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# Increased risk of psychotic disorder among immigrants in Malmö: a 3-year first-contact study

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## ABSTRACT

**Background.** Previous findings of increased rates of psychotic disorders among immigrants to Sweden are primarily based on hospital samples. The aim of the current study was to compare the risks of first contact for psychotic and schizophrenic disorders among first- and second-generation immigrants to the risks in native ‘Swedes’.

**Method.** During a 3-year period, diagnostic information was collected on all patients with a possible psychotic disorder who made a first-in-lifetime contact with both in-patient and out-patient psychiatric services in Malmö.

**Results.** First-generation immigrants to Sweden had an increased risk of developing psychotic and schizophrenic disorders compared to Swedes (age- and gender-adjusted relative risk, RR 2.9, 95% CI 2.0–4.0 and RR 4.0, 95% CI 1.8–8.6 respectively). Risks for these disorders were not significantly increased in second-generation immigrants. The highest risks of developing psychotic disorder compared to Swedes were found in first-generation immigrants with ‘black’ (*versus* ‘neither black nor white’, or ‘white’) skin colour (RR 5.8, 95% CI 2.8–13.4) and birthplace in a developing (*versus* developed) country (RR 3.3, 95% CI 2.3–4.8).

**Conclusion.** The increased risks of psychosis obtained especially in immigrant groups having relatively disadvantaged status in Sweden suggest that psychosocial factors may contribute to the development of psychotic disorders.

## INTRODUCTION

The increased risk for psychotic and schizophrenic disorders associated with immigrant background has yet to be satisfactorily explained (Selten & Cantor-Graae, 2004). Selection factors appear increasingly irrelevant, in light of the elevated risks found among first- and second-generation immigrants (e.g. Harrison *et al.* 1988; Selten *et al.* 2001) and among first-generation immigrants resident in Denmark before their fifteenth birthday (Cantor-Graae *et al.* 2003).

Biological explanations seem equally unlikely, in light of the geographic diversity of the various sending countries (Cantor-Graae & Selten, 2005).

The degree of ethnic heterogeneity represented across samples is itself a clue, suggesting that aspects shared by immigrants may be more important than those associated with any specific ethnic background. In one recent study of first- and second-generation immigrants (Hjern *et al.* 2004), adjustment for socio-economic indicators resulted in an attenuation of the risks obtained for schizophrenia and psychosis, indicating that factors related to socio-economic adversity may contribute to the ‘migrant’ effect. The mechanism by which socio-economic

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adversity could lead to schizophrenia would nevertheless require some further elaboration. Moreover, the evidence implicating socio-economic adversity as a risk factor for schizophrenia is inconsistent; increased risks for schizophrenia have been associated both with higher parental socio-economic status (e.g. Mäkikyrö *et al.* 1997) and lower parental socio-economic status (e.g. Harrison *et al.* 2001). Also, Selten *et al.* (2001) find normal rates of schizophrenia in Turkish immigrants despite lower income and lower levels of education and employment.

In a recent meta-analytical review, increased risks for psychotic disorder were greatest among immigrants with 'black' skin colour and immigrants with low developmental levels of the sending country (Cantor-Graae & Selten, 2005). In countries where the integration of minority groups has only partially been successful, such immigrants may more often be exposed to social defeat. A recent hypothesis suggests that chronic experiences of social defeat, perhaps mediated by discrimination, may render individuals more vulnerable to the development of schizophrenia (Selten & Cantor-Graae, 2004; Cantor-Graae & Selten, 2005). It should be noted that the perception of social defeat is subjective and not necessarily determined by socio-economic status (Kessler *et al.* 1999). Individuals with darker skin colour, irrespective of social class, experience higher levels of discrimination than do other ethnic groups (Williams & Williams-Morris, 2000). Interestingly, in a recent prospective study, previously healthy individuals who reported discrimination were at an increased risk of developing psychotic symptoms (Janssen *et al.* 2003). Discrimination may lead to stress, low self-esteem, and increased use of psychoactive substances (Krieger, 2000), factors that are themselves currently implicated in the development of schizophrenia (Selten & Cantor-Graae, 2004). The social defeat hypothesis clearly warrants closer examination.

Malmö (total population 262 397) is the city in Sweden with the largest concentration of immigrants (26.1% foreign-born) in the population. The majority of these immigrants come from developing countries. In Malmö, ethnic polarization appears to be increasing rather than decreasing; i.e. an increasing proportion of foreign-born residents live in disadvantaged

neighbourhoods (Gullberg, 2002). Our previous 1-year (1997–1998) study of psychiatric admissions in Malmö found an elevated risk for admission for psychosis among immigrants, with highest risks obtained among immigrants from East Africa and Asia (Zolkowska *et al.* 2001). Nevertheless, that study was based on a prevalence sample, and therefore, the number of first-contact cases included was limited. The aim of the current study was to examine first-contact rates of psychotic and schizophrenic disorders in Malmö during a 3-year period (1999–2001) and to include all first-contact patients, i.e. those identified by out-patient clinics as well as those seen on treatment wards. Questions of interest were the following: are persons with an immigrant background at increased risk for developing psychotic or schizophrenic disorders compared to native 'Swedes', and is such risk related to 'darker' skin colour or to lower developmental level of the sending country?

## METHOD

### Sample

A list was generated of all patients between the ages of 18 and 54 years who had symptoms potentially fulfilling criteria for a psychotic disorder and who made a first-in-lifetime contact with psychiatric services (either through self-referral to out-patient sector clinics or to the emergency psychiatric treatment facility at Malmö's sole general hospital, or through referral to psychiatric services by physicians at other clinics, social services, police authorities, schools, or family members) during the period 1 January 1999 to 31 December 2001. Psychotic disorders were defined as cases meeting DSM-IV criteria (APA, 1994) either for schizophrenia, schizoaffective disorder, schizophreniform disorder, or for other non-affective psychosis (i.e. 297.1, 298.8, 298.9). All potential cases meeting these requirements were diagnosed according to DSM-IV by the second author (K.Z.), utilizing information routinely contained in the case records and (when necessary) supplementary information provided by attending doctors. A pre-test of diagnostic reliability between K.Z. and a senior psychiatrist (G. Johansson) performed on a random selection of patients with psychotic and non-psychotic disorders yielded satisfactory diagnostic agreement

(kappa=0.871,  $p<0.001$ ). During the study period, 159 patients made a first-in-lifetime contact for a suspected psychotic disorder. One patient was excluded from the sample due to non-residency in Malmö (see below), one patient had been hospitalized abroad previously for psychotic symptoms, and seven patients did not meet the above diagnostic criteria for psychotic disorders, leaving a final sample of 150 patients with psychotic disorder, 34 of whom met DSM-IV criteria for schizophrenic disorder. Schizophrenic disorder was defined as the above diagnoses, excluding other non-affective psychosis.

### Ethnicity

Place of birth, parentage, and parental birth-place for each patient was established on the basis of information obtained from the Malmö Municipal Person Register by an administrative assistant having no knowledge of the individual's diagnostic status. The register also contains detailed information on duration of residence in Sweden for foreign-born residents. All residents are required by law to report to this registry within 2 weeks of address change. Applicants for asylum are not required to register with the Municipal Person Register. Therefore, such patients were excluded from the study. Information in the Municipal Person Register is compiled on a yearly basis by the Swedish Central Office of Statistics, and thus, provides a time-specific description of the background population of Malmö.

Migration to Sweden is a relatively recent phenomenon, beginning in the 1960s with the migration of labourers from southern Europe. Thus, the majority of second-generation immigrants (i.e. persons born in Sweden having at least one parent born abroad) are still relatively young and comprise a lesser proportion of the population in Malmö than do first-generation immigrants. In our previous study (Zolkowska *et al.* 2001), separate population denominators for second-generation immigrants were not available, and such persons were considered 'Swedes'. Currently, however, separate population denominators are available for second-generation immigrants. The municipality of Malmö provided yearly denominators (stratified by age and gender) for the years 1999, 2000, and 2001 for three groups: first-generation

immigrants (i.e. persons born outside Sweden), second-generation immigrants (i.e. persons born in Sweden with one or more parents born outside Sweden), and native Swedes (i.e. persons born in Sweden having both parents born in Sweden). Calculations were thus performed separately for first- and for second-generation immigrants *versus* native Swedes (see Statistical methods and data analysis below).

### Patient measures

Information from case-notes was collected for each patient concerning: (a) demographic background (highest education or occupational level, current civil status, number of own children), (b) clinical background (age at onset of psychosis, history of psychosis in a first- or second-degree relative, history of substance abuse=periodic maladaptive usage), and for first-generation immigrants, (c) migration background (age at arrival in Sweden, reason for migration = family reunification, asylum or work/studies, current level of Swedish language fluency = fluent, adequate, or poor). First-episode patients are routinely given a thorough investigation by a specialized psychosis team, including interviews with relatives for information concerning family history of psychiatric disorder. Substance abuse history was determined on the basis of information contained in the case records, including results from laboratory screening for drug usage. Drug screening tests are routinely performed on all first-episode patients. Categorization of socio-economic level was determined on the basis of the patient's highest occupation or educational level attained. The Board of Research Ethics at Lund University gave their approval for the study.

### Statistical methods and data analysis

Analyses of category and numerical variables were performed using  $\chi^2$  and independent  $t$  tests respectively (SPSS, 1997). First-contact rates for psychotic disorders (including schizophrenic disorders) and for schizophrenic disorders were calculated by dividing the number of cases by the number of person-years. Age- and gender-adjusted relative risks (RR) for the development of psychotic and schizophrenic disorders were calculated using Poisson regression analysis with age (four categories: 18–24, 25–34, 35–44, 45–54 years) and gender entered as independent

variables in the Poisson regression model (SAS, 1999).

Relative risks were calculated for (a) the development of psychotic and schizophrenic disorders (separately) among first- and among second-generation immigrants *versus* native Swedes, and (b) the development of psychotic disorders among first-generation immigrants from 'developing' countries and from 'developed' countries respectively, *versus* native Swedes, and (c) the development of psychotic disorders among first-generation immigrants from countries where the predominant skin colour is 'black', 'neither black nor white', and 'white' respectively, *versus* native Swedes.

For analysis (b), the developmental level of each birthplace country represented in the study (numerator and denominator) was classified according to the criteria used by the United Nations Conference on Trade and Development (UNCTAD; United Nations, 2002). UNCTAD ranks countries of the world on the basis of national income, human assets, and educational/nutritional level. In this system, the USA, Canada, Israel, Australia, New Zealand, Japan, South Africa, countries in Western Europe, and selected countries in Eastern Europe including the former Soviet Union are considered 'developed' countries; the remainder are 'developing' countries. For analysis (c), birthplace countries represented in the background population were classified according to the skin colour of the majority of the population (e.g. Ghana = 'black', Vietnam = 'neither black nor white', Norway = 'white'). Information on patients' skin colour was either obtained from the case records or from attending caregivers. One foreign-born patient was excluded from analysis (c). For analyses (b) and (c), the municipality of Malmö provided information on the exact number of persons belonging to each birthplace country represented in the foreign-born background population. Birthplace information for the background population was available stratified according to the above four age categories, but age stratification was not available for males and females separately. Thus, analyses (b) and (c) were adjusted for age but not for gender. The above methodology for the categorization of developmental level and skin colour is identical to that utilized in Cantor-Graae & Selten (2005).

## RESULTS

### Risks for psychotic and for schizophrenic disorders

During the 3-year study period, a total of 150 patients (78 males, 72 females) meeting DSM-IV criteria for a psychotic or schizophrenic disorder had a first-in-lifetime contact with psychiatric services in Malmö. The mean age at first contact was 30.6 (s.d. = 9.5) years for men and 34.9 (s.d. = 10.3) years for women. Annual first-contact rates (crude) for the entire sample for the study period were 3.7 (95% CI 3.1–4.3) for psychotic disorders and 0.9 (95% CI 0.6–1.1) for schizophrenic disorders, per 10 000 persons respectively. First-contact rates (crude) per 10 000 persons by group were the following: for native Swedes, 2.4 (95% CI 1.7–3.0) for psychotic disorders and 0.4 (95% CI 0.2–0.7) for schizophrenic disorders, for first-generation immigrants, 6.8 (95% CI 5.3–8.2) for psychotic disorders and 1.6 (95% CI 0.9–2.4) for schizophrenic disorders, and for second-generation immigrants, 3.2 (95% CI 1.6–4.9) for psychotic disorders and 1.1 (95% CI 0.1–2.0) for schizophrenic disorders. Table 1 shows the age- and gender-adjusted relative risks for first- and second-generation immigrants *versus* native Swedes. Relative risks for psychotic disorders and for schizophrenic disorders were significantly elevated in first-generation immigrants ( $p < 0.0001$ ,  $p = 0.0004$  respectively), but not in second-generation immigrants ( $p = 0.28$ ,  $p = 0.21$  respectively).

### Characteristics of the patient sample

Table 2 shows the frequency of the DSM-IV diagnoses for patients making a first-in-life contact for psychotic disorder. A follow-up of a random selection of patients from the sample ( $n = 120$ ) was conducted in order to examine diagnostic stability over time. Three to five years later, all 120 were still undergoing treatment for psychotic disorder; 75% had the same DSM-IV diagnoses as previously. The majority of those patients with diagnostic conversion, i.e. from psychosis to schizophrenia ( $n = 20$ ), at follow-up were immigrants. In one patient (Swedish) diagnosis was converted from schizophrenia to psychosis.

The demographic and background characteristics for each separate patient group in the

Table 1. Age- and gender-adjusted relative risks of first-contact for psychotic and schizophrenic disorders for first- and for second-generation immigrants in Malmö, for the period 1999–2001

| Population sector                         | Person-years at risk | Psychotic disorders <sup>a</sup> |                 | Schizophrenic disorders <sup>b</sup> |                 |
|---|----------------------|----------------------------------|-----------------|--------------------------------------|-----------------|
|   |                      | Cases                            | RR (95% CI)     | Cases                                | RR (95% CI)     |
| Native Swedes <sup>c</sup>                | 237 542              | 56                               | 1.0 (reference) | 10                                   | 1.0 (reference) |
| First-generation immigrants <sup>d</sup>  | 117 105              | 79                               | 2.9 (2.0–4.0)   | 19                                   | 4.0 (1.8–8.6)   |
| Second-generation immigrants <sup>e</sup> | 46 619               | 15                               | 1.4 (0.8–2.4)   | 5                                    | 2.0 (0.7–5.9)   |

RR, Relative risk; CI, confidence interval.

<sup>a</sup> Includes DSM-IV categories schizophrenia, schizophreniform disorder, schizoaffective disorder, delusional disorder, brief psychotic disorder, psychotic disorder not otherwise specified.

<sup>b</sup> Includes only DSM-IV categories schizophrenia, schizophreniform disorder, schizoaffective disorder.

<sup>c</sup> Born in Sweden; both parents are also born in Sweden.

<sup>d</sup> Born outside Sweden.

<sup>e</sup> Born in Sweden; one or both parents are born outside Sweden.

Table 2. Frequency of DSM-IV diagnoses for residents in Malmö who made first contact for a psychotic disorder during the period 1999–2001, by immigrant status

|   | First-generation immigrants<br>(n = 79) | Second-generation immigrants<br>(n = 15) | Swedes<br>(n = 56) |
|---|---|--|--------------------|
|   | n (%)                                   | n (%)                                    | n (%)              |
| Schizophrenia                               | 4 (5.1)                                 | 3 (20.0)                                 | 8 (14.3)           |
| Schizophreniform disorder                   | 9 (11.4)                                | 2 (13.3)                                 | 1 (1.8)            |
| Schizoaffective disorder                    | 6 (7.6)                                 | —  | 1 (1.8)            |
| Delusional disorder                         | 17 (21.5)                               | 1 (6.7)                                  | 7 (12.5)           |
| Brief psychotic disorder                    | 18 (22.8)                               | 3 (20.0)                                 | 14 (25.0)          |
| Psychotic disorder, not otherwise specified | 25 (31.6)                               | 6 (40.0)                                 | 25 (44.6)          |
| Total                                       | 79 (100.0)                              | 15 (100.0)                               | 56 (100.0)         |

sample are shown in Table 3. Approximately half the patients in each group were hospitalized at the time of investigation by the psychosis team. First-generation immigrant patients were characterized by lower socio-economic levels, more frequent marital relationships, and also by greater numbers of offspring (latter results not shown,  $t=4.3$ ,  $p<0.001$ ) versus native Swedish patients.

### Risks for psychotic disorder in relation to UNCTAD level and skin colour

Table 4 shows information pertaining to migration history for the first-generation immigrant patients. Among the 79 first-generation immigrant patients with psychotic disorders, 19 patients were born in developed countries (Western Europe,  $n=15$ ; Scandinavia,  $n=2$ ; South Africa,  $n=1$ ; former Soviet Union,  $n=1$ ), and 60 patients were born in developing countries (former Yugoslavia,  $n=24$ ; Middle East,

$n=17$ ; South America,  $n=7$ ; Africa,  $n=6$ ; Asia,  $n=6$ ). The age-adjusted relative risks for the development of psychotic disorders among first-generation immigrants from both developed and from developing countries versus native Swedes were 2.2 (95% CI 1.3–3.6) and 3.3 (95% CI 2.3–4.8) respectively. Six patients had 'black' skin colour, 24 patients had 'neither black nor white' skin colour, and 48 had 'white' skin colour. The age-adjusted relative risks for the development of psychotic disorders among first-generation immigrants from countries where the majority of the population is 'white', 'neither black nor white', and 'black' were 2.9 (95% CI 2.0–4.2), 2.6 (95% CI 1.6–4.2), and 5.8 (95% CI 2.8–13.4) respectively.

### DISCUSSION

The results show that first-generation immigrants to Sweden have significantly increased

Table 3. Demographic and background characteristics of the total patient sample

|   | First-generation immigrants<br>(n = 79) | Second-generation immigrants<br>(n = 15) | Swedes<br>(n = 56) |
|---|---|--|--------------------|
| Mean age at first contact, yr   | 35.0 (9.6 s.d.) <sup>a</sup>            | 23.8 (5.0) <sup>b</sup>                  | 31.7 (10.3 s.d.)   |
| Male/female ratio, n  | 40/39                                   | 9/6                                      | 29/27              |
| In-/out-patient ratio, first contact                                  | 40/39                                   | 8/7                                      | 30/26              |
| Socio-economic level, n (%)   |   |  |                    |
| High  | 12 (15.2%) <sup>c</sup>                 | 1 (6.7%)                                 | 14 (25.0%)         |
| Middle  | 28 (35.4%)                              | 10 (66.7%)                               | 31 (55.4%)         |
| Low   | 39 (49.4%)                              | 4 (26.6%)                                | 11 (19.6%)         |
| Current civil status, n (%)   |   |  |                    |
| Single  | 26 (32.9%) <sup>d</sup>                 | 13 (86.7%)                               | 39 (69.6%)         |
| Married/cohabiting  | 31 (39.2%)                              | 2 (13.3%)                                | 7 (12.5%)          |
| Formerly married  | 22 (27.9%)                              | 0 (0.0%)                                 | 10 (17.9%)         |
| Family history of psychosis (first- or second-degree relative), n (%) |   |  |                    |
| Negative  | 71 (89.9%)                              | 13 (86.7%)                               | 49 (87.5%)         |
| Positive  | 8 (10.1%)                               | 2 (13.3%)                                | 7 (12.5%)          |
| History of substance abuse, n (%)                                     |   |  |                    |
| Negative  | 64 (81.0%)                              | 11 (73.3%)                               | 40 (71.4%)         |
| Positive  | 15 (19.0%)                              | 4 (26.7%)                                | 16 (28.6%)         |

<sup>a</sup> First-generation immigrants versus second-generation immigrants,  $t = 6.7$ ,  $p < 0.0001$ .

<sup>b</sup> Second-generation immigrants versus native Swedes,  $t = 4.20$ ,  $p < 0.001$ .

<sup>c</sup> First-generation immigrants versus native Swedes,  $\chi^2 = 12.4$ ,  $p = 0.002$ .

<sup>d</sup> First-generation immigrants versus native Swedes,  $\chi^2 = 18.9$ ,  $p < 0.001$ .

Table 4. Migration history of patients born outside Sweden

|                                       | Patients with psychotic disorder<br>(n = 79) |
|---------------------------------------|--|
| Mean number of years in Sweden (s.d.) | 11.6 (8.2), range 1–36                       |
| Mean age at arrival (s.d.)            | 23.4 (11.4), range 0–48                      |
| Reason for migration, n               |  |
| Asylum                                | 37 (46.8%)                                   |
| Work/studies                          | 6 (7.6%)                                     |
| Family reunification                  | 36 (45.6%)                                   |
| Swedish language proficiency, n       |  |
| Fluent                                | 19 (24.1%)                                   |
| Adequate                              | 35 (44.3%)                                   |
| Poor                                  | 25 (31.6%)                                   |
| UNCTAD rank for country of birth, n   |  |
| Developed country                     | 19 (24.1%)                                   |
| Developing country <sup>a</sup>       | 60 (75.9%)                                   |
| High income                           | 8 (13.3%)                                    |
| Middle income                         | 31 (51.7%)                                   |
| Low income                            | 21 (35.0%)                                   |

UNCTAD, United Nations Conference on Trade and Development.

<sup>a</sup> Developing country: High income = 1995 *per capita* GDP above US\$4000. Middle income = 1995 *per capita* GDP between US\$800 and US\$4000. Low income = 1995 *per capita* GDP below US\$800.

risks for developing psychotic and schizophrenic disorders compared to native Swedes. Second-generation immigrants' risks for these disorders were not significantly increased.

The overall (crude) rates of psychotic disorders currently found fall well within the upper end (70% quantile) of the rate distribution obtained in a recent comprehensive review of schizophrenia incidence (McGrath *et al.* 2004), suggesting that case finding generally has been adequate. However, the study yielded relatively few cases of psychosis in second-generation immigrants. A power calculation performed *post-hoc* indicated that the study might have had insufficient power to detect an effect size in this group. Thus, the study had 80% power to detect a relative risk of 1.8 in first-generation immigrants at 5% significance level, whereas the corresponding risk that could be detected at this level in second-generation immigrants was 2.2. Thus, the current population of second-generation immigrants in Malmö may be too small at the present time to be informative regarding potential effect sizes of lesser magnitude. Moreover, immigrants from Africa, Asia, and the Middle East first arrived in Malmö during the 1990s; thus, their offspring are only now approaching early adulthood, and it may take some years before their risk can adequately be investigated. Finally, another unknown factor in the current study is the extent to which

immigrants (first- or second-generation) and Swedes differ in treatment-seeking behaviour. Although it was not possible to monitor other potential points of first-contact such as social services and primary care, persons presenting with psychotic symptoms would nevertheless be referred to psychiatric services for treatment.

A potential limitation in the current study is that diagnostic information was based upon case-note review rather than face-to-face interviews. However, in their systematic review of incidence studies, McGrath *et al.* (2004) found that the use of chart records yielded similar incidence rates as the use of face-to-face interviews. A potential advantage in case-note review is that case-notes were examined 'blindly' (K.Z.) regarding ethnicity; i.e. case-notes do not provide complete information concerning birthplace and parentage. Complementary information from the Municipal register is therefore necessary, and is especially vital for the ascertainment of second-generation immigrant status. Case-notes may, however, reflect biased perceptions, insofar as psychiatrists are not necessarily 'colour blind' when labelling psychiatric patients. Although this type of bias cannot entirely be excluded, approximately half of the psychiatrists employed in Malmö have an immigrant background. Moreover, the degree of diagnostic stability indicated by the follow-up suggests that the initial diagnoses were largely accurate. Thus, it is unlikely that the current results are solely due to systematic bias.

First-generation immigrants having black skin colour or birthplace in a developing country had higher risks for developing a psychotic disorder (*versus* Swedes) than did first-generation immigrants with other characteristics. The relative risks currently obtained for black skin colour and for birthplace in a developing country (5.8, 3.3 respectively), although strikingly similar to the corresponding relative risks obtained in a recent meta-analysis (4.8 and 3.3 for these categories respectively; Cantor-Graae & Selten, 2005), should be regarded here as more tentative, due to overlapping confidence intervals in both instances. Although the dichotomization of developmental level (developed *versus* developing countries) may not adequately reflect the variation in economic development that exists within the developing countries, a more extensive subdivision of the category developing

countries (e.g. tripartite division) was not possible due to sample size. Nevertheless, comparison of these methods (dichotomization *versus* tripartite) in a much larger sample showed that both methods yield similar results (Cantor-Graae & Selten, 2005). In the current study, most immigrants with black skin colour were born in developing countries, whereas the majority of the developing countries represented in the background population are not countries where black is the predominant skin colour. Thus, the degree of overlap between these categories would be minimal. It should, however, be kept in mind that 'developing' country and 'black' skin colour are imprecise concepts, each having considerable complexity. This complexity notwithstanding, a possible commonality shared by immigrants with black skin colour and immigrants born in developing countries is that both groups are severely disadvantaged in Sweden with regard to housing, employment, and other aspects of integration (Gullberg, 2002; Kindlund & Biterman, 2002).

It may be noted that over 50% of the first-generation immigrants had resided in Sweden for 10 years or more prior to their first-contact for psychotic symptoms, suggesting that the risk associated with migration may accumulate over time. The length of residence prior to first appearance of illness is similar to findings in Swedish (Zolkowska *et al.* 2001), Dutch (Selten *et al.* 2001), and German samples (Haasen *et al.* 1998). Although a possible negative selection effect cannot entirely be excluded regarding increased risks among first-generation immigrants, the comparatively higher risks obtained in immigrants with black skin colour or with birthplace in a developing country suggest that some component of increased risk may be due to psychosocial factors. In total, the current pattern of results suggests that persistent exposure to social defeat may partly contribute to the increased incidence of psychotic disorder found in first-generation immigrants.

In contrast to previous 'psychosocial' hypotheses invoking socio-economic disadvantage (e.g. Hjern *et al.* 2004) and/or psychosocial stress (e.g. Bhugra, 2000; Eaton & Harrison, 2000), the social defeat hypothesis provides a possible link to disturbed brain dopaminergic function (Selten & Cantor-Graae, 2004). Animal studies using the 'defeated intruder' paradigm show



that social defeat stress leads to excess dopamine release or dopaminergic hyperactivity in mesocorticolimbic circuits (Tidey & Miczek, 1996) and also to behavioural sensitization to dopamine agonists (e.g. Miczek *et al.* 2004). Thus, even small amounts of illicit substances could have deleterious effects in immigrants 'sensitized' by chronic social defeat. Indeed, immigrant studies of psychosis do not show more frequent history of substance abuse (e.g. Zolkowska *et al.* 2001; Veen *et al.* 2002), despite accumulating evidence implicating a role for cannabis abuse in the aetiology of schizophrenia (e.g. Zammit *et al.* 2002).

The social defeat hypothesis would thus provide a plausible model for the development of a brain disorder in humans that would be characterized by a dopamine disturbance (i.e. schizophrenia), yet partly mediated by psychosocial factors. Implicit in such a model is the potential contribution of genes or a genetic-environmental interaction. The current data are suggestive rather than confirmative, and further test of the social defeat hypothesis in immigrants and in other socially vulnerable groups is indeed necessary. All in all, the challenge posed by the comparatively high risks of psychotic disorder found in certain immigrant groups represents a unique opportunity to identify candidate risk factors for psychosis that also may be relevant for the general population.

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## DECLARATION OF INTEREST

None.

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