



**Using census and migration data to  
explain gender disparities in New  
Zealand's prime adult age groups  
1986-2006**

***Richard Bedford, Paul Callister and  
Robert Didham***

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AUTHORS Richard Bedford  
National Institute of Demographic and Economic  
Analysis , University of Waikato  
Email: rdb@waikato.ac.nz

Paul Callister  
Institute of Policy Studies  
Email: paul.callister@vuw.ac.nz

Robert Didham  
Statistics New Zealand  
Email: robert.didham@stats.govt.nz

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INSTITUTE OF POLICY STUDIES School of Government  
Victoria University of Wellington  
PO Box 600  
Wellington  
NEW ZEALAND

Fax: + 64 4 463 7413  
Website www.ips.ac.nz

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## **Using census and migration data to explain gender disparities in New Zealand's prime adult age groups 1986-2006**

### **Abstract**

Questions concerning the widening disparity in numbers between males and females in the prime working age groups in New Zealand's population have attracted increasing attention from researchers and the media following the release of recent census data. Unfortunately it will not be possible to address these questions in 2011 because the census scheduled for that year has been cancelled due to a devastating earthquake in Christchurch two weeks before the enumeration was scheduled to take place. This working paper reviews some of the findings from research that has been addressing several inequalities based on gender and ethnicity in New Zealand's population. The analysis here complements and extends that in a paper published in the *New Zealand Population Review* in May 2006. Our main finding is that a complex combination of issues related to the way our stock (census) and flow (arrival/departure) data are used to compile the population estimates that are used as the base for population projections have contributed to exaggerating the apparent gender disparities in the 20-49 year age groups at successive censuses. There is no single explanation for these disparities. Our conclusions, which we had hoped to assess with reference to the 2011 census data next year, and the mid-year estimates based on these census data after adjustment for census under-enumeration, will now have to be assessed with reference to a census in 2016 unless the Government decides to enumerate the population in 2012.

**Key words:** missing men, sex ratios, gendered migration, undercount

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## **Using census and migration data to explain gender disparities in New Zealand's prime adult age groups 1986-2006**

Census year 2011 and researchers, policy makers, the media and members of the public have had their expectations of a valuable new data set to test their hypotheses and argue their favoured causes dashed by advice that, due to the devastating earthquake in Canterbury on 23 February, the enumeration scheduled for 8 March 2011 has been cancelled. One of the more trivial questions that would have excited some media attention when the results were published would have been: is the surplus of females over males in the prime working age groups (20-49 years) larger than it was in 2006, as it has been at successive censuses since 1986, or will it have become smaller as suggested by the latest projections of New Zealand's population?

The puzzle about 'missing men' in age groups where it is normal for males to exceed the numbers of females has not been resolved by reference to sex-selective permanent and long-term net migration (Callister et al. 2006a, 2006b, 2007) or to sex-selective under-enumeration in the census (Bycroft, 2006), or to unusually high sex-selective mortality (Callister et al. 2006a and Callister and Didham 2009). All of these potential causes of the gender disparities in the 20-49 year age group make a contribution, but singly or in combination they cannot account for the disparities. Other factors contribute to this unusual ratio of males to females aged 20-49 years, and the primary objective of this paper is to summarise findings from further analysis of census and flow data and to assess the possibility that a different factor that contributes to explaining the anomaly – a failure to take adequate account of female net migration gains through category jumping. In this case, the search is not so much for missing men, but rather for establishing whether there is an unexpectedly large number of women in the census population of 20-49 year olds.

The deficit of men aged 20-49 years, or 'man drought' as the media like to term this condition, is not something that is unique to New Zealand's population. It is apparent in Australia's recent censuses, although not nearly as pronounced as it is in recent New Zealand census data (Salt, 2008). It is also found in some Pacific island countries where there is a long history of extensive emigration, especially of young adult men. In New Zealand's case, the male deficit is significantly larger in proportional terms than that found in recent Australian censuses, despite the fact that

for much of the period over which the gender gap has been widening New Zealand has been experiencing net migration gains rather than losses. Indeed, between 1 April 1986 and 31 March 2010 New Zealand had an aggregate net gain of just under 183,300 through permanent and long-term (PLT) migration.

While this overall PLT net migration gain cannot provide a convenient, simple answer to the puzzle, we need to keep in mind that the 183,300 surplus of PLT arrivals over PLT departures is the balance of a sizeable net loss of New Zealand citizens (-513,200) that is more than offset by the net gain of 696,500 citizens of other countries during the 24 years. The question that then arises concerns the gender balance in the net gains and losses in these two populations – the New Zealanders travelling overseas and the immigrants and visitors who are not travelling on New Zealand passports.

We summarise here some of the key findings that have emerged from an extensive examination of the ‘missing men’ puzzle that has been undertaken as part of a FRST-funded research programme examining a range of disparities and inequalities as these can be identified by gender and ethnicity in New Zealand’s extant population, education and employment data bases (Callister 2007). The discussion focuses on the migration dimension of the puzzle, including an analysis of the complications caused by category jumping in reconciling net migration gains and losses, by gender, for PLT and total migration flows in New Zealand. This reconciliation is important because it impacts on the assumptions made about net migration by age and sex that influence both the mid-year estimates of the resident population (ERP) each year, and the projections of future population change that draw on the ERP for their base populations.

The first part of the paper revisits the gender balance in the 20-49 year age group in New Zealand’s censuses since 1901. The gender balance in recent projections of the population in this age group is also examined briefly with reference to three broad age groups: 20-29, 30-39 and 40-49 years. This is followed by an examination of the changing gender compositions of 10 birth cohorts that make up the 20-49 year age group in the five censuses between 1986 and 2006. The analysis then shifts from the census data to the permanent and long-term (PLT) arrival and departure data, firstly with reference to the net gains and losses to the 10 cohorts since the early 1960s, and secondly with reference to net migration gains and losses

for the age group as a whole between January 1986 and December 2005. The final section examines the differences between the PLT and total net migration estimates by age group and gender since the late 1990s drawing on the 'head count' data as well as the readily available sample data for total arrivals and departures that have been produced since 1998.

A recurring theme through the analysis is the tension between an explanation for the growing deficits of males in the prime working ages that highlights greater net migration losses of men than women (the 'missing men' explanation) and an explanation which has become particularly evident in the arrival departure statistics in recent years that places more emphasis on 'unacknowledged women' in the estimates of net migration gains and losses that are based on the PLT data. There is no single explanation for the 'missing men', and the often-cited 'exodus' of New Zealanders to Australia, especially since the late 1970s, is certainly not an adequate simple answer (Callister et al 2006a). Rather the explanation for the male deficits lies in a complex mix of three major interacting factors – net migration losses of men, category-jumping by women, and differential census undercount for males and females.

### **Situating the Missing Men Puzzle: the Censuses 1901-2006**

Between 1986 and 2006 sex ratios amongst the resident population aged between 20 and 49 years in New Zealand's Census of Population and Dwellings dropped from 1.001 males per female to 0.934 males per female – the lowest for this age group at any census in the 20<sup>th</sup> century other than the one in 1945 (0.886) when troops were still returning from war overseas (Table 1). The only other year between 1901 and 2006 when the sex ratio was below 1.000 for the age group 20-49 years was in 1916 (0.935) when thousands of New Zealanders, especially men, were overseas fighting in Europe.

Table 1: Sex ratios, population aged 20-49 years, 1901-2006

Year	Sex ratio				All ages
	20-29	30-39	40-49	20-49	
1901	1.021	1.114	1.293	1.105	1.107
1906	1.117	1.161	1.209	1.150	1.127
1911	1.115	1.167	1.155	1.142	1.116
<b>1916</b>	<b>0.739</b>	<b>1.006</b>	<b>1.132</b>	<b>0.935</b>	<b>1.007</b>
1921	0.941	1.023	1.116	1.019	1.046
1926	1.029	0.951	1.075	1.017	1.044
1936	1.034	1.021	0.952	1.006	1.028
<b>1945</b>	<b>0.748</b>	<b>0.938</b>	<b>1.001</b>	<b>0.886</b>	<b>0.954</b>
1951	1.034	0.986	1.053	1.023	1.009
1956	1.062	1.010	1.027	1.033	1.012
1961	1.037	1.059	0.996	1.031	1.010
1966	1.038	1.063	1.009	1.037	1.008
1971	1.028	1.029	1.046	1.034	0.999
1976	1.024	1.024	1.056	1.032	0.997
1981	1.015	1.002	1.025	1.013	0.988
<b>1986</b>	<b>1.007</b>	<b>0.989</b>	<b>1.008</b>	<b>1.001</b>	<b>0.982</b>
<b>1991</b>	<b>0.981</b>	<b>0.970</b>	<b>0.999</b>	<b>0.982</b>	<b>0.971</b>
<b>1996</b>	<b>0.962</b>	<b>0.949</b>	<b>0.981</b>	<b>0.963</b>	<b>0.966</b>
<b>2001</b>	<b>0.948</b>	<b>0.911</b>	<b>0.952</b>	<b>0.935</b>	<b>0.952</b>
<b>2006</b>	<b>0.966</b>	<b>0.900</b>	<b>0.939</b>	<b>0.934</b>	<b>0.953</b>

Source: Unpublished time series, censuses 1901-2006, Statistics New Zealand

The twenty years 1986-2006 thus stand out as something of an anomaly in the historical record of New Zealand's 20<sup>th</sup> century censuses, in so far as the balance between males and females at ages between 20 and 49 years is concerned. Unlike the other two years during the century when sex ratios for this age group fell below unity, there were no wars that can be cited as explanations for the absence of men in the prime working and family development age groups. The two decades between 1986 and 2006 were ones of significant economic change in New Zealand, but it was not change that had an obvious gender bias, at least not to the extent of being responsible for a growing depletion numbers of men in this age group. The extent of the male deficit in the 20-49 year age group can be seen in Table 2.

Table 2: Male surplus/deficit, population aged 20-49 years, 1901-2006

Year	Male surplus/deficit				All ages
	20-29	30-39	40-49	20-49	
1901	1585	5517	9219	16321	39041
1906	10300	9712	7942	27954	53177
1911	10742	12717	7457	30916	55036
<b>1916</b>	<b>-24879</b>	<b>578</b>	<b>8140</b>	<b>-16161</b>	<b>3985</b>
1921	-5821	2156	8638	4973	27457
1926	3108	-4866	6619	4861	28939
1936	4280	2204	-4569	1915	20751
<b>1945</b>	<b>-33052</b>	<b>-7723</b>	<b>64</b>	<b>-40711</b>	<b>-37574</b>
1951	4745	-1923	6205	9027	8410
1956	8710	1540	3558	13808	12604
1961	5450	9125	-619	13956	11768
1966	6744	9595	1346	17685	10567
1971	5867	4477	7197	17541	-919
1976	5909	4533	8611	19053	-5299
1981	3786	423	3903	8112	-18213
<b>1986</b>	<b>1950</b>	<b>-2601</b>	<b>1419</b>	<b>768</b>	<b>-29916</b>
<b>1991</b>	<b>-5318</b>	<b>-7882</b>	<b>-202</b>	<b>-13402</b>	<b>-48819</b>
<b>1996</b>	<b>-10489</b>	<b>-15209</b>	<b>-4852</b>	<b>-30550</b>	<b>-63378</b>
<b>2001</b>	<b>-13081</b>	<b>-26988</b>	<b>-13346</b>	<b>-53415</b>	<b>-91266</b>
<b>2006</b>	<b>-8808</b>	<b>-30339</b>	<b>-19218</b>	<b>-58365</b>	<b>-96717</b>

Source: Unpublished time series, censuses 1901-2006, Statistics New Zealand

In all years except 1916 and 1945 and the period between 1991 and 2006 there were overall male surpluses in the age group 20-49 years with a high degree of consistency in these from the mid-1950s to the mid-1970s. There was some variability across the three ten year age groups shown in Table 2 reflecting, in the main, the ageing of those who returned from the Second World War. Thus in 1951 there was a deficit of males in the age group 30-39 years (-1,923), which was reflected 10 years later in the deficit in the 40-49 age group (-619). However, recovery in the adult male population after the war, largely as a result of extensive immigration, was quickly masking the effect of war-time fatalities on New Zealand's gender balance at working ages. In the case of the aftermath of the First World War, the recovery was much slower – the 1926 deficit in males aged 30-39 years (-4,866) is followed by a deficit of -4,569 ten years later in the age group 40-49 years. There was much less migration-led recovery in the male population after WWI, largely because of the impact of the Great Depression.

Between the censuses in 1976 and 1981 the surplus of males over females aged 20-29 years more than halved from just over 19,000 (1976) to just over 8,000 (1981). During this intercensal period New Zealand experienced the economic impact of the second major oil price rise, and the largest net out-migration of New Zealanders ever recorded. However, this net out-migration, which was male-dominated (see below), did not result in any deficits in the 20-49 year age group, although the surpluses in the three 10 year age groups shown in Table 2 fell markedly. By 1986 the overall surplus of males aged between 20 and 49 years had dropped to 768, with a reasonably large deficit (-2,601) appearing in the age group 30-39 years for the first time since 1951. There were still male surpluses for those aged in their 20s and the 40s in 1986 but these were much lower than they had been five years earlier (Table 2).

Over the next 20 years New Zealand's population aged between 20 and 49 years experienced a very rapid gender transformation with male deficits increasing between censuses at an unprecedented rate, especially in the age group 30-39 years. In the 1986 census there were 2,601 fewer males than females in the resident population. This deficit had trebled to just under -7,900 by 1991, then more than doubled again to -15,209 in 1996, and had doubled again by 2006 (-30,339). In the most mobile age group for New Zealanders, people aged 20-29 years, the deficits were much smaller at every census than they were for the 30-39 year population. Emigration of young New Zealand males in their 20s has not been the main cause of the rising disparities between numbers of males and females in the population aged 20-49 years; the biggest contributions to the disparities in each census year are found in the age group 30-39 years, perhaps reflecting a mix of immigration of women, as well as emigration of men. We return to the evidence from migration data shortly.

Looking ahead to the mid-21<sup>st</sup> century, projections prepared by Statistics New Zealand just before the 2006 census suggested that the sex ratio for the age group 20-49 years is unlikely to fall below 0.950, assuming there are no major wars or marked shifts in patterns of mortality, in any of the five year periods between 2006 and 2051 (Table 3). It is evident from the figures produced by the medium projection variant for the national population in 2005 that the sex ratios start to converge again for the three age groups (Table 3)<sup>i</sup>. This convergence was already beginning to occur in the sex ratios for those aged 20-29 years by 2006 and by 2011 the sex ratio for this age

group had regained a male dominance in the projected population. For the 30-39 year age group, the male dominance does not return until 2026 according to the projected population structures, and 2036 for the 40-49 year age group (Table 3). For the 20-49 year age group as a whole, the projections forecast a return to male dominance in the prime adult population by 2031. According to the projections, this would be the first time the 20-49 year population had more males than females since 1986 (Table 3).

*Table 3: Projected sex ratios, population aged 20-49 years, 1986-2051*

Year	Sex ratio				All ages
	20-29	30-39	40-49	20-49	
<i>Census</i>					
1986	1.007	0.989	1.008	1.001	0.982
1991	0.981	0.970	0.999	0.982	0.971
1996	0.962	0.949	0.981	0.963	0.966
2001	0.948	0.911	0.952	0.935	0.952
2006	0.966	0.900	0.939	0.934	0.953
<i>Projected</i>					
2011	1.013	0.915	0.925	0.950	0.963
2016	1.045	0.936	0.911	0.963	0.966
2021	1.052	0.971	0.916	0.979	0.967
2026	1.051	1.003	0.936	0.996	0.968
2031	1.058	1.009	0.970	1.011	0.968
2036	1.064	1.007	1.000	1.023	0.969
2041	1.064	1.015	1.006	1.028	0.970
2046	1.064	1.021	1.004	1.029	0.972
2051	1.065	1.021	1.012	1.032	0.975

Source: Unpublished time series: censuses 1901-2006, projections 2011-2101

Table 4: Projected male surplus/deficit, 20-49 years, 1986-2051

Year	Male surplus/deficit				
	20-29	30-39	40-49	20-49	All ages
<i>Census</i>					
1986	1950	-2601	1419	768	-29916
1991	-5318	-7882	-202	-13402	-48819
1996	-10489	-15209	-4852	-30550	-63378
2001	-13081	-26988	-13346	-53415	-91266
2006	-8808	-30339	-19218	-58365	-96717
<i>Projected</i>					
2011	3770	-25140	-24780	-46150	-82440
2016	13770	-19030	-28570	-33830	-79900
2021	15620	-9070	-25840	-19290	-79470
2026	14800	860	-19770	-4110	-80540
2031	17530	2900	-9910	10520	-82090
2036	19430	2160	0	21590	-83110
2041	19290	4890	2050	26230	-81950
2046	19280	6840	1380	27500	-77990
2051	19340	6730	4100	30170	-70660

Source: Unpublished time series: censuses 1901-2006, projections 2011-2101

The return to sizeable male surpluses in the projected population aged 20-29 years is rapid, commencing in 2011 and reaching over 13,000 by 2016 – larger than any male surplus in this age group since 1901 (Tables 1 and 4). Surpluses in excess of 1,000 in the population aged 30-39 years do not return until 2031 in the projected population, and 2041 for the population aged 40-49 years. The projected surpluses in these two age groups are much smaller than the surpluses in the 20-29 year age group, and there is only a weak cohort effect shown in the numerical recovery of male surpluses across the three age groups. The much more common situation of having more males than females in the age group 20-49 years, that persisted through most of the 20<sup>th</sup> century, returns by 2031 and for the period 2036-2051 the projected sex ratios are very similar to those that were found in the period 1951-1971 (Tables 1 and 3). The male surpluses are larger in the projected populations between 2036 and 2051 than in the 1951-1971 period, especially for the 20-29 year olds, but this is, in part, a reflection of a much larger population in the 21<sup>st</sup> century than was in New Zealand in the middle of the 20<sup>th</sup> century.

## A Cohort Perspective on 'Missing Men' Aged 20-49 Years

At any census the age group 20-49 years includes survivors of six five-year birth cohorts. For the five censuses between 1986 and 2006, the birth cohorts represented span a total of 50 years – from the mid-1930s until the mid-1980s (Table 5). The first of the cohorts, which spans the years ended March 1937 to March 1941, incorporates the beginnings of the recovery in fertility that initiated what was to become known as the 'post-war baby boom'. This cohort is represented in the censuses under discussion by the 45-49 year age group in 1986 (Table 5). The 'war baby' cohort, years ending March 1942-1946, appears twice in the matrix in Table 11 – as 40-44 year olds in the 1986 census and as 45-49 year olds in the 1991 census. The three major baby boom cohorts, spanning the March years 1947-51, 1952-56, 1957-61, reach 45-49 years in 1996, 2001 and 2006 respectively (Table 5).

*Table 5: Five year birth cohorts in the population aged 20-49 years at censuses between 1986 and 2006*

Census	Age-group and birth cohort					
	20-24	25-29	30-34	35-39	40-44	45-49
1986	1962-66	1957-61	1952-56	1947-51	1942-46	1937-41
1991	1967-71	1962-66	1957-61	1952-56	1947-51	1942-46
1996	1972-76	1967-71	1962-66	1957-61	1952-56	1947-51
2001	1977-81	1972-76	1967-71	1962-66	1957-61	1952-56
2006	1982-86	1977-81	1972-76	1967-71	1962-66	1957-61

In order to understand why a given birth cohort has a specific age-sex composition it is necessary to trace the history of the cohort over key periods of its life cycle. In this analysis, attention is focussed on what happens to each cohort's gender balance, and any associated male surpluses and deficits at each five year age group since the members of the cohort reached 20 years of age (Table 6). All of the survivors of the 1937-41 birth cohort had reached age 20 by the census in March 1961 (Table 6), and this birth cohort comprised the age group 20-24 years in 1961. The progress of the cohort through 5 successive 5-year age groups to age 45-49 years is then tracked. Only four of the 10 birth cohorts reach age 45-49 years between

1986 and 2006; those born in the six cohorts between 1962-66 and 1982-86 reach age 45-49 years at censuses between 2011 and 2031 (Table 6).

*Table 6: Five year birth cohorts at ages 0 and 20 and censuses when birth cohorts are aged 20-24 and 45-49 years*

5 year birth cohort at		Censuses when cohort aged	
Age 0	Age 20	20-24	45-49
1937-41	1957-61	1961	1986
1942-46	1962-66	1966	1991
1947-51	1967-71	1971	1996
1952-56	1972-76	1976	2001
1957-61	1977-81	1981	2006
1962-66	1982-86	1986	2011
1967-71	1987-91	1991	2016
1972-76	1992-96	1996	2021
1977-81	1997-01	2001	2026
1982-86	2002-06	2006	2031

The sex ratios for the 10 birth cohorts show clearly that it was the older age groups (initially those in their 40s and then later, those in their 30s) that first experienced the shift to having larger numbers of females than males in the age group (Table 7). It was not until the 1996 census that female numbers exceeded males in the age group 20-24 years; as Table 7 shows, this happened more than 10 years earlier for the age groups 25-29 years and above. The male surpluses/deficits reflected in the sex ratios are the result of a mix of the effects of increases and decreases over time in the sizes of birth cohorts and the differential as well as cumulative impact of net migration gains and losses on the populations in each age group. These surpluses/deficits are summarised in Table 8.

*Table 7: Sex ratios for age groups 20-24 to 45-49 years in the 10 birth cohorts*

Birth	Age-group and sex ratio					
Cohort	20-24	25-29	30-34	35-39	40-44	45-49
1937-41	1.026	1.032	1.020	1.027	1.013	1.010
1942-46	1.044	1.021	1.022	1.004	1.007	1.006
1947-51	1.034	1.018	1.000	0.997	0.994	0.994
1952-56	1.029	0.988	0.982	0.976	0.968	0.963
1957-61	1.039	0.991	0.965	0.955	0.941	0.951
1962-66	1.023	0.956	0.943	0.922	0.927	
1967-71	1.006	0.940	0.899	0.902		
1972-76	0.985	0.916	0.898			
1977-81	0.982	0.936				
1982-86	0.994					

Data source: Censuses between 1961 and 2006

*Table 8: Male surpluses/deficits for age groups 20-24 to 45-49 years in the 10 birth cohorts*

Birth	Age-group and male surplus/deficit					
Cohort	20-24	25-29	30-34	35-39	40-44	45-49
1937-41	2023	2608	1672	2337	1101	789
1942-46	4136	1932	2196	417	633	515
1947-51	3935	2196	6	-372	-717	-692
1952-56	3713	-1425	-2229	-2986	-4160	-4729
1957-61	5211	-1263	-4896	-6629	-8617	-7320
1962-66	3213	-6179	-8580	-12105	-11898	
1967-71	861	-8397	-14883	-15552		
1972-76	-2092	-10883	-14787			
1977-81	-2198	-8007				
1982-86	-801					

Data source: Censuses between 1961 and 2006

Tables 7 and 8 reveal some interesting patterns with regard to sex ratios and male surpluses/deficits with the successive ageing of the ten 5-year birth cohorts between the ages of 20-24 and 45-49 years. In the cohorts born between 1937-41 and 1942-46 the number of males exceeded the number of females at all of the 5-year age groups between ages 20-24 and 45-49 years with sex ratios equalling or close to those at birth for the 20-24 year age groups, followed by slight reductions in these but still male surpluses, through the late 20s, the 30s and the 40s (Tables 7 and 8). The

1942-46 cohort had much larger male surpluses aged 20-24 than the 1937-41 cohort, partly because of its larger size at birth, but also because of the impact of high post-war levels of immigration and the differential impact of immigration on the numbers of males and females in different age groups through the 1950s and 1960s.

The male surpluses at age groups 35-39 and 45-49 for the 1942-46 cohort were, however, smaller than those found for the 1937-41 cohort, despite the larger numbers of males and females in the respective age group populations. There were still male surpluses at every age, but the size of these was starting to diminish for subsequent birth cohorts. This was not due to rising mortality amongst males aged in their late 30s and above in these birth cohorts – there was continuous improvement in life expectancy at different ages for both males and females through the period 1961-1991 when the survivors in these two birth cohorts were aged between 20 and 49 years.

When the 1947-51 birth cohort reached age 30-34 in 1981 it is clear that something was happening to the male/female balance in the population. The sex ratio was balanced and there were only 6 more males than females in an age group where males and females each numbered over 118,000. At each age group after 30-34 the surplus became a deficit and we begin to see the emergence of the ‘missing men’ phenomenon – not when the cohort was aged 20-24 years or 25-29 years in 1971 and 1976, but in the older age groups in the cohort in 1986 (35-39), 1991 (40-44) and 1996 (45-49). The impact of the major exodus of New Zealanders in the late 1970s on people in their late 20s, 30s and 40s was beginning to show in the age composition of the 1947-51 birth cohort (Table 8).

The shift towards male deficits in age groups from 25-29 years became much more obvious in the 1952-56 and 1957-61 birth cohorts which reached 20-24 years of age in 1976 and 1981 respectively. Interestingly, the significant net migration losses in the late 1970s do not appear to have had a major impact on the sex ratio of those aged 20-24 years in the 1981 census – for both the 1952-56 and the 1957-61 birth cohorts, sex ratios for people aged 20-24 years in 1976 and 1981, respectively, remained around 1.029 and 1.039 – levels that were found for the earlier birth cohorts at this age (Table 7). Again it was the age groups 30 and above that had much higher male deficits than those aged 25-29 years for both of the 5-year cohorts born in the 1950s.

The 1952-56 cohort reached ages 30-34 in 1986, 35-39 years in 1991, 40-44 in 1996 and 45-49 years in 2001. The cumulative impact of three decades of fluctuating net migration gains and losses to the population through international migration between 1971 and 2001 was undoubtedly reflected in the progressive increases in the male deficits over the same period in the cohort's age groups from 25-29 to 45-49 years (Table 8).

A similar situation exists for the 1957-61 birth cohort which was aged 30-34 in 1991, 35-39 in 1996, 40-44 in 2001 and 45-49 in 2006. The cumulative male deficit in this birth cohort when they reached their early 40s was over 8,000 (Table 8). These are the last two birth cohorts for whom we have data that spans the 6 age groups between 20-24 and 45-49 years. For those born after 1962, the age groups with data are reduced one age group every five years (Tables 7 and 8). It was only for the cohorts born after 1962 that the sex ratio for the 20-24 year olds began to fall consistently for successive cohorts, and dropped below unity when the 1972-76 cohort was 20-24 years in the 1996 census (Table 7). At the 1991 and 1986 censuses, there were still more males than females aged 20-24, but the surpluses were much smaller than was the case for earlier birth cohorts. For example when the 1967-71 birth cohort reached the age group 20-24 in 1991 there were only 861 more males than females in the age group compared to over 3,213 for the 1962-66 birth cohort when they reached 20-24, and 5,211 for the 1957-61 birth cohort (Table 8).

The 1962-66 birth cohort was the first to have a substantial male deficit (-6,179) when it reached 25-29 years in 1991, following a short-lived but substantial net migration loss in the late 1980s. This deficit was more than four times larger than the male deficit for the 25-29 age group in the two preceding birth cohorts in 1986 (the 1957-61 birth cohort) and 1981 (the 1952-56 birth cohort). Given that the net migration losses in the late 1970s were larger and over a greater number of years than those in the late 1980s, it seems that there may be factors other than just gender-selective net migration that had an impact on the major surge in the male deficit for 25-29 year olds in 1991.

Interestingly, the male surplus (861) in the age group 20-24 years for the 1967-71 birth cohort in 1991 was much smaller than the male surplus (5,211) for the 1951-57 birth cohort when they were aged 20-24 years in 1981 (Table 6). This age group also seems to have been affected much more in the late 1980s by gender-

selective migration, or some other processes that were contributing to removing males aged 20-24 from the enumerated population, than was the case in the late 1970s.

The male deficit in the 1996 census for those aged 25-29 years in the 1967-71 birth cohort was -8,397, over 2,200 more than it had been for the 1962-66 birth cohort (-6,179) when it was aged 25-29 years in 1991. Five years later, in 2001, there was a male deficit of -10,883 for the 1972-76 birth cohort when it reached age group 25-29 – again over 2,000 more than it had been for the 1967-71 birth cohort when it was aged 25-29 in 1996 (Table 8). The growth in male deficits in this age group ceased after the 2001 census; in the 2006 census there were 8,007 fewer males than females aged 25-29 than there had been at the 2001 census. The 1977-81 birth cohort had not been affected to the same extent as the 1972-76 birth cohort by the factors that were causing male deficits in the 25-29 year age group.

Male deficits in the 5-year age groups between 30 and 49 years began with the 1947-51 birth cohort and grew rapidly with successive cohorts. These age groups have always had larger deficits than the age groups in the 20s. The 1957-61 birth cohort, for example, the last one for which we have census data for the age group 45-49 years, had male deficits of -4,896 when they were 30-34 in 1991, -6,629 when they were in their late 30s in 1996, -8,617 when they were in their early 40s in 2001, and -7,320 when they were 45-49 in 2006 (Table 8). In their 20s this birth cohort had a large surplus of males aged 20-24 (5,211) in 1981, and a small deficit of -1,263 when they were 25-29 years in 1986.

The 1967-71 birth cohort still had a small surplus (861) of males when it was aged 20-24 in 1991, but a large deficit (-8,397) when it reached 25-29 in 1996, and a much larger one again when it reached the early 30s (-14,883) in 2001, growing again to -15,552 when the cohort was 35-39 in 2006 (Table 6). A similar pattern can be seen for the 1972-76 birth cohort, the first to have a male deficit aged 20-24 years in 1996 (-2,092). When the cohort reached 25-29 in 2001 the deficit was five times larger (-10,883), and it had increased again by the time it reached 30-34 years in 2006 (-14,787).

The last two birth cohorts, born in the late 1970s and early 1980s, show signs of declining deficits for males in their early 20s (1982-86) and late 20s (1977-81). The 1972-76 birth cohort also had a marginally smaller male deficit when it was aged

30-34 years in 2006 (-14,787) than the 1967-71 cohort had when it was this age in 2001 (-14,883) (Table 6). The drivers of the missing men phenomenon seem to be weakening, although it will not be until 2016 that we can tell if this is spreading over all the age groups.

### **Net migration gains and losses to the 10 birth cohorts**

The extent to which there are male surpluses or deficits in the permanent and long-term (PLT) net migration data for 5-year age groups between 20 and 49 years for successive birth cohorts is examined in this section. It is important to keep in mind when assessing the migration data that they refer to ALL movements for 12 months or more into and out of the country – new immigrants arriving and some subsequently leaving; New Zealanders leaving and some subsequently returning. PLT net migration, by age group, sex and 5-year period has been obtained for the years ending March 1957-2006. The PLT net migration periods that relate to specific five age groups in each of the 10 birth cohorts since 1937-41 are shown in a matrix in Table 9.

*Table 9: PLT net migration periods for age groups 20-24 and 45-49 in 10 birth cohorts*

Birth Cohort	Age-group and net migration period					
	20-24	25-29	30-34	35-39	40-44	45-49
1937-41	1957-61	1962-66	1967-71	1972-76	1977-81	1982-86
1942-46	1962-66	1967-71	1972-76	1977-81	1982-86	1987-91
1947-51	1967-71	1972-76	1977-81	1982-86	1987-91	1992-96
1952-56	1972-76	1977-81	1982-86	1987-91	1992-96	1997-01
1957-61	1977-81	1982-86	1987-91	1992-96	1997-01	2002-06
1962-66	1982-86	1987-91	1992-96	1997-01	2002-06	
1967-71	1987-91	1992-96	1997-01	2002-06		
1972-76	1992-96	1997-01	2002-06			
1977-81	1997-01	2002-06				
1982-86	2002-06					

The permanent and long-term net migration gains and losses in each of the five year periods shown in Table 9 for the different age groups in the 10 cohorts are given in Table 10. It is very clear from this table that the age group 20-24 has been consistently affected by net migration losses – only 3 of the 10 cohorts did not have

net losses when they were aged between 20 and 24 – the two at the beginning of the series (1937-41, 1942-46) and the one at the end (1982-86). Net losses at ages 20-24 were particularly significant for the birth cohorts 1957-61, 1962-66, 1967-71 and 1977-81.

In the case of the 1957-61 birth cohort, this reflects the very considerable net losses when they reached their early 20s between 1977 and 1981 – the time of the most sustained heavy net migration losses New Zealand has ever had. The 1962-66 and 1967-71 birth cohorts went through their early 20s during the 1980s – between 1982 and 1991. This was a decade of considerable turmoil associated with the last years of the Muldoon era of economic protectionism and the Lange/Labour restructuring era. It was also the decade when the late baby boom cohorts reached their early 20s and sought their ‘overseas experience’ (Table 10).

*Table 10: PLT net migration gains and losses in the periods shown in Table 9 to the age groups 20-24 to 45-49 in the 10 birth cohorts*

Birth Cohort	Age-group and PLT net gains/losses					
	20-24	25-29	30-34	35-39	40-44	45-49
1937-41	8914	12608	2973	7062	-4873	-529
1942-46	13584	2654	10812	-7239	-85	-1129
1947-51	-10588	14934	-10092	1238	-250	4812
1952-56	-3568	-17740	2780	973	9489	-25
1957-61	-52475	2102	1945	12072	2068	3924
1962-66	-31863	-36	15945	2541	8772	
1967-71	-36751	13142	4516	13049		
1972-76	-15517	-3344	19579			
1977-81	-26980	15717				
1982-86	954					

The impact of outflows during the late 1970s is also reflected in the largest net migration losses shown in Table 10 for the cohorts born before 1957. The 1937-41 cohort experienced its greatest loss (-4,873) between 1977 and 1981 when they were at ages 40-44. The 1942-46 cohort was aged 35-39 years when its greatest net loss (-7,239) occurred in the late 1970s. For the cohort born between 1947 and 1951 there were two significant net losses – one in the late 1970s when they were in their early 30s (-10,092), and a slightly larger one a decade earlier in the late 1960s (-10,588)

when they were in their early 20s and when New Zealand experienced its first net migration loss since the Second World War. The late 1960s net loss was associated with a relatively short-lived recession before the very significant net gains of the early 1970s. The cohort born between 1952 and 1956 had its largest net loss (-17,740) when it was aged 25-29 between 1977 and 1981.

The recession in the late 1990s is associated with much smaller net losses for the cohorts that were then in their 20s (the 1972-76 cohort, aged 25-29 between 1997 and 2001, and the 1977-81 cohort aged 20-24 at this time) than was the case with the recession in the late 1970s and, for those in their early 20s in the late 1980s. The 30s and early 40s age groups during the recession between 1998 and 2001 experienced net gains, while the 1952-56 birth cohort, aged 45-49 in the late 1990s, had a very small net loss (-25) (Table 10). The prevailing pattern in Table 10 is for net migration gains to the populations in the birth cohorts at ages above 25, not net losses. The net losses are heavily concentrated in the ages between 20 and 25 years for nearly all of the cohorts, and the only event that produced net losses across all of the prime working age groups was the recession in the late 1970s.

The sex ratios and male surpluses/deficits for the net migration gains and losses are shown in Tables 11 and 12. There are six ways to express these ratios and surpluses/deficits and a combination of italics, signs and brackets in the tables indicates the nature of the flow to which each sex ratio refers. These combinations are:

1. numbers with no italics, sign or brackets indicate net gains of both males and females where the net gain of males is larger than the net gain of females (a male surplus in the net gain);
2. numbers with a minus sign, but no italics or brackets, indicate net gains of both males and females, but the net gain of males is smaller than the net gain of females (a male deficit in a net gain)
3. numbers in italics and with a minus sign (but no brackets) indicate net losses of both males and females;
4. numbers in italics which are enclosed in brackets with a minus sign indicate a net loss to males which is larger than a net gain to females producing an overall net migration loss (a male deficit in the net loss);

5. numbers not in italics with a bracket just round the sign indicate that there was a net loss to males which is smaller than the net gain of females producing an overall net migration gain (a male deficit in the net gain);
6. numbers in italics with a bracket around the sign indicate a net gain to males which is smaller than a net loss of females producing an overall net migration loss (a male surplus in the net loss).

*Table 11: Sex ratios for PLT net migration gains/losses in the age groups 20-24 to 45-49 in the 10 birth cohorts*

Birth	Age-group and sex ratio					
Cohort	20-24	25-29	30-34	35-39	40-44	45-49
1937-41	1.239	1.252	1.032	1.344	<i>-1.314</i>	<i>-0.746</i>
1942-46	1.146	<i>-0.142</i>	1.172	<i>-1.630</i>	<i>(-)0.620</i>	<i>-0.327</i>
1947-51	<i>-2.128</i>	<i>-0.903</i>	<i>-1.534</i>	1.927	<i>(-)0.605</i>	2.139
1952-56	<i>-4.947</i>	<i>-1.702</i>	1.022	2.378	1.249	<i>(-)0.945</i>
1957-61	<i>-1.330</i>	<i>(-)0.235</i>	<i>-0.488</i>	1.066	1.563	2.129
1962-66	<i>-1.263</i>	<i>(-1.015)</i>	<i>-0.980</i>	<i>-0.585</i>	1.302	
1967-71	<i>-1.256</i>	<i>-0.603</i>	<i>-0.421</i>	1.162		
1972-76	<i>-1.171</i>	<i>(-2.686)</i>	<i>-0.895</i>			
1977-81	<i>-1.057</i>	<i>-0.534</i>				
1982-86	1.789					

*Table 12: Male surplus/deficits in PLT net migration gains/losses in the age groups 20-24 to 45-49 in the 10 birth cohorts*

Birth	Age-group and male surpluses/deficits					
Cohort	20-24	25-29	30-34	35-39	40-44	45-49
1937-41	950	1410	47	1036	<i>-661</i>	77
1942-46	926	<i>-1992</i>	856	<i>-1735</i>	<i>(-)363</i>	573
1947-51	<i>-3818</i>	<i>-758</i>	<i>-2126</i>	392	<i>(-)1016</i>	1746
1952-56	<i>-2368</i>	<i>-4610</i>	30	397	1051	<i>(-)885</i>
1957-61	<i>-7425</i>	<i>(-)3396</i>	<i>-669</i>	388	454	1416
1962-66	<i>-3701</i>	<i>(-4950)</i>	<i>-157</i>	<i>-665</i>	1152	
1967-71	<i>-4167</i>	<i>-3254</i>	<i>-1840</i>	979		
1972-76	<i>-1219</i>	<i>(-7310)</i>	<i>-1087</i>			
1977-81	<i>-752</i>	<i>-4773</i>				
1982-86	270					

It is clear from the ratios of males to females shown in Table 11 that males have dominated in the net migration gains and losses to New Zealand's population aged 20-24 years in all 10 of the birth cohorts (sex ratios above 1.0 indicate more males than females; ratios below 1.0 indicate more females than males). When these cohorts reached their late 20s and early 30s the pattern changed and there were almost equal numbers of situations where the sex ratios favoured females and there were far more net gains rather than net losses in the age group. By the 40s the male domination of net gains and losses becomes more obvious again in the sex ratios.

With regard to surpluses of males or females in the net flows, the 20s, and especially the early 20s, are the time when males consistently had higher levels of net loss than was the case for any other age group. Around half of the net gains to the cohorts when they were in their 20s and early 30s had larger numbers of females than males (the un-italicised numbers with a minus sign indicate the deficits in numbers of males compared with females in the net migration gains). The pattern of surpluses/deficits by gender for all age groups except 20-24 years is quite complex – the story conveyed by Tables 11 and 12 is certainly not simply one of male deficits in either PLT net gains or net losses. Gains of women as well as losses of men are very evident in the net migration stories of the majority of the 10 cohorts as they progress through the age groups between 20 and 49 years. The missing men issue is related as much to gender-selective migration adding people to the population through net gains as well as removing them through net losses.

The cohort analysis has allowed us to situate the missing men issue in the changing dynamics of birth cohorts between the late 1930s and the mid-1980s. It is evident in the record of the sex ratios and male surpluses/deficits for the different cohort populations that short-falls in numbers of males compared with females occurred first when they were in their 40s and late 30s, later in their early 30s and late 20s, and then most recently in their early 20s (Table 8). The PLT net migration losses worked in the opposite direction – they occurred first, and most frequently when the cohorts were in their early 20s, and then less frequently at older ages where there were often larger numbers of females in the net gains or net losses (Table 12).

There seems to be an inherent contradiction here, but in fact the two patterns are logical. Sex ratios and male surpluses in the population's age groups are highest for younger age groups and diminish with age. The high net losses in most cohorts

when they were 20-24 do not necessarily result in the removal of all the surplus of males in the age group's total population. Progressive attrition of male surpluses as the cohorts age through sex-selective emigration (more men leaving than women) or sex-selective immigration (more women than men arriving) will lead, over time, to sex ratios in the 40s and late 30s falling and eventually reaching a situation where there are more women than men in the age group population.

### **The PLT Migration System, 1986-2006**

The missing men issue has some additional dimensions to those that can be revealed through an analysis of cohorts. There are some quite different patterns of net migration within New Zealand's international migration system for the population aged 20-49 years between 1986 and 2006, both by source and destination as well as by citizenship. In this section we examine briefly some dimensions of gender disparities in migration flows between two major components of the migration system, and for the two key groups of migrants – New Zealand citizens and citizens of other countries. The analysis draws on a series of more detailed preliminary reports for the missing men project that can be obtained on request from the authors.

New Zealand's international migration system can be described with reference to two major components: trans-Tasman flows of people, and flows of people between New Zealand and other countries in the world. The two components are defined on the basis of responses given by those arriving in or leaving from New Zealand for periods of 12 months or more – the permanent and long-term (PLT) migrants. In these statistics there is a residual category for people who did not state a country of last or next permanent residence (CL/NPR) as well as for some New Zealanders who recorded that New Zealand was their country of next residence even though they were leaving for 12 months or more. The latter disappeared from the statistics from 2000 – the relevant question on the arrival and departure cards was changed to remove any ambiguity with regard to residence of New Zealanders departing for or returning from an overseas stay of 12 months or more.

Table 13 summarises the PLT arrival, departure and net migration statistics for the period 1 January 1986 to 31 December 2005 – the 20 December years between the 1986 and 2006 population censuses. December year data have been

used because a series of special-purpose tables had already been generated for another 'missing men' analysis for the period January 1978 to December 2007 (Bedford and Didham 2009). The December year data, while not as consistent with the 20 year period between the 1986 and 2006 censuses as the March year migration data, are adequate for the purposes of this exploratory analysis.

*Table 13: The PLT migration system, 1986-2005 (December years)*

CL/NPR <sup>1</sup>	PLT migration 1986-2005			Percentage	
	Arrivals	Departures	Net mig.	Arrivals	Departures
<b>20-49 years</b>					
Australia	163747	330948	-167201	20.7	44.2
Other countries	620781	402630	218151	78.6	53.8
NZ and NS	4806	15258	-10452	0.6	2.0
Total	789334	748836	40498	100.0	100.0
<b>All ages</b>					
Australia	260368	556824	-296456	20.8	49.3
Other countries	982876	551397	431479	78.7	48.9
NZ and NS	6242	20403	-14161	0.5	1.8
Total Dec yrs	1249486	1128624	120862	100.0	100.0

<sup>1</sup> Country of last/next permanent residence

Data source for this table and others in this section: Unpublished arrival and departure tables, Statistics New Zealand

Between January 1986 and December 2005 there were 1.25 million PLT arrivals in and 1.13 million PLT departures from New Zealand resulting in an accumulated net gain of just under 121,000 (Table 13). Those aged between 20 and 49 years comprised 63 percent of the arrivals and 66 percent of the departures. The accumulated net gain of people in the prime working ages was 40,498, only a third of the total net gain of 120,862. The major net gain to New Zealand's population over this period was in the age group 0-19 years (75,717 or 62 percent) with a small net gain to those aged 50 and over (4,647 or 4 percent).

The 40,498 net gain in the population aged 20-49 years was the balance between a net loss of 167,201 to Australia, a net gain of 218,151 from other countries, and a net loss of 10,452 amongst those who did not state a CL/NPR or gave New Zealand as their CL/NPR during the period (Table 13). The shares of PLT arrivals and

departures in the major components of the migration system aged 20-49 years and in the total PLT migrant population (all ages) were similar. A slightly higher proportion (54 percent) of the 20-49 year olds were leaving New Zealand for countries other than Australia than was the case for the total PLT outflow (49 percent). As far as PLT arrivals were concerned, 21 percent of both age groups had Australia as their country of last permanent residence (Table 13).

The gender mix amongst the arrivals, departures and net migration gains and losses in the movers aged 20-49 years, as well as the total PLT flows (all ages), are shown in Table 6. There were heavier net losses of males to Australia than females aged 20-49 years and at all ages. In the case of net migration gains from other countries, women (111,402) outnumbered men (106,749) in the flows of 20-49 year olds while the reverse applied in the total PLT net gain (males exceeded females) (Table 14). Men aged 20-49 comprised just over a quarter of the total net gain of 40,498 for this age group – PLT migration between 1986 and 2005 generated a much larger net gain of women rather than men to the working age population. The difference between males and females in their shares of the net gain is much smaller for the population at all ages – males comprised 46 percent and females 54 percent of the 120,862 net gain over the 20 years.

Table 14: PLT migration by CL/NPR and sex, 1986-2005

CL/NPR	Arrivals		Departures		Net migration	
	Males	Females	Males	Females	Males	Females
<b>20-49 years</b>						
Australia	84941	78806	175422	155526	-90481	-76720
Other countries	308327	312454	201578	201052	106749	111402
NZ and NS	2610	2196	8486	6772	-5876	-4576
Total	395878	393456	385486	363350	10392	30106
<b>All ages</b>						
Australia	133966	126402	288891	267933	-154925	-141531
Other countries	493947	488929	271124	278273	220823	210656
NZ and NS	3344	2898	10977	9426	-7633	-6528
Total	631257	618229	570992	555632	58265	62597
<b>% 20-49 yrs</b>						
Australia	63.4	62.3	60.7	58.0	58.4	54.2
Other countries	62.4	63.9	74.3	72.2	48.3	52.9
NZ and NS	78.1	75.8	77.3	71.8	77.0	70.1
Total	62.7	63.6	67.5	65.4	17.8	48.1

The annual net migration gains and losses of males and females aged 20-49 years for the December years between 1986 and 2005 are shown in Table 15. It is clear from this table that there have been two periods of high net losses for both men and women between 1986 and 1989 and between 1998 and 2000. In both periods the net losses were higher for men than women. The major periods of net gains were between 1994 and 1996 and during 2002 and 2003 (Table 15). In these periods women tended to outnumber men in the net gains. In half of the years during the period the sex ratio of the net loss/gain favoured males (mainly the net losses) while in the other 10 cases the sex ratios favoured women (mainly net gains).

Table 15; PLT net migration gains/losses by year, population aged 20-49 years

Year ended December	PLT net migration			Surplus	Sex ratio
	Males	Females	Total	M over F <sup>1</sup>	(M/F)
1986	-7436	-4961	-12397	-2475	1.499
1987	-4213	-2791	-7004	-1422	1.509
1988	-8302	-6199	-14501	-2103	1.339
1989	-5245	-3426	-8671	-1819	1.531
1990	2117	2544	4661	-427	0.832
1991	1788	1633	3421	155	1.095
1992	1763	665	2428	1098	2.651
1993	2943	3256	6199	-313	0.904
1994	4505	5607	10112	-1102	0.803
1995	7216	7745	14961	-529	0.932
1996	5983	6958	12941	-975	0.860
1997	-91	1417	1326	-1508	-0.064
1998	-4929	-2191	-7120	-2738	2.250
1999	-5162	-2951	-8113	-2211	1.749
2000	-6190	-4859	-11049	-1331	1.274
2001	615	1011	1626	-396	0.608
2002	10289	9476	19765	813	1.086
2003	10291	10406	20697	-115	0.989
2004	3220	4598	7818	-1378	0.700
2005	1230	2168	3398	-938	0.567
Total 20 years	10392	30106	40498	-19714	0.345

<sup>1</sup> Figures in italics refer to greater net losses of males in situations where there are net losses to both males and females. Other figures with - signs refer to situations where there are fewer males than females in the net migration gains. Overall there were 19,714 fewer males than females in the aggregate net migration gain to New Zealand from PLT migration between 1 January 1986 and 31 December 2005.

The shortfall of males over females in the net gain was 19,714 – the equivalent of a third of the deficit of males aged 20-49 years at the time of the 2006 census. This suggests that a smaller overall contribution to New Zealand’s prime working age male population has been made by PLT net migration during the 20 years than is the case for the equivalent female population. It is not necessarily a case of emigration being the main driver of the deficit in working age men even though net losses of men to Australia are higher than those for females (Table 13). There is evidence in the aggregated PLT migration data that the larger net gains of women may not be being acknowledged sufficiently as a contributor to the ‘man drought’. It could be as much a case of an abundance of women as a shortage of men.

The other useful discriminating variable in this overview of the migration system is citizenship status, which allows the people travelling on New Zealand passports with free access to Australia to be differentiated from those travelling on other passports. Almost 73 percent of the net loss of over 245,000 New Zealand citizens aged between 20 and 49 was to Australia (Table 16). The share of the net gain of 285,835 citizens of countries other than New Zealand, who had come from Australia, was very small by comparison – just 4 percent. Over 96 percent of the net gain of people who were not New Zealand citizens had come from countries other than Australia (Table 8).

*Table 16: PLT migration by citizenship and CL/NPR, 1986-2005*

CL/NPR	New Zealand citizens			Citizens other countries		
	Arrivals	Departs	Net mig.	Arrivals	Departs	Net mig.
<b>20-49 years</b>						
Australia	112873	291511	-178638	50874	39437	11437
Other countries	207302	264158	-56856	413479	138472	275007
NZ and NS	3487	13330	-9843	1319	1928	-609
<b>Total</b>	<b>323662</b>	<b>568999</b>	<b>-245337</b>	<b>465672</b>	<b>179837</b>	<b>285835</b>
<b>All ages</b>						
Australia	172483	492210	-319727	87885	64614	23271
Other countries	284506	344103	-59597	698370	207294	491076
NZ and NS	4348	17429	-13081	1894	2974	-1080
<b>Total</b>	<b>461337</b>	<b>853742</b>	<b>-392405</b>	<b>788149</b>	<b>274882</b>	<b>513267</b>
<b>% 20-49 yrs</b>						
Australia	65.4	59.2	55.9	57.9	61.0	49.1
Other countries	72.9	76.8	95.4	59.2	66.8	56.0
NZ and NS	80.2	76.5	75.2	69.6	64.8	56.4
<b>Total</b>	<b>70.2</b>	<b>66.6</b>	<b>62.5</b>	<b>59.1</b>	<b>65.4</b>	<b>55.7</b>

When a gender dimension is included in the analysis by CL/NPR and citizenship, it can be seen from the sex ratios that males were more numerous in almost all of the flows, both those to New Zealand as well as those from New Zealand (Table 17). There are a few exceptions to this – the PLT arrival and departure flows of female New Zealand citizens into and out of countries other than Australia were larger than the corresponding flows for males. There was also a marginally larger

number of females travelling on passports of other countries heading for Australia (20,190) than was the case for males (19,247) – the sex ratio for this flow is 0.953 (Table 17). The main explanation for the much smaller overall net gain of males aged 20-49 years (10,392) in the PLT flows between 1986 and 2005 than the net gain for females (30,106) (Table 16) lies in the smaller loss of female New Zealand citizens to Australia (-112,109) than was the case for male New Zealand citizens (-133,178) (Table 17). It is the New Zealand citizen flow to Australia, rather than the flows of citizens of other countries, that is responsible for most of the male surplus in the in the departure figures and the aggregate net migration loss of -19,714.

*Table 17 PLT migration by citizenship, sex and CL/NPR, 1986-2005*

CL/NPR	New Zealand citizens			Citizens other countries		
	Arrivals	Departs	Net mig.	Arrivals	Departs	Net mig.
<b>Males 20-49 yrs</b>						
Australia	59418	156125	-96707	25523	19247	6276
Other countries	100246	131149	-30903	208081	70429	137652
NZ and NS	1889	7457	-5568	721	1029	-308
Total	161553	294731	-133178	234325	90705	143620
<b>Females 20-49 yrs</b>						
Australia	53455	135336	-81881	25351	20190	5161
Other countries	107056	133009	-25953	205398	68043	137355
NZ and NS	1598	5873	-4275	598	899	-301
Total	162109	274218	-112109	231347	89132	142215
<b>Male surplus/deficit</b>						
Australia	5963	20789	-14826	172	-943	1115
Other countries	-6810	-1860	-4950	2683	2386	297
NZ and NS	291	1584	-1293	123	130	-7
Total	-556	20513	-21069	2978	1573	1405
<b>Sex ratio</b>						
Australia	1.112	1.154	1.181	1.007	0.953	1.216
Other countries	0.936	0.986	1.191	1.013	1.035	1.002
NZ and NS	1.182	1.270	1.302	1.206	1.145	1.023
Total	0.997	1.075	1.188	1.013	1.018	1.010

The male surplus/deficits in the arrival, departure and net migration statistics by CL/NPR for both the population aged 20-49 years and the total population show

that sex-selective migration to Australia generates the only sizeable male surpluses in the departure flows (Table 18). Other parts of the migration system have much smaller male surpluses, especially for the population aged 20-49 years. Most of the flows have male surpluses (recalling that a net loss in italics with a '-' sign indicates a larger net loss of males than females while a number not in italics with a '-' sign indicates a smaller number of males than females in an overall net gain). The magnitude of the male surpluses in the arrival, departure and net migration flows for the total (all ages) and 20-49 year group are very similar and consistent (Table 18). In the case of the flows from other countries there are some differences.

*Table 18: Male surpluses/deficits, sex ratios in PLT migration flows, 1986-2005*

CL/NPR	Male surpluses/deficits			Sex ratios		
	Arrivals	Departs	Net mig.	Arrivals	Departs	Net mig.
<b>20-49 years</b>						
Australia	6135	19896	<i>-13761</i>	1.078	1.128	<i>1.179</i>
Other countries	-4127	526	<i>-4653</i>	0.987	1.003	0.958
NZ and NS	414	1714	<i>-1300</i>	1.189	1.253	1.284
Total	2422	22136	<i>-19714</i>	1.006	1.061	0.347
<b>All ages</b>						
Australia	7564	20958	<i>-13394</i>	1.060	1.078	<i>-1.565</i>
Other countries	5018	-5149	10167	1.010	0.981	1.048
NZ and NS	446	1551	<i>-1105</i>	1.154	1.165	1.169
Total	13028	17360	<i>-4332</i>	1.021	1.031	0.931

In the prime working age group there was a deficit of males in the arrivals in New Zealand (-4,127) compared with a male surplus in the all ages population (5,018). The converse applies in the case of departure flows – there was a small male surplus in the departures of men aged 20-49 (526) compared with a male deficit of -5,149 in the departures of those at all ages. It is this variation in gender mix in the PLT arrivals and departures from countries other than Australia that accounts for the major difference in the deficits of males in the net losses for the two age groups -- -19,714 for those aged 20-49 years and -4,332 for the total age range (Table 18).

The analysis in this section has focussed on an examination of the extent to which patterns of PLT migration out of and into New Zealand might have impacted on the resident population aged between 20 and 49 years at the time of five censuses

between 1986 and 2006. Extensive use has been made of data on the gender and age compositions of permanent and long-term migration flows in and out of the country over the 20 years. The primary concern has been to see if there are significant gender biases in permanent and long-term migration flows and, if there are biases, are they of sufficient magnitude to account for the shortfalls in males in the population aged between 20 and 49 years that are shown in Table 2. We have established that the shortfall of 19,714 males compared with females in the accumulated PLT net migration gain of 40,498 in this age group during the years between 1 January 1986 and 30 December 2005 is the equivalent of 34 percent of the 58,365 'missing men' in the 2006 census population.

### **Unexpected net gains of women?**

In the final section we summarise some of the key findings from a comparison of the net gains and losses from the PLT flows and those from the total flows (including short-term migration) into and out of New Zealand. The purpose of this analysis is to get a sense of the potential contribution category jumping in the migration flows might be making to the missing men puzzle. Category jumping occurs when arrivals and departures in one migration category (either PLT or short-term) end up actually being in the other migration category either because the mover stayed away for a longer (or shorter) than expected stay, or the people coming into New Zealand stayed longer (or for a shorter period) than intended. Category jumping has long been recognised as a process that affects estimates of net migration and it is taken into consideration in the preparation of population estimates and projections (see Bedford et al. (2010: 102-103) for further information about category jumping).

Statistics New Zealand has estimated the net effects of category jumping between short-term and long-term categories of movement to total around 92,400 between 1986 and 2006, with 58,400 (63 percent) of this additional contribution to New Zealand's population occurring between the censuses in 2001 and 2006 (Bedford et al. 2010: 102). This is a very substantial additional contribution from net migration to New Zealand's population during the 20 years between April 1986 and March 2006. Over the same period PLT net migration added 138,100, and total net migration added 250,000 (Table 19). The difference between PLT and total net

migration was 111,900, and this can be interpreted as the estimate of category jumping that is gained from a simple comparison of the aggregated annual net migration gains and losses between 1 April 1987 and 31 March 2006.

*Table 19: Net migration gains and losses, PLT and total flows, 1987-2006 (March years)*

YE 31 Mar	Males		Females		Total	
	PLT NM	Tot NM	PLT NM	Tot NM	PLT NM	Tot NM
1987	-8028	964	-6241	3393	-14269	4357
1988	-8304	-1720	-7321	763	-15625	-957
1989	-13471	-10289	-11237	-8009	-24708	-18298
1990	-2079	-1825	-1939	192	-4018	-1633
1991	6072	11222	5544	3354	11616	14576
1992	2980	2016	1307	922	4287	2938
1993	3868	2852	2980	5228	6848	8080
1994	7956	8427	7631	7366	15587	15793
1995	10718	7236	10979	13165	21697	20401
1996	15495	16601	14337	12025	29832	28626
1997	10421	18557	10527	19222	20948	37779
1998	443	-7579	2264	9502	2707	1923
1999	-6498	-8804	-3701	-5148	-10199	-13952
2000	-5306	-1465	-3681	3614	-8987	2149
2001	-6666	3097	-5934	1861	-12600	4958
2002	13702	29476	11933	38345	25635	67821
2003	22219	29322	19373	34882	41592	64204
2004	13989	14744	13989	18220	27978	32964
2005	4714	-11861	5299	1218	10013	-10643
2006	4374	2869	5365	-13947	9739	-11078
1987-2006	66599	103840	71474	146168	138073	250008

There are several problems with simple aggregations of total net migration figures, including the fact that they are drawn from a sample of arrival and departures cards, not the full count of people entering and leaving New Zealand. Sampling error, while relatively small when estimates of total arrivals and departures are being used, is there nevertheless, and its effects are compounded through addition of annual estimates of net migration as has been done in Table 19. This is not a problem with the PLT data – all of the arrival and departure cards for people entering or leaving the country for 12 months or more are processed so there is no sampling error. A simple test of the possible impact of sampling on the estimates of total arrivals, departures and net migration gains/losses for the total population was done by comparing the figures obtained from the sample of arrival/departure cards with a set of head-count

data collected at the border for the period 1 April 1999-31 March 2006 (Table 20). The head count data come from Statistics New Zealand's monthly *Hot off the Press* releases on international migration, and the weighted sample totals come from the database containing coded data from arrival and departure cards maintained by Statistics New Zealand and used for analysis of characteristics of arrivals in and departures from New Zealand.

*Table 20: Head count and sample total migration data, March years 2000-2006*

Data category	Arrivals	Departures	Net migration
<b>Total (both sexes)</b>			
Head count data	25265483	25071428	194055
Sample data	25205823	25055448	150375
Difference (H-S)	59660	15980	43680
% of total H	0.24	0.06	22.51
<b>Sample data</b>			
Males	13084402	13015030	69373
Females	12121421	12040418	81002
Sex ratio	1.079	1.081	0.856
Male surp/def.	962981	974611	-11630
<b>Head count data</b>			
Est males	13115185	13023325	91860
Est females	12150298	12048103	102195
Sex ratio	1.079	1.081	0.899
Male surp/def.	964888	975222	-10334
Difference (H-S)			
Males	30783	8295	22488
Females	28877	7685	21192
Total	59660	15980	43680

It can be seen from Table 20 that the sample data under-estimate both arrivals and departures, with a greater problem of under-estimation appearing for the arrivals. This applies especially to the March years since 2005 when the gap between estimates based on the sample data and the head count data began to deviate much more significantly. Based on the total estimates for the seven March years between 2000 and 2006, it appears that the sample data under-estimated the total net gain to New Zealand's population by 43,680. Data on the gender balance in the head count data are not available, but if we assume that the sex ratios for the arrivals and

departures in the sample data applied to the head count data then the additional 43,680 would have included 22,488 males and 21,192 females. The total net gain in the head count data over the seven years (194,055) comprised more women (102,195) than men (91,860), however, with a short-fall in males by 10,334 (Table 20). This was marginally smaller than the deficit for males in the sample net migration data (11,630). In summary, the overall estimate of category jumping in the head count data is greater than that in the sample data, but the impact of this difference on the estimates of missing men or unacknowledged women in the total population (all ages) is negligible.

A second problem associated with aggregation of total arrival and departure cards, which can overlap with category jumping, is the problem of 'end-point effects'. The great majority of border crossings are by short-term travellers, either visiting New Zealand or heading overseas for trips of less than 12 months. If short-term visitors arrive and leave in the same reference period (say, a year ended March), the movements in and out of the country are cancelled out – there is no net gain or loss recorded. If, however, the short-term arrivals and departures overlap two reference periods (two years ended March) then there will be surplus arrivals or departures recorded from short-term migration in each reference period. These are the 'end point effects'. For a more comprehensive review of the difficulties of calculating end-point effects and taking them into account in aggregations of arrival and departure statistics see Bedford et al. (2010: 102-03).

Adjustments for sampling error and end-point effects have been made in the Statistics New Zealand estimates of category jumping between 1986 and 2006, and have resulted in a reduction to 92,400 in the overall estimate for the additional net migration gain that might be due to category jumping rather than the 111,900 that can be derived from the sample migration data (Table 19). Females (74,700) accounted for two thirds of the difference between the total and PLT net migration gains. If this share held for the 92,400 estimate for category jumping then an additional 61,600 females, not accounted for in the PLT net migration figures, would have been added to the population through net migration gains between April 1987 and March 2006. The corresponding number of unaccounted for males added to the population would have been 30,800.

*Table 21: Differences between PLT and total (sample) net migration gains, 20-49 years and all ages, 1987-2006*

	Net migration			
Sex	Total	PLT	Difference	% difference
<b>20-49 years</b>				
Males	16376	12475	3901	9.8
Females	69112	32991	36121	90.3
Total	85448	45466	39982	100.1
Sex ratio	0.237	0.378	0.108	
M. surp/def.	-52736	-20516	-32220	
<b>All ages</b>				
Males	103840	66600	37240	33.3
Females	146160	71500	74660	66.7
Total	250000	138100	111900	100.0
Sex ratio	0.710	0.931	0.499	
M. surp/def.	-42320	-4900	-37420	

These estimates of category jumping apply to the total population (all ages). When the difference between total and PLT net migration gains between April 1986 and March 2006 is calculated for males and females aged 20-49 years the estimate of category jumping falls to just under 40,000 (39,982). Females account for 90 percent of this estimate (Table 21). If this is adjusted downwards to take account of end-point effects by the same proportion that the estimate for category jumping of 111,900 for people of all ages is adjusted to reach 92,400, then the estimate of category jumping for the 20-49 year age group falls to 33,000. The shares of this total that are males and females, based on the 10/90 percent split shown in Table 20, are 3,300 males and 29,700 females. The estimated deficit of males due to category jumping is 26,400 – more than the 20,500 deficit of males that is accounted for by PLT net migration between 1 April 1986 and 31 March 2006.<sup>ii</sup> The combined deficit (46,900) is equivalent to 88 percent of the 58,365 ‘missing men’ aged 20-49 years in the 2006 census population (Table 2).

The explanation for most of the short-fall in males aged 20-49 years is not excessive male-dominated net emigration, however. Much more important in the analysis of PLT net migration, and the contribution that might be being made through category jumping, is female-dominated net migration gains. It seems that the missing

men puzzle arises from a mix of male-dominated net migration losses, especially in the age group 20-25, coupled with female-dominated net migration gains, especially for age groups in the late 20s, 30s and 40s. It is more a combination of missing men and unacknowledged, or unaccounted for, women.

## **Conclusion**

Unravelling the contribution that international migration makes to the widening disparities in numbers of men and women aged between 20 and 49 years in New Zealand's population since the early 1980s is not straight-forward. Intuitively the answer seems to lie in sex-selective emigration of New Zealand men to Australia, and analysis of the flows of New Zealand citizens across the Tasman does provide support for this argument. There are heavier PLT net losses of men than women aged 20-49 years to Australia. Countering this, however, is the tendency for women to dominate in the PLT net gains of citizens of other countries into New Zealand, and over the period 1986-2006 these net gains have been larger than the net losses to Australia. In the overall PLT net gain to New Zealand's population aged 20-49 years between 1 January 1986 and 30 December 2005 (40,500) there were 30,100 females and 10,400 males. The surplus of males (19,700 for December-year data and 20,500 for March-year data) accounted for around 34-35 percent of the total male deficit of just under 58,400 in the 20-49 year age group in the 2006 census.

An examination of the gender composition of the various five year birth cohorts that comprise the age group 20-49 years at different times during the 20 years under review (1986-2006), and the contributions that net migration makes to the numbers in these age groups, demonstrated that while deficits in males in the age group populations began at the older ages in the 1980s, and gradually progressed over time down through the age groups to those in their 20s, the only time that the birth cohorts were consistently affected by male-dominated net migration losses was when they were in the 20-25 year age group. In all of the other age groups the cohorts had a mix of net losses and net gains, many of which were female rather than male-dominated.

The contribution that female-dominated category-jumping seems to make to helping account for the gap between numbers of males and females in those aged 20-

49 years at the time of the 2006 census seems to be quite considerable. On the basis of a Statistics New Zealand estimate of 92,400 net gain of category jumpers at all ages over the period 1 April 1986 and 31 March 2006, it was shown that around 40,000 of this unaccounted for net migration gain was aged between 20-49 years, and that females heavily dominated this group. The deficit of males in the category jumping net gain was larger (26,400) than in the PLT net gain (20,500) for the 20 years between 1 April 1986 and 31 March 2006, and could have accounted for around 45 percent of the 58,400 missing men in 2006.

Overall, an explanation for the great majority of the deficit in males can be found in the international migration data – a conclusion that is somewhat at variance with that in our initial analysis of the ‘missing men’ puzzle in 2006 where we concluded that sex-selective PLT net migration accounted for only a small part of the accumulating deficit of males in successive censuses since 1981 (Callister et al. 2006a and 2006b). At that time we had not examined the total migration data and the associated gender dimensions of category jumping. More exhaustive analysis of arrival and departure data, in the wider contexts of the changing gender mix within successive birth cohorts as they progress through the prime working ages, the feminisation of migration, the main population exchanges within New Zealand’s international migration system, and the differing contributions that New Zealand citizens and citizens of other countries make to net gains and losses in the country’s population, have provided a firmer evidence base on which to assess the contribution that international migration makes to explaining the widening disparities between men and women in the age group 20-49 years.

International migration is, indeed the main contributor to this deficit of males, but it is not due mainly to New Zealand ‘tithing its 30-something men in particular to other, bigger economies’ (Salt (2005) cited in Callister et al. 2006b: 23). It is due more to not acknowledging enough in population estimates the contribution that net migration of women makes to enhancing New Zealand’s adult population. There would be no surprises for Marilyn Waring (...) here – after all failure to acknowledge adequately the contributions women make in all sorts of social and economic contexts is endemic in most societies.

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## Notes

- <sup>i</sup> Similar patterns can be found in national projections produced in 2007 and 2009.
- <sup>ii</sup> The deficit of males in the PLT net gain for the 20 years ended March 1987-2006 was 20,516 (Table 20). This compares with the 19,714 deficit of males in the PLT net gain for the 20 years ended December 1986-2005 (Table 15).

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