ORIGINAL ARTICLE

The Influences of Place of Birth and Socioeconomic Factors on Attempted Suicide in a Defined Population of 4.5 Million People

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Background: Our knowledge of the influence of place of birth and socioeconomic status on attempted suicide in a defined national population is limited.

Methods: The study population at baseline in 1993 included approximately 4.5 million Swedish persons aged 25 to 64 years, of whom 570 000 had been born abroad. Each individual was tracked until attempted suicide, remigration, death, or the end of the study on December 31, 1998. The Cox regression was used in the analysis.

Results: Labor migrants from Finland and other OECD (Organisation for Economic Cooperation and Development) countries and refugees from Poland and Iran had higher hazard ratios of attempted suicide than Swedish-born control subjects. Women born in Latin America, Asia, and Eastern Europe had significantly higher hazard ratios of attempted suicide than Swedish-born women. In contrast, men born in southern Europe and Asia had significantly lower hazard ratios of attempted suicide. The hazard ratios of attempted suicide among women from Iran, Asia, southern Europe, Latin America, and eastern Europe considerably exceeded those of men from the same country of origin. When socioeconomic status was included in the final model, the hazard ratios remained high for women, while the risk of attempted suicide among men declined sharply with increased income.

Conclusions: Place of birth, socioeconomic status, and sex are associated with attempted suicide. Socioeconomic status explains only part of the association between place of birth and attempted suicide.

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EXPLORING THE relationship between place of birth and attempted suicide is of growing importance in view of the increasing number of migrants, refugees, and displaced people in the world. In January 2000, the United Nations High Commission for Refugees reported the existence of 22 million refugees and other displaced persons of concern.[1]

Refugees and labor migrants have an increased risk of psychological distress,[2,3] an established risk factor for attempted suicide.[4-6] However, the literature describing the influence of ethnic patterns in attempted suicide is not consistent. Rates of attempted suicide seem to vary between ethnic groups.[4,7,8] However, relatively few reports have directly estimated the increased risk of attempted suicide among refugees and labor immigrants in relation to native-born persons. This study explored how place of birth and socioeconomic status (SES) interact in attempted suicide. Low SES,[9,10] unemployment,[11,12] young age,[4,7,13] female sex,[4,13,14] and living alone[6,11,14] are well-known risk factors for attempted suicide.

Most of the existing studies on place of birth and attempted suicide were based on self-reported data, had small sample sizes, were conducted in restricted regions, or were focused on a few selected groups of migrants. These limitations will be addressed in the present study by using national follow-up data on approximately 4.5 million Swedish persons, including approximately 600 000 foreign-born people in 11 different groups of refugees and labor immigrants.

The first aim of this study was to determine the relationship between place of birth and attempted suicide. The second aim was to analyze whether the relationship between place of birth and attempted suicide remained after accounting for confounding factors, including age, marital status, and SES.

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METHODS

POPULATION

The study population included all individuals aged 25 to 64 years at baseline on January 1, 1993, according to the Swedish Population Register included in the research database MigMed. The Swedish 10-digit personal identification number was used to link the different registers included in MigMed. MigMed con

sisted of the following databases: Louise, a register that contains annual specifics for the entire population and information on SES; the Immigration Register, which contains data about place of birth; and the Total Population Register, which comprises all individuals who stay in Sweden more than 6 months and includes annual data on emigration and immigration to Sweden. The National In-Care Register and Cause of Death Register were included in MigMed. The personal identification number was the key to linking the registers and also to tracking all individuals during the study period from January 1, 1993, to December 31, 1998. There were no major changes in the Swedish population during this period that could affect the results. Person-years at risk were calculated from January 1, 1993, until attempted suicide or death, censoring because of remigration, or December 31, 1998.

CLASSIFICATION OF ATTEMPTED SUICIDE

Attempted suicide was defined as cases logged in medical records according to the World Health Organization *International Classifications of Diseases*, 9th and 10th revisions (*ICD-9* and *ICD-10*), as deliberate self-harm (E950-959 and X60-X84, respectively) and undetermined self-harm (E980-989 and Y10-34, respectively). Deliberate self-harm and undetermined self-harm were combined in this analysis and are called *attempted suicide* in the text. Attempted suicides that did not result in injury serious enough to be treated medically on emergency wards or to require hospitalization were not included in the study. All first hospital admissions in Sweden for attempted suicide during a 5-year period from 1993 to 1998 are included in this study. The In-Care Register was connected to the Cause of Death Register to ensure that we did not double-count completed suicides.

EXPLANATORY VARIABLES

All variables are based on individual data and were collected from the MigMed database at the start of the study on January 1, 1993.

Age was analyzed in the following groups: 25 to 34, 35 to 44, 45 to 54, and 55 to 64 years.

Socioeconomic status was defined as individual income, stratified into quartiles based on the distribution of all incomes of the total study populations. Three groups were used in the analysis: low income (first quartile), average income (second and third quartiles), and high income (fourth quartile).

Marital status comprised 2 levels, (1) living alone and (2) married or cohabiting couple with own children.

Place of birth was defined for each person in a geographic and cultural sense according to the country or region of birth. The 12 groups based on place of birth in this study were selected to combine countries with a comparable level of living conditions and culture. To ensure sufficient numbers for statistical data analyses, countries with fewer than 20 000 immigrants living in Sweden were combined into major regions.

All people living in Sweden were divided into 12 categories based on place of birth: (1) Swedish-born; (2) other OECD (Organisation for Economic Cooperation and Development) countries (eg, the United States, Canada, Australia, New Zealand, Japan, and western Europe except Finland and southern Europe); (3) Finland; (4) southern Europe (eg, Portugal, Spain, Italy, Cyprus, Greece, and the former Yugoslavia); (5) Poland; (6) Turkey; (7) Iran; (8) Latin America (eg, Chile, Uruguay, Argentina, and other Latin American and Central American countries); (9) Iraq and other Arabic-speaking countries (including north Africa); (10) Asia; (11) eastern Europe (eg, the former Soviet Union, excluding former Yugoslavia); and (12) Africa (excluding north Africa).

STATISTICAL METHODS

The analyses were conducted with the SAS software package (SAS Institute Inc, Cary, NC). Age-adjusted incidence rates (per 100 000 persons per year) of attempted suicide were calculated between 1993 and 1998. A Cox regression model[15] was used to estimate the hazard ratio of attempted suicide in the different factors. The results are shown as hazard ratios with 95% confidence intervals. Women and men were analyzed separately in a model adjusted for age and in a model including all explanatory variables. Interactions between place of birth and SES were analyzed.

RESULTS

The study population included all individuals aged 25 to 64 years at baseline, January 1, 1993, and was made up of both women (n = 2 200 562, of whom 285 044 had been born abroad) and men (n = 2 268 845, of whom 287 900 had been born abroad).

Table 1 shows the distribution of the estimated population and numbers of attempted suicides by place of birth and sex. During the study period of 1993 through 1998, 23 527 cases of attempted suicide occurred, 4154 of which were among foreign-born people and 19 373 among native Swedes. Attempted suicide was classified accordingly to *ICD-9* and *ICD-10*. Most of the cases were deliberate self-harm (85% in women and 76% in men) and the rest were undetermined self-harm. These figures varied only marginally with place of birth.

Table 2 shows that women from Iran, Finland, Poland, and Latin America had the highest age-standardized hazard ratios of attempted suicide, roughly double the risk for Swedish women. Women from the other OECD countries, Asia, eastern Europe, and Iraq and other Arabic-speaking countries had high hazard ratios, ranging between 1.53 and 1.26. No foreign-born women had significantly lower risks for attempted suicide than Swedish-born women. The high risks for nearly all foreign-born women changed only marginally when marital status and SES were included in the full model (**Table 3**).

Men from Finland and Poland had the highest age-adjusted hazard ratios, roughly double the risk for Swedish men (Table 2). Men born in other OECD countries and Iran had high risks: 1.69 and 1.26, respectively. Men born in southern Europe and Africa had low age-adjusted hazard ratios, about half the risk of Swedish men. In the full model, after adjusting for marital status and SES, the hazard ratios decreased for men born in Finland and Poland from 2.26 to 1.87 and from 1.70 to 1.42, respectively (Table 3). The hazard ratios for men born in Iran decreased to nearly nonsignificant levels in the full model including marital status and SES. Low risk of attempted suicide was found among men who had emigrated from southern Europe, Asia, and Africa.

There were significant interactions between place of birth and SES. **Figure 1** shows that the risk of

Table 1. Numbers of Women and Men Aged 25 to 64 Years and Cases of Attempted Suicide by Place of Birth and Sex During 1993 Through 1998 in the Swedish Population

Place of Birth	Women		Men		*P* Value for Difference in Rate Between Men and Woman
	No.	Cases of Attempted Suicide	No.	Cases of Attempted Suicide	
Sweden	1 915 518	10 331	1 980 945	9042	<.001
OECD countries	57 350	367	60 312	305	.02
Finland	96 585	956	76 903	736	.84
Southern Europe	24 898	133	33 352	102	<.001
Poland	17 431	193	8199	64	.07
Turkey	8275	45	10 216	54	.72
Iran	12 078	146	18 708	160	<.001
Latin America	14 439	139	14 506	66	<.001
Iraq and Arabic-speaking countries	13 307	100	25 098	143	.30
Asia	14 452	131	10 889	37	<.001
Eastern Europe	19 971	146	19 912	74	<.001
Africa	6258	28	9805	29	.02
Total	**2 200 562**	**12 715**	**2 268 845**	**10 812**	<.001

Abbreviation: OECD, Organisation for Economic Cooperation and Development.

Table 2. Age-Adjusted Hazard Ratios (HRs) With 95% Confidence Intervals (CIs) of Attempted Suicide Among Non–Swedish-Born People Compared With Swedish-Born People by Place of Birth and Sex in 1993 Through 1998 (Cox Regression Model)

Place of Birth	Women		Men	
	HR	95% CI	HR	95% CI
Sweden	1	Reference	1	Reference
OECD countries	1.36	1.22-1.50	1.26	1.13-1.42
Finland	1.95	1.82-2.08	2.26	2.09-2.43
Southern Europe	1.02	0.86-1.21	0.71	0.58-0.87
Poland	1.95	1.70-2.25	1.70	1.33-2.17
Turkey	0.93	0.69-1.25	1.07	0.82-1.40
Iran	2.06	1.75-2.43	1.69	1.45-1.98
Latin America	1.72	1.45-2.03	0.97	0.76-1.23
Iraq and Arabic-speaking countries	1.26	1.03-1.53	1.13	0.96-1.34
Asia	1.53	1.29-1.82	0.71	0.51-0.98
Eastern Europe	1.42	1.21-1.68	0.91	0.72-1.14
Africa	0.74	0.51-1.07	0.59	0.41-0.85

Abbreviation: OECD, Organisation for Economic Cooperation and Development.

attempted suicide among men declined sharply with increasing income in almost every group. In marked contrast, the suicide risk among women often rose as income increased (**Figure 2**). This risk reversal was most dramatic for women from Iran, Latin America, Asia, and eastern Europe, but it also held true for other OECD countries and Iraq and other Arabic-speaking countries. Even for women born in Sweden and Poland, where the suicide risk fell with rising income, it declined much less for women than for men. The pattern of attempted suicide differed distinctly between the sexes in several aspects (Tables 2 and 3). Being single was a significant risk factor in this study compared with people who were married or cohabiting. In the total study population, the risk of attempted suicide increased for people aged 35 to 44 years, and after that the risk decreased with age.

Table 3. Hazard Ratios (HRs) With 95% Confidence Intervals (CIs) of Attempted Suicide by Place of Birth and Sex Adjusted for SES and Marital Status (Cox Regression, Full Model), 1993 Through 1998

	Women		Men	
	HR	95% CI	HR	95% CI
Place of birth				
Sweden	1	Reference	1	Reference
OECD countries	1.32	1.19-1.47	1.15	1.02-1.29
Finland	1.87	1.75-2.00	1.87	1.73-2.01
Southern Europe	1.05	0.88-1.25	0.59	0.48-0.71
Poland	1.90	1.65-2.19	1.42	1.11-1.82
Turkey	1.10	0.82-1.47	0.89	0.68-1.17
Iran	2.17	1.84-2.56	1.18	1.01-1.39
Latin America	1.67	1.42-1.98	0.74	0.58-0.94
Iraq and Arabic-speaking countries	1.40	1.15-1.70	0.84	0.71-0.99
Asia	1.59	1.33-1.89	0.60	0.43-0.82
Eastern Europe	1.44	1.23-1.70	0.79	0.63-1.00
Africa	0.75	0.51-1.08	0.44	0.30-0.63
Income				
High	1	Reference	1	Reference
Average	1.05	1.01-1.10	1.66	1.55-1.76
Low	1.46	1.41-1.57	4.06	3.79-4.34
Marital status				
Married	1	Reference	1	Reference
Single	2.30	2.22-2.39	2.07	1.99-2.16
Age, y				
25-34	1	Reference	1	Reference
35-44	1.24	1.18-1.29	1.35	1.28-1.41
45-54	0.94	0.90-0.99	1.13	1.07-1.19
55-64	0.51	0.48-0.54	0.71	0.67-0.76

Abbreviations: OECD, Organisation for Economic Cooperation and Development; SES, socioeconomic status.

COMMENT

To our knowledge, this is the first study to examine the relationship between place of birth and attempted suicide among native Swedes and foreign-born people in a large national sample of both women and men aged 25

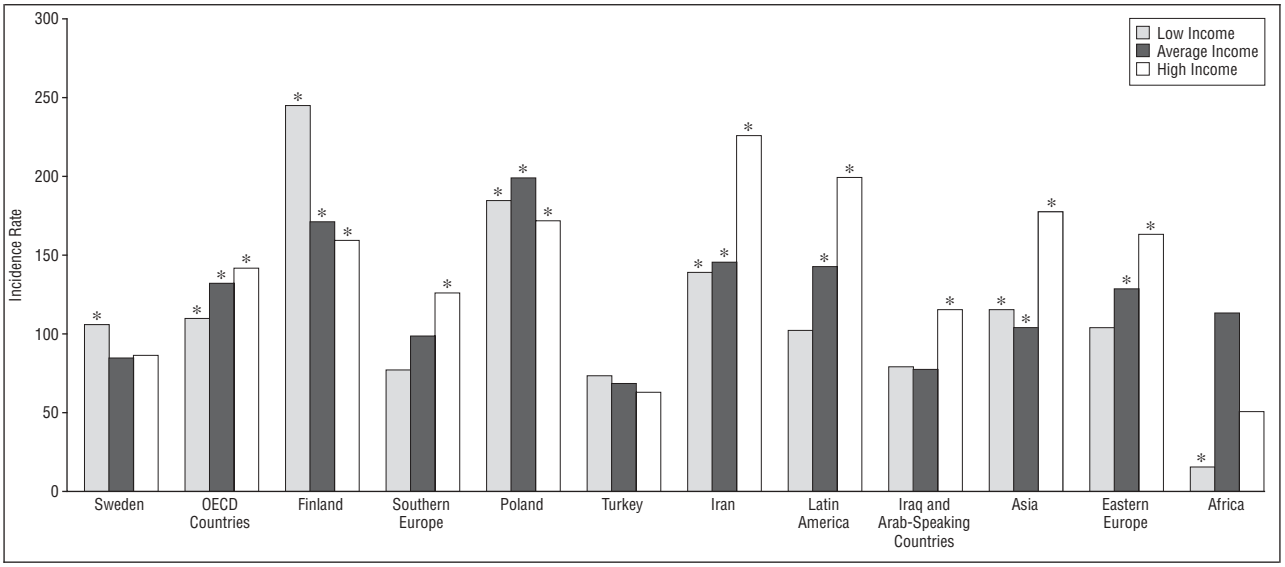

Figure 1. Interaction between place of birth and socioeconomic status for women in 1993 through 1998, showing age-adjusted incidence rates for attempted suicide per 100 000 person-years by place of birth and sex. OECD indicates Organisation for Economic Cooperation and Development. Asterisk shows significant difference in rate compared with Swedish-born women with high income (P<.05).

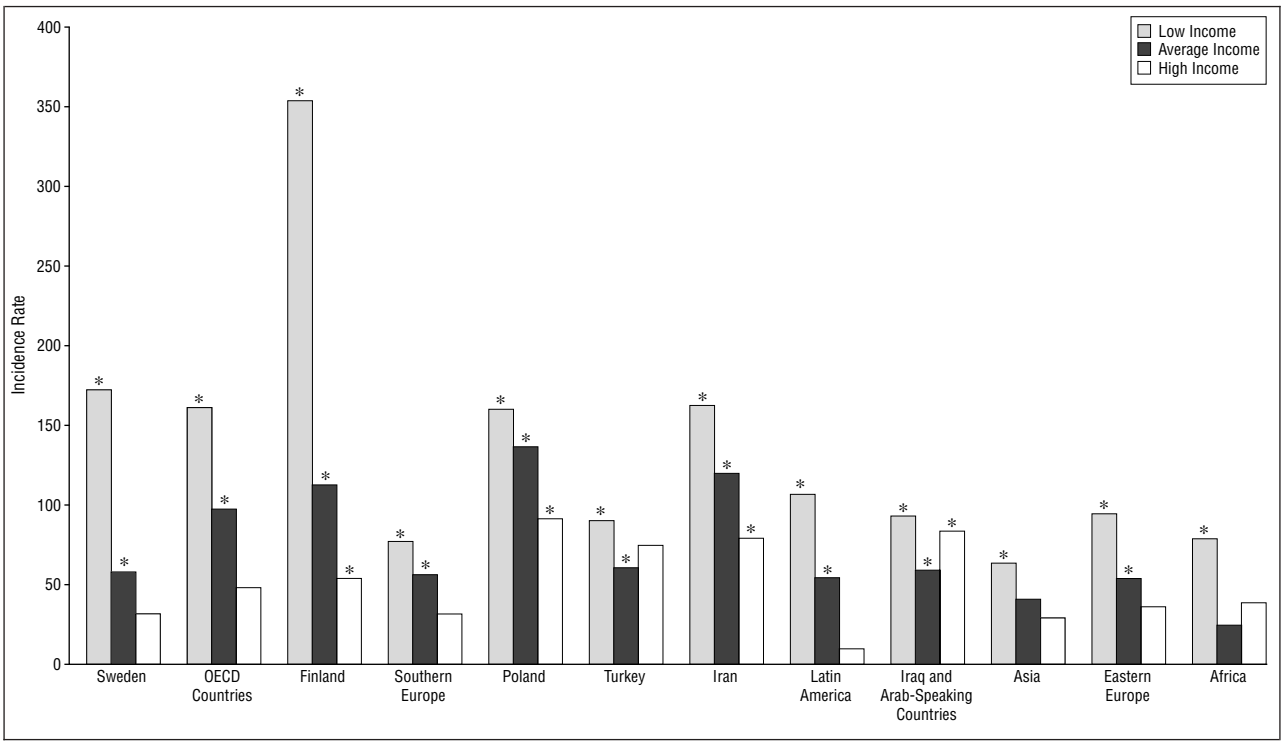

Figure 2. Interaction between place of birth and socioeconomic status for men in 1993 through 1998, showing age-adjusted incidence rates for attempted suicide per 100 000 person-years by place of birth and sex. OECD indicates Organisation for Economic Cooperation and Development. Asterisk shows significant difference in rate compared with Swedish-born men with high income (*P*<.05).

to 64 years. Consistent with our expectations, place of birth was associated with attempted suicide. Low SES could only partly explain the association between place of birth and attempted suicide. Moreover, there were important sex differences in attempted suicide, to the disadvantage of women.

This study has several strengths. For example, one advantage is the well-defined study population made up of all people living in Sweden aged 25 to 64 years. Sweden has a more than 200-year-old tradition of registering and administering social, demographic, morbidity and mortality, and health care data. A 10-digit personal identification number, assigned to each person in Sweden for his or her lifetime, including refugees and immigrants staying more than 6 months in the country, is recorded in all registers and was used for record linkage between the registers forming the database MigMed. Another advantage is that national registers in Sweden are audited regularly because they

form the basis for allocating resources to communities and health care services. The dropout rate is exceptionally low, as registration is mandatory according to Swedish law. Moreover, nonparticipation is not likely to have produced a serious selection bias in this study, since the databases have very few missing data and have a completion rate of 98% except for SES among older immigrants. This is a minor problem, however, with young immigrants in Sweden.

This study has a certain limitation due to the use of official national registers, since the data were not collected specifically to test the proposed study aims. However, the combination of data from several registers in MigMed was collected particularly to answer the proposed study aims. Age, marital status, and SES might be confounders of the associations between place of birth and attempted suicide. However, adjusting for these possible confounders only marginally affected the results.

Another limitation is the classification of attempted suicide. It may be difficult to determine the difference between deliberate self-harm and undetermined self-harm. This study therefore included both deliberate and undetermined self-harm to avoid misclassification of attempted suicide. Thus, we may have included persons who had no intention to attempt suicide. At the same time, we may have excluded persons who attempted suicide but were reported under another *ICD* code for a minor accident. However, in this study, most cases of attempted suicide (85% in women and 76% in men) were classified as deliberate self-harm. These figures varied only marginally between different place-of-birth groups. Research in other countries suggests that suicidal acts may be underestimated by 10% to 50%, since not all suicide attempts lead to medical treatment.[16] Another limitation is that the categorization of subjects into living alone vs married or cohabiting might conceal important differences between subjects, eg, lifetime single status might be very different than recent widowhood.

Another weakness is the application of the concept of place of birth. The 12 categories based on place of birth in this study are broad and generalizing but are based on officially recognized national states in the world, and we have tried to combine countries with similar social, economic, and cultural factors. We emphasize that regions such as "eastern Europe" and "Asia" include people who have come to Sweden from many different countries, ethnic groups, and backgrounds. However, even though the subjects are diverse and characterized by different social, economic, and cultural factors, generalization into broad categories based on place of birth was useful for the purpose of the study.

The present study extends the recent work of Bayard-Burfield et al,[8] who found that foreign-born people had higher age-adjusted risks of attempted suicide than native Swedes. However, in that study the numbers of cases were too small to allow subdivision into different categories of places of birth. Other studies have shown little or no increase in the risk of attempted suicide in ethnic minority groups.[4,7,17] In the present study, the risks of attempted suicide varied considerably with place of birth, in which context migrants from Finland, Poland, and Iran had roughly double the risk of Swedish-born people. In contrast, low risks of attempted suicide were reported for men from Asia, southern Europe, and Africa. In general, women were at higher risk of attempted suicide than men from the same country.

Sweden is an important country of resettlement. In times of prosperity, Sweden has recruited large numbers of migrant workers to Swedish industries. During the 1960s and 1970s, large groups of labor migrants arrived particularly from Finland and southern Europe. During the past 30 years, Sweden has not recruited labor migrants, although family reunions have continued. Finnish labor migrants had the highest risk of attempted suicide of all groups in this study, which is consistent with the findings of Wasserman et al,[18] who reported high rates of attempted suicide for Finnish labor migrants in Sweden. The high rates of attempted suicide among this group may reflect the high rates of attempted suicide in their country of birth. The highest average male age-standardized rate of attempted suicide for 16 European centers was reported, with 314 incident cases per 100 000 men in Helsinki, Finland.[10] In the 1980s, Finnish immigrants had poor mental health compared with Swedish-born persons.[19] The "healthy migrant effect" may be expected less for people born in Finland inasmuch as the migration between Finland and Sweden occurs without borders. It has been suggested that foreign-born populations are generally in better health than their native-born contemporaries because of the so-called healthy migrant effect.[20] Consistent with this view, men who were labor migrants from southern Europe had a lower risk of attempted suicide than men born in Sweden.

The finding that labor migrants from other OECD countries, who are highly skilled and have attained a high level of education, ran a higher risk of attempted suicide than labor immigrants from southern Europe agreed with a study from western Australia that showed higher incidence rates of attempted suicide among male migrants from other OECD countries (New Zealand and Scotland) and lower incidence rates among those from southern Europe.[21] The low risk of attempted suicide for southern European men was in agreement with a European multicenter study in which the lowest rate was reported for men (45/100 000) in Guipuzcoa, Spain.[10] In this study, women from southern Europe had a risk of attempted suicide similar to that of Swedish women.

We were not able to replicate the low risk of attempted suicide for Polish immigrants in this study.[21] On the contrary, immigrants from Poland and women from eastern Europe were at increased risk in our study. Migration from Poland and eastern Europe to Sweden has occurred as a consequence of poor economic conditions, revolts, and political and religious persecution. In 1996, migrants from Poland had a substantially increased risk of self-reported psychiatric illness compared with the Swedish reference group.[3] High risk of suicide attempts has been reported for imigrants from eastern Europe (former Soviet Union) to Israel.[22]

The past 20 years of migration to Sweden, and many other Western countries, has been characterized by forced mass migration from non-European countries because of war and human rights violations. There has been an influx of refugees from Latin America, Arabic-speaking countries, Asia, and Africa. In this study, refugees from

Iran and Iraq and other Arabic-speaking countries (women only) had high risks of attempted suicide. These high risks of attempted suicide among refugees from Iran and Iraq and other Arabic-speaking countries can be viewed in the light that Muslims are generally expected to run a lower risk of attempted suicide than Christians.[23] Moreover, rates of attempted suicide are also known to be low in Arabic-speaking countries.[24] In addition, high levels of psychological distress have been reported among refugees from Iran[25,26] and Latin America,[27] a finding partially in agreement with the results of the present study.

Women from southern Europe, Iran, Latin America, Asia, and eastern Europe were more likely to be at risk for attempted suicide than men from the same countries. In general, women run a higher risk of attempted suicide than men.[4,13,14] Consistent with the results of earlier studies, the findings of this study confirm that Asian women are likely to be at high risk of attempted suicide.[28-30] Attempted suicide seems to be a sex-related problem. There was a different pattern of attempted suicide between immigrant women and men when the interaction between place of birth and income was analyzed. The risk of attempted suicide among men declined sharply with increased income in almost every ethnic group, while immigrant women showed the opposite pattern. Even for women from Sweden, where the suicide risk falls with income, it declines much less for women than for men. As part of the explanation, other studies suggest that women from ethnic minority groups often reported marital dysfunction[31] and cultural conflicts as a key factor in attempting suicide.[30,32] One of the most consistent observations over time is the association between SES and attempted suicide,[9,10,33] especially among men. In this study, many foreign-born groups exhibited high age-adjusted risks of attempted suicide. However, even though the risk of attempted suicide became less prominent after adjustment for SES, this could only partly explain the association between place of birth and attempted suicide.

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