Scand J Work Environ Health 1994;20(5):364-370

<https://doi.org/10.5271/sjweh.1385>

Issue date: 01 Oct 1994

Role of migrant factors in work-related fatalities in Australia.

by [Corvalan CF](#), [Driscoll TR](#), [Harrison JE](#)

Affiliation: National Institute of Occupational Health and Safety, Sydney, NSW, Australia.

This article in PubMed: www.ncbi.nlm.nih.gov/pubmed/7863300

This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).

Role of migrant factors in work-related fatalities in Australia

by Carlos F Corvalan, MPH,^{1,2} Timothy R Driscoll, MBBS,¹ James E Harrison, MBBS³

CORVALAN CF, DRISCOLL TR, HARRISON JE. The role of migrant factors in work-related fatalities in Australia. *Scand J Work Environ Health* 1994;20:364–70.

OBJECTIVES — The importance of workers' language and migration characteristics to safety in the work environment has been debated but remains unclear. This study examined the role of these factors in the occurrence of work-related fatalities in Australia.

METHODS — The study was based on an investigation of all work-related fatalities occurring in Australia during 1982–1984. Denominators for each year were obtained according to gender and country-of-birth census data from the 1981 and 1986 national censuses, interpolated and adjusted according to annual labor force survey estimates for the period 1981 to 1986 to indicate the true movement of the employed civilian labor force over the study period.

RESULTS — Of 1211 decedents identified with known country of birth, 333 were born outside of Australia. The overall fatality incidence per 100 000 person-years in the employed civilian labor force was 7.12 [95% confidence interval (95% CI) 6.36–7.88], which is similar to that of Australian-born persons, 6.56 (95% CI 6.12–6.99). However, fatality incidences in rural and mining occupations were significantly increased among overseas-born persons when they were compared with Australian-born persons. Mortality ratios standardized separately for occupation and age showed significantly elevated mortality for duration of residence of less than five years, particularly for persons of non-English speaking background. These values converged to the Australian rate with increasing duration of residence.

CONCLUSION — This study suggests that factors related to country of birth (eg, language) and duration of residence of overseas-born workers are important determinants of safety at work in Australia.

KEY TERMS — industry, language, occupation, safety.

Australia has a large migrant population. In 1992, over 1.9 million persons (24.8%) in the employed civilian labor force had a birthplace outside of Australia (1). Migrants differ from the Australian-born population in their labor-force participation rates, unemployment rates, and their distribution in industrial and occupational groups (1–7). However, some studies have reported that differences between migrants and Australian-born persons tend to decrease with increasing duration of residence and that this is particularly the case for migrants from non-English speaking backgrounds (2, 3, 7).

No detailed study on language and migrant status and work-related fatalities has been published in Australia. Overseas studies which have considered ethnic differences (usually in a limited way) have been based on racial differences, and they have ignored the birthplace of the subjects (8–11). Given

that it has a relatively new and large migrant population, Australia provides an ideal setting for the study of the effect of migrant status and language in general. Unfortunately, information on actual ethnic origin is often not available in either numerator or denominator data, but country-of-birth information is accepted as a more objective and reliable measure and can be used as a proxy (12).

Migrant status alone is not a factor which should cause differential occupational health and safety outcomes. Adverse outcomes are more likely to be related to variables associated with migrant status, such as lack of English language proficiency, or occupation, and they are more likely to be modified by other factors, such as duration of residence. Treating Australian-born persons as one group makes it possible to study factors specific to migration, and these factors can then be compared with the Australian-born group being used as reference. This paper describes work-related fatalities in light of these factors.

Subjects and methods

Language and migrant factors were examined as part of a larger study of work-related fatalities in Australia, where deaths attributable to work-related injury during 1982–1984 were studied. The study

¹ National Institute of Occupational Health and Safety, Sydney, NSW, Australia.

² Institute of Occupational Health, Helsinki, Finland.

³ National Injury Surveillance Unit, Australian Institute of Health and Welfare, Bedford Park, SA, Australia.

Reprint requests to: Dr TR Driscoll, Epidemiology and Surveillance Unit, NIOHS (Worksafe Australia), GPO Box 58, Sydney NSW 2001, Australia.

method has been described in detail elsewhere (13) and is briefly outlined in this report.

A list was obtained of all deaths which occurred in the study period and which had been assigned codes of the International Classification of Diseases, revision 9 (ICD 9), corresponding to external causes of death, but excluding suicide and medical misadventure. The list contained 16 246 cases, and coroners' files were found for 15 462 (95.2%) of these cases. Research officers examined the files and assessed which of them met the study definitions of work-related fatalities. Data were extracted from the coroners' files for these cases, recorded on data forms, and subsequently entered into computer files for analysis. The original study classed 1738 cases as work-related, of which 1278 were defined as coming from the employed civilian labor force, after the exclusion of 266 fatalities that occurred on the road during journeys to and from work.

There were 65 (5.1%) cases for which country of birth was not stated and two cases later assessed as not meeting study definitions of work-relatedness. This study is therefore based on 1211 fatalities that occurred among persons of 51 different nationalities. For most of these nationalities, however, the number of fatalities was too small for meaningful rates to be derived. The number of fatalities among the women was small: 34 among Australian-born persons and 13 among overseas-born persons. Analyses excluding women did not change significantly the comparisons of the variables of interest between different migrant groups. Therefore all of the reported rates include both genders. Data on industry was missing for 133 (11.0%) persons. In addition, denominator data was not available for industry. Information on duration of residence was missing for 28 (18.5%) persons born in the main English-speaking countries and for 23 (12.6%) persons born in non-English-speaking countries.

The employed civilian labor force consisted of persons who worked for pay, profit, or payment-in-kind in a job or business or on a farm (including employees, employers and self-employed persons) and persons who worked without pay for 15 h or more per week in a family business or on a farm. Persons 15 years of age or younger and members of the permanent armed forces were excluded.

Country of birth and language group (as persons born in English- or in non-English-speaking countries) were coded for each decedent to be consistent with denominator data supplied by the Australian Bureau of Statistics. Using the Bureau's classification, we defined persons from English-speaking countries as those born in the United Kingdom and Ireland, the United States, Canada, New Zealand, and South Africa (12). Occupations were coded according to the Classification and Classified List of Occupations (CCLO) (14).

Special care was given to the construction of denominator data. The Australian Labor Force Survey

provides information on country of birth, and information on duration of residence can also be obtained on request from the Bureau of Statistics. The Labor Force Survey is based on a multi-stage area sample of private dwellings covering about two-thirds of one percent of the population. Given these size limitations, sampling error is an important issue. Data from the Labor Force Survey, when stratified by a few variables, provide very small numbers, which are subject to significant standard errors (4). The attraction of the Labor Force Survey is that data are available on a monthly basis, with language and migrant status data published yearly.

Census data appeared as the most attractive denominator when only the employed labor force was selected and the armed forces were excluded, because theoretically there should be no sampling errors. The main disadvantage of using census data was that only data for 1981 and 1986 were available. Preliminary studies on data from the Labor Force Survey and census showed an increase in persons in the employed civilian labor force between 1981 and 1986, but the Labor Force Survey showed a decline below the linear interpolation of the census data for the period 1983–1984, which corresponded to a time of lower economic activity in Australia. It was therefore necessary to adjust the linear interpolation of the census data according to the Labor Force Survey data. The issue was further complicated by the observation that not all ethnic groups behaved similarly to the overall population. Some ethnic groups increased in number, while others decreased, in the labor force during this period. Important gender differences were also observed. Therefore, specific denominators were obtained for each of the gender and country-of-birth combinations available from the census data and then adjusted according to the gender and country-of-birth yearly movements indicated by the Labor Force Survey.

Data were analyzed with the SAS (statistical analysis system) package (15). Confidence intervals were calculated for incidence estimates with the use of the Poisson distribution (or its normal approximation for numbers greater than 100) (16). Confidence intervals for indirect standardization were obtained as described by Rothman (17).

Results

During the years 1982 to 1984, of 1211 work-related fatalities identified among persons with known country of birth, 878 (72.5%) occurred among Australian-born workers, 151 (12.5%) among workers born in the main English-speaking countries, and 182 (15.0%) among workers born in non-English-speaking countries. Persons born overseas had slightly higher fatality rates than Australian-born persons [rate ratio 1.09, 95% confidence interval (95% CI) 0.96–1.23]. In particular, elevated rates were ob-

served for persons born on the American continent and in Italy, former Yugoslavia, Oceania, and New Zealand. However, only those born in New Zealand and former Yugoslavia had rates statistically significantly higher than those of Australian-born persons and overseas-born persons as a group. Slightly higher fatality rates were observed for migrants born in non-English-speaking countries than for migrants born in English-speaking countries. However, the differences were not statistically significant (figure 1).

Figure 1. Work-related fatality incidence rates by country of birth. Point estimates and 95% confidence intervals. (Vertical line = Australian-born rate, ES = English-speaking countries, NES = non-English-speaking countries, UK = United Kingdom, NZ = New Zealand)

The mean age at death for the Australian-born group was 38.2 (SD 14.7) years. Persons born in the main English-speaking countries had a mean age of 39.3 (SD 13.3) years at death, while for migrants born in non-English-speaking countries the mean age was 42.0 (SD 11.7) years at death. There was an increasing trend of fatality with age which was more marked for the Australian-born persons (trend $X_1^2 = 46.1$, $P < 0.0001$). The trend was significant for the non-English-speaking group (trend $X_1^2 = 8.9$, $P = 0.003$), but marginal for the English-speaking group (trend $X_1^2 = 3.1$, $P = 0.08$).

The number of deaths and the fatality rate decreased for all persons combined for the years 1982 to 1984. The overall incidence per 100 000 person-years was 7.35 for 1982, 6.60 for 1983, and 6.16 for 1984. This decreasing trend was heavily influenced by the Australian-born group, which had a statistically significant decreasing trend (trend $X_1^2 = 12.8$, $P = 0.0003$). For migrants born in English-speaking countries, and more particularly for migrants born in non-English-speaking countries, there was a nonsignificant increase in incidence in the three years under study.

Large differences in incidence were observed for the major occupational classifications. These differences remained when occupation was stratified by country of birth (Australia, main English-speaking countries and non-English-speaking countries), and, in some cases, stratification highlighted the occupational differences. Significantly elevated rates were observed for the occupational categories "farmers,

Table 1. Incidence of fatalities by occupation and language group. (95% CI = 95% confidence interval)

Major group ^a	Australian-born			English-speaking countries			Non-English-speaking countries		
	N	Incidence ^b	95% CI	N	Incidence ^b	95% CI	N	Incidence ^b	95% CI
Professional, technical and related workers; administrative executive and managerial workers (0 & 1)	37	1.40	0.99–1.93	9	1.87	0.86–3.55	5	1.34	0.44–3.13
Clerical; sales workers (2 & 3)	26	0.69	0.45–1.01	4	0.70	0.19–1.79	5	1.09	0.36–2.55
Farmers, fishermen, hunters, timber getters and related workers (4)	205	19.58	16.90–22.26	15	26.92	15.07–40.40	27	34.75	22.90–50.56
Miners, quarrymen and related workers (5)	41	49.70	35.67–67.42	9	64.78	29.62–122.97	11	118.09	58.95–211.29
Workers in transport and communications (6)	268	39.08	34.40–43.76	45	47.67	34.77–63.78	31	30.76	20.90–43.66
Tradesmen, production-process workers and laborers (7 & 8)	252	7.44	6.52–8.36	53	8.35	6.25–10.92	89	7.93	6.37–9.75
Service, sport and recreation (9)	40	3.67	2.62–5.00	12	5.81	3.00–10.15	11	4.25	2.12–7.61
Inadequately described or not stated (11)	9	—	—	4	—	—	3	—	—
All	878	6.56	6.12–6.99	151	7.06	5.94–8.18	182	7.17	6.13–8.21

^a Code of the Classification and Classified List of Occupations (14) in parentheses.

^b Fatalities per 100 000 person-years for the relevant language and occupational group.

fishermen, hunters, timber getters and related workers" (CCLO major group 4), and for "miners, quarrymen and related workers" (CCLO major group 5) for both non-Australian-born groups in comparison with the Australian-born group and, in particular, for migrants born in non-English-speaking countries. For migrants born in English-speaking countries, the rate ratio of fatality (compared with Australian-born persons) was 1.37 (95% CI 0.81–2.32) for occupational group 4; and 1.30 (95% CI 0.63–2.68) for occupational group 5. These estimates, while elevated, were imprecise and did not show statistical significance. For migrants born in non-English-speaking countries, the rate ratio for these two occupational groups was significantly elevated at 1.77 (95% CI 1.19–2.65)

for group 4 and 2.37 (95% CI 1.22–4.62) for group 5 (tables 1 and 2).

Mortality differences between industrial groups were highlighted when stratified by language group. For Australian-born persons, nearly 25% of all deaths occurred in the industrial group "agriculture, forestry, fishing and hunting." For other groups, particularly for migrants born in the main English-speaking countries, the proportion of fatalities in this category was considerably lower. For migrants born in non-English-speaking countries a large proportion of fatalities occurred in the industrial groups "manufacturing" and "construction." These two groups combined accounted for 40% of deaths among migrants born in non-English-speaking countries. In contrast,

Table 2. Rate ratios (RR) of fatality by occupation and language group. (95% CI = 95% confidence interval)

Major group ^a	English-speaking countries/ Australian-born		Non-English-speaking countries/ Australian-born	
	RR	95% CI	RR	95% CI
Professional, technical and related workers; administrative, executive and managerial workers (0 & 1)	1.34	0.64–2.77	0.96	0.38–2.44
Clerical; sales workers (2 & 3)	1.01	0.35–2.91	1.58	0.61–4.11
Farmers, fishermen, hunters, timber getters and related workers (4)	1.37	0.81–2.32	1.77	1.19–2.65
Miners, quarrymen and related workers (5)	1.30	0.63–2.68	2.37	1.22–4.62
Workers in transport and communications (6)	1.22	0.89–1.67	0.79	0.54–1.14
Tradesmen, production-process workers and laborers (7 & 8)	1.12	0.83–1.51	1.07	0.84–1.36
Service, sport and recreation (9)	1.58	0.83–3.02	1.16	0.59–2.26
All	1.08	0.91–1.28	1.09	0.93–1.28

^a Code of the Classification and Classified List of Occupations (14) in parentheses.

Table 3. Distribution of fatalities by industry and language group.

Industry	Australian-born		English-speaking		Non-English-speaking	
	N	%	N	%	N	%
Agriculture, forestry fishing and hunting	218	24.8	15	9.9	25	13.7
Mining	41	4.7	11	7.3	8	4.4
Manufacturing	79	9.0	16	10.6	28	15.4
Electricity, gas and water	10	1.1	2	1.3	3	1.7
Construction	111	12.6	26	17.2	45	24.7
Wholesale and retail trade	53	6.0	10	6.6	16	8.8
Transport and storage	159	18.1	30	19.9	23	12.6
Communication	7	0.8	1	0.7	2	1.1
Finance, property and business services	22	2.5	6	4.0	5	2.8
Public administration and defense	29	3.3	3	2.0	2	1.1
Community services	27	3.1	3	2.0	0	0.0
Recreational, personal and other services	26	3.0	10	6.6	6	3.3
Not stated	96	10.9	18	11.9	19	10.4
All	878	100.0	151	100.0	182	100.0

Table 4. Standardized mortality ratios^a (SMR) for overseas-born persons and language group, by duration of residence. (95% CI = 95% confidence interval)

Duration of residence (years)	Overseas-born persons		English-speaking		Non-English-speaking	
	SMR	95% CI	SMR	95% CI	SMR	95% CI
0—1	220	147—328	124	64—239	391	237—643
2—4	167	114—243	167	99—285	165	97—281
5—9	63	41—99	105	64—172	25	9—65
10—14	84	63—113	74	48—114	94	65—138
15—19	97	71—131	117	79—171	76	47—124
≥ 20	100	82—122	97	69—135	102	81—128

^a Standardized by occupation to Australian-born population fatality rates.

the same industrial groups were responsible for nearly 28% of the deaths among migrants born in the main English-speaking countries, and 22% of the deaths among Australian-born persons (table 3 on page 367).

The risk for migrants appeared to be modified by duration of residence in Australia, with significant excess risk in the first five years when compared with Australian-born workers. This excess risk remained when differences in occupation and age were controlled with the use of standardized mortality ratios (standardization by either age or occupation indicating nearly identical patterns). These differences were more marked among the migrants born in non-English-speaking countries (table 4).

Discussion

Language has been identified as one of the crucial factors affecting safety at work. In the report of the Joint ILO/WHO Committee on Occupational Health (18), the following two significant observations were made for language: (i) migrants are adversely affected in the simplest aspects of everyday life and (ii) migrants are particularly affected at work, where the unintelligibility of verbal communication is exacerbated by the work environment. In this case, work environment refers to physical aspects, such as background noise, and more importantly to personal aspects, such as background knowledge of work practices and the work environment itself. In addition, preventive measures cannot always be communicated with ordinary work language. Instead, they may require the communication of abstract knowledge demanding higher language proficiency (19).

In this study, given the basis of language classification, the potential for misclassification was significant. Most persons born in the main English-speaking countries (and Australia) are likely to be proficient in English and are therefore probably classified correctly as English-speaking. However, it is likely that some persons born in non-English-speaking countries were also proficient in English and so were incorrectly classified as non-English-speaking. This misclassification affects only the measurement of

proficiency with English and occurs independently of the outcome and its measurement. If it is assumed that proficiency with English is a determinant of fatality risk, the inclusion of English speakers in the non-English-speaking group would have attenuated the estimate of the rate ratio of fatality (as compared with Australian-born). Therefore, at worst, the observed association may have been biased towards the null, meaning that migrants born in non-English-speaking countries who were truly non-English speakers may have had a higher risk than that actually observed in this study.

In their original paper on work-related fatalities in Australia, Harrison et al (13) reported a decreasing trend of fatalities over the three years 1982—1984. However, when stratified by country of birth, fatalities showed a significant decline among Australian-born persons, but no declining trend for persons of either English-speaking or non-English-speaking backgrounds. The implications of these findings are uncertain. Interpretation is difficult without rates calculated for a number of sequential years because of random fluctuation, and unfortunately data from other years are not currently available in Australia.

From demographic studies of migrants in Australia, it is well known that migrants differ greatly from Australian-born persons in their occupational distributions (5, 6, 20). If migrants are over-represented in dangerous occupations, a higher number of accidents and work-related fatalities would be expected. Stratified analysis by occupation is one way of removing the effect of confounding arising from differential occupational distributions of migrants and Australian-born persons. In the absence of major confounding, and presuming that there was no relationship between migrant status and risk of fatality, similar fatality rates would be expected for all language or migrant groups within each occupational group. However, major occupational categories are too broad for this conclusion to be made unequivocally, as it is possible that occupational differences occur within major occupational categories. Such a detailed stratification was not possible in this study because the number of fatalities was not large enough. Therefore, if migrants were concentrated in the most dangerous occupations within a major occupational

group, higher fatality rates would be expected in these subgroups. However, these higher rates would not be observed when only the major occupational groups were considered. Given these limitations, the data showed important differences in some major occupational groups when Australian-born persons, migrants born in English-speaking countries, and migrants born in non-English-speaking countries were compared.

The largest concentration of workers was in the occupational group "tradesmen, production-process workers and laborers." The denominator data used in this study indicated that 25.3% of the Australian-born persons in the employed civilian labor force were in this group, compared with 29.7% of migrants born in English-speaking countries and 44.2% of migrants born in non-English-speaking countries. Similar associations between country of birth and proportions of workers in this occupational group have been reported (2, 5, 6). However, the fatality incidences in this occupational group were not statistically significantly higher than the fatality incidence for all occupations in each of these three birthplace groups. In addition, these three birthplace groups were not statistically significantly different from each other.

This study showed a marked variation in fatality incidence with duration of residence for overseas-born persons. In general terms, the incidence was highest for shorter duration of residence and then approached the rate for Australian-born persons as duration of residence increased. This finding is consistent with those from other studies in which increasing duration of residence is associated with employment characteristics that are increasingly similar to those of Australian-born persons (2, 3, 7). Standardization of the observed rates separately by age and occupation did not alter this pattern. Duration of residence is strongly associated with language proficiency, with better proficiency in English after a longer duration of residence. Therefore, if differences in fatality rates between Australian-born persons and non-English-speaking migrants are due to language differences, then decreasing rates with increasing duration of residence would be expected. Elevated rates among English-speaking migrants with a short duration of residence in Australia are presumably not due to language difficulties. However, they may have been related to different work practices or experience or to social stress such as isolation and insecurity (which applies to non-English-speaking migrants as well). It is also possible that new arrivals, regardless of ethnic background, are placed initially in the most dangerous categories within each occupational group. Such features of the data would not be detected by this analysis, which was based on only a broad occupational grouping.

This is one of the few published studies to use accurately determined, contemporaneous denominators to investigate the occupational experience of migrant

workers. Its major strength was that it was population-based, with adequate information on the relevant ethnic variables. Adjustment of 1981 census data to allow for fluctuations during the study period allowed an accurate calculation of rates. In fact, comparisons made using other (unadjusted) denominators showed differences important enough to alter the ranking of rates and to obscure short-term trends. The major limitations of the study were that the data were not assembled primarily for the study of language and migrant factors. In particular, accurate information on the language proficiency of the decedent would have been useful.

In this study there was a significant limitation in the interpretation of the results that derived from wide confidence intervals (low power) resulting from small numerators. Although the results showed consistently elevated rates for migrants, in particular for migrants born in non-English-speaking countries, most of these results lacked statistical significance. Data from a greater number of years than was available for this study would be needed to resolve this issue. Lack of statistical significance, however, should not be equated with equal rates for migrants and nonmigrants and should not stop specific attempts to improve the occupational health and safety of migrants. This study has clearly demonstrated that factors related to language and to duration of residence in Australia were strongly associated with a major health and safety outcome among migrants, namely, traumatic death as a result of work. Migrants born in non-English-speaking countries were particularly at risk in the first five years of residence in Australia, a finding suggesting that language is an important contributory factor to work-related accidents. Migrants born in English-speaking countries were also at risk, a finding suggesting that other factors, such as work practices or experience, may also contribute to work-related accidents.

Targeting newly arrived migrants with specific information on the work practices of the host country and instruction in occupational health and safety seems important in the light of these findings. In addition, for migrants whose native language is not that of the host country, relevant information in their own language, plus the teaching of the language of the host country in the workplace, may greatly improve their occupational safety.

References

1. Australian Bureau of Statistics (ABS). The labor force Australia: August 1992. Canberra: ABS, 1992. Cat no 6203.0.
2. Chapman BJ, Miller PW. An appraisal of immigrants' labor market performance in Australia. In: Poole ME, de Lacey PR, Randhawa BS, editors. Australia in transition. Sydney: Harcourt Brace Jovanovich, 1985: 300-10.
3. Stromback T. Migrants in the labor market. In: Baker L, Miller P, editors. The economics of immigration.

- Canberra: Australian Government Publishing Service, 1987:130—42.
4. Australian Bureau of Statistics (ABS). The labor force Australia: historical summary 1966 to 1984. Canberra: ABS, 1987. Cat no 6204.0.
5. Krieger R, Sloan J. Technological change and migrant employment. South Australia: National Institute of Labor Studies Incorporated, 1984. Working papers series 62.
6. Castles S, Morrissey M, Pinkstone B. Migrant employment and training and industry restructuring. In: Jupp J, editor. The challenge of diversity: policy options for a multicultural Australia. Canberra: Australian Government Publishing Service, 1989:127—40.
7. Miller PW. Aspects of occupational mobility and attainment among immigrants in Australia. *Int Migr Rev* 1987;21:96—113.
8. Stout-Wiegand N. Fatal occupational injuries in the United States in 1980—1984: results of the first national census of traumatic occupational fatalities. *Scand J Work Environ Health* 1988;14 suppl 1:90—2.
9. Cone JE, Daponte A, Makofsky D, Reiter R, Becker C, Harrison R, et al. Fatal injuries in California. *J Occup Med* 1991;33:813—7.
10. Cryer PC, Fleming C. A review of work-related fatal injuries in New Zealand 1975—84 — numbers, rates and trends. *NZ Med J* 1987;100:1—6.
11. National Institute of Occupational Safety and Health (NIOSH). National traumatic occupational fatalities: 1980—1985. Morgantown, WV: NIOSH, 1989.
12. Vaughan G. Birthplace differences in occupational attainment: census of 30 June 1986. Canberra: Australian Bureau of Statistics, 1992. Cat no 6282.0.
13. Harrison JE, Frommer MS, Ruck EA, Blyth FM. Deaths as a result of work-related injury in Australia, 1982—1984. *Med J Aust* 1989;150:118—25.
14. Australian Bureau of Statistics (ABS). Classification and classified list of occupations. Canberra: ABS, 1980. Cat no 1206.0.
15. SAS Institute. SAS system, release 6.04. Cary, NC: SAS 1988.
16. Armitage P, Berry G. Statistical methods in medical research. 2nd ed. Oxford: Blackwell Scientific Publications, 1988.
17. Rothman KJ. Modern epidemiology. Boston, MA: Little, Brown and Company, 1986.
18. Joint ILO/WHO Committee on Occupational Health. Report of the joint ILO/WHO committee on occupational health: migrant workers occupational safety and health. Geneva, International Labour Office, 1975. Occupational safety and health series 34.
19. Stromback T, Preston A. The costs of low levels of English proficiency amongst immigrants in the workforce. Canberra: Australian Government Publishing Service, 1991.
20. Castles S, Lewis D, Morrissey M, Black JD. Patterns of disadvantage among the overseas-born and their children. Wollongong: Centre for Multicultural Studies, 1986.

Received for publication: 20 February 1994