Migrant Differences in Adolescents' Medicine Use for Common Health Problems: A National Representative Survey

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Abstract: *Aim*: Despite the substantial proportion of adolescents use medicine for common health problems, prevalence of medicine use among adolescents with migrant background have rarely been documented, and the causal pathway continue to be poorly understood. The aim was to examine whether there are migrant differences in adolescents' medicine use for common health problems, and if feeling safe at school, as a non-exposure to discrimination, explained these differences. *Methods*: Data derived from the 2006 Danish contribution to the World Health Organization collaborative study Health Behaviour in School-aged Children (HBSC). Medicine use for headache, stomach-ache, difficulties getting to sleep and nervousness and feeling safe at school were self-reported. The population included boys and girls from ages 11 to 15 who were enrolled in the cross-sectional study. Included were 8480 ethnic Danes, 508 descendants and 456 migrants. Logistic regression was applied to assess associations. Multi-level logistic regression was used to assess the independent effect of school cluster. *Results*: Immigrant girls reported the highest past-month prevalence of medicine use for the four ailments included in the analysis. The highest prevalence of medicine use was found for alleviating headache (54.7%), followed by stomach-ache (30.4%). Among the boys who took medicine for stomach-ache, the odds were 2.11 (1.46-3.05) for descendants and 1.55 (1.00-2.39) for immigrants. Feeling safe at school modifies the effect by reducing the odds to 1.93 (1.32-2.81) for descendants and to 1.30 (0.81-2.07) for immigrants. When simultaneously controlling for the clustering effect of school, feeling safe at school and specific symptoms, the risk of using medicine for stomach-ache was still higher for descendant boys 1.90 (1.26-2.85). *Conclusions*: Self-reported medicine use for common health problems is high among adolescents with migrant background, particularly among first generations immigrant girls. Feeling safe at school partially mediated the association between migrant background and adolescent's medicine use. As the process of migration is becoming more and more frequent, our findings suggest that more adolescents may be using medicines for reasons that cannot only be explained by frequency of symptoms alone.

Keywords: Adolescents, pharmacoepidemiology, minority group, Denmark, school health.

INTRODUCTION

In the Western world, substantial proportions of adolescents use medicine for common health problems [1, 2] and these numbers are on the increase [3, 4]. A review of 6- to 17-year-old healthy children's perceptions of medicines showed that their autonomy in using medicine is high and disturbing given their poor knowledge [5]. Research also suggests that many adolescents using medicines beyond formal therapeutic indication may be at risk of suicidal ideation [6], developing inappropriate ways to dealing with daily stressors [7, 8], and limiting their cognitive development [8, 9]. A further concern about inappropriate use of medication during adolescence is that in addition to these currents effects, the results of a longitudinal study suggest that medicine use in adolescence predicts medicine use in young adulthood [10]. Given the high proportion of adolescents who use medicines, it is critical to identify factors that influence adolescents' medicine use, and to understand the causal pathways behind medicine use. Variations between countries in self-reported medicine use for common health problems among adolescents have already been documented [2, 11]. Further, medicine use for common health problems among adolescents is sensitive to a range of socio-demographic and psychosocial circumstances, e.g. age, sex, gender and socioeconomic conditions [12].

Medicine use for common health problems may also be sensitive to other socio-demographic factors such as migrant background, as cultural minorities may carry with them different patterns of medicine use [1]. In addition, adolescents from migrant backgrounds (first generation immigrants and descendants) may be exposed to psychosocial strain triggered and reinforced by peer and adult discrimination [13] (threats of violence or verbal abuse, based on ethnic background or language skills [14]) which affects how safe they feel at school. Differences in self-reported medicine use for common health problems in relation to adolescents' migrant background (immigrant and descendants) have rarely been studied. We have been able to find one

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short communication on this subject which suggests that adolescents with migrant background use more medicine than the national majority [15], and a recent study suggesting that self-medication was not related to migrant background [16]. The mechanisms behind potential differences in medicine use according to migrant background still remain unknown.

Studies from other health research fields have found that perceived discrimination and daily psychosocial stressors among adolescents with migrant background were associated with mental health problems [17], higher blood pressure [18] and substance use [19] among young adults belonging to minority groups. Several longitudinal research studies conducted among general populations show that positive school experiences are associated with fewer behavioral and emotional problems [20, 21]. Further, feeling safe at school in national research has been associated with later indicators of higher school achievement and mental health [22] and feeling safe at school is also an indicator of non-exposure to discrimination. We expect that ”feeling safe at school”, as an indicator of non-exposure to discrimination, is a protective factor in the potential association between migrant background and adolescents' medicine use.

We therefore investigated 1) migrant differences in adolescents' medicine use for common health complaints, 2) the association between feeling safe at school and medicine use, and 3) whether feeling safe at school explained potential differences in adolescents' medicine use. The study focuses on medicine use for common complaints: headache, stomach-ache, nervousness and difficulties in getting to sleep and migrant background among a group of 11-, 13- and 15-year-old adolescents living in Denmark in 2006.

METHODS

Study Population

We used data from the Danish contribution to the WHO-affiliated international cross-sectional survey Health Behaviour in School-aged Children (HBSC) in 2006 [23]. The aim of this survey is to examine the complex relationships that exist between health behaviors and their social and environmental contexts and attempts to describe how these factors are related to health. The study population includes young people who attended ordinary schools (not schools for pupils with special needs) in three age groups, 11-, 13-, and 15-years in a random sample of schools. The sample was stratified to ensure a sufficient share of pupils from rural regions. Sample 1 was a national random sample of schools; 100 schools received an invitation to participate in the study and 80 of them did participated. Sample 2 was a sample of 27 schools in the southern part of Jutland and all 27 schools participated in the study. The response rate of participating schools was 99.0% of pupils present on the day of data collection, corresponding to 89.2% of the pupils formally enrolled in the participating classes, n= 9514 pupils (boys: 4170 ethnic Danes, 244 descendants, 224 migrants and 36 unknown. Girls: 4310 ethnic Danes, 264 descendants, 232 migrants and 34 unknown).

Data Collection

The participating pupils completed the inter-nationally standardized HBSC [24] questionnaire after instruction from a teacher. The data collection was anonymous and the pupils participated voluntarily and anonymously after informed consent. They returned the completed questionnaires to their teacher in sealed envelopes to protect anonymity, and no school staff members had access to the completed questionnaires. In Denmark, ethical approval of fully anonymous surveys is not required but the researchers asked for approval and consent of the school management, the board of parents, and the board of pupils in every participating school.

Measurements

The outcome measure was the HBSC questions on medicine use behaviour: “In the last month: did you take tablets or medicines for the following? 1) headache, 2) stomach-ache, 3) difficulties in getting to sleep, and 4) nervousness”. The response code was “yes, several times”, “yes, once”, “no”. Very few pupils used the first response category and we dichotomized the responses into “yes” and “no”. We did not ask about specific medications as our study concerns medicine use behaviour.

The independent variable “migrant background” was measured by the following items: 1) “Were you born in Denmark?”, 2) “In which country was your mother born?”, 3) “In which country was your father born?” The responses were divided into four categories, namely 1) ethnic Dane, 2) immigrant, 3) descendant, and 4) unknown. We followed the definition used by Statistics Denmark which considers only country of birth (child/parent). An *immigrant* is a person born abroad, both of whose parents (or one of them if there is no available information on the other parent) are foreign

citizens or born abroad. If there is no available information on either parent and the person was born abroad, the person is also defined as an immigrant. *A descendant* is defined as a person born in Denmark whose parents (or one of them if there is no information on the other parent) are either immigrants or descendants with foreign citizenship. If there is no available information on either of the parents and the person in question is a foreign citizen, the person is also defined as a descendant.

The potential mediator "feeling safe at school" was measured by the following item: "How often do you feel safe at school?" The response code was "always", "mostly", "sometimes", "seldom" and "never". We recoded the responses into three levels, namely, 1) always/mostly, 2) sometimes, 3) seldom/never. We used category 1 as reference in the comparisons.

As symptoms are the strongest predictor for adolescents' medicine use [25], we included specific symptoms for each of the health problems in the analysis. Symptom prevalence was measured by four items from the validated HBSC Symptoms Check List as follows: "During the last 6 months, how often have you experienced 1) headache, 2) stomach-ache, 3) difficulties getting to sleep, or 4) nervousness?" [26]. The responses were recoded into three levels namely, 1) at least weekly, 2) monthly, 3) seldom/never. We used category 3 as reference in the comparisons for all items.

Statistical Procedures

First, we tested the association between migrant background and medicine use for each symptom (model 1, Table **3**). As we consider age to be a confounder [2], all the analyses were adjusted for age. Sensitivity analyses were conducted to better understand the dose-response effect for medicine use and feeling safe at school. Second, we tested whether the potential mediator – feeling safe at school – was associated with the determinant migrant background (results not shown) and the outcome measure "medicine use" (Table **2**). Third, we tested the mediating role of feeling safe at school by examining the change in the association between migrant background and medicine use when feeling safe at school was included in the statistical model. The results of this analysis are presented in model 2 (Table **3**). Fourth, we examined the mediating role of the specific symptoms for the common health problems included (model 3, Table **3**). In order to compensate for the design effect produced by the cluster sampling (school), we applied multilevel models in the logistic regression analyses in Table **4**. Type 3 analyses were included in Tables **2**, **3** and **4** to better understand the statistically significant power of the variables included in the analysis, considering different levels of dose-response.

Participants who failed to provide full information on parents' country of birth were not included in the analyses (36 boys and 34 girls). The percentage of missing data for medicine use was in the range of 3.1-6.8% for girls, and 2.7-5.4% for boys. The percentage of missing data for symptoms as well as feeling safe at school was in the range of 1.2%-1.8% for girls and 1.1-2.4% for boys. The minimal number of girls and boys for the final analyses was 4462 for girls and 4362 for boys in the category medicine use for nervousness.

RESULTS

Table **1** shows the migrant background, specific distributions of sample and grade, prevalence of medicine use, prevalence of symptoms and frequency of feeling safe at school. For both boys and girls, the percentage of the study population with migrant background (immigrant or descendant) was approximately 10%.

Immigrant girls reported the highest past-month prevalence of medicine use for the four ailments included in the analysis. The highest prevalence of medicine use was found for alleviating headache (54.7%), followed by stomach-ache (30.4%). Medicine use for difficulties getting to sleep and nervousness showed much lower prevalence (8.2% and 7.2% respectively).

Similar to the pattern for medicine use, adolescent girls reported the highest prevalence for symptoms. The highest prevalence was found for nervousness (59.1% among immigrant girls) followed by difficulties getting to sleep (53.3% among descendant girls). For headache, the highest prevalence was registered for ethnic Danish girls (51.0%). Finally, for stomach-ache, immigrant girls were again the groups showing the highest prevalence (51.5%).

Table **2** shows the association between feeling safe at school and medicine use for four ailments examined after adjusting for age groups. The odds ratio (OR) of medicine use was higher among those adolescents who seldom or never felt safe at school, being statistically significant for all type 3 analyses.

Table 1: Descriptive Information about the Study Population According to the Applied Variables

	Boys (n= 4674)				Girls (n= 4840)			
	Ethnic Danes	Descendants	Immigrants	Unknown	Ethnic Danes	Descendants	Immigrants	Unknown
	(n= 4170)	(n= 244)	(n= 224)	(n=36)	(n=4310)	(n=264)	(n=232)	(n=34)
Grade								
5th (age 11+)	1434	92	65	13	1505	94	71	19
7th (age 13+)	1501	97	81	12	1581	103	91	5
9th (age 15+)	1235	55	78	11	1224	67	70	10
Prevalence of medicine use in the past month for (%)								
Headache	37.6	43.5	44.4	45.1	51.1	47.4	54.7	60.0
Stomach-ache	8.3	16.4	12.1	16.6	21.6	27.0	30.4	36.6
Nervousness	3.7	5.8	6.8	10.0	3.5	3.8	7.2	3.8
Difficulties getting to sleep	5.1	7.4	6.8	13.3	4.7	4.6	8.2	7.6
Prevalence of symptoms within the past month for (%)								
Headache	38.1	32.2	38.0	26.4	51.0	46.4	47.3	60.0
Stomach-ache	25.9	31.9	29.3	17.6	46.9	50.9	51.5	54.8
Nervousness	46.1	44.2	52.7	39.3	52.2	54.5	59.1	56.6
Sleep difficulties	46.3	50.2	48.3	57.5	52.9	53.3	43.4	74.1
Feeling safe at school (%)								
Mostly/Always	82.5	67.6	65.4	77.4	80.6	65.6	68.7	72.4
Sometimes	8.8	10.0	13.0	6.4	12.1	12.2	13.8	10.3
Seldom/Never	8.5	22.2	21.5	16.1	7.26	22.1	17.4	17.2

Table 2: OR (95% CI) for Medicine Use by Feeling Safe at School

Feeling safe at school	Medicine use for			
	Headache	Stomach-ache	Nervousness	Difficulties getting to sleep
	n=4481	n=4385	n=4362	n=4369
Boys				
Sometimes vs. always/mostly	1.33 (1.08-1.64)	1.25 (0.88-1.77)	1.23 (0.74-2.04)	1.40 (0.92-2.14)
Seldom/never vs. always/mostly	1.36 (1.11-1.66)	1.90 (1.41-2.55)	1.87 (1.23-2.84)	1.64 (1.12-2.42)
Type 3 analysis	*0.0005*	*<0.0001*	*0.012*	*0.0182*
Girls				
Sometimes vs. always/mostly	1.39 (1.16-1.66)	1.40 (1.14-1.72)	1.43 (0.91-2.25)	1.48 (1.00-2.18)
Seldom/never vs. always/mostly	1.31 (1.06-1.63)	1.47 (1.14-1.88)	2.61 (1.70-3.98)	2.21 (1.49-3.28)
Type 3 analysis	*0.0002*	*0.0002*	*<0.0001*	*0.0002*

Table 3a: OR (95% CI) for Medicine Use by Migrant Background: Boys

	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
	Aches					
	Headache			**Stomach-ache**		
Migrant background						
Ethnic Danes	1	1	1	1	1	1
Descendant	1.29 (0.99-1.69)	1.22 (0.93-1.60)	1.45 (1.08-1.95)	2.11 (1.46-3.05)	1.93 (1.32-2.81)	1.96 (1.31-2.94)
Immigrant	1.30 (0.99-1.72)	1.24 (0.93-1.65)	1.37 (1.01-1.87)	1.55 (1.00-2.39)	1.30 (0.81-2.07)	1.46 (0.90-2.35)
Type 3 analysis	*0.0328*	*0.124*	*0.0076*	*<.0001*	*0.002*	*0.0018*
Feeling safe at school						
Mostly/always		1			1	
Sometimes		1.32 (1.07-1.63)			1.23 (0.87-1.75)	
Seldom/never		1.33 (1.08-1.62)			1.77 (1.31-2.39)	
Type 3 analysis		*0.0014*			*0.0008*	
Symptoms						
Seldom/never			1			1
Monthly			3.81 (3.26-4.45)			3.82 (2.97-4.91)
At least weekly			8.29 (6.89-9.96)			7.51 (5.62-10.05)
Type 3 analysis			*<0.0001*			*<0.0001*
Psychological symptoms						
	Difficulties getting to sleep			**Nervousness**		
Migrant background						
Ethnic Danes	1	1	1	1	1	1
Descendant	1.44 (0.86-2.41)	1.39 (0.83-2.35)	1.43 (0.83-2.46)	1.53 (0.85-2.74)	1.41 (0.78-2.55)	1.57 (0.86-2.85)
Immigrant	1.40 (0.79-2.46)	1.27 (0.70-2.29)	1.46 (0.80-2.64)	1.92 (1.08-3.39)	1.69 (0.93-3.06)	1.75 (0.96-3.18)
Type 3 analysis	*0.2092*	*0.3491*	*0.2179*	*0.0364*	*0.133*	*0.0749*
Feeling safe at school						
Mostly/always		1			1	
Sometimes		1.40 (0.92-2.15)			1.21 (0.73-2.02)	
Seldom/never		1.57 (1.05-2.33)			1.80 (1.17-2.75)	
Type 3 analysis		*0.0365*			*0.0233*	
Symptoms						
Seldom/never			1			1
Monthly			3.68 (2.43-5.59)			3.64 (2.43-5.47)
At least weekly			6.03 (4.25-8.57)			5.90 (3.93-8.85)
Type 3 analysis			*<0.0001*			*<0.0001*

Model 1: adjusted for age group;
Model 2: migration background and feeling safe at school, adjusted for age group;
Model 3: migration background, adjusted for age group and symptoms;

Table 3b: OR (95% CI) for Medicine Use by Migrant Background: Girls

	Model 1	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
	Aches					
	Headache			**Stomach-ache**		
Migrant background						
Ethnic Danes	1	1	1	1	1	1
Descendant	0.86 (0.66-1.11)	0.79 (0.61-1.03)	0.85 (0.64-1.14)	1.39 (1.03-1.88)	1.27 (0.93-1.73)	1.21 (0.86-1.68)
Immigrant	1.13 (0.85-1.48)	1.07 (0.81-1.42)	1.26 (0.93-1.71)	1.55 (1.14-2.11)	1.46 (1.06-2.01)	1.58 (1.13-2.21)
Type 3 analysis	*0.3381*	*0.1838*	*0.1638*	*0.0028*	*0.0239*	*0.0156*
Feeling safe at school						
Mostly/always		1			1	
Sometimes		1.39 (1.16-1.67)			1.41 (1.14-1.74)	
Seldom/never		1.34 (1.08-1.66)			1.41 (1.10-1.82)	
Type 3 analysis		*0.0001*			*0.0004*	
Symptoms						
Seldom/never			1			1
Monthly			3.50 (3.01-4.08)			4.34 (3.61-5.22)
At least weekly			7.13 (6.07-8.37)			7.63 (6.18-9.42)
Type 3 analysis			*<0.0001*			*<0.0001*
Psychological symptoms						
	Difficulties getting to sleep			**Nervousness**		
Migrant background						
Ethnic Danes	1	1	1	1	1	1
Descendant	0.99 (0.53-1.85)	0.90 (0.48-1.70)	0.99 (0.53-1.87)	1.08 (0.54-2.15)	0.82 (0.39-1.72)	0.92 (0.48-1.74)
Immigrant	1.86 (1.10-3.12)	1.65 (0.96-2.82)	2.11 (1.22-3.65)	2.13 (1.23-3.71)	1.81 (1.02-3.23)	1.97 (1.13-3.42)
Type 3 analysis	*0.063*	*0.169*	*0.0266*	*0.0264*	*0.0989*	*0.1842*
Feeling safe at school						
Mostly/always		1			1	
Sometimes		1.48 (1.00-2.18)			1.43 (0.91-2.24)	
Seldom/never		2.13 (1.42-3.19)			2.48 (1.60-3.84)	
Type 3 analysis		*0.0005*			*0.0002*	
Symptoms						
Seldom/never			1			1
Monthly			3.13 (1.96-4.99)			2.33 (1.53-3.55)
At least weekly			5.75 (3.95-8.36)			4.10 (2.74-6.15)
Type 3 analysis			*<0.0001*			*<0.0001*

Model 1: adjusted for age group;
Model 2: migration background and feeling safe at school, adjusted for age group;
Model 3: migration background, adjusted for age group and symptoms;

Table 4: OR (95% CI) for Medicine Use for Four Symptoms and Migrant Background, Multivariate Multilevel Analyses

	Medicine use for			
	Headache	**Stomach-ache**	**Difficulties getting to sleep**	**Nervousness**
Boys				
Migrant background				
Ethnic Danes	1	1	1	1
Descendant	1.43 (1.05-1.95)	1.90 (1.26-2.85)	1.37 (0.79-2.38)	1.51 (0.83-2.75)
Immigrant	1.31 (0.96-1.79)	1.36 (0.84-2.20)	1.37 (0.75-2.50)	1.68 (0.92-3.07)
Type 3 analysis	*0.0177*	*0.0063*	*0.1434*	*0.1332*
Feeling safe at school*	1.20 (1.02-1.42)	1.39 (1.07-1.79)	1.26 (0.92-1.74)	1.29 (0.90-1.84)
Symptoms**	5.27 (4.61-6.03)	4.61 (3.70-5.75)	4.96 (3.55-6.93)	4.37 (3.04-6.28)
Girls				
Migrant background				
Ethnic Danes	1	1	1	1
Descendant	0.82 (0.60-1.10)	1.15 (0.82-1.62)	0.88 (0.44-1.77)	0.89 (0.42-1.91)
Immigrant	1.16 (0.85-1.58)	1.54 (1.10-2.16)	2.08 (1.18-3.64)	1.67 (0.91-3.05)
Type 3 analysis	*0.3188*	*0.0350*	*0.0684*	*0.4011*
Feeling safe at school*	1.19 (1.02-1.40)	1.23 (1.02-1.48)	1.56 (1.14-2.13)	1.64 (1.16-2.32)
Symptoms**	4.91 (4.32-5.58)	5.33 (4.48-6.33)	4.73 (3.27-6.84)	3.05 (2.10-4.44)

* Dichotomized variable: seldom or never vs. always or mostly
** Dichotomized variable: at least weekly or monthly vs. seldom or never

There were great differences regarding feeling safe at school between ethnic Danes and descendant and immigrant populations, with 22.2% descendant boys and 22.1% descendant girls vs. 8.5% ethnic Danish boys and 7.2% ethnic Danish girls seldom or never feeling safe at school (Table **1**). Among boys, the OR of seldom or never feeling safe at school vs. always or mostly was 3.14 (95% CI: 2.26-4.37) for descendants and 3.28 (95% CI: 2.30-4.66) for immigrants compared to ethnic Danes. Among girls, the OR of seldom or never feeling safe at school vs. always or mostly was 3.76 (95% CI: 2.71-5.20) for descendants and 2.81 (95% CI: 1.94-4.07) for migrants (results not shown).

Table **3** shows the OR for medicine use among descendants and immigrant boys and girls compared with ethnic Danes. Among boys, only descendants had higher odds of using medicine for stomach-ache, after adjusting for relevant symptoms (Model 3). No statistically significant differences were found for the other ailments studied. Immigrant girls had higher odds of using medicine for stomach-ache, difficulties getting to sleep and nervousness, after adjusting by relevant symptoms (Model 3). When "feeling safe at school" was included in the analysis (Model 2), the results were slightly attenuated for both for descendant boys and immigrant girls.

When simultaneously controlling for the clustering effect of school, feeling safe at school and corresponding complaint (Table **4**), the risk of using medicine for stomach-ache was still higher for descendant boys. Among girls, the risk of using medicine for stomach-ache and difficulties getting to sleep was still higher among immigrants.

DISCUSSION

Main Findings

This study examined migrant differences in adolescents' medicine use for headache, stomach-ache, difficulties getting to sleep, and nervousness, and the mediating effect of feeling safe at school among 11-, 13- and 15-year-old adolescents living in Denmark in 2006. After controlling for frequency of symptoms, descendant boys are at higher risk of using medicine for stomach-ache than ethnic Danes, and immigrant girls are at higher risk of using medicine for stomach-ache, difficulties getting to sleep and nervousness than

ethnic Danes. When compensating for the design effect produced by the cluster sample (school), the multilevel analysis still showed a higher risk of medicine use for descendant boys and immigrant girls compared to ethnic Danes. As the process of migration is becoming more and more frequent, our findings suggest that more adolescents may be using medicines for aches and psychological problems for reasons that cannot only be explained by frequency of symptoms alone.

Comparison with Other Studies

Our results are consistent with other studies showing that adolescent girls have a higher past-month prevalence of medicine use compared to boys for the common health problems included in the analysis, after controlling for symptoms [2, 12]. What we add to this analysis is the identification of immigrant girls as a group that may be more vulnerable because of their higher medicine use. Further, the sex segregated analysis and the inclusion of first generation immigrants and descendants in the study show that descendant adolescent boys are vulnerable group as well.

Although our findings show that more immigrant girls and descendants boys are using medicine for common health complaints, other studies show opposites results [16]. In Norway, Log *et al.* showed that there were no differences in the dispensing of prescribed analgesics between descendant adolescents and ethnic Norwegians. This study, however, does not provide insight into the common-over-the-counter (OTC) medicine use among adolescents. Research suggests that OTC medicines may be the ones most used by young people to alleviate pain as well as discomfort and stress, especially among young women [7, 34, 35].

Potential Explanations

One of the main hypotheses in studies of migration and health is that differences by migrant background converge over time, i.e. should be less visible among descendants than among immigrants [27]. It is therefore surprising to find that the prevalence of medicine use among descendant boys does not converge towards those of ethnic Danes, as it does for girls. These findings suggest that the mechanisms behind the association between migrant background and medicine use are sensitive to gender. Perhaps differences in the acculturation process for adolescent boys and girls may be explained by differences in the way boys and girls are raised [28, 29], divergent integration profiles [30] and power relations among boys and girls [31, 32].

Indeed research in other fields of public health suggests that the acculturation process plays a role in the psychological wellbeing of adolescent immigrants. Based on the International Study of Ethnocultural Youth (ICSEY) conducted in 13 immigrant-receiving countries and focused on the acculturation profiles of individuals and groups, Berry *et al.* [30] showed that, those adolescents fitting the “integration profile” (adolescents reporting high involvement in their ethnic and national cultures, scoring well on their ethnic and national identities, and on national language proficiency, but average on ethnic language proficiency. They also had peer contacts with both their own ethnic group and national groups) were most likely to experience positive psychological adaptation and positive socio-cultural adaptation. Psychological adaptation includes both psychological well being and high levels of satisfaction with their lives, and socio-cultural adaptation includes school adjustment. The study also showed that girls more often fit the “integration profile” and boys the “diffuse profile” (where neither cultural maintenance nor interaction with the other is sought) [30].

In addition, Berry *et al.* [30] showed that adolescents with the diffuse profile reported more perceived discrimination. Perceived discrimination also showed a stronger relationship with the two adaptation outcome variables that any other variable included in the analysis; it was negatively related to psychological adaptation and contributed to poor socio-cultural adaptation. Finally the authors concluded that when individuals experience discrimination, they are likely to reject close involvement with the national society and be more oriented to their own ethnic groups or be confused or ambivalent about their involvement. However, when not discriminated against, they approach the national society with the same degree of respect that has been accorded to them.

Berry’s findings make us believe that the causal pathways between medicine use and migrant background vary for the different subgroups included in the analysis. In other words, potential predictors for medicine use for ethnic Danes may not be the same for immigrants and descendant boys or girls living in Denmark. For example, the association between drunkenness and medicine use present in general populations and showed by Andersen *et al.* [33] may not exist for specific groups of immigrant and

descendant adolescents included in our samples, and this is especially relevant for immigrant girls. Further research looking at specific predictors for different subgroups of adolescents could shed light on the different casual pathways of the association between migrant background and medicine use.

Strengths and Limitations

Our study design is cross-sectional and we do not know the sequence in which the included factors operate. Our assumption is that feeling safe at school as an indicator of non-exposure to discrimination which may act as a protective factor or buffer against aches and psychological problems and therefore limit the use of medications. However, we cannot know if feeling safe at school comes before or after symptoms and medicine use. It may also be that taking some kind of medication may increase the probability that the pupil feels less safe at school. In this case, medicine use may be the determinant rather than the outcome. We need longitudinal or qualitative studies to shed light on the sequences.

Our study was based on a large, national representative study with a high response rate, and this fact limits a potential selection bias (response rate of 99% of those pupils who were present at the day of data collection corresponding to 89.2% of the students formally enrolled in the participating classes). Nevertheless, the non-participating students may introduce a selection bias in our findings. If pupils who are immigrants or descendants do not feel safe at school and use more medicine, are more likely not to participate in the study, e.g. because they were absent due to sickness, then our analyses may have under-estimated the association between migrant background and medicine use. We were not able to identify the migrant background of 36 boys and 34 girls. However, there is no reason to believe that there are more immigrants or descendants grouped under the "unknown migrant background", but that some adolescents, irrespective of their ancestry, may have some cognitive problems that make it difficult for them to understand certain questions.

Validation studies suggest that the measurement of symptoms and the measurement of medicine use are appropriate in age-equivalent populations [26, 36]. The measurement of feeling safe at school by a single item may limit its validity, and it may well be that adolescents don't feel safe at school for reasons beyond discrimination. Specific questions where adolescents are asked about perceived discrimination could be included in future HBSC questionnaires. In addition, adolescents with a different cultural background, sex or age may understand this question differently or may associate it with different individual problems e.g. integration problems, bullying or sense of belonging to the community. Sawyer *et al.* (2008) showed potential ethnic and gender variation in the way children reported victimization for bullying depending on the method to estimate prevalence. In their study, for example, African American youth who were victimized tended to under-report being a victim of "bullying" [37]. We did not include questions related to the length of stay or citizenship. Both variables could have an impact on the way adolescents experience feeling safe at school.

Last, our analyses did not include other potential factors like life-style confounders or parental socioeconomic position due to power restrictions of the sample. As previous studies conducted among the general population have shown the influence of drinking and smoking habits as well as the educational and income background of the parents, we encourage further research to include these factors as potential mediators.

Despite the mentioned limitations, our results suggest that immigrant girls and descendant boys are two vulnerable population groups that deserve special attention. We recommend studying the association between migrant background and feeling safe at school for specific ethnic groups. The mediating effect examined here deserve further research focused on analyzing whether feeling safe at school acts as a protective factor for adolescent medicine use across different cultures or just for specific ethnic groups. This recommendation is in line with Bonny *et al.* [38] who suggested acquiring better understanding of the link between ethnicity, gender and school connectedness (associated with feeling safe at school) in different immigrant and descendant populations, and recommend that school health providers target youth in need, in case this association was found in specific adolescents groups. From a methodological perspective, Ozer and Weinstein [22] suggested that interviews would enable richer investigation of adolescents' utilization of support and other resources in varying cultural contexts, in addition to experiences that contribute to feeling safer at school. We encourage future research to make use of qualitative methods to explore reasons for migrant differences in adolescents' medicine use behavior.

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CONFLICT OF INTEREST

We have identified no conflicts of interest.

IMPLICATIONS AND CONTRIBUTION

School health professionals seeking to promote good health behaviours among adolescents can improve individual and group attitudes towards medicines by modifying features of the school environment. Initiatives multi-ethnic and integrative schools may promote using medicines in an appropriate way.

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