

# Origin and schizophrenia in young refugees and inter-country adoptees from Latin America and East Africa in Sweden: a comparative study

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## Background

Migrants' socioeconomic adversity has been linked to schizophrenia.

## Aims

To investigate whether the more favourable socioeconomic situation of adoptees prevents them from the high risk of schizophrenia found in other migrants.

## Method

Register study in a cohort of refugees and inter-country adoptees aged 16–40 years, born in East Africa ( $n=8389$ ), Latin America ( $n=11\,572$ ) and 1.2 million native Swedes. Cox-regression models estimated hazard ratios (HRs) of schizophrenia in data from psychiatric care.

## Results

Despite diverse income levels, HRs for schizophrenia were similar for refugees and adoptees, with East Africans having

the highest HRs: 5.83 (3.30–10.27) and 5.80 (5.03–6.70), followed by Latin Americans: HRs 3.09 (2.49–3.83) and 2.31 (1.79–2.97), compared with native Swedes. Adjustment for income decreased these risks slightly for refugees, but not for adoptees.

## Conclusions

This study suggests that risk factors associated with origin are more important determinants of schizophrenia than socioeconomic adversity in the country of settlement.

## Declaration of interest

None.

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Epidemiological studies conducted in Europe and Israel have consistently shown an increased risk for schizophrenia and other psychotic disorders in migrants, especially among visible minorities.<sup>1–5</sup> The aetiology behind this increased morbidity has caused considerable debate.

The explanations proposed can roughly be divided into risk factors associated with the country of origin, such as a higher incidence in the populations of origin, perinatal risk factors and malnutrition;<sup>1,3</sup> stressors related to the migration process itself and its underlying social and environmental aftermath;<sup>2,4</sup> and finally risk factors in the country of resettlement, such as experience of discrimination and racism, socioeconomic adversity and housing in low-status neighbourhoods.<sup>6–10</sup>

Immigration to Sweden of children under the age of 18 years from the 1970s onwards has been dominated by refugees and inter-country adoptees. Sweden has the largest population of inter-country adoptees in Europe and the highest per capita population of inter-country adoptees in the world.<sup>11</sup> Refugees and inter-country adoptees can both be expected to have experienced adversity in the country of origin, and they also share the experience after migration of having a physical appearance that differs from that of the majority population. In terms of socioeconomic living conditions after migration, however, there are large differences, with the adoptees being raised by parents from the majority population, often with considerable material and educational resources, whereas refugees on average have a much lower socioeconomic position.<sup>12,13</sup>

In this national cohort study, we compared the rates of schizophrenia in these two diverse types of migrants, refugees and adoptees, with origin in two different regions in the world, Latin America and East Africa, and compare them with the native Swedish population. Our aim thus was to exploit this natural experiment to investigate whether the more affluent socioeconomic situation of adoptees after migration protects them from

the higher risk for schizophrenia associated with migration and if these factors are more important than risk factors associated with the population of origin.

## Method

Sweden has a long tradition of national registers with high-quality data for health and socioeconomic indicators, protected by special legislation.<sup>14</sup> These registers can be linked to each other through individually unique 10-digit personal identification number (PIN) that follows every Swedish resident from birth (or time of immigration) to death. The study was approved by the Regional Ethics Committee in Stockholm before any records were linked.

## Study population

The study population includes all individuals born between 1972 and 1988 who were alive and resident in Sweden in the Register of the Total Population (RTP) on 31 December 2004. The migrant population was created from the two largest migrant populations in Sweden in these cohorts that include significant numbers of adoptees as well as refugees, Latin Americans and East Africans. We first identified 7956 individuals from East Africa (Somalia, Eritrea and Ethiopia) and 5824 individuals from Latin America who were under the age of 19 years when they received a permanent residency in Sweden as refugees or because of family relations to a refugee, according to STATIV – a longitudinal database for integration studies. Inter-country adoptees were identified in the Multi-Generation register; we identified 433 individuals from East Africa and 5748 from Latin America who were under the age of 8 years when they settled in Sweden, as this is the most common age profile among the adopted children in Sweden. Information on the country of birth, date of immigration and year of birth was obtained from the RTP. A total of

1 255 782 native Swedish born with two Swedish-born parents constituted the comparison population.

### Predictors

Information on the region of birth and age at immigration was obtained from the RTP. We categorised into East Africa and Latin America. The migrant population was categorised into refugee if they had obtained residency as a refugee or family relation to a refugee according to STATIV and inter-country adoptees if they were adopted under the age of 8 years and had at least one Swedish-born adoptive parent according to the Multi-Generation register.

### Outcome

The outcome was defined as at least one entry of specialised psychiatric in-patient or out-patient care, with a diagnosis of schizophrenia, F20-F29 (according to ICD-10). We included the first case of schizophrenia from 1 January 2005 to 31 December 2012 in the Swedish Patient Register held by the Swedish National Board of Health and Welfare. The quality of the schizophrenia diagnosis in the Swedish Patient Register has been evaluated and found to be acceptable.<sup>15</sup>

### Covariates

Sociodemographic variables, age, gender, disposable income and type of municipality, were retrieved from the Longitudinal Integration Database for Health Insurance and Labor Market Studies (LISA) in 2004. Since the Swedish health organisation has been shown to have regional differences in provision of care between rural and urban communities, we created an indicator of type of municipality, defined by the municipality of residence in 2004 into three categories: 'big city' (metropolitan areas of Sweden's three largest cities Stockholm, Gothenburg and Malmö); town (other predominately urban communities) and rural. This categorisation is recommended by the Swedish Association of Local Authorities and Regions. Disposable income included all registered sources of income deducted by taxes and thereafter divided by consumer units in the household according to a formula developed by Statistics Sweden. The variable was divided into quintiles in the analysis.

### Statistical analysis

Cox-regression models estimated hazard ratios (HRs) of schizophrenia in person time in the study from January 2005 to December 2012. Person time was calculated as time from start

of the follow-up to the first hospital admission or out-patient visit with a diagnosis of schizophrenia, death, emigration or end of the study, whichever was sooner.

In Model 1 we adjusted for gender, age and type of municipality of residence. Disposable income was adjusted for in Model 2. First, we analysed the HRs of schizophrenia among refugees and inter-country adoptees from Latin America and East Africa with the general Swedish population as the reference category. Thereafter, we analysed differences in the HRs of schizophrenia between Latin Americans and East Africans in each migrant category separately, using the same adjustment procedure.

A sensitivity analysis on the significance of age at immigration on the outcome in the refugees and inter-country adoptees was conducted, where the adopted group was categorised into 0–1, 2–3 and 4–7 years of age and the refugee group into categories 0–6, 7–12 and 13–19 years of age.

## Results

Sociodemographic characteristics of the study population are presented in Table 1. The study population consisted of slightly more males than females, with the exception of inter-country adoptees from East Africa. The migrant study groups were younger than the Swedish comparison population with refugees having the lowest age (mean age 23 years). Inter-country adoptees arrived in Sweden in early childhood (mean age 1 year), in contrast to the refugees (mean ages 13 and 10 years respectively). The refugee study groups were most likely to live in the metropolitan areas of Sweden's three largest cities: Stockholm, Gothenburg and Malmö. The lowest income (quintile) was found among the refugee study groups. No considerable income differences were found between native Swedish and inter-country adoptees.

The rates of hospital admission and/or out-patient care because of schizophrenia were 3.2% and 2.6% respectively, among adoptees and refugees born in East Africa and 1.5 and 1.1% in adoptees and refugees from Latin America, in comparison with 0.5% in the native Swedes. When adjusted for age, gender and type of municipality, the HRs of schizophrenia were higher for East African inter-country adoptees 5.83 (3.30–10.27) and refugees 5.80 (5.03–6.70) respectively, as well as for Latin American inter-country adoptees, 3.09 (2.49–3.83) and refugees, 2.31 (1.79–2.97). These risks were attenuated somewhat in the refugee

**Table 1** Sociodemographic indicators of the study population

Variables	Variable characteristics	Sweden	East Africa		Latin America	
		Native Swedish <i>n</i> =1 255 782 %	Adoptees <i>n</i> =433 %	Refugees <i>n</i> =7 956 %	Adoptees <i>n</i> =5 748 %	Refugees <i>n</i> =5 824 %
Gender	Male	51.4	45.2	55.9	55.3	53.2
	Female	48.6	54.8	44.1	47.7	47.8
Age in 2005	Mean age	28.9	26.7	22.9	23.2	23.1
Age at immigration	Mean age		1.3	12.7	1.5	10.5
Municipality	Big city	42.7	53.1	72.1	51.6	65.9
	Town	43.7	37.5	25.6	40.8	29.3
	Rural	13.6	9.4	2.3	7.6	4.8
Income in quintiles	1	16.0	12.6	58.0	15.3	38.3
	2	19.8	18.9	18.7	18.8	26.2
	3	20.7	18.7	9.4	20.6	18.0
	4	21.8	23.6	8.5	24.1	11.7
	5	21.7	26.2	5.4	21.3	5.8

a. *N*=population size.

**Table 2** Rates of hospital care because of schizophrenia among inter-country adoptees and refugees in Sweden

Region of birth	N <sup>a</sup>	Type of care			Cox regression models	
		Outpatient care (%)	Inpatient care (%)	Any type of care (%)	HR 95% CI Model 1 <sup>b</sup>	HR 95% CI Model 2 <sup>c</sup>
Sweden	1255782	5396 (0.4)	3873 (0.3)	6237 (0.5)	1	1
East Africa						
Adoptees	433	13 (3.0)	10 (2.3)	14 (3.2)	5.83 (3.30–10.27)	5.74 (3.26–10.13)
Refugees	7956	182 (2.3)	157 (2.0)	207 (2.6)	5.80 (5.03–6.70)	4.34 (3.74–5.04)
Latin America						
Adoptees	5748	81 (1.4)	51 (0.9)	87 (1.5)	3.09 (2.49–3.83)	3.11 (2.50–3.85)
Refugees	5824	56 (1.0)	39 (0.7)	63 (1.1)	2.31 (1.79–2.97)	1.84 (1.43–2.37)

HR, hazard ratio; CI, confidence intervals.  
a. N=population size.  
b. Adjusted for age, gender and municipality.  
c. Adjusted for age, gender, municipality and income.

population when income was adjusted, whereas the risk estimates for adoptees remained more or less the same after these adjustments (Table 2).

Sensitivity analyses (not shown in the table) revealed that East African inter-country adoptees had a higher HR for schizophrenia than the Latin American inter-country adoptees: 2.13 (1.16–3.94) as did East African refugees compared with refugees born in Latin America 2.51 (1.87–3.36). In another sensitivity analysis it was shown that inter-country adoptees who arrived at the age of 4 years onwards had a higher risk of schizophrenia than those who were arrived at the age 0–1 year: HR 2.33 (1.42–3.82).

## Discussion

In this register, follow-up study of schizophrenia in a national cohort of young refugees and international adoptees, a twofold to fivefold higher risk for schizophrenia in the migrant study groups was found in comparison with the native Swedish population. Migrants from East Africa had a higher risk than those from Latin America, irrespective if they were adopted or refugees. Adjusting for income attenuated the higher risk compared with the native population somewhat for the refugee study groups, but not at all for the adoptees. A higher age at arrival was associated with an increased risk for schizophrenia in inter-country adoptees, but not in refugees.

Our results do not support the hypothesis that socioeconomic adversity after settlement is the main explanation behind the increased rates of schizophrenia in migrants in Europe,<sup>6,7</sup> considering the high risk in adoptees despite a favourable income level. Although the limited data available in this register cannot exclude the possibility that the similar pattern in migrants and adoptees from the same origin are caused by altogether different mechanisms, the pattern is more congruent with hypotheses associated with the origin of these migrants.

Risk factors associated with the country of origin can be divided into those that are at play before and after migration. Adoptees and refugees to a certain extent can be expected to share experiences of early life adversity in relation to the economic development of the society where they are born. This includes exposure to such risk factors such as infectious agents, malnutrition and perinatal complications.<sup>16</sup> Latin America consists of middle-income countries, whereas East Africa is much poorer, which would be consistent with their higher risk. Genetic contribution of consanguineous marriages for the overall heritable effects in the aetiology of schizophrenia<sup>17</sup> could to a certain extent also be similar among refugees and adoptees from East Africa. Both refugees and adoptees may have experienced war trauma/

maltreatment in the country of origin, and for the adoptees, also early parental separation is mandatory.<sup>18</sup>

With regard to risk factors after migration, our findings are congruent with hypotheses about racial discrimination and schizophrenia, since geographic origin is related to physical appearance/colour of the skin in a similar manner in adoptees and refugees. Perceived racial discrimination has been suggested to increase the risk of schizophrenia through chronic stress, feelings of exclusion and hopelessness, low self-esteem and anxiety. These risk factors would be more common in East African migrants, since their physical appearance differs more from the native Swedish population than that of Latin American migrants. Findings linking discrimination and schizophrenia have been reported in Black and ethnic minorities in many European countries.<sup>8–10,19–23</sup> The possibility of discriminatory treatment within the healthcare organisation, through referral bias and differential treatment, also has to be considered as a possibility to explain our findings. Studies in the UK have shown that the excessive risks of schizophrenic diagnosis among visible minorities could be attributed to incorrect schizophrenic diagnosis caused by existence of structural racism that is embedded within social institutions, policies, etc.<sup>24</sup>

The effect of vitamin D deficiency developed in the Swedish sun-deprived environment<sup>25</sup> could also be added to the list of potential risk factors in the country of resettlement that would also apply to refugees and adoptees after migration.

In our study, older age at the time of immigration was associated with increased risks for schizophrenia among adoptees but not for refugees. This is not surprising as previous studies of adoption have demonstrated that older age at adoption is associated with an increased risk for psychiatric morbidity and social maladjustment in general.<sup>26</sup> Older age at migration for them is the same as an older age at adoption, and thus associated with a longer period of exposure to early life deprivation, often in orphanages.<sup>27</sup> In this study, we could not confirm the pattern found in other studies that younger age at immigration is associated with increased risks for psychotic disorder among non-adopted migrants.<sup>28</sup>

## Strengths and limitations and methodological issues

The major strength of our study is the exploitation of a uniquely large population of international adoptees in Sweden, which enabled us to compare risks in migrant populations in very diverse socioeconomic contexts, but with a similar origin. The high quality of the Swedish registers used also provides a very low rate of attrition, which is otherwise a main problem in studies of mental health in migrants.<sup>15</sup>

The study also has some noteworthy shortcomings that need to be considered when interpreting our results. The population from Latin America is quite diverse in terms of geographic origin with most adoptees originating in Colombia and most refugees from Chile. In the East African population, most adoptees arrived from Ethiopia, whereas refugees arrived from Somalia. Furthermore, despite the uniquely large population of international adoptees in Sweden, the population of adoptees that could be compared with refugees from similar origins was too small to allow for a more sophisticated analysis of pre- and post-migration risk factors. Thus, further studies are needed to investigate these associations, especially among individuals born in East Africa that have a very high risk of schizophrenia in Sweden. It is also important to highlight that the crude nature of our exposure does not allow us to test more specific mechanisms about possible mediating pathways underlying the associations, for instance, the role of urbanicity, misuse of substances, genetic indicators, discrimination, vitamin D, etc.

In conclusion, this study found that adoptees, despite having a more favourable level of income, had similar increased rates of schizophrenia compared with refugees with the same origin in East Africa or Latin America. East Africans had the highest risks, with a fivefold to sixfold increase compared with the native population. Further studies are needed to clarify the mechanisms behind this pattern.

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