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## Ethnic enclaves and risk of psychiatric disorders among first and second generation immigrants in Sweden

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### Abstract

**Purpose**—Some non-Western immigrant groups in Europe have elevated risk of psychosis relative to native-born. It is hypothesized that neighborhood ethnic density moderates this risk. Immigration to Sweden has increased substantially recently, particularly from the Middle East. This study examined the relationship between neighborhood ethnic density (i.e., living in an immigrant enclave) and risk of psychotic and affective disorders among three groups: Iraqi immigrants, immigrants from other nations, and native-born Swedes.

**Methods**—Individuals aged 15 to 60, without prevalent psychopathology, were drawn from Swedish population-based registries and followed from 2005 to 2010 (N=1,442,931). Multi-level logistic regression was used to examine the association between neighborhood ethnic composition and incident psychopathology.

**Results**—Cumulative incidence of psychopathology was greater in Iraqi enclaves relative to predominantly Swedish neighborhoods (6.3% vs. 4.5%). Iraqis living in enclaves did not have significantly greater risk of psychosis (Odds Ratio (OR): 1.66, 95% Confidence Interval (CI): 0.92 – 2.97) or affective disorders (OR: 1.04, 95%CI: 0.85 – 1.27) relative to those in predominantly Swedish neighborhoods. There was no increased risk of psychosis (OR: 0.93,  $p>0.05$ ) or affective disorders (OR: 0.93,  $p>0.05$ ) for other immigrants living in an enclave. Swedes living in an enclave had elevated risk of both psychosis (OR: 1.37,  $p<0.05$ ) and affective disorders (OR: 1.14,  $p<0.05$ ) relative to those in predominantly Swedish neighborhoods. Second-generation Iraqis had higher risk of psychotic but not affective disorders relative to first-generation.

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**Conclusions**—Neighborhood ethnic density does not moderate risk of psychopathology for immigrants in Sweden. Findings regarding Swedes are consistent with social drift.

### Keywords

Immigrants; neighborhood; psychosis; depression; multi-level

## INTRODUCTION

There is a growing appreciation of the role of contextual factors (*neighborhood factors*) on risk of psychopathology. Numerous studies have shown that urbanicity, neighborhood socioeconomic deprivation, and neighborhood social disorganization are associated with risk of both psychotic and affective disorders (Faris & Dunham, 1939; McGrath et al., 2004; Kirkbride et al., 2007; Lofors & Sundquist, 2007; Kim, 2008).

Neighborhood ethnic composition – the degree to which one's neighbors are of the same ethnic background as oneself – has emerged as potential contributor to psychopathology, particularly for racial/ethnic minorities (Veling & Susser, 2011). There are two competing hypotheses about the relationship between neighborhood ethnic composition and psychopathology among ethnic minorities (Halpern, 1993; Mair et al., 2010). The *ethnic density hypothesis* postulates that ethnic minorities who live in neighborhoods with a high concentration of people from their same ethnic background will have lower risk of psychopathology than those who live in majority-populated neighborhoods because of shared cultural values, language, and social support with their neighbors (Bhurgra & Arya, 2005; Veling & Susser, 2011; Bosqui et al., 2014) and/or reduced exposure to racism and discrimination (Becares, Nazroo & Stafford, 2009). This hypothesis argues that, particularly for immigrants who have limited knowledge of the customs and language of their host country, living near individuals of their same ethnicity provides a social network buffer against stressors and serves as a resource for socioeconomic advancement. Conversely, the *residential segregation hypothesis* holds that ethnic minorities who live in neighborhoods with a high ethnic density have higher risk of psychopathology than those who reside in majority-populated areas because these neighborhoods are generally more economically disadvantaged, have higher rates of crime, have restricted access to the labor market, and have fewer positive resources (Veling & Susser, 2011; Xie & Gough, 2011).

Ethnic enclaves may be particularly important to the mental health of immigrants because they provide a resource in terms of cultural goods, language, and kinship or social networks (Logan et al., 2002). Enclaves are generally conceptualized as transitional spaces, in which individuals or their offspring leave as they become more acculturated to the host nation; alternatively, Logan, Zhang, and Alba (2002) defined an ethnic enclave as one in which ethnic minorities, particularly second generation and beyond, may choose to live in despite having the ability to live in a more integrated setting (Logan et al., 2002; Edin et al., 2003). The process of spatial assimilation varies across immigration groups and has changed over time as the source of immigrants to the United States and Northern and Western Europe has shifted from Eastern European countries to Asian, African, and Latin American nations (South et al., 2005; Iceland & Scopilliti, 2008). This indicates that new research on the

determinants of mental health of racial/ethnic minority immigrants is needed as prior work may have limited applicability to the modern immigration experience.

Previous research indicates that the relationship between neighborhood ethnic composition and psychopathology varies by ethnic group and geographic location (Bosqui et al., 2014). In the US, there is modest evidence that neighborhood ethnic composition is protective for depressive symptoms among Latinos (Mair et al., 2010). In contrast, most studies indicate that living in neighborhoods with high concentrations of African Americans is associated with higher prevalence of depression among this group (Mair et al., 2010), largely due to the fact these neighborhoods are often socioeconomically disadvantaged and formed largely by a process of racial segregation rather than coalescing around a shared social identity (Massey & Denton, 1993). In the UK and the Netherlands, where immigrants from Afro-Caribbean and North African backgrounds, respectively, have elevated risk of non-affective psychosis, there is suggestive evidence that this risk is mitigated by living in neighborhoods with high density of ethnic immigrants (Kirkbride et al., 2007; Veling et al., 2008; Becares et al., 2008; Schofield et al., 2011). However, an important limitation of many prior studies stems from the way ethnic enclaves are defined and identified. Many studies rely on convenience measures of “neighborhoods” (e.g., Census tracts) that often do not correspond to a social space, many have failed to account for the correlations in contiguous space, and often enclaves are identified by quantitative metrics alone (i.e., percent of the neighborhood population that is immigrant) rather than identifying qualitatively distinct geographic areas (i.e., distinct clusters of individuals with the same ethnic background).

The diversity of the Swedish population has increased substantially in the past 25 years. Today nearly one in five Swedish residents is of foreign nationality (Statistics Sweden, 2009) and Sweden has become one of the main accepters of asylum seekers from conflict areas of the Middle East, particularly Iraq (Statistics Sweden, 2009). Parallel to this influx of immigration, income inequality has grown faster in Sweden than in any other industrialized country (Organization for Economic Co-operation and Development [OECD], 2011). Recent civil unrest by predominantly young Middle Eastern immigrants in Stockholm has brought the relationship between the social and economic position of immigrants and satisfaction and life outlook to the political forefront (Higgins, 2013). This confluence of increasing diversity and income inequality makes Sweden a particularly relevant place to investigate the relationships between immigrant ethnic enclaves and psychopathology.

The aim of this study was to assess whether living in an immigrant ethnic enclave moderates risk of two classes of psychiatric disorders, non-affective psychosis and affective disorders, among first and second-generation immigrants and native Swedes from 2005 to 2010. Specifically, we sought to test the ethnic density vs. residential segregation hypotheses and contrast the findings for three distinct populations: Iraqi immigrants, immigrants of other nations, and native-born Swedes. This analysis focuses on Iraqi immigrants because this population is the largest non-European migrant group in Sweden (and the largest among asylum seekers) during the study period (Migrationsverket, 2014), and because Iraqi immigrants are among the least socially-integrated migrant groups (Fredlund-Blomst, 2014). Finally, we chose to focus on a single nationality in order to account for migration history differences (e.g., asylum vs. employment driven) that vary across immigrant groups.

## METHODS

### Sample

The study population was derived from nationwide registry data linked at the Centre for Primary Health Care Research at Lund University in Malmö Sweden (Sundquist et al., 2004; Lofors & Sundquist, 2007). National census data in 2005 (e.g., age, sex, marital status, education, household income and nationality) was linked to a Geographic Information Systems (GIS) database which covers the entire nation. All residential addresses in Sweden have been geocoded to small geographic units that have boundaries defined by homogeneous types of buildings. These neighborhood areas, called Small Area Market Statistics (SAMS), have an average of 1000 people (2000 in the Stockholm area) and were used to approximate neighborhoods (Sundquist et al., 2004). All linkages were performed using an individual national identification number that is assigned to each person (including immigrants upon settlement) in Sweden for their lifetime, which was replaced by a random serial number for analysis in order to provide anonymity.

The Swedish Census records nation of birth but not other characteristics of race/ethnicity. In order to identify the three subpopulations of interest – first- and second-generation Iraqi immigrants, first- and second-generation immigrants from other nations, and native Swedes – the Census data was linked to the Multi-Generational Registry (MGR). The MGR identifies each individual's mother and father (if known) and place of birth. 'Native Swedes' were defined as individuals who were born in Sweden (2<sup>nd</sup> generation) and both of whose parents were also born in Sweden (1<sup>st</sup> generation). Iraqi immigrants were defined as individuals who were either born in Iraq (1<sup>st</sup> generation) or who had at least one parent who was born in Iraq (2<sup>nd</sup> generation). Similarly, members of other immigrant groups were defined as individuals who were either born outside of Sweden (1<sup>st</sup> generation) or who had at least one parent who was born outside of Sweden (2<sup>nd</sup> generation), excluding Iraq. The 10 most common non-Iraqi immigrant groups represented in this analyses were from Finland (25%), countries in Asia (other than Turkey, Iran or Iraq) (10.9%), countries in Africa (8.5%), Yugoslavia (7.2%), Iran (6.4%), Poland (5.0%), Turkey (4.0%), Bosnia (3.8%), Chile (2.7%) and nations in South America (other than Chile) (2.7%).

This analysis is restricted to individuals aged 15 to 60 living in the three most populated municipalities in Sweden: Stockholm, Malmö, and Goteborg. Approximately 17.9% of the Swedish population resides in these areas. The total number of SAMS included was 1,490 (N=1,442,931 people). The analytic sample is restricted to individuals with no history of non-affective psychosis (for the non-affective psychosis analysis) or affective disorder (for the affective disorder analysis) in 2004 (one year before follow-up began).

This study is approved by the Institutional Review Board at the Centre for Primary Health Care Research at Lund University.

### Measures

**Immigrant enclaves**—There are various approaches to quantifying neighborhood ethnic composition, and an enclave generally does not indicate that the majority of the neighborhood is of the same ethnicity (Logan et al., 2002). Rather, Borjas (1998) argued that

an immigrant enclave is a neighborhood in which the probability that an immigrant resides there is more than twice the probability of an immigrant living in other areas; that is, enclaves can be defined as areas with a relatively higher proportion of immigrants as compared to surrounding areas.

Iraqi immigrant enclaves were defined using GIS methods. The number of the Iraqi immigrants (first or second generation) in each SAMS was used to identify ethnic enclaves using the Moran Index (MI) (Anselin, 1995; Logan et al., 2002). The MI is a measure of relative similarity across areas (spatial autocorrelation), which ranges from  $-1$  to  $+1$ . The probability of these values follows an approximately normal distribution and produces a z-score and associated p-value. Positive MI values indicate that a neighborhood characteristic (e.g., number of Iraqi immigrants) is more similar to its neighboring areas than expected under the null hypothesis of a random distribution of attributes (Moran, 1948). This SAMS is then considered part of a cluster, or *enclave*. Negative MI values indicate that a SAMS is more dissimilar to its neighboring areas under the null; this SAMS is an outlier. Only clusters with positive MI values and p-values  $<0.05$  were considered enclaves for this analysis.

Using this approach, each SAMS was identified as either being an Iraqi enclave or not. We identified 15 enclaves in Stockholm with an average population density of Iraqis of 10.2%; nine in Malmö with an average population density of Iraqis of 15.5%; and 25 in Goteborg with an average population density of Iraqis of 13.1% (Supplemental Figure 1). As a comparison, Iraqi immigrants make up only 2.1% of the total sample population in these urban areas (Table 1), and only 1.4% of the total population in Sweden. We identified only 2 outlier SAMS, which were excluded from the analysis.

**Psychopathology**—Incident cases of non-affective psychosis and affective disorders from 2005 – 2010 were identified from nationwide psychiatric inpatient and outpatient registries. The quality of these registries in Sweden is very high (Ludvigsson et al., 2011). For both conditions we identified a “broad” and “narrow” case definition. The broad case definition of non-affective psychosis included schizophrenia and other non-affective psychotic disorders indicated by ICD10 codes F20 (schizophrenia, all subtypes), F22 (persistent delusional disorders), F23 (acute and transient psychotic disorders), F28 (other non-organic psychotic disorders) and F29 (unspecified non-specific organic psychosis). The narrow definition was limited to ICD10 code F20. The broad case definition of affective disorders included F32 (depressive episode), F33 (recurrent depressive episode), F34.1 (dysthymia), F40 (phobic anxiety disorders), and F41 (other anxiety disorders). The narrow definition of affective disorders was limited to ICD10 codes F32, F33, and F34.1. Prevalent cases (January 1, 2004 – December 31, 2004) of non-affective psychosis and affective disorders (both broad case definitions) were excluded from analysis for each outcome, respectively.

**Other covariates**—Individual-level covariates included age, sex, educational attainment (categorized as  $\leq 9$  years, 10–11 years or  $\geq 12$  years of schooling), income (categorized into quartiles), and first or second-generation immigrant status. Because of the correlation between immigrant status and residential socioeconomic status (SES), we also accounted for

neighborhood deprivation. As previously described (Sundquist et al., 2004; Mezuk et al., 2013), a neighborhood deprivation index at the SAMS level was compiled from information on (a) percent with low educational attainment, (b) percent with low income, (c) percent unemployed, and (d) percent receiving social welfare assistance. These components were combined into a weighted sum, with higher values indicating more deprived neighborhoods. This index was then standardized and categorized for analysis as low deprivation ( $>1$  standard deviation (SD) below the mean), moderate deprivation ( $\pm 1$  SD below and  $\pm 1$  SD above the mean) and high deprivation ( $>1$  SD above the mean).

## Analysis

The goal of this analysis was to assess whether the incidence of non-affective psychosis and affective disorders in the Iraqi enclaves differed from that of the other SAMS, and whether this effect was consistent across three subpopulations: Iraqi immigrants, immigrants from other nations (excluding Iraq), and native Swedes. Models were estimated separately for these three subpopulations. Multi-level logistic regression was used to assess the association between residing in an Iraqi enclave and incidence of psychopathology while accounting for the nesting of observations within SAMS. For each subpopulation, three models were estimated: Model 1: unadjusted, Model 2: adjusted for neighborhood deprivation, and Model 3: additionally adjusted for individual-level demographic characteristics and SES. Comparing the estimates from Models 1 and 2 illustrates the degree to which any effect of living in an Iraqi enclave has on psychopathology independent from that of neighborhood deprivation. Comparing the estimates from Models 2 and 3 illustrates the degree to which individual-level risk factors contribute to psychopathology risk, independent from those related to neighborhood context. Finally, we estimated the intraclass correlation coefficient (ICC), the proportion of variance in the outcome attributable to differences between individuals in different SAMS *versus* differences between individuals within the same SAMS (Bryk & Raudenbush, 1992; Snijders & Bosker, 1999). The ICC ranges from 0 to 1; higher values indicate that individuals within the SAMS are more highly correlated than individuals in different SAMS.

Analyses were completed using ArcGIS software (version 10), SAS (version 9.2) and MLwiN (version 2.021). All p-values refer to two-tailed tests.

## RESULTS

Figure 1 illustrates the distribution of Iraqi enclaves and the cumulative incidence of non-affective psychosis and affective disorders in the three municipalities. Table 1 shows how the population composition and SES of the neighborhood varied as a function of the proportion of the SAMS that is an immigrant (first or second generation, from any nation). It indicates, consistent with prior work, that immigrant density was strongly inversely correlated with neighborhood SES; the average neighborhood deprivation score for SAMS with the lowest density of immigrants was 0.48 as compared to 4.15 for SAMS with the highest density.

As shown by Table 2, the overall cumulative incidence of psychotic and affective disorders was greater in the Iraqi enclaves than in the predominantly-Swedish areas (6.3% vs. 4.5%).

Overall, immigrants had higher cumulative incidence of affective disorders (5.9% for Iraqi and 4.7% for other immigrants) but not non-affective psychosis (0.5% for Iraqi and 0.7% for other immigrants) relative to native-born Swedes (3.9% for affective disorders and 0.5% for non-affective psychosis).

The relationship between neighborhood ethnic density and psychopathology varied across the subpopulation groups. In crude and neighborhood-deprivation adjusted models, Iraqis living in enclaves had similar risk of affective disorders as those living in predominantly Swedish areas (Odds Ratio (OR)<sub>Crude</sub>: 0.94, 95% Confidence Interval (CI): 0.80 – 1.11; OR<sub>Neighborhood</sub>: 1.06, 95% CI: 0.86–1.29). In crude and neighborhood-deprivation adjusted models, Iraqi immigrants living in enclaves had elevated risk of psychotic disorders relative to Iraqis living in predominantly-Swedish neighborhoods (OR<sub>Crude</sub>: 1.43, 95% CI: 0.92 – 2.22; OR<sub>Neighborhood</sub>: 1.66, 95% CI: 0.93 – 2.96), but these differences were not statistically significant. As shown by Table 3, these relationships were largely unchanged after accounting for other individual-level covariates (for affective disorders, OR: 1.04, 95% CI: 0.85 – 1.27 and for psychotic disorders (OR: 1.66, 95% CI: 0.92 – 2.97). Regardless of neighborhood context, second-generation Iraqi immigrants had elevated risk of psychotic disorders (OR: 2.50, 95% CI: 1.28 – 4.89), but not affective disorders (OR: 0.92, 95% CI: 0.74 – 1.13), relative to first-generation immigrants.

For immigrants from other nations, consistent with the residential segregation hypothesis, living in an enclave was associated with higher risk of both forms of psychopathology, but this relationship was entirely due to these areas having higher neighborhood deprivation (left-hand column, Table 4). However, native Swedes living in an Iraqi enclave had elevated risk of both affective disorders (OR: 1.12, 95% CI: 1.00 – 1.25) and psychotic disorders (OR: 1.36, 95% CI: 1.06 – 1.76) relative to Swedes living in predominantly Swedish neighborhoods, even after accounting for neighborhood deprivation and individual characteristics (right-hand column, Table 4). These relationships were similar for the narrow definition of the outcomes.

## DISCUSSION

In this study we sought to explore and contrast the predictions of the ethnic density and residential segregation hypotheses of how ethnic enclaves relate to mental health. The primary finding of this study is that, in contrast to several prior reports of non-Western immigrants in other parts of Europe (Halpern & Nazroo, 2000; Kirkbride et al., 2007; Kirkbride et al., 2008; Veling et al., 2008; Schofield et al., 2011; Shaw et al., 2012), our results did not support the ethnic density hypothesis (e.g., lower risk of psychopathology for immigrants living in ethnic enclaves) for Iraqi immigrants in Sweden. Our findings were consistent with the residential segregation hypothesis (e.g., higher risk psychopathology for immigrants in ethnic enclaves) for immigrants from other nations. Finally, our analysis of the native-born population indicates that living in an ethnic enclave is associated with elevated risk of psychopathology among native-born Swedes. Our findings are consistent with the conclusions of recent reviews of the ethnic density hypothesis for psychotic disorders which argued that the relationship between ethnic density and psychopathology is not uniform across immigrant groups (Shaw et al., 2012; Bosqui et al., 2014). To our

knowledge this is the first study to examine the relationship between residential ethnic composition and psychopathology in Sweden, and among the first to examine this relationship among immigrants from the Middle East specifically.

There are several reasons why our findings differ from prior reports. The first pertains to the measurement of ethnic density, and specifically the identification of Iraqi ethnic enclaves. Our approach of using spatial autocorrelation to identify enclaves has not, to our knowledge, been widely applied in prior research of psychopathology. We feel there are several strengths to this method over other metrics, particularly the ability to quantify the degree of clustering relative to a specific null hypothesis. However, in order to more directly compare our findings to reports that have modeled neighborhood immigrant density as a continuous variable, we conducted a *post hoc* sensitivity analysis using this formulation and our findings were consistent with our main analysis (Supplemental Table 1). Another difference stems from our focus on Iraqi immigrants. To our knowledge this is the first study to examine whether ethnic density is related to psychopathology for this group. The intersection of ethnic identity, experiences of discrimination, and expectations and attitudes toward the host nation is complex and differs for each migrant group (Veling & Susser, 2011; Verkuyten & Martinovic, 2012). The complex relationship between these characteristics may, in part, be reflected by the findings regarding generational status and psychopathology among the Iraqi sample. Our results indicate that second-generation Iraqi immigrants have increased odds of non-affective psychosis, but not affective disorders, compared to first-generation regardless of their neighborhood context. While cross-national comparisons must be interpreted with caution given differences in immigration histories, these results are consistent with the greater prevalence of psychiatric disorders in second-generation relative to first-generation Latinos in the US (Alegria et al., 2007) and among African and Caribbean black immigrants to Western Europe (McGrath J et al. 2004). It is common for Latinos living in the U.S. to “shift back and forth” between the customs, values, and traditions of two cultures, which may impose additional social and psychological pressures to assimilate while in a minority status position (Alegria et al., 2007), particularly if this process occurs in the context of exposure to discrimination (Chakraborty & McKenzie, 2002; Veling & Susser, 2011). Unfortunately we do not have data on these psychosocial social constructs and experiences to test how these processes relate to psychopathology in the present study. Finally, there may be particularities about Sweden as a host nation that makes our findings differ from prior research; specifically, we note that high deprivation urban neighborhoods in Sweden have a higher concentration of both health-harming (e.g., bars, fast-food restaurants) and health-promoting (e.g., exercise facilities, health clinics) resources (Kawakami, Li & Sundquist, 2011) than low poverty areas, which may contribute to our null findings.

Our findings regarding the relationship between immigrant ethnic density and greater risk of psychopathology for native born Swedes are consistent with the social drift hypothesis (e.g., psychopathology negatively impacts SES attainment) and replicate prior work on the health of whites who live in neighborhoods where the majority of the population is non-white (e.g., majority-minority neighborhoods) (Halpern & Nazroo, 2000; Termorshuizen et al., 2014). Although our findings do not support the ethnic density hypothesis, we note that every



immigration experience is unique (e.g., social norms, cultural customs, and resources of the immigrant group; the migration and acculturation process, including experiences of discrimination; and the norms, customs, and economic status of the host nation), and thus it is not surprising that findings regarding the relationship between ethnic density and mental health are mixed. We also note that the immigrants in our sample had higher cumulative incidence of affective disorders but not non-affective psychosis relative to the native-born population; this is consistent with other research showing that the cumulative experience of pre-migration stressors, the migration experience itself, and exposure to stressors after arriving in the host country, including experiences of discrimination, are important determinants of stress-related psychopathology such as affective disorders for immigrants (Tinghög et al., 2007; Tinghög et al., 2010; Veling & Susser, 2011; Gilliver et al., 2014).

These results should be interpreted in light of study limitations. Immigrant enclaves are characterized both by the people that live in them (e.g., immigrants with limited material resources) and by their physical environment (e.g., limited access to goods, services and other resources). We acknowledge that our reliance on quantitative data means that we have only a limited understanding as to how life differs for individuals (both immigrants and native Swedes) living in these areas as compared to predominantly Swedish neighborhoods (Borjas, 1998; Logan et al., 2002). Finally, while we chose to focus on a single immigrant group to account for variation in migration history, we acknowledge that there is heterogeneity within the Iraqi immigrant population (e.g., religious affiliations) we were unable to capture with our data. While we feel that the strengths of our categorical definition of enclaves outweigh the limitations of this method, the results of our sensitivity analysis using a continuous measure were consistent with our main analysis. As with prior studies in the field, we have no information on immigrants who repatriated to their country of origin. Our assessments of psychopathology are limited to cases clinically-identified in specialty care. Psychiatric care is readily available in Sweden in a universal manner, however if immigrants who live in enclaves, particularly those with less severe symptomology, were less likely to access healthcare than those living in predominantly Swedish areas this reduce our ability to detect a significant effect. This study also has a number of strengths. We were able to empirically identify Iraqi immigrant enclaves using GIS methods and our large sample and prospective design provided precision regarding the relationship between living in an immigrant enclave and risk of a broad range of psychopathology.

Our findings add to the growing literature on the relationship between contextual factors and psychopathology, particularly for ethnic minority immigrants, and illustrate the complexity inherent in investigating the relationships between ethnicity and mental health.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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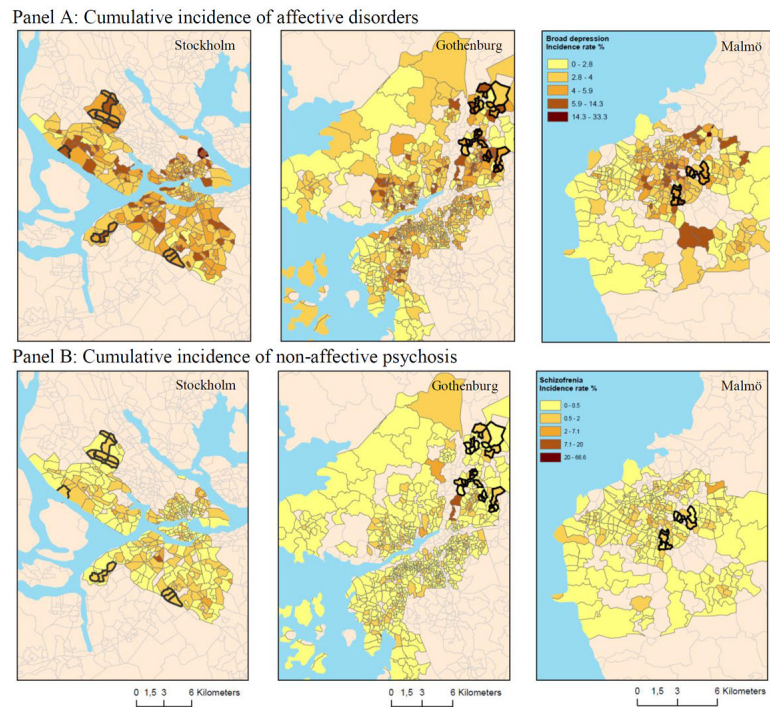
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**Figure 1.**

Spatial distribution of cumulative incidence of affective disorders and non-affective psychosis: 2005 – 2010

Dark outlined areas indicate Iraqi immigrant enclaves (N=49) in three municipalities (Stockholm, Gothenburg and Malmö) (N=1,442,931). Areas without coloring are not included in the analysis (insufficient population size).

**Table 1**

Sample characteristics by neighborhood immigrant ethnic density: 2005

SAMS characteristics	Overall	Quintiles of Immigrant Population				
		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
<b>Study population</b>	950,979	191,791	188,734	191,434	190,024	188,996
% Iraqi	2.1	0.2	0.3	0.4	1.6	8.1
% Other immigrants	24.4	12.0	15.2	18.3	27.1	49.9
% Swedish	73.5	87.9	84.5	81.3	71.4	41.9
1 <sup>st</sup> generation						
No	580,808	127,969	109,955	111,390	111,496	119,998
%		22.0	18.9	19.2	19.2	20.7
2 <sup>nd</sup> generation						
No	370,171	63,822	78,779	80,044	78,528	68,998
%		17.2	21.3	21.6	21.2	18.6
Total number of cases	44,404	6,079	8,016	8,190	10,156	11,963
Affective disorders (broad)	39,531	5,583	7,221	7,354	9,004	10,369
Non-affective psychosis (broad)	4,873	496	795	836	1,152	1,594
Affective disorders (narrow)	22,144	3,328	4,213	4,083	4,904	5,616
Non-affective psychosis (narrow)	2,238	221	391	385	515	726
N SAMS	1,502	313	254	338	351	246
Neighborhood deprivation index (range)*	-2.55 to +10.14	-2.55 to -1.11	-1.11 to -0.65	-0.65 to ±0.11	+0.11 to +1.84	+1.84 to +10.14
Neighborhood deprivation index (mean ± SD)*	0.48 ± 2.24	-1.51 ± 0.26	-0.87 ± 0.14	-0.31 ± 0.22	0.90 ± 0.53	4.15 ± 1.93

\* Neighborhood deprivation index values refer to standard deviations from the mean-standardized composite score, with higher values indicating more economically disadvantaged areas (see Methods).

**Table 2**  
Cumulative incidence of psychiatric disorders in Iraqi enclaves vs. predominantly Swedish SAMS: 2006 – 2010

Type of neighborhood	Number of SAMS	Neighborhood deprivation index (Mean, SD)	Cumulative incidence of psychiatric disorders (%)			
			Overall	Iraqi immigrants	Other Immigrants*	Native Swedes
<u>Iraqi enclave</u>	49	4.88 ± 2.14				
Any affective or non-affective psychosis disorder			6.3	6.5	5.8	7.2
Affective disorders (broad)			5.5	5.9	5.0	6.1
Non-affective psychosis (broad)			0.9	0.6	0.8	1.1
Affective disorders (narrow)			3.1	3.7	2.9	3.2
Non-affective psychosis (narrow)			0.4	0.2	0.3	0.7
<u>Non-enclave</u>	1453	-0.02 ± 1.64				
Any affective or non-affective psychosis disorder			4.5	6.4	5.3	4.3
Affective disorders (broad)			4.0	6.0	4.6	3.8
Non-affective psychosis (broad)			0.5	0.4	0.7	0.4
Affective disorders (narrow)			2.3	3.8	2.7	2.1
Non-affective psychosis (narrow)			0.2	0.1	0.3	0.2

\* Other immigrants includes 1<sup>st</sup> and 2<sup>nd</sup> generation immigrants from all nationalities other than Iraq.

**Table 3**  
Multi-level logistic regression of psychiatric disorders among Iraqi immigrants (N=19,975)

	Affective disorders (broad)			Non-affective psychosis (broad)			Affective disorders (narrow)			Non-affective psychosis (narrow)		
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Iraq in an enclave (ref. Iraq not in an enclave)	1.04	0.85	1.27	1.66	0.92	2.97	1.06	0.83	1.35	2.28	0.84	6.19
<b>Neighborhood deprivation (ref. Low deprivation)</b>												
Level 2	1.03	0.82	1.28	0.69	0.33	1.45	1.06	0.81	1.40	0.67	0.19	2.42
Level 3	0.93	0.72	1.20	0.95	0.44	2.05	0.89	0.65	1.23	1.09	0.31	3.83
Level 4	0.89	0.68	1.17	0.82	0.37	1.83	0.83	0.60	1.16	0.43	0.10	1.92
Level 5	0.77	0.56	1.06	0.61	0.25	1.50	0.80	0.54	1.17	0.62	0.14	2.65
Age (years)	1.02	1.01	1.03	1.03	1.00	1.06	1.02	1.01	1.03	1.05	1.01	1.10
Gender (ref. Female)	0.56	0.49	0.64	1.57	1.01	2.46	0.60	0.51	0.70	1.18	0.54	2.60
<b>Family income (ref. High income)</b>												
Middle-high income	0.96	0.81	1.13	1.09	0.63	1.89	0.94	0.77	1.16	1.17	0.50	2.74
Middle-low income	0.77	0.64	0.93	1.02	0.55	1.87	0.73	0.59	0.92	0.50	0.16	1.59
Low income	0.67	0.55	0.82	0.65	0.33	1.29	0.61	0.48	0.78	0.27	0.06	1.10
<b>Education attainment (ref. 12 years)</b>												
9 years	1.33	1.16	1.53	1.63	1.01	2.62	1.36	1.15	1.62	1.81	0.78	4.19
10–11 years	1.43	1.19	1.72	1.36	0.70	2.63	1.47	1.17	1.83	2.08	0.75	5.78
Generation status (ref. First generation)	0.92	0.75	1.13	2.50	1.28	4.89	0.81	0.62	1.05	4.03	1.16	14.04



Table 4

Multi-level logistic regression of psychiatric disorders among other immigrants (N=232,356) and native-born Swedes (N=698,648)

Outcomes	Other immigrant living in an Iraqi enclave vs. predominantly Swedish neighborhood		Native-born Swede living in an Iraqi enclave vs. predominantly Swedish neighborhood	
	Odds Ratio	95% CI	Odds Ratio	95% CI
<b>Affective disorders (broad)</b>				
Crude model	1.12	1.03	1.21	1.52
Neighborhood deprivation adjusted model	0.94	0.85	1.04	1.07
Full model	0.93	0.84	1.03	1.00
<b>Non-affective psychosis (broad)</b>				
Crude model	1.26	1.04	1.53	1.71
Neighborhood deprivation adjusted model	0.84	0.66	1.07	1.00
Full model	0.93	0.74	1.16	1.06
<b>Affective disorders (narrow)</b>				
Crude model	1.08	0.98	1.19	1.40
Neighborhood deprivation adjusted model	0.98	0.86	1.11	1.08
Full model	0.97	0.85	1.10	1.03
<b>Non-affective psychosis (narrow)</b>				
Crude model	1.15	0.86	1.54	1.66
Neighborhood deprivation adjusted model	0.81	0.56	1.18	0.90
Full model	0.99	0.70	1.38	1.05