Selective international migration by social position, health behaviour and personality

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Background: Immigrants is an important minority in many countries, but little is known how they are self-selected. We analysed differences in psycho-social and health behavioural factors between international migrants and non-migrants prior to migration in a large cohort of Finnish twins. Methods: A questionnaire was sent to Finnish twins in 1975 (response rate 89%, N=26555 twin individuals). Follow-up data on migration and mortality were derived from population registries in Finland and Sweden up to 31 March 2002. In 1998, another questionnaire was sent to Finnish twins migrated to Sweden and their co-twins (response rate 71%, N=1534 twin individuals). The data were analysed using Cox and conditional logistic regression models. Results: Life dissatisfaction, higher alcohol use and smoking at baseline predicted future migration. In men additionally, unemployment, neuroticism and extroversion increased the probability to migrate. Similar associations were found for alcohol use in men and smoking in men and women within twin pairs discordant for migration. Twins also reported retrospectively that prior to migration the migrant twin had been less satisfied with his/her educational institution or job and was generally less satisfied with life, used more alcohol (men) and smoked more (women) than the co-twin stayed in Finland. Conclusion: Migrants are self-selected by health behavioural and personality factors, which may compromise their health. The special requirements of migrants should be recognized in health care.

Keywords: health behaviour, migrants, personality

Introduction

Migration is one of the key forces affecting population size and socio-demographic structure. Characteristics of immigrants is also an important public health question, since they form an important minority in many countries with different disease and risk factor profiles. Selective migration has received scientific attention since the beginning of the 20th century, but understanding how international migrants differ from non-migrants is still limited. A previous US study found that immigrants in USA are better educated than the general population in their country of origin. Mothers who had migrated to USA also had lower rates of preterm deliveries, low birth weight newborns and infant mortality compared to US born mothers in the same ethnic groups. A study of Finnish immigrants in Sweden found that infants of migrant mothers had no higher infant mortality than native born Swedes and lower infant mortality than mothers in Finland. Furthermore, other short term outcomes were relatively good in spite of more risk factors such as maternal smoking and a higher proportion of mothers aged 35 or more. The results on mortality are, however, somewhat contradictory: compared to the native born population, lower mortality rates in immigrants were found in a US study and higher in a Swedish study. Higher suicide mortality than in the native born population and high prevalence of mental health problems have been reported in some migrant groups but ethnic variation is large.

In this study, we analyse factors affecting migration from Finland to Sweden in Finnish twins. Our study design is unique in two respects. First since 1954, Finland and Sweden formed with other Nordic counties a common labour market and no special permission is needed for the citizens of these countries to migrate to any other Nordic country. Thus, selective migration in this case is purely because of self-selection and not selection by immigration policies. Second, twins reared together share the same family background. Thus, comparing twin pairs discordant for migration after childhood allows study of personal characteristics affecting migration when family background is adjusted for.

Methods

The Finnish Twin Cohort was established in 1974 and includes same-sex twin pairs born in Finland before 1958 and both twins alive in 1975. A baseline questionnaire was sent to all twins in 1975 (response rate 89%, N=26555 twin individuals). Follow-up data on migration and mortality up to 31 March 2002 were derived from population registries in Finland and Sweden using the unique personal identification number assigned to all Finnish citizens. Since an official report of change of address is required in Sweden for employment and social benefits, it is likely that we had information on virtually all study subjects who had migrated to Sweden. During the follow-up period, 834 subjects who had responded to the baseline survey had migrated to Sweden including 575 twin pairs discordant with respect to migration.

Education was assessed using an eight grade classification and transformed to years of education. Marital status was dichotomized as married or cohabited and non-married, divorced or widowed and employment status as unemployed and employed or non-employed. Two dimensions of
personality, neuroticism and extroversion, were measured by an abbreviated (19 items) version of the Eysenck Personality Inventory questionnaire. Persons ranking high in extraversion are assumed to be characterized by good social skills, numerous friendships, enterprising vocational interests, etc., whereas persons ranking high in neuroticism by low self-esteem, irrational perfectionist beliefs and pessimistic attitudes.

General attitudes to life were measured by four questions. The first three questions read: ‘Do you feel that your life is now (i) very interesting, quite interesting, quite boring or very boring; (ii) very happy, quite happy, quite unhappy or very unhappy; and (iii) very easy, quite easy, quite hard or very hard?’. The fourth question reads: ‘Do you feel that you are now very lonely, quite lonely or not lonely at all?’. We used these questions both as a summary life satisfaction score and as individual items. When used as individual items, the variables were dichotomized by combining the categories one and two and three and four for the questions i–iii and one and two for the fourth question. Each of the above questions had also the response alternative ‘can not say’, and this was coded as missing value when used as individual items.

Health behavioural variables included physical exercise, body mass index (BMI, kg/m²), alcohol consumption and smoking. Physical exercise was measured by questions on monthly frequency, mean duration and mean intensity of leisure time physical activity and transformed to an activity metabolic equivalent (MET) index. Self-reported BMI showed good validity in a subset of participants in a later survey in 1990. Smoking was dichotomized as current smokers and current non-smoker; the proportions of former smokers were similar in migrants (23% in men and 10% in women) and non-migrants (22 and 13%, respectively). Average alcohol consumption was assessed by questions on frequency and quantity of the consumption of beer, wine and spirits and transformed to average alcohol consumption per month.

In 1998, another questionnaire was sent to twins who had migrated to Sweden and their co-twins living in Sweden or in Finland identified from the Finnish Twin Cohort provided that both twins were alive at the time of the data collection (response rate 71%, N = 1534 twin individuals including 451 twin pairs discordant for migration). Because of the lower response rate than in the initial survey and mortality between twin pairs discordant for migration is lower than in the 1975 survey. This questionnaire included seven retrospective questions on similarity compared to the co-twin prior to migration. The questions read: ‘If you compare yourself to your twin brother/sister before one (or both) of you migrated to Sweden, i.e. at the time when both of you were living in Finland, which one of you was (i) healthier; (ii) smoked more; (iii) used more alcohol; (iv) had more physical exercise; (v) weighed more; (vi) was more satisfied to his/her educational institution/job; and (vii) was generally more satisfied to life’. The response alternatives were: ‘(i) absolutely me; (ii) presumably me; (iii) we were similar; (iv) presumably my twin brother/sister; and (v) absolutely my twin brother/sister’. We regarded a twin pair as discordant if they agreed on dissimilarity or only one of the twins responded that they had been similar.

We started the analyses by studying factors at baseline associated with probability to migrate during the follow-up. With the aim to facilitate comparisons of explaining factors, we used standardized hazard ratios (HR) by transforming each variable to have a mean of zero and standard deviation of one. Cox proportional hazard model was used with follow-up time in days until migration (cases), death (censored cases) or the end of follow-up (non-cases) as the outcome variable. The effect of the non-random sample design, i.e. sampling of twin pairs rather than independent individuals, on standard errors was taken into account by treating twin pairs as sample clusters. Proportional hazard assumptions were tested using Schoenfeld residuals. A statistically significant violation in hazard assumptions was only found for neuroticism ($P = 0.03$), whereas for other variables no violation was found ($P = 0.09–0.85$); since we had done multiple tests, this one statistically significant $P$-value may be because of type 1 error. This suggests that the risk factors of migration have the same relative effect on migration probability regardless of the time of migration. We did not find any heterogeneity according to zygosity, i.e. no statistically significant interactions were found between zygosity and explaining variables ($P$-values $= 0.13–0.99$). Thus we combined monozygotic and dizygotic twins in the further analyses and also included into the analyses twins with unknown zygosity (1986 twin individuals).

We computed age adjusted HRs for all variables. Since the association between age and migration was found to be non-linear, we included age into the models both as a linear variable and as categorized into 5-year age groups. Second, we conducted multivariate modelling to estimate the independent effect of each variable on migration probability. Because the life attitude items were strongly mutually correlated (age adjusted Spearman correlations 0.22–0.68 when the scale of loneliness was reversed), we did not include them into the same model and adjusted the model only for other variables.

We continued the analyses within twin pairs discordant for migration. This was done by conducting conditional Cox proportional hazard model, i.e. we analysed the follow-up time to migration in relation to the follow-up time of the co-twin. To avoid the possible effect of non-linearity, we dichotomized the values of the within pair dissimilarity to higher or lower compared to the co-twin. Since twin pairs were reared together and are thus standardized for family background, a found association suggests direct association with migration probability or the effect of factors not shared by the twin pair. The modelling was carried out by conducting Cox proportional hazard models stratified by twin pair.

Finally, we analysed the retrospective questions on discordance prior to migration. This was done by computing odds ratios (OR) using conditional logistic regression model. Correspondingly to the above model, this model analyses whether discordance in explaining factors, i.e. self-reported difference compared to the co-twin prior to migration, is associated with discordance in migration status within twin pairs. All analyses were carried out by the Stata statistical package, version 8.2.

**Results**

Table 1 presents the baseline characteristics of study subjects by future migration status. Migrants were younger than non-migrants, and thus we adjusted the means of other variables for age. We found that male migrants scored higher in neuroticism (difference 0.3 points, $P$-value of the difference 0.020) and extraversion (0.4 points, $P = 0.007$), used more alcohol (90 g/month, $P = 0.011$), and were more often unemployed (4%, $P < 0.001$) and smokers (9%, $P < 0.001$) than non-migrants. When we studied individual items of the life satisfaction scale, male migrants found life less interesting (5%, $P = 0.005$) than non-migrants. Among women, we found similar differences in unemployment (2%, $P = 0.027$), smoking (12%, $P < 0.001$), extraversion (0.3 points, $P = 0.036$), consumption of alcohol (30 g/month, $P = 0.004$) and founding life less interesting (7%, $P < 0.001$). In addition, female migrants were slightly better educated (0.3 years, $P = 0.04$), had lower life satisfaction (0.4 points, $P = 0.003$) and found
Table 1 Age adjusted means and proportions of baseline characteristics by migration during follow-up (standard deviations are given in brackets for continuous variables)

<table>
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<tbody>
<tr>
<td>Age (years)</td>
<td>36 (13.7)</td>
<td>29 (8.9)</td>
<td>38 (8.9)</td>
<td>29 (10.4)</td>
</tr>
<tr>
<td>Education (years)</td>
<td>7.3 (2.62)</td>
<td>7.3 (2.60)</td>
<td>7.4 (2.66)</td>
<td>7.7 (2.89)</td>
</tr>
<tr>
<td>Married</td>
<td>44%</td>
<td>43%</td>
<td>43%</td>
<td>39%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>4%</td>
<td>8%</td>
<td>4%</td>
<td>6%</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>3.7 (2.57)</td>
<td>4.0 (2.74)</td>
<td>4.8 (2.49)</td>
<td>4.8 (2.54)</td>
</tr>
<tr>
<td>Extroversion</td>
<td>4.7 (2.45)</td>
<td>5.1 (2.56)</td>
<td>4.5 (2.49)</td>
<td>4.8 (2.56)</td>
</tr>
<tr>
<td>Physical exercise (MET)</td>
<td>2.7 (3.43)</td>
<td>2.6 (3.63)</td>
<td>1.7 (3.22)</td>
<td>1.8 (2.45)</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>23 (3.0)</td>
<td>23 (2.7)</td>
<td>23 (3.6)</td>
<td>23 (3.2)</td>
</tr>
<tr>
<td>Alcohol use (g/month)</td>
<td>330 (540)</td>
<td>420 (568)</td>
<td>120 (201)</td>
<td>150 (308)</td>
</tr>
<tr>
<td>Current smoker</td>
<td>39%</td>
<td>48%</td>
<td>22%</td>
<td>34%</td>
</tr>
<tr>
<td>Life satisfaction*</td>
<td>8.8 (2.87)</td>
<td>9.1 (3.14)</td>
<td>8.6 (3.12)</td>
<td>9.1 (2.95)</td>
</tr>
<tr>
<td>Life is easyb</td>
<td>85%</td>
<td>80%</td>
<td>88%</td>
<td>81%</td>
</tr>
<tr>
<td>Feeling of lonelinessb</td>
<td>88%</td>
<td>85%</td>
<td>95%</td>
<td>91%</td>
</tr>
</tbody>
</table>

Table 2 presents standardized HRs of baseline characteristics for migration during follow-up

<table>
<thead>
<tr>
<th></th>
<th>Men (N = 12913)</th>
<th>Women (N = 13642)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
</tr>
<tr>
<td></td>
<td>HR 95% CI</td>
<td>HR 95% CI</td>
</tr>
<tr>
<td>Education</td>
<td>0.96 0.86–1.09</td>
<td>1.00 0.88–1.12</td>
</tr>
<tr>
<td>Married</td>
<td>0.96 0.83–1.01</td>
<td>0.98 0.84–1.14</td>
</tr>
<tr>
<td>Unemployed</td>
<td>1.16 1.08–1.24</td>
<td>1.13 1.04–1.22</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>1.13 1.02–1.26</td>
<td>1.11 0.99–1.25</td>
</tr>
<tr>
<td>Extroversion</td>
<td>1.15 1.03–1.28</td>
<td>1.21 1.08–1.37</td>
</tr>
<tr>
<td>Physical exercise</td>
<td>0.99 0.89–1.09</td>
<td>0.98 0.89–1.08</td>
</tr>
<tr>
<td>BMI</td>
<td>0.89 0.78–1.02</td>
<td>0.90 0.78–1.04</td>
</tr>
<tr>
<td>Alcohol use</td>
<td>1.15 1.07–1.23</td>
<td>1.07 0.98–1.17</td>
</tr>
<tr>
<td>Current smoker</td>
<td>1.23 1.11–1.36</td>
<td>1.11 0.98–1.25</td>
</tr>
<tr>
<td>Life satisfaction*</td>
<td>1.11 1.00–1.23</td>
<td>1.05 0.94–1.18</td>
</tr>
<tr>
<td>Life is easyb</td>
<td>0.86 0.78–0.94</td>
<td>0.87 0.78–0.96</td>
</tr>
<tr>
<td>Feeling of lonelinessb</td>
<td>1.03</td>
<td>0.92–1.15</td>
</tr>
</tbody>
</table>

Model 1 = adjusted for age (both as a linear variable and classified into 5-year age groups)
Model 2 = additionally adjusted for education, neuroticism, physical exercise, BMI, alcohol use, current smoking, and life satisfaction

Table 2 presents standardized HRs of baseline characteristics for migration during follow-up

a: Higher scores indicate lower life satisfaction
b: Individual items of the life satisfaction scale

themselves less happy in life (4%, P = 0.010) and more lonely (8%, P = 0.001) than non-migrants. High standard deviations were found for physical exercise and alcohol consumption reflecting high proportions of sedentary/very active persons as well as abstainers/heavy drinkers. We found no difference by future migration status in the proportions of sedentary persons (MET-index less than one) but found lower proportions of abstainers in migrants than non-migrants (6%, P < 0.001 in men and 5%, P = 0.016 in women) supporting the results based on the continuous measures (data not shown).

Table 2 presents standardized HRs of baseline characteristics when predicting future migration. Both in men and women, the strongest association was found for current smoking, whereas slightly weaker but still statistically significant associations were found for alcohol consumption and life satisfaction. Additionally, unemployment, neuroticism and extraversion were associated with migration in men; education and extraversion were marginally statistically significant in women. When we studied individual items of life satisfaction scale, finding life uninteresting and unhappy was associated with migration in men and women. Additionally, the feeling of loneliness was associated with migration in women (Model 1). When we tested interactions with sex (data not shown), we found differences between men and women in neuroticism (P = 0.04) and feeling of loneliness (P = 0.03), whereas in education the sex difference only approached statistical significance (P = 0.08). Adjusting the results for other variables except the four individual items of life satisfaction scale decreased the association with migration for alcohol use in men and women and current smoking in men; for other variables the effect was small or even slightly strengthened the associations for extraversion in men and feelings of loneliness in women (Model 2).

We next analysed whether the above baseline characteristics were associated with further migration within twin pairs discordant both for migration status and their self-ratings prior to migration (table 3). The migrant twin used on average more alcohol in men and smoked more in men and women as compared to the non-migrant co-twin. When we pooled men and women (data not shown), we also found that the twin
who found life more interesting was less likely to migrate (HR = 0.77, 95% confidence interval (CI) 0.60–1.00).

Finally, we analysed how retrospectively self-reported discordance within twin pair was associated with migration status (Table 4). In men, the migrated twin reported to have used more alcohol and in women smoked more prior to migration than his or her non-migrated co-twin. Both men and women reported that the migrated twin had been on average less satisfied with his or her educational institution or job and generally less satisfied to life prior to migration than the non-migrated co-twin.

**Discussion**

We found that international migrants were self-selected by many characteristics including life attitudes, personality and health behavioural factors. Both male and female migrants had lower general life satisfaction than non-migrants. In individual items of the life satisfaction scale, both men and women found life less interesting and were less happy in life than non-migrants and additionally migrated women reported more feelings of loneliness. Analyses within discordant twin pairs confirmed these findings, and we found that migrated twins more commonly reported life to be less interesting prior to migration and retrospectively reported that they had been less satisfied with their educational institution/job and generally less satisfied with life than their non-migrant co-twins. This association thus is not because of the family background or other factors shared by co-twins, but appears to be rather a direct effect of life dissatisfaction on migration propensity. Migration thus seems to be at least partly a response to an unsatisfactory life-situation. These and other personality related factors may contribute to a higher mortality from violent causes found in this cohort among immigrants in Sweden as compared to non-migrants.13

Migrants and non-migrants also differ by their personality. Migrant men and to a lesser extent migrant women ranked higher in extraversion compared to non-migrants. This may not be surprising because better social skills associated with extraversion probably help a person to adapt to a new environment and thus increase the likelihood to make the decision to remain in a new country. Extravert persons are also likely to seek out new experiences such as migration. Interestingly, men also ranked higher in neuroticism whereas in women no association was seen. We could not confirm the association between personality and migration in the analyses of migration discordant pairs. Notably, the point estimates did not differ substantially between these analyses but the confidence intervals were wider in the pair-wise analyses. Thus, the somewhat different results may reflect lack of power in the intra-pair analyses rather than confounding by family background in the analyses comparing migrants to non-migrants in general. A previous study found that environmental factors shared by a twin pair did not affect extraversion and neuroticism in these data.13

With regard to health behaviour, we found that among both men and women migrants were more commonly smokers and used more alcohol than non-migrants prior to migration.
This association was systematic and found in individual level analyses and in analyses within discordant pairs reported both at baseline and retrospectively after migration. On the other hand, no difference was found in physical activity or in BMI between migrants and non-migrants. A previous study based on the 1998 survey also found that migrants in Sweden smoked more than their co-twins in Finland, and this difference was largely formed already before migration. Previous Swedish studies have found that immigrants from many countries, including Finland, have higher health behavioural risk factors than native born Swedes. Our results suggest that concerning smoking and alcohol consumption this can be partly due to self-selection.

The process of migration was not an important explanatory factor for migration in our data; only among women we found some evidence that migrants would have been slightly more educated than non-migrants. This is somewhat unexpected, since in a previous US study immigrants were found to be systematically better educated than the general population in their home countries, but it may be explained by special features of the migration from Finland to Sweden. During the 1970s, when there was extensive migration from Finland to Sweden, most jobs available in Sweden for immigrants were manual jobs in industry, which do not require high education. Thus, it has been easier for those with low education to find a job with good salary relative to their educational level in Sweden than it was for better educated immigrants. The educational level in our study cohorts was also poor reflecting the fact that the expansion of education was started in Finland only in the 1970s. Thus, well educated Finns in these cohorts probably had good job opportunities in Finland and did not need to migrate to Sweden because of unemployment. Our results showed that unemployment increased probability to migrate in men but not in women.

Our data have several strengths but also limitations. An important strength is the twin study design, which allows optimal adjustment for family background. Nordic countries form a unique case for studying migration, since during the whole study period they formed a common labour market and no legal restriction existed on residence in any country including work license and full social benefits. This means, however, that our results should not be directly generalized to all international migration but rather migration not regulated by immigration policy. We had a large number of participants and information on several background factors including personality. Our register data on migration are also likely to be very reliable since the official report is required for employment and social benefits. A limitation is that we focused only on migrants to Sweden. After the Second World War, Sweden was the main target country for Finnish migration and more than 500 000 Finns migrated to Sweden, whereas 180 000 Finns migrated to other countries. Most of the migrants were attracted to Sweden by unemployment in Finland and higher salary level in Sweden, and thus the migration motive to Sweden was usually economic. If we would have studied all emigrants, they may have been differently selected.

In conclusion, our results show that migrants are unfavourably selected by many health behavioural and personality factors, which may compromise their health in the long term. Immigrants should be an important target group for primary prevention.

Acknowledgements

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Conflicts of interest: None declared.

Key points

- Immigrants is an important minority in many countries. It has been suggested that international migrants are better educated and have better physical fitness than general population, but otherwise little is known how they are self-selected.
- Based on both prospective and retrospective surveys, we found that migrants prior to migration smoked more, used more alcohol, had lower life satisfaction and in men scored higher in extraversion and neuroticism than non-migrants. We were able to confirm most of these associations within migrant discordant twin pairs suggesting that these factors directly influence migration propensity rather than reflect the effect of family background.
- Migrants are unfavourably selected by many health behavioural and personality factors, which may compromise their health in long-term. Immigrants should be an important target group for primary prevention.

References


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