	1.5	1.5	1.4	1.4	1.4	1.4
High migration	1.8	2.2	2.1	2.0	1.9	1.8	2.0

Source: Northern Territory Population Projections, 2011

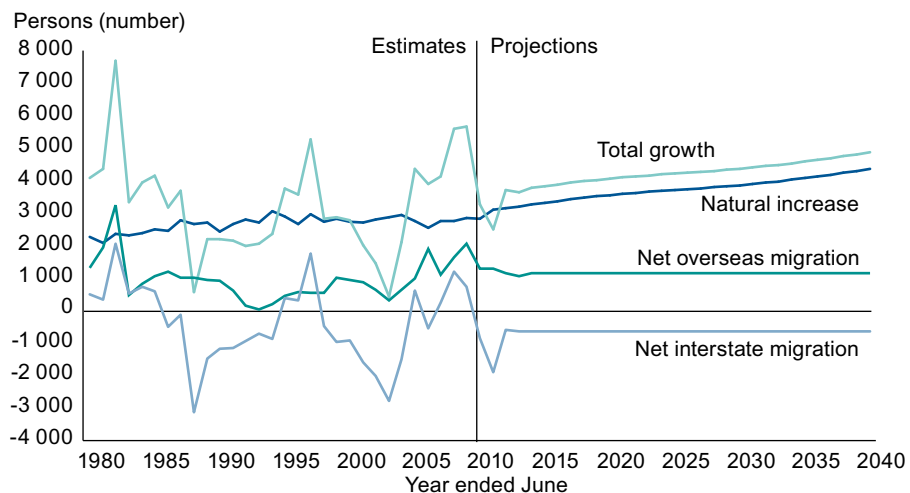
The following tables and charts present results from the NTG baseline projections scenario, the NTG official projections series. Chart 3 shows actual ABS population estimates from 1980 to 2010 and NTG baseline projections from 2011 to 2040 for the Indigenous, non-Indigenous and total populations. The volatility in the historical estimates is evident in the non-Indigenous population. The smooth trajectory of the projected non-Indigenous population growth does not imply that volatility will not be present in actual non-Indigenous population growth as it occurs in the future. Rather it is not sensible to attempt to project the exact trend as this is driven by the largely unpredictable and unknown future short-term major projects and associated employment. The volatility of the Territory's population estimates are further illustrated in Chart 4.

Chart 3: Territory Estimates and Projections, NTG Baseline Projections Scenario, 1980 to 2040



Source: ABS Cat. No. 3101.0; Northern Territory Population Projections, 2011

Chart 4: Territory Components of Growth, Estimates and Projections, NTG Baseline Projections Scenario, 1980 to 2040



Source: ABS Cat. No. 3101.0; Northern Territory Population Projections, 2011

## Age Structure

The population aged 15 years and under is projected to increase from 53 000 to 82 000 persons by 2040 (Table 4). Despite this, the proportion of the population aged 15 years and under is projected to remain unchanged at 23.1 per cent (Table 5). The proportion of the population aged 15 years and under for the Territory's Indigenous population is projected to decline 4.7 percentage points from 33.5 per cent to 28.8 per cent by 2040, reflecting falling levels of fertility over the life of the projections and stronger growth in the older age groups. The Territory's non-Indigenous population is projected to experience a slight increase in the proportion of the population aged 15 years and under, increasing from 18.7 per cent to 20.6 per cent in 2040.

The Territory's working-age population (15-64 years) is projected to increase to 239 000 by 2040, growing by 1.3 per cent per annum on average over the life of the projections. However, the proportion of the working-age population is projected to decline to 67.3 per cent by 2040 for both the Indigenous and non-Indigenous populations. This decline is primarily driven by an increase in the proportion of the older age population (65 years and over), which is projected to nearly triple by 2040. The proportion of the Indigenous population in the older age groups is projected to increase from 3.1 per cent to 9.3 per cent by 2040, significantly higher than the projected increase (6.6 per cent to 9.7 per cent) for the non-Indigenous population.

Table 4: Territory Estimates and Projections, by Age Cohort, NTG Baseline Population Projections Scenario, 2010 to 2040

Scenario	2010	2020	2030	2040	Average annual growth rate 2010-40
	No.	No.	No.	No.	%
<b>Aged 15 years and under</b>					
Indigenous	22 979	24 932	27 858	31 356	1.0
Non-Indigenous	30 100	39 330	45 532	50 893	1.8
Total	53 079	64 261	73 390	82 248	1.5
<b>Aged 15-64 years</b>					
Indigenous	43 562	52 091	59 763	67 433	1.5
Non-Indigenous	120 311	131 151	149 876	172 021	1.2
Total	163 873	183 242	209 639	239 454	1.3
<b>Aged 65 years and over</b>					
Indigenous	2 120	3 755	6 397	10 085	5.3
Non-Indigenous	10 604	15 819	20 051	23 982	2.8
Total	12 724	19 574	26 448	34 067	3.3
<b>Median age (years)</b>					
Indigenous	23.2	25.7	27.5	28.6	
Non-Indigenous	34.7	34.2	34.6	34.7	
Total	31.3	31.8	32.6	33.0	

Source: Northern Territory Population Projections, 2011

Table 5: Percentage by Age Cohort, NTG Baseline Population Projections Scenario, 2010 to 2040

Scenario	2010	2020	2030	2040
	%	%	%	%
<b>Aged 15 years and under</b>				
Indigenous	33.5	30.9	29.6	28.8
Non-Indigenous	18.7	21.1	21.1	20.6
Total	23.1	24.1	23.7	23.1
<b>Aged 15-64 years</b>				
Indigenous	63.4	64.5	63.6	61.9
Non-Indigenous	74.7	70.4	69.6	69.7
Total	71.3	68.6	67.7	67.3
<b>Aged 65 years and over</b>				
Indigenous	3.1	4.6	6.8	9.3
Non-Indigenous	6.6	8.5	9.3	9.7
Total	5.5	7.3	8.5	9.6

Source: ABS Cat. No. 3238.0; Northern Territory Population Projections, 2011

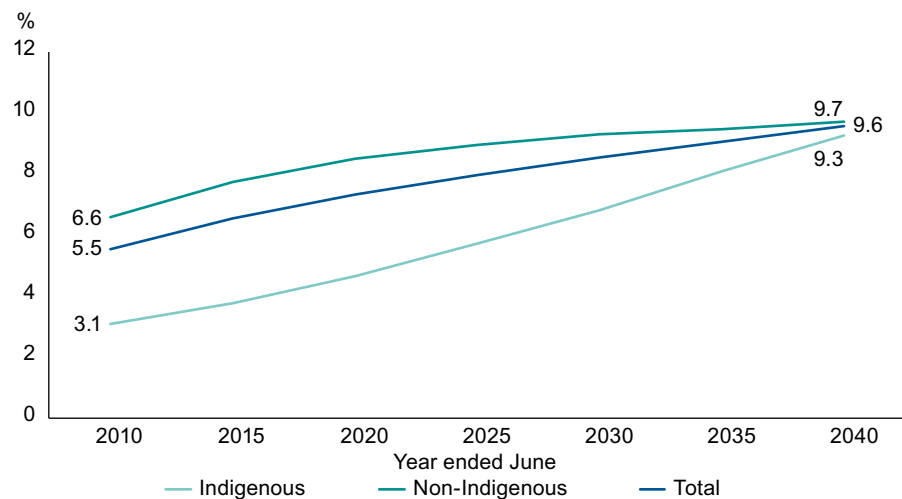
By 2040, the proportion of the Indigenous population aged over 65 years is projected to be virtually the same as the non-Indigenous population (Chart 5). This is primarily driven by improvements in Indigenous life expectancy, which is projected to increase from 62.4 years to 71.1 years for Indigenous males and from 70.1 years to 78.8 years for Indigenous females (Table 6).

Table 6: Life expectancy at birth, NTG projections, Northern Territory

	2010	2020	2030	2040	Change 2010-40
	Years	Years	Years	Years	Years
<b>Indigenous</b>					
Territory males	62.4	65.4	68.1	71.1	8.7
Territory females	70.1	73.1	75.8	78.8	8.7
<b>Non-Indigenous</b>					
Territory males	76.6	78.5	79.4	80.2	3.6
Territory females	82.0	83.3	83.9	84.5	2.5

Source: Northern Territory Population Projections, 2011

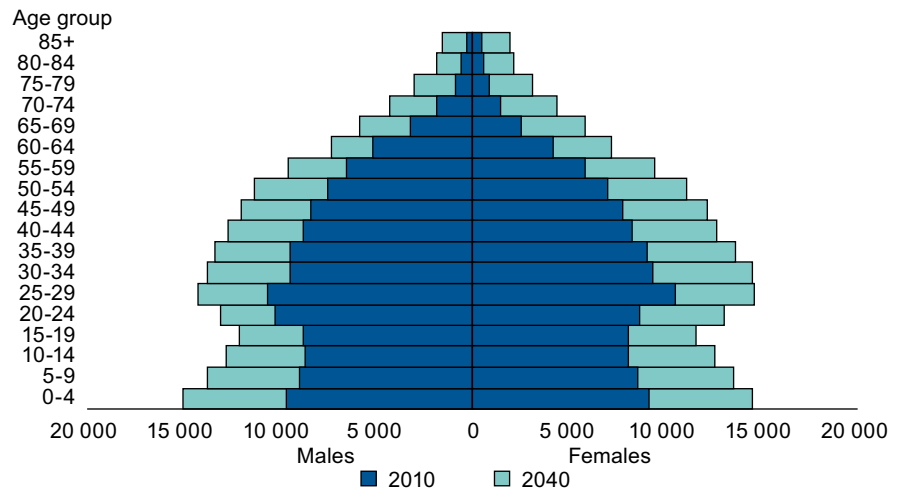
Chart 5: Proportion of the population aged 65 years and over, Northern Territory, NTG Baseline Scenario, 2010 to 2040



Source: Northern Territory Population Projections, 2011

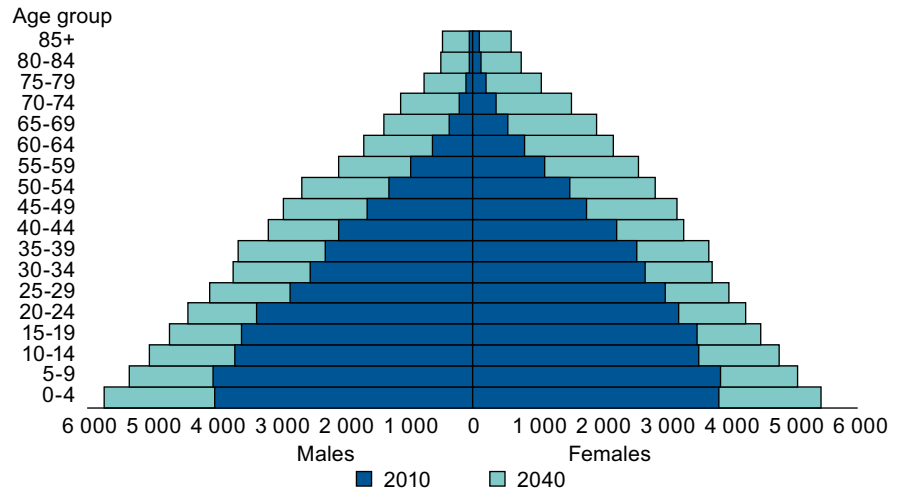
Charts 6 to 8 show the current (2010) and projected age distributions of the total Indigenous and non-Indigenous populations under the NTG baseline projections scenario assumptions. The shape of the age pyramids is not projected to change markedly. Although, there is some flattening out of the Indigenous age pyramid for 2040 in the older years due to improving life expectancy. However, the distribution of the age pyramid is still heavily influenced by high fertility, high mortality and low net migration. The non-Indigenous population in 2040 similarly exhibits the same patterns as a consequence of migration churn in the middle years as it did in 2010. The ageing of both populations can be seen in the increasing numbers of older people at the top of the pyramids.

Chart 6: Age Pyramid, Northern Territory, Age group 2010 and 2040, NTG Baseline Projections Scenario



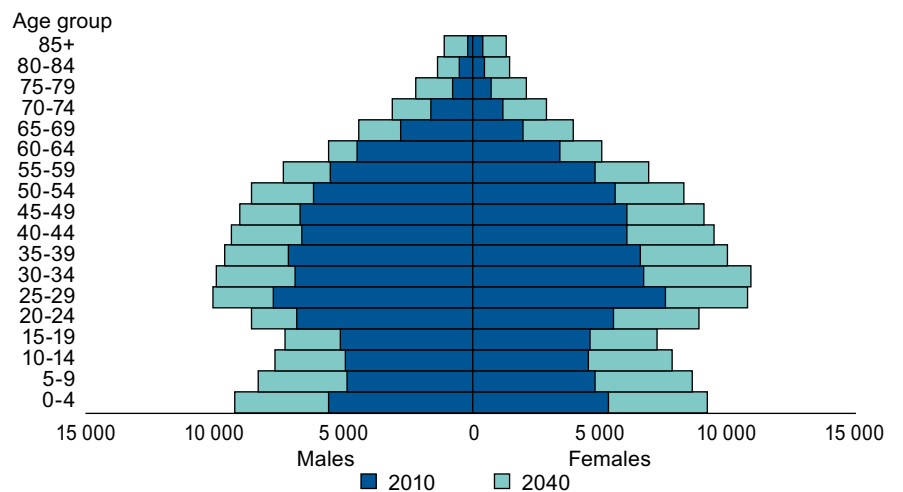
Source: Northern Territory Population Projections, 2011

Chart 7: Age Pyramid, Northern Territory Indigenous Population 2010 and 2040, NTG Baseline Projections Scenario



Source: Northern Territory Population Projections, 2011

Chart 8: Age Pyramid, Northern Territory Non-Indigenous Population 2010 and 2040, NTG Baseline Projections Scenario



Source: Northern Territory Population Projections, 2011

## Regional Projections

Projections for the regions are produced for five-year periods and five-year age groups, from 2010 to 2025, reflecting the uncertainty and difficulty associated in projecting small area populations compared with the total Territory population. One of the major difficulties is the small population numbers for some regions, particularly for older non-Indigenous Territorians. In addition, projections of intra-Territory migration by age, sex and Indigenous status is particularly problematic due to small numbers for some age and cohort groups and the need to constrain to total migration at the Territory level.

Analyses of Census patterns of movement between 2001 and 2006 are used to set the main parameters and the trend for regional migration. There are limitations in this approach in that the period chosen, in this case 2001-06, may be atypical for some regions. However, due to changes in estimation methods between Censuses, the approach used is the most robust.

The assumptions for fertility and mortality used for the Territory total projections are retained in the regional model. Currently, the available births and deaths data does not support the accurate estimation of regional fertility and mortality patterns.

The results from the regional projections model (Table 7) show the population of the Darwin region is projected to increase to 166 000 persons by 2025. The share of the Territory's population living in the Darwin region (Darwin City, Palmerston, and Litchfield) is projected to gradually increase from 55.4 per cent to 57.8 per cent in 2025 with corresponding gradual declines in all other regions. The increase in the share would result in an additional 39 000 people living in the Darwin region by 2025. The changing share is reflected in the higher growth rates in the Darwin region population. Compared with other regions, the Darwin region is projected to increase by an average of 1.7 per cent per annum in the five years to 2015, before increasing to 1.9 per cent per annum on average between 2015 and 2025. The Indigenous population in the Darwin region is projected to grow more strongly than the non-Indigenous population, although from a lower base, mainly due to the impact of interstate out-migration of non-Indigenous persons from the Darwin region.

Table 7: Estimates and Projections and Average Annual Growth Rates (Five-Year Periods), Northern Territory Statistical Reporting Regions, NTG Projections Baseline Scenario

Scenario	2010	2015	2020	2025	2010-15	2015-20	2020-25
	No.	No.	No.	No.	%	%	%
<b>Darwin region</b>							
Indigenous	14 176	16 331	18 850	21 719	2.9	2.9	2.9
Non-Indigenous	113 078	121 871	132 912	144 640	1.5	1.7	1.7
Total	127 254	138 202	151 762	166 359	1.7	1.9	1.9
Share of Territory population (%)	55.4	55.9	56.8	57.8			
<b>Rest of Darwin</b>							
Indigenous	9 178	9 595	9 998	10 367	0.9	0.8	0.7
Non-Indigenous	3 260	3 396	3 516	3 647	0.8	0.7	0.7
Total	12 438	12 991	13 514	14 014	0.9	0.8	0.7
Share of Territory population (%)	5.4	5.3	5.1	4.9			
<b>East Arnhem</b>							
Indigenous	10 240	11 003	11 730	12 434	1.4	1.3	1.2
Non-Indigenous	6 035	6 415	6 770	7 111	1.2	1.1	1.0
Total	16 274	17 419	18 499	19 545	1.4	1.2	1.1
Share of Territory population	7.1	7.0	6.9	6.8			
<b>Katherine</b>							
Indigenous	13 032	14 039	15 067	16 118	1.5	1.4	1.4
Non-Indigenous	11 201	11 837	12 371	12 883	1.1	0.9	0.8
Total	24 233	25 875	27 438	29 001	1.3	1.2	1.1
Share of Territory population (%)	10.6	10.5	10.3	10.1			
<b>Barkly</b>							
Indigenous	5 334	5 452	5 568	5 652	0.4	0.4	0.3
Non-Indigenous	2 852	2 981	3 094	3 192	0.9	0.7	0.6
Total	8 186	8 432	8 662	8 845	0.6	0.5	0.4
Share of Territory population (%)	3.6	3.4	3.2	3.1			
<b>Alice Springs</b>							
Indigenous	16 701	18 146	19 566	20 945	1.7	1.5	1.4
Non-Indigenous	24 589	26 089	27 637	29 214	1.2	1.2	1.1
Total	41 290	44 235	47 203	50 159	1.4	1.3	1.2
Share of Territory population (%)	18.0	17.9	17.7	17.4			

Source: Northern Territory Population Projections, 2011

## Comparison of Projection Releases

This section of the report compares the difference in results between the 2009 release (2006 jump-off year) of the Northern Territory population projections and the 2011 release (2010 jump-off year). Projections of the Indigenous population are relatively similar between the two projection releases, reflecting the similar assumptions about natural increase between the two releases.

The projected results for the non-Indigenous population show a difference between the releases, reflecting the changes to assumptions about migration. The assumption for interstate migration was changed from a net loss of 814 persons per annum to a net loss of 643 persons per annum, based on current available data. This difference is then compounded through the cohort-component process resulting in more births and consequently higher levels of population.

The difference in the older age groups between the projection releases reflects changed assumptions about life expectancy, with non-Indigenous life expectancy assumptions lower in the 2011 release, based on the latest ABS data. It should be noted that the change in life expectancy reflects a methodological change by the ABS and cannot be compared with other life expectancy estimates. Indigenous life expectancy between the two releases is largely the same.

Table 8: Comparison of projection results for years 2020 and 2030

	2006 projections	2010 projections	Difference
<b>2020</b>			
<b>Territory total</b>			
Indigenous	80 330	80 778	448
Non-Indigenous	179 446	186 229	6 783
Total	259 776	267 077	7 301
<b>Age structure</b>			
Aged 15 years and under	63 928	64 261	333
Aged 15-64 years	179 132	183 242	4 110
Aged 65 years and over	20 272	19 574	-698
<b>2030</b>			
<b>Territory total</b>			
Indigenous	93 181	94 018	837
Non-Indigenous	201 673	215 459	13 786
Total	294 854	309 477	14 623
<b>Age structure</b>			
Aged 15 years and under	71 387	73 390	2 003
Aged 15-64 years	199 357	209 639	10 282
Aged 65 years and over	28 109	26 448	-1 661

Source: Northern Territory Population Projections, 2009 and 2011

## Appendix 1: Technical Details of the NTPOP Population Projections Model

In addition to the summary presented below, interested readers are referred to the Treasury website [http://www.nt.gov.au/ntt/economics/nt\\_population.shtml](http://www.nt.gov.au/ntt/economics/nt_population.shtml) for the mathematical details of NTPOP (Wilson, T, *Mathematical details of the NTPOP projection model*, School for Social and Policy Research, CDU, Darwin).

The projections in this report were produced using the NTPOP projection model, a cohort-component model designed especially for the Territory to project both Indigenous and non-Indigenous populations.

The model produces projections of the population disaggregated by:

- sex (male and female);
- Indigenous status (Indigenous and non-Indigenous);
- region (Northern Territory, Northern Territory Statistical Reporting regions and rest of Australia); and
- single-year and five-year age cohorts.

Projected population numbers are calculated at 30 June for each year of the projection horizon, and demographic components of change reflect the year to 30 June.

Each cohort (age, sex, Indigenous status and region) is individually calculated in the projection model. Projection calculations proceed in one-year intervals, from 30 June of one year to 30 June in the next. During every projection interval various quantities are added to the initial population and other quantities are subtracted, leaving the projected population at the end of the year. These quantities are known as the demographic components of change (hence the description 'cohort-component' model).

The population accounting equation in the NTPOP model is:

Population at time  $t$  = population at time  $t-1$  + (births - deaths) + (interstate in migration - interstate out migration) + (overseas arrivals - overseas departures).

For the NTG regions, interstate, intra-regional and overseas migration are combined into one net migration input figure which represents the expected net flow of migrants to the region over a five-year period. The conceptual basis however is essentially the same as that presented above with the components of growth being added to or subtracted from the initial population.

Projection assumptions and parameters are required for each component of the population equation for Indigenous and non-Indigenous populations for the Territory, the rest of Australia and each region for each year of the projections.

Demographic components of change in the accounting equation are calculated by multiplying rates by populations, for example:  $deaths = death\ rate \times population$ ; or in the case of net migration, set as numbers directly.

More information on these calculations is given below.

## Components of NTPOP Population Projections Model

### Jump-Off Year

The current version of the model commences from the 30 June 2010 ABS Estimated Resident Populations (ERPs). Ideally, a jump-off year would usually coincide with a Census year as the ABS produces Indigenous ERPs for these years only. In addition, in theory, the ERP for a Census year is the most accurate estimate of population available. With each passing year from a Census year, ERPs become prone to greater error due to inaccuracies in the intercensal measurement of the growth components of births, deaths and migration.

ERPs are preferable to Census counts because they adjust for Census net undercount among other things. ERPs are also Australia's official population estimates.

Using ABS published ERPs in the base year provides the model with a credible starting point. In addition, with each passing year and the publishing of further ERPs by ABS, the model can be updated, if required, with these revised ERPs. It is not desirable to have two sets of estimates in circulation, particularly when ABS estimates are used for all official purposes. As a consequence, this release provides more up-to-date and relevant population projections to align with published ABS data.

### NTPOP Projection of Cohort Births

The projection of cohorts born in each projection interval is performed in a three step process.

1. The number of babies born by Indigenous status of mother is projected by multiplying age-specific fertility rates by the female population in each single-year age group from 15 to 49 years. This gives projected births to Indigenous mothers and non-Indigenous mothers.
2. Births to these two groups of mothers are then cross-classified by the Indigenous status of the infant, giving rise to a four-fold classification of infants:
  - a. Indigenous births to Indigenous mothers;
  - b. non-Indigenous births to Indigenous mothers;
  - c. Indigenous births to non-Indigenous mothers; and
  - d. non-Indigenous births to non-Indigenous mothers.

Babies in groups (a) and (c) are then grouped as Indigenous births; (b) and (d) as non-Indigenous births.

3. The resulting Indigenous and non-Indigenous infant cohorts then have various components of change added or subtracted in the same manner as for other cohorts. The previous accounting equation is modified slightly, with births replacing the start-of-year population.

### Geography

The projection model considers Australia to be divided into two geographic regions, Northern Territory and 'rest of Australia'. Migration between the two geographic regions is allowed, as is migration into and out of Australia through either of the regions. Within the Northern Territory, migration is allowed between the regions, as well as to and from the rest of Australia and overseas.

## Parameter Setting

The model splits all demographic rates into two parts: a summary indicator and an age profile. For the fertility component for example, initially the user needs to set the total fertility rate (TFR) and a fertility age profile for each population group. The fertility age profile consists of age-specific fertility rates. Once the fertility age profile has been set, it does not need to be changed again for the life of the model unless new information comes to light that warrants this. The TFR however can be easily changed allowing different scenarios to be explored.

A similar split into age profile and summary indicator is used for all the other components of growth.

## Fertility

The model applies TFRs to four population subgroups (Territory Indigenous mothers; Territory non-Indigenous mothers; rest of Australia Indigenous mothers; rest of Australia non-Indigenous mothers), adjusts for the percentage of Indigenous births to these mothers, and uses the age-profiles of fertility at each reproductive age to calculate age-specific fertility rates. The projected numbers of births are then calculated by multiplying the age-specific fertility rates by the relevant populations.

The input parameters are TFRs, sex ratios at birth, the percentage of Indigenous births, and age profiles of fertility for each of the population subgroups of mothers and for each year of the projections.

## Mortality

The model uses life expectancies at birth for eight population subgroups (Territory Indigenous males; Territory Indigenous females; Territory non-Indigenous males; Territory non-Indigenous females, rest of Australia Indigenous males; rest of Australia Indigenous females; rest of Australia non-Indigenous males; rest of Australia non-Indigenous females) and age-specific death rates (ASDRs) to calculate numbers of deaths for each of the groups for each year of the projections.

Inputs are the life expectancies at birth and ASDRs for the eight groups for each year of the projections.

Different mortality scenarios can be explored by changing the life expectancy at birth estimates.

## Interstate Migration

The NTPOP model calculates in-and out-migration differently. The user defines a net interstate migration figure and an out-migration figure is added to this to obtain a total in-migration figure. The out-migration figure is calculated by multiplying the Territory population by age-specific out-migration rates. These out-migration rates are known as gross migration rates (GMRs) and are inputs to the model. They are similar in concept to TFRs in that they are the sum of all the age-specific migration rates. The GMR represents the total number of out-moves a person might make in his or her lifetime.

Numbers of in-migrants by age and sex are calculated by applying the age and sex-specific rates of in-migration to the Territory from the rest of Australia to the population of rest of Australia. These numbers are then scaled so they sum to the total in-migration figure calculated as above. This ensures that sensible in-migration numbers are maintained.

Inputs are:

- Net interstate migration (NIM) numbers for the Territory for each year of the projections for: (i) Indigenous males; (ii) Indigenous females; (iii) non-Indigenous males; and (iv) non-Indigenous females.
- GMRs for out-migration from the Territory (to the rest of Australia) for each year of the projections for: (i) Indigenous males; (ii) Indigenous females; (iii) non-Indigenous males; and (iv) non-Indigenous females.
- Age profiles of interstate in-and out-migration for each year of the projections for the same four categories as above. Age-specific migration rates are stable over time, and as a consequence these age profiles remain fixed over the life of the projections.

## Overseas Migration

Immigration (migration into Australia from overseas) is projected as numbers rather than rates. It is common practice to use numbers rather than rates in the projection of immigration for several reasons, including: (i) the origin population for immigration is the rest of the world, so taking a 'rates times origin population' approach would require projections for the rest of the world; and (ii) unlike many other demographic variables, immigration has little to do with the global population size and more to do with things like migration policy and major refugee generating events.

Emigration (migration from Australia to overseas) is calculated by multiplying emigration rates by the origin (Territory or rest of Australia) population and then scaling to the user-defined total.

By having a user-defined total for emigration, it is possible to also indirectly set net overseas migration totals because, as described above, immigration assumptions are also set in terms of numbers.

Inputs are:

- Immigration totals for each year of the projections for: (i) Territory Indigenous males; (ii) Territory Indigenous females; (iii) Territory non-Indigenous males; (iv) Territory non-Indigenous females; (v) rest of Australia Indigenous males; (vi) rest of Australia Indigenous females; (vii) rest of Australia non-Indigenous males; and (viii) rest of Australia non-Indigenous females.
- Emigration totals for each year of the projections for each of the eight categories above.
- Age profiles of immigration and emigration for each of the eight categories above. These age profiles remain fixed over time in the model.

## Changes in Indigenous Identification

Direct migration between the Indigenous and non-Indigenous populations is possible in the model, simulating changes in the propensity for people to change their Indigenous status. This is a unique feature of the model but currently the lack of available information about people's propensity to identify as Indigenous means that it has not been feasible to set meaningful values for these parameters. Hence currently changes in identification, which are projected as rates multiplied by populations, are set at zero.

# Notes on Data Sources and Assumptions for the NTG Projections Scenarios

## Key Publications

Key ABS publications used in setting assumptions and parameters are:

- 3201.0- Population by Age and Sex, Australian States and Territories, Jun 2010 (21/12/2010);
- 3222.0- Population Projections, Australia, 2006 to 2101 (09/04/2008);
- 3218.0- Regional Population Growth 2009-10 (31/3/2011);
- 3235.0- Population by Age and Sex, Regions of Australia, 2009 (05/08/2010);
- 3238.0- Experimental Estimates and Projections, Aboriginal and Torres Strait Islander Australians, 1991 to 2021 (08/09/2009); and
- 3412.0- Migration, Australia 2009-10 (29/07/2010).

## Fertility

### TFR

Territory Indigenous TFR is sourced from ABS Cat. No. 3238.0 for 2007 (2.49 births per woman), which is reduced by the rate assumed in 3238.0, to derive the 2010 TFR (2.45). This TFR is then decreased at a constant rate of 0.012 per cent per annum until 2021. For years 2022 to 2040 the TFR is assumed to remain constant.

Territory non-Indigenous TFR is set at a constant ratio of the total TFR. This ratio is calculated using 2006 data from the Health Gains Planning branch of the Department of Health and Families (DHF) (0.9 of the total Territory TFR) and applied to the total Territory TFR as published for 2010 in ABS Cat. No. 3222.0. Territory non-Indigenous TFR is held constant from 2021.

Territory non-Indigenous fertility rates are assumed to increase from 2.08 to 2.14, reflecting the increase in total fertility rates to the highest levels since the 1970's. This increase has been driven by the cohort effect, whereby the cohort of women who delayed having children during the last decade are now having children at older ages. Other factors driving higher non-Indigenous fertility rates include; increased wealth, increased maternity leave benefits and flexible working arrangements to support woman in the workplace and the cohort effect.

Rest of Australia Indigenous TFR is based on published TFRs in 3238.0 for 2007 to which the published assumption of a decline of 0.05 per cent per annum is applied to obtain the 2010 Indigenous TFR and the TFR for future years. Rest of Australia non-Indigenous TFR is set to the Series B assumptions for TFR from. 3222.0

Regional TFRs and the percentage of Indigenous births are set to the five-year cohort-period projected averages for the total Territory. There is currently insufficient evidence to suggest that regional TFRs can be accurately set to existing published figures for proxy regions (e.g. balance of Northern Territory, LGAs within regions etc).

## Sex Ratios at Birth

Territory sex ratios at birth for Indigenous mothers are set to a 10 year average based on Health Gains Planning data up to and including 2006 (106.5 males per 100 females), while sex ratios at birth for non-Indigenous mothers are set to published figures in ABS Cat. No. 3301.0 (105.6)

Rest of Australia sex ratios at birth for Indigenous mothers are set to those published in 3238.0 (105.5). Sex ratios at birth for non-Indigenous mothers are set to those published in 3222.0 (105.5).

## Percentage Indigenous Births

The Territory's percentage of Indigenous births to non-Indigenous mothers is based on published data in 3238.0 for 2007. A constant increase of 0.017 per cent per annum is applied based on existing research to derive the 2010 figure (8.7 per cent) and future years. The percentage of Indigenous births to Indigenous mothers is set to 100 per cent for the life of the projections.

The rest of Australia percentage of Indigenous births to non-Indigenous mothers are set to those published in 3238.0 for 2007, to which a constant rate of increase of 0.1 per cent per annum (as assumed in 3238.0) is applied to derive the figure for 2010 (1.04 per cent) and future years. The rest of Australia percentage of Indigenous births to Indigenous mothers is set to 96.3 per cent based on the work of Kinfu and Taylor (2002).

## Mortality

### Life Expectancies

Indigenous and non-Indigenous life expectancies are based on 3238.0 published for 2005-2007 with Indigenous males (61.5 years) and Indigenous females (69.2 years). These estimates are then increased at a constant rate of 0.3 years per annum to give the 2010 jump off and subsequent life expectancies of 62.4 years for males and 70.1 years for females. Non-Indigenous life expectancy estimates from 2005-2007 adjusted according to research by Wilson (2007) to give life expectancy estimates for 2010 of 76.6 years for non-Indigenous males and 81.9 years for non-Indigenous females.

The assumption of improvement in Indigenous life expectancy is based on current research in the field, reflecting gradual improvements over time in Indigenous health and education, leading to improved socio-economic outcomes resulting in increased life expectancy.

Indigenous and non-Indigenous life expectancy for rest of Australia is based on the same methodology as above.

## Regional Fertility and Mortality

The same Indigenous and non-Indigenous TFRs as for the Territory total population (see above) are used for all the regions, after discussions with Health Gains Planning. There is uncertainty over the data on place of usual residence for mothers giving birth in the Territory, hence the TFRs published by the ABS for regions are not considered accurate.

The percentage of births that are Indigenous is based on five-year averages of Territory rates.

For mortality, Indigenous and non-Indigenous life expectancy is not set for each region. Rather the model draws on the Territory level life expectancy and age-specific death rates and a standardised mortality ratio (SMR) for each region. The SMRs are currently set at 100 for all regions. This assumes

that mortality is the same across all regions and Territory as a whole. This is known not to be the case however there is insufficient accurate data to justify an alternative approach.

### Interstate Migration

Territory net interstate migration for Indigenous persons is set to -13 persons per annum as published in 3238.0. Research has shown that Indigenous persons engage in interstate migration, particularly around cross-border areas such as the Northern Territory/South Australia border. However, due to data limitations capturing these movements is difficult. Census data indicates that the numbers of Indigenous interstate movements is small and that, in net terms the number is close to zero.

The parameters for the net interstate migration for non-Indigenous Territorians are based on the average level of the 10 year period between 2000 and 2010. This is split equally between males and females. GMRs for non-Indigenous Territorians were based on Census out-migration levels. Initial GMR values were obtained by examining projected out-migration totals for the first few years of the projections and adjusting to ensure they were roughly in line with past trends. Trends in Census data suggests a gradual decline in GMRs over time.

Age profiles of migration to and from the Territory were based on movements of people between Censuses. Data from past Censuses shows that the profile is remarkably stable over time.

### Overseas Migration

Net overseas migration for Indigenous people for both the Territory and rest of Australia is set at zero.

For non-Indigenous people, overseas arrivals and departures data for 2010 is sourced from ABS Cat. No. 3412.0. Projections for 2011 and 2012 are based on Northern Territory Treasury Budget forecasts, with projections from 2013 based on the 10-year average net overseas migration, held constant for the life of the projections.

Net overseas migration is skewed to a higher proportion of males in both arrivals and departures. To account for this a gendered split based on the past 4 years of data is applied. Territory arrivals have a gender ratio of 59% males, and for departures 66% are male.

For the age profiles of overseas migration for non-Indigenous people, the average age profile over the period 1995-96 to 2005-06 was based on passenger card data supplied by ABS. The data refers to long-term and permanent migrants.

### Regional Migration

As noted previously in this report, the regional population projections have greater limitations than the Territory total projections because the base input data is less accurate for smaller geographic areas, and the migration flows become more complex at lower geographic levels as intra-regional as well as interstate and international migration to the Territory needs to be taken into account.

Regional net migration is set as the sum of (1) net interstate, (2) net intra-Territory and (3) net overseas migration, with net intra-Territory migration summing to zero. Regional net migration for all three types of migration for all regions sums to net interstate and net overseas migration for the Territory as a whole.

Census data on migration patterns was used to allocate migration to the regions, with the majority of interstate and overseas migration taking place in the Darwin region. However, because of small numbers of migrants to and from individual regions, and hence the ability of the model to produce negative numbers in some age cohorts at the regional level, adjustments need to be made for some age groups at regional levels. As a consequence users should use the estimates of the regions with caution.

## Appendix 2: Map of Regions

The map shows the Northern Territory Government Statistical Reporting Regions of Darwin, Katherine, East Arnhem, Barkly and Alice Springs. The area of Greater Darwin, which sits within the Darwin region and consists of Darwin, Palmerston and Litchfield, is indicated by the shaded blue area.

