

POPCORN:

Population Projections for a Country's Regions

User Guide

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Disclaimer. Whilst every care has been taken in the production of POPCORN, the University of Queensland accepts no responsibility for decisions or actions taken as a result of the use of the POPCORN model.

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1 Introduction

What is POPCORN?

POPCORN (Population Projections for a Country's Regions) is a population projection system for up to 75 sub-national areas. It uses a cohort component model to project the population by sex and age group every five years for up to 50 years ahead. It has been specially designed with relatively low input data requirements: all necessary input data should be available directly from the ABS website without the need to purchase customised tables. The user interface of POPCORN consists of a fairly simple Excel 2007 workbook (though for computational speed most of the projection calculations are performed in the background by a fortran 95 program).

What this User Guide does

This User Guide takes users through all the steps required to produce a set of population projections using POPCORN, including data gathering, input data calculations, assumption-setting, running, error handling and projection output reviewing.

Before you begin

It is advised that users:

- are familiar with the general principles of the cohort-component projection model and the basics of demography;
- have a high level of computer literacy generally;
- have experience in using Microsoft Excel;
- are comfortable navigating the ABS website.

Please also ensure that you have available a computer running Windows with at least 1 GB of memory (most standard PCs have more than this) and that Microsoft Excel 2007 has been installed.

In addition, users are advised to register with the ABS TableBuilder service in order to obtain 2006 Census data. See: www.abs.gov.au/TableBuilder.

Contents of the POPCORN CD

The CD contains the following files.

Directory	Files
POPCORN	POPCORN.exe salflibc.dll
POPCORN\documentation	POPCORN User Guide.pdf
POPCORN\input	Census migration data for POPCORN.xlsx POPCORN input data.xlsm POPCORN input data - State & Territory example.xlsm
POPCORN\output	<i>Empty – files are generated on running POPCORN</i>
POPCORN\technical	<i>Empty – files are generated on running POPCORN</i>

2 Installation

Step 1

Copy the POPCORN directory from the CD to C:\ on your computer. Users will require full access to this directory (i.e. ensure you do not need administrator privileges).

N.B. The files **POPCORN.exe** and **salflibc.dll** must be kept in the directory C:\POPCORN. Other files in the POPCORN directory may be placed anywhere.

Step 2

Open up Excel 2007. Adjust the settings to allow macros to run by going to

- Excel button (top left-hand corner)
- Excel options (at the bottom of the list)
- Trust Center
- Trust Center Settings
- Macro Settings. Choose “Disable all macros with notification”.

Close Excel.

POPCORN is now ready to use.

3 Input data workbook

All data inputs required to produce population projections should be supplied in the **POPCORN input data.xlsm** Excel workbook (in POPCORN\input). Whenever you open **POPCORN input data.xlsm** a “Security Warning” will appear. Click on the “Options” box and select “Enable this content”.

It is recommended that separate copies of the input data workbook are created for every projection scenario you wish to produce. The input data workbook can be given any name, e.g. POPCORN input data – principal projection.xlsm or POPCORN input data – low fertility scenario.xlsm.

The workbook consists of the following sheets:

Name of sheet	Purpose
Cover	Projection program title. (User inputs not required)
Glossary	Explains the meaning of demographic terms used in the workbook. (User inputs not required)
Labels	Jump-off and final years of the projections are set; names of regions are supplied.
Jump-off pops	Jump-off populations are required
TFR	Total Fertility Rate assumptions are set
Fertility age profiles	Fertility age profile assumptions are set
Life expectancy	Life expectancy at birth assumptions are set
Mortality surface	The assumed mortality surface is supplied
In-migration	In-migration probabilities are required
Out-migration	Out-migration probabilities are required
NIM	Net Internal Migration assumptions are set
Immigration	Immigration numbers are required
Emigration	Emigration probabilities are required
NOM	Net Overseas Migration assumptions are set
Validate	Projection are validated
Run	The button to run the projection model is in this sheet
POPCORNinputs	All the data inputs from the rest of the workbook are gathered together in a format for the POPCORN projection program to read in. (User inputs not required)

As a general rule user-supplied data should be placed in the green cells of the workbook. Other cells may contain formulae or values which are used elsewhere in the workbook and should not be changed. To add notes to cells go the Review ribbon and select ‘New Comment’.

Please do not add rows and columns to the workbook. POPCORN reads in data from specific cells in several sheets. If they change location POPCORN may not run correctly.

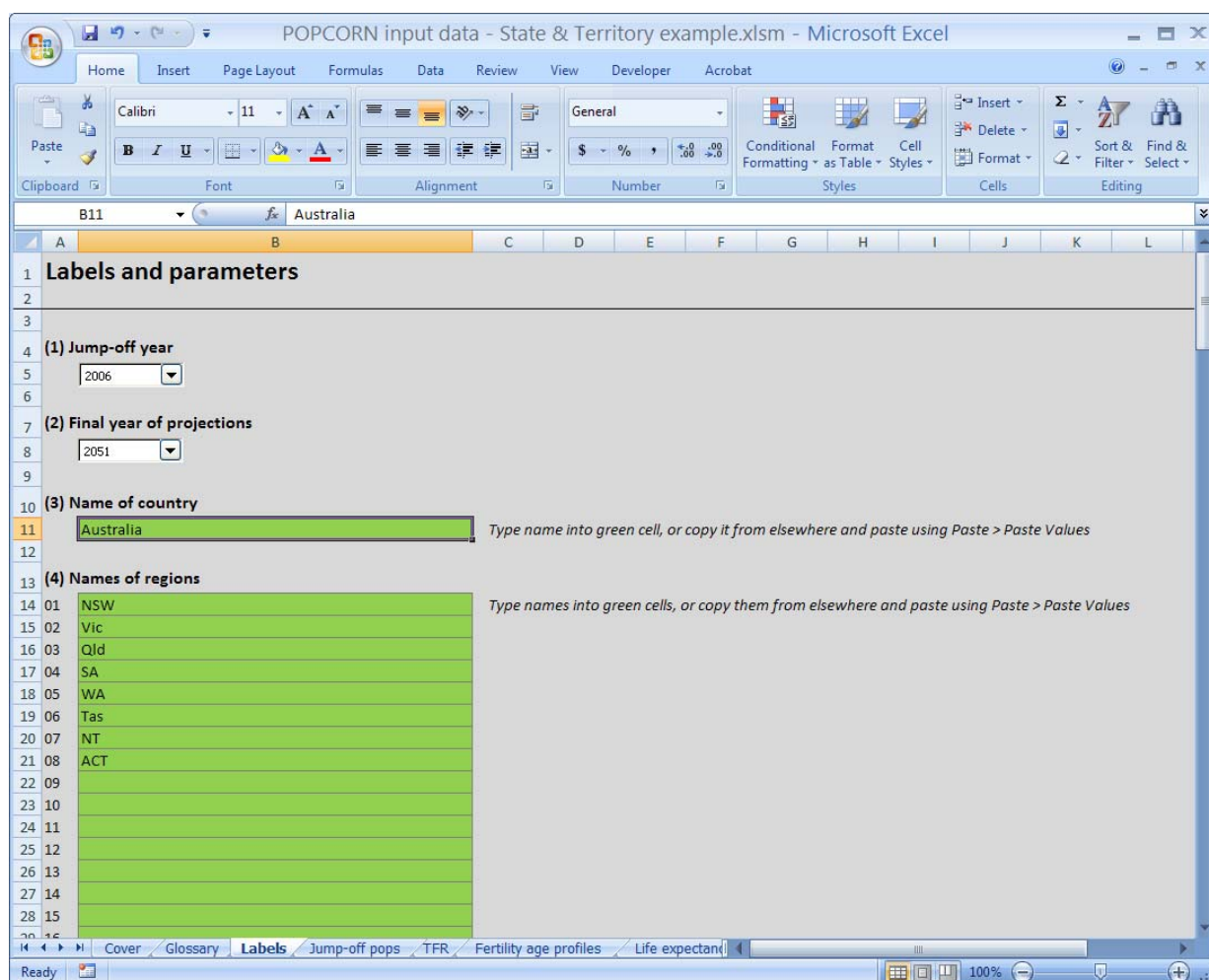
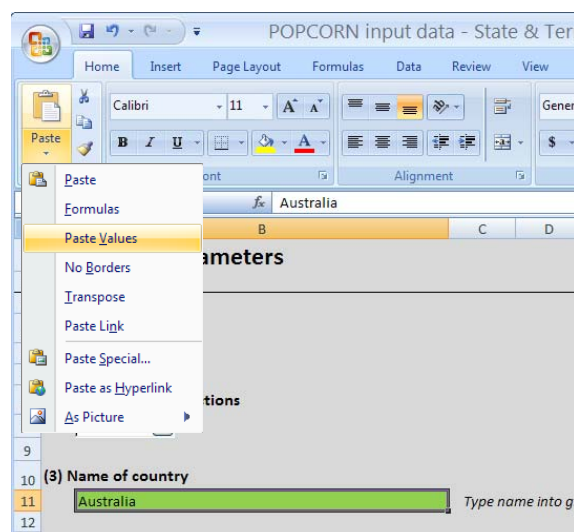
3.1 Labels sheet

In the Labels sheet set the jump-off (or starting) year of the projections and the final year using the pull-down menus. Then, in the green cells, supply the name of the country (e.g. Australia) and the names of the regions.

If you are copying names from elsewhere be sure to 'Paste Values' to avoid changing the formatting in the worksheet. To do this:

- (a) Select the 'Home' ribbon.
- (b) Click on the small down arrow on the 'Paste' button.
- (c) Select 'Paste Values' (as shown to the right).

Please ensure that your regions cover the whole country (excluding Other Territories). If, for example, you wish to produce projections for the regions of just one State then create one additional Rest of Australia "region" comprising the remainder of the country.



3.2 Jump-off populations sheet

In this sheet supply jump-off (starting) Estimated Resident Populations (ERPs) for each region by sex and five year age group from 0-4, 5-9, ... 80-84 and 85+. Female ERPs are supplied towards the top of the sheet; male ERPs are supplied a little further down.

Please ensure that if you copy and paste data from elsewhere that you 'Paste Values' into the green cells.

Beneath row 159 are the populations from the green cells summed over age group and sex to provide regional population totals. These can be used to check against original sources to pick up any errors.

ERPs are available from the ABS website, www.abs.gov.au. ERPs for sub-State regions may be found in the publication *Population by Age and Sex, Regions of Australia* (catalogue number 3235.0).

POPCORN input data - State & Territory example.xlsm

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	2006 jump-off populations												
2													
3													
4	Region		Sex	Age group									
5	01 NSW		Females	211,577	215,559	222,208	222,908	231,968	233,261	251,218	249,502	252,789	247,364
6	02 Vic		Females	154,064	156,291	163,706	169,593	181,054	176,993	190,211	196,916	192,092	185,420
7	03 Qld		Females	130,250	134,736	141,330	138,335	145,393	136,230	147,477	151,270	153,134	148,118
8	04 SA		Females	43,917	46,892	49,684	50,875	53,083	47,591	50,927	55,336	57,898	58,487
9	05 WA		Females	63,280	65,809	69,131	70,880	71,801	67,484	72,289	76,410	77,745	75,960
10	06 Tas		Females	14,620	15,603	16,628	16,467	15,443	13,893	15,485	17,052	17,927	18,732
11	07 NT		Females	8,667	8,218	8,108	7,406	8,260	8,858	8,912	8,558	7,783	7,362
12	08 ACT		Females	10,002	10,214	10,565	11,877	14,431	13,712	13,173	12,736	12,665	12,616
13	09												
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Ready | Cover | Glossary | Labels | Jump-off pops | TFR | Fertility age profiles | Life expectancy

3.3 TFR sheet

There are three main TFR assumption-setting approaches available in POPCORN:

- Option 1 Set a national TFR assumption and assume regional TFRs maintain the same ratio to the national TFR as in the base period;
- Option 2 Set each regional TFR assumption for each projection interval separately;
- Option 3 Assume the base period TFRs hold into the future.

Select the TFR option in the box at the top of the worksheet. The screen shot below shows option 1; the other TFR options can be seen by scrolling to the right. 'Selected option' in red will appear above the option which has been chosen for the projections.

It is recommended that the base period is a three or five year period immediately preceding the jump-off year of the projections. Base period TFRs are not required for option 2.

At the top, to the right, supply the assumed Sex Ratio at Birth expressed as the number of male births per 100 female births, e.g. 105.5. The same Sex Ratio at Birth is used for all regions and projection intervals.

Regional TFR data may be obtained from the ABS publication *Births, Australia* (catalogue number 3301.0).

POPCORN input data - State & Territory example.xlsm - Microsoft Excel

Choose TFR option

- 1. Set national TFR assumption and use regional TFR scaling factors
- 2. Set TFR assumptions for each region and projection interval separately
- 3. Keep base period TFRs fixed

Projected sex ratio at birth (male per 100 female)

SELECTED OPTION

OPTION 1. Set national TFR assumption and use regional TFR scaling factor

Region	Base period	Scaling factor	2006-11	2011-16	2016-21	2021-26	2026-31	2031-36	2036-41	2041-42
00 Australia	1.767		1.900	1.800	1.800	1.800	1.800	1.800	1.800	1.800
01 NSW	1.749	0.9900	1.881	1.782	1.782	1.782	1.782	1.782	1.782	1.782
02 Vic	1.689	0.9560	1.816	1.721	1.721	1.721	1.721	1.721	1.721	1.721
03 Qld	1.853	1.0487	1.992	1.888	1.888	1.888	1.888	1.888	1.888	1.888
04 SA	1.737	0.9832	1.868	1.770	1.770	1.770	1.770	1.770	1.770	1.770
05 WA	1.817	1.0285	1.954	1.851	1.851	1.851	1.851	1.851	1.851	1.851
06 Tas	1.971	1.1153	2.119	2.007	2.007	2.007	2.007	2.007	2.007	2.007
07 NT	2.183	1.2356	2.348	2.224	2.224	2.224	2.224	2.224	2.224	2.224
08 ACT	1.623	0.9183	1.745	1.653	1.653	1.653	1.653	1.653	1.653	1.653
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3.4 Fertility age profiles sheet

In POPCORN, assumptions about the level of fertility (the TFR) are supplied separately from assumptions about fertility age profiles (in the form of age-specific fertility rates, ASFRs). The reason for this is to simplify changing assumptions: users can create scenarios with different TFRs without the need to supply a whole new set of ASFRs.

ASFRs supplied in this sheet are scaled to the assumed TFRs when POPCORN runs (so the ASFRs supplied in this sheet do not need to match the TFR assumptions). The TFRs shown in this sheet are supplied to assist with checking that the correct data have been entered.

There are two main fertility age profile options:

- Option 1 Adjust regional ASFRs in line with assumed national fertility age profile projections;
- Option 2 Just provide regional base period fertility age profiles which are held constant.

Regional ASFRs

It is recommended that ASFRs averaged over 3 to 5 years are used as the base period ASFRs. ASFRs for states and territories and statistical divisions may be obtained from the Excel files on the ABS *Births, Australia* web pages (catalogue number 3301.0). Note that ABS generally presents ASFRs expressed per 1000 of the population. ASFRs in POPCORN, however, are not multiplied by 1000.

National ASFRs (option 1 only)

National projected ASFRs are supplied at the right-hand side of the sheet. One possibility is to use ABS ASFR projections from *Population Projections, Australia* (cat. no. 3222.0).

POPCORN input data - State & Territory example.xlsm - Microsoft Excel

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Fertility age profile assumptions		Choose fertility age profile option											
2			<div>1. Scale regional fertility age profiles in line with the national age profile</div> <div>2. Keep base period regional fertility age profiles constant</div>											
3														
4														
5														
6			Data required for both options											
7	Region		Base period age-specific fertility rates								Data required for OPTION 1			
8	00	Australia	15-19	20-24	25-29	30-34	35-39	40-44	45-49	TFR	Base period		15-19	20-24
9	01	NSW	0.01503	0.05473	0.10405	0.11458	0.05813	0.01095	0.00055	1.790	2006-11	0.01510	0.0512	
10	02	Vic	0.01045	0.04137	0.09393	0.11917	0.06098	0.01112	0.00050	1.688	2011-16	0.01330	0.0465	
12	03	Qld	0.02133	0.06402	0.10893	0.10763	0.04945	0.00867	0.00043	1.802	2016-21	0.01160	0.0420	
13	04	SA	0.01557	0.05273	0.10292	0.11097	0.05182	0.00968	0.00052	1.721	2021-26	0.01090	0.0402	
14	05	WA	0.01940	0.05845	0.10590	0.11260	0.05317	0.00925	0.00042	1.796	2026-31	0.01090	0.0402	
15	06	Tas	0.02755	0.08030	0.12412	0.11157	0.04777	0.00817	0.00033	1.999	2031-36	0.01090	0.0402	
16	07	NT	0.06318	0.10165	0.11273	0.10172	0.05528	0.01182	0.00063	2.235	2036-41	0.01090	0.0402	
17	08	ACT	0.00925	0.03355	0.08783	0.11500	0.06103	0.01192	0.00070	1.596	2041-46	0.01090	0.0402	
18	09										2046-51	0.01090	0.0402	
19	10										2051-56	0.01090	0.0402	
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CoverGlossaryLabelsJump-off popsTFRFertility age profilesLife expectancy

Ready

100%

3.5 Life expectancy sheet

There are three life expectancy at birth options:

- Option 1 Set national life expectancy at birth assumptions and assume regional life expectancies maintain the same ratio to the national life expectancies as in the base period;
 - Option 2 Set life expectancy at birth by sex for each region and projection interval;
 - Option 3 Keep base period life expectancy assumptions constant.
- Select the life expectancy option in the box at the top of the worksheet.

Regional life expectancies

It is recommended that life expectancies averaged over 3 to 5 years are used as base period values. Life expectancies for states and territories and statistical divisions may be obtained from the Excel files on the ABS *Deaths, Australia* web pages (catalogue number 3302.0).

National life expectancies (option 1 only)

For option 1 national life expectancies are required. One possibility is to use ABS life expectancy projections from *Population Projections, Australia* (cat. no. 3222.0).

Important note: All life expectancy assumptions must lie within the range described by the mortality surface (see next page). The minimum and maximum life expectancy values are reported at the top of the sheet in columns M to P. If you require life expectancies outside this range please request a new mortality surface from the Queensland Centre for Population Research.

POPCORN input data - State & Territory example.xlsm - Microsoft Excel

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Life expectancy at birth assumptions

Choose life expectancy option

1. Set national life expectancy assumptions and use regional scaling factors
2. Set life expectancy assumptions for each region, sex and projection interval
3. Keep base period life expectancies fixed

Life expectancy

SELECTED OPTION

OPTION 1. Set national life expectancy assumptions and use regional scaling factors

Region	Sex	Base period	Scaling factor	2006-11	2011-16	2016-21	2021-26	2026-31	2031-36	2036-41
00 Australia	Females	83.70		84.36	85.31	85.91	86.35	86.66	86.91	87.16
01 NSW	Females	83.90	1.002	84.56	85.51	86.12	86.56	86.87	87.12	87.37
02 Vic	Females	83.90	1.002	84.56	85.51	86.12	86.56	86.87	87.12	87.37
03 Qld	Females	83.70	1.000	84.36	85.31	85.91	86.35	86.66	86.91	87.16
04 SA	Females	83.80	1.001	84.46	85.41	86.01	86.45	86.76	87.01	87.26
05 WA	Females	84.00	1.004	84.66	85.62	86.22	86.66	86.97	87.22	87.47
06 Tas	Females	82.30	0.983	82.95	83.88	84.47	84.91	85.21	85.46	85.70
07 NT	Females	78.40	0.937	79.02	79.91	80.47	80.88	81.17	81.41	81.64
08 ACT	Females	84.00	1.004	84.66	85.62	86.22	86.66	86.97	87.22	87.47
09										
10										
11										
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Glossary Labels Jump-off pops TFR Fertility age profiles Life expectancy Mortality

Ready 100%

3.6 Mortality surface sheet

The Mortality surface worksheet is one of the few that does not require user input.

This sheet contains nL_x values (life table stationary populations) of past and projected Australian life tables calculated by the Queensland Centre for Population Research. These nL_x values may be thought of as a mortality surface ranging from relatively low life expectancy at the left of the sheet to high life expectancy at the right.

In POPCORN it is assumed that all regions follow the age pattern of mortality described by this surface, albeit starting at different points and progressing at varying speeds. This is a simplifying assumption which will be adequate for most regions, but probably not all.

Life expectancy at birth assumptions (previous sheet) must fall within the range of the mortality surface. The maximum and minimum values are reported at the top of the Life expectancy worksheet. If users wish to set life expectancy assumptions less than the minimum or greater than the maximum please contact the Queensland Centre for Population Research.

POPCORN input data - State & Territory example.xlsm - Microsoft Excel

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1 National nL_x mortality surface

This mortality surface comprises life table nL_x values from mortality projections produced by the Queensland Centre for Population Research

Age group	Sex	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0	Females	99202.1	99324.9	99499.1	99568.2	99606.4	99689.8	99742.3	99786.0	99822.3	99852.5	99877.6	99898.5	99915.8	99930.1
1-4	Females	396092.4	396724.3	397542.3	397898.9	398104.3	398498.1	398752.9	398964.5	399140.3	399286.3	399407.5	399508.1	399591.6	399661.0
5-9	Females	494554.5	495427.5	496523.1	497044.1	497346.3	497886.2	498242.8	498539.3	498785.8	498990.8	499161.2	499302.9	499420.6	499518.5
10-14	Females	494102.6	495044.8	496151.1	496745.2	497098.7	497667.1	498054.1	498376.7	498645.8	498870.1	499057.1	499213.0	499343.0	499451.5
15-19	Females	493381.2	494367.6	495553.9	496169.3	496658.1	497250.5	497684.3	498048.5	498354.4	498611.5	498827.6	499009.3	499162.3	499291.0
20-24	Females	492267.9	493287.1	494665.7	495269.1	495964.5	496588.1	497090.9	497516.9	497878.3	498185.1	498445.7	498667.4	498856.0	499016.8
25-29	Females	491020.0	492108.5	493675.7	494243.6	495167.3	495799.4	496367.8	496853.9	497270.3	497627.4	497934.1	498197.9	498425.2	498621.4
30-34	Females	489702.1	490824.7	492516.6	493049.2	494183.6	494829.4	495459.7	496004.1	496475.0	496883.2	497237.8	497546.4	497815.7	498051.2
35-39	Females	487958.7	489200.9	490924.8	491485.1	492825.0	493538.1	494254.8	494879.8	495426.2	495904.9	496325.3	496695.4	497022.0	497310.9
40-44	Females	485265.6	486749.5	488670.4	489268.4	490828.6	491748.4	492618.6	493384.0	494058.7	494654.6	495182.2	495650.3	496066.4	496437.1
45-49	Females	480813.7	482827.3	485196.9	486013.1	487793.2	489155.5	490303.0	491316.3	492212.5	493006.5	493710.9	494336.9	494893.9	495390.5
50-54	Females	473418.9	476469.6	479670.2	480994.3	483298.3	485289.4	486906.9	488334.1	489594.5	490708.6	491694.4	492567.6	493341.7	494028.9
55-59	Females	461848.0	466354.1	470903.0	473204.2	476449.7	479290.0	481645.3	483721.9	485553.3	487169.1	488595.4	489855.1	490968.1	491952.3
60-64	Females	444245.2	450582.8	457060.9	461217.9	465866.5	469852.3	473322.2	476387.5	479094.6	481484.9	483595.4	485458.9	487104.4	488557.8
65-69	Females	417795.1	426071.4	435248.5	442508.7	449443.8	454872.8	460012.6	464575.4	468622.3	472208.8	475385.4	478197.4	480685.7	482887.0
70-74	Females	377735.8	388697.6	401027.7	412498.0	423535.4	430553.7	438134.8	444928.4	451005.9	456434.6	461277.5	465593.1	469435.2	472853.1
75-79	Females	319282.8	332558.8	348864.1	365296.5	381479.3	390760.9	401699.9	411656.2	420692.9	428874.7	436266.7	442932.5	448933.4	454328.0
80-84	Females	239798.9	254312.0	273271.2	294761.3	314468.6	326733.5	341353.2	354992.3	367665.5	379398.9	390227.7	400193.4	409341.9	417721.6
85-89	Females	148253.6	161882.0	178756.8	199944.0	220848.2	234403.2	250852.8	266744.5	282014.3	296616.0	310518.4	323704.1	336166.9	347910.2
90+	Females	91132.4	104553.5	122815.7	147970.7	172215.5	193062.6	218044.0	244291.2	271729.9	300291.0	329912.3	360538.9	392124.1	424629.3
T(0)	Females	7877871.4	7977368.6	8098537.5	8215149.8	8333181.3	8417469.1	8510542.7	8599301.6	8684042.7	8765059.4	8842640.1	8917066.9	8988614.2	9057548.1
0	Males	98989.4	99141.7	99369.4	99466.5	99517.2	99620.7	99687.4	99742.4	99787.9	99825.4	99856.3	99881.7	99902.7	99920.0
1-4	Males	394998.2	395814.3	396883.2	397371.3	397661.7	398148.5	398473.8	398742.0	398963.1	399145.4	399295.7	399419.5	399521.6	399605.7
5-9	Males	492949.6	494153.3	495576.3	496276.5	496716.5	497385.7	497843.4	498221.2	498532.8	498789.9	499002.0	499176.9	499321.1	499440.1
10-14	Males	492194.0	493571.7	495093.1	495871.8	496391.9	497115.8	497621.7	498039.0	498383.1	498666.9	498900.9	499093.9	499253.0	499384.1
15-19	Males	490447.5	492000.0	493851.9	494705.7	495522.4	496345.6	496971.9	497490.9	497920.9	498277.1	498572.1	498816.6	499019.1	499186.8

Labels Jump-off pops TFR Fertility age profiles Life expectancy Mortality surface

Ready 100%

3.7 In-migration sheet

This worksheet is where base period in-migration probabilities must be supplied. These are in-migration probabilities conditional upon survival within the country (Rees et al. 2000) and are defined as:

$$\text{In-migration probability} = \frac{\text{People resident anywhere in Australia except the region 5 years before the census who were living in the region on census night}}{\text{People resident anywhere in Australia except the region 5 years before the census who were living anywhere in Australia on census night.}}$$

Probabilities are calculated for each sex and period-cohort. They are termed 'period-cohort' probabilities because they refer to cohorts over a certain period (in this case five years). The ages of the people in each cohort change over time. For example, the cohort aged 5-9 years five years before the census is aged 10-14 years on census night. The labels at the top of the In-migration sheet are therefore not age group labels but period-cohort labels. They describe the ages of the cohort five years before the census and on census night.

The calculation of these probabilities is automated in the file **Census migration data for POPCORN.xlsx**. A step by step guide to the extraction of these data in TableBuilder, and preparation of the required probabilities, is given in the Appendix.

It is suggested that users now go to the Appendix and follow the steps to create the migration inputs.

POPCORN input data - State & Territory example.xlsxm - Microsoft Excel

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3.8 Out-migration sheet

This worksheet is where base period out-migration probabilities must be supplied. These are out-migration probabilities conditional upon survival within the country (Rees et al. 2000) and are defined as:

$$\text{Out-migration probability} = \frac{\text{People resident in the region 5 years before the census who were living elsewhere in Australia on census night}}{\text{People resident in the region 5 years before the census who were living anywhere in Australia on census night}}$$

The calculation of these probabilities is automated in the file **Census migration data for POPCORN.xlsx**.

POPCORN input data - State & Territory example.xlsm - Microsoft Excel

W81

Out-migration probability assumptions

Scroll down for a graph of out-migration probability age profiles

Base period out-migration probabilities
Period-cohort

Region	Sex	birth - 0-4	0-4 - 5-9	5-9 - 10-14	10-14 - 15-19	15-19 - 20-24	20-24 - 25-29	25-29 - 30-34	30-34 - 35-39	35-39 - 40-44	40-44 - 45-49	45-49 - 50-54
01 NSW	Females	0.034290	0.055965	0.043350	0.046589	0.083520	0.087167	0.078637	0.065569	0.046100	0.035815	0.025503
02 Vic	Females	0.024052	0.040219	0.032333	0.027926	0.054467	0.070288	0.059654	0.047144	0.034743	0.026503	0.018211
03 Qld	Females	0.030991	0.049804	0.037627	0.035665	0.068198	0.092337	0.076441	0.056797	0.040094	0.032709	0.025503
04 SA	Females	0.029603	0.052358	0.045510	0.040869	0.081634	0.106081	0.081212	0.059471	0.043451	0.035210	0.025503
05 WA	Females	0.027635	0.045872	0.036475	0.029442	0.056198	0.083323	0.076720	0.057198	0.039811	0.029134	0.025503
06 Tas	Females	0.039095	0.069943	0.061697	0.066083	0.165058	0.155671	0.104851	0.076635	0.064330	0.049892	0.035815
07 NT	Females	0.123982	0.221406	0.194848	0.194685	0.249039	0.312102	0.321068	0.284844	0.232137	0.195924	0.155671
08 ACT	Females	0.102578	0.172188	0.139221	0.125077	0.235472	0.304709	0.253798	0.199595	0.144964	0.109814	0.078637
09												
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Fertility age profiles Life expectancy Mortality surface In-migration Out-migration

3.9 NIM sheet

There are four Net Internal Migration (NIM) options:

- Option 1 Set national totals of absolute NIM per annum and accept regional base period NIM values scaled to these totals using the plus-minus method (Smith, Tayman and Swanson 2001 pp 251-258) ;
 - Option 2 Set NIM assumptions for each region and projection interval (these must sum across regions to zero);
 - Option 3 Keep the base period regional NIM levels constant (having adjusted them to sum to zero if necessary);
 - Option 4 Assume that no internal migration occurs (zero in-migration and zero out-migration).
- Select the option in the box at the top of the worksheet.

All NIM values must be expressed as annual figures, not five year totals.

At the state and territory scale NIM data are available in the ABS publications *Migration, Australia* (cat. no. 3412.0) and *Australian Demographic Statistics* (cat. no. 3301.0).

At the sub-State scale an approximate value of NIM for the five year period up to the census may be obtained by using census five year migration data:

$$\text{NIM} = \text{Census in-migration} - \text{Census out-migration}.$$

(Conceptually, census data are the wrong type of migration data but in the absence of better information we have to use them).

POPCORN input data - State & Territory example.xlsm - Microsoft Excel

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Net internal migration assumptions		Choose internal migration option											
2			1. Set national totals of absolute net internal migration and scale base period levels											
3			2. Set net internal migration assumptions for each region and projection interval											
4			3. Keep base period net internal migration levels fixed											
5	N.B. Net internal migration migration assumptions should be set as annual averages.		4. Produce projections assuming that no internal migration occurs											
6														
7														
8			SELECTED OPTION											
9	Region		Net internal migration		OPTION 1. Set national totals of absolute net internal migration and scale base									
			Base period	Adjusted	2006-11	2011-16	2016-21	2021-26	2026-31	2031-36	2036-41	2041-46	2046	
10	National absolute net internal migration total		59,693	59,693	59,000	58,000	57,000	56,000	55,000	54,000	53,000	52,000	51,000	
11														
12	01	NSW	-24,214	-24,220	-23,939	-23,533	-23,127	-22,721	-22,316	-21,910	-21,504	-21,098	-20,692	
13	02	Vic	-1,871	-1,872	-1,850	-1,819	-1,787	-1,756	-1,725	-1,693	-1,662	-1,631	-1,600	
14	03	Qld	25,100	25,093	24,802	24,381	23,961	23,541	23,120	22,700	22,280	21,859	21,438	
15	04	SA	-3,754	-3,755	-3,711	-3,648	-3,586	-3,523	-3,460	-3,397	-3,334	-3,271	-3,208	
16	05	WA	4,199	4,198	4,149	4,079	4,009	3,938	3,868	3,798	3,727	3,657	3,586	
17	06	Tas	55	55	54	53	53	52	51	50	49	48	47	
18	07	NT	451	450	445	438	430	423	415	408	400	392	384	
19	08	ACT	50	50	49	49	48	47	46	45	44	44	43	
20	09		0	0	0	0	0	0	0	0	0	0	0	
21	10		0	0	0	0	0	0	0	0	0	0	0	
22	11		0	0	0	0	0	0	0	0	0	0	0	
23	12		0	0	0	0	0	0	0	0	0	0	0	
24	13		0	0	0	0	0	0	0	0	0	0	0	
25	14		0	0	0	0	0	0	0	0	0	0	0	
26	15		0	0	0	0	0	0	0	0	0	0	0	
27	16		0	0	0	0	0	0	0	0	0	0	0	
28	17		0	0	0	0	0	0	0	0	0	0	0	
29	18		0	0	0	0	0	0	0	0	0	0	0	
30	19		0	0	0	0	0	0	0	0	0	0	0	
31	20		0	0	0	0	0	0	0	0	0	0	0	
32	21		0	0	0	0	0	0	0	0	0	0	0	
33	22		0	0	0	0	0	0	0	0	0	0	0	

Life expectancyMortality surfaceIn-migrationOut-migrationNIMImmigration

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3.10 Immigration sheet

This sheet requires five year ago immigration numbers from the census. The preparation of these data is automated in the file **Census migration data for POPCORN.xlsx**.

Immigration assumptions			Scroll down for a graph of immigration age profiles										
			Base period immigration numbers										
Region	Sex		birth - 0-4	0-4 - 5-9	5-9 - 10-14	10-14 - 15-19	15-19 - 20-24	20-24 - 25-29	25-29 - 30-34	30-34 - 35-39	35-39 - 40-44	40-44 - 45-49	45-49 - 50-54
00 Australia	Females		15,843	28,879	26,072	31,789	58,547	71,053	67,863	46,540	32,266	20,144	11,9
01 NSW	Females		5,003	8,860	7,715	9,677	20,105	27,610	25,308	15,713	10,119	6,158	3,7
02 Vic	Females		3,655	6,665	6,020	8,819	17,275	19,146	17,343	10,919	7,440	4,609	2,4
03 Qld	Females		3,371	6,252	5,762	6,010	10,087	11,963	12,256	9,248	6,860	4,468	2,9
04 SA	Females		1,083	1,884	1,602	2,068	3,493	3,426	3,366	2,692	1,869	1,053	6
05 WA	Females		2,178	4,209	4,063	4,120	5,647	6,496	7,243	6,347	4,833	3,043	1,6
06 Tas	Females		148	294	292	347	590	588	672	461	334	236	1
07 NT	Females		126	213	175	149	269	539	499	341	245	187	1
08 ACT	Females		281	502	443	599	1,081	1,285	1,176	819	566	390	2
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3.11 Emigration sheet

Emigration is usually the most problematic demographic component in any regional population projection. By its nature, emigration is not picked up in the national census, and direct estimates of emigration are published by the ABS only for Australia as a whole and the states and territories. (Estimating emigration as population change left over after all other demographic components have been taken into account often results in nonsensical values). There is no generally accepted method of estimating sub-State emigration and very little research on this problem internationally.

Until regional emigration estimates become available from ABS or a research program finds a way of generating them, we must make do with very approximate emigration data. The file **Census migration data for POPCORN.xlsx** prepares such data. Crude estimates of emigration are prepared by taking regional immigration numbers from the census and multiplying them by the national emigration/immigration ratio. The data to calculate this ratio are the 'NOM departures' (emigration) and 'NOM arrivals' (immigration) reported in Table 16 of the 'Australian Demographic Statistics' Excel datacube accompanying ABS *Australian Demographic Statistics* (cat. no. 3301.0).

Emigration probabilities are calculated automatically in the file **Census migration data for POPCORN.xlsx**. They are probabilities conditional upon survival, and are defined as:

$$\text{Emigration probability} = \frac{\text{People resident in the region 5 years before the census who were living outside Australia on census night}}{\text{People resident in the region 5 years before the census who were living anywhere in Australia or overseas on census night.}}$$

POPCORN input data - State & Territory example.xlsm - Microsoft Excel

Emigration probability assumptions													Scroll down for a graph of emigration probability age profiles											
Emigration probabilities																								
Region	Sex	birth - 0-4	0-4 - 5-9	5-9 - 10-14	10-14 - 15-19	15-19 - 20-24	20-24 - 25-29	25-29 - 30-34	30-34 - 35-39	35-39 - 40-44	40-44 - 45-49	45-49 - 50-54												
00 Australia	Females																							
01 NSW	Females	0.011925	0.020340	0.016829	0.021317	0.046428	0.066584	0.052717	0.030816	0.019408	0.011883													
02 Vic	Females	0.012254	0.021204	0.017899	0.026111	0.052533	0.060491	0.047733	0.027152	0.018722	0.011828													
03 Qld	Females	0.014378	0.025090	0.021423	0.023014	0.039901	0.050684	0.045796	0.032322	0.023314	0.015271													
04 SA	Females	0.012214	0.020014	0.015599	0.020269	0.034051	0.037193	0.033406	0.023590	0.015523	0.008515													
05 WA	Females	0.018535	0.033460	0.029850	0.029867	0.043175	0.054044	0.053443	0.042530	0.031547	0.019776													
06 Tas	Females	0.005157	0.009422	0.008531	0.010107	0.017847	0.021167	0.022210	0.013382	0.009042	0.006007													
07 NT	Females	0.007587	0.013071	0.010968	0.010213	0.020282	0.037318	0.029500	0.019489	0.016003	0.013041													
08 ACT	Females	0.013749	0.023524	0.019551	0.026394	0.045825	0.051279	0.044989	0.030750	0.021165	0.014420													
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3.12 NOM sheet

There are four Net Overseas Migration (NOM) options:

- Option 1 Set national totals of NOM per annum and scale regional base period NOM values to these totals (using the plus-minus method);
 - Option 2 Set NOM assumptions for each region and projection interval;
 - Option 3 Keep the base period regional NOM levels constant;
 - Option 4 Assume that no overseas migration occurs (zero immigration and zero emigration).
- Select the option in the box at the top of the worksheet.

All NOM values must be expressed as annual figures, not five year totals.

Unfortunately, for sub-State regions no direct NOM data are available. An approximate estimate of five year NOM may be obtained by

(a) calculating total net migration as a residual:

$$\text{Total net migration} = \text{Population}(t+5) - \text{Population}(t) - \text{Births} + \text{Deaths}$$

(b) then estimating NOM as:

$$\text{NOM} = \text{Total net migration} - \text{NIM}.$$

POPCORN input data - State & Territory example.xlsm - Microsoft Excel

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Net overseas migration assumptions

N.B. Net overseas migration assumptions should be set as annual averages.

Choose overseas migration option

1. Set national totals of net overseas migration and scale regional base period levels
2. Set net overseas migration assumptions for each region and projection interval
3. Keep base period net overseas migration levels fixed
4. Produce projections assuming that no overseas migration occurs

SELECTED OPTION

OPTION 1. Set national totals of net overseas migration and scale regional base period levels

Region	Base period	2006-11	2011-16	2016-21	2021-26	2026-31	2031-36	2036-41	2041-46	2046-51	2051-56
National net overseas migration total	179,620	240,000	190,000	180,000	190,000	200,000	210,000	220,000	230,000	240,000	250,000
1 NSW	56,700	75,760	59,977	56,820	59,977	63,133	66,290	69,447	72,603	75,760	78,917
2 Vic	47,700	63,735	50,457	47,801	50,457	53,112	55,768	58,423	61,079	63,735	66,391
3 Qld	34,200	45,696	36,176	34,272	36,176	38,080	39,984	41,888	43,792	45,696	47,600
4 SA	11,700	15,633	12,376	11,725	12,376	13,028	13,679	14,330	14,982	15,633	16,284
5 WA	26,100	34,874	27,608	26,155	27,608	29,061	30,514	31,967	33,421	34,874	36,327
6 Tas	1,440	1,924	1,523	1,443	1,523	1,603	1,684	1,764	1,844	1,924	2,004
7 NT	1,080	1,443	1,142	1,082	1,142	1,203	1,263	1,323	1,383	1,443	1,503
8 ACT	700	935	740	701	740	779	818	857	896	935	974
9		0	0	0	0	0	0	0	0	0	0
10		0	0	0	0	0	0	0	0	0	0
11		0	0	0	0	0	0	0	0	0	0
12		0	0	0	0	0	0	0	0	0	0
13		0	0	0	0	0	0	0	0	0	0
14		0	0	0	0	0	0	0	0	0	0
15		0	0	0	0	0	0	0	0	0	0
16		0	0	0	0	0	0	0	0	0	0
17		0	0	0	0	0	0	0	0	0	0
18		0	0	0	0	0	0	0	0	0	0
19		0	0	0	0	0	0	0	0	0	0
20		0	0	0	0	0	0	0	0	0	0
21		0	0	0	0	0	0	0	0	0	0
22		0	0	0	0	0	0	0	0	0	0
23		0	0	0	0	0	0	0	0	0	0
24		0	0	0	0	0	0	0	0	0	0
25		0	0	0	0	0	0	0	0	0	0
26		0	0	0	0	0	0	0	0	0	0
27		0	0	0	0	0	0	0	0	0	0
28		0	0	0	0	0	0	0	0	0	0
29		0	0	0	0	0	0	0	0	0	0
30		0	0	0	0	0	0	0	0	0	0
31		0	0	0	0	0	0	0	0	0	0
32		0	0	0	0	0	0	0	0	0	0
33		0	0	0	0	0	0	0	0	0	0

In-migration Out-migration NIM Immigration Emigration NOM Validate Run

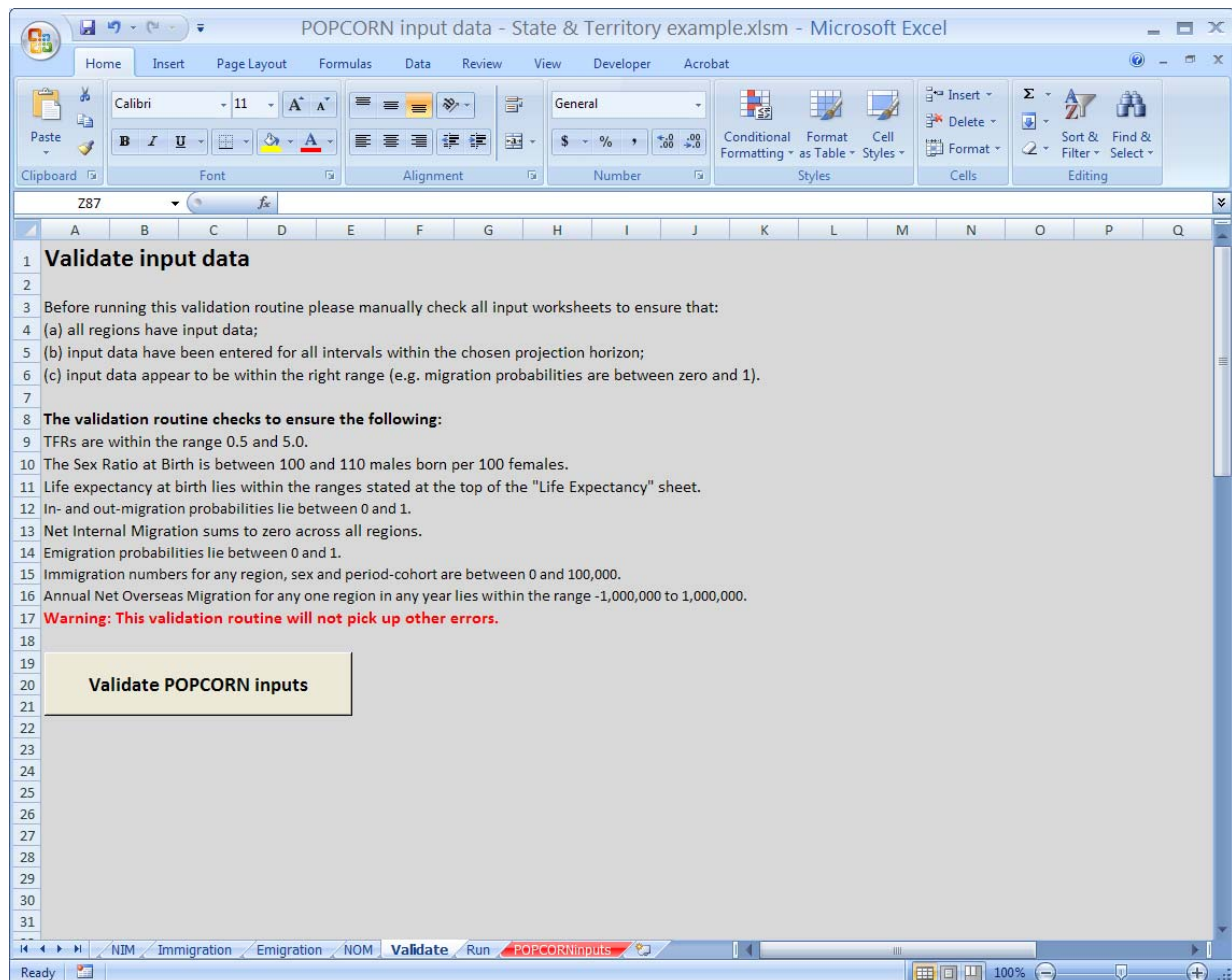
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3.13 Validate sheet

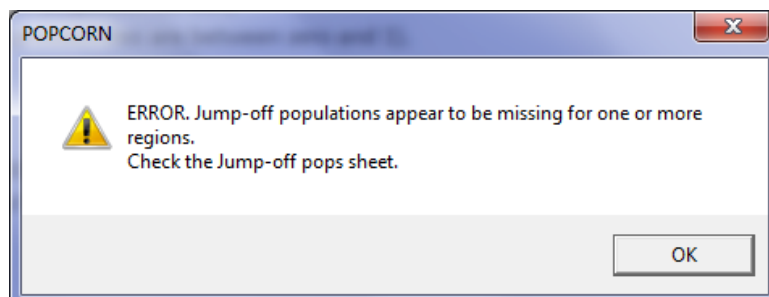
The Validate worksheet links to a routine which checks input data for obvious errors, such as out-migration probabilities being outside the theoretical range of 0 to 1. A list of checks made by the Validate routine is given in the Excel workbook (see the screen shot below).

Please ensure that manual checks of the input data have been made beforehand.

The Validate routine will only look for very obvious errors. Be aware that other errors will not be picked up.



If the validation routine picks up any problems they will be reported like this:



4 Running POPCORN

Once all the input data have been entered and validated POPCORN is ready to be run.

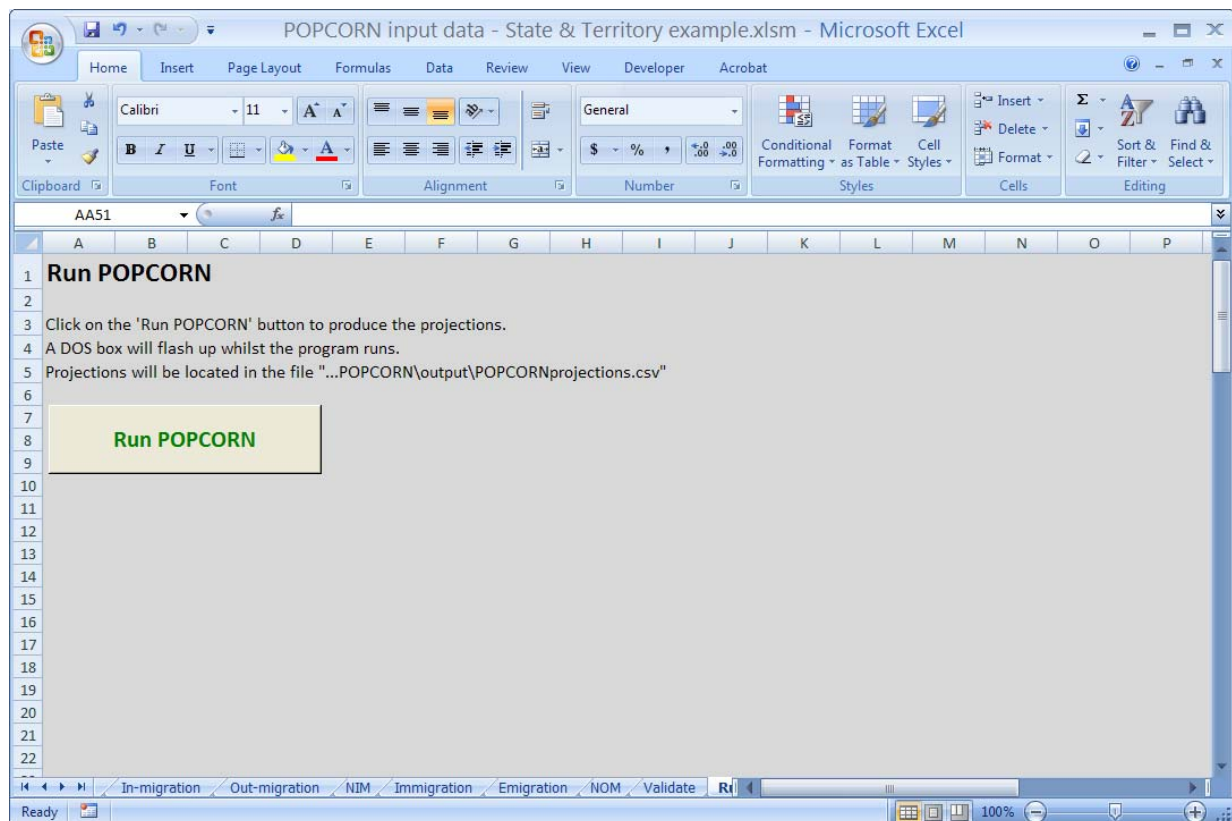
Click on the 'Run POPCORN' button. This will automatically:

- (1) create an input file from the POPCORNinputs sheet of the workbook;
- (2) run the POPCORN executable file to create the projections (with progress being reported in a DOS box); and
- (3) write out the output file at C:\POPCORN\output\POPCORNprojections.csv.

The disappearance of the DOS box signals that the output file has been created.

It is recommended that the POPCORNprojections.csv output file is copied to another directory. Subsequent runs of POPCORN will overwrite the file without warning.

Please do not change anything in the POPCORNinputs sheet of the workbook. The formatting and location of data must remain fixed.



5 Run-time problems

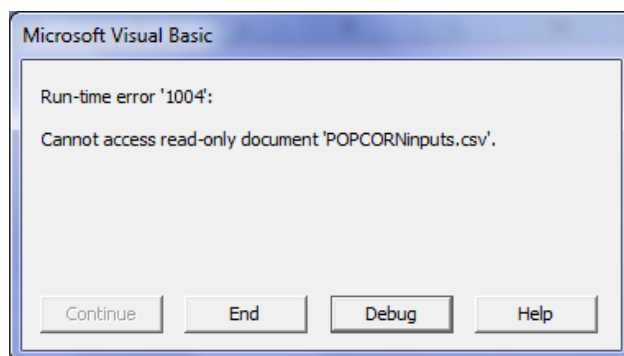
In a limited number of circumstances POPCORN will not run or will abort part-way through.

Negative populations

The program will abort if negative projected populations are detected, usually the result of extreme NIM and NOM assumptions. POPCORN calculates preliminary in-migration, out-migration, immigration and emigration flows using the base period probabilities and flows, and then adjusts them proportionally to obtain the set NIM and NOM assumptions. If the preliminary flows have to be adjusted by very significant amounts then it is possible that negative populations will result. Please adjust NIM and NOM assumptions so that they vary less from base period values.

Access problems

If you see a message like this it suggests that you do not have full access to the files at C:\POPCORN. Ask your computing support officer for full access to this directory.



6 Reviewing projection output

Once POPCORN has been run it is recommended that projection outputs are subject to a number of plausibility and consistency checks. As a result of this reviewing stage, projection assumptions (usually those for migration) are often fine-tuned and the projections re-run.

The reviewing and adjustment part of the projections process is far more art than it is science, with no hard and fast rules or quantitative measures of projection plausibility and consistency to rely upon. Very little has been written about this side of producing population projections (though exceptions can be found in Smith, Tayman and Swanson (2001) and Pittenger (1976)). Judgements about plausibility must be made in light of general knowledge of demographic processes as well as information about local factors which may explain deviations from expected patterns. As a minimum it is recommended that checks are made of projected:

- (i) population age profiles,
- (ii) sex ratios by age, and
- (iii) aggregate components of change.

Population age profiles

Many regional and local area populations are characterised by distinctive age profiles, fashioned to a large extent by age-specific migration flows. Many localities undergo only gradual change in their age profiles over time. For example, areas which experience considerable young adult out-migration will often possess an obvious indentation in their age profiles at these ages. If projections indicate a loss of this indentation in the future, or a significant shift in its position in the age profile, then there must be a good reason for it; otherwise it is possibly indicative of flaws in the migration age profile assumptions. Similarly, areas which traditionally gain many young adults through migration will tend to feature a protrusion in their age profiles at these ages. Again, if this characteristic changes noticeably in relative size and position in the age profile over time, it implies problems with migration assumptions.

If you have regions with small populations then communal establishments, such as prisons, military bases and residential schools/colleges, may cause problems. Adjustments to migration assumptions may be required in order to maintain plausible projected age profiles. This is due to the migration data on which the assumptions are based failing to fully capture moves into and out of the communal establishment. Communal establishment populations are usually easy to spot in a local area population age profile because they are highly age and sex-concentrated, and create a protrusion in the age profile. Importantly, the age composition of communal establishment populations tends to change little over time. If projections indicate the protrusion in the population age profile changing noticeably over time then adjustments will probably be required.

Sex ratios by age

Sex ratios usually change gradually by age. For the youngest children sex ratios reflect the sex ratio at birth of between 105 and 106 male babies per 100 female babies. Unless the net migration is highly sex-selective then the sex ratio of the population will gradually decline with age over the younger and middle adult ages before declining more rapidly in the older adult ages due to higher male mortality. It is quite possible for very slight errors in male and female migration probability age profiles to compound over time and, several decades into the projection horizon, result in implausible sex ratios in the population over certain ages. For less populous regions the age pattern of sex ratios may vary from the 'standard' pattern. Commonly this will be due to communal establishments, but there are also some areas where it is due to certain industries (such as mining) or localised residential patterns.

Aggregate components of change in historical context

Total births, deaths and net migration over the projection horizon are usefully compared to historical trends. In the absence of any major events or changes of circumstance it would be expected that projected births, deaths and net migration would broadly follow on from historical values. Expect regional net migration numbers to fluctuate more over time than births and deaths.

7 Example projections: States and territories

To illustrate how POPCORN data inputs should be prepared an example POPCORN input data workbook, **POPCORN input data – States & Territories example.xlsm**, is supplied as part of the POPCORN model package. All the required input data have been entered into the workbook and it is ready to be run.

8 References

Pittenger D B (1976) *Projecting State and Local Populations*. Cambridge MA: Ballinger.

Rees P, Bell M, Duke-Williams O and Blake M (2000) "Problems and solutions in the measurement of migration intensities: Australia and Britain compared" *Population Studies* Vol. 54 No. 2 pp 207-222.

Smith S K, Tayman J and Swanson D A (2001) *State and Local Population Projections*. New York: Kluwer Academic.

9 Glossary

Age-specific rate

The rate at which a demographic event occurs. Rates are calculated as the number of demographic events divided by the population at risk of that event.

Base period

The period over which inputs to a projection model are calculated. In POPCORN this often refers to the five year period leading up to the jump-off year.

Cohort-component model

The standard demographic projection model in which the population is divided into birth cohorts and projected into the future by adding and subtracting the demographic components of change (births, deaths and migration).

Emigration

Migration out of a country to another (commonly defined as for a minimum of 12 months)

Estimated Resident Population (ERP)

The best estimate of the usually resident population of a region or country.

Immigration

Migration into a country from another (commonly defined as for a minimum of 12 months)

In-migration

Migration into a region from elsewhere within the country.

Jump-off populations

The starting populations for a set of projections.

Jump-off year

The starting year of the projections, from which the projections "jump-off".

Life expectancy at birth

The average number of years of life a newly-born baby would live if a particular set of age-specific death rates remained constant.

Migration probability

The probability of living in another region at the end of a specific time interval (e.g. 5 years).

Net Internal Migration (NIM)

In-migration minus out-migration.

Net migration

Migration into a country or region minus migration out of a country or region. Often this is broken up into net internal migration and net overseas migration.

Net Overseas Migration (NOM)

Immigration minus emigration

Out-migration

Migration out of a region to elsewhere within the country.

Period-cohort

A birth cohort in a specific time interval. A period-cohort will become older over time, for example, the period-cohort aged 5-9 years in 2006 will be aged 10-14 years in 2011.

POPCORN

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Projection horizon

The period between the jump-off year and the final year of the projections.

Projection interval

The time increments in which a projection model moves forward. In POPCORN five year projection intervals are used.

Total Fertility Rate

The average number of children born to women according to a particular set of age-specific fertility and death rates.

10 Appendix: Obtaining and preparing migration data

This section describes how to extract census migration data and prepare the requisite migration probabilities and immigration flows for **POPCORN input data.xlsm**. Six tables of census data are extracted using the ABS TableBuilder service. They are:

- * female in-migration and immigration
- * female out-migration
- * male in-migration and immigration
- * male out-migration
- * female populations
- * male populations at risk.

The first four tables provide the numerators of the in- and out-migration probabilities as well as immigration numbers. The last two tables contain populations at risk data used as the migration probability denominators.

These tables are then copied and pasted into the **Census migration data for POPCORN.xlsx** file which automatically calculates the required migration input data for POPCORN. The Queensland Centre for Population Research can prepare these migration inputs on behalf of users on a cost recovery basis.

Not registered to use TableBuilder?

Go to the ABS TableBuilder webpage, www.abs.gov.au/TableBuilder and click on 'Subscribe' on the left-hand menu. Users will need to fill in and send to ABS the 'Application and Undertaking' form and then complete the online tutorials.

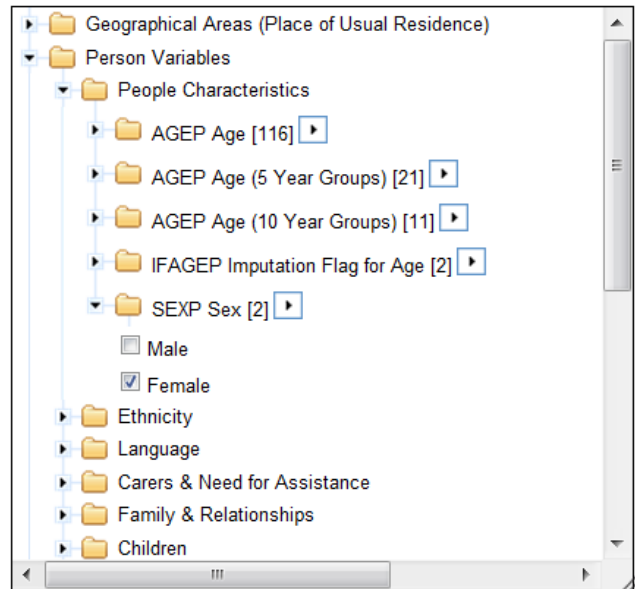
Please note that whatever geography you choose it is essential that it covers the whole country (excluding Other Territories). If you wish to produce projections for the regions of just one State then create a Rest of Australia "region" comprising the remainder of the country.

The following instructions use the example of Australian States and Territories.

File 1: Female in-migration and immigration

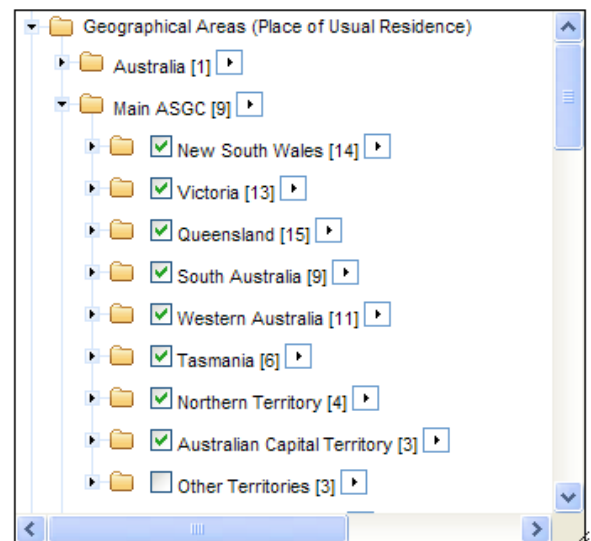
(a) Go to the ABS TableBuilder webpage, www.abs.gov.au/TableBuilder, and **Enter TableBuilder**. From the available databases select 'Counting persons, place of usual residence'; then click on **Next**.

(b) From the variables window on the left of the screen open the 'Person Variables' folder (by clicking on the little arrow to the left of the yellow file icon), then 'People Characteristics', and then 'SEXP Sex [2]'. Check the 'Female' box and click on **Add to Row** above the window.



(c) Then click on the small arrow to the right of 'AGEP Age (5 Year Groups) [21]', and select from the drop-down menu 'AGEP - 5 Year Age Groups'. Then click on **Add to Column**.

(d) Open up the 'Geographical Areas (Place of Usual Residence)' folder and, depending on which areas you wish to produce projections for, open up one of the sub-folders. In this example choose 'Main ASGC' and check the boxes for the States and Territories. Be sure to *exclude* 'Other Territories', 'Not applicable', 'Not stated', 'Offshore areas and migratory', 'No usual address' and any other categories which are not regions you want to produce projections for. Then click on **Add to Row**.



(e) Return to 'Person Variables' and open up the 'Usual Address' folder. Select 'PUR5P Place of Usual Residence Five Years Ago'. Again, note that the regions selected in this step will vary depending on the regions you have chosen to produce projections for. In this example check the boxes for the States and Territories and 'Overseas'. Exclude 'Not applicable', 'Not stated' and 'Other Territories'. *Note: if you are selecting lower levels of geography, such as Statistical Divisions, you will need to open up the State level 'Overseas' folder and check the 'Overseas' box at the same level as your regions.* Then click on **Add to Row**. Your table outline should now look like this.

SEXP Sex, State/Territory (STE) and PUR5P Place of Usual Residence Five Years Ago by AGEP Age (5 Year Groups)															
Counting: Persons Place of Usual Residence															
For further information see Confidentiality of Census Data .															
Table cell count, including totals: 3,960 (22 columns x 180 rows).															
AGEP Age (5 Year Groups) ⓘ ⓘ ⓘ			0-4 years	5-9 years	10-14 years	15-19 years	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years	50-54 years	55-59 years	60+ years
SEXP Sex ⓘ ⓘ ⓘ ⓘ	State/Territory (STE) ⓘ ⓘ ⓘ ⓘ	PUR5P Place of Usual Residence Five Years Ago ⓘ ⓘ ⓘ ⓘ	⬆️⬆️	⬆️⬆️	⬆️⬆️	⬆️⬆️	⬆️⬆️	⬆️⬆️	⬆️⬆️	⬆️⬆️	⬆️⬆️	⬆️⬆️	⬆️⬆️	⬆️⬆️	⬆️⬆️
	New South Wales	New South Wales	-	-	-	-	-	-	-	-	-	-	-	-	-
		Victoria	-	-	-	-	-	-	-	-	-	-	-	-	-
		Queensland	-	-	-	-	-	-	-	-	-	-	-	-	-
		South Australia	-	-	-	-	-	-	-	-	-	-	-	-	-
		Western Australia	-	-	-	-	-	-	-	-	-	-	-	-	-
		Tasmania	-	-	-	-	-	-	-	-	-	-	-	-	-
		Northern Territory	-	-	-	-	-	-	-	-	-	-	-	-	-
		Australian Capital Territory	-	-	-	-	-	-	-	-	-	-	-	-	-
		Overseas	-	-	-	-	-	-	-	-	-	-	-	-	-
	Victoria	New South Wales	-	-	-	-	-	-	-	-	-	-	-	-	-
		Victoria	-	-	-	-	-	-	-	-	-	-	-	-	-
		Queensland	-	-	-	-	-	-	-	-	-	-	-	-	-
		South Australia	-	-	-	-	-	-	-	-	-	-	-	-	-
		Western Australia	-	-	-	-	-	-	-	-	-	-	-	-	-
		Tasmania	-	-	-	-	-	-	-	-	-	-	-	-	-
		Northern Territory	-	-	-	-	-	-	-	-	-	-	-	-	-
		Australian Capital Territory	-	-	-	-	-	-	-	-	-	-	-	-	-
		Overseas	-	-	-	-	-	-	-	-	-	-	-	-	-
	Queensland	New South Wales	-	-	-	-	-	-	-	-	-	-	-	-	-
		Victoria	-	-	-	-	-	-	-	-	-	-	-	-	-
		Queensland	-	-	-	-	-	-	-	-	-	-	-	-	-
		South Australia	-	-	-	-	-	-	-	-	-	-	-	-	-
		Western Australia	-	-	-	-	-	-	-	-	-	-	-	-	-
		Tasmania	-	-	-	-	-	-	-	-	-	-	-	-	-
		Northern Territory	-	-	-	-	-	-	-	-	-	-	-	-	-
		Australian Capital Territory	-	-	-	-	-	-	-	-	-	-	-	-	-
		Overseas	-	-	-	-	-	-	-	-	-	-	-	-	-

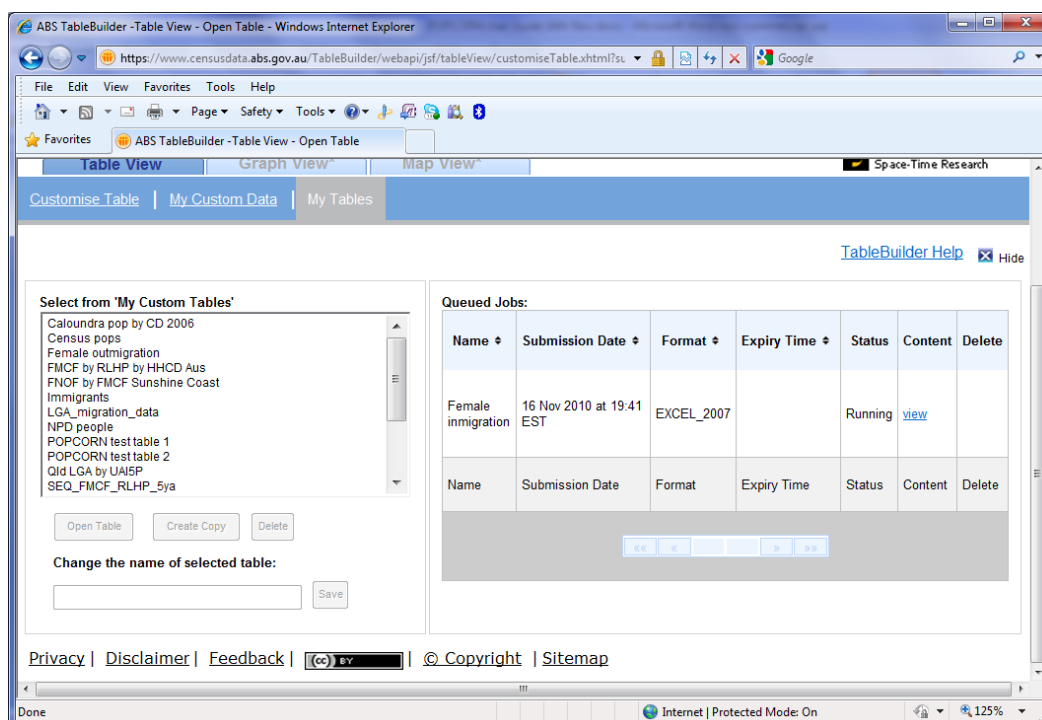
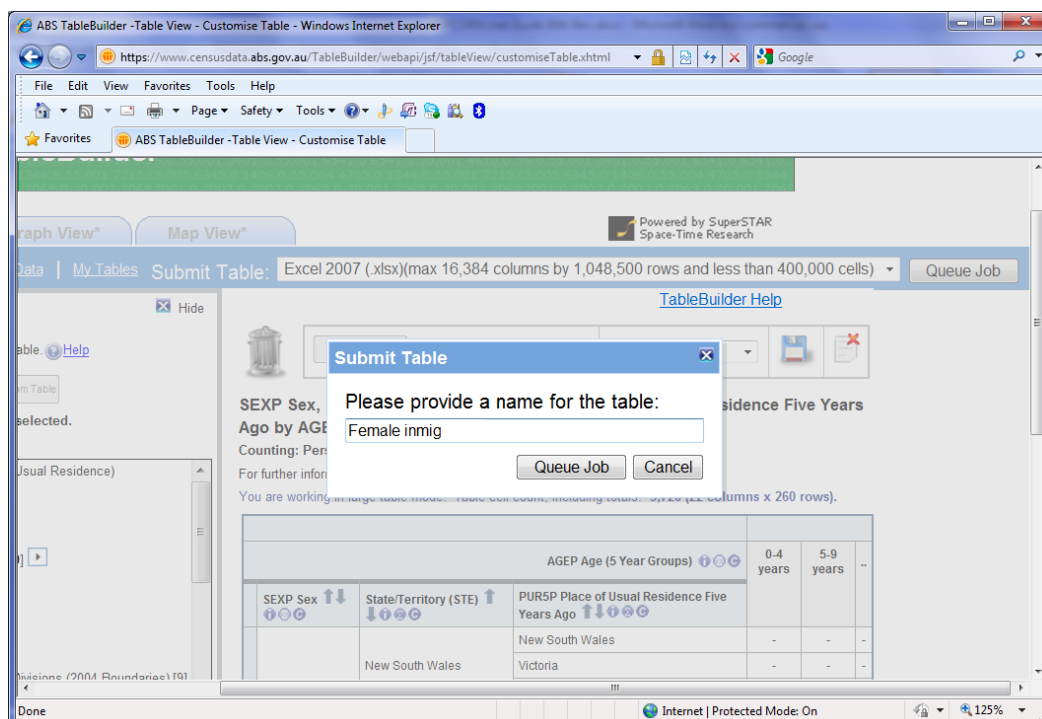
(f) The next step depends on whether TableBuilder has entered Large Table Mode or not (if it has you will have been informed by a pop-up message).

Not in Large Table Mode

Click on the **Go** button at the top right of the screen and then **Save**. Supply a suitable name for the table, e.g. "Female inmig".

In Large Table Mode

Click on **Queue Job** at the top right of the screen and then supply a name for the table, e.g. "Female inmig". Then click on **Queue Job**. Go to the 'My tables' page by clicking on the 'My Tables' link in the blue band towards the top of the screen. The Status will probably be shown as 'Running'. Wait a short while and then refresh the screen (using right-click and 'Refresh'). When the table has been extracted click on the 'Completed, click here to download' link.



File 2: Female out-migration

(a) If you were previously in Large Table Mode return to the table-building page by clicking on 'Customise Table' in the blue band towards the top of the screen.

(b) Place the cursor over 'PUR5P Place of Usual Residence 5 Years Ago' heading in the table outline so that a four arrow symbol appears. Then hold down the right mouse button and drag it to the left so that it is next to SEXP. The table outline should now look like this.

SEXP Sex, PUR5P Place of Usual Residence Five Years Ago and State/Territory (STE) by AGEP Age (5 Year Groups)																
Counting: Persons Place of Usual Residence																
For further information see Confidentiality of Census Data .																
Table cell count, including totals: 3,960 (22 columns x 180 rows).																
AGEP Age (5 Year Groups) ⓘ ⓘ ⓘ			0-4 years	5-9 years	10-14 years	15-19 years	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years	50-54 years	55-59 years	60-64 years	65+ years
SEXP Sex ↑↓ⓘⓘ	PUR5P Place of Usual Residence Five Years Ago ↑↓ⓘⓘⓘ	State/Territory (STE) ↑↓ⓘⓘⓘ	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑
	New South Wales	New South Wales	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Victoria	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Queensland	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		South Australia	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Western Australia	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Tasmania	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Northern Territory	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Australian Capital Territory	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Victoria	New South Wales	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Victoria	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Queensland	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		South Australia	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Western Australia	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Tasmania	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Northern Territory	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Australian Capital Territory	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Queensland	New South Wales	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Victoria	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Queensland	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		South Australia	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Western Australia	-	-	-	-	-	-	-	-	-	-	-	-	-	-

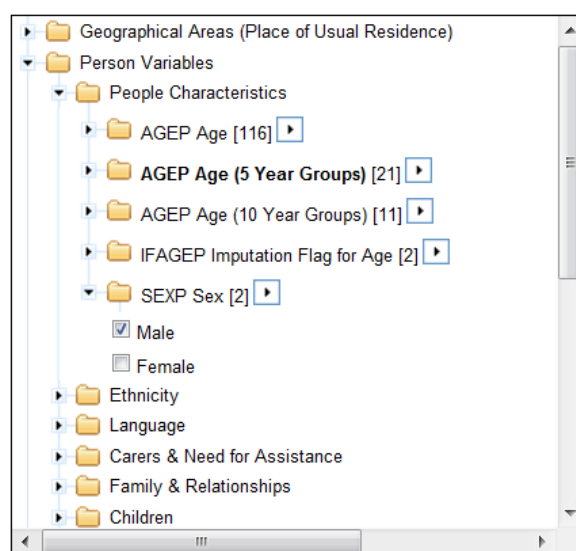
(c) Download the table by following Step (f) for File 1, but instead name the file "Female outmig".

File 3: Male out-migration

(a) If you were previously in Large Table Mode return to the table-building page by clicking on 'Customise Table' in the blue band towards the top of the screen.

(b) Females need to be replaced by Males in this table. Place the cursor over the 'SEXP Sex' heading so that the four arrow symbol appears. Then hold down the right mouse button and drag it to the rubbish bin icon above.

(c) From the variables window select 'Male' and then click on **Add to Row**.



(d) SEXP will be located in the wrong place in the table. So place the cursor over the 'SEXP Sex' heading so that a four arrow symbol appears again. Then drag the heading to the left of the table so that it looks like this.

SEXP Sex, PUR5P Place of Usual Residence Five Years Ago and State/Territory (STE) by AGEP Age (5 Year Groups)														
Counting: Persons Place of Usual Residence														
For further information see Confidentiality of Census Data .														
Table cell count, including totals: 3,960 (22 columns x 180 rows).														
AGEP Age (5 Year Groups) ⓘⓂⓂⓂ			0-4 years	5-9 years	10-14 years	15-19 years	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years	50-54 years	
SEXP Sex ⓘⓂⓂⓂ	PUR5P Place of Usual Residence Five Years Ago ⓘⓂⓂⓂⓂⓂ	State/Territory (STE) ⓘⓂⓂⓂⓂⓂ	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓
New South Wales	New South Wales	New South Wales	-	-	-	-	-	-	-	-	-	-	-	-
		Victoria	-	-	-	-	-	-	-	-	-	-	-	-
		Queensland	-	-	-	-	-	-	-	-	-	-	-	-
		South Australia	-	-	-	-	-	-	-	-	-	-	-	-
		Western Australia	-	-	-	-	-	-	-	-	-	-	-	-
		Tasmania	-	-	-	-	-	-	-	-	-	-	-	-
		Northern Territory	-	-	-	-	-	-	-	-	-	-	-	-
		Australian Capital Territory	-	-	-	-	-	-	-	-	-	-	-	-
	Victoria	New South Wales	-	-	-	-	-	-	-	-	-	-	-	-
		Victoria	-	-	-	-	-	-	-	-	-	-	-	-
Victoria	Victoria	Queensland	-	-	-	-	-	-	-	-	-	-	-	-
		South Australia	-	-	-	-	-	-	-	-	-	-	-	-
		Western Australia	-	-	-	-	-	-	-	-	-	-	-	-
		Victoria	-	-	-	-	-	-	-	-	-	-	-	-

(e) Download the table by following Step (f) for File 1, but instead name the file "Male outmig".

File 4: Male in-migration and immigration

(a) If you were previously in Large Table Mode return to the table-building page by clicking on 'Customise Table' in the blue band towards the top of the screen.

(b) Place the cursor over the 'PUR5P Place of Usual Residence 5 Years Ago' heading in the table so that the four arrow symbol appears. Then drag it to the right so that table outline looks like this.

SEXP Sex, State/Territory (STE) and PUR5P Place of Usual Residence Five Years Ago by AGEP Age (5 Year Groups)														
Counting: Persons Place of Usual Residence														
For further information see Confidentiality of Census Data .														
Table cell count, including totals: 3,960 (22 columns x 180 rows).														
AGEP Age (5 Year Groups) ⓘ ⓘ ⓘ			0-4 years	5-9 years	10-14 years	15-19 years	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years	50-54 years	55-59 years
SEXP Sex ⓘ ⓘ ⓘ	State/Territory (STE) ⓘ ⓘ ⓘ ⓘ ⓘ	PUR5P Place of Usual Residence Five Years Ago ⓘ ⓘ ⓘ ⓘ ⓘ	⬆️⬆️	⬆️⬆️	⬆️⬆️	⬆️⬆️	⬆️⬆️	⬆️⬆️	⬆️⬆️	⬆️⬆️	⬆️⬆️	⬆️⬆️	⬆️⬆️	⬆️⬆️
	New South Wales	New South Wales	-	-	-	-	-	-	-	-	-	-	-	-
		Victoria	-	-	-	-	-	-	-	-	-	-	-	-
		Queensland	-	-	-	-	-	-	-	-	-	-	-	-
		South Australia	-	-	-	-	-	-	-	-	-	-	-	-
		Western Australia	-	-	-	-	-	-	-	-	-	-	-	-
		Tasmania	-	-	-	-	-	-	-	-	-	-	-	-
		Northern Territory	-	-	-	-	-	-	-	-	-	-	-	-
		Australian Capital Territory	-	-	-	-	-	-	-	-	-	-	-	-
		Overseas	-	-	-	-	-	-	-	-	-	-	-	-
	Victoria	New South Wales	-	-	-	-	-	-	-	-	-	-	-	-
		Victoria	-	-	-	-	-	-	-	-	-	-	-	-
		Queensland	-	-	-	-	-	-	-	-	-	-	-	-
		South Australia	-	-	-	-	-	-	-	-	-	-	-	-
		Western Australia	-	-	-	-	-	-	-	-	-	-	-	-
		Tasmania	-	-	-	-	-	-	-	-	-	-	-	-
		Northern Territory	-	-	-	-	-	-	-	-	-	-	-	-
		Australian Capital Territory	-	-	-	-	-	-	-	-	-	-	-	-
		Overseas	-	-	-	-	-	-	-	-	-	-	-	-
	Queensland	New South Wales	-	-	-	-	-	-	-	-	-	-	-	-
		Victoria	-	-	-	-	-	-	-	-	-	-	-	-
		Queensland	-	-	-	-	-	-	-	-	-	-	-	-
		South Australia	-	-	-	-	-	-	-	-	-	-	-	-
		Western Australia	-	-	-	-	-	-	-	-	-	-	-	-

(e) Download the table by following Step (f) for File 1, but instead name the file "Male inmig".

File 5: Male populations at risk of migration

So far, in- and out-migration numbers from the census have been extracted. These form the numerators of the migration probabilities for POPCORN. Populations at risk which form the denominators of the probabilities are obtained in files 5 and 6.

(a) If you were previously in Large Table Mode return to the table-building page by clicking on 'Customise Table' in the blue band towards the top of the screen.

(b) Place the cursor over the column heading for the usual address on census night, in this example 'State/Territory (STE)', and drag it to the rubbish bin icon. The table outline should look like this.

SEXP Sex and PUR5P Place of Usual Residence Five Years Ago by AGEP Age (5 Year Groups)											
Counting: Persons Place of Usual Residence											
For further information see Confidentiality of Census Data .											
Table cell count, including totals: 440 (22 columns x 20 rows).											
AGEP Age (5 Year Groups) ⓘⓂⓂ		0-4 years	5-9 years	10-14 years	15-19 years	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years
SEXP Sex ↑↓ⓘⓂⓂ Ⓜ	PUR5P Place of Usual Residence Five Years Ago ↑ ↓ⓘⓂⓂⓂ	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓
Male	New South Wales	-	-	-	-	-	-	-	-	-	-
	Victoria	-	-	-	-	-	-	-	-	-	-
	Queensland	-	-	-	-	-	-	-	-	-	-
	South Australia	-	-	-	-	-	-	-	-	-	-
	Western Australia	-	-	-	-	-	-	-	-	-	-
	Tasmania	-	-	-	-	-	-	-	-	-	-
	Northern Territory	-	-	-	-	-	-	-	-	-	-
	Australian Capital Territory	-	-	-	-	-	-	-	-	-	-
	Overseas	-	-	-	-	-	-	-	-	-	-

(e) Download the table by following Step (f) for File 1, but instead name the file "Male PAR".

File 6: Female populations at risk of migration

- (a) Place the cursor over the 'SEXP' heading in the table and drag it to the rubbish bin icon.
- (b) From the variables window select 'Female' and then click on **Add to Row**.
- (c) SEXP will be located in the wrong place in the table. So place the cursor over the 'SEXP Sex' heading in the table so that a four arrow symbol appears again. Then drag the SEX variable to the left of the table so that it looks like this.

SEXP Sex and PUR5P Place of Usual Residence Five Years Ago by AGEP Age (5 Year Groups)													
Counting: Persons Place of Usual Residence													
For further information see Confidentiality of Census Data .													
Table cell count, including totals: 440 (22 columns x 20 rows).													
AGEP Age (5 Year Groups) ⓘ ⓘ ⓘ		0-4 years	5-9 years	10-14 years	15-19 years	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years	50-54 years	55-59 years
SEXP Sex ⓘ ⓘ ⓘ ⓘ	PUR5P Place of Usual Residence Five Years Ago ⓘ ⓘ ⓘ ⓘ	↕↕	↕↕	↕↕	↕↕	↕↕	↕↕	↕↕	↕↕	↕↕	↕↕	↕↕	↕↕
Female	New South Wales	-	-	-	-	-	-	-	-	-	-	-	-
	Victoria	-	-	-	-	-	-	-	-	-	-	-	-
	Queensland	-	-	-	-	-	-	-	-	-	-	-	-
	South Australia	-	-	-	-	-	-	-	-	-	-	-	-
	Western Australia	-	-	-	-	-	-	-	-	-	-	-	-
	Tasmania	-	-	-	-	-	-	-	-	-	-	-	-
	Northern Territory	-	-	-	-	-	-	-	-	-	-	-	-
	Australian Capital Territory	-	-	-	-	-	-	-	-	-	-	-	-
	Overseas	-	-	-	-	-	-	-	-	-	-	-	-

- (e) Download the table by following Step (f) for File 1, but instead name the file "Female PAR".

Checking the downloaded tables

Please make some quick checks of the files you have just downloaded.

First, open each file in Excel and check that the rows contain all your regions.

Ensure there are no rows which include:

- “Offshore areas & migratory”
- “....no usual address”
- “Other territories”
- “Not applicable”
- “Not stated”.

Third, check that the data in each file is located in row 6 and below.

Transferring the data to Census migration data for POPCORN.xlsx

Now the census migration data can be copied and pasted into **Census migration data for POPCORN.xlsx**.

Open **Census migration data for POPCORN.xlsx** and at the top of the ‘In-migration’ sheet enter the number of regions you have divided the country into.

Open the female in-migration file you downloaded. Click at the top left hand corner to highlight all cells. Press CTRL C to copy the file. Then return to **Census migration data for POPCORN.xlsx** and select the ‘Females_in’ sheet. Click on cell A1 and press CTRL V to paste.

Repeat the same process for the other five files. Then save **Census migration data for POPCORN.xlsx**.

In-migration, out-migration and emigration probabilities, and immigration numbers should have been automatically calculated from these data.

Transferring migration probabilities and immigration flows to POPCORN input data.xlsm

Scroll to the right of the ‘In-migration’, ‘Out-migration’, ‘Immigration’ and ‘Emigration’ sheets in **Census migration data for POPCORN.xlsx** and copy and Paste Special the red data into the **POPCORN input data.xlsm** workbook.