



## Socio-economic status and risk for suicide by immigration background in Norway: A register-based national study



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### ABSTRACT

The relative importance of socio-economic factors on risk for suicide in the immigrant population may differ from that for the native population; however, few studies have addressed this issue on a national basis. With a nested case-control design and data from Norwegian population registers we identified 11,409 suicide cases in the years 1992–2012 and 191,785 sex-birthdate-matched controls. The influence of socio-economic factors on the risk for completed suicide was assessed through conditional logistic regression. Among 11,409 suicides, 1139 (10%) were individuals with an immigration background of either themselves or their parent(s). Suicide cases, as well as the controls, with an immigration background differed in several aspects of their socio-economic status from those without such a background. Being single or separated, divorced or widowed, was, however, associated with an increased risk of suicide regardless to the subjects' immigration background. Low level of education and low annual income significantly increased the risk for suicide in almost all the study subgroups. Living in the capital area was associated with a reduced risk of suicide in first-generation immigrants but an increased risk in native Norwegians. In conclusion, persons with an immigration background, as well as native Norwegians, shared most common risk factors for suicide, but the strength of associations between socio-economic factors and risk for suicide can differ by immigration background.

### 1. Introduction

Over the last decades Norway, like many other western countries, has experienced a steady increase in the number of people with an immigration background ('immigrants'). According to Statistics Norway, the proportion of first- and second-generation immigrants has gradually increased from around 1.5% of the national population in 1970 to 16.8% in 2017 (SSB, 2017b). The psychosocial well-being of immigrants, including suicidal behaviour, has become of increasing interest for suicide research. We have previously reported a lower risk for suicide death among first- and second-generation immigrants than among native Norwegians, whereas the suicide risks for Norwegian-born subjects with one foreign-born parent and foreign-born individuals with at least one Norwegian-born parent were significantly higher (Puzo et al., 2017). It is evident that suicide risk in the general population is highly associated with socio-economic factors such as single marital status or cohabitation, unemployment, low income, low level of education and living in urbanized areas, with slight differences in their effects by sex and age of the subjects (Agerbo et al., 2002; Andrés et al., 2010; Kposowa, 2000; Lorant et al., 2005a, 2005b; Mortensen et al.,

2000; Qin et al., 2000, 2003). However, knowledge on the relative importance of socio-economic factors with respect to risk for suicidal behaviour in the immigrant population is relatively lacking. The few studies having examined the impact of these factors on suicide among immigrants have identified unemployment, unmarried status and low social integration as risk factors (Bayard-Burfield et al., 1999; Duldulao et al., 2009; Johansson et al., 1997; Kposowa et al., 2008; Tinghög et al., 2007). Low educational levels have also been shown to increase the risk of attempting suicide in young immigrants (van Bergen et al., 2010). However, these studies were not based on a detailed classification of immigration background, but mostly distinguished between native-born and foreign-born subjects. Since immigrants in reality represent a very heterogeneous group, analyses should be based on a detailed classification to provide more accurate findings.

In this large population study, we wanted to use data from Norwegian national registers to investigate the associations of socio-economic factors with suicide risk according to the subjects' immigration background, and moreover to assess whether these socio-economic factors influence risk for suicide in immigrant population differently from that of the native population. We hypothesized that suicide risk is

Abbreviations: ORs, Odds ratios; 95% CI, 95% confidence interval

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associated with socio-economic disadvantages both in the natives and immigrant populations, with differences in the strength of associations.

## 2. Methods

### 2.1. Data sources, design and subjects

This nested case-control study (Clayton et al., 1993) was based on the entire population of Norway. Data were retrieved from three Norwegian longitudinal registers that were interlinked on an individual level via the encrypted personal identifier of all residents in Norway. The Cause-of-Death Register contains dates and causes of all deaths in Norway since 1969. Suicide was coded according to the International Classification of Diseases (ICD), 9th Revision for the years 1992–95 (codes E950–E959) and 10th Revision for the years 1996–2012 (codes X60–X84, Y870). The Central Population Register, computerized since 1964, contains demographic data such as country of birth, citizenship, date of immigration or emigration, alongside sex, date of birth and links to parents. The Statistics Norway's Events Database (FD-Trygd) includes data on personal socio-economic status such as place of residence, marital status, annual income and education attainment, and it keeps computerized personal records since its establishment in 1992.

Study cases were all suicides identified from the Cause-of-Death Register from 1992 through 2012 with a formal residence in Norway at the time of death, yielding a total of 11,409 suicide cases. Population controls were drawn from a 25% representative sample of the total population in the Central Population Register through a nested case-control design. Each suicide case was matched with up to 20 individuals who were alive at the date of case suicide and who had the same sex/age profile as the suicide case. If more than 20 eligible controls were available, 20 individuals were randomly selected; otherwise, all eligible controls were included. This procedure yielded a control group of 191,785 individuals.

### 2.2. Immigration background

Data on immigration background for both suicide cases and comparison controls were obtained from the Central Population Register, and categorized as native Norwegians (Norwegian-born persons to two Norwegian-born parents), first-generation immigrants (foreign-born persons to two foreign-born parents), second-generation immigrants (Norwegian-born persons to two foreign-born parents), Norwegian-born persons with one foreign-born parent, and foreign-born individuals with at least one Norwegian-born parent (including inter-country adoptees, for which our data sources do not allow us to distinguish). This is the same classification as used in our recently published study (Puzo et al., 2017), based on Statistics Norway's classification on immigration background (SSB, 2011b).

### 2.3. Socio-economic factors

Socio-economic factors included in this study were marital status, education attainment, annual income, and place of residence. This information was drawn from the Statistics Norway's Events Database for the period 1992–2012. The marital status was categorized as “married”, “single” (never married), “separated, divorced or widowed” and “unknown marital status”. Education attainment, either achieved in Norway or in foreign countries, was classified into four independent categories based on the Norwegian Standard Classification of education NUS2000 (SSB, 2003), including “compulsory education” (primary education and lower secondary education), “intermediate education” (upper secondary or post-secondary non-tertiary education), “tertiary education” (bachelor, master or doctoral degrees), and “no education or unknown education”. Annual gross income includes wages, pensions, entrepreneurial income and property income (SSB, 2017f), and it was divided into the following categories: 200,000 NOK or less, between

200,001 and 300,000 NOK, between 300,001 and 400,000 NOK, more than 400,000 NOK, and unknown annual income. According to Statistics Norway, the median gross income for all adults in Norway amounted to 225,400 NOK in 2002, and gradually increased to 340,500 NOK in 2012 (SSB, 2017f). Information concerning income was available only from 1993 and it was extracted for the year prior the year of suicide or matching; so people with a suicide or matching date before 1994 make up the majority of the missing category. Place of residence was classified as whether in the capital area of Norway (the Oslo and Akershus counties) or other areas.

### 2.4. Statistical analysis

The effect of socio-economic factors on suicide risk was estimated with conditional logistic regression models (Collett, 1991), using R statistical software (version 3.3.3) (RCoreTeam, 2017). Crude odds ratios were adjusted only for the effects of sex, age and calendar year through matching; adjusted odds ratios were further adjusted for all socio-economic factors included in the study. With the use of incidence density sampling, i.e. selecting controls from the at-risk source population at the time as cases occur, via a nested case-control design, the estimated odds ratios for a rare event (suicide) can be interpreted as relative risk (King and Zeng, 2002; Szklo and Nieto, 2014). The overall effect differences of each specific socio-economic factor on suicide risk across various immigrant groups were tested by the log likelihood ratio test. Such test was performed by comparing the likelihood value of the full model, including the immigration background variable (as main effect) and its interactions with all individual socio-economic factors, with the likelihood value of the same model excluding only the interaction between the immigration background and the specific socio-economic factor. Differences in the strength of associations between socio-economic factors and risk for suicide across specific immigrant groups were tested using the ‘linearHypothesis’ procedure in R.

In our stratified analyses assessing the influence of socio-economic factors on suicide risk specifically for males and females, we combined first- and second-generation immigrants in one group, and people with a mixed immigration background (comprising Norwegian-born with one foreign-born parent and foreign-born individuals with at least one Norwegian-born parent) in another group. The rationale for this is to enhance the statistical power for the analysis, and it is supported by our recently published findings of similarly reduced risk of suicide in the first combined group and increased risk for the second combined group (Puzo et al., 2017). We further analysed the influence of place of residence across the populations by three age groups (35 years or less, 36–64 years, and 65 years or more) to obtain more insights into this specific socio-economic factor.

For all analyses, a P value less than 0.05 was considered to be statistically significant.

### 2.5. Ethical considerations

Access to data for the study was approved by the Regional Ethical Committee for Medical and Health Research (REK South-East) and owners of the relevant individual registers.

## 3. Results

Of the 11,409 subjects who died by suicide between 1992 and 2012 in Norway, 90% (n = 10,270, 2778 females and 7492 males) were native Norwegians and 10% (n = 1139, 354 females and 785 males) were individuals with an immigration background. The latter group comprised 566 (5.0%) first-generation immigrants, 30 (0.3%) second-generation immigrants, 366 (3.2%) born in Norway with one foreign-born parent, and 177 (1.6%) born abroad with at least one Norwegian-born parent.

Table 1 shows the distribution of socio-economic factors among

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