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Missing Men and Unacknowledged Women: Explaining Gender Disparities in New Zealand's Prime Adult Age Groups, 1986-2006

RICHARD BEDFORD *
PAUL CALLISTER †
ROBERT DIDHAM ‡

Abstract

Questions concerning the widening disparity in numbers of males and females in the prime working age groups in New Zealand's population have attracted attention from researchers and the media in recent years. This paper reviews some of the findings from research for a FRST-funded programme that has been investigating several inequalities based on gender and ethnicity in New Zealand's population. The analysis here complements and extends that in our 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 population estimates (the base for population projections), have contributed to exaggerating apparent gender disparities in the 20-49 year age groups at successive censuses. There is no single explanation for this, and the main new finding from our analysis is that gender disparities in the prime adult age groups in New Zealand's population are as much a function of 'unacknowledged women' as of 'missing men'.

An apparent deficit of men aged 20-49 years in New Zealand's population, or a 'man drought' as the media like to term this situation, became the subject of considerable public comment and speculation in the mid-2000s (Callister et al., 2006a, 2006b; Laugesen and

* Professor of Population Geography in the National Institute of Demographic and Economic Analysis (NIDEA) at the University of Waikato and Pro Vice-Chancellor (Research) at AUT University, Auckland. E-mail: rdb@waikato.ac.nz.
† Institute of Policy Studies, Victoria University of Wellington
‡ Statistics New Zealand

Courtney, 2005; Salt, 2005). The phenomenon attracted attention because in national populations it is usual for the number of men to exceed the number of women at all ages from birth to around 50 years - unless a process is removing unusually large numbers of men, or adding more females, to the adult population. Significant gender disparities in the prime working ages can be found in populations heavily impacted by sex-selective international migration. Examples include male deficits in populations where there is extensive overseas labour migration of men (for example, Cook Islands and Niue in the 1970s and 1980s), or surpluses of working age men or women in countries seeking extensive immigrant labour (for example, several of the Middle East oil exporting countries).

In New Zealand, 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), nor to unusually high sex-selective mortality (Callister et al., 2006a; Callister & Didham, 2009). These make contributions to the disparities, but cannot solely account for it.

The deficit of men aged 20-49 years is not unique to New Zealand's population. It is apparent in Australia's 2006 census, 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 (Haberkorn, 2007/08). In New Zealand's case, the male deficit is significantly larger in proportional terms than that found in recent Australian censuses (Callister et al., 2006b). This is despite the fact that for much of the period over which the gender gap has been widening in New Zealand the country 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 almost 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.

The results presented in this paper 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 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. 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 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.

Therefore, the search is not so much for 'missing men', but rather to establish whether there are an unexpectedly large number of women in the census population of 20-49 year olds.

This somewhat belated focus on unacknowledged women, after an extensive search for an explanation for an unanticipated short-fall in numbers of men would not have surprised some analysts such as Marilyn Waring. She has been arguing for many years that women tend to be rendered invisible in social and economic analysis (refer to Waring, 1988).

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 20th century other than in 1945 (0.886) when troops were still returning from war overseas (Table 1). The only other census 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				
	20-29	30-39	40-49	20-49	All ages
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
1916	***0.739***	**1.006**	**1.132**	***0.935***	**1.007**
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
1945	***0.748***	***0.938***	**1.001**	***0.886***	***0.954***
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*
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***

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

The twenty years between 1986 and 2006 thus stand out as something of an anomaly in the historical record of New Zealand's 20th century censuses, with respect to the balance between males and females aged between 20 and 49 years. Unlike the other two occasions during the century when sex ratios for this age group fell below unity, war cannot be cited as an explanation 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 in 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, 1901-2006

	Male surplus/ deficit				
Year	20-29	30-39	40-49	20-49	All ages
1901	1585	5517	9219	16321	39041
1906	10300	9712	7942	27954	53177
1911	10742	12717	7457	30916	55036
1916	***-24879***	**578**	**8140**	***-16161***	**3985**
1921	*-5821*	2156	8638	4973	27457
1926	3108	*-4866*	6619	4861	28939
1936	4280	2204	*-4569*	1915	20751
1945	***-33052***	***-7723***	**64**	***-40711***	***-37574***
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*
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***

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 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 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 by 1991 (-7,900), more than doubled by 1996 (-15,209), 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. 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-21st century, projections prepared by Statistics New Zealand in 2008 suggested that the sex ratio for the age group 20-49 years was unlikely to fall below 0.950, assuming there were 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 that the sex ratios start to converge again for the three age groups (Table 3).[1] This convergence is 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

	Sex ratio				
Year	20-29	30-39	40-49	20-49	All ages
Census					
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*
Projected					
2011	1.013	*0.915*	*0.925*	*0.950*	*0.963*
2016	1.045	*0.937*	*0.911*	*0.963*	*0.966*
2021	1.052	*0.972*	*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	1.065	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: Statistics New Zealand Unpublished time series, censuses 1901-2006, projections 2011-2101

According to the 2008 national population projections, there may be more males than females in the age group 20-49 years by 2031. The projected sex ratios between 2036 and 2051 are very similar to those that were found in the period 1951-1971 (Tables 1 and 3). However, this convergence is a function of the assumptions in the projections about the age-sex characteristics of fertility, mortality and migration. It could be that these assumptions, especially as they relate to migration, are only capturing part of the story.

Net Migration Gains and Losses

This section examines the extent of 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.

At any census, the age group 20-49 years includes survivors of six five-year birth cohorts (Table 4). 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. The oldest of the cohorts represented is the survivors of those born between March 1937 and March 1941, and they were aged 45-49 years in 1986. The youngest cohort represented is the survivors of those born between 1982 and 1986 who were aged 20-24 in 2006. They would reach 45-49 years in 2031. (A detailed analysis of the changing gender composition of these cohorts, and the PLT net gains and losses by sex at different ages between 20-49 years at successive censuses between 1986 and 2006 can be found in Bedford et al. (2011)).

Table 4: Five year birth cohorts in the population aged 20-49 years at censuses between 1986 and 2006

	Age-group and birth cohort					
Census	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

The cohort analysis allowed us to situate the missing men issue in the context of 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 5). 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 6).

Table 5: Male surpluses/deficits for age groups 20-24 to 45-49 in 10 birth cohorts

	Age-group and male surplus/deficit					
Census	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					

Source: Statistics New Zealand

Table 6: PLT net migration gains and losses to the age groups 20-24 and 45-49 years in the 10 birth cohorts

	Age-group and PLT net gains / losses					
Census	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					

Source: Statistics New Zealand

There seems to be an inherent contradiction here, but in fact the two patterns are logical. Sex ratios and male surpluses are highest among 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

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. These 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 7 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.[2] 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. 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, (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 (Table 13)) - 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).

Table 7: The PLT migration system, 1986-2005 (December years)

CL/NPR[1]	PLT migration 1986-2005 Arrivals	Departures	CL/NPR [1]	Percentage Arrivals	Departures
20-49 years					
Australia	163,747	330,948	-167,201	20.7	44.2
Other countries	620,781	402,630	218,151	78.6	53.8
NZ and NS	4806	15,258	-10,452	0.6	2.0
Total	789,334	748,836	40,498	100.0	100.0
All ages					
Australia	260,368	556,824	-296,456	20.8	49.3
Other countries	982,876	551,397	431,479	78.7	48.9
NZ and NS	6242	20,403	-14,161	0.5	1.8
Total Dec yrs	1,249,486	1,128,624	120,862	100.0	100.0

1. Country of last/next permanent residence

Source: Unpublished arrival and departure tables, Statistics New Zealand

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 8. 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 at all ages) (Table 8). 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 8: PLT migration by CL/NPR and sex, 1986-2005

	Arrivals		Departures		Net migration	
CL/NPR	Males	Females	Males	Females	Males	Females
20-49 years						
Australia	84,941	78,806	175,422	155,526	-90481	-76720
Other countries	308,327	312,454	201,578	201,052	106,749	111,402
NZ and NS	2610	2196	8486	6772	-5876	-4576
Total	395,878	393,456	385,486	363,350	10,392	30,106
All ages						
Australia	133,966	126,402	288,891	267,933	-154,925	-141,531
Other countries	493,947	488,929	271,124	278,273	220,823	210,656
NZ and NS	3344	2898	10,977	9426	-7633	-6528
Total	631,257	618,229	570,992	555,632	58,265	62,597
% 20-49 yrs						
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

Source: Unpublished arrival and departure tables, Statistics New Zealand

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 9. 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 9). 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 9: PLT net migration gains/losses by year, population aged 20–49 years

December	PLT net migration Males	Females	Total	Surplus M over F[1]	Sex ratio (M/F)
1986	-7436	-4961	-12,397	*-2475*	*1.499*
1987	-4213	-2791	-7004	*-1422*	*1.509*
1988	-8302	-6199	-14,501	*-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	10,112	-1102	0.803
1995	7216	7745	14,961	-529	0.932
1996	5983	6958	12,941	-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	-11,049	*-1331*	*1.274*
2001	615	1011	1626	-396	0.608
2002	10,289	9476	19,765	813	1.086
2003	10,291	10,406	20,697	-115	0.989
2004	3220	4598	7818	-1378	0.700
2005	1230	2168	3398	-938	0.567
Total 20 years	10,392	30,106	40,498	-19,714	0.345

Source: Unpublished arrival and departure tables, Statistics New Zealand

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 7). 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 10). 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 10).

Table 10: PLT migration by citizenship, sex and CL/NPR, 1986-2005

	NZ Citizens			Citizens of other countries		
CL/NPR	**Arrivals**	**Departs**	**Net mig.**	**Arrivals**	**Departs**	**Net mig.**
20-49 years						
Australia	112,873	291,511	-178,638	50,874	39,437	11,437
Other countries	207,302	264,158	-56,856	413,479	138,472	275,007
NZ and NS	3487	13,330	-9843	1319	1928	-609
Total	323,662	568,999	-245,337	465,672	179,837	285,835
All ages						
Australia	172,483	492,210	-319,727	87,885	64,614	23,271
Other countries	284,506	344,103	-59,597	698,370	207,294	491,076
NZ and NS	4348	17,429	-13,081	1894	2974	-1080
Total	461,337	853,742	-392,405	788,149	274,882	513,267
% 20-49 yrs						
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
Total	70.2	66.6	62.5	59.1	65.4	55.7

Source: Unpublished arrival and departure tables, Statistics New Zealand

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 11). 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 11). 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 8) lies in the smaller loss of female New Zealand citizens to Australia (-81,881) than was the case for male New Zealand citizens (-96,707) (Table 11). 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 deficit in the overall net migration gain of 40,498 during the 20 years, and an aggregate shortfall of -19,714 males (Table 9).

Table 11: PLT migration by citizenship, sex and CL/NPR, 1986-2005

	NZ Citizens			Citizens of other countries		
CL/NPR	Arrivals	Departs	Net mig.	Arrivals	Departs	Net mig.
Males 20-49 years						
Australia	59,418	156,125	-96,707	25,523	19,247	6276
Other countries	100,246	131,149	-30,903	208,081	70,429	137,652
NZ and NS	1889	7457	-5568	721	1029	-308
Total	161,553	294,731	-133,178	234,325	90,705	143,620
Females 20-49 years						
Australia	53,455	135,336	-81,881	25,351	20,190	5161
Other countries	107,056	133,009	-25,953	205,398	68,043	137,355
NZ and NS	1598	5873	-4275	598	899	-301
Total	162,109	274,218	-112,109	231347	89,132	142,215
Male surplus/deficit						
Australia	5963	20,789	-14,826	172	-943	1115
Other countries	-6810	-1860	-4950	2683	2386	297
NZ and NS	291	1584	-1293	123	130	-7
Total	-556	20,513	-21,069	2978	1573	1405
Sex ratio						
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

Source: Unpublished arrival and departure tables, Statistics New Zealand

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 12). 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 (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 12). In the case of the flows from other countries there are some differences.

Table 12: Male surpluses/deficits, sex ratios in PLT migration flows, 1986-2005

	Male surpluses/deficits			Sex ratios		
CL/NPR	Arrivals	Departs	Net mig.	Arrivals	Departs	Net mig.
20-49 years						
Australia	6135	19,896	*-13,761*	1.078	1.128	*1.179*
Other countries	-4127	526	-4653	0.987	1.003	0.958
NZ and NS	414	1714	-1300	1.189	1.253	1.284
Total	2422	22,136	-19,714	1.006	1.061	0.347
All ages						
Australia	7564	20,958	*-13,394*	1.060	1.078	*-1.565*
Other countries	5018	-5149	10,167	1.010	0.981	1.048
NZ and NS	446	1551	-1105	1.154	1.165	1.169
Total	13,028	17,360	-4332	1.021	1.031	0.931

Source: Unpublished arrival and departure tables, Statistics New Zealand

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) (Table 12). 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 12).

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 this 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 that 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 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).

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, p. 102). This represents a substantial 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 (see Table 13). 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 13: Net migration gains and losses, PLT and total flows, 1987-2006 (March years)

	Males		Females		Total	
YE 31 Mar	PLT NM	Tot NM	PLT NM	Tot NM	PLT NM	Tot NM
1987	-8028	964	-6241	3393	-14,269	4357
1988	-8304	-1720	-7321	763	-15,625	-957
1989	-13,471	-10,289	-11,237	-8009	-24,708	-18,298
1990	-2079	-1825	-1939	192	-4018	-1633
1991	6072	11,222	5544	3354	11,616	14,576
1992	2980	2016	1307	922	4287	2938
1993	3868	2852	2980	5228	6848	8080
1994	7956	8427	7631	7366	15,587	15,793
1995	10,718	7236	10,979	13,165	21,697	20,401
1996	15,495	16,601	14,337	12,025	29,832	28,626
1997	10,421	18,557	10,527	19,222	20,948	37,779
1998	443	-7579	2264	9502	2707	1923
1999	-6498	-8804	-3701	-5148	-10,199	-13,952
2000	-5306	-1465	-3681	3614	-8987	2149
2001	-6666	3097	-5934	1861	-12,600	4958
2002	13,702	29,476	11,933	38,345	25,635	67,821
2003	22,219	29,322	19,373	34,882	41,592	64,204
2004	13,989	14,744	13,989	18,220	27,978	32,964
2005	4714	-11861	5299	1218	10,013	-10,643
2006	4374	2869	5365	-13947	9739	-11,078
Total 20 years	66,599	103,840	71,474	146,168	138,073	250,008

Source: Unpublished arrival and departure tables, Statistics New Zealand

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 departure 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 13. 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 14). 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 14: Head count and sample total migration data, March years 2000-2006

Data category	Arrivals	Departures	Net migration
Total (both sexes)			
Head count data	25,265,483	25,071,428	194,055
Sample data	25,205,823	25,055,448	150,375
Difference (H-S)	59,660	15980	43,680
% of total H	0.24	0.06	22.51
Sample data			
Males	13,084,402	13,015,030	69,373
Females	12,121,421	12,040,418	81,002
Sex ratio	1.079	1.081	0.856
Male surp/def.	962,981	974611	-11,630
Head count data			
Est males	13,115,185	13,023,325	91,860
Est females	12,150,298	12,048,103	102,195
Sex ratio	1.079	1.081	0.899
Male surp/def.	964,888	975,222	-10,334
Difference (H-S)			
Males	30,783	8295	22,488
Females	28,877	7685	21,192
Total	59,660	15,980	43,680

Source: Unpublished arrival and departure tables, Statistics New Zealand

It can be seen from Table 14 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 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 14). 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 15). 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 15: Differences between PLT and total (sample) net migration gains, 20-49 years and all ages, 1987-2006

Sex	Net migration			% difference
	Total	PLT	Difference	
20-49 years				
Males	16,376	12,475	3901	9.8
Females	69,112	32,991	36,121	90.3
Total	85,448	45,466	39,982	100.1
Sex ratio	0.237	0.378	0.108	
M. surp/def.	-52,736	-20,516	-32,220	
All ages				
Males	103,840	66,600	37,240	33.3
Females	146,160	71,500	74,660	66.7
Total	250,000	138,100	111,900	100.0
Sex ratio	0.710	0.931	0.499	
M. surp/def.	-42,320	-4900	-37,420	

Source: Unpublished arrival and departure tables, Statistics New Zealand

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 15). 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 15 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.[3] The combined deficit (46,900) is equivalent to 88 percent of the 58,365 'missing men' aged 20-49 years at the 2006 census (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 straightforward. 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 less than 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 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, 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 widening disparities between men and women in the age group 20-49 years.

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Notes

1. Similar patterns can be found in national projections produced in 2007 and 2009.

2. 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 & 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.

3. The deficit of males in the PLT net gain for the 20 years ended March 1987-2006 was 20,516 (Table 15). This compares with the 19,714 deficit of males in the PLT net gain for the 20 years ended December 1986-2005 (Table 9).

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