Health status and mortality rates of adolescent and young adults in the Brussels-Capital Region: Differences according to nationality of origin and migration history

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Abstract

Adolescence and young adulthood are assumed to be the most healthy life stages, but they also imply a time of adapting risky lifestyles. Those health risks are not evenly spread in the population. Therefore, this paper addresses differences in self-rated health and all-cause mortality according to nationality of origin, migration history and education among youngsters aged 15-34 and living in the Brussels-Capital Region. The results are derived of the census 2001 linked to death and emigration for the period of 01/10/2001-01/01/2005, using logistic and Poisson regression. There are pronounced health disparities but no statistically significant mortality differences between nationalities of origin. Second generation Turkish and Maghreb youngsters are worse off than first generation migrants, regarding both health status and mortality. Educational differences are important, but do not explain all the variation. There's an urgent need to develop health programs with specific attention to the Maghreb and Turkish youngster population.

Introduction

This paper addresses social inequalities in health and mortality among adolescents and young adults living in the Brussels-Capital Region (BCR). Being healthy and keeping up a healthy lifestyle at an early age is a prerequisite for practising a steady profession, building up one's own future and growing old in adequate living standards. Young adulthood and especially adolescence are often assumed to be the most healthy life stages (Blum, 2009), but they also imply a time of adapting risky lifestyles, thinking of drug and alcohol abuse, unsafe sex, unhealthy eating patterns, etc. Those health risks are not evenly spread in the population. Although the social gradient in health is widely demonstrated (Mackenbach et al., 1997; Marmot, 2004; Solar & Irwin, 2007), the pattern is less straightforward among youngsters (West, 1997). Some conclude that there is 'social equalisation' in adolescence (Vuille & Schenkel, 2001), with school climate and social networks as stronger differentiators than family affluence (Richter & Lampert, 2008), while others stress the persistent importance of socio-economic position (SEP) (Halldorsson, Kunst, Kohler, & Mackenbach, 2000; Vereecken, Maes, & De Bacquer, 2004). Either way, parental education and social class of the parents appear not to be decisive in adolescence (Hagquist, 2007; West, 1997). Findings of Koivusilta et al (2006) also suggest that the SEP of the youngsters is a stronger indicator in adolescent health research than the parents' socio-economic indicators. As social class in adolescence and young adulthood is not yet crystalized, education is a better measure for socio-economic position. It captures

both the material and intellectual resources of the family of origin, as one's own future employment and income (Galobardes, Shaw, Lawlor, Lynch, & Smith, 2006).

Besides unequal health risks between different socio-economic positions, there are health differences among ethnic groups as well. In most Western-European countries economic migration in the sixties resulted in a large share of the population being of foreign descent nowadays. In Belgium economic migrants were mostly recruited in Turkey and Morocco and to a lesser extent in South-European and Sub-Saharan African countries (ADSEI, 2003). Poor health, both physically and mentally, is widely observed among these ethnic minorities, especially those from Maghrebin or Turkish descent (Bos, Kunst, Keij-Deerenberg et al., 2004; Reijneveld, Verheij, & de Bakker, 1999). These ethnical differences have both social and cultural grounds. Social conditions, e.g. living in more deprived circumstances and having lower educational levels than the host population, are often put forward as more important rather than ethnicity itself (Lorant, Van Oyen, & Thomas, 2008). Karlsen & Nazroo (2002), for example, found that after controlling for SEP most of the health differences between the native and foreign population disappeared. Other findings, however, suggest that it fails to explain health differences completely (Bos et al., 2004; Nielsen & Krasnik, 2010). Cultural background, beliefs and norms, acculturation and (un)healthy lifestyles are also non-negligible modifying factors (Hosper, 2007; Smith, Cahaturvedi, Harding, et al., 2000).

In Belgium, as in other Western-European countries, there is no government commitment to specifically tackle ethnic health inequalities (Lorant & Bhopal, 2010). The Belgian government offers health-care facilities to ethnic minorities through mainstream services. This can be justified by the belief that second- and third-generation migrants are more similar to the native population than first-generation migrants and should therefore not be approached any different than the native youngster population in health policies (Hosper, 2007). However, there isn't much proof for these assumptions. Most research makes the comparison between first-generation migrants and the native population, focusing on the adult population (Deboosere & Gadeyne, 2005; Lorant et al., 2008) or on the children who migrated with them (Perreira & Ornelas, 2011; Van Oort et al., 2007). Research that has focused on second-generation migrants renders credit to the opposite: instead of a decrease in the differences between natives and ethnic minorities, the differences are getting more substantial.

Poor health is an indicator for premature death, even in younger populations (Breidablik, Meland, & Lydersen, 2008). European research found an increase in adolescent and young adult mortality (Borrell et al., 2001; Heuveline & Slap, 2002). In overviews of all-cause mortality, ethnic differences are almost never included. The pattern between health and mortality seems somewhat contradictory for certain ethnic minorities (Bos et al., 2004), e.g. Moroccan and Turkish migrants generally have poorer health than the native population, but lower mortality (Nielsen & Krasnik, 2010). For adults who came to the host country through economic migration, these lower mortality rates might be due to selection processes ("The Healthy Migrant Effect") rather than reflecting real differences (Smith et al., 2000), while others stress that migrants become more prey to chronic but not life-threatening diseases (Uitenbroek &

Verhoeff, 2002). These approaches are inadequate in explaining the differences in adolescent and young adult mortality.

The following research questions are therefore scrutinized:

1) Are there differences in self-rated health and all-cause mortality between native youngsters and Maghrebins, Turks and Sub-Saharan Africans?;

2) Does self-reported health and all-cause mortality differ between the migration generations, and do the second-generation migrants tend to converge to the native population?;

3) Is education an important mediator of the relation between nationality of origin and health/mortality among adolescents and young adults?

The choice for the Brussels-Capital Region (BCR) as study location is manifold. BCR is characterised by a young and diverse population, of which more than half is of foreign descent. Also, almost one third of the foreign population living in Belgium is centred in the BCR anno 2010 (FOD Economie, 2010). The population of Brussels has become the youngest of all Belgian regions, with a mean age of 37.8 years in 2006 (Deboosere, Eggerickx, Van Hecke, et al., 2009), because the international hallmark of the capital attracts both young migrants and (foreign) students (Rea, 2009). The former move to Brussels because they can associate with the existing migrant communities; the latter to get an appropriate training or pursue an international career. Unfortunately, not all Brussels' adolescents and young adults have a bright future in front of them. Early school dropout and unemployment are high (Roesems & Feyaerts, 2010); Brussels' adolescents disproportionally live in deprived neighbourhoods, also referred to as the "poor half-moon" (Deboosere & Willaert, 2005); and their self-rated health is lower than in other Belgian regions (Van der Heyden et al., 2010). Employing the research questions to this setting, will make it possible to pinpoint some of the causes of their deprived and little rosy situation and can help in mapping health problems of Brussels' youth.

Methods

Instrument and study population

The data are derived from the 2001 census for the BCR linked to death and migration records for the period of 01/10/2001-01/01/2005. Over a period of 3.25 years from the 1st October 2001 every death or dropout as a consequence of migration is registered for the population present at the moment of the census. This database is exhaustive de jure of all people living in BCR and comprises 973,347 people. The study population consists of adolescents and young adults aged 15-34 at the moment of the census. For the aim of the study young adults aged 25-34 are included in the analysis, as there is a certain lag time of health problems that can come into play ten till fifteen years after becoming of age (18 years), e.g. health problems as consequence of bad sanitation, polluted air... Of the total population of youngsters, the

native Belgians are compared to the largest non-European migrant groups and their descendants: Turks, Maghrebins and Sub-Saharan Africans. There are 283,688 adolescents and young adults living in BCR, of which there are 37.9% Belgians, 20.0% Maghrebin, 5.4% Turks and 4.2% Sub-Saharan Africans, together making up two thirds of the total population of youngsters[1]. The excluded part consists of Europeans (26.4%) and a rest category (6.1%) of mainly Asians and (Latin) Americans.

Variables

- Nationality of Origin

To construct nationality of origin, information on the nationality of birth of both parents of the respondents who were still living at home is used. When only one of the parents is a foreigner or both are foreigners but with different nationalities, the nationality of the mother is used to determine the nationality of the child. For those who already left their parental home, information from the census of 1991 is used to construct nationality of origin. In this manner, it was possible to almost entirely reconstruct the first and second-generation migrants aged 15-34.

Nationality of origin is grouped into four categories as mentioned above. The choice for grouping the nationalities of Maghreb countries is based on history. Although the population originating from Morocco, Libya, Algeria, Tunesia and Mauritania identify themselves with their proper country of origin, they share the same history and cultural background; feeling united through being both Arab and Muslim (Lacoste & Lacoste, 1995). Most of the Maghreb youth in BCR has a Moroccan background (93.3%). Slightly more than half of the Sub-Saharan Africans originates from Congo (55.9%), as this was a former colony of Belgium.

- Migration History

First-generation migrants are defined as those who are born in a foreign country and have at least one parent who is foreign-born. *Second-generation migrants* are born in Belgium, but at least one of their parents is foreign-born. These definitions are analogous to the definitions of Statistics Netherlands (Centraal Bureau voor Statistiek, 2000). Corrections were made to identify the descendants of colonists who were born in the Democratic Republic of Congo, but of which both parents were native Belgians. Coming back to Belgium they are not seen as migrants but as natives. When analyzing the differences in health and mortality by migration history, age of migration and duration of residence are also important to take into account. Therefore, an intermediating group is constructed, indicating the '*1.5 generation migrants*'. Following Portes & Rivas (2011) this group includes children born abroad but brought to the host society before adulthood. These children were not totally socialized into the customs of their birth country and may therefore adapt more easily to the host country (Rumbaut, 2004). Although this group can be decomposed in different age groups, we restrict the definition to persons aged 18 or younger. As the

[1] 'Youth' and 'youngsters' will be used as synonymous for adolescents and young adults aged 15-34. When a specific

migration data are incomplete – for a non-negligible share of the migrants the migration year was missing, see Table 2 - not all migrants could be attributed to this category and will be left out of the analyses.

- Self-rated health (SRH)

The health status at the moment of the census was measured through self-assessment, by answering the question: "What is your general state of health?" on a 5-point Likert-scale from 1 'Very good' till 5 'Very bad'. This variable has been recoded into a dummy variable with 1 standing for 'Good health' and 2 'Poor health'. The latter includes the answers 'moderately, poor and very poor health'. Self-rated health is a widely used measure in health surveys and proves to be a good indicator for later morbidity and mortality, even when it's measured during adolescence (Breidablik et al., 2008). Nevertheless, there is discussion of its use in comparing different ethnic groups, as the meaning of self-rated health might differ between them (Shetterly, Baxter, Mason, et al., 1996). Chandola & Jenkinson (2000) found that there was little evidence that SRH differed between ethnic groups, whereas Agyemang et al. (2006) found it was an invalid measure for interethnic health comparison. Nielsen & Krasnik (2010) noted that including other, more objective measures is advisable and also checking for migration history might lower the possibility of measuring artefacts rather than real health differences. Using SRH with caution is recommended either way.

In the total young population, there were 15.8% missings on the dependent variable, but this differed widely across nationality of origin: 25.3% among the SSA were missing, compared to 8.8% among the Belgian youngsters. For this reason, various sensivity analyses were conducted (see infra).

- All-cause mortality

All deaths of people living in the Brussels-Capital Region at the moment of the 2001 census and dying in the period of 01/10/2001-01/01/2005 are used in the analysis. During this period, 1.3% of all deaths (N=435) were adolescents or young adults.

- Educational level

Educational level is coded into 7 groups: no/primary education, vocational/technical lower secondary education, general lower secondary education, vocational/technical higher secondary education, general higher secondary education, non-academic higher education, university or higher (doctorate). The current educational level of a lot of the youngsters, who are still in their teens or in early adulthood, is still unfinished and malleable. However, academic orientation (being technically or rather theoretically oriented) has shown to be a rough indicator of future social position and a stronger predictor than parents' education (Hagquist, 2007), which makes it useful in this situation. Missings for this variable are highest among the populations of interest, namely Maghrebin (15.9%) and Turkish youth (16.2%).

Data analysis

The first part of the results section concentrates on some descriptive results of the census, comparing the explanatory and dependent variables between Belgians, Maghrebin, Turks and Sub-Saharan Africans (SSA).

The second part focuses on the relation between nationality of origin and health. Therefore, odds ratios were calculated through logistic regression analysis, controlling for age group, gender, education and migration history. Missings for education were included in as well as excluded from the analysis through listwise deletion. Also, multiple imputation techniques were used, without important differences in the finality of the results. The last part relates to mortality differences and shows both age-standardized rates (ASMR) using direct standardisation and mortality rate ratios using Poisson regression. For the ASMR the Belgian population anno 2001 is used as standard population. The OR's and MRR's are accompanied by 95% confidence intervals (CI). The analyses are performed for both sexes separately, controlling for 5-year age groups and education. All analyses have been performed in STATA MP 11.2.

Results

Description of young population

In comparing the key variables between native youth and those from foreign descent, the *difference in age structure* is noticeable (Table 1). The share of adolescents in transition (15-24 years) is higher in Maghrebin and Turkish young men and even more pronounced in young women of the same origin.

As current educational level is used to compare *educational differences*, Table 1 split up the results for 15-19 and 20-34 year olds, to avoid misinterpretations as a consequence of differences in age structure of the nationality groups. In both age groups, the differences are higher between nationalities than between sexes. In general, youngsters of Turkish/Maghreb origin are less educated than the native or SSA youth. This is already apparent in adolescence, where Turks and Maghrebins end up more in vocational or technical education, whereas Belgians or SAA are more in general education. University level degrees are extremely low in Turkish men and women (aged 20-34): respectively 4.0 en 3.2% of the Turkish male and female young population reaches this level, compared to 28.1 and 28.6% of Belgian youngsters.

Concerning *self-rated health*, similar patterns are observed: Turkish and Maghreb youngsters tend to rate their health a little worse than Belgian/SSA youngsters. However, almost the same percentage of Turks/Maghrebins as Belgians rate their health as good (around 39-40%). In total, almost three quarters of the Turks and Maghrebins consider themselves in good or even very good health. There are no sex differences in self-rated health for Belgians (χ^2=0.88; df=1; p=0.348), but women of foreign descent tend to perceive themselves as less healthy than men.

Age-adjusted mortality rates among men show quite large differences between Turkish and Maghreb youngsters. While mortality in Turkish adolescents is rather low (57.1 per 100,000 PY; [11.8-166.9]), mortality is highest in Maghreb adolescents (106.7 [6.7-199.0]). In early adulthood the pattern reverses with high rates among Turkish youth (181.1 [93.6-316.3]). In general, the lowest rates are registered for SSA youngsters and the highest for Maghrebins. Among women the differences are less clear, with large rates for SSA women due of small sample sizes.

Table 2 describes the migration history of the youngster population. More than half of the Maghreb youth is part of the second-generation, meaning that they were born in Belgium, but have at least one parent who was born in one of the Maghreb countries. Among Turkish youth this is almost fifty per cent. This pattern is the same in men and women. Of those who migrated from Turkey, slightly more than one third recently migrated to Belgium (less than five years before 2001). The age at migration for Turkish women is somewhat younger than that of men (χ^2=32.1; df=1; p<0.001), which is also the case for Maghreb women (χ^2=240.1; df=1; p<0.001). Among Maghreb youth the reverse is true; more men than women have recently migrated (χ^2=88.7; d=1; p<0.001). Turkish first-generation migrants are generally younger than Maghrebins upon migration (χ^2=457.0; df=1; p<0.001). The distribution is different for SSA, which might be due to the different type of migration, which is more recent than the labour migration of Turks and Maghrebins in the sixties. While Turks and Maghrebins now migrate through family reunification or marriage, a large share of the SSA, most of them coming from Congo, come to Belgium as students. Because of this largely recent immigration, the share of first-generation SSA migrants is respectively 81.3% of the men and 82.8% of the women.

Relationship between nationality of origin and health

Health differences between minority groups and the native young population do exist. Graph 1a shows the odds ratios (OR) of the self-rated health of Maghreb, Sub-Saharan African and Turkish youngsters compared to native Belgian youngsters aged 15-24, separately for men and women, while Graph 1b does the same for those aged 25-34. Model 1 includes nationality of origin, while Model 2 controls for age and educational level. The health differences are more pronounced among those aged 25-34 than those aged 15-24. In the age group 15-24 the health advantage of SSA men and women is not statistically significant (OR Men: 1.20 [0.99-1.45], OR Women: 1.05 [0.98-1.35]). SSA men perceive a better health status than Belgian men at ages 25-34 (OR: 1.98 [1.69-2.31]). Turkish and Maghreb youth have lower self-rated health than the natives in both age groups. This pattern is similar for men and women, but the differences between girls are somewhat more pronounced (OR Maghreb women 25-34: 0.40 [0.38-0.43], OR Turkish women 25-34: 0.34[0.31-0.37]). These differences diminish somewhat in Model 2. Again, this pattern is stronger for those aged 25-34 than those who are still in transition. Turkish men, but especially Turkish women benefit the most from education, in both age groups. For Maghrebins aged 15-24, there isn't much difference in their health status after statistical control. At older ages, there are significant changes benefitting their health (e.g. OR Maghreb women: 0.40[0.38-0.43], and after controlling: 0.64 [0.61-0.68]). For SSA women the same happens at ages 25-34 (OR: 1.42 [1.25-1.62]). SSA men still have better self-rated health at ages 25-34 (OR: 1.70 [1.45-2.00]).

The analyses were also run in order to define the differences in health according to migration generation. As the health of Maghrebins is in keeping with the health of the Turkish youth, the analyses were run for both of these groups at once, and that of SSA separately. Three groups are compared: first-generation migrants who migrated during adulthood, those who migrated during adolescence or earlier ("1,5

generation"), and second-generation migrants. This last category functions as reference category (Graph 2). The health of second-generation men of Maghreb or Turkish descent significantly differs from Belgians, first and 1,5 generation migrants. In Model 2, the difference between second and 1,5 generation migrants disappears. Instead of becoming similar to the health status of Belgians, the second-generation Maghrebins and Turks have a worse health status: OR 1.47 [1.39-1.56]. This pattern is stronger in women, although a lot is being explained by education: OR 2.17 [2.06-2.26], and after controlling: OR 1.63 [1.54-1.73]. The health differences between first-generation migrants and the other migrant groups are less pronounced in women: OR 1.15 [1.05-1.25] after controlling. Among men, first-generation migrants tend to be healthier than second-generation migrants ($z=4.65$, $p<0.001$). Analyses according to migration generation of SSA were not included in the graph. There were no significant differences among women. Among SSA men, there were differences between all the generations, but not between Belgians and second-generation migrants. 1.5 generation migrants (OR 1.44 [1.05-1.98]) and especially first-generation migrants (OR 2.48 [1.78-3.46]) were healthier than second-generation SSA men, also after controlling for education.

Relation between nationality of origin and mortality

Direct standardization gives a first impression of the differences in mortality rates according to nationality and migration generation (Table 3). The SMR of Maghreb and Turkish youngsters is similar to that of the Belgians, both for women and men, whereas the SMR of the SSA male youth is the lowest: on average there are 16.7 deaths per 100,000 among Sub-Saharan African youngsters. There is more variation when comparing the migration generations. The confidence intervals of the migration generations of SSA men and women are however quite broad, so these results are not conclusive. The second-generation male migrants of Maghreb or Turkish descent have the highest SMR: 31.2 per 100.000 PY [23.4-38.9]. Among Maghreb and Turkish women, the 1,5 generation has the highest mortality rate: 17,7 [8.1-27.3].

Graph 3 shows the results of the Poisson regression of deaths according to migration generation of Maghrebins and Turks only, as there were no significant differences for SSA. Between different generations within the Maghreb and Turkish youngsters, there are some small differences. The 1,5 generation does not differ from the Belgian group and shows the largest confidence intervals as well. The first-generation Maghreb and Turkish migrants have lower mortality rates than their Belgian counterparts, for men (MRR: 0.45 [0.23-0.88]; $z=-3.59$, $p<0.050$) and for women, although CI shows not to be statistically significant (MRR: 0.54 [0.21-1.34]). Second-generation male Maghrebins and Turks have a higher mortality rate than Belgian males ($z=2.00$, $p<0.050$), but this difference can roughly be explained by education, as it disappears after controlling (MRR: 1.03 [0.72-1.46]). When rerunning the analysis with second-generation Maghrebins and Turks as reference category, the results mark a significant difference between first and second-generation migrant men (MRR: 0.39 [0.23-0.69]; $z=-3.29$; $p<0.010$; not in graph). The difference stays robust after statistical control: MRR of 0.44 [0.21-0.89]: first-generation male

Maghrebins and Turks have lower mortality rates than second-generation ones. There are no such differences for women of Maghreb or Turkish descent.

Education and health/mortality

As education showed to influence health and mortality differences, Table 4 depicts in detail both the odds ratios of self-rated health and the mortality rate ratios according to educational level attained, controlled for age and nationality of origin. Regarding self-rated health, there is a manifest gradient according to educational level: with every level of schooling, the self-rated health gets better. When having a university degree, the self-rated health of male youngsters is four times higher than that of male youngsters without a degree or only finishing primary school ($z=29.19$; $p<0.001$), for women even 4,5 times higher ($z=30.39$; $p<0.001$). Not only the years of schooling matter, but also the academic orientation one gets. In general, someone with a higher secondary degree has a higher self-rated health status than someone with a higher secondary degree in vocational or technical schooling, for both sexes. The story is different between men and women when comparing mortality rates. The mortality rate ratios of men are in agreement with the odds ratios: a higher educational level goes together with lower mortality rates, although not all the educational levels significantly differ from having no education. A male youngster with a lower or higher secondary degree of vocational or technical schooling has the same mortality rates as someone with no schooling, while when a male youngster finishes with a higher non-academic degree, he is less likely to die than a male youngster who has no education ($z=-3.27$; $p<0.010$). For women, the gradient is less clear, with higher MRR for the more educated than the lower educated. These differences are not statistically significant due to small group sizes and because some cause-specific deaths like breast cancer, which can come into play in the early thirties, have an inverse gradient, while the 'normal' gradient comes into play for other deaths. The combination of the two can result in inconclusive all-cause mortality rate ratios.

Discussion

Interpretation

The results show clear health differences according to nationality of origin. Maghreb and Turkish youngsters have worse self-rated health compared to Belgians, while Sub-Saharan Africans have a better health status. This pattern is more pronounced in youngsters aged 25-34 than those who are still in transition (15-24). There is a significant drop in the odds ratios of Turks and Maghrebins aged 25-34 when controlling for educational level. The differences are however not fully eliminated. Furthermore, we found significant differences between first and second-generation migrants: the latter have a worse health status than the former, and rate their health also lower than Belgians. Those who migrated before the age of 18 end up in the same situation as second-generation Maghrebins and Turks when education is accounted for. The difference between first and second-generation youngsters is smaller among women than among men.

The mortality rate ratios showed quite broad confidence intervals for the different nationalities and migrant generations. However, the results lie in the same line as in the analyses on self-rated health. The social gradient in health and mortality is apparent among adolescents and young adults: with every year of schooling, one gains a better health status.

That the health differences are less pronounced among 15-24 year olds and that education plays a lesser part in this age period is plausible, as this is the period in which the youngsters are still in a "searching" mode. They are still studying, possibly changing the direction of their educational path, looking for a first job… This might be the main reason that education is not altering the relation between health and nationality of origin that much. Although the educational level might be unfinished, the social gradient is markedly present in the transitional age period. When the final educational degree is raked in, the strength of this indicator emerges as well. Emphasizing education in the teenage years, turns it into profit when one settles down in the age period of 25-34.

Migration history plays an important part in health differences. While the health of second-generation youngsters is intuitively thought to be better than that of the first-generation, or at least more in line with that of the native population as they should be more integrated, the results suggest the opposite. Regarding Turkish and Maghreb youngsters and in line with other research (Hosper, 2007) the second-generation is worse off and education, although playing a large role in explaining the difference between Belgian and second-generation Maghreb and Turkish women, is not the whole story. That the youth of Maghreb or Turkish origin are not feeling as healthy as native Belgian youngsters is not a surprise, as they are a troubled segment in Belgian society: second and third generation migrants still have problems learning the native language, they live in the more deprived neighbourhoods of BCR and a large share have almost no social contact with native Belgians. The acculturation process moves slower than expected – being born in the BCR doesn't necessarily make the second generation more similar to the native Belgians - and might be an important contributor to the apparent differences in health as well. Other factors related to nationality of origin and their migrant status, such as cultural norms, lifestyle behaviours and the degree of acculturation, should be included in further research.

The low number of deaths makes it less easy to draw conclusions on mortality differences. First-generation migrants have lower mortality rates than Belgians, while second-generation Maghrebins and Turks have higher mortality rates. The first observation can be explained by the healthy migrant effect: those who migrated to Belgium belong to a subset of the country of origin with above-average health. There is no selection bias for second-generation Maghrebins and Turks, and although they have comparable mortality rates to those of native Belgians when controlling for education, there is a clear split with the earlier generation. Most of the deaths in adolescence or early adulthood are probably preventable – as most deaths in adolescence have external causes (Borrell et al., 2001)- and knowing that they are susceptible to the social gradient, although less pronounced than in health differences, makes it even more important to intervene.

Limitations

There are a few limitations to this study, most importantly concerning self-rated health. In itself it is not an undiscussed topic in the methodological literature concerning measures of health (Agyemang et al., 2006; Chandola & Jenkinson, 2000; Shetterly et al., 1996). The criticism for using this measure is twofold: (i) some object to it when it is used as single measure for health by arguing that such a subjective measure should also be balanced with an objective one, such as doctor reports (Mossey & Shapiro, 1982) as it can be biased according to social desirability, expectations and desirability and (ii) using it to compare different ethnic groups is found to lead to ambiguous results, as some ethnic groups over- or underestimate their well-being, while others don't.

The first criticism can easily be countered, as its wide use in epidemiology has proven to be a good indicator for subsequent morbidity and mortality {e.g. Idler & Benyamini, 1997; Breidablik et al., 2008). However, using multiple measures can make the argument more powerful, and a solution would be, as Nielsen & Krasnik (2010) suggest, to include more than one indicator for health besides self-rated health in the analysis. A subdivision of different components of health, including psychological well-being, suicidal attempts, obesity,… could certainly give more power to the results in this paper too. Yet, in using the census linked to death certificates, the only measure for health at hand, besides the number of deaths, is self-rated health. In future analysis, other databases or surveys should be drawn on to meet this need.

The second criticism cannot that easily be led aside, as it is both proved (Chandola & Jenkinson, 2000) and countered (Agyemang et al., 2006) that one can use self-rated health when making interethnic comparisons. The latter, although depicting the same ethnic groups as used in this article, only includes the middle aged and elderly first-generation migrants. Furthermore, it might be not reliable on the individual level, but using this measure for large samples or censuses is different, as it compares group differences. Agyemang et al. (2006) only tested their assumptions on rather small samples (N<2000) compared to our data. As the mortality rate ratios – an objective measure - are in line with the odds ratios of self-rated health of different Maghreb and Turkish generations, this gives us credit that the comparisons made are valid.

Another remark on the data used concerns the missing data on both self-rated health, educational level and, to a lesser extent, migration data. Several measures were used in order to avoid misinterpretations: the missings were excluded through listwise deletion and afterwards included, without significant differences. Multiple imputations did not alter the results either. As these missings are not random, but contain people who are socially disadvantaged, the bias introduced is conservative and underestimates the differences between native Belgians and other nationalities of origin.

Then lastly, the limited number of variables included in the models needs some further explanation. There are many indicators that may influence health and mortality of adolescents and young adults: income (own

or parents'), employment situation, household composition, housing environment, lifestyle behaviours… It was an explicit choice to concentrate only on nationality of origin and education for several reasons. (i) Adolescents and young adults are a transitional group in the sense that a lot of their environment is strongly dependent on change: they are still studying or starting their first job, they decide to live on their own, together or to marry, to move to another part of town… In other words, finding indicators that can grasp this malleable situation are few. (ii) Using a lot of indicators to measure SEP does not take into account the life stage of the persons under study (Galobardes et al., 2006). Every indicator measures a different aspect of SEP, and not all indicators attributed to adult health can be transferred to adolescent health (Currie, Elton, Todd, & Platt, 1997). As Koivusilta et al (2006) found that SEP of youngsters is a stronger indicator than that of their parents; education is the one indicator that teenagers and those in their young adulthood have in common. Although schooling might still be unfinished, adding academic orientation in the response categories is found to give a good impression of the future social position (Hagquist, 2007). In this way, educational level measures both the years of education and its degree.

Conclusion

Despite the limitations mentioned in the discussion section, this study provides an important contribution to the limited literature on adolescent health of ethnic minorities. It has demonstrated the importance of including migration generation when comparing health differences according to various nationalities of origin. The findings also suggest that it's worthwhile to invest in education. Public health policies concentrating on adolescent health could benefit by approaching youth in school programs, with special attention to adolescents of Turkish and Maghrebin descent. Either way, the migrant population and their descendants would gain by staying longer at school and get more counselling throughout their curriculum.

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Tables & Graphs

Table 1: Descriptive statistics of youngster population of Belgian, Sub-Saharan African (SSA), Maghreb or Turkish origin living in the BCR

	Belgian	SSA	Maghreb	Turkish	Belgian	SSA	Maghreb	Turkish
5-year age groups (%)								
15-19	10,044 (18.5)	1,135 (20.3)	6,381 (21.3)	1,625 (21.0)	9,545 (18.0)	1,258 (19.8)	6,244 (23.3)	1,603 (20.9)
20-24	11,854 (21.8)	1,217 (21.8)	7,451 (24.9)	2,058 (26.6)	12,072 (22.7)	1,531 (24.1)	7,634 (28.4)	2,312 (30.2)
25-29	15,969 (29.4)	1,475 (26.4)	8,067 (27.0)	2,172 (28.0)	15,727 (29.6)	1,798 (28.4)	7,112 (26.5)	2,126 (27.7)
30-34	16,509 (30.4)	1,759 (31.5)	8,016 (26.8)	1,890 (24.4)	15,780 (29.7)	1,755 (27.7)	5,860 (21.8)	1,624 (21.2)
Educational level 15-19 year olds (%)								
No/primary education	1,270 (12.6)	205 (18.1)	959 (15.0)	245 (15.1)	804 (8.4)	187 (14.9)	869 (13.9)	272 (17.0)
Vocational/Technical lower secondary	1,390 (13.8)	158 (13.9)	1,548 (24.3)	453 (27.9)	1,019 (10.7)	133 (10.6)	1,232 (19.7)	333 (20.8)
General lower secondary	3,978 (39.6)	355 (31.3)	1,846 (28.9)	359 (22.1)	3,883 (40.9)	401 (31.9)	1,916 (30.7)	419 (26.1)
Vocational/Technical higher secondary	588 (5.9)	46 (4.1)	596 (9.3)	176 (10.8)	670 (7.0)	62 (4.9)	679 (10.9)	172 (10.7)
General higher secondary	1,900 (18.9)	122 (10.8)	627 (9.8)	156 (9.6)	2,393 (25.1)	209 (16.6)	824 (13.2)	170 (10.6)
Higher non-academic	17(0.2)	0 (0.0)	14 (0.2)	5 (0.3)	26 (0.3)	3 (0.2)	16 (0.3)	6 (0.4)
University	30 (0.3)	0 (0.0)	2 (0.0)	0 (0.0)	43 (0.5)	2 (0.2)	4 (0.1)	0 (0.0)
Missing	871 (8.7)	249 (21.9)	789 (12.4)	231 (14.2)	707 (7.4)	261 (20.8)	704 (11.3)	231 (14.4)
Educational level 20-34 year olds (%)								
No/primary education	1,566 (3.5)	152 (3.5)	3,199 (9.5)	1,282 (16.9)	1,185 (2.7)	275 (5.4)	2,651 (12.9)	1,341 (22.2)
Vocational/Technical lower secondary	3,559 (8.0)	187 (4.2)	4,700 (13.4)	1,566 (18.2)	2,789 (6.4)	244 (4.8)	2,615 (12.7)	991 (16.4)
General lower secondary	2,109 (4.8)	195 (4.4)	3,685 (7.8)	841 (7.9)	1,668 (3.8)	279 (5.5)	1,677 (8.4)	389 (6.4)
Vocational/Technical higher secondary	6,676 (15.1)	486 (10.9)	5,049 (18.9)	1,423 (20.4)	5,891 (13.5)	685 (13.8)	4,457 (21.6)	1,200 (19.8)
General higher secondary	6,332 (14.4)	732 (16.5)	3,777 (13.4)	765 (10.0)	5,660 (13.0)	828 (16.3)	2,706 (13.1)	576 (9.5)
Higher non-academic	6,969 (15.8)	600 (13.5)	2,111 (8.9)	321 (5.1)	10,744 (24.7)	841 (16.5)	2,363 (11.5)	416 (6.9)
University	12,462 (28.1)	805 (18.0)	2,081 (8.8)	245 (4.0)	12,462 (28.6)	717 (14.1)	1,119 (5.4)	194 (3.2)
Missing	4659 (10.5)	1,294 (29.0)	5,313 (19.2)	1,302 (17.5)	3,180 (7.3)	1,215 (23.9)	3,018 (14.7)	957 (15.8)

Table 1 (Continued)

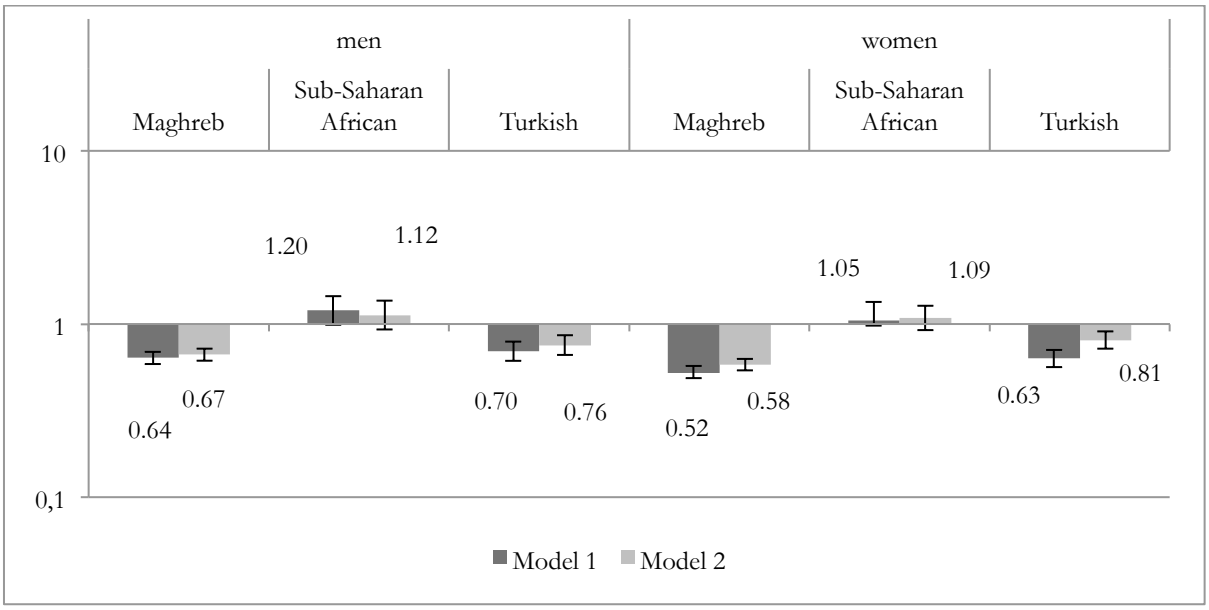
	Men				Women			
	Belgian	SSA	Maghreb	Turkish	Belgian	SSA	Maghreb	Turkish
Health status (%)								
Very bad	294 (0.5)	19 (0.3)	232 (0.8)	73 (0.9)	174 (0.3)	16 (0.3)	163 (0.6)	53 (0.7)
Bad	586 (1.1)	45 (0.8)	546 (1.8)	202 (2.6)	579 (1.1)	52 (0.8)	590 (2.2)	215 (2.8)
Moderate	3,747 (6.9)	232 (4.2)	2,999 (10.0)	827 (10.7)	3,978 (7.5)	383 (6.0)	3,670 (13.7)	1,027 (13.4)
Good	21,278 (39.1)	1,621 (29.0)	11,705 (39.1)	3,155 (40.7)	22,000 (41.4)	2,149 (33.9)	11,421 (42.5)	3,203 (41.8)
Very good	23,096 (42.5)	2,191 (39.2)	9,838 (32.9)	2,444 (31.6)	22,456 (42.3)	2,351 (37.1)	7,822 (29.1)	2,216 (28.9)
Missing	5,375 (9.9)	1,478 (26.5)	4,595 (15.4)	1,044 (13.5)	3,937 (7.4)	1,391 (21.9)	3,184 (11.9)	951 (12.4)
Age Adjusted Mortality Rate (per 100.000 PY) and confidence intervals								
15-19	67.7 [42.4-102.5]	55,1 [6.7-199.0]	106.7 [66.8-161.5]	57.1 [11.8-166.9]	35.6 [17.8-63.7]	0.0	24.7 [8.0-57.7]	19.3 [0.5-107.8]
20-24	89.2 [61.8-124.6]	26.6 [0.6-148.0]	84.3 [51.5-130.2]	181.1 [93.6-316.3]	46.4 [27.5-73.4]	104.6 [34.0-244.1]	36.6 [16.8-69.5]	53.8 [14.7-137.8]
25-29	92.1 [67.7-122.5]	90.6 [24.7-232.0]	106.2 [70.0-154.5]	71.8 [23.3-167.6]	41.8 [25.9-63.9]	36.1 [4.4-130.4]	52.5 [27.2-91.8]	14.6 [0.4-81.4]
30-34	115.3 [88.2-148.2]	74.8 [20.4-191.5]	102.5 [66.9-150.4]	49.6 [10,2-145.1]	61.2 [41.6-86.9]	147.1 [63.5-289.8]	63.6 [32.9-111.1]	38.4 [4.7-138.9]

Table 2: Crosstabulation of migration history

	Men			Women		
	SSA	Maghrebin	Turkish	SSA	Maghrebin	Turkish
Migrant generation						
First generation	4,496 (81.3)	13,043 (43.9)	3,908 (50.7)	5,215 (82.8)	10,641 (39.9)	3,910 (51.1)
Second generation	1,033 (18.7)	16,685 (56.1)	3,809 (49.3)	1,085 (17.2)	16,050 (60.1)	3,735 (48.9)
Years of residence[a]						
New migrants (<6 years)	1,367(38.4)	6,274 (53.0)	1,195 (34.9)	1,639 (39.9)	4,429 (46.7)	1,188 (34.6)
> 5 years or longer	2,195 (61.6)	5,569 (47.0)	2,229 (65.1)	2,466 (60.1)	5,065 (53.3)	2,241 (65.4)
Age at migration[a]						
≤18 year	1,610 (45.2)	3,858 (32.6)	1,655 (48.3)	1,888 (46.0)	4,073 (42.9)	1,892 (55.2)
> 18 year	1,952 (54.8)	7,982 (67.4)	1,769 (51.7)	2,217 (54.0)	5,421 (57.1)	1,537 (44.8)
Unknown migration year						
	932 (20.9)	1,200 (9.2)	484 (12.4)	1,110 (21.3)	1,147 (10.8)	481 (12.3)

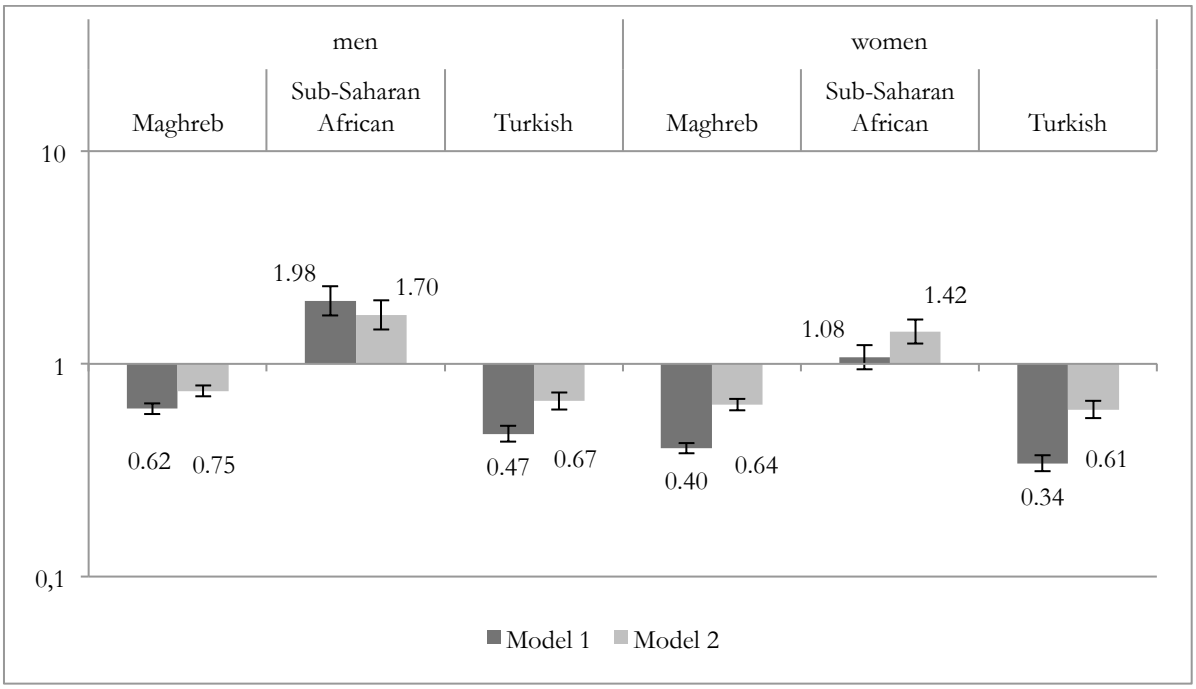
[a]: for the first generation migrants only

*Graph 1a: Odds ratios of self-rated health according to nationality of origin and split by sex, with native Belgians of **15-24** as reference category*



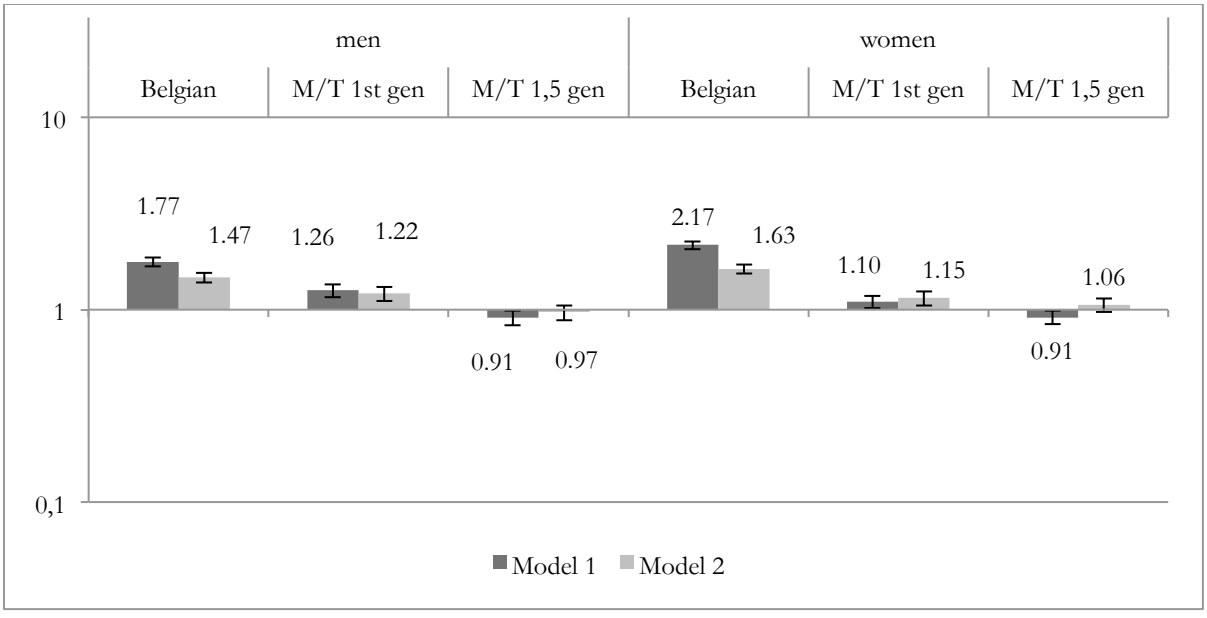
Model 1: Nationality of origin is included in the model
Model 2: Model 1 controlled by age and educational level

Graph 1b: Odds ratios of self-rated health according to nationality of origin and split by sex, with native Belgians of ***25-34*** *as reference category*



Model 1: Nationality of origin is included in the model
Model 2: Age-adjusted and controlled by educational level

Graph 2: Odds ratios of self-rated health according to migration generation and nationality with native second generation Maghrebins and Turks (M/T) as reference category

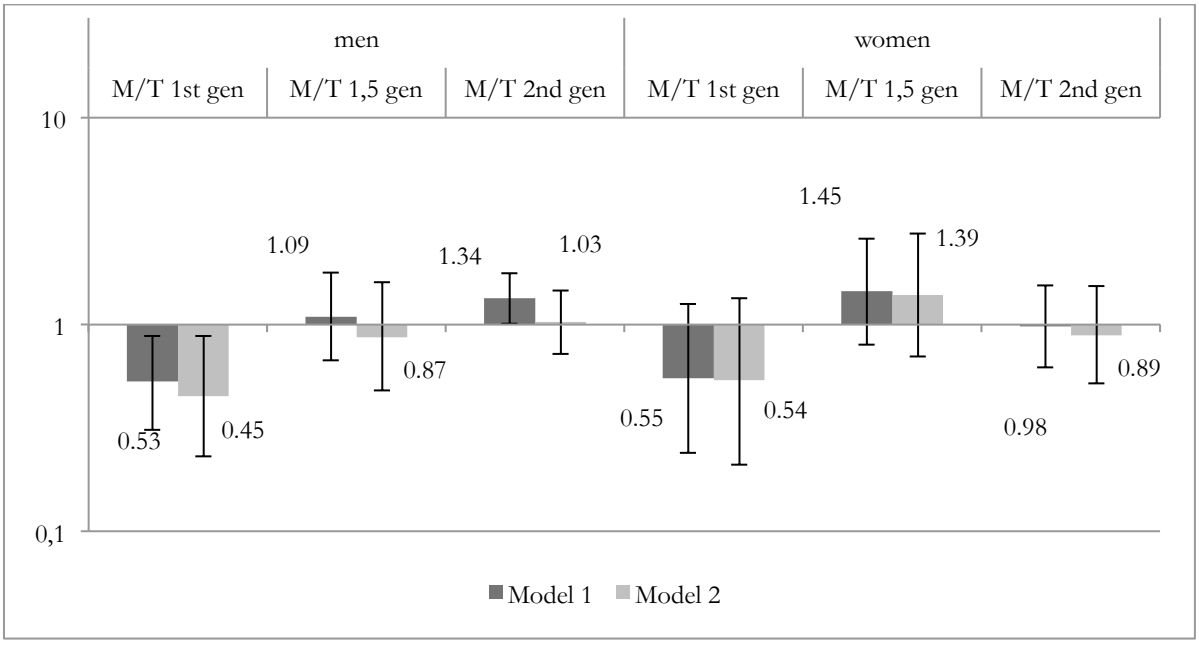


Model 1: Age-adjusted
Model 2: Age-adjusted and controlled by educational level

Table 3: SMR per 100,000 PY through direct standardisation according to nationality and migration generation, and confidence intervals (CI)

Sex	Nationality	SMR	CI	Migration generation	SMR	CI
men	Belgian	24.3	[20.6-28]			
	Maghrebin	26.0	[20.8-31.3]	M/T 1st gen	17.2	[6.9-27.5]
	Turkish	23.1	[13.6-32.6]	M/T 1,5 gen	26.0	[13.9-38.1]
				M/T 2nd gen	31.2	[23.4-38.9]
	SSA	16.7	[6.8-26.6]	SSA 1st gen	6.3	[0.0-14.9]
				SSA 1,5 gen	19.3	[0.0-42.3]
				SSA 2nd gen	35.7	[0.0-73.6]
women	Belgian	12.3	[9.6-15]			
	Maghrebin	12.0	[8.2-15.9]	M/T 1st gen	6.5	[0.9-12.0]
	Turkish	8.1	[2.4-13.8]	M/T 1,5 gen	17.7	[8.1-27.3]
				M/T 2nd gen	13.2	[7.7-18.7]
	SSA	19.9	[9.8-30.0]	SSA 1st gen	16.5	[3.3-29.7]
				SSA 1,5 gen	29.8	[4.0-55.5]
				SSA 2nd gen	0.0	/

Graph3: MRR of Turks and Maghrebins according to migration generation (ref cat= Belgians) and gender, in the first part controlled for age, in the second age and education



Model 1: Only education in the model
Model 2: Age-adjusted and controlled by educational level

Table 4: Odds-ratios of self-rated health and Mortality Rate Ratios according to educational level (ref cat= no/primary education), controlled for age and nationality, split by gender

Gender	Educational level	OR	CI	MRR	CI
Men	No or primary education	1.00		1.00	
	Vocational technical lower secondary	1.13	[1.04-1.22]	0.98	[0.60-1.60]
	General lower secondary	1.38	[1.27-1.51]	0.51	[0.28-0.92]
	Vocational technical higher secondary	1.53	[1.42-1.66]	0.78	[0.48-1.28]
	General higher secondary	1.81	[1.67-1.97]	0.61	[0.36-1.03]
	Higher non-academic education	2.70	[2.54-3.08]	0.32	[0.16-0.63]
	University (or doctorate)	4.04	[3.68-4.43]	0.35	[0.19-0.63]
Women	No or primary education	1.00		1.00	
	Vocational technical lower secondary	0.92	[0.86-1.00]	0.26	[0.11-0.61]
	General lower secondary	1.21	[1.11-1.31]	0.40	[0.19-0.86]
	Vocational technical higher secondary	1.32	[1.23-1.43]	0.37	[0.19-0.72]
	General higher secondary	1.78	[1.64-1.93]	0.32	[0.15-0.66]
	Higher non-academic education	3.10	[2.84-3.38]	0.37	[0.19-0.73]
	University (or doctorate)	4.53	[4.11-4.99]	0.49	[0.25-0.94]