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ASPECTS OF MENTAL AND PHYSICAL HEALTH IN IMMIGRANTS IN SWEDEN: AN EPIDEMIOLOGICAL STUDY

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ABSTRACT

Background: Foreign-born people constitute 12.5% of the Swedish population in Sweden, which calls for further research concerning health outcomes in this population group.

Objectives: To examine the association between country of birth and attempted suicide after accounting for age, marital status, and socioeconomic status (SES) (study 1). To examine the association between country of birth and suicide after accounting for age, marital status, SES and hospitalization for psychiatric disorders or substance abuse (study 2). To examine the association between country of birth and hospital admission for psychotic, affective and neurotic disorders after accounting for age, marital status, and SES (study 3). To examine the possible differences in self-rated health between Finns living in Sweden and Finns living in Finland (study 4).

Methods: In total 4.5 million individuals aged 25-64 were followed from January 1, 1993 until attempted suicide or until December 31, 1998 (study 1). In total 4.4 million individuals aged 25-64 years were followed from January 1, 1994, to December 31, 1999, for suicide (study 2). A two-year national cohort study of 4.5 million individuals in the age group 25–64 years was performed (study 3). National registers including individual demographic and socioeconomic data were linked to the Hospital Discharge Register and the Cause of Death Register and Cox regression was used in the analyses (studies 1, 2, and 3). In study 4, data were obtained from the Swedish Annual Level of Living Survey between 1996 and 2003 and the Finnish national survey Health 2000. Odds ratios (OR) of poor self-rated health were estimated adjusting for age, marital status, education, employment and smoking. The participants were 21 991 Swedes and 836 Finns living in Sweden, and 5096 Finns living in Finland (study 4).

Results: Immigrants from Finland, other OECD countries, Poland and Iran had significantly higher risks of attempted suicide than Swedish-born controls. Women born in Latin America, Asia, and Eastern Europe had significantly higher risks of attempted suicide than Swedish-born women. Men born in Southern Europe and Asia had significantly lower risks of attempted suicide. When SES was included in the final model, the risks remained high for women, while the risk of attempted suicide among men declined sharply with increasing income (study 1). Among men the highest risk of suicide was found among men from Finland. Among women the highest risk of suicide was found among women from Finland, Poland, and Eastern Europe (study 2). Several groups of immigrants had higher age-adjusted risks of hospital admission for psychotic, affective, or neurotic disorders than the Swedish controls. After adjustment for SES several of the risks decreased to non-significance among foreign-born men, whereas the risks remained significant among most foreign-born women (study 3). For Finnish women living in Sweden the odds of poor self-rated health were significantly higher than for Finnish women living in Finland. Finnish men living in Finland had higher odds of poor self-rated health than Finnish men living in Sweden, although not to a statistically significant extent (study 4).

Conclusions: Country of birth, SES and gender are associated with attempted suicide, suicide and hospital admissions for mental disorders. Key factors for preventing suicide include early detection and treatment of mental disorders and/or substance abuse, especially among certain groups of immigrants, and among low-income individuals. The effect of migration on Finnish men's and Finnish women's self-rated health may differ. Further studies are needed to investigate the complex pathways underlying these findings.

Keywords: epidemiology, ethnicity, gender, mental disorders, migration, self-rated health, socioeconomic status, suicide, suicide attempts

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LIST OF ABBREVIATIONS

CI	Confidence Interval
DSM	Diagnostic and Statistical Manual of Mental Disorders
GP	General Practitioner
HR	Hazard Ratio
ICD	International Classification of Diseases
IR	Incidence Rates
n	Sample size
N	Population size
OECD	Organization for Economic Cooperation and Development
OR	Odds Ratio
SALLS	Swedish Annual Level of Living Survey
SES	Socioeconomic Status
ULF	Undersökning av levnadsförhållanden
WHO	World Health Organization

1 INTRODUCTION

Migration

In recent decades many developing and developed countries have faced rapid demographic changes due to increasing global migration. About 175 million people lived elsewhere than in their country of birth at the beginning of the millennium (International Organization for Migration, 2003). Many immigrants have come to Sweden since World War II, and at the turn of the century first- and second generation immigrants comprised about 20% of the population (Statistics Sweden, 2000). Today, the foreign-born population in Sweden consists of persons born in more than 200 different countries.

Migration in Sweden has varied substantially during the past two centuries. Before World War II, migration from Sweden predominated, whereas migration to Sweden was relatively small. For example, between 1820 and 1910 over 1,200,000 people, about one fourth of the population, emigrated from Sweden, mainly to the United States in order to create a better future for themselves and their families (Lundh & Ohlsson, 1999). However, during World War II Sweden received more than 200,000 refugees, mainly from Denmark, Finland, Norway, Germany, Poland and the Baltic countries (Lundh & Ohlsson, 1999). After the war had ended, some of these refugees returned to their home countries, whereas others remained in Sweden. During the 1950s and 1960s many political immigrants from Eastern Europe came to Sweden. Roughly speaking, post-war immigration to Sweden can be divided into two periods, with the first period dominated by labour immigrants and the second period by refugees. Labour immigration to Sweden started relatively soon after the end of the war. Following the establishment in 1954 of a common labour market in the Nordic countries, more than one million Nordic citizens migrated between the Nordic countries. Today, persons born in Finland constitute by far the largest group of immigrants in Sweden. During the 1960s and 1970s, the demand for labour was so great in Sweden that workers were recruited directly from Finland and Southern Europe. Thousands of people left their home countries and moved to Sweden in order to gain better employment opportunities than in their home countries (Lundh & Ohlsson, 1999). Since the early 1980s the amount of migration to Sweden from Nordic and other European countries has become relatively small (Migrationsverket, 2002), and large-scale labour immigration has come to an end (Migrationsverket, 2002). During the past 20 years migration to Sweden, especially from non-European countries in Latin America, the Middle East, Asia, and Africa, has been characterized by forced migration due to war and human rights violations. The predominance of non-European immigrants changed temporarily at the beginning of the 1990s, when about 120,000 refugees from former Yugoslavia, of which 50,000 were from Bosnia, escaped from the war zone to Sweden. Since 1995 there has again been a predominance of non-European immigrants, mainly refugees from Iran, Iraq, and Somalia seeking asylum in Sweden (Migrationsverket, 2002). In 2005, the largest groups of asylum seekers in Sweden came from Iraq, Serbia and Montenegro, and Russia (Statistics Sweden, 2006b).

The word “migration” comes from the Latin word “migrare”, which means to move or wander from one place to another. There are a number of possible reasons behind the decision to migrate. Throughout history, natural disasters, starvation, poverty, war and religious and political persecution have led people to leave their homes in order to survive. Some persons are forced to migrate for external reasons, whereas others migrate voluntarily in order to gain better job opportunities or for personal reason such as reuniting their family and marriage. People normally move to places where they believe they can create a better future. Migration can be explained from both individual and structural perspectives. The individual perspective suggests that migration is an act driven by each person’s desire and motivation to find a better place to live and invest their human capital (e.g. education, working skills, and physical strengths) in order to gain the best position possible. On the other hand, the structural perspective argues that people migrate because they are forced to do so because of social, economic, and political factors, and not so much based on personal motivation (Peter Stalker, 2001). According to the structural perspective, the decision to migrate is complex and consists of several concurrent push and pull factors (Peter Stalker, 2001). For example, poverty can push humans to leave, while dreams of a better future can pull towards the country of destination. A third perspective is the system theory, which combines the individual and structural perspectives and argues that individuals cannot make decisions to migrate independent of the structures in society, and structures do not exist independent of individuals’ acts (Peter Stalker, 2001). The most common directions of migration are from insecure environments to secure environments and from poor countries to wealthier countries (Peter Stalker, 2001).

Migrants, refugees, and other displaced people are of particular concern with respect to their health and well-being according to the WHO (World Health Organization, 1998). Migration is associated with profound social, economic, and cultural changes, which in turn have a potential impact on physical and mental health. Several studies have investigated various aspects of health in different immigrant groups (Gadd et al., 2003; Hjern et al., 2004; Westman et al., 2003; Wiking et al., 2004) and it has often been found that immigrants have poorer health than the native-born population. For example, Finnish immigrants in Sweden have a higher risk of cardiovascular diseases (Gadd et al., 2003), mental illness (Saraiva Leao et al., 2005), attempted suicide (Westman et al., 2003), suicide (Johansson et al., 1997a) and overall mortality (Bayard-Burfield et al., 1998) than Swedish-born persons.

Definitions of health and disease

The World Health Organization (WHO) has defined health as “a state of complete physical, mental and social well-being, not merely the absence of disease or infirmity”. Disease, illness, and sickness are different aspects of health. Disease refers to the objective part of health from a professional point of view, classifying diseases partly on the basis of how they are caused. Illness refers to the subjective feeling of being healthy or not. The presence of illness is not necessarily a function of the existence of disease, and vice versa. Sickness is defined as the social dimension or as the social consequence of ill health. Disorder is a term that describes a condition in which there is a disturbance of normal functioning. The psychiatrist and anthropologist Artur Kleinman (1991)

suggested that illness refers to the patient's perception, experience, expression and coping with the symptoms, whereas disease refers to the way practitioners convert illness in terms of their theoretical models of pathology. Psychiatric diagnoses are thus an interpretation of a person's experience (Kleinman, 1991). Antonovsky presented health as a continuum between a state of complete health and a state of poor health, where salutogenetic factors and the concept sense of coherence have a protective effect on health and compensate for the damaging effect of potential stressors (Antonovsky, 1979, 1987).

Self-rated health

The outcome self-rated health (study 4) has been used in previous studies (Kawachi et al., 1999; Wiking et al., 2004) and is based on how a person perceives his or her general health. Self-rated health includes illness and is therefore a more subjective health measure than disease, for example. However, several studies have shown a strong association between self-rated health and mortality (Idler & Angel, 1990; McGee et al., 1999; Mossey & Shapiro, 1982; Sundquist & Johansson, 1997), which indicates that a subjective health assessment is a valid health status indicator that can be used in population health monitoring. The reliability of self-rated health has been shown to be high in test-retests (Lundberg & Manderbacka, 1996; Miilunpalo et al., 1997).

Mental disorders

The lifetime risk of developing any mental disorder is about 50% (Kessler et al., 1994; Kringlen et al., 2001). This risk is so high that a large proportion of the population will at some time experience such a disorder, either in themselves or in a close relative or friend. Mental disorders include a broad range of disorders, with psychological or behavioural symptoms and/or impairment in social functioning due to a psychological, genetic/biological or physical/chemical disturbance. Study 3 included the most common groups of mental disorders, i.e. psychotic, affective and neurotic disorders.

Psychotic disorders including schizophrenia, schizotypal, and delusional disorders

This group includes schizophrenia and schizotypal disorder, persistent delusional disorders, and a larger group of acute and transient psychotic disorders. Schizophrenia and other psychoses are characterized by a disturbance in thoughts, behaviours and reality perception. The symptoms of schizophrenia include hallucinations, delusions, and other unusual or disorganized behaviour and/or unresponsiveness, lack of activity, and loss of interest (World Health Organization, 1993). Although much research has been done to further the understanding of schizophrenia and other psychotic disorders, it appears that the causes are still under debate. According to recent research on schizophrenia, neuro-biological dysfunctions and/or genetic inheritance are significant contributing factors (Kelly & Murray, 2000; Shih et al., 2004). Other researchers have observed that family stress, trauma, drug abuse and poor social interactions all have the

tendency to promote psychotic behaviour, although they do not necessarily cause it (Broome et al., 2005; Howes et al., 2004). It is also possible that perinatal conditions such as malnutrition, infections, and birth complications affect the development of schizophrenia later in life (Kelly & Murray, 2000).

Mood (affective) disorders

Mood disorders (affective disorders) are a heterogeneous group including unipolar (depressive) and bipolar (manic-depressive) disorders that are characterized by pervasive mood disturbances, psychomotor dysfunction, and vegetative symptoms. This group contains disorders in which the fundamental disturbance is a change in affect or mood to depression or to elation or mania (World Health Organization, 1993). The mood change is usually accompanied by a change in overall level of activity. One commonly held view about depression is that it is a disease that is caused by a chemical or hormonal imbalance in the brain (Duman et al., 1997; Vaidya & Duman, 2001). In addition, genetic, psychological, and environmental factors, as well as a serious loss, difficult relationship, financial problem or any stressful change in life patterns, may be involved in its onset (Goldberg, 2006). Researchers have suggested the possible presence of a biological vulnerability to affective disorders, especially bipolar disorder, that can be inherited (Shih et al., 2004). Suicide is the most dreaded complication of major depressive disorders and was included in study 2 as an outcome.

Neurotic, stress-related and somatoform disorders

This group mainly includes different forms of neurotic disorders in which manifestation of severe and excessive anxiety is the major symptom. Anxiety may be expressed in an isolated form or accompanied by symptoms such as panic attacks, phobias, and obsessions (World Health Organization, 1993). Stress-related disorders include disorders that are identifiable not only on the basis of the symptoms but also based on the causative influences of a traumatic life event or a major life change leading to continued severe stress reactions (World Health Organization, 1993). In post traumatic stress disorder the anxiety associated with traumatic memories is often extremely intense and is painfully re-experienced (World Health Organization, 1993). Somatoform disorders are characterized by physical symptoms that suggest but are not fully explained by a physical disorder, and that cause significant psychological distress (World Health Organization, 1993). Considerable cultural variations seem to occur in the presentation of somatoform disorders (Janca et al., 2006). Depressive or other psychiatric symptoms may also be present in neurotic disorders, given that they are secondary symptoms (World Health Organization, 1993).

Classification of Mental disorders

At present there are two established classification systems for mental disorders: the International Classification of Diseases (ICD) that is published by the World Health Organization (WHO), and the classification system recommended by the American Psychiatric Association (APA), the Diagnostic and Statistical Manual of Mental

Disorders (DSM-IV). The classification systems converged to a great extent in their last revisions, and diagnoses therefore seem to be largely comparable, although differences exist (Regier et al., 1994).

The International Classification of Diseases (ICD) was designed to promote international comparability in the collection, processing, classification, and presentation of all kinds of somatic and psychiatric morbidity and mortality statistics. ICD is a detailed description of diseases and injuries that is published by WHO, revised periodically and is currently in its 10th edition (ICD-10). ICD-10 has been used in Swedish medical registers since 1997. Studies 1-3 also included data from before 1997, and therefore both the 9th and 10th editions of ICD were used. Since there is no official translation from ICD-9 to ICD-10, the codes from ICD-9 were chosen to correspond as closely as possible to the codes in ICD-10. A field study aimed to determine whether the use of ICD-10 provides greater diagnostic reliability than ICD-9 and for schizophrenia it was found that the diagnoses of each rater remained stable after the change from ICD-9 to ICD-10 (Albus et al., 1990). In an examination carried out to test the reliability of ICD-10, most clinicians found that for research regarding mental and behavioural disorders, the diagnostic criteria were explicit and easy to apply (Sartorius et al., 1993). In addition, the inter rater agreement was high for most diagnostic categories, with the exception of some polymorphic psychotic disorders or milder forms of affective disorders where the criteria were considered as somewhat difficult to use and the reliability was lower (Sartorius et al., 1995).

Country of birth and other related concepts

Several somewhat similar terms have been used in health research to describe a person's background and cultural identity (Bhopal, 1997; Senior & Bhopal, 1994). ***Country of birth*** and ***Country of origin*** refer to the country in which the person was born as defined by political and geographical boundaries. ***Place of birth*** is a term that refers in a geographical sense to the country, continent or region where a person was born. ***Migrant*** is a term that describes individuals who have moved across national boundaries voluntarily or under compulsion (International Organization for Migration, 2004). ***Emigration*** means expatriation from one country to another, leaving one's native country. ***Immigration*** means entering a new country, resettlement in a foreign place. ***Repatriation*** means returning to one's native country (Johansson, 1997).

The term ***foreign-born*** is used to distinguish between persons born in a specific nation or abroad from those born within the specific country that is the subject of study (International Organization for Migration, 2004). ***Refugees*** include individuals who have applied for asylum and are unable to return to their country of origin because of circumstances such as war, religious or political persecution or humanitarian factors, whereas ***labour migrants*** have moved voluntarily in order to gain better employment opportunities (International Organization for Migration, 2004). These terms should not be confused with ***ethnicity*** and ***culture,*** which include shared background, shared culture or traditions, and common language or religion (Senior & Bhopal, 1994). Culture is a constantly changing process that is dependent on the behaviour and attitudes of a social group rather than something exotic or deviant (Scarlett & Kelsey,

2000; Senior & Bhopal, 1994). Marsella has defined culture as “shared, learned behaviour which is transmitted from one generation to another to promote individual and group adjustment and adaptation. Culture is represented externally as artefacts, roles, and institutions, and is represented internally as values, beliefs, attitudes, cognitive styles, epistemologies and consciousness patterns“ (Marsella, 1988). ***Ethnocultural identity*** has been defined as “the extent to which an individual or group is committed to both endorsing and practicing a set of values, beliefs and behaviours which are associated with a particular ethnocultural-cultural tradition” (Marsella et al., 1990). ***Ethnocentrism*** means that the majority population will regard themselves as normative, whereas the experiences of the minority populations will be regarded as deviant. Ethnocentrism could therefore sometimes represent a preliminary stage to racism and discrimination. In epidemiological research, ***race*** is often defined as racial groups that are homogeneous in a biological sense. However, genetic differences between racial groups are small in comparison with genetic differences within racial groups (Jorde et al., 2000). Terms such as country of birth, ethnicity, and race are often used interchangeably in the literature (Scarlett & Kelsey, 2000). Even if country of birth is a crude measure, the variable is easily defined and measured and therefore useful in epidemiological research. Since there are immigrants from more than 210 countries represented in Sweden, an attempt was made to group countries together based on geographical region, economic/cultural similarities between countries, or size of the immigrant population (studies 1-3). This follows the practice in other studies in the area (Hjern et al., 2004; Morrell et al., 1999).

Acculturation involves the complex, multidimensional processes of integration and adaptation to the new country. Berry described four acculturation strategies: (1) migrants who wished to maintain their cultural identity and at the same time establish relationships with other groups in the new society were called *integrated;* (2) migrants who wished to maintain their own cultural identity and were not interested in contacts with other groups were designated as *separated;* (3) migrants who did not want to maintain their original cultural identity and wanted relationships with other groups in society were considered to be *assimilated;* and (4) migrants who were neither interested in maintaining their cultural identity nor in establishing contact with other groups were called *marginalized* (Berry, 1992; Johansson, 1997).

Mental disorders and migration

Previous studies from Scandinavia have examined the association between immigrant status and psychotic disorders, one of the most disabling categories of mental disorders. A study from Malmö, a city in southern Sweden, included all adult patients admitted for inpatient psychiatric treatment during a one-year period and found that the foreign-born patients had an increased risk of admission for schizophrenia-like psychosis compared to the majority population in Malmö (Zolkowska et al., 2001). A Danish study showed that among immigrants the relative risk of developing schizophrenia was 2.45 (95% CI 2.25-2.67) compared with Danes (Cantor-Graae et al., 2003). Many immigrant groups live under poor economic conditions, which is associated with an increased risk of psychotic disorders (Sundquist et al., 2004). A Swedish study found

that the increased risk of psychosis was considerably reduced after adjustment for socioeconomic indicators (Hjern et al., 2004).

Studies from other industrialized countries have also shown an association between immigrant status and psychotic disorders. For example, a study from Perth, Western Australia, found that Polish and Yugoslavian immigrants had higher hospital admission rates for psychotic disorders, while South-East Asian immigrants had lower admission rates compared to the Australian-born reference group (Bruxner et al., 1997). A Dutch study found an increased relative risk of schizophrenia among Surinamese- and Antillean-born immigrants, and the risks were higher for male than for female immigrants (Selten et al., 1997). Caribbean immigrants in the U.K. had a greatly elevated risk (incidence ratios above 7) of all psychotic disorders compared to the majority population (Harrison et al., 1997). In a three-centre comprehensive survey of clinically relevant first-onset psychotic syndromes conducted in London it was found that all psychoses were more common in the black and ethnic minority groups (crude IRR, 3.6 95% CI, 3.0-4.2) (Kirkbride et al., 2006).

The association between immigrant status and affective or neurotic disorders has been studied to a lesser extent than the association between immigrant status and psychotic disorders. For example, a study from the U.S. found that African-American and Hispanic middle-aged women had the highest odds of depression, while Japanese and Chinese women had the lowest odds. These differences were partly explained by socioeconomic conditions (Bromberger et al., 2004). Depression and anxiety disorders were examined among Jews from the former Soviet Union five years after their immigration to Israel, and the results showed an increase in psychopathology after immigration (Zilber et al., 2001). In contrast, recent Russian immigrants' scores on anxiety and depression scales were less than comparative data for the U.S. and notably less than comparative data for Russian immigrants to Israel (Hoffmann et al., 2006). A study from Australia found that depression and anxiety scores were higher among elderly individuals born in Greece than among the Australian controls (Kiropoulos et al., 2004). Living in the U.S. was associated with an increase in depression rates among poor African-American women. Among U.S.-born African-American women the odds of probable depression were 2.94 times greater than in African-born women (Miranda et al., 2005).

Suicide

According to WHO, global suicide rates have increased by approximately 60% during the last half-century (World Health Organization, 2006b) and awareness of suicide as a major problem is lacking in many countries worldwide. Although suicide represents one of the leading causes of death in both developing and developed countries, only a few countries have included prevention of suicide in their health care policies (Levi et al., 2003).

Suicidal behaviour includes suicidal ideas, suicide attempts and completed suicide. Suicide can be defined as death from self-inflicted injury, poisoning or suffocation where there is an intention to kill. Attempted suicide has a similar definition, although

without a lethal outcome (O'Carroll et al., 1996). However, the definition of suicide and of attempted suicide is not without problems. For example, to classify behaviour as suicidal, a judgment about the intention behind the act is needed, and this may often be difficult to assess.

Attempted suicide and suicide constitute an important public health problem, especially since suicidal acts are without doubt the most severe signs of poor mental health and suffering. Effective prevention of suicide must therefore focus on factors that are known to increase the risk of suicide. In previous research a number of factors have been found to be associated with suicide including gender (Qin et al., 2000; Spicer & Miller, 2000), age (Spicer & Miller, 2000), marital status (Johansson et al., 1997b; Kposowa, 2000), socioeconomic status (Qin et al., 2003), hospitalization for psychiatric disorders (Angst et al., 2002; Mortensen et al., 2000), and substance abuse (Oyefeso et al., 1999; Rossow & Amundsen, 1995). Several immigrant groups have an increased risk of hospitalization due to psychiatric disorders (Sundquist et al., 2004), which is associated with suicide (Angst et al., 2002; Mortensen et al., 2000).

There are approximately 8,000 cases of attempted suicide and 1,500 cases of suicide per year in Sweden according to Swedish hospital registers (The national board of health and welfare, 2006). Although suicide accounts only for a small part of the total mortality rate (approximately 2.5% for men and 1.1% for women), it nevertheless accounts for a relatively large proportion of the total mortality among persons of working age. During the past decade, suicide rates in Sweden have decreased by approximately 20% (Karlsson & Åberg, 2000). One possible reason for this decrease could be that medical treatment of depression has been facilitated by the new generation of antidepressants, i.e. serotonin antagonists. However, the incidence rates for attempted suicide have remained at the same level as before (Karlsson & Åberg, 2000). A clear gender difference appears in the rates of attempted suicide among younger individuals and is consistent even in the elderly, regardless of race or ethnicity (Blum et al., 2000; Schmidtke et al., 1996; Spicer & Miller, 2000). Attempted suicide is more frequent among women, whereas suicide is more frequent among men (Pritchard, 1996; Weissman et al., 1999). Suicidal acts are more likely to be fatal among men and the elderly, as they often use methods that are more lethal in comparison with the methods used by younger persons and women (Spicer & Miller, 2000). In general, suicide rates increase with increasing age in industrial regions of the world and the highest rates are found among persons over 65 years. However, although rates of suicide are highest in this age group it is not one of the leading causes of death, as persons over 65 years are more likely to die of other causes, such as heart disease (Karlsson & Åberg, 2000). Among persons under 45 years of age, suicide is one of the leading causes of death (Karlsson & Åberg, 2000). Higher rates of suicide have been found for divorced or widowed persons than for married persons. Living with a partner or being married seems to have a protective effect against suicide (Johansson et al., 1997b; Kposowa, 2000). Several studies indicate an important association between mental disorders and suicide rates in the general population (Angst et al., 2002; Mortensen et al., 2000), although less is known about the impact of mental disorders on suicide rates among immigrants. About 10 to 15 percent of patients formerly hospitalized with depression commit suicide (Angst et al., 1999). Other important risk factors for suicide are addiction to alcohol and/or drugs (Angst et al., 2002; Mortensen

et al., 2000). Biological-genetic factors as well as cultural/religious factors might also have an impact on rates of suicide and attempted suicide.

Various theories have tried to explain the cause of suicide (Lester, 1994). According to Durkheim, suicide is correlated with the degree of integration in society, and persons with low social status and a low level of integration have an increased risk of suicide unless they are protected by their religion or anti-suicidal norms (Durkheim, 1897). Others have criticized Durkheim for his emphasis on social factors at the expense of individual psychological and psychiatric causes, and argue that suicide nearly always occurs in people with mental disorders across various cultures (Angst et al., 2002; Cheng, 1995; Mortensen et al., 2000). However, the association between low SES and attempted suicide and suicide has been observed in many studies after Durkheim, where those with high SES and employment have lower risks of attempted suicide and suicide than those with low SES and without employment (Beautrais et al., 1998; Johansson & Sundquist, 1997; Schmidtke et al., 1996). The association between low SES and suicidal acts seems to be especially true for men (Taylor et al., 1998).

Socioeconomic status

Studies on health in immigrant populations need to include socioeconomic status (SES), because SES differs considerably between ethnic groups (Krieger et al., 1997; Scarlett & Kelsey, 2000). In addition, SES has a major impact on health (please see below). The most commonly used measures of SES in epidemiological research are income, educational status, and occupation. These factors are highly correlated to each other. For example, in most Western countries a person's income and educational status are highly correlated. A low educational level could contribute to difficulties in finding a job and a low income. Long-term unemployment creates economic disadvantages and sometimes results in exclusion from large sectors of society. Income is a useful measure of SES as it relates directly to a person's material living conditions and possibility to access to service facilities in society. Income therefore has a direct impact on a person's material surroundings, and a high income leads to fewer worries about the future and increases the possibilities of making more positive choices. Income and economic wealth have associations with mortality that are at least as strong as, and often stronger than, other measures of SES, including education, occupation, and employment (Daly et al., 1999). For example, irrespective of social class, men with greater material resources have lower rates of mortality from all causes than men with fewer material resources (Wannamethee & Shaper, 1997).

Socioeconomic status and health

A large body of evidence has established that individuals with low SES are often more likely to suffer from diseases and are at higher risk of premature mortality. A population-based study found that SES is a strong predictor of all-cause mortality in Sweden (Sundquist et al., 1997). Other studies suggest that persons with low SES have fewer contacts with the healthcare system, despite their poorer health status, than persons with high SES (McGrath, 1990; Townsend, 1982). One could argue that poor health in itself could lead to low social status. However, even if poor health affects

social mobility, the effect seems to be too small to explain the overall differences in health between social classes (Macintyre, 1997). Low SES may increase the risk of mental disorders by operating through a variety of psychosocial mechanisms such as low self-esteem, a greater degree of stress, and social exclusion, as well as through less access to safe environments and healthcare. Moreover, a greater degree of emotional problems is found among those who have experienced poverty (Beiser et al., 2002) and insecure housing (Lewis et al., 2003). Individuals with low SES are two to five times more likely to suffer from a serious mental disorder than those with high SES (Bourdon et al., 1994). However, serious mental disorders may in themselves have a negative impact upon the various components of SES (e.g. education, income, occupation) over the life course.

Finnish migration and health

Approximately 250 000 Finns, mainly labour migrants, have resettled in Sweden since World War II (Lundh & Ohlsson, 1999) and become Swedish residents. During the 1960s and the 1970s, tens of thousands of the Finnish population left Finland each year for Sweden. By the 1980s, a strong Finnish economy brought an end to large-scale migration to Sweden. In fact, the overall population flow was reversed because each year several thousands of Finns returned to Finland (Lundh & Ohlsson, 1999; Migrationsverket, 2002).

Today, Finnish migrants constitute by far the largest immigrant group (184 000 persons in 2005) and make up about 16 % of the immigrant population in Sweden (Statistics Sweden). Finland's history has been considerably more dramatic than that of Sweden. Sweden has not been involved in any wars for a long period of time, whereas in Finland the first half of the 20th century was characterized by wars and internal instability. Finland was an autonomous part of Russia until 1917, and became independent after the Russian revolution. In January 1918 this situation led to Civil War, with the Whites (rightists) and the Reds (the leftists) fighting one another to gain political power. This war ended with the victory of the white army. After that several Reds were sentenced to death and executed or sent to concentration camps. The Soviet Union attacked Finland at the beginning of World War II. Initially, the Finnish army succeeded in resisting the Soviet offensive but was finally forced to leave the Eastern parts of the country during the so-called Winter War (from November 1939 to March 1940). In 1941 Finland took part in operation Barbarossa, Hitler's attack against the Soviet Union. A few days later, the Finnish army started an offensive to recapture the lost parts of the country. Field Marshal and Supreme Commander Gustav Mannerheim led this offensive, which was defeated in 1944 by the Soviet army. During the two wars, approximately 70,000 Finnish men were killed and over 200,000 were wounded (Johansson, 1997). Sweden accepted 139,000 refugees from Finland between 1939 and 1944, among these 70, 000 children were evacuated and nearly 25% of them remained in Sweden. For many of these children this situation was a traumatic experience. "These children had experienced separation and break-up from their biological family, confrontation with a foster family or orphanage, sometimes difficult experiences from the war itself, and a change of language and culture, all of which can be very traumatic" (Johansson, 1997).

Previous studies have shown that Finnish immigrants in Sweden have poorer health than Swedes. For example, they have a higher risk of cardiovascular diseases (Gadd et al., 2003), mental illness (Saraiva Leao et al., 2005), attempted suicide (Westman et al., 2003), suicide (Johansson et al., 1997a) and over-all mortality (Bayard-Burfield et al., 1998). In addition, although Sweden and Finland are neighbouring Nordic countries, the population in Finland has a higher morbidity for cardiovascular diseases, higher suicide rates and a higher overall mortality than the population in Sweden (World Health Organization, 2006a). Several studies have investigated various aspects of health in different immigrant groups. Most of these studies have compared the health among immigrant groups with the native-born population. However, few studies have been able to compare the health among immigrant groups with the health among the population in their country of origin. This was the main purpose of study 4 in which the possible differences in self-rated health between Finns in Sweden and Finns in Finland were compared.

2 AIMS

GENERAL AIM

To study the association between country of birth and the following health outcomes: suicide attempts, suicide, hospitalization for mental disorders and self-rated health.

SPECIFIC AIMS

Study 1

The first aim of study 1 was to examine the association between country of birth and attempted suicide in a national cohort. The second aim was to analyse whether the hypothesized association between country of birth and attempted suicide remains after accounting for confounding factors including age, marital status, and SES (income).

Study 2

The first aim of study 2 was to examine the association between country of birth and suicide in a national cohort. The second aim was to analyse whether the hypothesized association between country of birth and suicide remains after accounting for confounding factors including age, marital status, SES (income), and hospitalization due to psychiatric disorders or substance abuse.

Study 3

The first aim of study 3 was to examine the association between country of birth and hospital admission due to mental disorders, i.e. psychotic, affective and neurotic disorders. The second aim was to analyse whether the hypothesized association between country of birth and suicide remains after accounting for confounding factors including age, marital status, and SES (income).

Study 4

The first aim of study 4 was to investigate the possible differences in self-rated health between Finns in Sweden and Finns in Finland. The second aim was to investigate possible differences in self-rated health between Swedes and Finns living in Sweden or Finland.

3 MATERIALS

MAIN DATA SOURCES

The MigMed database

Studies 1-3 were based on data from MigMed, a research database located at Family and Community Medicine, Karolinska Institutet. The name MigMed was chosen as an abbreviation for Migration Medicine because the inclusion of immigrants in the database makes it possible to study various health aspects in immigrant groups. All individuals living in Sweden for more than 12 months, with the exception of asylum-seekers, are assigned a unique personal number in national Swedish registers. This personal number was replaced by an unidentifiable serial number in order to provide anonymity for all individuals. The serial numbers were used in order to construct MigMed through linkage with several national registers. One important advantage of Swedish national registers is that demographic and socioeconomic data about the entire population are updated annually. Registration in national registers is compulsory by law and the completion rate in these registers is 96–99%.

The following registers were included in MigMed:

The *Total Population Register* comprises all individuals who stay in Sweden for more than 12 months and have a residence permit. It includes annual, individual data on marriages, divorces, childbirths, and emigration from and immigration to Sweden.

Louise is a register including the entire population aged 20 and above. Louise contains annual specifications of income from different sources (e.g. employment, self-employment, unemployment, and parental leave), education, employment status, place of work, and domicile.

The *Immigration Register* contains data about emigration, immigration, and country of birth of all individuals living in Sweden.

The *Swedish National Hospital Discharge Register* covers all hospitals in all regions in Sweden. It is based on WHO recommendations and contains data on all hospital admissions with dates of admission and discharge according to the International Classification of Diseases (ICD). ICD-9 was used during the period 1987–1996 and ICD-10 from 1997 onwards.

The *Cause of Death Register* contains annual information about all deaths in Sweden. All death causes are classified according to ICD-9 and ICD-10, according to WHO recommendations. The undercoverage is very low (0.36% in 1996). The coding error estimated from a sample of deaths was approximately 3%. The register is produced by Statistics Sweden and since 1994 it has been published by the National Board of Health and Welfare. The register is based on standardized death certificates. Since the autopsy frequency has decreased successively from 50 percent (1970) to 19 percent (1996)

(Lindstrom et al., 1997), the register is mostly based on the physician's statement on the standardized death certificates.

The Swedish Annual Level of Living Survey (SALLS) and Health 2000 in Finland.

Study 4 was based on survey data from the Swedish Annual Level of Living Survey (SALLS) in Sweden and Health 2000 in Finland.

SALLS has been conducted by Statistics Sweden since 1974 and contains comprehensive questions about health, education, economic resources, housing, employment, and working environment. The main purpose of SALLS is to collect information about the Swedish population's living conditions. The data are collected in face-to-face interviews conducted by trained interviewers. The interviews last approximately one hour and are mostly performed in the participants' homes. The annual sample, drawn from the Total Population Register, is a simple random sample of individuals aged 16–84 who are permanent residents in Sweden. The annual sample size has varied over the years, ranging from approximately 6,000 to 9,000 individuals. Between 1996 and 2003 the response rate was on average 78%. Analysis of the non-respondents in SALLS 88/89 showed that about 70 percent consisted of refusals, 20 percent were not found and 10 percent were ill. The reliability of the variables has been analysed by re-interviews (test-retest method) giving kappa coefficients between 0.7 and 0.9 (Wärneryd, 1991). A sample of variables has been evaluated in several re-interview studies, showing good stability over time (Statistics Sweden, 1989). Other advantages of SALLS are the availability of data, the sample size, the periodicity (annual since 1975), the construct (a national, simple random sample), and the large amount of variables, approximately 700.

Health 2000: The Finnish data were derived from the Health 2000 health examination survey, which is representative of the Finnish population aged 18 and over. The study was coordinated by the Finnish National Public Health Institute and it was completed in 2000–2001. The sample was constructed using a two-stage cluster sampling design. During the first stage, the country was regionally stratified according to five university hospital regions, each consisting of roughly one million inhabitants. From within these hospital regions a total of 80 health care districts (including 160 municipalities) were sampled as clusters so that the 15 largest health centre districts were all selected and the remaining 65 were sampled with systematic PPS sampling in each stratum. These 80 health centre districts were the primary sampling units. In the second stage, people were selected from the health centre districts using systematic sampling. The observations were weighted to reduce the bias due to non-response (Aromaa & Koskinen, 2004). During home visits the interviewers from Statistics Finland conducted a comprehensive interview using a structured and standardised questionnaire. All interviewers underwent special training before the survey started. The response rate for the interviews was 89%.

4 METHODS

Table 1 provides an overview of the four studies.

Table 1. An overview of the four studies.

	Study 1	**Study 2**	**Study 3**	**Study 4**
Data source	MigMed	MigMed	MigMed	SALLS Health 2000
Outcome	Attempted suicide	Suicide	Psychotic, affective and neurotic disorders	Poor self-rated health
Number of cases	23,527	6,442	31,612	6,443
Study design	Follow-up	Follow-up	Follow-up	Cross-sectional
Measure of risk	Hazard Ratio	Hazard Ratio	Hazard Ratio	Odds Ratio
Statistical model	Cox proportional hazard model	Cox proportional hazard model	Cox proportional hazard model	Logistic regression
Interview period	–	–	–	1996-2003 (Sweden) 2000 (Finland)
Follow-up	Jan 1, 1993 – Dec. 31,1998	Jan 1, 1994 – Dec. 31,1999	Jan 1, 1997 – Dec. 31,1998	–
Age	25-64	25-64	25-64	30-64
Sample size	–	–	–	27 923
Population size	4,469,407	4,459,806	4,563,319	–
Response rate	–	–	–	78% Sweden 89 % Finland

STUDY 1

The study population included all individuals aged 25-64 at baseline on January 1, 1993, according to the Swedish Population Register included in the MigMed research database. The unidentifiable serial number was the key to tracking all individuals during the study period. Person-years at risk were calculated from January 1, 1993, until attempted suicide, death due to all causes, emigration or end of the study on December 31, 1998.

Outcome variable

Classification of attempted suicide
Attempted suicide was defined according to the International Classification of Diseases, 9th and 10th revisions (ICD 9 and ICD 10), as deliberate self-harm (E950-

959 and X60-X84, respectively) and undetermined self-harm (E980-989 and Y10-34, respectively). Deliberate self-harm and undetermined self-harm were both classified as attempted suicide in this study. Attempted suicides that did not result in injury serious enough to require hospitalization were not included in the study. All first hospital admissions for attempted suicide from 1993 to 1998 were included in this study. The Swedish Hospital Discharge Register was compared with the Cause of Death Register to ensure that completed suicides were not included.

Explanatory variables

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

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

Socioeconomic status (SES) was defined as individual income, stratified into quartiles based on the distribution of all incomes of the total study populations. Three groups were used in the analysis: low income (1st quartile), average income (2nd and 3rd quartiles), and high income (4th quartile).

Marital status comprised two groups, i.e. (1) single and (2) married, or cohabiting individuals with children in common. Childless people who are cohabiting under marriage-like conditions are classified as being single in Swedish data.

Country of birth was defined for each individual in a geographical and/or cultural sense according to the country or region of birth. The 12 groups were chosen in order to combine countries with a comparable level of living conditions and culture. To ensure sufficient numbers for statistical data analyses, countries with fewer than 20,000 immigrants living in Sweden were combined into major regions.
All people living in Sweden were divided into 12 categories based on country of birth: (1) Swedish-born; (2) other OECD countries (including the U.S., Canada, Australia, New Zealand, Japan, and Western Europe except Finland and Southern Europe); (3) Finland; (4) Southern Europe (e.g. Portugal, Spain, Italy, Cyprus, Greece, and Yugoslavia); (5) Poland; (6) Turkey; (7) Iran; (8) Latin America (e.g. Chile, Uruguay, Argentina, and other Latin American and Central American countries); (9) Iraq and other Arabic-speaking countries (including north Africa); (10) Asia; (11) eastern Europe (e.g. the former Soviet Union, excluding former Yugoslavia); and (12) Africa (excluding north Africa).

Statistical Methods

The analyses were conducted using the SAS software package version 8. Age-adjusted incidence rates (per 100,000 persons per year) of attempted suicide were calculated between 1993 and 1998. A Cox regression model (Kleinbaum, 1995) was used to estimate the hazard ratio (HR) of attempted suicide by the different factors. The results are shown as HRs with 95% confidence intervals (CI). Women and men were analysed separately in a model adjusted for age and in a model including all explanatory

variables (age, marital status and SES). Interactions between country of birth and SES were analysed.

STUDY 2

The study population obtained from the research database MigMed consisted of all individuals living in Sweden aged 25 to 64 on January 1, 1994, i.e. 4,459,806 individuals of whom 561,479 were born abroad. The age range 25–64 was chosen because people in this group represent the socioeconomically active part of the population. The unidentified serial number was used to follow each individual until death due to all causes, out-migration, or end of the study on December 31, 1999. Furthermore, to minimize the risk of including individuals no longer living in Sweden, taxable income was used as an indicator of residence; this excluded one percent of the population with no taxable income from either employment or subsidies. This method was developed in Sweden in order to minimize bias in register studies of unrecorded out-migration (Weitoft et al., 1999).

Outcome variable

Suicide was defined according to the WHO International Classification of Diseases (9th and 10th revisions, ICD-9 and ICD-10) as death due to deliberate self-harm (E950–959 in ICD-9 and X60–X84 in ICD-10) and undetermined death (E980–989 in ICD-9 and Y10–34 in ICD-10).

Explanatory variables

Besides the main variable country of birth, the following variables, all of which are associated with suicide, were included in the analysis: gender (Qin et al., 2000; Spicer & Miller, 2000), age (Spicer & Miller, 2000), marital status (Johansson et al., 1997b; Kposowa, 2000), socioeconomic status (Qin et al., 2003), hospitalization for psychiatric disorders (Angst et al., 2002; Mortensen et al., 2000), and substance abuse (Oyefeso et al., 1999; Rossow & Amundsen, 1995).

Country of birth
In the Swedish registers 210 different countries are represented in the variable Country of birth. Therefore, country of birth was classified into eight categories based on geographical region, economic/cultural similarities between countries or size of the immigrant population. For example, Finnish-born immigrants were classified into one group because they represent the largest immigrant group in Sweden. In addition, some countries, e.g. Yugoslavia and Czechoslovakia, no longer exist. However, these countries are still recorded in the Swedish immigration registers, which were based on the name of the country of birth on arrival in Sweden. In the list below only the five largest immigrant groups are mentioned for each category.

Sweden, which was used as the reference group.

Finland

Southern Europe, which mainly included immigrants from Greece, Italy, Portugal, Spain, and Yugoslavia. Immigrants from these countries consist mainly of labour immigrants, including immigrants from Yugoslavia.

OECD countries mainly included immigrants from Denmark, (Western) Germany, Norway, the U.K., and the U.S.

Poland

Eastern Europe, which to a great extent consisted of political refuges mainly from Czechoslovakia, Estonia, Hungary, Romania, and the Soviet Union.

The Middle East mainly included immigrants from Lebanon, Iran, Iraq, Syria, and Turkey.

Other non-European countries mainly included immigrants from Chile, Ethiopia, India, Somalia, and Thailand.

Age was categorized in 10-year intervals (25–34, 35–44, 45–54, and 55–64 years).

Marital status comprised two groups: (1) single (including never married, divorced, and widowed individuals) and (2) married (including cohabiting couples with children in common). Childless people who are cohabiting under marriage-like conditions are classified as being single in Swedish data.

Socioeconomic status was defined as individual disposable income, stratified into quartiles based on the distribution of all incomes of the total study populations. Three groups were used in the analysis: low income (1st quartile), average income (2nd and 3rd quartiles), and high income (4th quartile).

Hospitalization due to psychiatric disorders or substance abuse was defined as the first hospital admission during the period 1989 through 1999 taken from the Swedish Hospital Discharge Register. The diagnostic codes were based on WHO ICD-9 and ICD-10 classifications: *Schizophrenia and other psychoses* (ICD-9: 295, 297, 298.C, 298.E, 298.W, 298.X and ICD-10: F20–F29); *Affective disorders* (ICD-9: 296, 298.A, 298.B, 300.E, 301.B, 311 and ICD-10: F30–F39); *Neurotic disorders* (ICD-9: 300.A, 300.B, 300.C, 300.D, 300.F, 300.G, 300.H, 300.W, 300.X, 306, 308, 309 and ICD-10: F40–F48); and *Substance abuse* (ICD-9: 291, 292, 303, 304, 305, and ICD-10: F10-F19). *Substance abuse* included addiction to alcohol and drugs.

Statistical Methods

The software used was the SAS software package, version 8. Age-adjusted suicide rates (per 100,000 persons per year) were calculated from January 1, 1994, until migration from Sweden, death from all causes, or the end of the study on December 31, 1999. A Cox regression model (Kleinbaum, 1995) was used to estimate hazard ratios (HR) in the different models. Results are shown as HRs with 95% confidence intervals (CI).

Women and men were analysed separately because of large gender differences in suicide risk. The final model was adjusted for all the explanatory variables simultaneously. Interaction tests between country of birth and socioeconomic status showed no obvious pattern of interactions.

STUDY 3

This cohort study of all individuals aged 25–64 years and living in Sweden, i.e. a total of 2,315,461 men and 2,247,858 women, started on January 1, 1997, and ended on December 31, 1998. All individuals were obtained from the MigMed research database. The individuals were followed until the first hospital admission due to psychotic, affective or neurotic disorders, death, emigration or the end of the study. First hospital admissions were defined as first hospital admissions during the study period.

Outcome variables

First hospital admissions during the study period for psychotic, affective or neurotic disorders were obtained from the Swedish National Hospital Discharge Register. Only main diagnoses at discharge were considered in the analysis. Diagnoses were classified according to the International Classification of Diseases (World Health Organization, 1992), 9th and 10th revisions (ICD-9 and ICD-10). The following diagnosis codes were included:

Psychotic disorders (including schizophrenia): ICD-9: 295, 297, 298.2, 298.4, 298.8, 298.9 and ICD-10: F20–F29

Affective disorders: ICD-9: 296, 298.0, 298.1, 300.4, 301.1, 311 and ICD-10: F30–F39

Neurotic disorders: ICD-9: 300.0, 300.1, 300.2, 300.3, 300.5, 300.6, 300.7, 300.8, 300.9, 306, 308, 309 and ICD-10: F40–F48

ICD-10 replaced ICD-9 on January 1, 1997. However, there is no official translation from ICD-9 to ICD-10. Therefore the diagnosis codes in ICD-10 were chosen to correspond as closely as possible to the codes in ICD-9.

Explanatory variables

Age was classified in 10-year intervals as follows: 25–34, 35–44, 45–54 and 55–64 years.

Country of birth was classified into eight categories based on geographical region, economic/cultural similarities between countries, or size of the immigrant population. For example, Finnish-born immigrants were classified as one group because they represent the largest immigrant group in Sweden. In addition, some countries such as Yugoslavia and Czechoslovakia no longer exist; however, these countries are still recorded in the Swedish immigration registers, which are based on the name of the

country of birth upon arrival in Sweden. In the list below, only the five largest immigrant groups in each category are mentioned.

Sweden, which was used as the reference group.

Finland

Southern Europe, which mainly included immigrants from Greece, Italy, Portugal, Spain, and Yugoslavia. Immigrants from these countries consisted mainly of immigrants seeking work, including those from Yugoslavia.

OECD countries mainly included immigrants from Denmark, (Western) Germany, Norway, the U.K., and the U.S.

Poland

Eastern Europe consisted largely of political refugees, mainly from Czechoslovakia, Estonia, Hungary, Romania, and the Soviet Union.

The Middle East mainly included immigrants from Lebanon, Iran, Iraq, Syria, and Turkey.

Other non-European countries mainly comprised immigrants from Chile, Ethiopia, India, Somalia, and Thailand.

Socioeconomic status (SES) was defined as individual annual income. By law, employers must report the salaries of their employees to the Swedish tax authorities. This variable included all kinds of income, i.e. salary, social welfare subsidies, and pensions. Income was initially divided into four groups of equal size and then categorized into three groups for the analysis: low income (25% of the study population), average income (50% of the study population) and high income (25% of the study population).

Marital status comprised two categories: single (including never married, divorced, widowed and cohabiting people without children) and married (including cohabiting people with children in common). Childless people who are cohabiting under marriage-like conditions are classified as being single in Swedish data.

Statistical methods

Analyses of the data in this study were done using SAS software package version 8. Age-adjusted first hospital admission rates (during the study period) were calculated per 100,000 person-years at risk of psychotic disorders, affective disorders, and neurotic disorders. A proportional hazard model (Kleinbaum, 1995) was used to estimate the hazard ratios (HR), with 95% confidence intervals (CI), of first hospital admissions in the different diagnosis categories. Person-years at risk were calculated from January 1, 1997, until first hospital admission, emigration from Sweden, death, or end of the study on December 31, 1998. Analyses of data for men and for women were

done separately in one model adjusted for age and one model adjusted for all the explanatory variables.

STUDY 4

This study used data from the Swedish Annual Level of Living Survey (SALLS) between 1996 and 2003 and from the Finnish national survey "Health 2000". Data from Sweden and Finland were combined for the purpose of analysing possible differences in self-rated health between Finns in Sweden, Finns in Finland and Swedes in Sweden. Please see above for descriptions of SALLS and Health 2000. The response rate in SALLS was on average 78% during the study years between 1996 and 2003. The response rate in Health 2000 was 89%.

Variables

All variables were based on survey data with the exception of country of birth, which was based on national population registers.

Outcome variable

Self-rated health: In SALLS, the respondents were asked to rate their health on a five-point scale (very good, good, fair, poor and very poor). Those who answered that their general health was very poor, poor or fair were considered as having poor self-rated health. Those who answered that their general health was very good or good were considered as having good self-rated health. In Health 2000, the original response categories for self-rated health were good, rather good, fair, rather poor, and poor. Those who answered that their general health was poor, rather poor or fair were considered as having poor self-rated health. Those who answered that their general health was good or rather good were considered as having good self-rated health.

Explanatory variables

Country of birth and residence was divided into three groups:

1. Finns living in Sweden
2. Finns living in Finland
3. Swedes living in Sweden

Country of residence was based on where the respondent lived at the time of the survey. Both Finnish- and Swedish-speaking individuals born in Finland were included in the category "Finns".

Age was classified in the following groups: 30-39, 40-49, 50-59 and 60-64 years of age.

Marital status was divided into two groups: (1) married/living with a partner or (2) not living with a partner.

Education was categorised in three groups based on years of education.
High level of education was defined as more than 12 years of education.
Medium level of education was defined as 10 to 12 years of education.
Low level of education was defined as 9 years or less of education.

Employment status was divided into two categories: employed and non-employed. The latter group mainly consisted of persons who were unemployed or who had retired early, housewives and students.

In SALLS, *smoking habits* was based on the following question: "Do you smoke daily?" The respondents were divided into two groups based on their answers, i.e. "yes" or "no". In Health 2000, daily smokers were defined as those who reported currently being daily smokers.

Statistical Methods

Stata version 8 was used for the statistical analysis. Men and women were analysed separately. The prevalence of poor self-rated health was estimated for men and women by country of birth and residence and the other explanatory variables. Logistic regression was used (Kleinbaum, 1994) to calculate odds ratios (OR) with 95% confidence intervals (CI) by taking the complex survey design into consideration, using the survey (svy) commands in Stata 8. Two models are presented: the first is adjusted for age, and the second is adjusted for all variables. There were no statistically significant interactions between the explanatory variables. The complex sampling design of the Finnish Health 2000 study was taken into account by using the strata and primary sampling units in the analysis. The Swedish sampling design was simple random sampling. The non-response was accounted for by using the post stratification weights. Post stratification was based on gender, age and region. In addition, in defining the post stratification weights, marital status was used in Sweden and main language was used in Finland.

ETHICS

Approval for all procedures for studies 1-3 that are included in the thesis was obtained from the Ethics Committee at Huddinge University Hospital, Karolinska Institutet (Registration no. 00/14, March 6, 2000).

Ethical approval for the Swedish part of study 4 was obtained from the Ethics Committee at Karolinska Institute in Stockholm (Registration no. 11/00 2000-03-06). Ethical approval was renewed on March 30, 2005, by the regional ethics committee in Stockholm for combining SALLS and Health 2000 in the analysis. The Health 2000 Study was approved in 2000 by the Ethics Committee for Epidemiology and Public Health in the hospital district of Helsinki and Uusimaa in Finland.

The MigMed database is unidentified, i.e. all personal registration numbers have been replaced by serial numbers. The key is kept by Statistics Sweden. The Personal Data

Act (1998:204) and the Act (1995:606) and the Ordinance (1995:1060) concerning Certain Personal Registers were used when linking different databases in MigMed. Although all data were unidentified data, use of the database is restricted under conditions of highest security. Only a few persons have written permission to perform analyses. Moreover, Statistics Sweden, the National Board of Health and Welfare, and the Center for Family and Community Medicine at Karolinska Institute in Stockholm have a secrecy agreement with defined information about how data should be used.

5 MAIN RESULTS

STUDY 1

During the study period 1993-1998, 23,527 cases of attempted suicide occurred, 4,154 of which were among foreign-born people and 19,373 among native Swedes. Among women and men there were 12,715 and 10,812 cases, respectively. The majority of cases were deliberate self-harm (85% in women and 76% in men) and the rest were undetermined self-harm. These figures varied only marginally with country of birth (data not shown).

Women from Iran, Finland, Poland, and Latin America had the highest age standardized hazard ratios of attempted suicide. The significant hazard ratios were roughly double as high as those for Swedish women. Women from the other OECD countries, Asia, Eastern Europe, and Iraq and other Arabic-speaking countries had high, significant hazard ratios, ranging between 1.26 and 1.53. The increased risks for nearly all foreign-born women changed only marginally when marital status and SES were included in the full model (Table 2).

Men from Finland and Poland had the highest, significant age-adjusted hazard ratios compared with Swedish men. Men born in other OECD countries and Iran had also high, significant hazard ratios ranging between 1.26 and 1.69. In contrast, men born in Southern Europe, Asia and Africa had lower age-adjusted hazard ratios than Swedish men (data not shown).

In the full model (Table 2), after adjusting for marital status and SES, the hazard ratios decreased for men born in Finland and Poland from 2.26 to 1.87 and from 1.70 to 1.42, respectively. Lower risks of attempted suicide compared to Swedish men (full model) were found among men who had emigrated from Southern Europe, Latin America, Iraq and other Arabic-speaking countries, Asia and Africa.

Table 2. Hazard ratios (HR) with 95% confidence intervals (CI) for attempted suicide by place of birth and sex, adjusted for SES and marital status (Cox regression, full model) 1993–1998.

	Women		Men	
Place of birth	HR	95% CI	HR	95% CI
Sweden	1	Reference	1	Reference
OECD countries	1.32	(1.19-1.47)	1.15	(1.02-1.29)
Finland	1.87	(1.75-2.00)	1.87	(1.73-2.01)
Southern Europe	1.05	(0.88-1.25)	0.59	(0.48-0.71)
Poland	1.90	(1.65-2.19)	1.42	(1.11-1.82)
Turkey	1.10	(0.82-1.47)	0.89	(0.68-1.17)
Iran	2.17	(1.84-2.56)	1.18	(1.01-1.39)
Latin America	1.67	(1.42-1.98)	0.74	(0.58-0.94)
Iraq and Arabic-speaking countries	1.40	(1.15-1.70)	0.84	(0.71-0.99)
Asia	1.59	(1.33-1.89)	0.60	(0.43-0.82)
Eastern Europe	1.44	(1.23-1.70)	0.79	(0.63-1.00)
Africa	0.75	(0.51-1.08)	0.44	(0.30-0.63)

Income (SES)				
High income	1	Reference	1	Reference
Average income	1.05	(1.01-1.10)	1.66	(1.55-1.76)
Low income	1.46	(1.41-1.57)	4.06	(3.79-4.34)
Marital status				
Married	1	Reference	1	Reference
Single	2.30	(2.22-2.39)	2.07	(1.99-2.16)
Age				
Age 25-34	1	Reference	1	Reference
Age 35-44	1.24	(1.18-1.29)	1.35	(1.28-1.41)
Age 45-54	0.94	(0.90-0.99)	1.13	(1.07-1.19)
Age 55-64	0.51	(0.48-0.54)	0.71	(0.67-0.76)

There were significant interactions between country of birth and SES. Figure 1 and 2 shows the risk of attempted suicide among men declined sharply with increasing income in almost every group while the risk of attempted suicide among women often rose with increasing income. This risk reversal was most dramatic for women from Iran, Latin America, Asia, and Eastern Europe, but also held true for other OECD countries and Iraq and other Arabic-speaking countries. Even for women born in Sweden and Poland, where the attempted suicide risk fell with rising income, it declined much less for women than for men.

Figure 1. Interaction between place of birth and SES for women in 1993-98. Age-adjusted incidence rates for attempted suicide per 100, 000 person years by place of birth and sex.
* Significant difference in rate compared to Swedish-born women with high income (P <0.05)

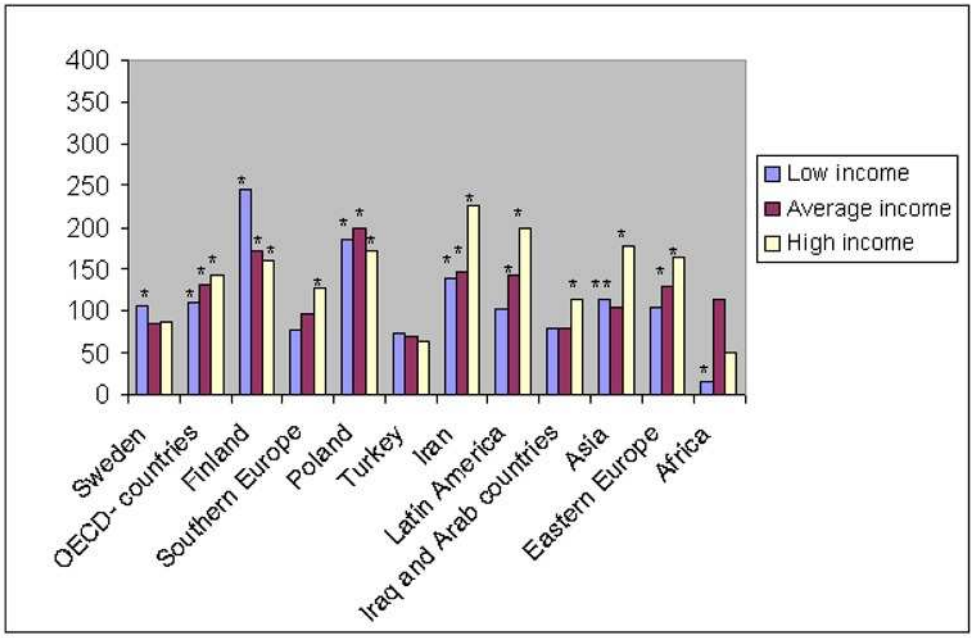
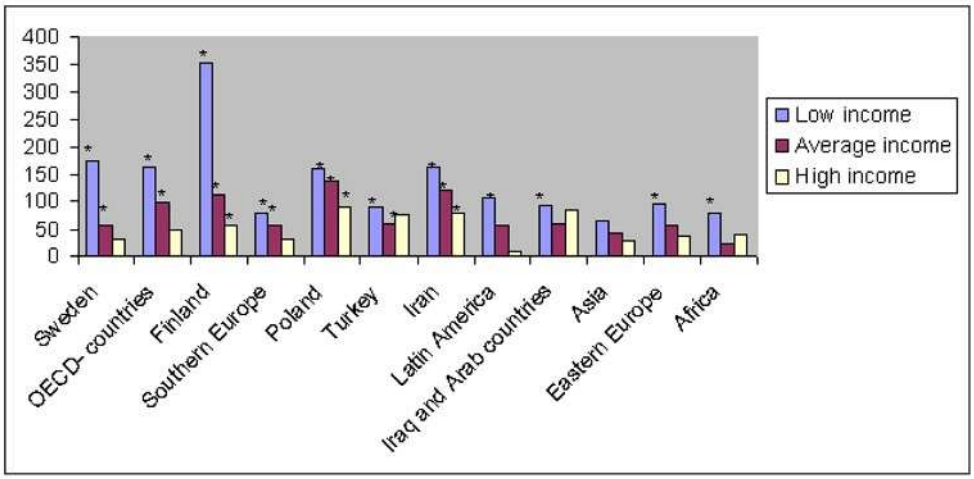


Figure 2. Interaction between place of birth and SES for men in 1993-98. Age-adjusted incidence rates for attempted suicide per 100, 000 person years by place of birth and sex.

* Significant difference in rate compared to Swedish-born men with high income (P <0.05)



STUDY 2

There were 4,596 suicides among the men and 1,846 among the women, i.e. the ratio between men and women was about 2.5. The highest age-adjusted suicide rates were found among men born in Finland (64.1 per 100,000 person-years). Their suicide rates were nearly twice as high as those for Swedish-born men (34.2 per 100,000 person-years). In contrast, men born in the Middle East had the lowest suicide rates (20.2 per 100,000 person-years) among all groups, including the Swedish-born reference group. Among women, the highest suicide rates were found among women born in Poland (29.4 per 100,000 person-years). Their suicide rates were more than twice as high as for Swedish-born women (13.7 per 100,000 person-years). As was the case for men, women born in the Middle East had the lowest suicide rates (4.1 per 100,000 person-years) among all groups (data not shown).

Table 3 (men) and Table 4 (women) show the three models in the Cox regression, after stepwise inclusion of the explanatory variables. Model 1 is adjusted for age; model 2 is also adjusted for marital status and socioeconomic status, and model 3 is also adjusted for hospitalization due to psychiatric disorder or substance abuse.

Men born in Finland was the only group with a significantly higher risk of suicide than the Swedish reference group (HR = 1.79, CI =1.58–2.05). Among the men, all other immigrant groups had the same or an even lower risk of suicide compared to the reference group. The latter was the case among men born in Southern Europe, the Middle East and other non-European countries (data not shown). All results remained

significant and almost unaltered after stepwise inclusion of the explanatory variables. However, the HR among men born in Finland decreased to 1.16 (CI = 1.03–1.32) after adjustment for age, marital status, socioeconomic status, and hospitalization due to psychiatric disorder or substance abuse in the final model.

Table 3. Hazard ratios (HRs) with 95% confidence interval (CI) of suicide by country of birth for men aged 25 to 64 years, followed from January 1, 1994, through 1999. Models 1–3, after stepwise inclusion of the explanatory variables, Cox-regression .

	Model 1 (adjusted for age)		Model 2 (adjusted for age, marital status, and socioeconomic status)		Model 3 (adjusted for age, marital status, socioeconomic status and hospitalization for psychiatric disorder or substance abuse)	
Country of birth	HR	CI	HR	CI	HR	CI
Sweden	1	Reference	1	Reference	1	Reference
Finland	1.79	(1.58–2.05)	1.50	(1.33–1.70)	1.16	(1.03–1.32)
Southern Europe	0.71	(0.53–0.96)	0.63	(0.47–0.84)	0.72	(0.54– 0.97)
OECD countries	1.09	(0.91–1.31)	1.03	(0.85–1.24)	1.09	(0.90–1.31)
Poland	1.13	(0.71–1.80)	1.00	(0.63–1.59)	1.02	(0.64–1.61)
Middle East	0.57	(0.44–0.73)	0.48	(0.37–0.62)	0.53	(0.41–0.69)
Eastern Europe	0.80	(0.57–1.12)	0.73	(0.52–1.02)	0.83	(0.59–1.16)
Other non-European countries	0.66	(0.49–0.89)	0.55	(0.41–0.75)	0.66	(0.49–0.89)

Among women, the risk of suicide was significantly higher for those from Finland, OECD countries, Poland, and Eastern Europe than for the Swedish reference group. The risk of suicide was more than twice as high among Polish-born women compared with Swedish-born women. In contrast, women born in the Middle East and other non-European countries had a significantly lower risk of suicide than the Swedish-born women. Results remained significant in the final model, except among women born in Finland. Among both men and women, low SES (income), living alone and hospitalization due to psychiatric disorders or substance abuse were associated with an increased risk of suicide (data not shown).

Table 4. Hazard ratios (HRs) with 95% confidence interval (CI) of suicide by country of birth for women aged 25 to 64 years, followed from January 1, 1994, through 1999. Models 1–3, after stepwise inclusion of the explanatory variables. Cox regression.

	Model 1 (adjusted for age)		Model 2 (adjusted for age, marital status, and socioeconomic status)		Model 3 (adjusted for age, marital status, socioeconomic status and hospitalization for psychiatric disorder or substance abuse)	
Country of birth	HR	CI	HR	CI	HR	CI
Sweden	1	Reference	1	Reference	1	Reference
Finland	1.55	(1.13–1.86)	1.43	(1.19–1.72)	1.13	(0.94–1.36)
Southern Europe	0.93	(0.58–1.44)	0.92	(0.58–1.46)	0.90	(0.57–1.44)
OECD countries	1.46	(1.12–1.88)	1.39	(1.08–1.80)	1.32	(1.02–1.71)
Poland	2.14	(1.49–3.07)	1.96	(1.36–2.81)	1.82	(1.27–2.61)
Eastern Europe	1.52	(1.04–2.23)	1.50	(1.02–2.19)	1.50	(1.03–2.20)
Middle East	0.40	(0.22–0.75)	0.44	(0.24–0.82)	0.42	(0.23–0.78)
Other non-European countries	0.83	(0.54–1.28)	0.81	(0.53–1.25)	0.84	(0.54–1.29)

STUDY 3

Among women, there were 5,233, 7,067 and 5,270 cases of first hospital admissions for psychotic, affective, and neurotic disorders, respectively. The corresponding figures for men were 5,567, 4,973 and 3,502, i.e. for psychotic disorders the number of cases was approximately equal for men and for women. In contrast, the number of cases of affective and neurotic disorders was higher among women than among men. For women, the highest first hospital admission rates for psychotic and affective disorders were found among those from Finland. For men, the highest first hospital admission rates for psychotic and affective disorders were found among those from Poland. For both men and women, the highest first hospital admission rates for neurotic disorders were found among immigrants from the Middle East (data not shown). First hospital admissions due to psychotic, affective, and neurotic disorders are referred to below as psychotic, affective, and neurotic disorders, respectively.

Women born in Finland, Southern Europe, Poland, Eastern Europe and other non-European countries had significantly higher risks of psychotic disorders than Swedish-born women, with age-adjusted hazard ratios varying between 1.55 and 1.96. For affective disorders, women born in Finland, Southern Europe, OECD countries, and the Middle East had significantly higher risks than Swedish-born women, with hazard ratios varying between 1.21 and 1.29. For neurotic disorders, all groups of foreign-born women had significantly higher risks of first hospital admissions than Swedish-born women, with hazard ratios varying between 1.23 and 2.07 (data not shown).

Table 5 shows the hazard ratios of first hospital admissions due to psychotic, affective, and neurotic disorders by country of birth for women, after adjustment for age (not shown), income and marital status (full model). For psychotic disorders, all of the increased risks among foreign-born women remained significant in the full model; hazard ratios varied between 1.32 and 1.69 for women born in Finland, Southern Europe, Poland, Eastern Europe and other non-European countries.

A similar pattern was observed for affective disorders; all of the increased risks remained significant and decreased only slightly for women born in Finland, Southern Europe, OECD countries, and the Middle East after the inclusion of income and marital status in the full model. For neurotic disorders, the risks decreased slightly and remained significant for all groups of foreign-born women in the full model, except among women from Poland and Eastern Europe.

Table 5. Hazard ratios (HR) with 95% confidence intervals (CI) of first hospital admissions due to psychotic, affective, and neurotic disorders, by country of birth, adjusted for age (not shown), income, and marital status for women followed between 1 January 1997 and 31 December 1998 (Cox regression). Significant results are in bold type.

WOMEN	**Psychotic disorders**		**Affective disorders**		**Neurotic disorders**	
Country of birth	HR	CI	HR	CI	HR	CI
Sweden	1	Reference	1	Reference	1	Reference
Finland	**1.69**	(1.52-1.88)	**1.20**	(1.08-1.34)	**1.17**	(1.02-1.34)
Southern Europe	**1.65**	(1.37-1.99)	**1.23**	(1.02-1.49)	**1.37**	(1.11-1.70)
OECD-countries	0.83	(0.68-1.02)	**1.20**	(1.04-1.39)	**1.30**	(1.10-1.54)
Poland	**1.32**	(1.04-1.67)	1.13	(0.90-1.43)	1.24	(0.95-1.62)
Eastern Europe	**1.32**	(1.09-1.59)	1.14	(0.95-1.36)	1.20	(0.97-1.47)
Middle East	1.16	(0.95-1.41)	**1.22**	(1.04-1.45)	**2.13**	(1.85-2.46)
Other non-European countries	**1.47**	(1.25-1.72)	1.02	(0.86-1.22)	**1.27**	(1.08-1.51)
Income						
High	1	Reference	1	Reference	1	Reference
Average	**3.49**	(3.14-3.87)	**1.52**	(1.42-1.62)	**1.31**	(1.22-1.41)
Low	**9.06**	(8.16-10.06)	**2.21**	(2.06-2.37)	**1.88**	(1.73-2.03)
Marital status						
Married	1	Reference	1	Reference	1	Reference
Single	**6.65**	(6.24-7.10)	**2.39**	(2.28-2.51)	**2.11**	(1.99-2.23)

Men born in Finland, Southern Europe, Poland, Eastern Europe, the Middle East and other non-European countries had a higher risk of psychotic disorders than Swedish-born men, with age-adjusted hazard ratios varying between 1.28 and 2.21. In contrast, men born in OECD countries had a lower risk than Swedish-born men (HR= 0.76; CI = 0.62–0.95). Immigrant men born in Poland and Southern Europe had significantly higher risks of affective disorders than Swedish-born men, with hazard ratios of 1.95 and 1.33, respectively. All male immigrant groups, with the exception of those born in Poland and Eastern Europe, had higher risks of neurotic disorders than Swedish-born men, with hazard ratios varying between 1.28 and 1.75 (data not shown).

Table 6 shows the hazard ratios of first hospital admissions due to psychotic, affective, and neurotic disorders by country of birth for men, after adjustment for age (not shown), income, and marital status in the full model. The increased risks of psychotic disorders decreased markedly after the adjustment and remained significant only for men from Finland, Poland, and other non-European countries. The increased risks of psychotic disorders for men from Southern Europe, Eastern Europe, and the Middle East disappeared in the full model. For affective disorders, only men born in Poland had an increased risk of affective disorders compared to Swedish-born men in the full

model (HR= 1.63; CI=1.16–2.28). For neurotic disorders, the increased risks disappeared for men from Finland, Southern Europe, and other non-European countries. In the full model, after adjustment for income and marital status, the increased risks of neurotic disorders remained only among men from OECD countries and the Middle East.

Table 6. Hazard ratios (HR) with 95% confidence intervals (CI) of first hospital admissions due to psychotic, affective, and neurotic disorders, by country of birth, adjusted for age (not shown), income, and marital status for men followed between 1 January 1997 and 31 December 1998 (Cox regression). Significant results are in bold type.

MEN	**Psychotic disorders**		**Affective disorders**		**Neurotic disorders**	
Country of birth	HR	CI	HR	CI	HR	CI
Sweden	1	Reference	1	Reference	1	Reference
Finland	**1.24**	(1.10-1.40)	0.95	(0.82-1.11)	1.08	(0.90-1.30)
Southern Europe	1.06	(0.87-1.28)	1.16	(0.95-1.41)	1.16	(0.91-1.47)
OECD-countries	**0.63**	(0.51-0.78)	0.87	(0.72-1.05)	**1.31**	(1.07-1.59)
Poland	**1.55**	(1.14-2.11)	**1.63**	(1.16-2.28)	1.09	(0.67-1.79)
Eastern Europe	1.05	(0.86-1.30)	0.90	(0.71-1.14)	0.93	(0.70-1.22)
Middle East	1.13	(0.99-1.28)	0.91	(0.77-1.08)	**1.30**	(1.11-1.52)
Other non-European countries	**1.30**	(1.12-1.50)	0.69	(0.54-0.88)	0.98	(0.78-1.23)
Income						
High	1	Reference	1	Reference	1	Reference
Average	**2.86**	(2.43-3.36)	**1.64**	(1.50-1.79)	**1.81**	(1.61-2.03)
Low	**15.80**	(13.50-18.42)	**3.23**	(2.95-3.53)	**3.96**	(3.53-4.46)
Marital status						
Married	1	Reference	1	Reference	1	Reference
Single	**6.93**	(6.36-7.55)	**2.11**	(1.99-2.25)	**1.75**	(1.63-1.89)

There was a strong association between income and first hospital admissions in all diagnosis groups for both men and women; the lower the income, the higher the risk of psychiatric admission. The association was more pronounced for psychotic disorders. The highest risk of psychotic disorders was found among men in the lowest income group; the hazard ratio was 15.80 (CI = 13.50–18.42). A similar pattern was observed for marital status; single persons had higher risks and this was also especially pronounced for psychotic disorders.

STUDY 4

The whole sample consisted of 21,991 Swedes living in Sweden, 5,096 Finns living in Finland, and 836 Finns living in Sweden. Among men the prevalence of poor self-rated health was highest among Finns living in Finland (34.1%), whereas among women the highest prevalence of poor self-rated health was found among Finns living in Sweden (33.7%). People with a low level of education, non-employed people, those not living with a partner and daily smokers had a higher prevalence of poor self-rated health in each category than the corresponding reference group (data not shown).

Table 7 shows ORs for poor self-rated health with 95% confidence intervals for Swedes, Finns living in Sweden, and Finns living in Finland according to two separate models. The first model shows the ORs of poor self-rated health adjusted for age, and the second model shows the ORs of poor self-rated health after adjustment for age, marital status, level of education, employment status and smoking. In addition, two sets of analyses were carried out. The first set of analyses was based on the entire dataset comparing Finns in Sweden and Finns in Finland with Swedes (reference group = Swedes; subtitle Finns and Swedes), whereas the second analysis was based on a subset including Finns only, comparing the possible difference between Finns in Sweden and Finns in Finland (reference group = Finns in Finland; subtitle Finns only).

(1) Finns and Swedes

Among both men and women, the ORs of poor self-rated health were significantly higher among Finns, irrespective of whether they lived in Sweden or Finland, than among Swedes. For example, Finnish men had about twice the OR of poor self-rated health compared to Swedish men. Finnish men living in Finland tended to have higher ORs of poor self-rated health than Finnish men living in Sweden, whereas an opposite pattern appeared among the women (age-adjusted model). The increased ORs decreased somewhat after inclusion of all the explanatory variables in model 2, but remained significantly higher than for Swedes (table 7).

(2) Finns only

Comparison between Finns living in Finland and those living in Sweden suggest that there is a gender difference in the association between emigration and self-rated health. For Finnish men living in Sweden, the OR of poor self-rated health tended to be lower than for Finnish men living in Finland; however, the difference was not statistically significant. In contrast, for Finnish women living in Sweden, the OR of poor self-rated health was significantly higher than for Finnish women living in Finland. Adjusting for marital status, education, employment and smoking did not affect the difference; in model 2, adjusting for all explanatory factors, the OR was 1.25 (CI = 1.02–1.54) for Finnish women living in Sweden compared to those living in Finland (table 7).

Table 7. Odds ratios (OR) for poor self-rated health with 95% confidence intervals (CI).

Variables	**Men**		**Women**	
	Model 1 [3]	**Model 2** [3]	**Model 1** [3]	**Model 2** [3]
	OR (CI)	OR (CI)	OR (CI)	OR (CI)
Finns and Swedes[1]				
Swedes	1	1	1	1
Finns in Sweden	1.91 (1.50-2.42)	1.50 (1.17-1.93)	1.75 (1.44-2.12)	1.49 (1.23-1.81)
Finns in Finland	2.26 (2.04-2.51)	1.78 (1.60-2.00)	1.42 (1.30-1.57)	1.19 (1.07-1.32)
Finns only [2]				
Finns in Finland	1	1	1	1
Finns in Sweden	0.84 (0.66-1.08)	0.84 (0.65-1.10)	1.23 (1.00-1.51)	1.25 (1.02-1.54)

1. Based on the analysis of the entire data set
2. Based on the analysis of Finns residing either in Finland or in Sweden (exluding Swedes)
3. Model 1 is adjusted for age and model 2 is adjusted for marital status, education, employment and smoking (not shown)

6 DISCUSSION

Main findings

Country of birth was associated with attempted suicide, which was only partly explained by low SES. There were important gender differences in attempted suicide, to the disadvantage of women. When the interaction between country of birth and income was analysed, the pattern of attempted suicide differed between immigrant women and men. The risk of attempted suicide among men declined sharply with increasing income in almost every ethnic group, while immigrant women showed an opposite pattern (study 1).

Among men, only those who were born in Finland had a significantly higher risk of suicide than Swedish-born men. Men born in Southern Europe, the Middle East and other non-European countries had a lower risk of suicide than Swedish-born men. Among women, those who were born in Finland, OECD countries, Poland, and Eastern Europe had a significantly higher risk of suicide than Swedish-born women. Women born in the Middle East and other non-European countries had a lower risk of suicide than Swedish-born women. Results remained significant in the final models after adjustment for age, marital status, SES and hospitalization due to psychiatric disorder or substance abuse, except among women born in Finland where the increased suicide risk disappeared (study 2).

Several groups of foreign-born men and women exhibited increased risks of a first hospital admission (during the study period) due to psychotic disorders, affective disorders and neurotic disorders. For foreign-born men, several of the results no longer remained significant after adjustment for demographic and socioeconomic factors. In contrast, most of the results remained significant for foreign-born women after adjustment for demographic and socioeconomic factors (study 3).

There was a difference in the prevalence of poor self-rated health between Finns living in Finland and Finns who had immigrated to Sweden. For Finnish women living in Sweden, the odds of poor self-rated health were significantly higher than for Finnish women living in Finland. An opposite pattern was observed among men, but the difference was not statistically significant. Among both men and women, the odds of poor self-rated health were significantly higher among Finns living in Sweden or Finland than among Swedes (study 4).

Suicide attempts, suicide and mental disorders (studies 1, 2, and 3)

Attempted suicide

The results of study 1 is in agreement with another Swedish study that found that foreign-born people had higher risks of attempted suicide than native Swedes (Bayard-Burfield et al., 1999). However, study 1 extends that work, as the number of cases allowed division into more subcategories based on country of birth. Other studies have

shown a small or no increase in the risk of attempted suicide in some ethnic minority groups (Kessler et al., 1999; Neeleman et al., 1996; Spicer & Miller, 2000). In study 1 the risks of attempted suicide varied considerably with country of birth; migrants from Poland, Finland, and Iran had roughly double the risk of Swedish-born people. A high risk of suicide attempts has also been reported for emigrants from Eastern Europe (former Soviet Union) to Israel (Ponizovsky & Ritsner, 1999). Migration from Poland and Eastern Europe to Sweden has occurred as a consequence of political and religious persecution, revolts, and poor economic conditions. In 1996, migrants from Poland had a substantially increased risk of self-reported psychiatric illness and intake of psychotropic drugs compared with the Swedish reference group (Bayard-Burfield et al., 2001), which could partly explain the findings in study 1. In addition, high levels of psychological distress have been reported among refugees from Iran (Khavarpour & Rissel, 1997; Sundquist et al., 2000) and Latin America (MacDonald et al., 1996).

In contrast, study 1 found lower risks of attempted suicide among men from Asia, Southern Europe, and Africa compared with Swedish-born men. It has been suggested that foreign-born populations are generally in better health than their native-born contemporaries due to the so-called healthy migrant effect (Strong et al., 1998). Consistent with this view, men who were labour migrants from Southern Europe had a lower risk of attempted suicide than men born in Sweden. In contrast, Finnish labour migrants had the highest risk of attempted suicide of all country groups. These findings are in agreement with the findings of Wasserman et al., who reported high rates of attempted suicide among Finnish labour migrants in Sweden (Wasserman et al., 1994). The high rates of attempted suicide among Finnish labour migrants may reflect the high rates of attempted suicide in their country of birth. In a comparison of 16 European centres, the highest average age-standardized rate of attempted suicide among men was reported in Helsinki, Finland, with 314 incident cases per 100,000 men in Helsinki, Finland (Schmidtke et al., 1996). In addition, Finnish immigrants have poorer mental health compared to Swedish-born persons (Leiniö, 1984). The lower risk of attempted suicide for Southern European men was also in agreement with the WHO/EURO multicentre study in which the lowest rate (45/100,000) was reported for men living in Spain (Schmidtke et al., 1996). In contrast to men, women from Southern Europe had a risk of attempted suicide that was similar to that of Swedish women.

Women had a higher risk of attempted suicide than men in most country groups; women from Southern Europe, Iran, Latin America, Asia, and Eastern Europe were more likely to be at risk for attempted suicide than men from the same countries. Previous studies have found that women have a higher risk of attempted suicide than men (Kessler et al., 1999; Weissman et al., 1999). Consistent with previous studies (Bhugra et al., 1999b; Merrill & Owens, 1986; Wai et al., 1999), the findings of study 1 confirm that Asian women are likely to be at high risk of attempted suicide. Attempted suicide could be regarded as a gender-related problem, which could partly be explained by marital dysfunction (Arcel et al., 1992), cultural conflicts (Bhugra et al., 1999a; Merrill & Owens, 1986) and possibly by biological differences between the sexes. In study 1, refugees from Iran, Iraq and other Arabic-speaking countries (women only) had higher risks of attempted suicide than the Swedish reference groups. These findings contradict the general expectation that Muslims run a lower risk of attempted suicide

than Christians (Alem et al., 1999). In addition, rates of attempted suicide are also low in Arabic-speaking countries (Daradkeh & Al-Zayer, 1988).

The association between SES and attempted suicide is well-known (Beautrais et al., 1998; Platt et al., 1988; Schmidtke et al., 1996), especially among men. However, even though the risk of attempted suicide decreased after adjustment for SES, the measure for SES could only partly explain the association between country of birth and attempted suicide.

Suicide

The finding that suicide rates were associated with country of birth is in agreement with previous studies (Hjern & Allebeck, 2002; Johansson et al., 1997a; Morrell et al., 1999). Further, the finding that Finnish immigrants had a higher risk of suicide is in accordance with other Swedish studies (Hjern & Allebeck, 2002; Johansson et al., 1997a). In a Swedish study based on data from the 1980s, Eastern European immigrants had an increased risk of suicide compared with the majority population (Johansson et al., 1997a). However, in study 2 an increased suicide risk was only found among women from Eastern Europe, while men from Eastern Europe had a suicide risk similar to that of Swedish-born men. These contradictory findings may be explained by the fact that study 2 was conducted a decade later on a partly new population. The finding that immigrants from the Middle East had a lower risk of suicide than the Swedish-born reference group was in agreement with previous studies (Hjern & Allebeck, 2002; Morrell et al., 1999) and may partly be explained by protective religious factors.

The suicide rates among certain immigrants may reflect the suicide rates in their country of birth. A study of suicide rates in the European Union found that Finland had the highest suicide rate, whereas the lowest suicide rates were found in many Southern European countries (Chishti et al., 2003). An important finding in study 2 is that the suicide rates among Finnish immigrant men and women were higher than among the native Finnish population. According to WHO, Finnish suicide rates varied between 37.6 and 45.2 per 100,000 person-years for men aged 25–64 and between 9.5 and 19.4 per 100,000 person-years for women in the same age group (World Health Organization, 2005). The corresponding suicide rates in study 2 were 64.1 and 23.4 for Finnish-born men and women, respectively. These differences in suicide rates between Finnish-born immigrants and the native Finnish population suggest that some factors related to migration are associated with increased suicide rates. Migration is often a stressful process that could provoke suicidal behaviour in some individuals.

Mental disorders

Previous studies from industrialized countries have shown that the rates of psychotic disorders are higher among some groups of immigrants (Cantor-Graae et al., 2003; Harrison et al., 1997; King et al., 1994; Selten et al., 2001; Zolkowska et al., 2001). For example, in Australia the rates of psychotic disorders were higher among Eastern European immigrants than in the Australian-born population (Bruxner et al., 1997),

which is in agreement with study 3. Data from the Netherlands showed that immigrants from Morocco, Surinam, Netherlands Antilles, and non-Western countries had a higher risk of psychotic disorders than natives. However, the risks for Turkish immigrants and immigrants from Western countries were not increased (Selten et al., 2001). A study from the United Kingdom found that African-Caribbean immigrants had an increased risk of psychotic disorders (Thomas et al., 1993). The conclusions of a recent meta-analysis were that migration is an important risk factor for schizophrenia and that the differential risk pattern across subgroups suggests that psychosocial adversity is involved in the development of schizophrenia (Cantor-Graae & Selten, 2005).

A large Swedish study found that some immigrant groups had higher risk ratios for schizophrenia as well as for other psychoses after adjustment for gender and age. However, the increased risk ratios disappeared or decreased considerably after adjustment for socioeconomic indicators (Hjern et al., 2004). The authors concluded that social adversity contributed to the elevated risks for psychoses among immigrants. Study 3 was based on separate analyses for women and men, and the increased risk of psychotic disorders among women was found to decrease only slightly after adjustment for socioeconomic indicators. In addition, the results for all categories of foreign-born women remained significant in the full model, which is in contrast to the results for foreign-born men.

The association between country of birth and both affective disorders and neurotic disorders was also studied and this has undergone less investigation than the association between country of birth and psychotic disorders. For example, a comparison between African-American and white patients in the U.S. found that African-American patients were less likely to be diagnosed with psychotic depression and more likely to be diagnosed with schizophrenia (Strakowski et al., 1996). A study among middle-aged Americans found higher rates of depressive symptoms among immigrants (Wilmoth & Chen, 2003). In study 3, several groups of female immigrants had increased risks of affective and neurotic disorders, while only a few male immigrant groups had increased risks of affective and neurotic disorders compared to the reference group. Another study from the United States among middle-aged women found that Hispanic and African-American women had higher risks of depression than white non-Hispanic women, whereas Chinese and Japanese women had lower risks (Bromberger et al., 2004). In contrast to the results for middle-aged women, a study of young adults living in South Florida found that African Americans had substantially lower rates of depressive disorders than non-Hispanic white participants (Turner & Gil, 2002). International migration is one of the largest challenges that humans must face. Few processes are as complex and extensive as those involved during migration, since practically everything in a person’s surroundings changes. Migration influences almost all aspects of life, ranging from daily routines, housing, family situation and social relations to climate, culture, language and SES.

Socioeconomic status

Socioeconomic disadvantage can adversely affect mental health (Williams & Williams-Morris, 2000). Low SES is associated with both poor mental health (Sundquist et al.,

2004) and suicide (Qin et al., 2003). The strong association between low SES and psychiatric admission rates in study 3 is consistent with the results of previous studies (Boardman et al., 1997). In study 3, low SES was a strong confounding factor that reduced the increased risks of mental disorders, especially among male immigrants. This could partly be explained by the fact that men are still regarded as the main breadwinner in the family. Men with low incomes might experience a stronger social stigma than women with low incomes. However, caution must be exercised when drawing any conclusions about causal relationships. The "causation" hypothesis implies that low SES causes mental disorders while, in contrast, the "selection" hypothesis implies that individuals suffering from mental disorders are unable to reach higher socioeconomic strata (Dohrenwend et al., 1992).

Low SES may represent a temporary condition in the resettlement process for immigrants. However, for many immigrants low SES is a permanent condition. Many foreign-born persons appear to carry the double burden of belonging to an ethnic minority and low SES. Although foreign-born persons have the same legal rights in the labour market as Swedish-born persons, the unemployment rates for many of them seem to be considerably higher (Rosmond et al., 1996). According to Statistics Sweden, foreign-born persons generally earned 16% less than Swedish-born persons in 2002 (Statistics Sweden, 2004). Income level also seems to be related to time since arrival in Sweden (Statistics Sweden, 2004), which represents a proxy measure for acculturation status (Ryder et al., 2000). In Australia, immigrants were found to be at a disadvantage in the labour market (Maani, 1994). Among immigrants in Sweden, financial difficulties may be a strong predictor of psychological distress (Sundquist et al., 2000). On the other hand, some immigrants experience high levels of achievement in the labour market (Boyd M, 1998) and consequently have a better socioeconomic situation than others. However, study 3 demonstrates that socioeconomic factors alone cannot explain the increased risk among certain immigrant groups of being hospitalized for mental disorders, which shows that other factors are involved in the increased risk of mental disorders, suicide attempts and suicide among certain immigrant groups.

Social networks

Previous studies have found an association between mood disorders, suicidal behaviours and poor social networks (Amann, 1991; Cheng et al., 2000; Hirschfeld et al., 2000; Johnsson Fridell et al., 1996). The increased risks of mental disorders among certain immigrant groups could thus be explained by lack of social stability and social support (Selten et al., 2001), which is associated with depression in the majority population (Amann, 1991). According to sociologist Steven Stack, "migration can break important ties between the individual and the social system including bonds to relatives, co-workers, familiar geography, and neighbors" (Stack, 2000). Poor social networks could thus partly mediate the increased risk of mental disorders, suicide attempts and suicide among certain immigrant groups. A review of the mental health among Mexican Americans in the U.S. found that Mexican-born immigrants, despite significant socioeconomic disadvantages, have better mental health profiles than U.S.-born Mexican Americans (Escobar et al., 2000). The authors concluded that one possible explanation for the better mental health among first-generation Mexican

immigrants is that they have better traditional family networks. Among second-generation Latin-Americans poor family networks increased the risk of depression (Hovey & King, 1996), which in turn is a strong risk factor for suicide (Angst et al., 2002). In a Canadian study the effect of migration on suicide varied depending on religious background (Trovato & Jarvis, 1986). For example, immigrants with Catholic backgrounds had lower suicide rates than immigrants without Catholic backgrounds. The authors hypothesized that this was due to stronger community ties in the Catholic immigrant groups (Trovato & Jarvis, 1986). Study 2 showed that among women, several immigrant groups had an increased risk of committing suicide. Among men, only those from Finland had an increased risk of committing suicide. It is possible that women may be more vulnerable than men to the loss of social ties due to migration.

Nearly all people who emigrate will experience loss at one time or another. Migration may force people to be physically separated from their families and loved ones and therefore cause grief as well as worry about those left behind. The losses experienced with migration include separation from people but also from familiar places, which may lead to mourning and grief that result in psychological problems. It is possible that refugees are more strongly affected by these losses because of their lack of choice. Many refugees have been forced to migrate and lack the possibility to return.

Traumatic experiences

Most refugees have been exposed to traumatic experiences both before and after migration and could therefore have an increased risk of mental disorders in the new country. Many factors during the migration process might lead to prolonged and chronic psychological distress including struggles during the journey, feelings of insecurity during the asylum process, difficulties in finding housing and getting a job, learning a new language, insecure physical environments, segregation, discrimination and racism. The uncertainty that is present during the asylum process puts many refugees under an enormous amount of psychological stress (Procter, 2005).

Traumatizing experiences of war and persecution could partly explain the increased risk of being hospitalized for mental disorders among some groups of immigrants. Dutch-Australian immigrants who had experienced World War II often suffered from posttraumatic stress disorder (PTSD), which is classified as a neurotic disorder (Den Velde et al., 2000). The prevalence rates of anxiety, depression and PTSD were high among Senegalese refugees (Tang & Fox, 2001). In addition, anxiety and depression were associated with each pre-migration traumatic event among Somali refugees in the U.K. (Bhui et al., 2003). Traumatic events and human rights violations before migration increased the risk of mental disorders in refugees, and this persisted 20 years after migration (Sabin et al., 2003). It is likely that many immigrants from the Middle East and other non-European countries have been exposed to war, political violence, and persecution. However, the suicide rates in these immigrant groups were lower than among the Swedish reference group. The low rates of suicide among immigrants from the Middle East and other non-European countries may be explained by protective religious factors maintained after migration (Burvill, 1998).

Selection theories

Migration could also include a selection process where individuals who are poorly adjusted in their home country migrate. Ödegaard, found higher rates of schizophrenia, controlled for sex and age, in Norwegians who had immigrated to Minnesota than in the native-born population and in Norwegians who had remained in Norway (Ödegaard, 1932). He also found a higher rate of schizophrenia among immigrants who returned to Norway. On the basis of these findings Ödegaard suggested two psychosocial theories, the selection theory and the stress theory. The selection theory stated that pre-schizophrenic individuals who were poorly adjusted and discontented with their home country were more prone to migrate. Ödegaard found an overrepresentation of personal disturbances, such as restlessness and anxiety, among single immigrants, often young men, who felt discontented with their situation in the home country. The stress hypothesis suggested that increased levels of stress related to migration may explain part of the increased psychiatric hospital admission rates among Norwegians in the U.S. (Ödegaard, 1932). In contrast, Marmot et al., proposed the notion of a healthy migrant effect, where the health status in immigrants is better than in the native-born population due to selective migration, i.e. a positive selection of healthy people (Marmot et al., 1984).

Although it may be argued that migration is a stressful process with a negative impact on mental health, it is also possible that migration creates positive opportunities such as better employment and thereby better life circumstances and health. Many migrants will experience hope for a brighter future, which replaces the lack of prosperity experienced in their home country. Nearly all individuals, irrespective of ethnic background, will at some time experience an unexpected loss or a serious setback that may lead to profound sadness, grief or distress. However, negative experiences do not necessarily lead to mental disorders. The mental health of migrants is influenced by events during the entire life course, as is the case for all persons. Difficulties during childhood, marital dysfunction, economic disadvantage and physical abuse might have a negative impact on mental health among immigrants, whereas personality, sensitivity, coping, and ability to gain support might have a protective effect and lead to better psychological adjustment among immigrants. However, if migration is voluntary and the encounter with the new society is positive, the feelings of loss could be replaced sooner by acceptance of the new situation, which could lead to better integration and adaptation.

Acculturation

Acculturation involves the complex, multidimensional processes of integration and adaptation to the new country (Ryder et al., 2000) and includes important factors in the adaptation process such as being gainfully employed and having good proficiency in the language spoken in the new country (Lieber et al., 2001). Acculturation could be regarded as a complex process that occurs over time in the immigrant (Ritsner & Ponizovsky, 1999; Ryder et al., 2000). It could also be regarded as a process that is relatively closely associated with the process of socialisation. For example, individuals with good social skills could be more likely to achieve high levels of acculturation in the host country, which in turn could imply better job opportunities and social

networks. It is likely that higher levels of acculturation may result in better social networks and socioeconomic conditions, including higher levels of education and income, which in turn could influence health.

Level of acculturation is associated with depression in studies across culturally diverse immigrant groups. For example, a study from the U.S. of midlife immigrant women from the former Soviet Union showed that higher acculturation levels, measured by English language and American behaviour, indirectly promoted mental health by reducing social alienation and, subsequently, lowering family and personal stress, both of which had direct relationships to symptoms of depression (Miller et al., 2006).

A study of Mexican-origin individuals in Texas found that self-rated mental and physical health outcomes differed by level of acculturation after accounting for individual characteristics (Franzini & Fernandez-Esquer, 2004).
However, the distribution of individual strengths, such as social support, and perceived personal opportunities reflected a socioeconomic gradient related to language use. The authors found that personal factors affected health outcomes differently. In addition, in determining individual strengths, their influence on health was characterized by a complicated interaction between acculturation and socioeconomic factors (Franzini & Fernandez-Esquer, 2004).

Discrimination

Chronic discrimination could partly explain the increased risk of being hospitalized for mental disorders among certain immigrant groups in study 3. Darker skin was associated with an increased level of discrimination experienced by African-Americans (Williams, 1999). In addition, chronic discrimination might evoke psychosis-like phenomena. A Dutch longitudinal study found that discrimination was associated with psychosis-like phenomena (Janssen et al., 2003), which in turn constitute a risk factor for the development of psychotic disorders (Poulton et al., 2000; van Os et al., 1995) and, subsequently, suicide (Mortensen et al., 2000). A study from the U.K. found that discrimination was associated with an increased risk of psychotic disorders among minority groups (Karlsen & Nazroo, 2002).

One aspect of discrimination and social stigmatization involves the fact that newly arrived immigrants are often directed to the most disadvantaged and segregated neighbourhoods (Kuusela, 1993). Previous studies have shown strong associations between neighbourhood characteristics and different health outcomes (Kawachi I, 2003). Segregated neighbourhoods are often characterized by crime, teenage gangs, violence, litter, broken glass, loose dogs, derelict buildings and abandoned cars. These kinds of features could make people feel unsafe and increase negative emotional feelings, such as hopelessness and alienation, with a potential negative impact on people's mental health. In addition, the association between mood disorders, suicidal behaviours and poor social networks has been shown in several previous studies (Amann, 1991; Cheng et al., 2000; Hirschfeld et al., 2000; Johnsson Fridell et al., 1996). In segregated neighbourhoods people often suffer from poor social networks, leisure-time passiveness, and alienation (Dalgard, 1980; Lindberg G & Lindén AL,

1986; Sundquist & Rosén, 1993; Tonboe, 1988). Thus, poor social networks and alienation might act as possible mediators between neighbourhood socioeconomic characteristics and mental disorders and suicidal behaviours. Finland was a part of Sweden for centuries, and the two countries are neighbours. Therefore, it seems odd that the risk of suicide among Finnish-born immigrants in Sweden is higher than in the native Finnish population. However, for a long period of time native Swedes discriminated against Finns. For example, Finns living in the northern parts of Sweden were not allowed to speak in their mother tongue until quite recently (Elenius, 2001).

Self-rated health among Finnish immigrants in Sweden (study 4)

To our knowledge, no previous study has compared the rates of poor self-rated health between Finns living in Sweden and Finns living in Finland. Although the different findings for Finnish women as compared to Finnish men remains unexplained in this study, the results suggest that the effect of migration on self-rated health may vary according to gender. For Finnish women living in Sweden the odds of poor self-rated health were significantly higher than for Finnish women living in Finland. An opposite pattern was observed among men, but the difference was not statistically significant.

The finding that Finns living in Sweden had higher odds of poor self-rated health than Swedes is consistent with previous studies of different health aspects among Finnish immigrants in Sweden (Albin et al., 2005; Gadd et al., 2003; Hjern & Allebeck, 2004; Hjern et al., 2004; Iglesias et al., 2003; Westman et al., 2003). The finding that Finns living in Finland rated their health as poorer than Swedes is consistent with a Nordic study where the prevalence of poor self-rated health was higher in the Finnish population than in the Swedish population (Kunst et al., 2005). Finns are heavier consumers of tobacco (Gallus et al., 2006) and alcohol (Makela et al., 2001) than Swedes, and are more often overweight (Rahkonen et al., 1998). The results concerning smoking are consistent with these findings. Other studies have found that self-rated health is related to smoking habits, physical activity and nutrition (Schulz et al., 1994; Shields & Shooshtari, 2001), which indicates that the difference in health between the Finnish and the Swedish populations could partly be explained by lifestyle factors. In addition, higher rates of several diseases have been observed in Finland than in Sweden (World Health Organization, 2006a).

In addition to lifestyle, there are several other possible explanations for the differences in self-rated health between Finns living in Sweden and Finns living in Finland. These differences could be influenced by factors associated with the migration process, such as socioeconomic conditions, poor social networks, and poor integration and acculturation in the new country. The results of study 4 show that non-employment and low level of education are associated with increased odds of poor self-rated health, which is consistent with previous research (Al-Windi, 2005; Heistaro et al., 1996; Wiking et al., 2004). Many Finns living in Sweden have lower employment rates, lower earnings and lower levels of education than the majority population (Saarela & Rooth, 2005). In study 4 the increased odds of poor self-rated health among Finns decreased but remained high even after adjustment for education and employment status, which suggests that factors in addition to socioeconomic conditions must be at work. For

example, a Swedish study found a strong association between migration and poor self-rated health that was partly was mediated by poor acculturation and discrimination (Wiking et al., 2004).

Historical discrimination against Finns living in Sweden has been described (Elenius, 2001). In addition, integration of Finns into the Swedish labour market has not been eased by the close social and geographic distance between the countries or the long history of free labour migration between Sweden and Finland (Saarela & Rooth, 2005). However, although Finland and Sweden are closely associated from a social and geographic point of view, they differ regarding culture and language. The Swedish and Finnish languages are very different from one another. Swedish belongs to the Indo-European language group while Finnish belongs to the Finno-Ugric language group. Although information about the language that was spoken is lacking in study 4, this language difference has remained a barrier for many Finns living in Sweden, which could have a potential negative impact on health.

Cultural and behavioural explanations underlying poor health

In order to cooperate in social groups, humans have developed certain ways of living, distinct behaviour patterns, shared language, and norms or beliefs that can be broadly termed "culture". This makes culture an important, as well as debated, contextual variable. In one sense culture could be described as a specific lifestyle shared by a specific group of people. In this perspective, differences concerning beliefs and lifestyles may explain part of the differences between immigrants and the non-immigrant population. In using cultural explanations, it should be kept in mind that culture is not static and that the majority population easily regards themselves as normative and minorities as abnormal (Littlewood, 1992). Cross cultural explanations for health and disease may vary among different ethnic groups in their conceptualization, diagnoses and treatment. Differences between ethnic groups in culturally-bound lifestyles may also affect health. For example, the high prevalence of obesity in African-Americans has been explained in part by cultural factors (James, 2004). Cultural norms associated with different ethnic groups may affect the experience and reporting of symptoms of depression. For example, in some cultures depression may be experienced largely in somatic terms (Baarnhielm & Ekblad, 2000). However, the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) asserts that a symptom should not be overlooked because it is part of a cultural norm (American Psychiatric Association, 2000). However, although there are differences between countries in the prevalence of depression (Copeland et al., 1999), a collaborative study conducted by WHO involving depressive patients from Canada, Iran, Japan, and Switzerland found considerable similarities in depressive symptoms across cultures when depressive disorders were assessed (Jablensky et al., 1981).

Genetic and biological factors

Although the focus of this thesis was mainly social epidemiologic, many of the mechanisms involved in the development of mental disorders might lie in a genetic and biological predisposition. A review from Johns Hopkins University found that family,

twin and adoption studies have provided major evidence for the role of genetics in several psychiatric disorders including obsessive-compulsive disorder, panic disorder, major depressive disorder, bipolar disorder, and schizophrenia. However, these disorders are of a complex nature and the search continues for patterns of inheritance and candidate genes for these complex disorders (Shih et al., 2004). Most underlying causes of mental disorders remain unknown. Although there is a strong heritable component to mental disorders, a combination with environmental influences is often needed in order to result in increased vulnerability. Evidence from preclinical, epidemiologic, and clinical studies convincingly demonstrates that stressful or traumatic events in early life increase the risk for mental disorders in adulthood (Nemeroff & Vale, 2005). In addition, corticotropin-releasing factor (CRF) has been identified as an important mediator of the stress response. Physical or sexual abuse during childhood results in long-lasting changes in the CRF-mediated stress response and a greatly increased risk of depression in genetically predisposed persons (Nemeroff & Vale, 2005). Thus, an adverse social and psychological environment could lead to neurobiological changes and depression. Severe depression could lead to suicide, an important public health problem in many countries. Suicide is associated with dysfunctional impulse control and/or social isolation and hopelessness, which in turn are related to the serotonergic system (Joiner et al., 2005). Evidence of involvement of the serotonergic system in suicidal behaviour has been obtained from the brains of suicide victims. The noradrenergic and dopaminergic systems have also been suggested to play a role in suicidal behaviour (Mann, 2003). A recent study of depressed suicide attempters measured levels of the dopamine metabolite homovanillic acid in cerebrospinal fluid and found that dopaminergic abnormalities were associated with suicidality but not with depression (Sher et al., 2006).

Although genetic and biological differences exist between racial groups, most differences are small in comparison with genetic differences within racial groups (Jorde et al., 2000). In addition, most mental disorders do not seem to be inherited in a simple Mendelian pattern. Until a specific gene is found for the mental disorder in question and this specific gene is found to be more common in certain racial groups, it will not be possible to claim that the differences in rates of a certain mental disorder between population groups is explained by genetic factors. Further research is needed regarding the interplay between genetic and environmental factors.

LIMITATIONS AND STRENGTHS

Studies 1, 2, and 3

One limitation is the application of the concept country of birth. For example, the categories based on country of birth are broad and generalizing. However, the combination of countries was based on geographical closeness and political, economic and cultural similarities, such as in the category “Eastern Europe”. In addition, the variable country of birth is not equivalent to an individual’s ethnicity. However, study 1-3 included the entire Swedish-born population, aged 25–64 years, and the only possibility for measuring ethnicity in an entire population was through the variable country of birth. In addition, country of birth has been used as a proxy for ethnicity in

other comparable cohort studies (Hjern & Allebeck, 2002). Second, it was only possible to adjust the results for hospitalization due to psychiatric disorder or substance dependency; data on outpatients were not available to us since the entire population in those ages was included. This implies that the data underestimate the true occurrence of mental disorders in the whole population. Access to alternative treatments and/or primary care and other general factors related to the probability of being admitted to hospital could affect hospitalization rates in the foreign-born population. Many admissions were re-admissions, which means that the results could be biased by a greater risk of re-admission in certain immigrant groups compared to the others. Third, it is possible that residual confounding exists. For example, in a study of socioeconomic status in African-Americans and whites it was found that residual confounding was present (Kaufman et al., 1997). Fourth, it was not possible to include individual social networks, since data comprised the entire population. However, marital status was included, which is a part of an individual's social network. Fifth, it is not possible to draw any conclusions about causal relationships. Sixth, due to cultural differences in how symptoms are presented, it is possible that some immigrants were misdiagnosed with mental disorders. Seventh, it is possible that the suicide rates were underreported, even though some studies have suggested that the underestimation of suicide rates is more modest than generally assumed (Sainsbury & Jenkins, 1982; Speechley & Stavraky, 1991). However, suicide and undetermined deaths were combined in study 2, as other studies have suggested that most cases of undetermined death are mainly due to suicide (Ohberg & Lonnqvist, 1998). In addition, 10-50% of all suicide attempts do not lead to medical treatment (Kjoller & Helweg-Larsen, 2000). Therefore, study 2 included both deliberate and undetermined self-harm in the classification of suicide attempts.

The limitations of study 1-3 are balanced by their strengths. First, the study population consisted of all men and women aged 25–64, about 4.5 million individuals. Second, data from the national database were nearly 100 percent complete for all variables. Third, the models were adjusted for the important confounders socioeconomic status (study 1-3) and hospitalization due to psychiatric disorder or substance dependency (study 2). Fourth, because of the unique Swedish identification number, replaced by a serial number in order to provide anonymity in all registers, it was possible to follow each individual during the whole follow-up period. A personal identification number is assigned to each person in Sweden for their lifetime, including refugees and immigrants staying in the country for more than twelve months. The number is recorded in all registers and was used for record linkage between the registers. Fifth, men and women were analysed in separate models after adjustment for demographic and socioeconomic factors. Sixth, the drop-out rate in national registers is exceptionally low, as registration is mandatory according to Swedish law. Seventh, some immigrants may have returned to their home country without informing the Swedish authorities (Weitoft et al., 1999). However, in order to minimize this problem, persons for whom no income was reported to the tax authorities in Sweden were excluded. Eighth, hospital care in Sweden is available to all Swedish residents, irrespective of individual income. Socioeconomic differences are therefore not likely to constitute a selection bias regarding access to hospital care.

Study 4

One limitation is the subjective nature of the outcome variable, i.e. self-rated health. However, several studies have shown that self-rated health is a good predictor of mortality (Idler & Benyamini, 1997; McGee et al., 1999; Sundquist & Johansson, 1997), and self-rated health has been recommended for comparisons of health status between populations (de Bruin et al., 1996). In addition, the measure of health is self-reported, which implies a risk of over- or underestimation of the actual prevalence of poor health. However, self-rated health has a high reliability when examined in test-retests (Lundberg & Manderbacka, 1996). Second, response bias may have occurred if the non-respondents differed from the respondents with respect to the outcome measure. However, the non-response rate was relatively low compared to rates in many other similar types of surveys.

The limitations of study 4 are balanced by several strengths. First, the response rate in Health 2000 was almost 90% and in SALLS it was on average 78% during the study years. The high participation rates in both the Finnish and the Swedish surveys mean that there is a minimum of selection bias. In addition, the similarities between Finland and Sweden regarding the survey questions and the approach used in the collection of data made valid comparisons between the two countries possible. Both Statistics Sweden and the Finnish National Public Health Institute are well-established governmental organizations with a long tradition of conducting national surveys. This is exemplified by the high reliability of the survey questions in SALLS, collected in face-to-face interviews by well-trained interviewers. The high reliability was determined when a sample of the participants were re-interviewed (test-retest method) (Statistics Sweden, 1989).

CONCLUSIONS AND IMPLICATIONS

Country of birth was associated with suicide and attempted suicide. Low SES could only partly explain these associations. Moreover, there were important gender differences; attempted suicide was more common among women, whereas suicide was more common among men. In addition, interaction tests revealed that the risk of attempted suicide among men declined sharply with increasing income in almost every immigrant group, whereas many immigrant women had an opposite pattern. Previous hospitalization for mental disorders and substance abuse were important confounders in the association between country of birth and suicidal behaviour. Several groups of immigrants, both men and women, had increased risks of a first hospital admission due to psychotic disorders, affective disorders and neurotic disorders, even after adjustment for demographic and socioeconomic factors. In addition, the impact of demographic and socioeconomic factors on this risk was larger for men than for women. For foreign-born men, several of the results no longer remained significant after adjustment for income and marital status, while for foreign-born women most of the results remained significant after the adjustment.

For Finnish women living in Sweden, the odds of poor self-rated health were significantly higher than for Finnish women living in Finland. An opposite pattern

appeared among men; Finnish men living in Finland tended to have higher odds of poor self-rated health than Finnish men living in Sweden, although not to a statistically significant extent. These findings suggest that migration may have a different effect on self-rated health for Finnish men as compared to Finnish women.

Policies for preventing suicide must take into account the increased risk of suicide in certain immigrant groups. Other key factors for preventing suicide in especially vulnerable population groups are early detection and treatment of mental disorders and/or substance dependency. General practitioners, district nurses and other primary healthcare personnel are in a unique position to identify patients at risk for suicide. A Finnish study showed that most suicidal individuals (85%) had contacted general practitioners or other primary care services during the year of the suicide, and a minority (20%) had contacted psychiatric services (Hintikka et al., 1998). Although only a minority seek psychiatric help for mood disorders, depressed people are significantly more likely than others to visit primary health care for some other reason (Wittchen et al., 1999). In addition, studies have shown that immigrants are unlikely to use mental health services even when they have a recent mental disorder, but they may use general practitioners (Vega et al., 1999).

Finally, some mental disorders tend to affect certain population groups more than others, e.g. certain groups of immigrants, and low-income men and women irrespective of immigrant status. This means that some population groups could be regarded as having one or more risk factors for mental disorders. For example, it is likely that unemployed, single immigrants with low income have an especially high risk of developing mental disorder. However, it is also important to remember that no one is predestined to develop mental disorders, no matter how many risk factors are present. For example, most immigrants are healthy and have no contacts with mental health services. The results of the studies included in the present thesis underline the importance of stratifying immigrants by gender and taking demographic and socioeconomic factors into account in the analysis.

7 SAMMANFATTNING (IN SWEDISH)

Summary in Swedish

Bakgrund

Den globala migrationen påverkar befolkningssammansättningen i både utvecklingsländer och industrialiserade länder som Sverige. I Sverige utgör första- och andra generationens invandrare omkring 20 % av befolkningen. Migration innebär djupgående förändringar för individen som kan påverka den fysiska och psykiska hälsan negativt. Tidigare studier har visat att vissa invandrargrupper har en ökad risk för psykiska sjukdomar som i svåra fall kan leda till sjukhusinläggningar. En del av dessa sjukhusinläggningar utgörs av djupa depressioner som kan leda till självmord. Självmord har enligt WHO ökat globalt med 60 % under det senaste halvseklet och är en av de vanligaste dödsorsakerna i befolkningen förutom i de allra äldsta åldersgrupperna. Effektiv prevention av självmord bör ta hänsyn till vilka individuella faktorer som har samband med en ökad risk för självmord, t ex kön, civilstånd, socioekonomisk status, invandrarbakgrund och tidigare sjukhusinläggning för psykisk sjukdom eller missbruk. I Sverige finns unika möjligheter att inkludera hela populationen i stora befolkningsbaserade studier eftersom svenska register är höggradigt kompletta och av hög kvalitet. Personnumret (ersatt med ett avidentifierat serienummer) användes för att länka data från olika nationella register till varandra i skapandet av den databas som användes i dessa studier. De nationella registren innehöll t.ex. demografiska och socioekonomiska individuella data, slutenvårdsdata samt uppgifter om dödsorsak.

Syfte

Delarbete 1
Att undersöka sambandet mellan födelseland och självmordsförsök hos kvinnor och män efter att ha tagit hänsyn till ålder, civilstånd och socioekonomisk status.
Delarbete 2
Att undersöka sambandet mellan födelseland och självmord hos kvinnor och män efter att ha tagit hänsyn till ålder, civilstånd, socioekonomisk status och tidigare sjukhusinläggning för psykisk sjukdom eller missbruk.
Delarbete 3
Att undersöka sambandet mellan födelseland och sjukhusinläggning för psykos, affektiv sjukdom eller neuros efter att ha tagit hänsyn till ålder, civilstånd och socioekonomisk status.
Delarbete 4
Att undersöka om skillnader finns i självskattad hälsa mellan individer födda i Finland som bor i Sverige och individer födda i Finland som bor i Finland. Dessutom att undersöka om skillnader finns mellan dessa båda grupper och svenskfödda avseende självskattad hälsa.

Metod

Delarbete 1
Studiepopulationen vid studiestart 1993 utgjordes av 4,5 miljoner personer i åldrarna 25-64 varav 600 000 var utlandsfödda. Varje individ följdes till självmordsförsök, död (alla orsaker) eller längst t o m 31 december, 1998. Cox regression användes i den statistiska analysen.
Delarbete 2
Studiepopulationen vid studiestart 1 januari 1994 utgjordes av 4,4 miljoner personer i åldrarna 25-64. Varje individ följdes till självmord, död (alla orsaker) eller längst t o m 31 december, 1999. Cox regression användes i den statistiska analysen.
Delarbete 3
Studiepopulationen vid studiestart 1 januari 1997 utgjordes av 4,5 miljoner personer i åldrarna 25-64 som följdes i två år t.o.m. första sjukhusinläggning för psykos, affektiv sjukdom eller neuros. Cox regression användes i den statistiska analysen.
Delarbete 4
Data från ULF (Undersökning av Levnadsförhållanden) mellan 1996 och 2003 användes i den svenska delen av denna studie. ULF utgörs av Statistiska Centralbyråns årliga intervjuer av ett representativt urval av befolkningen i åldrarna 16-84 år. I den finska delen av studien användes undersökningen Health 2000. Logistisk regression användes för att beräkna oddsen hos män och kvinnor för dålig självskattad hälsa efter att hänsyn tagits till ålder, civilstånd, utbildning, sysselsättning
(d v s i avlönat arbete eller ej), utbildning och rökning. 21 991 svenskar, 836 finlandsfödda boende i Sverige samt 5096 finlandsfödda boende i Finland deltog i studien.

Resultat

Delarbete 1
Invandrare från Finland, övriga OECD-länder, Polen och Iran hade en ökad risk för självmordsförsök jämfört med den svenskfödda kontrollgruppen. Kvinnor födda i Latinamerika, Asien och Östeuropa hade en ökad risk för självmordsförsök jämfört med de svenskfödda kvinnorna. Män födda i Sydeuropa och Asien hade en minskad risk för självmordsförsök jämfört med de svenskfödda männen. Risken för självmordsförsök hos kvinnor från Iran, Asien, Sydeuropa, Latinamerika och Östeuropa översteg riskerna hos män från motsvarande länder. När man tog hänsyn till socioekonomisk status i analysen kvarstod de höga riskerna för kvinnor men sjönk markant hos männen.
Delarbete 2
Risken för självmord hade samband med födelseland. Hos män observerades de högsta riskerna för självmord hos de finska männen medan hos kvinnor observerades de högsta riskerna för självmord hos de finska, polska och östeuropeiska kvinnorna.
Delarbete 3
Ett flertal invandrargrupper, både män och kvinnor, hade en ökad risk för att bli inlagda på sjukhus p.g.a. psykos, affektiv sjukdom eller neuros jämfört med den svenskfödda kontrollgruppen. Demografiska och socioekonomiska faktorer hade en större inverkan på dessa risker hos de utlandsfödda männen än hos kvinnorna. Exempelvis kvarstod ett

flertal av de förhöjda riskerna för psykiatrisk inläggning inte hos de utlandsfödda männen efter att hänsyn tagits till inkomst och civilstånd. Detta till skillnad från de utlandsfödda kvinnorna där de flesta av de förhöjda riskerna för psykiatrisk inläggning kvarstod efter att hänsyn tagits till inkomst och civilstånd. Låg inkomst och att vara ensamstående ökade risken för psykiatrisk inläggning generellt.

Delarbete 4

Hos finska kvinnor boende i Sverige var oddsen för dålig självskattad hälsa signifikant högre än hos finska kvinnor boende i Finland. Ett motsatt mönster skönjdes hos männen; finska män boende i Finland föreföll ha högre odds för dålig självskattad hälsa än finska män boende i Sverige även om denna skillnad inte var statistiskt säkerställd. Både finska män och kvinnor boende i Sverige och i Finland hade en ökad risk för dålig självskattad hälsa jämfört med den svenska kontrollgruppen.

Slutsatser

Födelseland, socioekonomisk status och kön har samband med självmordsförsök, självmord och psykiatrisk inläggning. Nyckelfaktorer för att förhindra självmord är en tidig upptäckt och behandling av psykiatriska sjukdomar och missbruk, särskilt hos vissa invandrargrupper och hos män och kvinnor med låga inkomster oavsett invandrarbakgrund. Migration förefaller ha en olikartad effekt på finska män och kvinnor avseende självskattad hälsa. Framtida studier kan undersöka de komplexa mekanismer som ligger bakom dessa fynd.

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