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To cite this article: Katrine Rich Madsen, Mogens Trab Damsgaard, Signe Smith Jervelund, Ulla Christensen, Gonneke G. W. J. M. Stevens, Sophie Walsh, Vibeke Koushede, Line Nielsen, Pernille Due & Bjørn E. Holstein (2016) Loneliness, immigration background and self-identified ethnicity: a nationally representative study of adolescents in Denmark, *Journal of Ethnic and Migration Studies*, 42:12, 1977-1995, DOI: [10.1080/1369183X.2015.1137754](https://doi.org/10.1080/1369183X.2015.1137754)

To link to this article: <http://dx.doi.org/10.1080/1369183X.2015.1137754>



Published online: 07 Feb 2016.



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Loneliness, immigration background and self-identified ethnicity: a nationally representative study of adolescents in Denmark

Katrine Rich Madsen^a , Mogens Trab Damsgaard^a, Signe Smith Jervelund^b, Ulla Christensen^c, Gonneke G. W. J. M. Stevens^d, Sophie Walsh^e, Vibeke Koushede^a, Line Nielsen^a, Pernille Due^a and Bjørn E. Holstein^a

^aNational Institute of Public Health, University of Southern Denmark, Copenhagen, Denmark; ^bDepartment of Public Health, Section for Health Services Research, University of Copenhagen, Copenhagen, Denmark; ^cDepartment of Public Health, Section of Social Medicine, University of Copenhagen, Copenhagen, Denmark; ^dUtrecht Centre for Child and Adolescent Studies, Utrecht University, Utrecht, The Netherlands; ^eDepartment of Criminology, Bar Ilan University, Ramat Gan, Israel

ABSTRACT

Migration is an increasing worldwide phenomenon that creates multicultural societies with a growing number of adolescents who have experienced a process of migration or who have an ethnic background other than that of the majority. Migration may lead to loss of social relations and create challenges related to acculturation in the new country. These experiences may induce feelings of loneliness. Research on ethnic and migrant disparities in loneliness among adolescents is limited and inconsistent. The purpose of this study was to examine how adolescents' immigration background and self-identified ethnicity are associated, independently and combined, with loneliness. We used data from the Danish 2010 Health Behaviour in School-aged Children survey which included a representative sample of 3083 13- and 15-year-olds. The results suggest that immigrants but not descendants of immigrants have an increased risk of loneliness compared to adolescents with a Danish origin. The results also suggest that adolescents' self-identified ethnicity plays an essential role but differently for immigrants and descendants: identifying with the Danish majority was protective against loneliness among immigrants, whereas identifying with an ethnic minority group was protective against loneliness among descendants.

ARTICLE HISTORY

Received 13 July 2015

Accepted 29 December 2015

KEYWORDS

Loneliness; immigration background; self-identified ethnicity; effect modification; adolescence

Introduction

The sense of belonging is fundamental to human nature (Baumeister and Leary 1995; Heinrich and Gullone 2006). Particularly during adolescence, the desire to belong and feel accepted is strong; and creating and maintaining good and reliable friendships are challenging and important tasks (Brennan 1982; Heinrich and Gullone 2006). Migration and global mobility are growing worldwide phenomena, creating multi-ethnic societies

with an increased proportion of adolescents with different countries of birth, cultures, languages, norms and traditions (Statistics Denmark 2013; Bhopal 2014). The migration process may lead to the loss of social relations and may create acculturation challenges in the new country such as learning a new language, adapting to changes in norms and beliefs, and defining a new identity (James 1997; Berry et al. 2006; Stevens and Vollebergh 2008; Tartakovsky 2009). Experiences like these may place individuals in a vulnerable position with regard to feeling accepted and understood and influence the character and extent of their social relations in the new country which may induce feelings of loneliness (de Jong-Gierveld, van Tilburg, and Dykstra 2006; van Staden and Coetzee 2010). To enhance the understanding of the potential causes leading to loneliness in adolescence, it is important to explore whether adolescents' ethnic and migrant background plays a role with regard to loneliness. So far, this is an understudied issue (Qualter et al. 2015) with ambiguous conclusions.

Loneliness in adolescence

Loneliness is typically defined as a feeling of sadness and emptiness that is caused by the cognitive awareness of a discrepancy between the social relations a person wishes to have and those the person perceives (s)he has (Peplau and Perlman 1982). The definition highlights that loneliness is a distressing, painful and subjective feeling. Some people will feel lonely when they are alone or even (more so) in a crowd and conversely, some people may not feel lonely in spite of being alone (de Jong-Gierveld, van Tilburg, and Dykstra 2006). For most adolescents, loneliness is a transient feeling related to particular experiences such as transferring schools or losing a significant social relation. Such experiences are common and most people feel lonely at some point in their life. Loneliness can vary in intensity and duration and for some people, especially adolescents (West, Kellner, and Moore-West 1986), loneliness can be strong and chronic with severe health and behavioural consequences (van Dulmen and Goossens 2013). Longitudinal studies have found that people who feel intense and prolonged loneliness during childhood or adolescence have a high risk of developing sleep problems (Harris, Qualter, and Robinson 2013), depressive symptoms (Qualter et al. 2010; Jones et al. 2011; Ladd and Ettekal 2013; Qualter et al. 2013), low perceived general health (Harris, Qualter, and Robinson 2013; Qualter et al. 2013), self-harm behaviour, eating disorders (Laye-Gindhu and Schonert-Reichl 2005; Levine 2012), and are at increased risk for suicide attempts (Stravynski and Boyer 2001; Jones et al. 2011; Schinka et al. 2012). Prolonged loneliness may also increase school absence and result in poorer grades in school (Juvonen, Nishina, and Graham 2000; Benner 2011). It is therefore important to prevent and ease loneliness in adolescence not only due to the emotional pain it involves but also because it is a risk factor for a range of adverse outcomes.

The causes of loneliness in adolescence are many and complex (Brennan 1982; Ladd 2006) and most studies focus on individual factors such as genes, personality traits and several dimensions of social relations as important risk factors (Peplau and Perlman 1982; Mahon et al. 2006; Goossens 2012). This paper focuses on immigration background

and self-identified ethnicity and investigates how these conditions may influence loneliness in adolescence.

Migrant and ethnic disparities in loneliness

In a study of 163 11–15-year-olds in the USA, a higher prevalence of loneliness was reported among immigrant Mexican-American youth as compared with US-born Mexican-American youth. Acculturation stress as well as a lack of English language proficiency contributed significantly to the association (Polo and Lopez 2009). These findings were supported by a study of 651 14 year-old adolescents in the UK, where adolescents with an Asian background had higher levels of loneliness as compared to adolescents from a non-Asian background (Shams 2001). A Dutch study of 249 22-year-olds revealed that Turkish immigrants felt lonelier than adolescents of Moroccan immigrant background and the Dutch majority (van Bergen et al. 2008) suggesting that experiences of loneliness may differ among groups from different cultural backgrounds in the same receiving country. Finally, an Australian study of 263 8–17-year-olds found higher levels of loneliness among students from minority ethnic groups relative to the majority group (Priest et al. 2014). They also found that experiences of racial discrimination were related to the higher levels of loneliness.

However, other studies did not find an association between adolescents' ethnic or immigrant background and loneliness. In a Portuguese study of 676 15-year-olds Neto (2002) found no significant differences in loneliness between Portuguese adolescents and adolescents with an immigrant background living in Portugal. Yet, self-esteem, duration of sojourn and perceived discrimination were the three most important predictors of loneliness among the immigrant adolescents. Likewise, Neto and Barros (2000) found no differences in the degree of loneliness among 363 15-year-old Portuguese adolescents living in Portugal and 95 15-year-old Portuguese immigrants in Switzerland. Neither did an American longitudinal study of 832 Caucasian, African-American, Hispanic and Asian children followed from the age of 9 to 15 find any ethnic differences in loneliness trajectories between the groups during adolescence (Schinka et al. 2013).

Epidemiological research on ethnic and migrant disparities in health is heterogeneous in the use of terms, conceptualisation and measurement, which means that studies are difficult to compare (Bhopal 2004; Salway et al. 2009; Urquia and Gagnon 2011). The inconsistent findings may be a result of this heterogeneity or the quite small and non-representative study populations. Furthermore, the personal consequences of immigration may be contextually dependent and affected by factors such as the diverging characteristics of immigrant groups, levels of trust and discrimination in the receiving countries, and country specific integration policies (Portes and Zhou 1993; Kwak 2003). These issues further complicate comparison of results.

The contradictory findings suggest that the issue is complex and warrants additional studies. We examined a large, nationally representative study of adolescents, categorised by immigration background, to explore the distribution of loneliness between ethnic Danes, immigrants and descendants of immigrants. As suggested by previous research, adolescents with immigration background (descendants and immigrants) are more prone to problems such as language barriers (Ernst and Cacioppo 1999; Polo and Lopez 2009), acculturation stress (Polo and Lopez 2009), discrimination (Neto 2002;

Priest et al. 2014) and low self-esteem (Neto 2002), which may induce feelings of loneliness. Moving away from close friends or family is a common explanation for loneliness making immigrants but not descendants particularly vulnerable candidates for experiencing loneliness (Peplau and Perlman 1982; James 1997; Tartakovsky 2009).

We also focus on the role of the adolescent's self-identified ethnicity. Ethnicity is a multifaceted quality, which refers to the social group(s) a person belongs to and identifies with or the social group people are ascribed to by others. A person's self-identified ethnicity is influenced by factors such as ancestry, cultural practices and values, language, religion and traditions (Bhopal 2004), and is recognised as dynamic and changing over time and context. Consequently, self-identified ethnicity may differ from a person's ascribed ethnicity such as their country of birth (Phinney 1990; Bhopal 2004; Stronks, Kulu-Glasgow, and Agyemang 2009). Today, the use of ethnic self-identification is gaining favour in epidemiological research (Stronks, Kulu-Glasgow, and Agyemang 2009; Bhopal 2014) and this may improve the ability to capture more meaningful groups that share language, religion, ancestry and traditions. As suggested by Hamm (2000) adolescents' selection of friendships is among other things based on circumstances related to their ethnic group. It is therefore important to explore ethnic self-identification in relation to loneliness because the probability of finding peers with whom you feel a mutual understanding and share norms and values may be higher when you feel you belong to the same ethnic group (Bellmore et al. 2007; Baskin et al. 2010; van Staden and Coetzee 2010).

The present study

The purpose of this study was to examine whether immigration background and self-identified ethnicity is associated with loneliness in a large nationally representative sample of adolescents. Among several aspects of acculturation, time in the receiving country as well as cultural orientation influence the well-being of young people (Phinney et al. 2001; Berry et al. 2006). We found it likely that self-identifying with the Danish majority and sharing characteristics such as language, norms and values could be protective against loneliness among immigrants and descendants due to the greater probability of finding peers and feeling accepted by them. The purpose of our study was twofold and included analyses in two steps: (1) examining the separate associations between immigration background and self-identified ethnicity and loneliness and (2) examining if the association between immigration background and loneliness was modified by the adolescent's self-identified ethnicity. Studying the separate associations as well as the joint effect of immigration and self-identification may provide a more nuanced picture of the relation between ethnic background and loneliness.

Material and methods

Setting

Large scale immigration is a fairly new phenomenon in Denmark and until the early 1960s the Danish population was relatively homogeneous. During the 1960s Denmark became in need of a larger labour force and immigrants from Turkey and Pakistan were invited to live and work in Denmark. Subsequently, conflicts and war around the world have resulted

in increased immigration to Denmark from countries such as Iraq, the former Yugoslavia, Somalia and Lebanon. Today, around 10% of the Danish population is characterised as immigrants or descendants with the three largest non-Western groups descending from Turkey, Lebanon and Iraq (Statistics Denmark 2013).

Study design and participants

This paper is based on Danish data from the international cross-sectional Health Behaviour in School-aged Children (HBSC) study from 2010 (Currie et al. 2012). The HBSC study gathers information on health, well-being, social environments and risk behaviours among nationally representative samples of 11-, 13- and 15-year-old schoolchildren, using an internationally standardised anonymous school-based questionnaire. Sampling of the participating schoolchildren is based on a random selection of schools from a complete list of schools in Denmark. Within each selected school, we collected data from all schoolchildren in the fifth, seventh and ninth grade. Of the 137 schools invited to participate 73 accepted the invitation (participation rate for schools: 53.7%). The most common reason for not participating was that the school had recently participated in a similar health survey. In total 5704 schoolchildren were enrolled in the relevant grades in the 73 participating schools. On the day of data collection, 4985 schoolchildren were present of which 4922 answered the questionnaire satisfactorily (participation rate: 86.3%). The question on loneliness was only posed to the 13- and 15-year-olds, creating a final sample of 3083 schoolchildren.

Variables

Loneliness

Loneliness was measured by the question: 'Do you feel lonely?' ('yes, very often', 'yes, often', 'yes, sometimes', 'no'). The response categories were dichotomised representing lonely (yes, very often/yes, often) and not-lonely (yes, sometimes/no). This categorisation was based on conceptual considerations: the category of adolescents feeling lonely 'often' or 'very often' captured the most severe and potentially chronic and prolonged cases. The category of adolescents feeling lonely 'sometimes' or 'never' captured less severe and more transient loneliness or a complete absence of loneliness. This categorisation has been applied in previous research among adolescents (Stickley et al. 2014) and across ethnic groups (Victor and Burholt 2012; Stickley et al. 2014). Schoolchildren with missing information on loneliness ($n = 20$) were excluded from the analyses.

Immigration background

In line with the definition from Statistics Denmark (2013) each schoolchild was categorised into: Danish origin (regardless of country of birth, having at least one parent born in Denmark), descendant (born in Denmark with both parents born outside of Denmark) or immigrant (born outside of Denmark by parents born outside of Denmark). This categorisation was based on three items: 'Were you born in Denmark?' ('yes', 'no'), 'In which country was your mother born?' (open-ended question) and 'In which country was your father born?' (open-ended question). A validation study has shown a high agreement between children and their parents' answers on these questions,

which suggests that schoolchildren are able to provide valid responses about country of birth regarding themselves and their parents (Nordahl et al. 2011). With regard to mother's country of birth, 64 countries were identified, with Denmark being the largest group ($n = 2604$) followed by Turkey ($n = 77$), Iraq ($n = 27$), Vietnam ($n = 26$), and Pakistan ($n = 24$). Furthermore, 59 countries were identified with regard to father's country of birth, with the five largest groups being Denmark ($n = 2561$), Turkey ($n = 83$), Vietnam ($n = 29$), Pakistan ($n = 28$) and Iraq ($n = 26$). Schoolchildren with insufficient information on origin ($n = 62$) were excluded from the analyses.

Ethnic self-identification

Information on the schoolchildren's self-identified ethnicity was obtained by asking: 'Do you primarily feel ...?' ('Danish', 'Turkish', 'Kurdish', 'Lebanese', 'Iraqi', 'Somali', 'Bosnian', 'Pakistani', 'Afghani', 'Vietnamese', 'don't know', 'other, please specify'). The schoolchildren were only allowed to choose one category. The five largest ethnic groups contained schoolchildren who felt mostly Danish ($n = 2644$), 'other' ($n = 131$), Turkish ($n = 45$), Kurdish ($n = 30$) and schoolchildren who did not know their ethnicity ($n = 28$). Most of the ethnic groups were small and were consequently merged into three: those feeling mostly Danish, those defining themselves with an ethnicity other than Danish, and those who did not know what ethnic group they belonged to. Finally, 99 schoolchildren with missing information on self-defined ethnicity were excluded from the analysis.

Covariates

We used sex (boy/girl), age group (13-year-olds/15-year-olds) and occupational social class (high/middle/low/unclassifiable and missing) as co-variables in the analyses. Grade was used as a proxy for age group because age groups are fairly homogeneous across school classes. Grade 7 and 9 correspond to 13- and 15-year-olds. Data on occupational social class stem from the students' reports of their parent's occupation. Based on the highest ranking parent the adolescents were grouped into occupational social class I (highest) to V by the research group. Several studies have demonstrated that schoolchildren are able to report their parents' occupation with a reasonable validity although often with a high proportion of unclassifiable or missing (Ensminger et al. 2000; Lien, Friestad, and Klepp 2001). We added occupational social class VI to include economically inactive parents who receive unemployment benefits, disability pension or other kinds of transfer income and the category 'unclassifiable' to describe parents for whom there was no information or where it was impossible to identify their exact occupation. We categorised occupational social class into high (family occupational class I–II), middle (family occupational class III–IV), low (family occupational class V–VI), and unclassifiable/missing. The unclassifiable/missing category comprised 5.4% of the participants. There was no missing on sex or age group.

Statistical methods

After excluding participants with missing data, the study population comprised 2946 schoolchildren. The first step was to inspect frequency distributions and test for homogeneity (using a chi-square test). We initially applied multi-level logistic regression models

with schools and school classes as random effects because of the cluster sampling of 2946 schoolchildren in 186 schools classes within 58 schools. It was not possible to detect measurable variation (cluster effect) in loneliness between schools or between school classes within schools. Nor was it possible to estimate school or school class level variance specifically among descendants or immigrants. Thus, we conducted multivariate logistic regression analysis, calculating odds ratios (OR) and 95% confidence intervals (95% CI), with loneliness as the dependent variable and immigration background and self-identified ethnicity as independent variables. These analyses were further stratified by sex and age group. No major differences in OR between strata were found and we decided to combine the strata and control for sex and age group. The association between self-identified ethnicity and loneliness was additionally controlled for immigration background.

To assess the possible effect modification of self-identified ethnicity on the association between immigration background and loneliness we followed a three step procedure recommended by Knol and VanderWeele (2012). The 28 schoolchildren who did not know their self-identified ethnicity were excluded from these analyses as we considered the group too small to stratify into further subgroups ($n = 2918$). First, immigration background and self-identified ethnicity were combined into a single variable with a common reference group (adolescents with Danish origin feeling mostly Danish) and OR and 95% CI of the joint effect on loneliness was estimated. The association was adjusted for sex and age-group. Secondly, we estimated OR and 95% CI for the association between immigration background and loneliness within strata of self-identified ethnicity being the possible effect modifier. Thirdly, we calculated the relative excess risk due to interaction (RERI) with 95% CI to assess effect modification on an additive scale as well as the ratio of odds ratios with 95% CI to assess effect modification on a multiplicative scale. RERI measures the extent to which the effect of both exposures together exceeds the sum of the effects of the two exposures considered separately. The ratio of odds ratios measures if the effect of both exposures together exceeds the product of each considered separately (VanderWeele and Knol 2014). Analyses were carried out using SAS version 9.3.

Sensitivity analysis

We carried out three types of sensitivity analyses to address alternative cut-points of the dependent variable; loneliness, and independent variable; immigration background, and to explore the role of the adolescents' socioeconomic position: (1) Analyses with different cut-points of loneliness did not change the direction of the associations although the associations were strongest when the lonely group comprised only schoolchildren who answered 'yes, very often' and weakest when the lonely group comprised schoolchildren who answered 'yes, very often', 'yes, often', 'yes, sometimes'. The initial dichotomisation was chosen on the basis of statistical power and conceptual considerations. (2) We carried out two sensitivity analyses to encompass the many ways in which immigration background is conceptualised and measured and to explore whether this could influence the results. First, we applied a coding of immigrant background where the adolescents were categorised into: Danish origin (both parents born in Denmark), descendant (born in Denmark with at least one parent born abroad) or immigrant (born abroad by

at least one parent born abroad). The coding regrouped 185 adolescents from the ethnic Danish into descendants ($n = 163$) and immigrants ($n = 22$). The OR of the two associations barely changed. Second, we carried out a sensitivity analysis to distinguish between descendants and immigrants originating from western and non-western countries. This distinction was used as individuals descending from non-western countries often experience more health and educational problems as compared with Western individuals (Statistics Denmark 2013; Abebe, Lien, and Hjelde 2014). The analysis revealed no differences in OR estimates between the Western and non-Western participants, and we chose to leave immigrants and descendants as groups without this distinction. (3) We finally carried out sensitivity analyses to explore how adolescents' socioeconomic position would affect the associations between immigration background and self-identified ethnicity and loneliness by including the adolescents' family occupational class as a covariate in the analyses. We found a graded but statistically insignificant association between family occupational class and loneliness. The main associations between immigration background, self-identified ethnicity and loneliness barely changed with the inclusion of family occupational class.

Ethics

The study complies with national guidelines regarding ethical standards and data protection and is registered at the Danish Data Protection Agency. There is no agency for ethical approval of population-based survey studies in Denmark. Instead, we asked the school principal, the school board on behalf of the parents, and the board of schoolchildren on behalf of the schoolchildren in each of the participating schools for approval of the study. We informed the participants orally and in writing that participation in the survey was voluntary and data would be anonymous. We did not collect any personal identification data from the schoolchildren.

Results

As shown in Table 1, the overall prevalence of loneliness among Danish schoolchildren was 4.8%. Loneliness was experienced more by girls (5.6%) than by boys (4.0%) ($p = .0182$) but no significant differences were found between age groups ($p = .9375$). In terms of immigration background, the majority of the schoolchildren were categorised as Danish (90.0%, $n = 2652$), 7.0% ($n = 207$) as descendants, and 3.0% ($n = 87$) as immigrants. Among schoolchildren with a Danish origin 4.3% indicated feeling lonely, while 5.8% of the descendants and 20.7% of the immigrants felt lonely ($p < .0001$). The majority of the schoolchildren identified themselves as Danish (88.9%) and of these 4.1% felt lonely. Of the 10.2% who identified themselves with an ethnic minority group 11.3% felt lonely and of the 0.9% percent who indicated not knowing their self-identified ethnicity 17.9% felt lonely ($p < .0001$).

Logistic regression analysis of the independent effects of immigration background and self-identified ethnicity on loneliness revealed that, as compared with ethnic Danish school children, feeling lonely was more prevalent among immigrants, OR = 5.76 (95% CI [3.32, 10.00]), but not significantly more prevalent among descendants, OR = 1.36 [0.74, 2.50]. Adjusting for relevant covariates barely changed the association (Table 2).

Table 1. Baseline characteristics of the 2946 13- and 15-year-old adolescents, % (n).

	Boys n = 1460	Girls n = 1486	Total n = 2946	p-values from chi-square tests for differences between boys and girls	Percent lonely
<i>Dependent variable</i>					
<i>Loneliness</i>					
Feeling lonely	4.0 (58)	5.9 (87)	4.9 (145)	p = .0182	
<i>Independent variables</i>					
<i>Immigration background</i>					
Danish origin	89.5 (1307)	90.5 (1345)	90.0 (2652)	p = .6670	4.3*
Descendant	7.4 (108)	6.7 (99)	7.0 (207)		5.8
Immigrant	3.1 (45)	2.8 (42)	3.0 (87)		20.7
<i>Self-identified ethnicity</i>					
Danish	87.5 (1277)	90.2 (1341)	88.9 (2618)	p = .0551	4.1*
Another ethnicity than Danish	11.5 (168)	8.9 (132)	10.2 (300)		11.3
Do not know their ethnicity	1.0 (15)	0.9 (13)	1.0 (28)		17.9
<i>Age group</i>					
13-year-olds	54.4 (794)	54.2 (806)	54.3 (1600)	p = .9375	5.2*
15-year-olds	45.6 (666)	45.8 (680)	45.7 (1346)		4.6

*p-values from chi-square test for differences in the prevalence of loneliness between immigration background ($p < .0001$), self-identified ethnicity ($p < .0001$) and age group ($p = .4675$).

As compared with the reference group of adolescents who identified themselves with a Danish ethnicity, loneliness was experienced more often among adolescents with another self-identified ethnicity than Danish, OR = 3.03 [2.02, 4.55] and among adolescents who indicated not knowing what ethnic group they belonged to, OR = 5.15 [1.92, 13.82]. Again, adjustment for relevant covariates barely changed the association (Table 2).

Table 3 presents the interaction analysis of the joint effect of immigration background and self-identified ethnicity on loneliness. The table comprises three sections: Section A which presents the joint effects, Section B with results from the stratified analysis, and Section C with tests for additive and multiplicative interaction. As shown in Section C, a statistically significant negative additive interaction (RERI = -3.75 [-7.51, -0.29]) and a statistically significant negative multiplicative interaction (ratio of odds ratios = 0.16 [0.04, 0.66]) were found within the group of descendants. Within the group of immigrants, no statistically significant positive additive interaction (RERI = 0.19 [-7.13, 7.51])

Table 2. OR and 95% CI for loneliness among 13- and 15-year-old adolescents by immigration background and ethnic self-identification, n = 2946.

	Percent lonely	Crude OR [95% CI]	Adjusted OR [95% CI]
<i>Immigration background</i>			
Danish origin (n = 2652)	4.3	1 [ref.]	1 [ref.] ^a
Descendent (n = 207)	5.8	1.36 [0.74, 2.50]	1.37 [0.74, 2.53]
Immigrant (n = 87)	20.7	5.76 [3.32, 10.00]	5.84 [3.36, 10.16]
<i>Self-identified ethnicity</i>			
Danish (n = 2618)	4.1	1	1 [ref.] ^b
Another ethnicity than Danish (n = 300)	11.3	3.03 [2.02, 4.55]	2.82 [1.52, 5.22]
Do not know their ethnicity (n = 28)	17.9	5.15 [1.92, 13.82]	5.42 [1.92, 15.30]

^aAdjusted for sex and age group.

^bAdjusted for sex, age group, and immigration background.

Table 3. OR [95% CI]^a for loneliness by combinations of immigration background and self-identified ethnicity among 13- and 15-year-old adolescents, $n = 2918$. Section A: Joint effect analysis; Section B: Stratified analysis; Section C: RERI and ratio of odds ratios.

		A. Analysis of joint effect						B. Stratified analysis		
		Immigration background								
		Danish origin		Descendant		Immigrant				
		n lonely/non lonely	OR [95%CI]	n lonely/non lonely	OR [95%CI]	n lonely/non lonely	OR [95%CI]	ORs [95%CI] for Danish origin within strata of self-identified ethnicity	ORs [95%CI] for descendants within strata of self-identified ethnicity	ORs [95%CI] for immigrants within strata of self-identified ethnicity
Self-identified ethnicity	Danish	100/2448	1.0 [ref.]	4/52	1.94 [0.69, 5.48]	2/12	3.73 [0.82, 16.94]	1.0 [ref.]	1.94 [0.69, 5.48]	3.73 [0.82, 16.94]
	Other ethnicity than Danish	12/75	4.06 [2.12, 7.77]	7/136	1.27 [0.58, 2.79]	15/55	6.97 [3.79, 12.80]	1.0 [ref.]	0.31 [0.12, 0.82]	1.72 [0.74, 3.98]
C. Measures of RERI and ratio of odds ratios										
Measure of effect modification on additive scale: RERI [95%CI]				−3.75 [−7.51, −0.29] ^b		0.19 [−7.13, 7.51] ^c				
Measure of effect modification on multiplicative scale: Ratio of odds ratios [95% CI]				0.16 [0.04, 0.66] ^b		0.46 [0.08, 2.61] ^c				

^aORs are adjusted for sex and age group.

^bMeasures of effect modification by contrasting 'descendant/other ethnicity than Danish' with 'Danish origin/other ethnicity than Danish' and 'descendant/Danish'.

^cMeasures of effect modification by contrasting 'immigrant/other ethnicity than Danish' with 'Danish origin/other ethnicity than Danish' and 'immigrant/Danish'.

and no statistically insignificant negative multiplicative interaction (ratio of odds ratios = 0.46 [0.08, 2.61]) were found. These results suggest that the association between immigration background and loneliness is modified by the adolescent's self-identified ethnicity but that the modifying effect differs between descendants and immigrants: self-identifying with the Danish majority did not have a protective effect on loneliness among the descendants. Instead a strong negative interaction was found indicating that reporting another self-identified ethnicity than Danish is protective against loneliness among descendants. Among immigrants, however, reporting another self-identified ethnicity than Danish seemed to increase the odds for loneliness as compared with feeling mostly Danish. As shown in Section A, the analysis of joint effects also revealed two subgroups for whom the odds for loneliness were significantly higher as compared with the reference group of adolescents with a Danish origin and a self-identified Danish ethnicity: adolescents with a Danish origin experiencing another ethnicity than Danish (OR = 4.06 [2.12, 7.77]) and immigrants experiencing another ethnicity than Danish (OR = 6.79 [3.79–12.80]). Confidence intervals were broad in some cases reflecting the small number of schoolchildren in these strata.

Discussion

This large and representative study of Danish adolescents adds important knowledge to the current limited research on ethnic and migrant disparities in loneliness (Qualter et al. 2015). It has four key findings. First, we found that as compared with adolescents with a Danish origin, the odds for loneliness were significantly higher among immigrants but not among descendants of immigrants. Second, we found that adolescents who defined themselves with another ethnicity than Danish or who did not know their self-identified ethnicity had significantly higher odds for loneliness than adolescents who self-identified as feeling part of the Danish majority, regardless of immigration background. Third, effect modification analyses revealed that the association between immigration background and loneliness was modified by the adolescents' self-identified ethnicity, but differently between immigrants and descendants: there seemed to be a small but protective effect on loneliness among immigrants who identified themselves with the Danish majority. The picture was reversed among descendants for whom self-identifying with an ethnic minority group seemed to have a large protective effect towards loneliness. Fourth, analyses of joint effects revealed two subgroups with significantly higher odds for loneliness as compared with adolescents with a Danish origin feeling mostly Danish: immigrants and ethnic Danes with another self-identified ethnicity than Danish.

In a world where migration is increasing and societies become increasingly multicultural, the number of adolescents who have experienced a process of migration or who have another ethnic background than the majority is growing. Our findings suggest that the immigration process and its consequences play an important role with regard to loneliness, and the specific finding that immigrants but not descendants have higher odds for loneliness than the ethnic majority is consistent with findings from two previous studies (Polo and Lopez 2009; Priest et al. 2014). In contrast to our findings, the studies by Neto (2002), Neto and Barros (2000) and Schinka et al. (2013) found no significant ethnic or migrant differences in loneliness. One reason for the different conclusions may be variations in the conceptualisation and measurement of immigration background. In the

studies by Neto and Barros (2000) and van Bergen et al. (2008) the immigrant group comprised of both descendants and immigrants. The experience of moving from close friends or family is a common explanation for loneliness making migrants but not descendants particularly vulnerable candidates for experiencing loneliness (Peplau and Perlman 1982; Tartakovsky 2009). Our findings highlight the importance of differentiating between immigrants and descendants from immigrants (also referred to as second-generation immigrants) in studies on loneliness. Furthermore, the mentioned studies differ with regard to reference group: where Polo and Lopez (2009) for instance compared immigrants and descendants within one ethnic subgroup in America, Shams (2001) compared one immigrant subgroup with the general population in England, and Neto and Barros (2000) compared Portuguese immigrants living in Switzerland with Portuguese who have never migrated. The inconsistent conclusions may also be explained by the country context in which the immigrants are received in, as this may have substantial influence on their well-being (Portes and Zhou 1993; Phinney et al. 2001; Kwak 2003).

Our results also suggest that adolescents' self-identified ethnicity plays an important role with regard to loneliness: adolescents who identified themselves with an ethnic minority group or who did not know their self-identified ethnicity had higher odds for loneliness than adolescents feeling mostly Danish, regardless of immigration background. As emphasised by Hamm (2000) adolescents' friendships are, among other things, based on circumstances related to their ethnicity. The probability of finding peers with whom you feel a mutual understanding and share norms and behaviours which may be higher when you feel you belong to the ethnic majority in a country (Bellmore et al. 2007; Baskin et al. 2010; van Staden and Coetzee 2010). As proposed by Baumeister and Leary (1995) the need to belong is a fundamental part of human life. This sense of belonging can be established through different social channels (Baumeister and Leary 1995; Baskin et al. 2010) such as through the ethnic group a person belongs (Stronks, Kulu-Glasgow, and Agyemang 2009). Our findings that adolescents who did not know their ethnicity had the highest odds for loneliness may support the point that people who experience persistent difficulties in satisfying their belongingness needs—for example, through an ethnic group, are likely to feel lonely (Chipuer and Pretty 2000). However, this may also reflect other mental problems and as this group of adolescents who did not know their ethnicity was very small, further research will be needed to look more carefully into this.

The small but protective effect of self-identifying with the Danish majority we found among immigrants and adolescents with a Danish origin supports our expectations of a possible protective effect of feeling part of the Danish majority. These findings emphasise that individual's self-identified ethnicity is not only shaped by their country of birth but also by other factors such as cultural practices and values, language, religion or traditions (Phinney 1990; Stronks, Kulu-Glasgow, and Agyemang 2009; Bhopal 2004). As suggested by Berry et al. (2006) identifying with the new society by, for example, speaking the new language or changing behaviour or norms may be protective against mental health issues among immigrants and descendants. Polo and Lopez (2009) also found that acculturation stress and language proficiency are important mediators for the association between ethnic generation and loneliness. We did not find that belonging to the Danish majority had a protective effect on loneliness among the descendants. In this group a sense of belonging to an ethnic minority seemed to be essential and associated with lower odds for loneliness. Young immigrants and descendants live in and between cultures of their parents, their

family or community on the one hand and the new society on the other hand (Phinney et al. 2001; Berry et al. 2006). Some adolescents more easily accept new cultures than their parents (Portes 1997) and when these cultural values are practised differently by two generations in a family it may induce intergenerational disagreement (Kwak 2003). The adolescents who self-identify with the new society (e.g. feel mostly Danish) may experience a cultural disagreement with their parents who orientate against their ethnic heritage culture prior to migration (Kwak 2003; van Bergen et al. 2008). This intergenerational conflict may create feelings of loneliness in the adolescents as it has been found that adolescents experiencing conflicts or an unsatisfactory relationship with their parents have higher risks of loneliness (van Bergen et al. 2008; Segrin et al. 2012). Hence, adolescents who share ethnicity with their parents or family may experience fewer conflicts and misunderstandings and feel less lonely. However, this is an issue for future research.

Strengths, limitations and future research

The merit of this study was firstly the large and representative study population and the high participation rate, suggesting that the study population reflects the ethnic composition of adolescents in Denmark. Previous studies within the field have mostly used small study populations and have often explored only one or two specific ethnic groups. Secondly, we examined the potential modifying effect of adolescents' self-identified ethnicity on the association between immigrant background and loneliness which to our knowledge has never been done before. Thirdly, we applied a clear description of the conceptualisation and measurement of ethnic self-identification and immigration background and applied careful sensitivity analyses to comply and compare with the existing adverse definitions of immigration background.

The study design is cross-sectional which can often induce problems with causality. In this study, this problem is small due to the exposure variables being immigration background but we acknowledge that the causal relationship between loneliness and self-identified ethnicity may go both ways. The cross-sectional data limits our opportunity to explore how immigration background and self-identified ethnicity affect prolonged loneliness in adolescents. We tried to accommodate this with our conceptual considerations regarding the outcome variable, loneliness: the category of adolescents feeling lonely 'often' or 'very often' captured the most severe and potentially chronic and prolonged cases. Sensitivity analyses with alternative cut-off point of the outcome variable confirmed these considerations.

The vast majority of non-participating schools explained their non-participation with lack of time or that they had recently participated in a similar survey, and we substituted non-participating schools with other schools chosen at random from the same complete list of all schools in Denmark. With a random selection of all schools in Denmark this study gives a representative picture of the loneliness among adolescents living in Denmark. Because of the anonymous data collection it is not possible to carry out individually based non-participation analyses. In the case that non-participants have higher rates of loneliness, our analyses are likely to underestimate the association between ethnic background and loneliness.

We obtained information about the adolescents' loneliness by asking: 'Do you feel lonely?' Research indicates that children and adolescents have a fundamental

understanding of what loneliness is, and that loneliness can be reliably measured in these age groups (Asher and Paquette 2003). However, loneliness carries a special social stigma and few people would admit feeling lonely. Consequently using the direct phrase may underestimate the actual level of loneliness (de Jong-Gierveld, van Tilburg, and Dykstra 2006) especially among males (Borys and Perlman 1985). Conversely, correlation analyses among college students have revealed that the single loneliness item used in this study is significantly associated with the accepted and validated UCLA Loneliness Scale (Russell 1982). We have no information on whether the potential underreporting is unequally distributed between the groups under study. It is likely that the degree to which loneliness is stigmatised is different between cultures as cultural background plays an important role on the experience of loneliness (Rokach et al. 2001; de Jong-Gierveld, van Tilburg, and Dykstra 2006; van Staden and Coetzee 2010).

In this study, the schoolchildren were only able to choose the one ethnic group they mostly felt to be. According to Phinney (1990) one category may not always be enough to capture the complexity of ethnicity, as some people will experience belonging to more than one ethnic group. Thus, our measure of the schoolchildren's self-identified ethnicity may be too simple and it is likely that schoolchildren who feel they belong to more than one ethnic group may differ in relation to loneliness (Borys and Perlman 1985).

It is likely that this study suffers from unmeasured confounding. We did not have information on the adolescents' reasons for migration. This information might be a relevant confounder as it could influence the adolescent's social relations or acculturation attitudes and consequently their feelings of loneliness (Urquia and Gagnon 2011). We did not include socioeconomic position and family structure as confounders in the analyses although they could be important covariates (Uruk and Demir 2003; Varga, Piko, and Fitzpatrick 2014). This was avoided to ensure any over-control of the associations. We did, however, conduct sensitivity analyses with adolescents' socioeconomic position included as a co-variate. This barely changed the results.

The mix of ethnic groups we had in this study made it possible to clarify loneliness in relation to feeling as the majority or as an ethnic minority in Denmark. As suggested by, for example, van Bergen et al. (2008) experiences of loneliness may differ among groups from different cultural backgrounds in the same receiving country. In future research it would be interesting to explore ethnic disparities in loneliness among specific ethnic groups. The findings also support a need for more knowledge about the potential mediators and moderators between immigration background, ethnicity and loneliness. Qualitative studies could be helpful to gain more insight into how and why adolescents with specific immigrant backgrounds belonging to specific ethnic groups perceive and experience loneliness differently.

The measure of loneliness applied in this study is based on a conceptual understanding of loneliness as a global phenomenon varying primarily in intensity (Russell 1996). An alternative way of conceptualising and defining loneliness can be inspired by Weiss (1973) who distinguish between social and emotional loneliness. Applying a loneliness measure inspired by this approach might forward our understanding of the pathways between ethnicity and immigrant background and loneliness in adolescence. This is an important topic for future research.

In addition, loneliness is a contextual phenomenon which can be experienced in any of the many different settings adolescents act within (Baskin et al. 2010). As children grow up

they spend a substantial amount of time in schools and this context becomes an increasingly influential arena for their social relations and well-being (Weare 2000; Youngblade et al., 2007). The probability of finding peers with whom you feel a mutual understanding and share norms and values might be higher when you feel you belong to the same ethnic group within the school class (Bellmore et al. 2007; Baskin et al. 2010; van Staden and Coetzee 2010). Drawing on findings from this study, exploring the extent to which belonging to the ethnic majority in the school class context is important.

Conclusion

The results of this study suggest that being an immigrant and self-identifying with an ethnic minority group may increase the risk of loneliness among adolescents in Denmark. Descendants of immigrants did not differ in loneliness from native Danish. The results also highlight that the adolescents' self-identified ethnicity plays an essential but different role with regard to loneliness, depending on the adolescent's immigration background: among adolescent immigrants self-identifying as the Danish majority seemed protective against loneliness whereas among adolescent descendants, self-identifying with an ethnic minority group seemed to be protective against loneliness.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by the Nordea Foundation [grant number 02-2011-0122]. The Nordea Foundation had no role in the design, analysis or writing of this article.

ORCID

Katrine Rich Madsen  <http://orcid.org/0000-0002-6591-9849>

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