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Suicide risk among native- and foreign-origin persons in Sweden: a longitudinal examination of the role of unemployment status

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Abstract

Purpose Prior research has documented an association between unemployment and elevated suicide risk. Yet, few Swedish studies have explicitly considered how such risk may vary by different migration background characteristics among persons of foreign-origin, who often experience diverse forms of labor market marginalization. This study examines the extent to which unemployment status may differentially influence suicide risk among the foreign-origin by generational status, region of origin, age at arrival, and duration of residence.

Methods Population-based registers were used to conduct a longitudinal, open cohort study of native-origin and foreign-origin Swedish residents of working age (25–64 years) from 1993 to 2008. Hazard ratios and 95% confidence intervals for suicide mortality were estimated using gender-stratified Cox proportional hazards models.

Results Elevated suicide risk observed among foreign-origin unemployed groups was generally of a similar or lower magnitude than that found in unemployed native-origin, although unemployed second-generation Swedish men demonstrated significantly greater ($p < 0.05$) excess risk of suicide than that observed among their native-origin counterparts. Unemployed foreign-born men with a younger age at arrival and longer duration of residence demonstrated an increased risk of suicide, while those who arrived as adults, and a shorter duration of residence did not show any increased risk. Among foreign-born women, excess suicide risk persisted regardless of age at arrival and duration of residence in the long-term unemployed.

Conclusions Multiple migration background characteristics should be considered when examining relationships between employment status and suicide among the foreign-origin.

Keywords Migrant mental health · Health equity · Employment status · Sweden · Suicide

Introduction

Suicidal behaviors are shaped by social forces and have a complex etiology, which for persons of foreign-origin encompass both origin and destination specific factors. Prior research has shown that migrants often tend to 'bring' the suicide risk of their country of origin with them to the destination country [1]. A correlation between migrants' suicide rates in their country of destination and suicide rates in their country of origin has also been observed [2, 3].

Such evidence suggests that origin-specific factors, including predominant cultural or religious norms [1] as well as genetic factors [3], may continue to influence suicide risk post migration and contribute to differences in suicide rates among different migrant groups and between migrant groups and native-origin individuals. Prior studies from the Swedish context have demonstrated decreased suicide risk in foreign-born persons relative to the native-born [4, 5], yet considerable heterogeneity in suicide risk remains among the foreign-born population. A recent review of mental health outcomes among migrants in Sweden showed higher suicide risk in persons from Finland and lower risk in persons from Southern Europe and the Middle East [6]. However, the extent to which these differences can be attributed to origin-specific factors remains unknown.

Exposure to unemployment has also been shown to be associated with poor mental health [7, 8], including severe outcomes like suicide [9, 10], which could be the ultimate

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consequence of mental health deteriorations associated with unemployment or job loss. Unemployment in the destination country may be a key risk factor for poor health among migrants, as persons of foreign-origin in Sweden [11, 12] and elsewhere [13, 14] have higher rates of unemployment compared to those of native-origin. They also tend to be more segregated into lower paid jobs [15, 16] and have less job security [17], suggesting that foreign-origin persons may be more vulnerable to the negative effects of unemployment due to this more tenuous labor market position. For example, transition into unemployment from an already disadvantaged position may exacerbate the socioeconomic consequences of job loss due to a lack of existing financial or other resources that may protect against negative effects. As such, one might expect the association between unemployment and suicide to be stronger among persons of foreign-origin, reflected by inequities in suicide rates. However, it is difficult to assess the extent to which protective and risk factors associated with the countries of origin and destination influence the risk of suicide. For example, individuals from non-European countries have been shown to face greater difficulties in the Swedish labor market relative to natives [18–20], suggesting increased stress and frustrations related to these difficulties; yet, they also demonstrate lower suicide rates compared to native-origin Swedes [4, 5].

To better understand the complexities surrounding relationships between migrant background, employment status, and suicide, it could prove useful to consider additional migration characteristics, such as age at arrival and duration of residence, which may also have implications for the extent to which migrant mental health may be influenced by employment status, and help to disentangle the relative influence of origin and destination contexts.

Persons who migrate at younger ages have been shown to have better language skills [21] and higher educational attainment, rates of employment, and higher wages [22, 23] than those who migrate at older ages. This suggests that younger age of arrival may promote labor market integration and in turn may also provide mental health benefits associated with employment [24, 25]. Similarly, a longer duration of residence generally entails improved occupational integration among the foreign-born, as employment rates among migrants tend to increase with greater residence duration [26]. However, these factors are not reflected in the migrant health literature, as younger age at arrival and greater duration of residence have been associated with a higher risk of mental disorders and suicide attempts among Hispanic migrants in the US [27, 28]. This suggests that earlier socialization and integration processes that occur in the destination context have a negative influence on mental health among the foreign-born. Such evidence, commonly known as unhealthy assimilation [29], refers to a convergence in poor health outcomes among migrants with

natives, but requires confirmation in country contexts such as Sweden, which provide universal access to health care and generous welfare protection benefits for those in need.

Prior Swedish studies have also demonstrated higher suicide risk among the children of migrants, commonly referred to as the second generation, compared to both the native-origin and foreign-born [4, 5]. Second-generation individuals grow up in the same social context as the native-origin, but may experience additional stressors that their native-origin peers do not, including discrimination or racism in the labor market [30] which may be translated into labor market disadvantages [31] that could also adversely impact mental health. Despite this, the second generation have been generally overlooked in the literature.

The main aim of this study is to assess if unemployment, a risk factor in the destination context, differentially influences the risk of suicide among groups of foreign-origin persons in Sweden. We compare the risk of suicide among unemployed persons of differing countries and regions of origin to that of employed native-origin to assess for potential inequalities in suicide risk between the foreign- and native-origin unemployed. We also consider age at arrival and duration of residence to examine the extent to which the destination context might modify (moderate or exacerbate) the association between unemployment and the risk of suicide in migrants with different migration characteristics. We hypothesize that no changes in relation to age at arrival and duration of residence might indicate a predominance of risk or protective factors associated with the context of origin, while significant changes in relation to these variables might indicate a stronger influence of factors associated with the destination context. Finally, we consider generational status to determine if unemployment in second-generation groups may have a differential impact on suicide risk compared to their native-origin peers. We also use post-estimation tests to compare the magnitude of risk estimates for suicide between unemployed foreign-origin groups and unemployed native-origin Swedes.

Migrants and their children currently comprise 30% of all Swedish residents [32], and are estimated to account for an even greater share of the population in the coming years [33]. Further investigation of the mental health impacts of unemployment in foreign-origin groups thus represents an important contribution to the existing migrant mental health literature.

Methods

Data, study population, and study design

Population-based register data from the Swedish Work and Mortality Data (HSIA) was utilized. These data contain

information on the total population of Sweden born before 1986 who were alive in 1980 or 1990, as well as foreign-born residents who arrived in Sweden between 1990 and 2002. An open cohort study design was used to allow for the inclusion of all eligible foreign-born persons who migrated to Sweden through December 2002.

The relationship between employment status and suicide was analyzed from 1993 to 2008. Person time at risk was calculated from age 25 (or age at first entry if 25 + years of age upon arrival) until age 65, first out-migration, death from suicide, death from other causes, or end of follow-up, whichever came first. Persons with missing information on education, income, or civil status in all years of follow-up and foreign-born persons with missing information on first entry date in Sweden were excluded. Ethical approval was granted by the Regional Ethical Review Board in Stockholm, Sweden (approval number 2012/1260-31).

Migration background characteristics

Information on country or region of birth from predefined categories constructed by Statistics Sweden was used to categorize the foreign-born into region of origin groups, as follows: Nordic countries (Denmark, Finland, Norway, Iceland); European + countries (all non-Nordic European countries, excluding former Yugoslavia, plus USA & Canada, and Australia and New Zealand); and other countries (all other countries). We have included the USA, Canada, Australia, and New Zealand together with European countries as (1) they are high income countries, similar to Europe and (2) migrants from these countries are more likely to migrate for similar reasons as European migrants, such as work or studies, and less likely to be forced to migrate. The group other countries is quite heterogeneous, comprised of persons from several world regions. We have included migrants from the former Yugoslavia in the other countries category as this group was more likely to be forced to migrate, unlike the European + countries migrants. Foreign-born persons were also classified according to (1) age at arrival, as children or adolescents (< 20 years) or adults (20 + years) and (2) duration of residence (< 10 years or 10 + years of residence).

Native-born Swedes with one or more foreign-born parent were coded as second generation. Native-born Swedes with two native-born parents were coded as Sweden (native-origin). A random sample of one million native-born Swedes was taken to decrease statistical processing time.

Employment status

A combination measure of annual employment was constructed using information on recorded employment status earned income, sickness and early retirement benefits, and the number of days in unemployment per year. Individuals classified as employed: (1) were listed as employed in the register; (2) had zero days of annual unemployment; (3) received annual income earnings (56,000 SEK minimum in 1993, adjusted annually for inflation); and (4) did not receive financial benefits above a maximum amount (27,500 SEK in 1993, adjusted annually for inflation). The self-employed and individuals on leave (e.g., parental leave) were also classified as employed. Individuals classified as unemployed: (1) were listed as unemployed in the register; (2) had 1 + recorded days of annual unemployment; and (3) did not receive financial benefits above a maximum amount (27,500 SEK in 1993, adjusted annually for inflation).

These restrictive criteria were utilized to minimize potential health selection effects, by ensuring that those who received high amounts of financial benefits (a proxy measure of poor health status) were not coded as unemployed. The income and benefits thresholds utilized were based on cutoffs used in prior Swedish research [34]. Individuals who had missing information on income or benefits received or who did not fulfill the employment status criteria described above were categorized as other/unknown (results not presented for this group).

Employment status was also measured as a time-varying exposure to provide a more precise estimation of how changes in employment status over the entire study period (1993–2008) produced changes in the hazard of the risk for suicide, e.g., how the hazard of suicide increased/decreased with change(s) in employment status. This contributes to the existing health literature with a more complex analysis of the association between unemployment and suicide mortality than has typically been conducted. As duration of unemployment has been shown to influence associations with mortality [35], annual unemployment spells were categorized as short-term (< 90 days/year) and long-term (90 + days/year). This cutoff was used to enable comparability with prior Swedish studies of unemployment and mortality [34, 36].

Suicide mortality

Mortality from suicide was classified using ICD codes for intentional self-harm (ICD-9: E950-E959; ICD-10: X60-X84, Y870) and events of undetermined intent (ICD-9: E980-E988; ICD-10: Y10-Y34). The inclusion of codes for events of undetermined intent may provide a more accurate measure of suicide mortality due to frequent underreporting of suicides [37], and also facilitates comparison with prior Swedish studies that have used both pairs of code classifications in combination to assess suicide mortality [5, 9].

Statistical analyses

Hazard ratios (HR) and 95% confidence intervals (CI) for suicide mortality were estimated using gender-stratified Cox

proportional hazard models. Employment status and additional covariates (time period of follow-up, education level, civil status, and disposable income quintile) were assessed as time-varying variables to account for changes in these variables over the study period. Attained age was used as the time scale in all Cox regression analyses.

Multiplicative interaction terms for migration background characteristics and employment status were utilized to assess for potential modification of associations between migration background characteristics and suicide by employment status. Hazard ratios were calculated using linear combinations of coefficients to compare differences in the relative risk of suicide. Employed, native-origin Swedes were used as the reference category in all models. Post-estimation linear hypothesis tests were conducted to assess for statistically significant ($p < 0.05$) differences in the magnitude of hazard ratio estimates between unemployed native-origin and foreign-origin groups.

Results

Over the follow-up period, 1493 suicide deaths occurred among women and 3496 among men. Table 1 displays the person-time, number of suicides, and suicide mortality rates/10,000 person years for women and men across categories of variables that were included in the study. When considering region of origin, the highest suicide rates were found among women and men from Nordic countries. Second-generation men had higher suicide rates compared to the native-origin and foreign-born. Migrants who arrived in Sweden as adults had lower suicide rates than those who arrived as children or adolescents. Foreign-born women and men who had lived in Sweden for less than ten years had the lowest suicide rates.

Excluding those with an other/unknown employment status, the highest suicide rates were observed in those exposed to long-term unemployment, but differences were modest across unemployment categories. A gradient in suicide rates was observed by education and income, whereby suicide mortality rates generally decreased as education and income levels increased. Individuals with partners demonstrated the lowest rates of suicide relative to those who were divorced, single, or widowed. There was little difference in suicide rates across different follow-up time periods.

Tables 2 and 3 show hazard ratio estimates from minimally adjusted (Model 1) and fully adjusted (Model 2) models with interaction terms for migration background characteristics (generational status, region of origin, age at arrival, and duration of residence) and employment status. Results for each migration background characteristic are described separately.

Generational status

The excess risk of suicide observed in second-generation and foreign-born women exposed to unemployment was of a similar magnitude to that seen in unemployed native-origin women. However, employed foreign-born women had a modestly increased risk of suicide compared to employed native-origin women. Unemployed second-generation men demonstrated the highest excess suicide risk, and the excess risk found among those exposed to short-term unemployment was significantly greater ($p = 0.00$) than that found among their native-origin counterparts. Employed foreign-born men showed a decreased risk of suicide compared to employed native-origin men. The excess risk among long-term unemployed foreign-born men was significantly lower ($p = 0.00$) than that among long-term unemployed native-origin men.

Region of origin

Increased suicide risk was observed among employed women from Nordic and European + countries relative to employed native-origin women (Model 2). Long-term unemployed women from Nordic countries showed the highest excess risk of suicide, but the risk was not significantly greater than that found among long-term unemployed native-origin women ($p = 0.08$). Women from Non-European countries showed the lowest suicide risk overall, with excess risk observed only among the long-term unemployed.

Elevated suicide risk was seen in Nordic men across all employment status categories. The highest excess risk was seen in short-term unemployed Nordic men but, similar to Nordic women, in the fully adjusted model this risk estimate did not significantly differ in magnitude from that of native-origin men exposed to short-term unemployment ($p = 0.07$). Among European + men, excess risk was observed only in those exposed to long-term unemployment. Non-European men showed no excess suicide risk regardless of employment status.

Age at arrival

Elevated risk of suicide was seen in employed women and short-term and long-term unemployed women and men who migrated to Sweden as children or adolescents (< 20 years). Among those who arrived as adults ($20 +$ years), elevated risk was only observed in women who experienced long-term unemployment. A decreased risk of suicide was observed in employed men who arrived in Sweden as adults.

Table 1 Study population person-time, number of suicides, and suicide rates (suicides per 10,000 person years)

Total (N=2 178 321)	Women	(N=1 082 046)			Men	(N=1 096 275)		
	No. of person years	No. of suicides	Suicide rate	95% CI	No. of person years	No. of deaths	Suicide rate	95% CI
	12,400,665	1493	1.20	1.14–1.27	12,516,679	3496	2.79	2.70–2.89
Sweden (native-origin)	5,373,068	645	1.20	1.11–1.30	5,570,371	1587	2.85	2.71–2.99
Generational status								
Second generation	2,395,843	311	1.30	1.16–1.45	2,537,849	913	3.6	3.37–3.84
Foreign-born	4,631,754	537	1.16	1.07–1.26	4,408,459	996	2.26	2.12–2.40
Region of origin								
Nordic countries	1,435,646	231	1.61	1.41–1.83	2,537,849	421	3.77	3.43–4.15
European countries+	1,085,715	148	1.36	1.16–1.60	1,115,907	202	1.91	1.67–2.19
Non-European countries	2,110,394	158	0.75	0.64–0.88	1,056,908	373	1.67	1.51–1.85
Age at arrival								
Under 20 years old	1,475,089	213	1.44	1.26–1.65	1,250,517	401	3.21	2.91–3.54
20+ years old	3,156,665	324	1.03	0.92–1.14	3,157,942	595	1.88	1.74–2.04
Duration of residence								
Less than 10 years	1,273,154	79	0.62	0.50–0.77	1,236,621	154	1.25	1.06–1.46
10+ years	3,358,600	458	1.36	1.24–1.49	3,171,838	842	2.66	2.48–2.84
Employment status								
Employed	7,018,350	333	0.47	0.43–0.53	7,791,294	1060	1.36	1.28–1.44
Short-term unemployed	766,249	64	0.84	0.65–1.07	699,873	235	3.36	2.95–3.82
Long-term unemployed	962,567	102	1.06	0.87–1.29	1,218,190	429	3.52	3.20–3.87
Other/unknown[a]	3,653,499	994	2.72	2.56–2.90	2,807,322	1772	6.31	6.02–6.61
Education								
Primary	2,595,399	428	1.65	1.50–1.81	2,864,548	1138	3.97	3.75–4.21
Secondary	5,716,568	709	1.24	1.15–1.33	5,963,271	1799	3.02	2.88–3.16
Tertiary	3,982,032	356	0.89	0.81–0.99	3,576,131	559	1.56	1.44–1.70
Missing	106,666	0			112,729	0		
Civil status								
Partner	6,590,449	432	0.66	0.60–0.72	6,076,775	942	1.55	1.45–1.65
Divorced	1,970,800	479	2.43	2.22–2.66	1,548,979	725	4.68	4.35–5.03
Single	3,540,693	532	1.50	1.38–1.64	4,813,060	1793	3.73	3.56–3.90
Widowed	298,441	50	1.68	1.27–2.21	77,426	36	4.65	3.35–6.45
Missing	282	0			439	0		
Disposable income quintile								
Q1 (Lowest)	1,802,848	253	1.40	1.24–1.59	1,556,863	690	4.43	4.11–4.78
Q2	2,209,535	443	2.00	1.83–2.20	1,521,004	907	5.96	5.59–6.36
Q3	3,361,831	411	1.22	1.11–1.35	2,173,683	712	3.28	3.04–3.53
Q4	2,990,352	226	0.76	0.66–0.86	3,287,077	635	1.93	1.79–2.09
Q5 (Highest)	2,035,819	160	0.79	0.67–0.92	3,977,612	552	1.39	1.28–1.51
Missing	282	0			439	0		
Follow-up period								
1993–1996	2,882,427	316	1.10	0.98–1.22	2,929,641	824	2.81	2.63–3.01
1997–2000	3,074,058	378	1.23	1.11–1.36	3,113,456	871	2.80	2.62–2.99

Table 1 (continued)

Total (N=2 178 321)	Women	(N=1 082 046)			Men	(N=1 096 275)		
	No. of person years	No. of suicides	Suicide rate	95% CI	No. of person years	No. of deaths	Suicide rate	95% CI
	12,400,665	1493	1.20	1.14–1.27	12,516,679	3496	2.79	2.70–2.89
2001–2004	3,215,333	390	1.21	1.10–1.34	3,239,159	908	2.80	2.63–2.99
2005–2008	3,228,847	409	1.27	1.15–1.40	3,234,421	893	2.76	2.59–2.95

[a]Person-time and suicide mortality information for the other/unknown employment status category is reported only for completion

Table 2 Hazard ratios for suicide mortality among women and men by employment status and native-origin, generational status, and region of origin combinations

	Women				Men			
	Model 1*		Model 2**		Model 1*		Model 2**	
	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
Sweden (native-origin)								
Employed[a]	1.00		1.00		1.00		1.00	
Short-term unemployed	2.73	1.79–4.18	2.24	1.46–3.43	2.24	1.73–2.89	1.67	1.29–2.16
Long-term unemployed	2.64	1.77–3.94	2.08	1.39–3.10	3.59	3.02–4.26	2.40	2.01–2.87
Generational status								
Second generation								
Employed	1.08	0.81–1.44	1.02	0.76–1.36	1.14	0.98–1.32	1.11	0.95–1.28
Short-term unemployed	2.89	1.74–4.78	2.28	1.38–3.78	*5.01*	4.02–6.25	*3.63*	2.90–4.54
Long-term unemployed	3.18	2.00-5.03	2.37	1.49–3.76	4.23	3.47–5.16	2.75	2.24–3.37
Foreign-born								
Employed	1.31	1.02–1.67	1.31	1.03–1.68	0.84	0.72–0.97	0.85	0.73–0.98
Short-term unemployed	1.56	0.99–2.44	1.51	0.96–2.38	1.67	1.32–2.14	1.44	1.12–1.84
Long-term unemployed	2.62	1.91–3.60	2.42	1.75–3.34	**1.59**	1.32–1.92	**1.26**	1.03–1.53
Region of origin								
Nordic countries								
Employed	1.49	1.08–2.04	1.42	1.03–1.95	1.36	1.12–1.66	1.27	1.04–1.55
Short-term unemployed	3.16	1.55–6.43	2.60	1.27–5.29	*3.65*	2.42–5.49	2.56	1.70–3.86
Long-term unemployed	4.53	2.75–7.50	3.50	2.11–5.80	3.39	2.51–4.58	2.13	1.57–2.89
European countries+								
Employed	1.44	0.97–2.14	1.51	1.02–2.23	0.62	0.46–0.83	0.66	0.49–0.89
Short-term unemployed	1.01	0.32–3.19	0.97	0.31–3.06	1.39	0.76–2.52	1.16	0.63–2.10
Long-term unemployed	3.10	1.79–5.36	2.79	1.60–4.85	**2.01**	1.39–2.91	**1.54**	1.06–2.23
Non-European countries								
Employed	0.99	0.67–1.46	1.03	0.69–1.52	0.60	0.47–0.76	0.62	0.48–0.79
Short-term unemployed	*1.22*	0.65–2.24	1.23	0.66–2.28	*1.29*	0.93–1.79	1.12	0.81–1.56
Long-term unemployed	1.76	1.11–2.78	1.72	1.08–2.72	**1.04**	0.80–1.37	**0.84**	0.65–1.11

Bold and italicized HR estimates denote those which were significantly different ($p < 0.05$) from HR estimates for short-term unemployed native-origin Swedes

Bold HR estimates denote those which were significantly different ($p < 0.05$) from HR estimates for long-term unemployed native-origin Swedes

*Model 1: adjusted for follow-up period

**Model 2: adjusted for follow-up period, education level, civil status, and disposable income quintile

[a]The reference category for all combinations of employment status and migration background is employed, native-born persons with two native-born parents

Table 3 Hazard ratios for suicide mortality among women and men by employment status and native-origin, age at arrival, and duration of residence combinations

	Women				Men			
	Model 1*		Model 2**		Model 1*		Model 2**	
	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
Sweden (native-origin)								
Employed[a]	1.00		1.00		1.00		1.00	
Short-term unemployed	2.73	1.79–4.18	2.24	1.46–3.43	2.24	1.73–2.89	1.67	1.29–2.16
Long-term unemployed	2.64	1.77–3.94	2.08	1.39–3.10	3.59	3.02–4.26	2.40	2.01–2.87
Age at arrival								
Arrived < 20 years old								
Employed	1.51	1.09–2.09	1.44	1.04-2.00	1.07	0.87–1.33	1.01	0.82–1.24
Short-term unemployed	2.56	1.30–5.03	2.17	1.10–4.26	3.17	2.23–4.52	2.28	1.60–3.26
Long-term unemployed	4.17	2.61–6.66	3.36	2.10–5.39	3.25	2.48–4.25	2.15	1.63–2.82
Arrived 20 + years old								
Employed	1.19	0.89–1.59	1.23	0.92–1.65	0.72	0.60–0.87	0.75	0.063-0.92
Short-term unemployed	*1.24*	0.70–2.18	1.24	0.70–2.20	*1.23*	0.90–1.70	*1.09*	0.79–1.51
Long-term unemployed	2.14	1.46–3.14	2.04	1.38–3.01	**1.15**	0.90–1.46	**0.93**	0.73–1.20
Duration of residence								
< 10 years of residence								
Employed	0.90	0.50–1.63	1.00	0.55–1.80	0.43	0.29–0.65	0.50	0.33–0.75
Short-term unemployed	*0.88*	0.39–1.98	0.98	0.42–2.22	*1.18*	0.79–1.77	1.16	0.78–1.74
Long-term unemployed	1.87	1.13–3.09	2.00	1.20–3.32	**0.90**	0.64–1.25	**0.81**	0.58–1.14
10 + years of residence								
Employed	1.38	1.07–1.78	1.37	1.06–1.76	0.94	0.80–1.10	0.93	0.79–1.08
Short-term unemployed	2.08	1.24–3.48	1.83	1.09–3.08	2.06	1.54–2.76	1.58	1.18–2.13
Long-term unemployed	3.11	2.15–4.50	2.61	1.80–3.78	**2.15**	1.74–2.67	**1.52**	1.22–1.90

Bold and italicized HR estimates denote those which were significantly different ($p < 0.05$) from HR estimates for short-term unemployed native-origin Swedes

Bold HR estimates denote those which were significantly different ($p < 0.05$) from HR estimates for long-term unemployed native-origin Swedes

*Model 1: adjusted for follow-up period

**Model 2: adjusted for follow-up period, education level, civil status, and disposable income quintile

[a]The reference category for all combinations of employment status and migration background is employed, native-born persons with two native-born parents

Duration of residence

Among the foreign-born with less than 10 years of residence in Sweden, women who experienced long-term unemployment were the only group that demonstrated excess suicide risk. Among those who had 10 or more years of residence, elevated suicide risk was observed in women and men exposed to short-term and long-term unemployment, as well as employed women. However, the excess risk among long-term unemployed men was of a significantly lower magnitude ($p = 0.00$) than that observed in their native-origin counterparts.

Discussion

This study aimed to assess if unemployment was differentially associated with suicide risk among foreign-origin groups, and contributed to inequalities in suicide risk between the foreign- and native-origin. With the exception of short-term unemployed second-generation men, no inequalities in suicide risk between the native- and foreign-origin were found: suicide risk among foreign-origin unemployed groups was generally of a similar or lower magnitude than that found among the native-origin unemployed. However, an increased risk of suicide was found with younger age at arrival and greater duration of residence. This, in combination with the excess suicide risk found among unemployed

second-generation men, points to the contribution of destination factors. Gender differences in suicide risk were also observed between foreign-origin men and women.

In line with the previous research [4, 5], greater excess risk of suicide was found among second-generation individuals relative to the native-origin; however, in the current study, this was evident only in unemployed second-generation men. The second generation grows up in the same social context as their native-origin peers, and should expect the same life chances and opportunities, yet prior Swedish research has demonstrated higher rates of unemployment among some second-generation individuals [31]. Factors such as increased job competition, a more flexible labor market, and exposure to discrimination or racism may contribute to these employment disparities [38]. The elevated suicide risk observed among unemployed second-generation men might then be related to higher amounts of stress or associated mental health declines experienced by this group as a result of unrealized employment expectations or thwarted occupational opportunities.

Employed foreign-born men demonstrated a decreased risk of suicide relative to employed native-origin men. Similarly, hazard ratio estimates observed in long-term unemployed foreign-born men were lower in magnitude than those found among their native-origin counterparts. Among foreign-born women, excess suicide risk was seen only in the employed and long-term unemployed. When region of origin was taken into account, these patterns of risk remained in men from European + and Non-European countries and women from European + countries. The highest excess risk by region of origin was observed in Nordic migrants exposed to unemployment. This is consistent with prior research which has shown higher levels of suicide risk among Nordic migrants [4, 5] and suggests that, in addition to the impact of unemployment, differences in suicide risk between native- and foreign-origin groups may also partially reflect the persistence of origin-specific determinants of suicide in the destination country [4]. Suicide risk among women and men from non-European countries was generally low, with increased risk observed only among long-term unemployed women. These region specific findings are generally in line with other research that has found similar patterns [4], but which has not investigated the role of employment status.

Although inequalities in suicide risk between native- and foreign-origin groups were generally not observed, the excess suicide risk found in the majority of unemployed foreign-origin groups points to the importance of unemployment as a social determinant of health, even among groups for whom origin-specific protective factors may persist in the destination context. Previous US-based studies have demonstrated an increased risk of poor mental health and suicidal behaviors among migrants with younger ages of arrival and longer residence durations [27, 28]. Similarly, in the current study, an increased risk of suicide was observed among unemployed foreign-born men and women who arrived at younger ages and had ten or more years of residence in Sweden. Employed men who arrived in Sweden as adults and who had shorter duration of residence had decreased suicide risk relative to employed native-origin men, and no excess suicide risk was observed among unemployed foreign-born men with these migration background characteristics. However, in foreign-born women, excess suicide risk persisted regardless of age at arrival or duration of residence among those who experienced long-term unemployment, suggesting that extended periods of unemployment might be particularly detrimental among migrant women. This supposition is in line with prior Swedish research that has demonstrated a higher risk of hospitalization for depressive disorders among unemployed foreign-born women relative to all native-born and foreign-born men and women and employed foreign-born women [8].

Although earlier arrival and longer duration of residence may facilitate certain types of integration (e.g., language, social) that can be conducive to post-migration labor market attachment, our overall findings suggest that longer residence in the destination country may also entail a convergence in suicide rates or attitudes regarding suicide with the native-born population. A longer duration of residence in combination with unmet expectations of life in the destination country could also play a role here: for example, foreign-born persons who arrived as children or adolescents or who have spent over a decade in the destination country, but have been unable to obtain stable employment may experience increased stress, poor mental health, or financial strain as a result of an unstable employment status, all of which could increase suicide risk or maladaptive coping behaviors that are associated with suicide. As such, improved labor market integration among foreign-origin persons might also lead to long-term improvements in mental health outcomes.

In contrast with the current study findings, however, recent research on work-related health outcomes among migrants in Sweden found that longer duration of residence was associated with increased risk of poor health in women, but decreased risk in men [39]. Still, other studies have shown heterogeneity by ethnic background in associations between mortality and duration of residence [40], as well as interaction effects in the health impact of duration of residence by age at arrival [41]. Such mixed findings point to the need for further studies on relationships between health, age at arrival, and duration of residence, to better elucidate how migration at critical periods during the life course may interact with social factors in the destination context and influence migrants' mental health.

Strengths and limitations

This longitudinal study utilized high quality population-based register data, which enabled an (1) examination of suicide risk across several migration background characteristics in combination with employment status and (2) assessment of employment status as a time-varying exposure, which provided a more precise estimation of time spent in unemployment during the study period. The evaluation of duration of residence and age at arrival permits an examination of the relative contribution of origin and destination factors to the risk of suicide while also identifying sensitive periods that can be used to inform policymaking [42]. To the authors' knowledge, this is the first study in Sweden to assess for differences in suicide risk across four migration background groups while also considering the role that employment status may play in influencing such associations.

However, due to data limitations, risk of suicide attempts was not investigated, for which different patterns of association may emerge. This may be particularly applicable to women in general [42], and non-European women specifically [43], who have demonstrated higher attempted suicide rates compared to men. In addition, information on number of days spent in unemployment was recorded annually. It is possible that, depending on the time at which unemployment occurred, some persons who experienced long-term unemployment could have been misclassified as short-term unemployed for two consecutive years. Although reason for migration may also differentially influence migrants' labor market trajectories as well as risk for mental ill-health, we were unable to investigate this migration characteristic, as we do not have information on the type of residence permit granted in the HSIA data. Recent Swedish research which did have access to such information, however, has suggested that the type of residence permit granted does not capture the reason for migration [44]. We believe that the region of origin categorization used in this study is informative, as the majority of Non-European migrants in Sweden come from countries in conflict, regardless of the type of residence permit granted, whereas European migrants tend to be workers and students.

In addition, despite the use of a restrictive definition of employment status to limit possible negative health selection effects into unemployment, such effects could nonetheless have impacted our findings. Previous studies have suggested that sickness absence and morbidity may partially account for the relationship between unemployment and suicide [5, 36], while others have suggested that this relationship is primarily causal [9]. It is outside the scope of the current research to examine this issue further, yet this study nonetheless represents an important initial step in describing and elucidating relationships between foreign-origin, employment status, and suicide risk across several migration background characteristics. Future studies examining unemployment and suicide risk in persons of foreign-origin should more explicitly investigate the causality of this relationship, as well as possible interaction effects between different migration background characteristics.

Due to statistical power limitations, the specificity of our migration background variables was also restricted. Heterogeneity by country of origin/parental country of origin within the region of origin and second-generation categorizations also limits the generalizability of the findings. Migrant health research in general is also often limited by unrecorded out-migration, which can result in denominator bias [45]. As unemployment may trigger out-migration among non-refugee migrants who can more easily return to their country of origin, this may be of particular importance for the current study. However, only minimal differences in hazard ratio estimates and post-estimation tests were observed in supplementary analyses in which individuals who had missing information on income for two consecutive years were excluded, as a proxy for unrecorded out-migration (see "Appendix 1").

Conclusions

Despite an overall marginalized labor market position, suicide risk observed among foreign-origin unemployed groups was of a similar or lower magnitude than that found in unemployed native-origin, with the exception of unemployed second-generation men. Future studies should, therefore, further examine the role of generational status in influencing employment and mental health. Duration of residence and age at arrival should also be investigated, as these factors may influence the degree to which unemployment may be detrimental to migrants' mental health and may serve to identify populations at higher risk. Given that migrants and their children will continue to comprise an increasing proportion of the eligible labor force in the coming years, increased knowledge surrounding the ways in which migrant background and work influence health is both pertinent and necessary.

Compliance with ethical standards

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

Appendix 1. Hazard ratios for suicide mortality among women and men by combinations of employment status and migration background characteristics after censoring for two consecutive years of missing income

	Women				Men			
	Model 1*		Model 2**		Model 1*		Model 2**	
	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
Sweden (native-origin)								
Employed[a]	1.00		1.00		1.00		1.00	
Short-term unemployed	2.55	1.64–3.96	2.10	1.35–3.28	2.26	1.74–2.94	1.70	1.30–2.21
Long-term unemployed	2.57	1.71–3.85	2.01	1.34–3.02	3.53	2.96–4.22	2.37	1.97–2.85
Generational status								
Second generation								
Employed	1.02	0.76–1.37	0.98	0.73–1.31	1.12	0.96–1.30	1.10	0.94–1.27
Short-term unemployed	2.59	1.52–4.43	2.08	1.22–3.55	*4.72*	3.73–5.98	*3.46*	2.72–4.39
Long-term unemployed	3.03	1.89–4.85	2.28	1.42–3.66	4.17	3.39–5.12	2.74	2.21–3.38
Foreign-born								
Employed	1.39	1.08–1.79	1.36	1.06–1.76	0.96	0.82–1.13	0.94	0.80–1.10
Short-term unemployed	1.76	1.04-3.00	1.57	0.92–2.68	2.03	1.53–2.69	1.59	1.19–2.12
Long-term unemployed	3.09	2.19–4.36	2.63	1.86–3.73	**1.80**	1.46–2.22	**1.32**	1.06–1.64
Region of origin								
Nordic countries								
Employed	1.49	1.08–2.05	1.41	1.02–1.94	1.43	1.17–1.74	1.31	1.07–1.60
Short-term unemployed	3.40	1.67–6.92	2.75	1.35–5.61	3.47	2.24–5.36	2.40	1.55–3.73
Long-term unemployed	**4.78**	2.89–7.90	3.62	2.18–6.00	3.41	2.51–4.64	2.13	1.56–2.91
European + countries								
Employed	1.48	0.98–2.25	1.52	1.00–2.31	0.65	0.47–0.89	0.66	0.48–0.92
Short-term unemployed	0.96	0.24–3.89	0.88	0.22–3.56	1.24	0.59–2.62	0.99	0.47–2.09
Long-term unemployed	2.79	1.47–5.30	2.40	1.26–4.57	**1.83**	1.19–2.81	**1.35**	0.88–2.08
Non-European countries								
Employed	1.13	0.72–1.77	1.12	0.71–1.76	0.72	0.54–0.94	0.70	0.53–0.92
Short-term unemployed	1.20	0.49–2.92	1.10	0.45–2.69	1.71	1.15–2.56	1.37	0.90–2.04
Long-term unemployed	2.28	1.34–3.89	2.05	1.20–3.50	**1.18**	0.86–1.62	**0.89**	0.64–1.23
Age at arrival								
Arrived < 20 years old								
Employed	1.38	0.98–1.94	1.33	0.94–1.87	1.08	0.87–1.35	1.02	0.82–1.27
Short-term unemployed	2.22	1.04–4.74	1.87	0.87-4.00	3.22	2.20–4.72	2.34	1.59–3.44
Long-term unemployed	4.49	2.81–7.18	**3.59**	2.24–5.76	**2.95**	2.19–3.97	1.96	1.45–2.65
Arrived 20 + years old								
Employed	1.39	1.02–1.90	1.39	1.02–1.89	0.88	0.72–1.07	0.87	0.71–1.06
Short-term unemployed	1.51	0.74–3.08	1.38	0.68–2.82	1.45	0.97–2.16	1.16	0.78–1.75
Long-term unemployed	2.41	1.54–3.78	2.11	1.34–3.32	1.37	1.04–1.79	**1.03**	0.78–1.36
Duration of residence								
< 10 years of residence								
Employed	1.84	0.86–3.93	1.92	0.90–4.12	0.91	0.54–1.52	0.95	0.57–1.60
Short-term unemployed	1.00	0.25–4.06	1.04	0.26–4.19	1.28	0.64–2.58	1.14	0.57–2.30
Long-term unemployed	2.06	1.01–4.22	2.04	1.00-4.19	**1.21**	0.79–1.84	**1.01**	0.66–1.54

	Women				Men			
	Model 1*		Model 2**		Model 1*		Model 2**	
	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
10 + years of residence								
Employed	1.36	1.05–1.77	1.33	1.03–1.73	0.97	0.82–1.14	0.94	0.79–1.10
Short-term unemployed	1.98	1.12–3.49	1.70	0.96–3.00	2.25	1.66–3.05	1.70	1.25–2.32
Long-term unemployed	3.45	2.37-5.00	2.81	1.92–4.09	**2.05**	1.63–2.58	**1.43**	1.13–1.81

Bold and italicized HR estimates denote those which were significantly different ($p < 0.05$) from HR estimates for short-term unemployed native-origin Swedes

Bold HR estimates denote those which were significantly different ($p < 0.05$) from HR estimates for long-term unemployed native-origin Swedes

*Model 1: adjusted for follow-up period

**Model 2: adjusted for follow-up period, education level, civil status, and disposable income quintile

[a]The reference category for all combinations of migration background and employment status is employed, native-born persons with two native-born parents

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