

# BMJ Open Healthy migrant effect in the Swedish context: a register-based, longitudinal cohort study.

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## ABSTRACT

**Objectives** Studies have found a ‘healthy-migrant effect’ (HME) among arriving migrants, that is, a better health status compared with others in the home country, but also in comparison with the population in the host country. The aims were to investigate whether the HME hypothesis is applicable to the Swedish context, that is, if health outcomes differed between a group of mainly labour migrants (Western migrants) and a group of mainly refugee/family reunion migrants (non-Western migrants) compared with the native Swedish population, and if there were any correlations between labour market attachment (LMA) and these health outcomes.

**Design** Register-based, longitudinal cohort study.

**Participants** The cohort was defined on 31 December 1990 and consisted of all migrants aged 18–47 years who arrived in Sweden in 1985–1990 (n=74 954) and a reference population of native Swedes (n=1 405 047) in the same age span. They were followed for three consecutive 6-year periods (1991–1996, 1997–2002 and 2003–2008) and were assessed for five measures of health: hospitalisation for cardiovascular and psychiatric disorders, mortality, disability pension, and sick leave.

**Results** Western migrants had, compared with native Swedes, lower or equal HRs for all health measures during all time periods, while non-Western migrants displayed higher or equal HRs for all health measures, except for mortality, during all time periods. Age, educational level, occupation and LMA explained part of the difference between migrants and native Swedes. High LMA was associated with higher HRs for cardiovascular disorders among Western migrants, higher HRs of psychiatric disorders among non-Western migrants and higher HRs of mortality among both migrant groups compared with native Swedes.

**Conclusions** There were indications of a HME among Western migrants, while less proof of a HME among non-Western migrants. Stratification for LMA and different migrant categories showed some interesting differences, and measurements of the HME may be inconclusive if not stratified by migrant category or other relevant variables.

## INTRODUCTION

During recent decades, Sweden has been one of the countries that have received most migrants related to the population, and today one-fifth of the Swedish population are born

## Strengths and limitations of this study

- This is a population-based study on all migrants to Sweden from six different regions.
- This is a longitudinal follow-up study of 18 years on high-quality Swedish registers.
- The registers only refer to medical inpatient care, which may impact the results.
- Migrants’ different health status prior to their arrival in Sweden can affect the outcomes, but cannot be assessed.

abroad.<sup>1 2</sup> The demographics of migrants to Sweden have also changed dramatically since the mid-1970s, from mainly Scandinavian, southern and south-eastern European labour migrants, to an influx dominated by refugees and family reunion migrants from conflict-ridden regions outside of Europe.<sup>3</sup> Although the official Swedish immigration policy, established in 1975, stipulates that migrants with residence permits have the same rights as native Swedes with regard to social security, labour market participation, education, healthcare and so on, experience shows that many immigrants nevertheless are disadvantaged in socioeconomic and health terms compared with native Swedes.<sup>3–5</sup>

Many studies have observed a ‘healthy migrant effect’ (HME), that is, that migrants often have a better health status than the remaining population in the native country, but also compared with the majority in the host country, especially during the first 5–10 years after immigration. The HME has been documented in studies worldwide and explained in different lines.<sup>6–18</sup> Most studies on the HME are undertaken in North America, but there are also enlightening studies from Europe, for example, Denmark,<sup>13</sup> Germany,<sup>14</sup> Spain<sup>16</sup> and Norway.<sup>19</sup> The findings from these studies are, however, not necessarily applicable to the Swedish context due to differences in migration patterns, immigration policies, social

security systems, labour market policies and so on. Nevertheless, knowledge on migrants' health in general is insufficient, and more so on the health of different categories of migrants,<sup>20–25</sup> and even more so on migrants' work-related health. Since every fifth employee in the Swedish labour market is born abroad,<sup>26</sup> this issue requires increased attention. Attachment to the labour market has been shown to be of importance for both physical and psychological health, while long periods of unemployment have been associated to deteriorating health and premature death.<sup>27–29</sup> Migrants have, however, to a higher extent been reported to work in manual and blue-collar work, and may therefore be more exposed to work-related risks and more vulnerable to work-related diseases.<sup>22</sup> When studying the Swedish immigration context during this period, it should be kept in mind that there was very little labour migration between 1973 and 2008 except for Scandinavians, for whom there has been a shared open labour market since 1954. The reasons for this can be found in strict regulations for labour migration as a vital part of the labour market policy, while the policy on asylum-seeking and family reunion migration on the contrary was generous.<sup>30</sup> These policies were reversed in some other major host countries, for example, the USA and Australia; hence, the selection of migrants by the host country to a great extent affects the proportion of labour versus refugee and family reunion migrants. This may also affect the outcome of the HME studies in different countries and pose challenges to making comparisons.

The aim of the study was to explore whether the HME hypothesis is applicable to the Swedish context, and if there were differences between migrants from Western countries, consisting mainly of labour migrants and kin, and migrants from non-Western countries, consisting mainly of refugees and kin. Moreover, we examined if there was any correlation between labour market attachment early after arrival in Sweden and health status as seen in the chosen outcomes.

## METHODS

### Study population

The cohort was defined on 31 December 1990 and included all migrants to Sweden in 1985–1990 aged between 18 and 47 years from six selected regions. They were aggregated into two groups, Western migrants (n=14 199) and non-Western migrants (n=60 755). The immigrant groups were compared with an age-matched and gender-matched group of native Swedes (n=1 405 047). Due to lack of data on reasons for migration during the study period, migrants from Western countries, that is, Western Europe, North America and Oceania, were regarded as a proxy for voluntary migrants (eg, labour migrants, students), since these migrant groups, according to the Swedish Migration Agency, mainly consist of labour or other voluntary migrants.<sup>31</sup> For the same reason, migrants from Middle East, Latin America and North/North-East Africa were regarded as

a proxy for refugees and family reunion migrants, since migrant groups with those origins mainly consist of such migrants according to the Swedish Migration Agency.<sup>31</sup> Moreover, we chose migrants within a rather narrow time span in order to have a more homogeneous migrant population with regard to length of stay in Sweden, a factor that is reported to be of importance for integration in the host country.<sup>19 22</sup> We did additional analyses on migrants, with Western migrants as the reference group, where we also adjusted the estimates for length of stay in Sweden at baseline (continuous 1–5 years). Length of stay in Sweden was, as we anticipated, of no importance for any of the studied outcomes in any of the follow-up periods. Migrants were defined as persons born outside Sweden with two parents born outside Sweden, and the Swedish reference population was defined as persons born in Sweden with two parents who were also born in Sweden. The age span was motivated by our intention to study individuals in active working age, that is, 18 years and older. The upper limit was motivated by the fact that individuals who immigrated in 1990 at the age of 47 would be 65 years at the end of the follow-up period in 2008, which is the regular retirement age in Sweden.

### The study cohort

All participants in the study were observed with regard to hospitalisation due to cardiovascular and psychiatric disorders, mortality, sick leave (register data are available from 1993), and disability pension for three consecutive 6-year periods (1991–1996, 1997–2002 and 2003–2008) in annually updated national registers. The characteristics of the cohort are presented in [table 1](#).

### The concept of 'Healthy migrant effect'

The 'healthy migrant effect' refers to observations that migrants have been found to have a better health status at immigration than the other population in their country of birth and to some extent also better health status than the population in the host country. Moreover, a number of studies show that migrants' health advantage diminishes over time and their health status becomes equal to or worse than the native population's within 5–10 years after immigration. Findings of a HME are mainly explained by a combination of four factors: immigration selection effects, outmigration selection effects, cultural effects and data artefacts. Immigration factors refer to a selection of healthy persons who migrate, not reflecting the average health status in their country of origin. The outmigration selection effects refer to observations that especially elderly migrants tend to return to their country of origin in larger numbers than others. The cultural effects explanation points at health-promoting lifestyle factors with regard to, for example, food, alcohol and drugs. Finally, data artefacts refer to register fallacies, such as over-registration, and that primarily elderly migrants return permanently to their geographical origin without notice and still remain in the registers (salmon bias).<sup>7 15 17 18</sup>

**Table 1** Characteristics at baseline year 1990 among the study population stratified by region

	Native Swedes	Western migrants	Non-Western migrants
	n (%)		
Total	1 405 047	14 199	60 755
Sex			
Male	720 155 (51.3)	7807 (55.0)	35 920 (59.1)
Female	684 892 (48.7)	6392 (45.0)	24 835 (40.9)
Education			
Elementary school or lower	314 947 (22.4)	2740 (19.3)	20 870 (34.4)
Upper secondary school	553 675 (39.4)	1708 (12.0)	11 203 (18.4)
University	531 234 (37.8)	5756 (40.5)	19 687 (32.4)
Unknown education	5191 (0.4)	3995 (28.1)	8995 (14.8)
Age (years)			
18–24	330 508 (23.5)	2846 (20.0)	13 206 (21.7)
25–35	494 356 (35.2)	8777 (61.8)	34 721 (57.1)
36–47	580 183 (41.3)	2576 (18.1)	12 828 (21.1)
Occupation			
White-collar	527 467 (37.5)	2660 (18.7)	3217 (5.3)
Blue-collar	639 097 (45.5)	4925 (34.7)	23 905 (39.3)
Other/Unemployed	238 483 (17.0)	6614 (46.6)	33 633 (55.4)
Labour market attachment* (years)			
0–2	196 972 (14.0)	8318 (58.6)	39 077 (64.3)
3–6	1 208 075 (86.0)	5881 (41.4)	21 678 (35.7)

\*Yearly income from work annually, 1991–1996.

## Registers

All data were collected from national registers at Statistics Sweden and The Swedish National Board of Health and Welfare. The diagnoses chosen are commonly related to working conditions and are prevalent enough to give fair numbers for comparison. We also limited ourselves to diagnoses that with some certainty would lead to inpatient care (table 2). Data on inpatient healthcare for cardiovascular and psychiatric disorders were collected from the *National Patient Register*, and the diagnoses were coded according to the International Classification of Diseases V.9 (ICD-9) and V.10 (ICD-10). The included diagnoses are displayed in table 2. ICD-9 was replaced by ICD-10 in 1996/1997 with slight changes within each diagnosis group. Mortality data were collected from the *Cause of*

*Death Register*, which includes all deceased persons who were registered in Sweden at the time of death. Data on demographic and socioeconomic variables, such as region of origin, sex, age and educational level, as well as work-related factors such as labour market attachment, sick leave and disability pension, were collected from the *Longitudinal Integration Database for Health Insurance and Labour Market Studies*. These high-quality and annually updated national registers include individual identification numbers which allow all registered residents in Sweden to be tracked in each separate register and through links between them. These identification numbers were coded by Statistics Sweden to prevent any violation of personal integrity.

## Statistical analyses

The HRs for all five chosen health outcomes were computed by performing Cox regression analyses. All analyses were made separately for the time periods 1991–1996, 1997–2002 and 2003–2008 and were adjusted for sex, age (continuous) and educational level (elementary, upper secondary or university as the highest achieved educational level), occupation (blue-collar, white-collar) and labour market attachment (economic active/inactive during the follow-up), dichotomised as a time-dependent covariate to also assess changes in labour market attachment during the follow-up period. Moreover, we

**Table 2** Diagnoses included in the analyses of hospitalisation according to the International Classification of Diseases (ICD) V.9 and V.10

Cardiovascular disorders	ICD-9: 401, 402, 403, 404, 413, 410, 414, 425 and 428. ICD-10: I10, I11, I12, I13, I20, I21, I25, I42 and I50.
Psychiatric disorders	ICD-9: 300, 308 and 309. ICD-10: F32, F33, F34, F38, F41, F43, F45 and F48.

performed a stratified analysis by degree of early labour market attachment during the first 6-year period. We examined how early labour market attachment after arrival correlated with health status by stratifying each group for 0–2 years and 3–6 years, respectively, of employment within the first 6-year period. Labour market attachment was measured as the presence of income from gainful employment annually during the time period 1991–1996. All analyses were censored for death, first emigration year or end of follow-up (1996, 2002 and 2008, respectively). A finite population adjustment was used for the 95% confidence limits of the HRs. All analyses were performed using SAS V.9.4.

### Patient and public involvement

There was no patient involvement in this study.

### RESULTS

The Western migrant group had, during the follow-up period, lower or equal HRs for all studied outcome measures compared with the native Swedish population (table 3). Similar patterns were found for all three periods of follow-up and the risk estimates were rather unchanged over time, even if there was a tendency towards lower differences compared with the native Swedish population. Stepwise adjustment by covariates showed that the risk estimates between Western migrants and the native Swedish population were narrowed with regard to most outcome measures. Adjustment for age increased the risk estimates with regard to most outcome measures, indicating a difference in age structure between Western migrants and the native Swedish population. Adjustment for type of occupation and labour market attachment lowered the risk estimates further and explained a large part of the differences in health outcomes between Western migrants and the native Swedish population.

The non-Western migrant group displayed, compared with the native Swedish population, higher or equal HRs for all studied outcomes except for mortality during all periods of follow-up (table 3). Adjustment for age increased the risk estimates also among non-Western migrants compared with the native Swedish population. Educational level, type of occupation and labour market attachment decreased the risk compared with native Swedes for all studied outcomes in stepwise adjustments. The risk estimates for both disability pension and sick leave increased over time, while the risk estimates for other outcomes were rather unchanged.

There were some but not any remarkable differences between men and women during the follow-up period, most notably lower HRs for cardiovascular disorders and mortality for both Western and non-Western women compared with men (data not shown).

When the analyses were stratified for labour market attachment, migrants, from both Western and non-Western countries, with high labour market attachment (3–6 years of employment during the first 6-year

period) had higher or equal HRs for both cardiovascular and psychiatric disorders and mortality compared with native Swedes with high labour market attachment (table 4). Migrants with low labour market attachment (0–2 years of employment during the first 6-year period) had to a high degree lower HRs for both cardiovascular and psychiatric disorders and mortality compared with native Swedes with low labour market attachment.

### DISCUSSION

We examined the applicability of the HME in the Swedish context for Western and non-Western migrants. As Western migrants over time had lower or equal risk of most studied outcomes compared with native Swedes, the study indicated a HME for Western migrants. Non-Western migrants had, on the contrary, equal or higher risk of all studied outcomes, except for mortality, throughout the follow-up compared with native Swedes. We therefore found much lower proof of a HME among non-Western migrants. The study also found higher HRs for some outcome measures among migrants with high attachment to the labour market in the first 6 years after immigration compared with native Swedes with high labour market attachment.

Previous studies on migrants' health status in Sweden are not conclusive, but they tend to paint a negative picture of migrants' health status compared with native Swedes.<sup>3 22 32 33</sup> Some explanatory views attributed to migrants' positive health status at arrival are present in the literature. One claims that migrants often constitute a selection of strong and healthy individuals who can handle the physiological, social and mental hardships of uprooting, travel and resettlement.<sup>18 34</sup> This could be a reason for the positive health outcomes of Western migrants in our study. The maximum age limit of 47 years at the start of follow-up may also contribute to positive results. Another track of interpretation is the 'cultural buffering' explanation, which claims that culturally determined lifestyle factors promote health, such as healthier diet, less drug and alcohol consumption, and so on.<sup>7 18</sup> It also suggests that stronger family and kinship bonds act as a health-promoting factor. The latter could potentially have the reverse effect if the person migrates and lives in the host country without his/her family and kin. Two more explanations highlight flaws in the recording of migrants. One is commonly referred to as the 'salmon bias', which means that primarily elderly migrants return permanently to their geographical origin without notice, just as the salmon returns to its birthplace to mate.<sup>7 15</sup> This study shows that the risk estimates for mortality for both Western and non-Western migrants are well below the risk estimates for the native Swedish population, which may be explained by people leaving Sweden without notice. If so, the salmon bias implies that these emigrants may remain in the host countries' national registers even after they are deceased, potentially forever, which is also true for Sweden. The other explanation refers to errors in

**Table 3** HRs\* for cardiovascular and psychiatric disorders, mortality, sick leave, and disability pension among Western and non-Western migrants compared with native Swedes

	n	Crude HR HR (95% CI)	Model 1	Model 2	Model 3	Model 4
<b>Cardiovascular</b>						
1991–1996						
Sweden	9413	1	1	1	1	1
Western	34	0.43 (0.33 to 0.57)	0.80 (0.61 to 1.05)	0.80 (0.61 to 1.07)	0.90 (0.63 to 1.27)	0.85 (0.54 to 1.32)
Non-Western	331	0.84 (0.77 to 0.92)	1.42 (1.29 to 1.55)	1.36 (1.24 to 1.5)	1.23 (1.08 to 1.41)	1.06 (0.90 to 1.26)
1997–2002						
Sweden	19233	1	1	1	1	1
Western	47	0.39 (0.31 to 0.50)	0.70 (0.55 to 0.88)	0.70 (0.55 to 0.89)	0.72 (0.54 to 0.96)	0.61 (0.42 to 0.90)
Non-Western	655	0.90 (0.84 to 0.96)	1.43 (1.34 to 1.53)	1.38 (1.29 to 1.48)	1.16 (1.06 to 1.28)	0.95 (0.84 to 1.08)
2003–2008						
Sweden	28858	1	1	1	1	1
Western	87	0.57 (0.48 to 0.68)	0.88 (0.74 to 1.05)	0.87 (0.73 to 1.04)	0.97 (0.79 to 1.19)	1.00 (0.78 to 1.29)
Non-Western	1132	1.08 (1.03 to 1.14)	1.54 (1.46 to 1.61)	1.46 (1.39 to 1.54)	1.31 (1.22 to 1.41)	1.16 (1.06 to 1.28)
<b>Psychiatric</b>						
1991–1996						
Sweden	7197	1	1	1	1	1
Western	46	0.74 (0.59 to 0.94)	0.78 (0.62 to 0.98)	0.77 (0.60 to 0.98)	0.97 (0.73 to 1.30)	0.95 (0.66 to 1.36)
Non-Western	633	2.10 (1.97 to 2.24)	2.23 (2.09 to 2.38)	2.04 (1.90 to 2.20)	1.80 (1.63 to 2.00)	1.36 (1.19 to 1.56)
1997–2002						
Sweden	11393	1	1	1	1	1
Western	73	1.02 (0.84 to 1.23)	1.04 (0.86 to 1.26)	1.02 (0.84 to 1.23)	1.00 (0.79 to 1.28)	0.76 (0.55 to 1.07)
Non-Western	691	1.59 (1.50 to 1.70)	1.65 (1.55 to 1.76)	1.52 (1.42 to 1.63)	1.37 (1.25 to 1.51)	0.99 (0.88 to 1.12)
2003–2008						
Sweden	11169	1	1	1	1	1
Western	62	1.07 (0.87 to 1.32)	1.06 (0.86 to 1.3)	1.08 (0.87 to 1.33)	1.05 (0.82 to 1.36)	0.97 (0.70 to 1.34)
Non-Western	737	1.80 (1.69 to 1.91)	1.80 (1.69 to 1.91)	1.70 (1.59 to 1.81)	1.53 (1.39 to 1.68)	1.14 (1.02 to 1.29)
<b>Mortality</b>						
1991–1996						
Sweden	9637	1	1	1	1	1
Western	56	0.68 (0.55 to 0.85)	0.90 (0.73 to 1.11)	0.62 (0.49 to 0.79)	1.04 (0.79 to 1.38)	0.83 (0.58 to 1.20)

Continued

Table 3 Continued

	n	Crude HR				
		Model 1	Model 2	Model 3	Model 4	
		HR (95% CI)				
Non-Western	300	0.74 (0.68 to 0.82)	0.92 (0.84 to 1.01)	0.71 (0.64 to 0.79)	0.80 (0.69 to 0.92)	0.57 (0.48 to 0.68)
1997–2002						
Sweden	14128	1	1	1	1	1
Western	61	0.70 (0.57 to 0.86)	1.02 (0.83 to 1.26)	0.76 (0.61 to 0.94)	1.20 (0.94 to 1.54)	0.98 (0.72 to 1.33)
Non-Western	314	0.59 (0.53 to 0.64)	0.79 (0.73 to 0.87)	0.61 (0.55 to 0.68)	0.76 (0.67 to 0.86)	0.48 (0.40 to 0.56)
2003–2008						
Sweden	21643	1	1	1	1	1
Western	61	0.56 (0.46 to 0.69)	0.83 (0.67 to 1.01)	0.66 (0.54 to 0.82)	0.90 (0.71 to 1.15)	0.81 (0.59 to 1.10)
Non-Western	440	0.58 (0.53 to 0.62)	0.79 (0.73 to 0.85)	0.62 (0.57 to 0.67)	0.74 (0.66 to 0.82)	0.53 (0.46 to 0.60)
Sick leave**						
1993–1996						
Sweden	152483	1	1	1	1	1
Western	1254	0.69 (0.66 to 0.73)	0.75 (0.71 to 0.79)	0.81 (0.77 to 0.86)	0.99 (0.93 to 1.05)	0.93 (0.86 to 1.00)
Non-Western	13271	1.11 (1.09 to 1.13)	1.21 (1.19 to 1.24)	1.19 (1.17 to 1.22)	1.44 (1.41 to 1.48)	1.31 (1.28 to 1.35)
1997–2002						
Sweden	265497	1	1	1	1	1
Western	1254	0.74 (0.71 to 0.78)	0.80 (0.77 to 0.84)	0.85 (0.81 to 0.89)	0.91 (0.87 to 0.96)	0.84 (0.78 to 0.90)
Non-Western	13271	1.35 (1.33 to 1.37)	1.50 (1.48 to 1.52)	1.47 (1.45 to 1.49)	1.50 (1.47 to 1.53)	1.41 (1.38 to 1.45)
2003–2008						
Sweden	264712	1	1	1	1	1
Western	1162	0.81 (0.78 to 0.85)	0.87 (0.83 to 0.91)	0.90 (0.86 to 0.95)	0.93 (0.88 to 0.98)	0.97 (0.89 to 1.05)
Non-Western	12876	1.49 (1.47 to 1.51)	1.65 (1.63 to 1.68)	1.61 (1.58 to 1.63)	1.49 (1.47 to 1.52)	1.48 (1.43 to 1.52)
Disability pension						
1991–1996						
Sweden	61250	1	1	1	1	1
Western	132	0.23 (0.20 to 0.27)	0.32 (0.28 to 0.37)	0.11 (0.10 to 0.13)	0.61 (0.51 to 0.73)	0.56 (0.45 to 0.70)
Non-Western	1694	0.64 (0.62 to 0.67)	0.88 (0.85 to 0.91)	0.40 (0.38 to 0.42)	1.37 (1.30 to 1.45)	1.10 (1.03 to 1.18)
1997–2002						
Sweden	53897	1	1	1	1	1
Western	230	0.70 (0.63 to 0.78)	0.94 (0.85 to 1.04)	0.96 (0.87 to 1.07)	1.10 (0.98 to 1.25)	0.75 (0.65 to 0.88)
Non-Western	4193	2.08 (2.03 to 2.13)	2.81 (2.74 to 2.89)	2.60 (2.53 to 2.67)	2.27 (2.18 to 2.36)	1.30 (1.24 to 1.36)

Continued

Table 3 Continued

	n	Crude HR HR (95% CI)	Model 1	Model 2	Model 3	Model 4
2003–2008						
Sweden	82 640	1	1	1	1	1
Western	349	0.81 (0.74 to 0.88)	1.01 (0.93 to 1.10)	1.03 (0.95 to 1.13)	1.01 (0.91 to 1.12)	0.83 (0.72 to 0.95)
Non-Western	5534	2.00 (1.96 to 2.04)	2.60 (2.54 to 2.66)	2.44 (2.38 to 2.50)	2.03 (1.97 to 2.10)	1.61 (1.54 to 1.69)

\*Data for sick leave is available 1993–2008

Model 1: adjusted for sex and age.

Model 2: adjusted for sex, age and educational level.

Model 3: adjusted for sex, age, educational level and occupation (blue-collar or white-collar).

Model 4: adjusted for sex, age, educational level, occupation (blue-collar or white-collar) and labour market attachment (economic active/inactive during the follow-up).

registers,<sup>18 35</sup> for example, multiple registrations due to different name spellings and so on. This risk is minimised in Swedish national registers due to the unique personal identification number given to every individual. An additional remark is that some host countries require health control as an instrument to allow immigration, which has never been the case in Sweden.

A number of studies also show that migrants' health advantage diminishes over time,<sup>36 37</sup> and is equal to or worse than the health of the native population 5–10 years after immigration. We could find tendencies for this in Western migrants, especially among those with less years at work in the first 6-year period. The non-Western group had HRs equal to or higher than the Swedish reference group already in the first 6-year period, and for several outcomes the HRs increased over time. A speculative assumption is that Western migrants with more initial years at work have integrated well enough to navigate the healthcare and social security systems in the latter 6-year periods and therefore appear in the registers. This argument is weakened by the choice of diagnoses, which often, at least in the case of cardiovascular disorders, are too serious to escape medical treatment. Other arguments for why health deteriorates stress that migrants, especially non-Western migrants, usually live under inferior socioeconomic conditions compared with the host population. They display higher unemployment figures, worse housing conditions and less access to healthcare, which are also the case in Sweden.<sup>38–40</sup> They may also be exposed to new risk factors which were not present in their original homestead, for example, air pollution, new allergens and so on. The elevated risks for sick leave and disability pension among non-Western migrants may also be indications of a vulnerable position on the labour market.<sup>41</sup> As seen in table 3, such deterioration occurred in almost all outcomes when only the outcome variables were taken into account.

The results of this study state that the HME seems to differ between different categories of migrants. Our findings provide stronger indications for a HME in a cohort of mainly labour migrants from Western countries, that is, individuals who migrated voluntarily from democratic welfare states. We were, however, not able to compare their health status with that of their average countrymen in their home countries, and we therefore cannot tell whether the migrants constitute a healthy selection of individuals or not. We can, however, argue that they are not traumatised from war, conflict or volatility on their journey to Sweden, and they have probably had access to good healthcare and good nutrition in childhood and adolescence. We can also argue that there is a relatively small cultural distance between those countries and Sweden. Their welfare and education systems, social codes and frames of reference are similar enough to reduce the hardships of resettlement and integration. The language barriers could also be less pronounced, since English is widely spoken among them as well as among Swedes. Taken together, this should predict a relatively

**Table 4** HRs\* for cardiovascular and psychiatric diagnoses and mortality of Western migrants and non-Western migrants for early labour market attachment (0–2 or 3–6 years between 1991 and 1996) for the periods 1997–2002 and 2003–2008 compared with native Swedes

	Time period	Population	0–2 years	3–6 years
			HR (95% CI)	
Cardiovascular	1997–2002	Sweden	1	1
		Western	0.35 (0.20 to 0.61)	0.89 (0.67 to 1.19)
		Non-Western	1.12 (1.01 to 1.24)	1.17 (1.04 to 1.31)
	2003–2008	Sweden	1	1
		Western	0.71 (0.49 to 1.02)	0.89 (0.71 to 1.12)
		Non-Western	1.21 (1.11 to 1.31)	1.35 (1.24 to 1.47)
Psychiatric	1997–2002	Sweden	1	1
		Western	0.70 (0.50 to 0.98)	1.05 (0.79 to 1.39)
		Non-Western	0.92 (0.86 to 1.04)	1.48 (1.31 to 1.68)
	2003–2008	Sweden	1	1
		Western	0.87 (0.60 to 1.25)	1.03 (0.77 to 1.39)
		Non-Western	1.06 (0.97 to 1.17)	1.80 (1.61 to 2.01)
Mortality	1997–2002	Sweden	1	1
		Western	0.32 (0.22 to 0.48)	1.35 (1.03 to 1.77)
		Non-Western	0.31 (0.27 to 0.36)	0.75 (0.63 to 0.90)
	2003–2008	Sweden	1	1
		Western	0.33 (0.22 to 0.50)	0.94 (0.72 to 1.23)
		Non-Western	0.31 (0.28 to 0.36)	0.81 (0.70 to 0.92)

\*Adjusted for sex, age and educational level.

good health status and reduce the risk of socioeconomic marginalisation, and this also seems to be the case. For non-Western migrants, the picture was different. Taken together, they displayed, compared with native Swedes, elevated or equal HRs for cardiovascular and psychiatric disorders during the first period, and they remain elevated during the full follow-up period. This contradicts the HME hypothesis for this group.

In our study, HRs of mortality among non-Western migrants are all well below the HRs of the native Swedish population. Similar low HRs for migrants have been found in several other studies, most often based on refugees, and are often referred to as a ‘salmon bias’ effect or register fallacies.<sup>35 42–44</sup> The latter explanation is negligible in the Swedish case, but the ‘salmon bias’ effect might be a plausible explanation for the lower risk of mortality compared with the host population in Sweden, at least for the non-Western migrant group. There is also a possibility that migrants do leave Sweden without notice, and we can in registers sometimes spot several periods of immigration without a record of any emigration in between. It may also be that these unregistered emigrants have a deviant health status, compared with the remaining immigrants, which may bias the outcomes. The salmon bias assumption is also suggested as an explanation for the observed longevity and low mortality risk among migrants, which could at least partially explain

our findings on mortality. When the non-Western migrant group was stratified on labour market attachment, there was a difference between those with high and low labour market attachment. Economic inactivity may indicate that the migrant has emigrated, but may also be an indication that they were working in the informal economy or were supported by the spouse or family. A previous study from our research group concluded that migrants, especially migrant women, to a higher extent ‘disappeared’ from registers due to economic inactivity, including no receipt of welfare benefits.<sup>45</sup> Since this study finds almost the same low risks for voluntary migrants, this issue should be further investigated before it can be concluded that this will reflect a true scenario, and hence indicate a HME. A recent study on migrants in Sweden, stratified by home country, presents a more nuanced result, where several country groups have higher HRs for mortality than native Swedes, while some groups still have lower HRs compared with the native Swedish population.<sup>46</sup>

Many studies have shown that having a job is a good way to foster mental and physical health and that unemployment leads to deteriorating health.<sup>28 47 48</sup> The finding that higher labour market attachment soon after arrival coincides with higher HRs for several of the outcome measures is therefore noteworthy. When we stratified the analyses for labour market attachment within the first 6-year period, we found that the HME holds true for



Western and to some extent also non-Western migrants with low labour market attachment (compared with native Swedes with low labour market attachment). For those with high labour market attachment, the HME seems not to hold. Our data do not allow us to determine if there is causality or in which direction it goes. There may also have been other residual confounders which have yet to be explored, such as premigration health, marital status, type of employment, income and so on. It has been shown that migrants often work in physically and psychosocially demanding sectors.<sup>22 23</sup> There may, however, be alternative explanations for the discrepancies between migrants and the native population with regard to labour market attachment. One plausible explanation is that native Swedes with high labour market attachment in general have less health problems compared to native Swedes with low labour market attachment.<sup>49</sup> This would then explain the relatively better health status among migrants with low labour market attachment. Thus the data do not allow us to draw any conclusions about the impact of work on health or vice versa, but the issue of labour market attachment and the HME should therefore be investigated in more detail in future studies.

Previous work experience in Sweden is required in order to be eligible for sickness benefits, and sickness absence will thus be associated with a selection of people with previous work experience. Disability pension can, however, be granted without prior work experience, and there is a considerable increase in the HR of disability pension from the first 6-year period to the second and third, especially for the non-Western migrant group. Migrants may have less knowledge of the Swedish social security system in the first years, and migrants without refugee status had during the first part of the studied period a qualification period of 5 years in order to be eligible for disability pension, which partly explains the low risk during the first 6-year period. Even in this case, the data do not allow us to investigate whether this is due to actual health deterioration or to changes in the management of the social security system.

### Strengths and weaknesses

This study has some main strengths, for example, that it is a population-based study with a total cohort of migrants within the defined criteria from six different regions, with a longitudinal follow-up of 18 years, and the high quality and reliability of Swedish registers.<sup>50</sup> The study also has some limitations. As there were no available data on reasons for migration for the studied time period, we used Western and non-Western immigrants as a proxy for voluntary and non-voluntary migrants. We are aware that some individuals from non-Western regions were living in Sweden as students and labour migrants, but their number during the studied time period is estimated to be rather small and therefore does not influence the outcomes more than marginally.<sup>31</sup> The registers only refer to medical inpatient care for cardiovascular and psychiatric disorders, since we lack data for primary

care and open specialist care and other diagnoses, which may impact the results. Migrants' health status and exposure prior to their arrival in Sweden can surely affect our outcomes,<sup>51 52</sup> but our data do not allow us to account for that. The education variable has some weaknesses, since it emanates from self-reported information among migrants who never have attended the Swedish educational system. Finally, the eligibility to having benefits from social security may differ between migrants and native Swedes because migrants to a higher extent are unemployed compared with Western migrants and the native Swedish population.<sup>49</sup> This may affect the HRs for sick leave and disability pension.

### CONCLUSIONS

We have in this study found an indication that the HME might hold true for Western migrants, that is, mostly voluntary migrants to Sweden, but less proof of a HME among non-Western migrants, mainly consisting of refugees and family reunion migrants. When stratifying for the variable labour market attachment, the HME was almost eradicated for migrants with high attachment to the labour market in the first 6-year period compared with the native Swedish population with high labour market attachment. Moreover, additional studies that can elucidate the paradox of low mortality even if other factors indicate worse health compared with the host population are warranted. One general conclusion is that HME outcomes can be inconclusive if they are not stratified by migrant category and other relevant variables, for example, employment status.

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**Data sharing statement** The data that support the findings of this study are available from Statistics Sweden and The Swedish National Board of Health and Welfare, but restrictions apply to the availability of these data, which were used with ethical permission for the current study and therefore are not publicly available.

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