



**MOTHER'S COUNTRY OF BIRTH AND PSYCHOTROPIC DRUG
USE IN SWEDISH ADOLESCENTS: A LIFE-COURSE
APPROACH**

Journal:	<i>BMJ Open</i>
Manuscript ID:	bmjopen-2012-001260
Article Type:	Research
Date Submitted by the Author:	13-Apr-2012
Complete List of Authors:	van Leeuwen, Willemijn; Lund University, Faculty of Medicine, Social Epidemiology Nilsson, Sofia; Lund University, Faculty of Medicine, Social Epidemiology Merlo, Juan; Lund University, Faculty of Medicine, Social Epidemiology
Primary Subject Heading:	Mental health
Secondary Subject Heading:	Epidemiology, Public health, Sociology, Health services research, Pharmacology and therapeutics
Keywords:	EPIDEMIOLOGY, Quality in health care < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, PUBLIC HEALTH, SOCIAL MEDICINE, Community child health < PAEDIATRICS, Child & adolescent psychiatry < PSYCHIATRY

SCHOLARONE™
Manuscripts

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

MOTHER'S COUNTRY OF BIRTH AND PSYCHOTROPIC DRUG USE IN SWEDISH ADOLESCENTS: A LIFE-COURSE APPROACH

Corresponding author

Juan Merlo

MD, PhD, Tenured Professor

Unit for Social Epidemiology, Skåne University Hospital

Jan Waldenströms gata 35

SE-20502 Malmö, Sweden

E-mail: juan.merlo@med.lu.se

Tel. +46 40391329

Authors

Willeminj Van Leeuwen^{1,2}

Sofia Nilsson¹

Juan Merlo¹

Affiliations

¹ Unit for Social Epidemiology, Faculty of Medicine, Lund University, Malmö, Sweden

² Dept. of Public Health, Academic Medical Center (AMC) University of Amsterdam,
Netherlands

Running title:

Psychotropic drug use in Swedish adolescents

Keywords

Psychotropic drugs, adolescent, second-generation immigrants, needs assessment, bias
(epidemiology)

Word count:

Abstracts: 246

Manuscript: 2916

ABSTRACT

Objectives

In addition to medical needs, psychotropic drug use in adolescence might be conditioned by the cultural context of the family. This knowledge is relevant for both detecting inequities in health care, and identifying information bias in epidemiological studies using psychotropic drugs as a proxy for impaired psychological health. Therefore, we investigated whether, independent of needs, the socioeconomic characteristics of the mother's country of birth are associated with psychotropic drug use in Swedish-born adolescents.

Methods

By linking the Swedish Medical Birth Registry to other national registers, we identified all 324510 singletons born between 1988 and 1990 who were alive and residing in Sweden until the age of 18 (years 2006 to 2008). We measured their psychotropic drug use in the year they turned 18. Applying a life-course approach, we included both the mother's and the children's characteristics throughout pregnancy, delivery, infancy, childhood and adolescence when calculating a risk score to adjust for needs. We classified the mother's country of birth according to the gross national income (GNI) per capita of each country.

Results

Overall, the lower the income of the mother's birth country, the lower the probability of psychotropic drug use among children. When adjusting for needs, the association became even stronger.

Discussion

Besides medical needs, use of psychotropic drugs by second-generation immigrants seems conditioned by the socioeconomic characteristics of the mothers' countries of birth. The threat of information bias must be considered when psychotropic drug use is employed as a proxy for impaired psychological health.

INTRODUCTION

In Sweden, as in many other countries, the healthcare system aims to allocate resources on equal terms and according to needs rather than by gender, socioeconomic position or country of birth [1].

Psychotropic drugs are potent therapy for treating impaired psychological disorders in childhood and adolescence [2]. Despite the many knowledge gaps concerning their safety and efficacy [3], the use of these drugs in adolescents has increased considerably during recent decades [4-6]. In addition, these drugs are used as a proxy for impaired psychological health in adolescents and young adults in register-based epidemiological studies [7-13].

Psychotropic drug use in adolescents should be conditioned by needs. However, the concept of 'need' is ambiguous, and care-seeking and care-giving are influenced by other factors in addition to disease [14, 15]. There are also complex relationships between symptoms, expectations, social factors and an individual's conception of disease [16, 17]. Furthermore, the concepts of disease, illness and need are culturally defined, to a great extent, and are influenced by societal and contextual factors acting over and above individual characteristics [18]. Therefore, psychotropic drug use may be conditioned by an individual's country of birth or interaction with Swedish society [19]. Patterns of healthcare utilisation may also be transmitted across generations. Nevertheless, there are many knowledge gaps concerning the determinants of psychotropic drug use in immigrants. To the best of our knowledge, this information is almost absent for second-generation immigrants. Nevertheless, this information is relevant not only for detecting inequities in health care but also for identifying information bias in epidemiological studies that use psychotropic drugs as a proxy for impaired psychological health.

In this context, we investigated psychotropic drug use in 18 year old adolescents born in

1
2
3 Sweden. We aimed to compare adolescents born to immigrant women (i.e., second-generation
4 immigrants) with those born to native mothers. Our hypothesis was that any difference would
5 disappear or at least decrease after adjusting for needs. We appraised needs using a risk score
6 [20] for psychotropic drug use, including information on the health and socioeconomic status
7 of the mothers and the children during pregnancy and delivery as well as throughout the
8 children's infancy, childhood and adolescence [21]. We studied every 18-year-old adolescent
9 in Sweden during the years 2006-2008.

20 21 **POPULATION AND METHODS**

22 23 24 **Study population**

25
26
27 The Swedish Medical Birth Registry is linked to several other national databases, including
28 the National Inpatient Registry, the National Mortality Registry, the Swedish Drug
29 Prescription Register, the Register of the Total Population, and the Swedish 1990 population
30 census, using a unique personal identification number. These registries are administered by
31 the Swedish authorities (i.e., The National Board of Health and Welfare and Statistics
32 Sweden). To ensure the anonymity of the subjects, these authorities encrypted the original
33 personal identification numbers of the individuals before delivering the data to us. The study
34 was approved by the Regional Ethics Review Board in southern Sweden.

35
36
37 Using the Medical Birth Register, we identified all singleton children born in Sweden
38 between 1988 and 1990 who were alive and residing in Sweden from birth until the year in
39 which the child turned 18 (2006-2008) and whose mother's country of birth could be
40 identified. The final study population represented 94% (324510/347148) of all children born
41 in 1988, 1989 and 1990. Figure 1 shows a flow diagram of the selection criteria used to define
42 the study population.

Assessment of the outcome variable

The outcome variable was the use of psychotropic drugs (i.e., dispensation at the pharmacy) according to the Drug Prescription Registry. We obtained this information in the calendar year that the child turned 18. Psychotropic drugs were defined as all drugs with Anatomic Therapeutic Chemical (ATC) classification system [22] codes starting with N5 or N6 (see Table 1). We dichotomised the outcome variable into use or non-use of psychotropic drugs.

Assessment of child's characteristics

We categorised *birth year* into 1988, 1989 or 1990, using 1988 as the reference group. *Apgar score* was measured on a scale from 1 – 10 at the first, fifth and 10th minute after birth, where a score of 10 indicates a delivery without distress for the infant. We created dummy variables where an *Apgar score* ≤ 5 was classified as 'low', and an *Apgar score* >5 was classified as 'not low'. The latter was used as the referent. We recoded the missing values at 5 or 10 minutes as 'not low Apgar' because it can be assumed that the subsequent *Apgar scores* were high and therefore not measured if the Apgar score after one minute was high [23]. This was the case for 37% of the children.

For every hospital discharge, a main diagnosis and up to seven secondary diagnoses are recorded in the Patient Register and coded according to the International Classification of Diseases (ICD). We defined a child admitted to a hospital with a diagnosis coded 290 to 319 or F00 to F90 (ICD versions 9 and 10, respectively) as *severe psychiatric morbidity*. Children never admitted to a hospital with any of these diagnoses were established as the reference group in the comparisons.

For every child, we calculated the total number of days spent in the hospital from birth until their 15th birthday. We distinguished between children with *extensive hospitalisation* (i.e.,

1
2
3 children spending 30 days or more in the hospital) and children with less than 30 days in the
4 hospital or who were never hospitalised, using the latter group as the referent. We combined
5 *history of psychiatric diagnosis* and *extensive hospitalisation* of the children into four
6 categories, as indicated in table 2.
7
8
9
10
11

12 **Assessment of mother's characteristics**

13
14
15 We categorised the mothers' *country of birth* by two different types of criteria: socioeconomic
16 and geographic. Both categorisations are listed in table 2. In our analyses, we used the
17 socioeconomic criterion, which categorises the mother's country of birth by means of the
18 World Bank classification of country economies. Countries were grouped according to their
19 gross national income (GNI) per capita using the World Bank Atlas method into low-, lower
20 middle-, upper middle-, and high-income countries. Sweden was included in the high-income
21 category. However, we separated Sweden from the group of high-income countries and used
22 Sweden as the referent in the comparisons because we conducted the study in the context of
23 Swedish culture.
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38

39 We classified *mother's age at delivery* into six groups (i.e., <20 years, 20-24 years, 25-29
40 29... >39 years). We considered mothers from the age group 25-29 the reference group in the
41 comparisons.
42
43
44
45
46
47

48 We classified *maternal smoking during pregnancy* into four categories: 'no smoking', 'light
49 smokers' (1-9 cigarettes per day), 'heavy smokers' (>9 cigarettes per day) and 'missing
50 values'. The missing values ranged from 7.6% among the Swedes to 11.8% among mothers
51 from low-income countries. We considered the non-smoking group the reference category.
52
53
54
55
56
57
58
59
60 The information on smoking was self-reported and recorded when the mother attended her
first scheduled antenatal care visit.

1
2
3 We identified all mothers with a diagnosis of *pre-eclampsia* (ICD-9 code 642) and considered
4
5 mothers who did not suffer from pre-eclampsia the reference group in the comparisons.
6
7

8
9 We defined mother's *educational achievement* as the highest completed level of education in
10
11 1990. This variable was categorised into four groups: 'elementary school or lower' (9 years),
12
13 'lower secondary school' (12 years total), 'higher educational achievement' (>12 years) and
14
15 'missing information'. We used the 'higher educational achievement' category as the
16
17 reference group in the comparisons.
18
19

20
21 Information regarding whether parents were *living together* was based on self-reported status
22
23 when the mother was first seen for antenatal care. We considered mothers living together with
24
25 the father of the child the reference group.
26
27

28
29 We identified mothers with *severe psychiatric morbidity* and with *extensive hospitalisation* in
30
31 a manner similar to that used for children (see above). In addition, we combined a history of
32
33 psychiatric diagnosis with extensive hospitalisation in the same way as we did for the children
34
35 (see table 2).
36
37
38
39

40 **Statistical Analyses**

41
42
43 To estimate needs, we applied a logistic regression and constructed an equation that predicted
44
45 the probability (i.e., the risk score) [20] of using psychotropic drugs around the age of 18 in
46
47 the unexposed group (i.e., children with mothers born in Sweden). This equation included the
48
49 maternal and child's characteristics mentioned above.
50
51
52

53
54 These variables were chosen using both previous knowledge and an explorative approach.

55
56 When two variables showed multicollinearity, we selected the variable that provided a better
57
58 goodness of fit by means of a chi-square test (e.g., mother's education compared with
59
60 household income).

1
2
3 Subsequently, we applied the risk score equation to the entire population (i.e., children with
4 mothers born in Sweden *and* children with immigrant mothers).
5
6
7

8
9 The equation of the risk score is presented in Table 1. The individual value of the risk score
10 (RS) (i.e., predicted probability) was obtained with the following formula:
11
12

$$13 \quad RS = [e^{\text{logit}} / (1 + e^{\text{logit}})] * 100.$$

14
15
16
17
18 In the analyses, we categorised the risk score into four groups by quartiles and used the group
19 with the lowest risk score as the reference group in the comparisons.
20
21
22

23
24 Using logistic regression, we developed two consecutive models to estimate the relative
25 differences (i.e., odds ratios) in the use of psychotropic drugs. In the first model, we
26 investigated the bare association between mother's country of birth and the use of
27 psychotropic drugs in adolescence. In the second model, we included the risk score described
28 above to adjust for possible dissimilarities in needs between the different maternal countries
29 of birth. We analysed boys and girls separately in the models because there are cultural
30 differences in gender roles, and gender may influence healthcare and psychotropic drug use
31 [24-26]. We used SPSS version 18 for all analyses.
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

RESULTS

Table 1 indicates the regression coefficients of the variables used in the logistic regression to obtain the risk score (i.e., predicted probability) for psychotropic drug use.

Table 1. Equation for estimation of the risk score (RS) used in the analyses to approximate the need for psychotropic drugs. The equation was calculated in the population of children born to Swedish mothers and subsequently applied to all the children. The RS corresponds to the predicted probability of using psychotropic drugs as a function of the variables included in the model.

$$\begin{aligned}
 \text{Logit (Use of psychotropic drugs)} = & \\
 & -3.467 = \text{intercept} \\
 & +0.180 * \text{'smoking 1-9 cigarettes per day'} \\
 & +0.291 * \text{'smoking more than 9 cigarettes per day'} \\
 & +0.057 * \text{'no information on smoking'} \\
 & +0.126 * \text{'pre-eclampsia'} \\
 & +1.742 * \text{'no information on age'} \\
 & +0.219 * \text{'age under 20'} \\
 & +0.071 * \text{'age 20 to 24'} \\
 & +0.001 * \text{'age 30 to 34'} \\
 & +0.094 * \text{'age 35 to 39'} \\
 & +0.204 * \text{'age over 39'} \\
 & +0.057 * \text{'low Apgar after 1 min'} \\
 & +0.192 * \text{'low Apgar after 1 and 5 min'} \\
 & +0.324 * \text{'low Apgar after 10 min'} \\
 & +0.087 * \text{'no information on Apgar score'} \\
 & +0.140 * \text{'no information on family situation'} \\
 & +0.221 * \text{'not living together'} \\
 & +0.152 * \text{'birth year 1989'} \\
 & +0.238 * \text{'birth year 1990'} \\
 & +0.164 * \text{'low educational level'} \\
 & +0.028 * \text{'middle educational level'} \\
 & +0.258 * \text{'no information on educational level'} \\
 & +0.259 * \text{'mother extensive hospitalisation and no psychiatric diagnosis'} \\
 & +0.530 * \text{'mother psychiatric diagnosis and no extensive hospitalisation'} \\
 & +0.605 * \text{'mother extensive hospitalisation and psychiatric diagnoses'} \\
 & +0.566 * \text{'child extensive hospitalisation and no psychiatric diagnosis'} \\
 & +1.539 * \text{'child psychiatric diagnosis and no extensive hospitalisation'} \\
 & +2.479 * \text{'child extensive hospitalisation and psychiatric diagnoses'}
 \end{aligned}$$

1
2
3 Table 2 shows the characteristics of the adolescents at different life stages and classified
4 according to the GNI categories of the mother's country of birth. This table indicates that
5 adolescents born to mothers from low-income countries used fewer psychotropic drugs than
6 do adolescents with mothers born in Sweden. However, adolescents with mothers from low-
7 income countries were hospitalised more frequently and had more psychiatric diagnoses than
8 were adolescents with Swedish mothers.
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For peer review only

Table 2. Maternal country of birth classified according to World Bank Gross National Income (GNI) by child's characteristics. Numbers are percentages unless otherwise indicated.

	Sweden	HIC	UMIC	LMIC	LIC
Number of children	288 626	15 905	9572	7972	2435
Number of girls	140 235	7743	4656	3883	1174
Use of psychotropics at age 18 (ATC code)					
– Psychotropics unspecified (N5+N6)	4.7	5.0	3.9	3.4	2.2
– Antipsychotics (N5A)	0.4	0.5	0.5	0.5	0.2
– Anxiolytics (N5B)	1.5	1.6	1.4	1.3	0.7
– Hypnotics and sedatives (N5C)	1.2	1.5	1.0	1.2	0.4
– Antidepressants (N6A)	2.8	2.9	2.0	1.6	0.9
– Psychostimulants (N6B)	0.8	0.7	0.5	0.4	0.3
Child's characteristics during perinatal period					
Birth year					
– 1988	32.1	33.2	31.2	28.7	28.1
– 1989	33.1	32.3	32.8	32.2	32.4
– 1990	34.8	34.5	35.9	39.1	39.4
Apgar score					
– Low Apgar score	94.1	94.4	93.6	93.8	91.7
– Low Apgar score (<6) after 1 min only	3.0	2.4	3.3	3.4	4.1
– Low Apgar score (<6) after 1 and 5 min.	0.7	0.7	0.9	0.7	1.2
– Low Apgar score (<6) after 10 min	0.4	0.5	0.4	0.5	0.8
– Apgar scores missing	1.9	2.0	1.8	1.6	2.2
Child's characteristics until age 15					
Hospitalised >30 days	2.1	2.0	2.7	2.2	3.0
Psychiatric diagnosis according to Patient Registry	1.6	1.8	1.9	1.8	2.5
Hospitalised >30 days (A) and psychiatric diagnosis (B) combined					
– (A) no and (B) no	96.7	96.5	95.9	96.3	94.9
– (A) yes and (B) no	1.8	1.7	2.3	1.9	2.5
– (A) no and (B) yes	1.2	1.4	1.4	1.5	2.1
– (A) yes and (B) yes	0.4	0.4	0.5	0.3	0.5

HIC: high-income country, UMIC: upper middle-income country, LMIC: lower middle-income country, LIC: low-income country.

1
2
3 Table 3 is similar to Table 1 but provides information on maternal characteristics. Low-
4
5 income countries are those countries outside of Europe. Compared with Swedish mothers,
6
7 mothers from low-income countries have lower income, lower educational achievement and
8
9 are less likely to live with the father of their children. Furthermore, a higher percentage of
10
11 mothers from low-income countries have been hospitalised for more than 30 days, and
12
13 mothers from low-income countries have a much lower smoking prevalence.
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For peer review only

Table 3. Maternal country of birth classified according to World Bank Gross National Income (GNI) by maternal characteristics. Numbers are percentages unless otherwise indicated.

Maternal characteristics during perinatal period	Sweden	HIC	UMIC	LMIC	LIC
Geographical region of birth					
– Sweden	100				
– Nordic country outside Sweden		79.4			
– Rest of Europe		14.6	63.4	27.6	
– Rest of the world		6.0	36.6	72.4	100
Years spent in Sweden at delivery					
– >18	98.9	49.8	9.5	13.2	7.6
– 6-18	0.6	32.5	35.3	20.7	30.9
– 0-5	0.4	15.9	38.1	46.5	44.4
– No information	0.1	1.9	17.2	19.6	17.1
Age at delivery in years					
– No information	0.0	0.2	8.3	8.4	8.3
– <20	2.8	2.7	5.3	3.6	2.9
– 20-24	24.3	19.4	24.9	22.5	22.8
– 25-29	36.9	33.5	26.6	32	35.7
– 30-34	24.9	27.6	21.3	22.5	22.2
– 35-39	9.3	13.2	11.3	9.2	7.3
– >39	1.8	3.3	2.4	1.8	0.9
Equalised disposable household income in 1990					
– Low	31.0	34.9	62.1	56.7	57.2
– Middle	33.1	30.4	19.3	20	22.9
– High	33.4	31.6	13.5	14.8	12.8
– No information	2.5	3.1	5.1	8.4	7.1
Highest completed educational level in 1990					
– Primary school (9 years) or less	17.2	25.2	41.2	36.8	46.9
– Lower secondary (12 years)	54.9	47.7	32.2	33.6	24.6
– Higher education (15 years)	25.1	22.1	14.6	13.4	9.9
– No information	2.9	5.0	12.1	16.2	18.6
Living with child's father					
– Yes	90.6	88.1	85.5	87	82.2
– No	5.2	6.9	6.9	5.4	9.8
– No information	4.2	5.0	7.6	7.6	8.0
Smoking during pregnancy					
– No	68.0	62.4	69.3	75.5	83.1
– 1-9 cigarettes per day	15.0	16.3	12.5	8.6	4.1
– >9 cigarettes per day	9.3	12.6	6.4	4.7	1.0
– No information	7.6	8.7	11.8	11.2	11.8
Pre-eclampsia					
	2.1	2.0	1.5	1.2	2.4
Maternal characteristics until child aged 15					
Death	0.6	1.0	0.8	0.6	0.9
Hospitalised >30 days	7.0	8.1	7.2	6.9	11.0
Psychiatric diagnosis according to Patient Registry	1.4	2.1	1.5	1.4	1.3
Hospitalised >30 days (A) and psychiatric diagnosis (B) combined					
– (A) no and (B) no	91.2	89.1	90.0	90.2	86.4
– (A) yes and (B) no	4.9	5.1	5.2	4.9	8.4
– (A) no and (B) yes	1.9	2.8	2.7	2.9	2.5
– (A) yes and (B) yes	2.1	3.0	2.1	2.0	2.6

HIC: high-income country, UMIC: upper middle-income country, LMIC: lower middle-income country, LIC: low-income country.

Table 4 shows the odds ratios and 95% confidence intervals for psychotropic drug use in adolescence as a function of the GNI categories of maternal country of birth stratified by gender. Overall, the lower the GNI of the mother's country of birth, the lower the probability of use of psychotropic drugs among second-generation immigrants compared with adolescents born to Swedish-born mothers. In the unadjusted analysis (Table 3, model 1), this association was more evident for girls than for boys. Nevertheless, after adjustment for the risk score (Table 3, model 2), the association was accentuated and evident in both sexes. The lowest risk for psychotropic drug use was found in girls born to mothers from low-income countries.

Table 4. Association between maternal birth country and psychotropic drug use at age 18, unadjusted (model 1) and adjusted (model 2) for risk score. * Values are odds ratios (ORs) and 95% confidence interval (CIs).

	Boys				Girls			
	Model 1		Model 2		Model 1		Model 2	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Maternal country of birth								
– Sweden	ref		ref		ref		ref	
– High-income country	1.08	(0.96 1.21)	1.01	(0.90 1.13)	1.08	(0.99 1.19)	1.03	(0.94 1.13)
– Upper middle-income country	0.94	(0.80 1.10)	0.80	(0.69 0.94)	0.74	(0.64 0.85)	0.66	(0.57 0.76)
– Lower middle-income country	0.90	(0.75 1.07)	0.78	(0.66 0.94)	0.59	(0.50 0.70)	0.53	(0.45 0.63)
– Low-income country	0.69	(0.48 0.98)	0.57	(0.40 0.82)	0.32	(0.21 0.48)	0.28	(0.19 0.42)
Risk score for psychotropic drug use*								
– 1st quartile			ref				ref	
– 2nd quartile			1.17	(1.01 1.29)			1.10	(1.04 1.21)
– 3rd quartile			1.45	(1.32 1.59)			1.31	(1.13 1.31)
– 4th quartile			2.55	(2.34 2.77)			1.81	(1.81 2.01)

*Variables included in the risk score: Perinatal period (Apgar score, child's birth year, maternal smoking during pregnancy, maternal age, maternal educational level, family situation); Infancy, Childhood and Adolescence (extensive hospitalisation child, psychiatric diagnosis child, extensive hospitalisation mother, psychiatric diagnosis mother).

DISCUSSION

Our analyses indicate that Swedish adolescents born to immigrant women have a lower use of psychotropic drugs in adolescence than do the offspring of native Swedish women. This observation was evident in both sexes but was especially pronounced in girls. Moreover, the relative use of psychotropic drugs decreased linearly with the income (i.e., GNI per capita) of the mother's country of birth and was lowest for girls with mothers born in low-income countries.

Several mechanisms could explain our findings. Adolescents born to immigrant women might have better psychological health and therefore lower needs for psychotropic drug treatment than the offspring of native Swedish women. If this were true, adjusting for needs would make any difference disappear or at least decrease. To create a risk score, we adopted a life-course approach [27] and observed that a number of maternal and offspring characteristics during pregnancy, delivery, infancy, childhood and adolescence predicted psychotropic drug use during adolescence. Nevertheless, after adjusting for needs using the risk score, the influence of mother's country of birth (i.e., lower use of psychotropic drugs among adolescents with mothers from low-income countries) remained independent and even increased. This finding suggests that differences in psychotropic drug use may reflect divergences in access to healthcare resources rather than lower needs. However, we cannot exclude the possibility that we missed other relevant factors, such as childhood adversities, which affect psychological health later in life (e.g., neglect and verbal or physical abuse) [28]. Because we were restricted to the available information, our adjustment for needs is inherently incomplete.

One explanation for the observed underutilisation of psychotropic drugs by second-generation immigrants may be that the cultural context in which one grows up influences healthcare-

1
2
3 seeking behaviour. Examples of these cultural influences are different conceptions of disease
4 and taboos [29]. Another factor affecting the lower use of psychotropic drugs by second-
5
6 generation immigrants may be so-called health illiteracy (i.e., unfamiliarity with the country's
7
8 healthcare system) [30].
9
10

11
12
13 These cultural and health illiteracy-related aspects may explain the underutilisation of health
14 care by mothers. However, the children in our study were *second*-generation immigrants who
15
16 grew up and attended school in Sweden. Thus, they had the opportunity to become familiar
17
18 with the Swedish system. Nevertheless, we think it is likely that the effects of cultural
19
20 influences and health illiteracy on mothers' healthcare-seeking behaviours are transmitted to
21
22 the next generation because it is often mothers who regulate healthcare contacts for children.
23
24
25

26
27
28 Interestingly, our results suggesting a relative underutilisation of psychotropic drugs in 18-
29
30 year-old second-generation immigrants contrast with previous findings that observed a higher
31
32 rate of psychotropic drug use in first-generation immigrants [31]. In addition, a study in the
33
34 Netherlands [32] found that in comparison with the native population, first- and second-
35
36 generation Turkish and Moroccan immigrants had an increased rate of antidepressant and
37
38 antipsychotic drug prescriptions and a decreased rate of ADHD medication and lithium
39
40 prescriptions. However, in our earlier investigations in the county of Scania, we observed that
41
42 overall utilisation of psychiatric healthcare resources in 18- to 80-year-old immigrants was
43
44 considerably less than expected according to self-reported needs [30].
45
46
47
48
49

50
51 As expected, we found a high correlation between time spent in Sweden before delivery and
52
53 mothers' country of birth. We observed the lowest percentage of mothers with more than 18
54
55 years in Sweden in the group of mothers from low-income countries. Because spending fewer
56
57 years in Sweden reduces the opportunity for acculturation, this variable may have contributed
58
59 to the relative underutilisation of psychotropic drugs in this group.
60

1
2
3 In the present analysis, we only considered prescribed drugs. Therefore, the results may be
4
5 biased by the sale of over-the-counter (OTC) drugs. In Sweden, the only available OTC
6
7 psychotropic drug is Propiomazine. Nevertheless, we believe it is improbable that our results
8
9 would be affected by the inclusion of Propiomazine in the analyses because this assumption
10
11 would imply that second-generation immigrants use this OTC drug as a substitute for all other
12
13 psychotropic drugs.
14
15

16
17
18 One strength of our study is that we had information from registries covering the entire
19
20 Swedish population. Furthermore, because giving birth at home is very unusual in Sweden,
21
22 nearly all births are registered in the Medical Birth Register. The information in the Medical
23
24 Birth Register, National Patient Register and National Cause of Death Register is mandatorily
25
26 reported by law, and the quality of the registries is regularly evaluated by the National Board
27
28 of Health and Welfare and Statistics Sweden.
29
30
31

32
33 Measurement of psychotropic drug use using administrative registries reflects both access to
34
35 healthcare and the presence of psychological disorders. From the perspective of community
36
37 medicine, the identification of an imbalance between needs and utilisation of psychotropic
38
39 drugs raises questions about equity in access to health care resources. However, our findings
40
41 also identify the existence of information bias when using a register-based measurement of
42
43 psychotropic drug use as a proxy for impaired psychological health if second-generation
44
45 immigrants are included in the analyses.
46
47
48
49

50
51 We performed analyses investigating specific groups of psychotropic drugs (results available
52
53 on request), but the results were similar to those found when analysing the entire medication
54
55 group. Moreover, because the therapeutic profiles of the studied medication groups overlap
56
57 each other (i.e., different psychiatric disorders can be treated with the same drug group), we
58
59 cannot create a direct link between specific medications and diagnoses.
60

1
2
3 The suitability of treating young people with psychotropic drugs is polemic. Certainly, there
4 are risks when these drugs are used more often than necessary [33, 34]. However, underuse
5 may engender avoidable suffering [35]. It is not clear whether adolescents in Sweden and
6
7
8
9
10 other high-income countries are prescribed these drugs in excess (i.e., overutilisation) [36].
11

12
13
14 If underutilisation of psychotropic drugs by adolescent second-generation immigrants occurs,
15
16 policy makers in the Swedish healthcare system should take this situation into account.
17

18
19 Swedish healthcare policy is based on the principle of equity that supports the distribution of
20
21 healthcare resources on equal terms and according to needs, regardless of any other
22
23 determinants. This aspect is particularly relevant because one of the main goals stated by the
24
25 Swedish National Institute of Public Health is 'secure and favourable conditions during
26
27 childhood and adolescence' and, specifically, 'improved mental health amongst children and
28
29 young people' (39). Paraphrasing Wittkampf [32], we need further research to clarify whether
30
31 patients of different ethnic backgrounds with the same symptoms receive similar diagnoses
32
33 and adequate treatment.
34
35
36
37
38
39
40
41
42

43 **COMPETING INTERESTS**

44
45 None declared
46
47
48
49

50 **FUNDING**

51
52 This work was supported by the Swedish Council for Working Life and Social Research
53 (FAS) [Dnr 2010-0402, PI Juan Merlo], the Swedish Research Council (VR) [Dnr K2011-
54 69X-15377-07-6, PI Juan Merlo] and the Centre for Economic Demography at Lund
55
56 University.
57
58
59
60

STATEMENT

“The Corresponding Author has the right to grant on behalf of all authors and does grant on behalf of all authors an exclusive licence (or non-exclusive for UK Crown Employees) on a worldwide basis to the BMJ Publishing Group Ltd, and its Licensees to permit this article (if accepted) to be published in The Journal of Epidemiology and Community Health and any other BMJ PGL products and to exploit all subsidiary rights, as set out in our licence.”

CONTRIBUTORSHIP STATEMENT

All authors WvL and JM had the original idea of the study. JM, WvL and SN participated in the design, analysis, interpretation of data, and drafting of the article. All authors approved the final version to be published. JM is the guarantor of the article.

REFERENCES

- 1 Health on equal terms--national goals for public health. *Scand J Public Health* 2001;**Suppl 57**:1-68.
- 2 Practice parameter on the use of psychotropic medication in children and adolescents. *J Am Acad Child Psy* 2009;**48**:961-73.
- 3 Vitiello B. An international perspective on pediatric psychopharmacology. *Int Rev Psychiatry* 2008;**20**:121-6.
- 4 Zito JM, Safer DJ, dosReis S, *et al*. Trends in the prescribing of psychotropic medications to preschoolers. *JAMA : the journal of the American Medical Association* 2000;**283**:1025-30.
- 5 Zito JM, Safer DJ, DosReis S, *et al*. Rising prevalence of antidepressants among US youths. *Pediatrics* 2002;**109**:721-7.
- 6 Thomas CP, Conrad P, Casler R, *et al*. Trends in the use of psychotropic medications among adolescents, 1994 to 2001. *Psychiatr Serv* 2006;**57**:63-9.
- 7 Sondergard L, Kvist K, Andersen PK, *et al*. Do antidepressants precipitate youth suicide?: a nationwide pharmacoepidemiological study. *Eur Child Adoles Psy* 2006;**15**:232-40.
- 8 Ekblad M, Gissler M, Lehtonen L, *et al*. Relation of prenatal smoking exposure and use of psychotropic medication up to young adulthood. *American journal of epidemiology* 2011;**174**:681-90.
- 9 Gyllenberg D, Sourander A. Psychotropic drug and polypharmacy use among adolescents and young adults: Findings from the Finnish 1981 Nationwide Birth Cohort Study. *Nord J Psychiat* 2012.
- 10 Lindblad F, Ringback Weitof G, Hjern A. Maternal and paternal psychopathology increases risk of offspring ADHD equally. *Epidemiol Psychiatr Sci* 2011;**20**:367-72.
- 11 Lindstrom K, Lindblad F, Hjern A. Preterm birth and attention-deficit/hyperactivity disorder in schoolchildren. *Pediatrics* 2011;**127**:858-65.
- 12 Lindblad F, Hjern A. ADHD after fetal exposure to maternal smoking. *Nicotine & tobacco research : official journal of the Society for Research on Nicotine and Tobacco* 2010;**12**:408-15.
- 13 Hjern A, Weitof GR, Lindblad F. Social adversity predicts ADHD-medication in school children--a national cohort study. *Acta paediatrica* 2010;**99**:920-4.
- 14 Campbell SM, Roland MO. Why do people consult the doctor? *Family practice* 1996;**13**:75-83.

- 15 Norcross WA, Ramirez C, LA P. The influence of women on the health care-seeking behavior of men. *J Fam Pract* 1996 Nov;43(5):475-480 1996;45:475-80.
- 16 Hopton J, Hogg R, McKee I. Patients' accounts of calling the doctor out of hours. *BMJ* 1996;313:991-4.
- 17 Fylkesnes K. Determinants of health care utilization--visits and referrals. *Scand J Soc Med* 1993;21:40-50.
- 18 Adamson J, Ben-Shlomo Y, Chaturvedi N, *et al.* Ethnicity, socio-economic position and gender--do they affect reported health-care seeking behaviour? *Soc Sci Med* 2003;57:895-904.
- 19 Lay B, Nordt C, Roessler W. Mental hospital admission rates of immigrants in Switzerland. *Social Psychiatry and Psychiatric Epidemiology* 2007;42:229-36.
- 20 Arbogast PG, Ray WA. Use of disease risk scores in pharmacoepidemiologic studies. *Statistical Methods in Medical Research* 2009;18:67-80.
- 21 Ben-Shlomo Y, Kuh D. A life course approach to chronic disease epidemiology: conceptual models, empirical challenges and interdisciplinary perspectives. *Int J Epidemiol* 2002;31:285-93.
- 22 WHO. ATC -Structure and principles. WHO Collaborating Centre for Drug Statistics Methodology 2011.
- 23 EpC. The Swedish Medical Birth Register -A summary of content and quality. 2003.
- 24 Cafferata GL, Meyers SM. Pathways to Psychotropic-Drugs - Understanding the Basis of Gender Differences. *Medical Care* 1990;28:285-300.
- 25 Benyamini Y, Blumstein T, Boyko V, *et al.* Cultural and educational disparities in the use of primary and preventive health care services among midlife women in Israel. *Womens Health Issues* 2008;18:257-66.
- 26 Ayonrinde O. Importance of cultural sensitivity in therapeutic transactions - Considerations for healthcare providers. *Disease Management & Health Outcomes* 2003;11:233-48.
- 27 Ben-Shlomo Y, Kuh D. A life course approach to chronic disease epidemiology: conceptual models, empirical challenges and interdisciplinary perspectives. *International journal of epidemiology* 2002;31:285-93.
- 28 Lanius RA, Vermetten E, Pain C. *The impact of early life trauma on health and disease : the hidden epidemic.* Cambridge, UK ; New York: Cambridge University Press 2010.
- 29 Lindert J, Schouler-Ocak A, Heinz A, *et al.* Mental health, health care utilisation of migrants in Europe. *European Psychiatry* 2008;23:S14-S20.
- 30 Merlo J. Fördelning av psykisk ohälsa och sjukvårdsresurser i Malmö, region Skåne. In: Östman M, ed. *Migration och psykisk ohälsa.* Malmö: Malmö högskola; Hälsa och samhälle 2008:45-94.

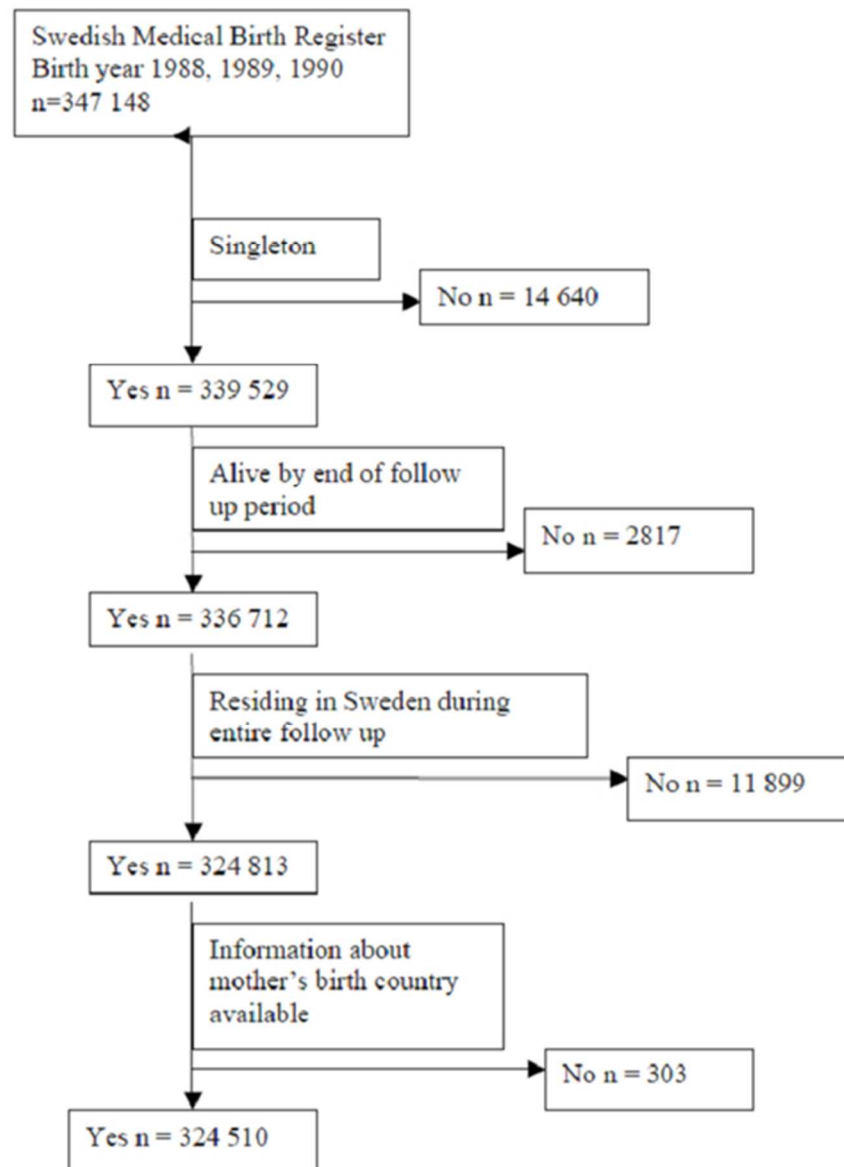
- 1
2
3 31 Hjern A. High use of sedatives and hypnotics in ethnic minorities in Sweden. *EthnHealth*
4 2001;**6**:5-11.
5
6
7 32 Wittkamp LC, Smeets HM, Knol MJ, *et al.* Differences in psychotropic drug
8 prescriptions among ethnic groups in the Netherlands. *Social psychiatry and psychiatric*
9 *epidemiology* 2010;**45**:819-26.
10
11 33 Zakriski Aea. Justifiable psychopharmacology or overzealous prescription? Examining
12 parental reports of lifetime prescription histories of psychiatrically hospitalised children.
13 *Child and Adolescent Mental Health* 2005;**10**:7.
14
15
16 34 Jureidini JN, Doecke CJ, Mansfield PR, *et al.* Efficacy and safety of antidepressants for
17 children and adolescents. *BMJ* 2004;**328**:879-83.
18
19 35 Gentile S. Efficacy of antidepressant medications in children and adolescents with
20 obsessive-compulsive disorder: a systematic appraisal. *J Clin Psychopharmacol*
21 2011;**31**:625-32.
22
23
24 36 Victorri-Vigneau C, Basset G, Jolliet P. How a novel programme for increasing
25 awareness of health professionals resulted in a 14% decrease in patients using excessive
26 doses of psychotropic drugs in western France. *European Journal of Clinical*
27 *Pharmacology* 2006;**62**:311-6.
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

LEGEND TO THE FIGURE

Figure 1. Information flow showing the number of individuals remaining after the application of the exclusion criteria

For peer review only



Information flow showing the number of individuals remaining after the application of the exclusion criteria
143x200mm (96 x 96 DPI)

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



**MOTHER'S COUNTRY OF BIRTH AND PRESCRIPTION OF
PSYCHOTROPIC MEDICATION IN SWEDISH ADOLESCENTS:
A LIFE COURSE APPROACH**

Journal:	<i>BMJ Open</i>
Manuscript ID:	bmjopen-2012-001260.R1
Article Type:	Research
Date Submitted by the Author:	18-Jul-2012
Complete List of Authors:	van Leeuwen, Willemijn; Lund University, Faculty of Medicine, Social Epidemiology Nilsson, Sofia; Lund University, Faculty of Medicine, Social Epidemiology Merlo, Juan; Lund University, Faculty of Medicine, Social Epidemiology
Primary Subject Heading:	Mental health
Secondary Subject Heading:	Epidemiology, Public health, Sociology, Health services research, Pharmacology and therapeutics
Keywords:	EPIDEMIOLOGY, Quality in health care < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, PUBLIC HEALTH, SOCIAL MEDICINE, Community child health < PAEDIATRICS, Child & adolescent psychiatry < PSYCHIATRY

SCHOLARONE™
Manuscripts

MOTHER'S COUNTRY OF BIRTH AND PRESCRIPTION OF PSYCHOTROPIC MEDICATION IN SWEDISH ADOLESCENTS: A LIFE COURSE APPROACH

Corresponding author

Juan Merlo

MD, PhD, Tenured Professor

Unit for Social Epidemiology, Skåne University Hospital

Jan Waldenströms gata 35

SE-20502 Malmö, Sweden

E-mail: juan.merlo@med.lu.se

Tel. +46 40391329

Authors

Willemijn Van Leeuwen^{1,2}

Sofia Nilsson¹

Juan Merlo¹

Affiliations

¹ Unit for Social Epidemiology, Faculty of Medicine, Lund University, Malmö, Sweden

² Dept. of Public Health, Academic Medical Center (AMC) University of Amsterdam,
Netherlands

Running title:

Psychotropic drug use in Swedish adolescents

Keywords

Psychotropic drugs, adolescent, second-generation immigrants, needs assessment, bias
(epidemiology)

Word count:

Abstracts: 247

Manuscript: 2916

ABSTRACT

Objectives

Besides medical needs, psychotropic medication use in adolescence might be conditioned by the cultural context of the family. This knowledge is relevant for both detecting inequities in health care, and identifying information bias in epidemiological studies using psychotropic medication as a proxy for impaired psychological health. Therefore, we investigated whether, independent of needs, the socioeconomic characteristics of the mother's country of birth are associated with psychotropic medication use in Swedish-born adolescents.

Methods

By linking the Swedish Medical Birth Registry to other national registers, we identified all 324510 singletons born between 1988 and 1990 and who were alive and residing in Sweden until the age of 18 (years 2006 to 2008). We measured their use of psychotropic medication in the year they turned 18. Applying a life-course approach, we included both the mother's and the children's characteristics throughout pregnancy, delivery, infancy, childhood and adolescence when calculating a risk score to adjust for needs. We classified the mother's country of birth according to the gross national income (GNI) per capita of each country.

Results

Overall, the lower the income of the mother's birth country, the lower the probability of psychotropic medication use among children. When adjusting for needs, the association became even stronger.

Discussion

Besides medical needs, use of psychotropic medication by descendants of immigrants seems conditioned by the socioeconomic characteristics of the mothers' countries of birth. The threat of information bias must be considered if psychotropic medication is used a proxy for impaired psychological health in descendants of immigrants.

INTRODUCTION

There are many knowledge gaps concerning the determinants of psychotropic drug use in immigrants and, to the best of our knowledge, this information is almost absent for descendants of immigrants. In Sweden, the healthcare system aims to allocate resources on equal terms and according to needs rather than by gender, socioeconomic position or country of birth^{1 2}. Therefore, from a public health perspective, it is important to regularly examine the distribution of health care resources in relation to health care needs across different socioeconomic groups, gender and country of births.

Psychotropic medication are potent therapy for treating impaired psychological disorders in childhood and adolescence³. Despite the many uncertainties concerning their safety and efficacy⁴, the use of this medication in adolescents has increased considerably during recent decades⁵⁻⁷. In addition, psychotropic medication is used as a proxy for impaired psychological health in adolescents and young adults in register-based epidemiological studies⁸⁻¹⁴.

Psychotropic drug use in adolescents should be conditioned by needs. However, the concept of 'need' is ambiguous, and care-seeking and care-giving are influenced by other factors in addition to disease^{15 16}. There are also complex relationships between symptoms, expectations, social factors and an individual's conception of disease^{17 18}. Furthermore, the concepts of disease, illness and need are culturally defined to a great extent, and are influenced by societal and contextual factors acting over and above individual characteristics¹⁹. Therefore, psychotropic drug use may be conditioned by an individual's country of birth per se or in interaction with Swedish society²⁰. Patterns of healthcare utilisation may also be transmitted across generations. This information is relevant not only for detecting inequities in health care but also for identifying information bias in epidemiological studies that use psychotropic medication as a proxy for impaired

1
2
3 psychological health.

4
5
6 In this context, we investigated psychotropic medication use in 18 year old adolescents born
7
8 in Sweden. We aimed to compare adolescents born to immigrant women (i.e., descendants of
9
10 immigrants) with those born to native mothers. Our hypothesis was that any difference would
11
12 disappear, or at least decrease, after adjusting for needs. We appraised needs using a risk
13
14 score²¹ for psychotropic drug use including information on the health and socioeconomic
15
16 status of the mothers and the children during pregnancy and delivery as well as throughout the
17
18 children's infancy, childhood and adolescence²². We studied every 18-year-old adolescent in
19
20 Sweden during the years 2006-2008.
21
22

23 24 25 **POPULATION AND METHODS**

26 27 28 **Study population**

29
30
31 The Swedish Medical Birth Registry is linked to several other national databases, including
32
33 the National Inpatient Registry, the National Mortality Registry, the Swedish Drug
34
35 Prescription Register, the Register of the Total Population, and the Swedish 1990 population
36
37 census, using a unique personal identification number. These registries are administered by
38
39 the Swedish authorities (i.e., The National Board of Health and Welfare and Statistics
40
41 Sweden). To ensure the anonymity of the subjects, these authorities encrypted the original
42
43 personal identification numbers of the individuals before delivering the data to us. The
44
45 database was approved by the Regional Ethics Review Board in southern Sweden.
46
47
48

49
50 Using the Medical Birth Register, we identified all singleton children born in Sweden
51
52 between 1988 and 1990 who were alive and residing in Sweden from birth until the year in
53
54 which the child turned 18 (2006-2008) and whose mother's country of birth could be
55
56 identified. The final study population represented 94% (324510/347148) of all children born
57
58
59
60

1
2
3 in 1988, 1989 and 1990. Figure 1 shows a flow diagram of the selection criteria used to define
4
5 the study population.
6
7

8 **Assessment of the outcome variable**

9
10
11 The outcome variable was the use of psychotropic medication (i.e., dispensation at the
12
13 pharmacy) according to the Drug Prescription Registry. We obtained this information in the
14
15 calendar year that the child turned 18. Psychotropic medication were defined as all drugs with
16
17 Anatomic Therapeutic Chemical (ATC) classification system²³ codes starting with N5 or N6
18
19 (see Table 1). We dichotomised the outcome variable into use or non-use of psychotropic
20
21 medication.
22
23
24

25 **Assessment of child's characteristics**

26
27
28 We categorised *birth year* into 1988, 1989 or 1990, using 1988 as the reference group. *Apgar*
29
30 *score* was measured on a scale from 1 – 10 at the first, fifth and 10th minute after birth, where
31
32 a score of 10 indicates a delivery without distress for the infant. We created dummy variables
33
34 where an Apgar score ≤ 5 was classified as 'low', and an Apgar score >5 was classified as
35
36 'not low'. The latter was used as the referent. We recoded the missing values at 5 or 10
37
38 minutes as 'not low Apgar' because it can be assumed that the subsequent Apgar scores were
39
40 high and therefore not measured if the Apgar score after one minute was high²⁴. This was the
41
42 case for 37% of the children.
43
44
45
46

47
48 For every hospital discharge, a main diagnosis and up to seven secondary diagnoses are
49
50 recorded in the Patient Register and coded according to the International Classification of
51
52 Diseases (ICD). We defined a child admitted to a hospital with a diagnosis coded 290 to 319
53
54 or F00 to F90 (ICD versions 9 and 10, respectively) as *severe psychiatric morbidity*. Children
55
56 never admitted to a hospital with any of these diagnoses were established as the reference
57
58
59
60

1
2
3 group in the comparisons.
4
5

6 For every child, we calculated the total number of days spent in the hospital from birth until
7 their 15th birthday. We distinguished between children with *extensive hospitalisation* (i.e.,
8 children spending 30 days or more in the hospital) and children with less than 30 days in the
9 hospital or who were never hospitalised, using the latter group as the referent. We combined
10 *history of psychiatric diagnosis* and extensive hospitalisation of the children into four
11 categories, as indicated in table 2.
12
13
14
15
16
17
18
19

20 **Assessment of mother's characteristics**

21
22 We categorised the mothers' *country of birth* by two different types of criteria: socioeconomic
23 and geographic. Both categorisations are listed in table 2. In our analyses, we used the
24 socioeconomic criterion, which categorises the mother's country of birth by means of the
25 World Bank classification of country economies. **Using this classification we assume that**
26 **countries in the same group resemble each other in access to material and welfare resources**
27 **and medical resources in particular. This procedure seems less prone to stigmatize individuals**
28 **than when using their demographic (e.g., immigrant vs. Swedish-born), or ethnic (e.g.,**
29 **Caucasian, Asian, Black) characteristics or their geographic origin (e.g., Northern European,**
30 **African).**
31
32
33
34
35
36
37
38
39
40
41
42
43

44 Countries were grouped according to their gross national income (GNI) per capita using the
45 World Bank Atlas method into low-, lower middle-, upper middle-, and high-income
46 countries. Sweden was included in the high-income category. However, we separated Sweden
47 from the group of high-income countries and used Sweden as the referent in the comparisons
48 because we conducted the study in the context of Swedish culture.
49
50
51
52
53
54

55 We classified *mother's age at delivery* into six groups (i.e., <20 years, 20-24 years, 25-29
56
57
58
59
60

1
2
3 29... >39 years). We considered mothers from the age group 25-29 the reference group in the
4
5 comparisons.

6
7
8 We classified *maternal smoking during pregnancy* into four categories: 'no smoking', 'light
9
10 smokers' (1-9 cigarettes per day), 'heavy smokers' (>9 cigarettes per day) and 'missing
11
12 values'. The missing values ranged from 7.6% among the Swedes to 11.8% among mothers
13
14 from low-income countries. We considered the non-smoking group the reference category.
15
16 The information on smoking was self-reported and recorded when the mother attended her
17
18 first scheduled antenatal care visit.
19
20

21
22 We identified all mothers with a diagnosis of *pre-eclampsia* (ICD-9 code 642) and considered
23
24 mothers who did not suffer from pre-eclampsia the reference group in the comparisons.
25
26

27
28 We defined mother's *educational achievement* as the highest completed level of education in
29
30 1990. This variable was categorised into four groups: 'elementary school or lower' (9 years),
31
32 'lower secondary school' (12 years total), 'higher educational achievement' (>12 years) and
33
34 'missing information'. We used the 'higher educational achievement' category as the
35
36 reference group in the comparisons.
37
38

39
40 Information regarding whether parents were *living together* was based on self-reported status
41
42 when the mother was first seen for antenatal care. We considered mothers living together with
43
44 the father of the child the reference group.
45
46

47
48 We identified mothers with *severe psychiatric morbidity* and with *extensive hospitalisation* in
49
50 a manner similar to that used for children (see above). In addition, we combined a history of
51
52 psychiatric diagnosis with extensive hospitalisation in the same way as we did for the children
53
54 (see table 2).
55
56

57 **Statistical Analyses**

58
59
60

1
2
3 To estimate needs, we applied a logistic regression and constructed an equation that predicted
4 the probability (i.e., the risk score)²¹ of using psychotropic medications around the age of 18
5 in the unexposed group (i.e., children with mothers born in Sweden). This equation included
6 the maternal and child's characteristics mentioned above.
7
8
9

10
11
12 These variables were chosen using both previous knowledge and an explorative approach.
13
14 When two variables showed multicollinearity, we selected the variable that provided a better
15 goodness of fit by means of a chi-square test (e.g., mother's education compared with
16 household income).
17
18
19

20
21
22 Subsequently, we applied the risk score equation to the entire population (i.e., children with
23 mothers born in Sweden *and* children with immigrant mothers).
24
25
26

27
28 The equation of the risk score is presented in Table 1. The individual value of the risk score
29 (RS) (i.e., predicted probability) was obtained with the following formula:
30
31
32

$$RS = [e^{\text{logit}} / (1 + e^{\text{logit}})] * 100.$$

33
34
35
36 In the analyses, we categorised the risk score into four groups by quartiles and used the group
37 with the lowest risk score as the reference group in the comparisons.
38
39
40

41
42 Using logistic regression, we developed two consecutive models to estimate the relative
43 differences (i.e., odds ratios) in the use of psychotropic medications. In the first model, we
44 investigated the bare association between mother's country of birth and the use of
45 psychotropic medication in adolescence. In the second model, we included the risk score
46 described above to adjust for possible dissimilarities in needs between the different maternal
47 countries of birth. We analysed boys and girls separately in the models because there are
48 cultural differences in gender roles, and gender may influence healthcare and psychotropic
49 drug use²⁵⁻²⁷. We used SPSS version 18 for all analyses.
50
51
52
53
54
55
56
57
58
59
60

RESULTS

Table 1 indicates the regression coefficients of the variables used in the logistic regression to obtain the risk score (i.e., predicted probability) for psychotropic drug use.

Table 1. Equation for estimation of the risk score (RS) used in the analyses to approximate the need for psychotropic drugs. The equation was calculated in the population of children born to Swedish mothers and subsequently applied to all the children. The RS corresponds to the predicted probability of using psychotropic drugs as a function of the variables included in the model.

$$\begin{aligned}
 \text{Logit (Use of psychotropic drugs)} = & \\
 & -3.467 = \text{intercept} \\
 & +0.180 * \text{'smoking 1-9 cigarettes per day'} \\
 & +0.291 * \text{'smoking more than 9 cigarettes per day'} \\
 & +0.057 * \text{'no information on smoking'} \\
 & +0.126 * \text{'pre-eclampsia'} \\
 & +1.742 * \text{'no information on age'} \\
 & +0.219 * \text{'age under 20'} \\
 & +0.071 * \text{'age 20 to 24'} \\
 & +0.001 * \text{'age 30 to 34'} \\
 & +0.094 * \text{'age 35 to 39'} \\
 & +0.204 * \text{'age over 39'} \\
 & +0.057 * \text{'low Apgar after 1 min'} \\
 & +0.192 * \text{'low Apgar after 1 and 5 min'} \\
 & +0.324 * \text{'low Apgar after 10 min'} \\
 & +0.087 * \text{'no information on Apgar score'} \\
 & +0.140 * \text{'no information on family situation'} \\
 & +0.221 * \text{'not living together'} \\
 & +0.152 * \text{'birth year 1989'} \\
 & +0.238 * \text{'birth year 1990'} \\
 & +0.164 * \text{'low educational level'} \\
 & +0.028 * \text{'middle educational level'} \\
 & +0.258 * \text{'no information on educational level'} \\
 & +0.259 * \text{'mother extensive hospitalisation and no psychiatric diagnosis'} \\
 & +0.530 * \text{'mother psychiatric diagnosis and no extensive hospitalisation'} \\
 & +0.605 * \text{'mother extensive hospitalisation and psychiatric diagnoses'} \\
 & +0.566 * \text{'child extensive hospitalisation and no psychiatric diagnosis'} \\
 & +1.539 * \text{'child psychiatric diagnosis and no extensive hospitalisation'} \\
 & +2.479 * \text{'child extensive hospitalisation and psychiatric diagnoses'}
 \end{aligned}$$

1
2
3 Table 2 shows the characteristics of the adolescents at different life stages and classified
4 according to the GNI categories of the mother's country of birth. This table indicates that
5 adolescents born to mothers from low-income countries used less psychotropic medication
6 than do adolescents with mothers born in Sweden. However, adolescents with mothers from
7 low-income countries were more frequently hospitalized, and also more often hospitalized
8 with a psychiatric diagnosis, than adolescents with Swedish mothers.
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Table 2. Child's characteristics by maternal country of birth classified according to World Bank Gross National Income (GNI) by. Numbers are percentages unless otherwise indicated.

	Sweden	HIC	UMIC	LMIC	LIC
Number of children	288 626	15 905	9572	7972	2435
Number of girls	140 235	7743	4656	3883	1174
Use of psychotropic medication at age 18 (ATC code)					
– Psychotropic medication unspecified (N5+N6)	4.7	5.0	3.9	3.4	2.2
– Antipsychotics (N5A)	0.4	0.5	0.5	0.5	0.2
– Anxiolytics (N5B)	1.5	1.6	1.4	1.3	0.7
– Hypnotics and sedatives (N5C)	1.2	1.5	1.0	1.2	0.4
– Antidepressants (N6A)	2.8	2.9	2.0	1.6	0.9
– Psychostimulants (N6B)	0.8	0.7	0.5	0.4	0.3
Child's characteristics during perinatal period					
Birth year					
– 1988	32.1	33.2	31.2	28.7	28.1
– 1989	33.1	32.3	32.8	32.2	32.4
– 1990	34.8	34.5	35.9	39.1	39.4
Apgar score					
– Low Apgar score	94.1	94.4	93.6	93.8	91.7
– Low Apgar score (<6) after 1 min only	3.0	2.4	3.3	3.4	4.1
– Low Apgar score (<6) after 1 and 5 min.	0.7	0.7	0.9	0.7	1.2
– Low Apgar score (<6) after 10 min	0.4	0.5	0.4	0.5	0.8
– Apgar scores missing	1.9	2.0	1.8	1.6	2.2
Child's characteristics until age 15					
Hospitalised >30 days	2.1	2.0	2.7	2.2	3.0
Psychiatric diagnosis according to Patient Registry	1.6	1.8	1.9	1.8	2.5
Hospitalised >30 days (A) and psychiatric diagnosis (B) combined					
– (A) no and (B) no	96.7	96.5	95.9	96.3	94.9
– (A) yes and (B) no	1.8	1.7	2.3	1.9	2.5
– (A) no and (B) yes	1.2	1.4	1.4	1.5	2.1
– (A) yes and (B) yes	0.4	0.4	0.5	0.3	0.5

HIC: high-income country, UMIC: upper middle-income country, LMIC: lower middle-income country, LIC: low-income country.

Table 3 is similar to Table 1 but provides information on maternal characteristics. Low-income countries are those countries outside of Europe. Compared with Swedish mothers, mothers from low-income countries have lower income, lower educational achievement and are less likely to live with the father of their children. Furthermore, a higher percentage of mothers from low-income countries have been hospitalised for more than 30 days, and mothers from low-income countries have a much lower smoking prevalence.

Table 3. Maternal characteristics by country of birth classified according to World Bank Gross National Income (GNI) by. Numbers are percentages

Maternal characteristics during perinatal period	Sweden	HIC	UMIC	LMIC	LIC
Geographical region of birth					
– Sweden	100				
– Nordic country outside Sweden		79.4			
– Rest of Europe		14.6	63.4	27.6	
– Rest of the world		6.0	36.6	72.4	100
Years spent in Sweden at delivery					
– >18	98.9	49.8	9.5	13.2	7.6
– 6-18	0.6	32.5	35.3	20.7	30.9
– 0-5	0.4	15.9	38.1	46.5	44.4
– No information	0.1	1.9	17.2	19.6	17.1
Age at delivery in years					
– No information	0.0	0.2	8.3	8.4	8.3
– <20	2.8	2.7	5.3	3.6	2.9
– 20-24	24.3	19.4	24.9	22.5	22.8
– 25-29	36.9	33.5	26.6	32	35.7
– 30-34	24.9	27.6	21.3	22.5	22.2
– 35-39	9.3	13.2	11.3	9.2	7.3
– >39	1.8	3.3	2.4	1.8	0.9
Highest completed educational level in 1990					
– Primary school (9 years) or less	17.2	25.2	41.2	36.8	46.9
– Lower secondary (12 years)	54.9	47.7	32.2	33.6	24.6
– Higher education (15 years)	25.1	22.1	14.6	13.4	9.9
– No information	2.9	5.0	12.1	16.2	18.6
Living with child's father					
– Yes	90.6	88.1	85.5	87	82.2
– No	5.2	6.9	6.9	5.4	9.8
– No information	4.2	5.0	7.6	7.6	8.0
Smoking during pregnancy					
– No	68.0	62.4	69.3	75.5	83.1
– 1-9 cigarettes per day	15.0	16.3	12.5	8.6	4.1
– >9 cigarettes per day	9.3	12.6	6.4	4.7	1.0
– No information	7.6	8.7	11.8	11.2	11.8
Pre-eclampsia	2.1	2.0	1.5	1.2	2.4

Maternal characteristics until child aged 15					
Death	0.6	1.0	0.8	0.6	0.9
Hospitalised >30 days	7.0	8.1	7.2	6.9	11.0
Psychiatric diagnosis according to Patient Registry	1.4	2.1	1.5	1.4	1.3
Hospitalised >30 days (A) and psychiatric diagnosis (B) combined					
– (A) no and (B) no	91.2	89.1	90.0	90.2	86.4
– (A) yes and (B) no	4.9	5.1	5.2	4.9	8.4
– (A) no and (B) yes	1.9	2.8	2.7	2.9	2.5
– (A) yes and (B) yes	2.1	3.0	2.1	2.0	2.6

HIC: high-income country, UMIC: upper middle-income country, LMIC: lower middle-income country, LIC: low-income country.

Table 4 shows the odds ratios and 95% confidence intervals for psychotropic medication use in adolescence as a function of the GNI categories of maternal country of birth stratified by gender. Overall, the lower the GNI of the mother's country of birth, the lower the probability of use of psychotropic medication among descendants of immigrants compared with adolescents born to Swedish-born mothers. In the unadjusted analysis (Table 3, model 1), this association was more evident for girls than for boys. Nevertheless, after adjustment for the risk score (Table 3, model 2), the association was accentuated and evident in both sexes. The lowest risk for psychotropic drug use was found in girls born to mothers from low-income countries.

Table 4. Association between maternal country of birth and psychotropic medication use at age 18, unadjusted (model 1) and adjusted (model 2) for the risk score for psychotropic medication use*. Values are odds ratios (ORs) and 95% confidence interval (CIs).

	Boys				Girls			
	Model 1		Model 2		Model 1		Model 2	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Maternal country of birth								
- Sweden	Ref		Ref		Ref		Ref	
- High-income country	1.08	(0.96 1.21)	1.01	(0.90 1.13)	1.08	(0.99 1.19)	1.03	(0.94 1.13)
- Upper middle-income country	0.94	(0.80 1.10)	0.80	(0.69 0.94)	0.74	(0.64 0.85)	0.66	(0.57 0.76)
- Lower middle-income country	0.90	(0.75 1.07)	0.78	(0.66 0.94)	0.59	(0.50 0.70)	0.53	(0.45 0.63)
- Low-income country	0.69	(0.48 0.98)	0.57	(0.40 0.82)	0.32	(0.21 0.48)	0.28	(0.19 0.42)
Risk score for psychotropic drug use*								
- 1st quartile			Ref				Ref	
- 2nd quartile			1.17	(1.01 1.29)			1.10	(1.04 1.21)
- 3rd quartile			1.45	(1.32 1.59)			1.31	(1.13 1.31)
- 4th quartile			2.55	(2.34 2.77)			1.81	(1.81 2.01)

*Variables included in the risk score for psychotropic drug use: Perinatal period (Apgar score, child's birth year, maternal smoking during pregnancy, maternal age, maternal educational level, family situation); Infancy, Childhood and Adolescence (extensive hospitalisation child, psychiatric diagnosis child, extensive hospitalisation mother, psychiatric diagnosis mother).

DISCUSSION

Our analyses indicate that Swedish adolescents born to immigrant women have a lower use of psychotropic medication in adolescence than do the offspring of native Swedish women. This observation was evident in both sexes but was especially pronounced in girls. Moreover, the relative use of psychotropic medication decreased linearly with the income (i.e., GNI per capita) of the mother's country of birth and was lowest for girls with mothers born in low-income countries.

Several mechanisms could explain our findings. Adolescents born to immigrant women might have better psychological health and therefore lower needs for psychotropic drug treatment than the offspring of native Swedish women. If this were true, adjusting for needs would make any difference disappear or at least decrease. To create a risk score, we adopted a life-course approach²⁸ and observed that a number of maternal and offspring characteristics during pregnancy, delivery, infancy, childhood and adolescence predicted psychotropic drug use during adolescence. Nevertheless, after adjusting for needs using the risk score, the influence of mother's country of birth (i.e., lower use of psychotropic medication among adolescents with mothers from low-income countries) remained independent and even increased. This finding suggests that differences in psychotropic drug use may reflect divergences in access to healthcare resources rather than lower needs. However, we cannot exclude the possibility that we missed other relevant factors that condition needs, such as childhood adversities, which affect psychological health later in life (e.g., neglect and verbal or physical abuse)²⁹. Because we were restricted to the available information, our adjustment for needs is inherently incomplete.

Since the National Prescription Register contains only prescriptions that were handled by the pharmacies, information on medication prescribed but never picked up at the pharmacy is not

1
2
3 available. Therefore, the observed differences in psychotropic drug use might reflect
4
5 disparities in primary compliance rather than in prescription behavior (i.e., medication could
6
7 be prescribed but the individual never pick it up from the pharmacy). In Sweden, at the time
8
9 of our study, the total yearly cost that a particular individual needed to pay for prescribed
10
11 medications was 4300 SEK (i.e., about 500 EU). Beyond this ceiling, medication was free of
12
13 charge³⁰. Therefore, individuals with a low socioeconomic position may be less prone to pick
14
15 up prescribed medication. We adjusted for socioeconomic factors in the risk score for
16
17 psychotropic drug use but this procedure might be insufficient.
18
19

20
21 One explanation for the observed underutilisation of psychotropic medication by descendants
22
23 of immigrants may be that the cultural context in which one grows up influences healthcare-
24
25 seeking behaviour. Examples of these cultural influences are different conceptions of disease
26
27 and taboos³¹. Another factor affecting the lower use of psychotropic medication by
28
29 descendants of immigrants may be so-called health illiteracy (i.e., unfamiliarity with the
30
31 country's healthcare system)³². These cultural and health illiteracy-related aspects may
32
33 explain the underutilisation of health care by mothers. However, the children in our study
34
35 grew up and attended school in Sweden. Thus, they had the opportunity to become familiar
36
37 with the Swedish system. Nevertheless, it is likely that the effects of cultural influences and
38
39 health illiteracy on mothers' healthcare-seeking behaviours are transmitted to the next
40
41 generation because it is often mothers who regulate healthcare contacts for children.
42
43 Another circumstance behind the observed patterns of use of medication could be the
44
45 communication between the patient and the health care provider. In this sense, insufficient
46
47 intercultural competence among the health care staff might affect the interpretation of the
48
49 patient's symptoms and hence, the prescription of medication.
50
51
52
53
54

55
56 The process of incorporating the host culture into an individual's behavior, such as for
57
58 example health care behavior, is known as acculturation³³. From this perspective the number
59
60

1
2
3 of years spent in Sweden might condition the degree of acculturation. Indeed, we found a high
4
5 correlation between time spent in Sweden before delivery and mothers' country of birth, the
6
7 lowest percentage of mothers with more than 18 years in Sweden being the group of mothers
8
9 from low-income countries.
10

11
12 Interestingly, our results suggesting a relative underutilisation of psychotropic medication in
13
14 18-year-old descendants of immigrants contrast with previous findings that observed a higher
15
16 rate of psychotropic drug use in first-generation immigrants³⁴. In addition, a study in the
17
18 Netherlands³⁵ found that in comparison with the native population, first- and descendants of
19
20 Turkish and Moroccan immigrants had an increased rate of antidepressant and antipsychotic
21
22 drug prescriptions and a decreased rate of ADHD medication and lithium prescriptions.
23
24 However, in our earlier investigations in the county of Scania, we observed that overall
25
26 utilisation of psychiatric healthcare resources in 18 to 80-year-old immigrants was
27
28 considerably less than expected according to self-reported needs³².
29
30
31
32

33
34 In the present analysis we only considered prescribed medication. Therefore, the results may
35
36 be biased by the sale of over-the-counter (OTC) medication. In Sweden, the only available
37
38 OTC psychotropic drug is Propiomazine. Nevertheless, we believe it is improbable that our
39
40 results would be affected by the inclusion of Propiomazine in the analyses because this
41
42 assumption would imply that descendants of immigrants use this OTC drug as a substitute for
43
44 all other psychotropic medication.
45
46

47
48 **Strength** of our study is that we had information from registries covering the entire Swedish
49
50 population. Furthermore, 98.6 % of all births are registered in the Swedish Medical Birth
51
52 Registry. Therefore, we do not believe that giving birth at home is an important source of bias
53
54 in our estimations. It could be possible that some mothers give birth at home because they are
55
56 illegally residing in Sweden or because the Swedish health care is very different to their
57
58
59
60

1
2
3 original traditions as is the case for Somali women³⁶. However, we do not have information
4
5 on the country of origin of the 1.4% of the women giving birth at home in Sweden.
6
7 Furthermore, all women in Sweden with a Personal Identification Number (PIN) have the
8
9 right to attend antenatal care and the majority of them do indeed use this service. However, a
10
11 minor percentage do not attend all visits that they have the right to, and immigrated women
12
13 tend to come later in the pregnancy than native Swedish women³⁷. Also, even if information
14
15 was quite complete overall, data on some variables was more frequently missing in children
16
17 with an immigrant mother than in children with a native mother which may originate
18
19 information bias. Besides, since smoking is a self-reported variable, there might be a bias due
20
21 to linguistic barriers or cultural differences in the attitude towards reporting smoking.
22
23
24
25

26 The information recorded in the Medical Birth Register, the National Patient Register and the
27
28 National Cause of Death Register is mandatorily reported by law, and the quality of the
29
30 registries is regularly evaluated by the National Board of Health and Welfare and Statistics
31
32 Sweden.
33
34

35
36 Measurement of psychotropic drug use using administrative registries reflects both access to
37
38 healthcare and the presence of psychological disorders. From the perspective of community
39
40 medicine, the identification of an imbalance between needs and utilisation of psychotropic
41
42 medication raises questions about equity in access to health care resources. However, our
43
44 findings also identify the existence of information bias when using a register-based
45
46 measurement of psychotropic drug use as a proxy for impaired psychological health if
47
48 descendants of immigrants are included in the analyses.
49
50
51

52 We performed analyses investigating specific groups of psychotropic medication (results
53
54 available on request), but the results were similar to those found when analysing the entire
55
56 medication group. Moreover, because the therapeutic profiles of the studied medication
57
58
59
60

groups overlap each other (i.e., different psychiatric disorders can be treated with the same drug group), we cannot create a direct link between specific medications and diagnoses.

The suitability of treating young people with psychotropic medication is polemic. Side effects can be severe and, certainly, there are risks when these medications are used in children and adolescents^{38 39}. Also, it is not clear whether adolescents in Sweden and other high-income countries are prescribed these medication in excess (i.e., overutilization)⁴⁰. However, underuse may engender avoidable suffering⁴¹ and therefore it is important to ensure that all people in need are granted access to medication.

If underutilisation of psychotropic medication by adolescent descendants of immigrants occurs, policy makers in the Swedish healthcare system should take this situation into account. Swedish healthcare policy is based on the principle of equity that supports the distribution of healthcare resources on equal terms and according to needs, regardless of any other determinants. This aspect is particularly relevant because one of the main goals stated by the Swedish National Institute of Public Health is achieve 'secure and favourable conditions during childhood and adolescence' and, specifically, 'improved mental health amongst children and young people' (39). Paraphrasing Wittkampf³⁵, we need further research to clarify whether patients of different ethnic backgrounds with the same symptoms receive similar diagnoses and adequate treatment.

COMPETING INTERESTS

None declared

FUNDING

This work was supported by the Swedish Council for Working Life and Social Research (FAS) [Dnr 2010-0402, PI Juan Merlo], the Swedish Research Council (VR) [Dnr K2011-69X-15377-07-6, PI Juan Merlo] and the Centre for Economic Demography at Lund University.

Contributorship Statement

WvL and JM had the original idea of the study. JM, WvL and SN participated in the design, analysis, interpretation of data, and drafting of the article. All authors approved the final version to be published. JM is the guarantor of the article.

Data Sharing Statement

The original data used in this study was obtained from the Swedish Board of Health and Welfare and from Statistics Sweden. The authors are not allowed to share the database without permission of those Swedish authorities.

REFERENCES

1. Health on equal terms--national goals for public health. *Scand J Public Health* 2001;Suppl 57:1-68.
2. Wadman C, Boström G, Karlsson AS. Health On Equal Terms? Results from the 2006 Swedish National Public Health Survey. *STATENS FOLKHÄLSOINSTITUT A 2008:1, Stockholm, Sweden* 2008.
3. Practice parameter on the use of psychotropic medication in children and adolescents. *J Am Acad Child Psy* 2009;48(9):961-73.
4. Vitiello B. An international perspective on pediatric psychopharmacology. *Int Rev Psychiatry* 2008;20(2):121-6.
5. Zito JM, Safer DJ, dosReis S, et al. Trends in the prescribing of psychotropic medications to preschoolers. *JAMA : the journal of the American Medical Association* 2000;283(8):1025-30.
6. Zito JM, Safer DJ, DosReis S, et al. Rising prevalence of antidepressants among US youths. *Pediatrics* 2002;109(5):721-7.
7. Thomas CP, Conrad P, Casler R, et al. Trends in the use of psychotropic medications among adolescents, 1994 to 2001. *Psychiatr Serv* 2006;57(1):63-9.
8. Sondergard L, Kvist K, Andersen PK, et al. Do antidepressants precipitate youth suicide?: a nationwide pharmacoepidemiological study. *Eur Child Adolesc Psy* 2006;15(4):232-40.
9. Ekblad M, Gissler M, Lehtonen L, et al. Relation of prenatal smoking exposure and use of psychotropic medication up to young adulthood. *American journal of epidemiology* 2011;174(6):681-90.
10. Gyllenberg D, Sourander A. Psychotropic drug and polypharmacy use among adolescents and young adults: Findings from the Finnish 1981 Nationwide Birth Cohort Study. *Nord J Psychiat* 2012.
11. Lindblad F, Ringback Weitoft G, et al. Maternal and paternal psychopathology increases risk of offspring ADHD equally. *Epidemiol Psychiatr Sci* 2011;20(4):367-72.
12. Lindstrom K, Lindblad F, Hjern A. Preterm birth and attention-deficit/hyperactivity disorder in schoolchildren. *Pediatrics* 2011;127(5):858-65.
13. Lindblad F, Hjern A. ADHD after fetal exposure to maternal smoking. *Nicotine & tobacco research : official journal of the Society for Research on Nicotine and Tobacco* 2010;12(4):408-15.
14. Hjern A, Weitoft GR, Lindblad F. Social adversity predicts ADHD-medication in school children--a national cohort study. *Acta paediatrica* 2010;99(6):920-4.

15. Campbell SM, Roland MO. Why do people consult the doctor? *Family practice* 1996;13(1):75-83.
16. Norcross WA, Ramirez C, LA P. The influence of women on the health care-seeking behavior of men. *J Fam Pract* 1996 Nov;43(5):475-480 1996;45(5):475-80.
17. Hopton J, Hogg R, McKee I. Patients' accounts of calling the doctor out of hours. *BMJ* 1996;313:991-4.
18. Fylkesnes K. Determinants of health care utilization--visits and referrals. *Scand J Soc Med* 1993;21(1):40-50.
19. Adamson J, Ben-Shlomo Y, Chaturvedi N, et al. Ethnicity, socio-economic position and gender--do they affect reported health-care seeking behaviour? *Soc Sci Med* 2003;57(5):895-904.
20. Lay B, Nordt C, Roessler W. Mental hospital admission rates of immigrants in Switzerland. *Social Psychiatry and Psychiatric Epidemiology* 2007;42(3):229-36.
21. Arbogast PG, Ray WA. Use of disease risk scores in pharmacoepidemiologic studies. *Statistical Methods in Medical Research* 2009;18(1):67-80.
22. Ben-Shlomo Y, Kuh D. A life course approach to chronic disease epidemiology: conceptual models, empirical challenges and interdisciplinary perspectives. *Int J Epidemiol* 2002;31(2):285-93.
23. WHO. ATC -Structure and principles: WHO Collaborating Centre for Drug Statistics Methodology, 2011.
24. EpC. The Swedish Medical Birth Register -A summary of content and quality, 2003.
25. Cafferata GL, Meyers SM. Pathways to Psychotropic-Drugs - Understanding the Basis of Gender Differences. *Medical Care* 1990;28(4):285-300.
26. Benyamini Y, Blumstein T, Boyko V, et al. Cultural and educational disparities in the use of primary and preventive health care services among midlife women in Israel. *Womens Health Issues* 2008;18(4):257-66.
27. Ayonrinde O. Importance of cultural sensitivity in therapeutic transactions - Considerations for healthcare providers. *Disease Management & Health Outcomes* 2003;11(4):233-48.
28. Ben-Shlomo Y, Kuh D. A life course approach to chronic disease epidemiology: conceptual models, empirical challenges and interdisciplinary perspectives. *International journal of epidemiology* 2002;31(2):285-93.
29. Lanius RA, Vermetten E, Pain C. *The impact of early life trauma on health and disease : the hidden epidemic*. Cambridge, UK ; New York: Cambridge University Press, 2010.
30. Socialdepartementet. Uppdaterade högkostnadsskydd - öppen hälso- och sjukvård samt läkemedel. Ds 2011:23. *Departementsserien (Ds)* 27 juni 2011.
31. Lindert J, Schouler-Ocak A, Heinz A, Priebe S. Mental health, health care utilisation of migrants in Europe. *European Psychiatry* 2008;23:S14-S20.
32. Merlo J. Fördelning av psykisk ohälsa och sjukvårdsresurser i Malmö, region Skåne. In: Östman M, editor. *Migration och psykisk ohälsa*. Malmö: Malmö högskola; Hälsa och samhälle, 2008:45-94.
33. Thomson MD, Hoffman-Goetz L. Defining and measuring acculturation: a systematic review of public health studies with Hispanic populations in the United States. *Soc Sci Med* 2009;69(7):983-91.
34. Hjern A. High use of sedatives and hypnotics in ethnic minorities in Sweden. *Ethn.Health* 2001;6(1):5-11.
35. Wittkamp LC, Smeets HM, Knol MJ, et al. Differences in psychotropic drug prescriptions among ethnic groups in the Netherlands. *Social psychiatry and psychiatric epidemiology* 2010;45(8):819-26.

- 1
- 2
- 3 36. Essen B, Johnsdotter S, Hovellius B, et al. Qualitative study of pregnancy and childbirth
- 4 experiences in Somalian women resident in Sweden. *BJOG* 2000;107(12):1507-12.
- 5 37. Ny P, Dykes AK, Molin J, et al. Utilisation of antenatal care by country of birth in a
- 6 multi-ethnic population: a four-year community-based study in Malmo, Sweden. *Acta*
- 7 *obstetrica et gynecologica Scandinavica* 2007;86(7):805-13.
- 8 38. Zakriski Aea. Justifiable psychopharmacology or overzealous prescription? Examining
- 9 parental reports of lifetime prescription histories of psychiatrically hospitalised
- 10 children. *Child and Adolescent Mental Health* 2005;10(1):7.
- 11 39. Jureidini JN, Doecke CJ, Mansfield PR, et al. Efficacy and safety of antidepressants for
- 12 children and adolescents. *BMJ* 2004;328(7444):879-83.
- 13 40. Victorri-Vigneau C, Basset G, Jolliet P. How a novel programme for increasing awareness
- 14 of health professionals resulted in a 14% decrease in patients using excessive doses of
- 15 psychotropic drugs in western France. *European Journal of Clinical Pharmacology*
- 16 2006;62(4):311-16.
- 17 41. Gentile S. Efficacy of antidepressant medications in children and adolescents with
- 18 obsessive-compulsive disorder: a systematic appraisal. *J Clin Psychopharmacol*
- 19 2011;31(5):625-32.
- 20
- 21
- 22
- 23
- 24
- 25
- 26
- 27
- 28
- 29
- 30
- 31
- 32
- 33
- 34
- 35
- 36
- 37
- 38
- 39
- 40
- 41
- 42
- 43
- 44
- 45
- 46
- 47
- 48
- 49
- 50
- 51
- 52
- 53
- 54
- 55
- 56
- 57
- 58
- 59
- 60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

LEGEND TO THE FIGURE

Figure 1. Flow diagram indicating the number of individuals remaining in the study sample after the application of the inclusion criteria

For peer review only