



Brain drain or OE? Characteristics of young New Zealanders who leave

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Abstract

Aims. To characterise the emigration patterns of young New Zealanders.

Methods. The 980 members of the Dunedin Multidisciplinary Health and Development Study participating in the "age-26" (1998-1999) assessment provided information about emigration behaviour, qualifications, aspects of physical and mental health and personality.

Results. 26% of the sample had moved overseas to live between the ages of 18 and 26, with the United Kingdom and Australia being the most common destinations. Compared to non-emigrants, emigrants had higher IQ scores, were better qualified, leaner and fitter, and had happier and less stress-prone personalities. Based on their

planned return date, 63% of emigrants were considered to be on their OE overseas experience (OE, return in <5 years), 18% were defined as brain-drain emigrants (return in >5 years or never) and 18% were uncertain about their return. Brain-drain emigrants were more likely than OE emigrants to leave for better work opportunities, and they were also more likely to go to Australia. However, there were no differences in terms of qualifications, intelligence and personality between OE and brain-drain emigrants.

Conclusions. Most young New Zealanders in this cohort who left for overseas were embarking on their OE. Brain-drain emigrants make up a sizeable minority of emigrants, but appear to possess no more skills than those who plan or choose to return.

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There has been recent concern in New Zealand about the large-scale emigration of young, skilled New Zealanders.¹⁻⁴ This phenomenon has been dubbed the 'brain drain,' a term which connotes that intelligent and skilled New Zealanders who travel overseas do not return. The brain drain is viewed negatively for a number of reasons. These include concerns about the investment in the education of young New Zealanders being wasted when they move permanently overseas, and more specifically, that those most capable of contributing to New Zealand's economy are taking their talents elsewhere. Additionally, some fear that New Zealand's 'health' may be adversely affected because health professionals and health researchers appear to be over-represented among those leaving.⁵⁻⁸

In contrast, the long-standing New Zealand tradition of the 'overseas experience,' (OE), during which young New Zealanders spend a year or more working and travelling overseas before returning home, tends to be viewed positively. Individuals on their OE may gain experience and skills which help both them and New Zealand.⁹⁻¹¹ They may gain knowledge of other countries which helps to establish business links with those countries. They may also gain an appreciation of New Zealand's qualities as compared to other parts of the world. There is also evidence that OE can hasten personality maturation and enhance coping skills.¹²

There is very little empirical research into the emigration patterns of young New Zealanders. This study sought to fill the void. Specifically, we examined what distinguished (a) those who emigrated from those who did not, and (b) those who plan to stay overseas (brain drain) from those who plan to return (OE), in terms of their qualifications, childhood socio-economic status and intelligence, physical and mental health, and personality.

Methods

Participants were 499 male and 481 female (mean age 26.0 years) members of the Dunedin Multidisciplinary Health and Development Study, a longitudinal investigation of the health, development and behaviour of 1037 children born in Dunedin during 1972-73.¹³ 96% of the living sample (980/1019) participated in the 'age-26' assessment between March 1998 and July 1999. A small number of Study members failed to complete every assessment module.

Emigration behaviour. We identified those who emigrated between ages 18-26 years (emigrants: n=252, 26% of sample, 55% male) and those who did not (non-emigrants: n=670, 68% of sample, 50% male). We excluded from analyses those Study members who had left New Zealand before age 18 years, most of whom had moved with their parents (n=57, 6% of sample, 39% male). Among emigrants we distinguished three groups based on their stated return plans: those who have already come back or plan to return within five years (OE: n=152, 63% of emigrants, 54% male), those who are uncertain (uncertain: n=44, 18% of emigrants, 64% male), and those who do not plan to return for at least the next five years (brain drain: n=44, 18% of emigrants, 52% male). Emigrants were asked the following questions: "Where is the farthest you've moved to live?"; "How old were you when you moved?"; "Do you think moving has been a step forward for you, a step backwards, or hasn't made a difference?"; and "Tell me if any of these reasons were why you moved overseas?" (response options listed in Table 1).

Qualifications and childhood socio-economic status (SES). At age 26 years, information was obtained about academic and trade qualifications. At earlier assessments, the 6-point Elley & Irving scale¹⁴ was used to assess the SES of the study member's parents. Family SES was measured by averaging parental SES at birth and ages 3, 5, 7, 9, 11, 13 and 15 years, using the higher of the mother's or father's SES at each age. Higher scores on this scale reflect higher family SES.

Intelligence. At ages 7, 9, 11 & 13 years, study members were administered the Wechsler Intelligence Scale for Children (WISC-R¹⁵). The mean of the pro-rated total scores across these ages was used in analyses.

Physical health. At age 26 years a medical examination was conducted by either a GP or registered nurse and included measures of: *Body mass index (BMI)*, which was calculated by dividing each individual's weight (kg) by the square of their height (m). Measurements were taken twice in light clothing and stocking feet and the two readings were averaged. *Systolic blood pressure*, which was taken as the first Korotkoff sound (K1) using

a Hawksley random-zero sphygmomanometer with a constant deflation valve. An average blood pressure score was calculated from three measures taken five minutes apart, with study members seated with the cuff on their right arm which rested at heart level. *Cardiorespiratory fitness*, was assessed during a 6-minute constant power submaximal exercise test on a friction braked cycle ergometer (Monark, Sweden). After a 2-minute warm-up at 50W during which heart rate response was gauged, the workload was then adjusted to elicit a steady-state heart rate in the range of 130-170 bpm. Study members cycled at this workload for a further 5-6 minutes with their heart rate assessed every minute. Maximal aerobic power (VO_2max) was predicted from the final heart rate, using a modification of the methods originally published by Astrand.¹⁶

Smoking status. Those who had smoked daily for a month or more in the year prior to the age 26 interview were considered smokers. The remainder were considered non-smokers.

Mental Health. At age 26 years data on mental health were collected in a private interview by using the diagnostic interview schedule,¹⁷ whose procedures have been described elsewhere.¹⁸ Using a reporting period of the past year, we assessed the following disorders according to the *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition (DSM-IV):¹⁹ anxiety (which included any of social phobia, specific phobia, panic disorder, agoraphobia, generalised anxiety disorder, obsessive-compulsive disorder, and post-traumatic stress disorder), depression (major depressive disorder or dysthymia) and antisocial disorder.

Personality. At age 26 years, study members completed Form New Zealand of the Multidimensional Personality Questionnaire (MPQ)^{20,21} which provides, for each person, a profile of scores on ten distinct personality traits: well being, social closeness, social potency, achievement, alienation, stress reaction, aggression, traditionalism, harm avoidance and control.

Statistical Methods. First, we compared emigrants to non-emigrants. Second, we performed comparisons between subgroups of emigrants, defined according to their return plans (OE; uncertain; brain drain). Chi-squared tests were used to compare groups on categorical measures (eg, reasons for leaving, attained tertiary degree) and analyses of variance tests with gender entered as a factor were used to compare groups on continuous measures (eg, personality scales, blood pressure). The statistical package SPSS 10.0 for Windows was used for all data analyses. Effects were considered statistically significant if $p < 0.05$. Where a significant difference among emigrant subgroups was found, pairwise comparisons were conducted with Bonferroni adjustment to the alpha level.

Results

Emigration behaviour. 26% of the sample had moved overseas to live between ages 18-26 years. Most who left went either to Australia (90/252, 36%) or the United Kingdom (104/252, 41%). Those who left for Australia were more likely to report that they planned to stay overseas: about one in three of those who left for Australia were brain-drain emigrants compared to one in twenty of those who left for the UK and one in five of those who left for elsewhere ($p < 0.001$). Put another way, although Australia only attracted 36% of all emigrants it was the destination of 66% of brain-drain emigrants.

The median age for leaving was 23 years, few ($n=35$, 14%) left before the age of 21, and a steady stream - 29, 39, 44, 50 and 52 - left at ages 21 through 25, respectively. Only three left at age 26 years. Most emigrants (87%) believed their move had been "a step forward", 12.6% believed it made no difference, and only one emigrant thought it had been "a step backwards".

Reasons for leaving. (Table 1). Almost all emigrants (91%) said they left to gain experience. Other commonly cited reasons were: a better lifestyle (59%), better work opportunities (58%), and to experience a big city (52%). Notably, very few left for low tax rates (7%) or to escape debts (2%). Brain-drain emigrants were more likely than OE emigrants to cite better work opportunities as a reason for leaving ($p < 0.001$).

Qualifications, childhood socio-economic status (SES) and intelligence. Emigrants were significantly more likely than non-emigrants to have a tertiary qualification (Table 2). Emigrants also came from more advantaged backgrounds and scored higher on childhood measures of intelligence. There were no differences among emigrant subgroups in terms of their qualifications and childhood intelligence, although brain-drain emigrants had lower childhood SES than OE emigrants ($p < 0.05$).

Physical health, smoking and mental health. Emigrants were leaner and fitter than non-emigrants, as indicated by their lower BMI and higher cardiorespiratory fitness (Table 3). A similar number of emigrants and non-emigrants were smokers. Among emigrants, brain-drain emigrants were less fit ($p < 0.01$) and about 1.5 times more likely to smoke ($p < 0.05$). Brain-drain emigrants were also slightly, though not significantly, more likely to meet DSM-IV diagnostic criteria for anxiety and depressive disorders.

Table 1. Reasons for leaving cited by the OE (already returned or plan to return within five years), brain-drain (plan to return within ten years, at retirement or not at all) and uncertain (uncertain about returning) groups. The % citing each reason is reported.

Tell me if any of these reasons were why you moved overseas:	OE (n=144)	Uncertain (n=44)	Brain-drain (n=44)
To gain new experiences, new culture, new language	92.4%	95.5%	81.8%
Better lifestyle, social life, climate	55.6%	56.8%	75.0%
Better work opportunities, better pay, more jobs	48.6%	65.9%	81.8%*
Big city - bright lights	53.5%	54.5%	45.5%
Education opportunities	20.1%	25.0%	36.4%
To get a fresh start from an old relationship or other problems	13.9%	25.0%	25.0%
To be with your spouse/partner	16.7%	9.1%	9.1%
Lower tax rates	6.9%	2.3%	11.4%
Transferred with your job	4.2%	9.1%	4.5%
To escape debts or an illegal past	1.4%	4.5%	2.3%

*emigrant subgroups differ, $p < 0.001$.

Personality. The personality profiles of emigrants and non-emigrants showed consistent differences (data not shown, table available on request). Emigrants had significantly higher scores on the well-being and social potency personality traits and significantly lower scores on the alienation, stress reaction, aggression, traditionalism, harm avoidance and control personality traits (all $p < 0.05$). This indicates emigrants tended to be happier, less stress-prone, less volatile and more thrill-seeking. There were no differences between emigrant subgroups on any personality traits.

Discussion

There were marked differences between emigrants and non-emigrants in terms of their skills, health and personality. Emigrants were better qualified, more intelligent and from more advantaged backgrounds; they were leaner and fitter; and they were happier, less stress-prone, less volatile, and more thrill seeking. This suggests that many of New Zealand's talented young adults are going overseas.

However, there were few differences between those who plan to stay overseas (brain-drain emigrants) and those who have returned or plan to return to New Zealand (OE emigrants). Brain-drain emigrants were no better qualified, no more intelligent, nor were they different in terms of their personality profile. They differed mainly in terms of their reasons for leaving, which were more career focussed (i.e., better work opportunities), and in terms of their destination, which tended to be Australia. This suggests that it is not the most talented who choose to stay overseas; the choice to stay overseas seems to be influenced more by the belief that better

Table 2. Tertiary qualifications, family socio-economic status (SES) and childhood intelligence scores of non-emigrants, emigrants, and emigrant subgroups.

	Non-emigrants (n=670)	Emigrants (n=252)	OE (n=152)	Emigrants subgroups Uncertain (n=44)	Brain-drain (n=44)
% with tertiary qualification	19.6	30.2*	28.3	36.4	25.0
SES means (SDs)	3.64 (1.10)	4.08 (1.10) [†]	4.16 (1.08)	3.98 (1.19)	3.64 (0.94) [†]
Intelligence means (SDs)	105.5 (14.2)	110.8 (12.3) [†]	109.9 (11.9)	112.8 (13.0)	109.9 (11.6)

*differs from non-emigrants, $p < 0.05$. [†]differs from non-emigrants, $p < 0.01$. †emigrant subgroups differ, $p < 0.05$.

Table 3. Physical health, mental health and smoking status of non-emigrants, emigrants, and emigrant subgroups.

	Non-emigrants (n=670)	Emigrants (n=252)	OE (n=152)	Emigrants Subgroups Uncertain (n=44)	Brain-drain (n=44)
Physical health measures means (SDs)					
Body mass index (weight[kg]/height[m] ²)	25.5 (4.6)	24.0 (3.3)*	24.0 (3.2)	23.9 (3.3)	23.8 (4.1)
Systolic blood pressure (Hg[mm])	116.6 (11.2)	117.0 (11.1)	117.4 (10.9)	116.6 (12.3)	116.9 (11.4)
Cardiorespiratory fitness (VO ₂ max/weight[kg])	43.5 (10.7)	46.9 (11.4)*	48.3 (11.8)	46.7 (10.8)	41.2 (8.7) [†]
Smoking status and mental health disorders					
Daily smoker	40.7%	38.5%	34.9%	38.6%	56.8% [†]
Anxiety	24.9%	23.8%	21.7%	20.5%	31.8%
Depression	16.2%	17.1%	14.5%	18.2%	27.3%
Antisocial disorder	4.8%	2.0%	1.3%	0%	4.5%

*differs from non-emigrants, $p < 0.001$. †emigrants subgroups differ, $p < 0.05$.

opportunities exist elsewhere, particularly in Australia. It is interesting, in this context, to note the increasing pay disparity between Australia and New Zealand.²² This finding is consistent with the popular view of the brain-drain emigrant as someone who leaves New Zealand because it cannot provide them with good work opportunities.

Because of the nature of the sample in this study - a birth cohort of 980 young (26-year-old) New Zealanders - there are a number of issues we cannot address. For instance, we cannot address the claim that small but important sub-populations (eg, doctors, lawyers, scientists) are over-represented amongst those leaving for good,^{7,23} nor can we address the claim that brain-drain emigration is on the rise.^{3,4,8,24} It is also worth noting that our estimate of the prevalence of emigration may be low since there are likely to be some Study members who have yet to emigrate by age 26 years. Our estimate of brain-drain emigration may also be low, since a sizeable minority of emigrants (18%) were undecided about their return. However, it must be noted in this regard that our threshold for classification as 'brain drain' (ie, does not plan to return in the next five years) was not high, and some of those we classify as brain-drain emigrants may in fact return to New Zealand by their mid-thirties.

Nonetheless, at least 18% of emigrants (ie, 4.5% of 26-year olds in this sample) have left and do not plan to return to New Zealand within five years. While this represents a problem, it is unclear whether this degree of loss is excessive compared to other developed countries.²⁵ Further, it may be that the skills

gained by those who leave and return compensate for the loss of skills of those who leave permanently.¹¹ However, this is no reason for governments and policy makers to be complacent and assume that most of those currently gaining skills and experience overseas will return for the benefit of New Zealand. Emigration 'peaks' tend to be associated with economic downturns²² and it is important that those entrusted with the governance of the country ensure that New Zealand remains a place worth returning to.

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1. Ansley G. Brain drain here to stay. *The New Zealand Herald* 2001 Apr 5; Sect A:6 (col 4).
2. Hoby K. Open-letter ad a Roundtable ploy: minister. *The New Zealand Herald* 2000 Oct 10; sect A:3 (col 1).
3. Springall L. The brain drain: Are New Zealand's skills going down the gurgler? *The Independent (NZ)* 2000 May 3: 14-15.
4. Sell B. There's no reason to return say expatriate boffins: more funding needed for research. *The New Zealand Herald* 1999 Nov 17; Sect A:6 (col 1).
5. Letter from Australia: Thank you New Zealand (Editorial). *NZ Med J*, 2001; 114: 149.
6. Clausen V. Young doctors' debt 'causing brain drain'. Press release from the Auckland University Medical Association 2001 Jan 9.
7. Williams K. Brain drain sparks health fears. *The Dominion* 1999 Nov 11; p3 (col 2).

8. Alexander M. Brain drain leaves NZ in scientific lurch. *The Sunday Star Times* 1998 Jul 26; A:8 (col 1).
9. Venkataraman SV. IT recruitment expert scoffs at the brain drain. *The National Business Review* 2001 Apr 12; p42 (col 1).
10. McClinchy A. High-flyer refutes Kiwi 'brain drain' claims. *The National Business Review* 1999 Nov 5; p83 (col 1).
11. Davenport S, Bibby DM. Globalisation and localisation in the knowledge world: the small country as SME. Paper presented to Constructing Tomorrow Conference; 1998 Sep; Bristol, University of the West of England, as cited in Pool I, Honey J. Appendix III: The scientific workforce: Implications for New Zealand's future science infrastructure. *Population Centre Discussion Papers* 1998; 28: 193-207.
12. Andrews G, Page AC, Neilson MD. Sending your teenagers away – controlled stress decreases neurotic vulnerability. *Arch Gen Psychiatry* 1993; 50: 585-9.
13. Silva PA, Stanton WR, editors. From child to adult. *The Dunedin Multidisciplinary Health and Development Study*. Auckland: Oxford University Press; 1996.
14. Filley WB, Irving JC. Revised socio-economic index for New Zealand. *NZ J Educ Stud* 1976; 11: 25-56.
15. Wechsler D. *Manual of the Wechsler Intelligence Scale for children-Revised*. New York: Psychological Corp; 1974.
16. Astrand PO. Aerobic work capacity in men and women with special reference to age. *Acta Physiol Scand* 1960; 49: 2-92.
17. Robins LN, Cottler L, Bucholz K, Compton W. *Diagnostic Interview Schedule for DSM-IV*. St Louis MO: Washington University; 1995.
18. Newman DL, Moffitt TE, Caspi A et al. Psychiatric disorder in a birth cohort of young adults: prevalence, comorbidity, clinical significance, and new case incidence from ages 11 to 21. *J Consult Clin Psychol* 1996; 64: 552-62.
19. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders* (4th ed). Washington, DC: American Psychiatric Association; 1994.
20. Tellegen A, Waller NG. Exploring personality through test construction: development of the Multidimensional Personality Questionnaire. In: Briggs SR, Cheek JM, editors. *Personality measures: development and evaluation*. Vol 1. Greenwich, CT: JAI Press. In Press.
21. Krueger R, Caspi A, Moffitt TE. Epidemiological personology: the unifying role of personality in population-based research on problem behaviors. *J Personality* 2000; 68: 967-98.
22. Heeringa V. Pain means drain: economic downturn may be driving a brain drain. *Unlimited* 1999 Jun; 28-9.
23. Read E. Bold incentives to halt brain drain. *The New Zealand Herald* 2001 Mar 16; Sect C:7 (col 1).
24. Pool I, Honey J. Appendix III: The scientific workforce: implications for New Zealand's future science infrastructure. *Population Centre Discussion Papers* 1998; 28: 193-207.
25. Iqbal M. Brain drain: empirical evidence of emigration of Canadian professionals to the United States. *Can Tax J* 2000; 48: 674-88.