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Research paper

# Social and sex differences in psychiatric comorbidity and psychosocial functioning among adolescents with depression

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ABSTRACT

*Background:* To determine social and sex differences in psychosocial functioning and psychiatric comorbidity among adolescents with depression.
*Methods:* A cohort-based study in Stockholm, Sweden. Adolescents who turned 13 years during 2001–2007, were followed in registers until they turned 18 in 2005–2011, ($n$ = 169,262). In the current study, those with depression at age 13–17 were included ($n$ = 6,439).
*Results:* Adolescents with parents with low (OR=1.5, CI 1.1–2.2) education were more likely to have low psychosocial functioning. Those with parents with low education and low household income were more likely to have comorbid internalizing (OR=1.3, CI 1.0–1.7/1.3, CI 1.0–1.7) and externalizing disorders (OR=2.5, CI 1.5–4.0/2.4, CI 1.4–4.2). Adolescents with parents born outside the Nordic countries were more likely to have comorbid externalizing disorders (OR=1.6, CI 1.1–2.4). No social differences were evident in relation to family receipt of unemployment benefits. Social differences were found for both girls and boys in relation to psychosocial functioning and comorbidity but the magnitude of social differences in depression with comorbidity was overall larger for boys than girls.
*Limitations:* The findings of the current study can only be generalized to adolescents that have sought care for and been diagnosed with depression, within a setting similar to this study, e.g. with free access to care.
*Conclusion:* Adolescents with depression and with more disadvantaged social circumstances in the childhood run a higher risk of psychiatric comorbidity and low psychosocial functioning, which can indicate a lengthy clinical course and poorer response to treatment. Both boys and girls follow this path but partly in different kinds of psychiatric comorbidity.

## 1. Introduction

Depression is a substantial public health problem (SBU 2004) and among 10–24 year-olds it is the leading cause of disability-adjusted life years in the world (FM et al., 2011). In addition to the distress caused by depression itself, many adolescents also experience additional mental disorders (depression with comorbidity) (Avenevoli et al., 2015; Hoffmann et al., 2012). The most common mental disorders that co-exist with depression are anxiety disorders, behavior disorders, attention deficit hyperactivity disorder (ADHD), and substance use disorder (Avenevoli et al., 2015). Children and adolescents with depression can have different levels of psychosocial functioning, i.e. functional ability overall, at home, school, and with peers. Children and adolescents with depression with comorbidity have also been found to have worse psychosocial functioning, compared to those with depression alone (Ezpeleta et al., 2006). Adolescents with worse psychosocial functioning have been found to have an increased risk of criminality (Lundh, 2012), and having not only depression but also additional mental health problems contributes to an even higher burden for the individual with consequences including decreased quality of life (Pirkola et al., 2005), longer duration of depressive episodes and recurrence (Melartin et al., 2004). Adolescents treated in the Public Child and Adolescent Mental Health Service (CAMHS) in Sweden that have low psychosocial functioning have furthermore been found to have an increased risk of bipolar disorder and borderline personality disorder in young adulthood (Lundh, 2012).

Social differences in diagnosed depression (McLaughlin et al., 2011; Miech et al., 1999) and in mental disorders overall (Paananen et al.,

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2013) have been found among adolescents. The results from these studies indicate that social adversities measured as low parental education and occupation and family financial hardship, is disadvantageous. Being socioeconomically disadvantaged in early life is also associated with overall mental health disorders, that coexist with alcohol disorders in young adulthood (Salom et al., 2014), and children from families that receive welfare benefits are more likely to have multiple mental disorders (Spady et al., 2001). However, not much is known about social differences in depression with comorbidity specifically or in impaired psychosocial functioning among adolescents with depression. Knowledge is also lacking concerning sex differences related to the effect of socioeconomic disadvantage on depression. Findings with regards to sex differences in risk due to socioeconomic disadvantage in poor mental health overall, are inconsistent, possibly due to various measures of poor mental health (Reiss, 2013). Girls have been found to have more internalizing disorders and boys more externalizing disorder (Roberts et al., 2007), which is true regarding patterns of comorbidity in relation to depression as well (Avenevoli et al., 2015; Hoffmann et al., 2012; Gallerani et al., 2010). As an example, girls have been found to have high levels of depression independent of prior anxiety whereas boys with prior anxiety had a higher risk of depression compared to those with no prior anxiety Psychosocial functioning has further been found to be lower among boys with symptoms of anxiety and depression, compared to girls (Derdikman-Eiron et al., 2011).

The present study expands upon previous findings based on the same population including also all adolescents without depression where social differences in the risk of depression were found to be modest (Wirback et al., 2018). It has previously been concluded that adolescents with severely impaired psychosocial functioning at end-of-treatment should be considered for intensified follow-up (Lundh, 2012). In the present study we therefore focus on social differences among those with a depression diagnosis.

## 2. Aim of the study

The aim of this study is to determine if adolescents with depression and with more disadvantaged social circumstances in childhood have a higher risk of low psychosocial functioning or depression with comorbidity, and if there are sex differences in these relationships.

## 3. Material and methods

The data used in this study derives from Stockholm Youth Cohort, *SYC,* which is a register based cohort, established at the Department of Global Public Health at Karolinska Institutet, containing most public psychiatric care and a measure of psychosocial functioning (CGAS) for children and adolescents in Stockholm County as well as information about social circumstances. It includes all individuals aged 0–17, residing in Stockholm County at any time between 2001 and 2011. The registers used include: CAMHS (in Swedish BUP), The Longitudinal Integration Database for Health Insurance and Labor Market Studies (LISA), The Cause of Death Register, health care registers in Stockholm County Council (VAL, Swedish acronym) and The National Patient register. Linkage to adolescents' first-degree relatives is achieved via the multi-generation register, which is part of the Total Population Register. The methods and data have been described in more detail elsewhere (Wirback et al., 2018). Stockholm regional ethical review board granted ethical approval for the study (case number: 2011/636–32).

In Stockholm, Sweden, most care is public (Dalman and Wicks, 2006), and with regard to children and adolescents all psychiatric care in Stockholm is public with few exceptions. Clinicians with the necessary competence set the diagnoses, e.g. physicians, psychologists, and counselors.

### 3.1. Design and participants

The study population was extracted from the SYC and includes those who turned 13 years during 2001–2007 (born 1988–1994), i.e. 7 cohorts followed until they turned 18, in 2005–2011, yielding 169,262 adolescents. Individuals were censored at first episode of depression diagnosis, death, moving out of the Stockholm County or end of follow-up at age 18, whichever occurred first. For the current study, the participants are those adolescents with a first episode of diagnosed depression, and thus the study population include 6439 participants.

### 3.2. Social circumstances

Social circumstances were measured with four separate measures, parental country of birth parental education, household disposable income, and family receipt of unemployment benefits. Parents were defined as social parents, i.e. persons with whom the child lives, including biological parents, adoptive parents, and other adults responsible for the child. In addition, sex (register based) was measured.

*Parental country of birth* was categorized into born in Sweden, born in a Nordic country but not Sweden or born outside the Nordic countries. Adolescents were classified as having non-Swedish parents if the lone or both parents were born outside of Sweden, where the parental country of birth geographically closest to Sweden was used in the categorization. *Parental education* was measured according to the Swedish standard for classification of individual educational programs (Statistics Sweden 2000). It was defined by the parent with the highest education and categorized in three groups: low (pre-secondary), medium (upper secondary) and high (post-secondary). *Household disposable income* (Statistics Sweden 2011) is an individualized weighted average income, i.e. the sum of the family members' disposable income multiplied by the individual consumption weights and divided by their aggregate consumption weight. It was categorized according to the distribution within the total study population in quintiles; low, medium low, medium, medium high and high. *Receipt of unemployment benefits* was defined and categorized as, both, or the single parent receiving it once or several times during the last year, or not. All measures of social circumstances were assessed at age 12, the year before the start of follow up, and collected from LISA.

### 3.3. Psychosocial functioning and depression with comorbidity

Psychosocial functioning and depression with comorbidity were assessed among the adolescents with a first time diagnosis of depression, i.e. major depressive disorder (DSM-IV:296.20–24, 296.30–36), unspecified depressive disorder (DSM-IV:311) or dysthymic disorder (DSM-IV: 300.4), the DSM-IV based diagnostic code 19 used at CAMHS in Stockholm do indicate depressive disorder or ICD-10: F32.0–9, (depressive episode and unspecified depressive episode) F38.0–8 (other mood disorder), F39 (unspecified mood disorder), F33.0–9 (recurrent mood disorder), F34.8–9 (other chronic mood disorders). Diagnoses were retrieved from CAMHS and from Stockholm County Council's databases (VAL), including in- and outpatients. CGAS (Children's Global Assessment Scale) values were retrieved from CAMHS. Diagnoses are clinical and not established specifically for the aim of this study.

#### 3.3.1. Psychosocial functioning

Psychosocial functioning was measured with the Children's Global Assessment Scale (CGAS) (Shaffer et al., 1983). CGAS is used by clinicians to assess the child's level of overall psychosocial functioning (at home, school, and with peers) during the last month and adds a dimension to the diagnostic criteria to assess a person's condition. CGAS is assessed at CAMHS when the contact is initialized and at the end of treatment to guide evaluation, progress and response to treatment (Stockholm County Council, 2015). It is a numeric scale (1 through 100) where a score between 91 to 100 stand for superior functioning, 1–10

stand for a constant need of supervision/24 h-care. For the current study a score registered +/−14 days in relation to the diagnostic date for depression was used and the CGAS scale was dichotomized into low (worse) CGAS; 1–60 (at its best; variable functioning with sporadic difficulties or symptoms in several but not all social areas) and high CGAS; 61–100 (at its least; some difficulty in a single area but generally functioning well). This cut-off for dichotomization has been used previously (Lundh, 2012) and was considered suitable since at 61 the disturbance is not apparent to those not well acquainted with the child (Shaffer et al., 1983) and thus being indicative of relatively good psychosocial functioning. Out of the participants with depression ($n$ = 6439) in the current study, 3809 adolescents had a documented CGAS value, 2630 participants were excluded due to a missing value or for not having a value within +/−14 days from the diagnostic date for depression. The mean value for CGAS was 50.1 (std 10.2, min 2, max 95). Few have a value above 71 and below 35.

#### 3.3.2. Comorbidity

Depression with comorbidity was defined when the diagnosis of first-time depression co-occurred with other mental disorders, i.e. depression and additional mental disorders registered +/−14 days in relation to the diagnostic date of depression. Co-occurring disorders (based on DSM-IV, ICD-10 or diagnostic codes used at CAMHS) were categorized in four mutually exclusive groups;1) Internalizing disorders. 2) Externalizing disorders. 3) Developmental disorders. 4) Other mental disorder. *Internalizing disorders* include mainly anxiety disorders. *Externalizing disorders* include substance related, behavior /conduct/disruptive behavior disorders. *Developmental disorders* include attention-deficit, communication, pervasive developmental, learning, motor skills and tic disorders as well as mental retardation and other disorders of infancy, childhood, or adolescence. *Other disorders* include disorders not included above, for example elimination, eating, sleep, sexual, psychotic, factitious, personality and dissociative disorders. In the total population, including all adolescents ($n$ = 169,262), 1.6% were diagnosed with depression alone and 2.2% had a depression diagnosis in combination with an additional diagnose of any other mental disorder.

### 3.4. Statistical analysis

Logistic regression was used to estimate the association between parental education, household disposable income, parental country of birth, family receipt of unemployment benefits and sex, with psychosocial functioning and comorbidity among adolescents with depression. The associations are presented as Odds Ratios (OR) with corresponding 95% Confidence Intervals (CI). Parental depression was considered a potential confounder since previous research have shown that children of parents with depression have a higher risk for depression (Beardslee et al., 1993), and a history of depression has been found to confound the relationship between SES and major depression among adults (Wang et al., 2010). Child's own birth cohort was also considered a potential confounder. Measures of psychosocial factors, e.g. childhood adversities such as divorce were considered to occur within the causal pathway and were not adjusted for. Information regarding parental depression was assessed based on the National Patient Register. All diagnoses before the child turned 13 was considered and parental depression defined as the following diagnoses from ICD 8, 9 and 10; F32.0–9, F33.0–9, F34.1,8,9, F38.0,1,8, F39, 300E, 296B, 311, 300, 296, 301.10, 302.99, 314.99, in inpatient or outpatient specialized care. Adjustments for parents' history of depression and child's own birth cohort did not change the estimates and were therefore not included in the final models. For depression with comorbidity, the reference group was those with depression without comorbidity. To make use of as much information as possible in the analyses, individuals with missing information on a particular exposure variable were excluded only for that analysis. A sensitivity analysis including complete cases showed no significant differences. All statistical analyses were performed using SAS version 9.4 (SAS Institute Inc. Cary, N.C., USA).

## 4. Results

Of the 6439 adolescents with depression, 30.7% were boys and 69.3% girls. The majority was diagnosed with depressive disorders (69.4%) followed by major depressive disorder (23.4%), unspecified depressive disorder (6%), and lastly dysthymic disorders (1.2%). There were no differences related to sex in type of diagnosis. Most of the adolescents with depression had low psychosocial functioning (87%) and had been diagnosed with additional mental disorders (60%). Comorbid internalizing disorders was most prevalent (22.3%, boys 18%, girls 25%), followed by comorbid "other" disorders (16%, boys 13%, girls 18%). Comorbid developmental disorders were also common (13.8%, boys 17%, girls 13%) but fewer had comorbid externalizing disorders (5.8%, boys 7%, girls 5%). Girls had thus a slightly higher percentage of comorbid internalizing and comorbid "other" disorders whereas boys had a slightly higher percentage of externalizing and developmental disorders.

The CGAS mean value was lower, indicating worse psychosocial functioning, for those with depression with comorbidity than for those with depression only (51.5 vs 43.0). This was evident in all social groups in all groups of comorbidities. Those with comorbid externalizing and comorbid developmental disorders had a slightly lower mean CGAS score than those with comorbid internalizing disorders, in all social groups. Among the participants in the current study most had parents with high education, parents born in Sweden and parents with no receipt of unemployment benefits.

## 5. Social circumstances and psychosocial functioning among adolescents with depression

Social differences related to psychosocial functioning can be seen in Table 1a and 1b. There was an increased risk of low psychosocial functioning amongst those diagnosed with depression with parents with a low (OR=1.5) and medium high (OR=1.3) education, compared to high education. The risk estimates were in line with and in the same direction for adolescents with a lower, but not the lowest household income, however these associations had lower statistical power. It was not possible to detect any differences between those with foreign-born versus those with Swedish-born parents, nor for adolescents with parental receipt of unemployment benefits, due to loss of statistical power. Adjustments for parental country of origin and education, where applicable, only marginally changed the risk estimates.

### 5.1. Social circumstances and depression with comorbidity among adolescents with depression

Social differences related to depression with comorbidity can be seen Table 2a. Adolescents with parents with low education had an increased risk of comorbid internalizing disorders (OR=1.3) and more than double the risk of comorbid externalizing disorders (OR=2.5) compared to those with high parental education. Medium high parental education increased the risk of comorbid externalizing disorders with an OR of 1.5. Regarding household income, there was an increased risk of comorbid internalizing disorders for those with the lowest and the second lowest income compared to the highest (OR=1.3 and OR=1.4). The same pattern was evident for comorbid externalizing disorders (OR=2.4 and OR=1.8). It was not possible to detect any social differences in comorbid "other" disorders. Neither was it possible to detect social differences in relation to receipt of unemployment benefits.

Having parents born in the Nordic countries increased the risk of comorbid developmental disorders compared to Swedish-born parents (OR=1.7). Having parents born outside the Nordic countries increased the risk of comorbid externalizing (OR=1.6) and comorbid "other" disorders (OR=1.3). The risk estimates for the two other groups of

**Table 1a**
Percentage and Odds Ratios (OR) for social circumstances and low psychosocial functioning (CGAS) among participants with depression.

| | Depression and low psychosocial functioning (%) | | | Depression and lowpsychosocial functioning (OR) | | |
|---|---|---|---|---|---|---|
| | *n*=3316All | *n*=1044Boys | *n*=2272Girls | Crude(95% CI) | Adjusted for parental country of origin(95% CI) | Adjusted for parental country of origin and education(95% CI) |
| Boy | 31.5 | | | 1.0 | | |
| Girl | 68.5 | | | **0.8 (0.7–1.0)** | | |
| **Parental country of origin** | | | | | | |
| Sweden | 81.5 | 80.5 | 81.9 | 1.0 | | |
| Nordic | 3.4 | 3.1 | 3.6 | 1.1 (0.7–2.0) | | |
| Outside Nordic | 13.8 | 14.9 | 13.3 | 0.9 (0.7–1.2) | | |
| Missing | 1.3 | 1.5 | 1.2 | | | |
| **Parental education** | | | | | | |
| High | 44.5 | 47.1 | 43.4 | 1.0 | 1.0 | |
| Medium | 43.9 | 42.7 | 44.5 | **1.3 (1.1–1.6)** | **1.3 (1.1–1.6)** | |
| Low | 9.8 | 8.5 | 10.4 | **1.5 (1.1–2.2)** | **1.5 (1.1–2.2)** | |
| Missing | 1.7 | 1.6 | 1.7 | | | |
| **Household income** | | | | | | |
| High | 16.3 | 15.8 | 16.6 | 1.0 | 1.0 | 1.0 |
| Medium high | 21.3 | 22.7 | 20.7 | 1.3 (0.9–1.7) | 1.3 (0.9–1.7) | 1.2 (0.9–1.6) |
| Medium | 23.4 | 24.6 | 22.8 | **1.3 (1.0–1.7)** | **1.3 (1.0–1.7)** | 1.2 (0.9–1.6) |
| Medium low | 21.9 | 21.2 | 22.2 | **1.3 (1.0–1.8)** | **1.3 (1.0–1.8)** | 1.2 (0.9–1.6) |
| Low | 15.9 | 14.5 | 16.5 | 1.0 (0.7–1.3) | 1.0 (0.7–1.3) | 0.9 (0.6–1.2) |
| Missing | 1.2 | 1.3 | 1.2 | | | |
| **Parental receipt of unemployment benefits** | | | | | | |
| Not received | 86.4 | 85.3 | 86.9 | 1.0 | 1.0 | 1.0 |
| Received | 6.7 | 7.8 | 6.2 | 0.8 (0.5–1.2) | 0.8 (0.5–1.2) | 0.8 (0.6–1.3) |
| Missing | 6.5 | 6.9 | 6.9 | | | |

**Table 1b**
Odds Ratios (OR) for social circumstances and low psychosocial functioning (CGAS) among participants with depression, by sex.

| | Depression and low psychosocial functioning | | | | | |
|---|---|---|---|---|---|---|
| | CrudeOR (95% CI) | | Adjusted for parental country of originOR (95% CI) | | Adjusted for parental country of origin and educationOR (95% CI) | |
| | Boys | Girls | Boys | Girls | Boys | Girls |
| **Parental country of origin** | | | | | | |
| Sweden | 1.0 | 1.0 | | | | |
| Nordic | 1.1 (0.4–3.2) | 1.2 (0.6–2.2) | | | | |
| Outside Nordic | 1.2 (0.7–2.2) | 0.9 (0.6–1.2) | | | | |
| **Parental education** | | | | | | |
| High | 1.0 | 1.0 | 1.0 | 1.0 | | |
| Medium | 1.2 (0.8–1.7) | 1.4 (1.1–1.7) | 1.2 (0.8–1.7) | 1.4 (1.1–1.7) | | |
| Low | 1.4 (0.7–2.9) | 1.6 (1.1–2.4) | 1.3 (0.6–2.7) | 1.7 (1.1–2.6) | | |
| **Household income** | | | | | | |
| High | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Medium high | 1.2 (0.7–2.2) | 1.3 (1.0–1.8) | 1.2 (0.7–2.2) | 1.3 (0.9–1.8) | 1.2 (0.6–2.1) | 1.2 (0.8–1.7) |
| Medium | 1.1 (0.6–2.0) | 1.4 (1.0–1.9) | 1.1 (0.6–1.9) | 1.3 (0.9–1.9) | 1.0 (0.6–1.8) | 1.2 (0.9–1.8) |
| Medium low | 1.2 (0.7–2.3) | 1.3 (0.9–1.9) | 1.2 (0.7–2.2) | 1.3 (0.9–1.9) | 1.1 (0.6–2.1) | 1.2 (0.8–1.7) |
| Low | 0.8 (0.4–1.5) | 1.0 (0.7–1.5) | 0.7 (0.4–1.6) | 1.1 (0.7–1.6) | 0.7 (0.4–1.4) | 0.9 (0.6–1.4) |
| **Parental receipt of unemployment benefits** | | | | | | |
| Not received | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Received | 0.7 (0.3–1.5) | 0.9 (0.5–1.4) | 0.7 (0.3–1.5) | 0.9 (0.5–1.4) | 0.7 (0.3–1.6) | 0.9 (0.6–1.5) |

comorbid disorders were in the same direction though slightly lower for those with parents born outside the Nordic countries, compared to those born in the Nordic countries, and with confidence intervals including one.

Adjustment for parental country of birth marginally decreased the elevated risk of comorbid internalizing and externalizing disorders among those with lower household income. Education had no further effect on comorbid internalizing disorders but further reduced the risk of comorbid externalizing disorders.

### 5.2. Sex differences

Girls with depression had a lower risk of low psychosocial functioning, compared to boys with depression (OR=0.8, CI=0.7–1.0) (Table 1a). Analyses stratified by sex (Table 1b) showed an increased risk of depression with low psychosocial functioning among girls with parents with lower education. Risk estimates for low psychosocial functioning among boys with lower parental education, and for boys and girls with lower household income, point in the same direction, but with somewhat lower estimates and CIs including 1. Adjustments for parental country of origin and education marginally changed the risk estimates.

Girls with depression had an increased risk of comorbid internalizing (OR=1.5) and comorbid "other" disorders (OR=1.5) whereas boys had an increased risk of comorbid externalizing (OR=0.7) and comorbid developmental disorders (OR=0.6) (Table 2b and 2c).

Regarding the impact of social differences in depression with comorbidity among boys and girls those boys with low parental education had a more elevated risk of internalizing disorder (OR=3.0, CI=1.9–4.9) than girls (OR=1.0, CI=0.7–1.3). There was likewise sex difference for those with parents born outside the Nordic countries (boys; OR=1.9,

**Table 2a**
. Odds Ratios (OR) for social circumstances and comorbidity among adolescents with depression.

| | Internalizing disorders | | | Externalizing disorders | | | Developmental disorders | | | Other disorders | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OR(CI 95%) | Crude | Adjusted for parental country of origin | Adjusted for parental country of origin and education | Crude | Adjusted for parental country of origin | Adjusted for parental country of origin and education | Crude | Adjusted for parental country of origin | Adjusted for parental country of origin and education | Crude | Adjusted for parental country of origin | Adjusted for parental country of origin and education |
| Boy | 1.0 | | | 1.0 | | | 1.0 | | | 1.0 | | |
| Girl | 1.5 (1.2–1.8) | | | 0.7 (0.5–1.0) | | | 0.6 (0.5–0.7) | | | 1.5 (1.2–1.9) | | |
| **Parental country of origin** | | | | | | | | | | | | |
| Sweden | 1.0 | | | 1.0 | | | 1.0 | | | 1.0 | | |
| Nordic | 1.3 (0.9–2.0) | | | 0.6 (0.2–2.0) | | | 1.7 (1.0–2.7) | | | 1.0 (0.6–1.7) | | |
| Outside Nordic | 1.2 (0.9–1.5) | | | 1.6 (1.1–2.4) | | | 1.3 (1.0–1.6) | | | 1.3 (1.0–1.7) | | |
| **Parental education** | | | | | | | | | | | | |
| High | 1.0 | 1.0 | | 1.0 | 1.0 | | 1.0 | 1.0 | | 1.0 | 1.0 | |
| Medium | 1.0 (0.8–1.2) | 1.0 (0.8–1.2) | | 1.5 (1.0–2.1) | 1.5 (1.0–2.0) | | 1.0 (0.8-1.3) | 1.0 (0.8–1.3) | | 0.9 (0.7–1.1) | 0.9 (0.7–1.1) | |
| Low | 1.3 (1.0–1.7) | 1.3 (1.0–1.7) | | 2.5 (1.5–4.0) | 2.3 (1.4–3.7) | | 1.3 (0.9-1.8) | 1.3 (0.9–1.8) | | 1.1 (0.8–1.5) | 1.0 (0.7–1.4) | |
| **Household disposable income** | | | | | | | | | | | | |
| High | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Medium high | 1.3 (1.0–1.7) | 1.3 (1.0–1.7) | 1.3 (1.0–1.7) | 1.6 (0.9–2.9) | 1.6 (0.9–2.9) | 1.5 (0.8–2.7) | 1.3 (1.0–1.9) | 1.3 (1.0–1.8) | 1.3 (0.9–1.8) | 1.3 (0.9–1.8) | 1.3 (0.9–1.8) | 1.3 (0.9–1.8) |
| Medium | 1.3 (1.0–1.7) | 1.3 (1.0–1.6) | 1.2 (1.0–1.6) | 1.4 (0.8–2.5) | 1.3(0.7–2.4) | 1.2 (0.7–2.2) | 1.2 (0.9–1.6) | 1.2 (0.8–1.6) | 1.1 (0.8–1.6) | 1.2 (0.9–1.6) | 1.2 (0.9–1.6) | 1.2 (0.9–1.6) |
| Medium low | 1.4 (1.1–1.8) | 1.4 (1.1–1.8) | 1.3 (1.0–1.7) | 1.8 (1.0–3.2) | 1.7 (1.0–3.01) | 1.5 (0.8–2.7) | 1.3 (1.0–1.9) | 1.3 (0.9–1.8) | 1.3 (0.9–1.8) | 1.3 (1.0–1.8) | 1.3 (1.0–1.8) | 1.3 (1.0–1.9) |
| Low | 1.3 (1.0–1.7) | 1.3 (1.0–1.7) | 1.3 (1.0–1.7) | 2.4 (1.4–4.2) | 2.2 (1.3–3.9) | 1.9 (1.0–3.4) | 1.2 (0.8–1.7) | 1.1 (0.8–1.6) | 1.1 (0.7–1.5) | 1.3 (0.9–1.8) | 1.2 (0.9–1.7) | 1.3 (0.9–1.8) |
| **Parental receipt of unemployment benefits** | | | | | | | | | | | | |
| Not received | 1.0 | 1.0 | 1.02 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Received | 1.1 (0.8–1.5) | 1.1 (0.8–1.4) | 1.0 (0.8–1.4) | 1.4 (0.8–2.4) | 1.3 (0.7–2.2) | 1.2 (0.7–2.1) | 0.8 (0.5–1.2) | 0.8 (0.5–1.2) | 0.7 (0.5–1.1) | 1.1 (0.8–1.6) | 1.0 (0.7–1.5) | 1.1 (0.7–1.5) |

CI=1.3–2.7, girls; OR=1.0, CI=0.8–1.3). The risk was more elevated for boys than for girls for comorbid internalizing disorders among those with medium low household income (boys; OR=1.8, CI=1.1–3.1, girls OR=1.3, CI=1.0–1.7) and low household income (boys; OR=1.9, CI=1.1–3.4, girls; OR=1.2, CI=0.9–1.6), however with overlapping CI:s. Both boys and girls with parents having low education had an increased risk of comorbid externalizing disorders. The magnitude of the difference was higher for boys (boys OR=3.8, CI=1.8–8.1 girls OR=2.1, CI=1.1–3.8). The pattern was the same for those with the lowest household income but with a CI including one for girls (OR=1.9, CI=0.9–4.1).

The increased risk of comorbid "other" disorders for those with more disadvantaged social circumstances was evident only among boys where crude OR:s showed double the risk of comorbid "other" disorders for those with low parental education (OR=2.3), with receipt of unemployment benefits (OR=2.2) and for those with parents born outside the Nordic countries (OR=1.8). The risk was tripled or almost tripled for those with lower household income (medium high OR=3.1, medium OR=2.6, medium low OR=2.5, low OR=2.9) and with parents born in the Nordic countries (OR=3.1).

Most of the elevated risk estimates for depression with comorbidity among those with more disadvantaged social circumstances remained or decreased marginally when adjusting for parental country of origin. Adding adjustments for parental education further lowered the risk estimates marginally. Adjustments did however have an impact on the risk of comorbid externalizing disorders among those with lower household income, e.g. from crude OR of 2.4 to OR 1.9 for those with the lowest income. Overall, the same pattern was found for boys and girls separately but adjustments for parental country of birth and education lowered the risk estimates for all groups of comorbid disorders in relation to lower household income, especially among boys. Further, adjustments for parental country of birth and education indicated elevated estimates for comorbid "other" disorders for girl with lower income.

## 6. Discussion

### 6.1. Summary of main findings

Among adolescents with depression, it was found that those with more disadvantaged social circumstances were more likely to have depression with low psychosocial functioning and psychiatric comorbidity. The association was found to be strongest for comorbid externalizing disorders and somewhat less strong for comorbid internalizing disorders and low psychosocial functioning. Parental country of birth did not reveal any strong differences in general but adolescents with parents born outside the Nordic countries were found to be more prone to comorbid externalizing disorders. It was not possible to detect any differences related to receipt of unemployment benefits for any of the outcomes.

Girls with depression were more likely to have low psychosocial functioning and comorbid internalizing disorders compared to boys with depression whereas the opposite was true for comorbid externalizing and comorbid developmental disorders.

In relation to social differences, both girls and boys with parents with lower education had an increased risk of comorbid externalizing disorders. The increased risk of low psychosocial functioning was slightly lower for boys than girls but with imprecise estimates for boys. The magnitude of social differences in comorbid externalizing and comorbid internalizing disorders was overall larger for boys than girls. The same pattern was noticed for the comorbidity groups of "other" disorders but rather the opposite for comorbid developmental disorders.

### 6.2. Social differences in psychosocial functioning and psychiatric comorbidity among adolescents with depression

The findings from this study support the common notion that depression often coexist with other mental disorders (SBU 2004; Avenevoli et al., 2015). In the current study 60% of the adolescents with depression had been diagnosed with additional mental disorders which are similar to the figure of 64% found for adolescents with depression in a study conducted in the USA (Avenevoli et al., 2015). Furthermore, the current study supports the findings that depression often coexists with the common disorders of anxiety and ADHD (Avenevoli et al., 2015) and that girls have more internalizing disorders while boys have more externalizing disorders (Roberts et al., 2007). The results from the current study are also supported by a study showing that those with depression with comorbidity have lower psychosocial functioning compared to those with depression alone (Masi et al., 2000).

Literature on social differences in psychosocial functioning and comorbidity among adolescents with depression is sparse, especially in countries like Sweden, with relatively small social differences. The current study found those with a medium and medium low household income to be of higher risk of low psychosocial functioning; but no increased risk of low psychosocial functioning was found for those with the lowest household income compared to those with the highest. Previous findings show that children with families with a receipt of a welfare benefit are more likely to have comorbidity than those not receiving it (Spady et al., 2001). In the current study, though focusing solely on adolescents with depression, this was supported by the fact that adolescents having lower household income had an increased risk of depression with comorbidity.

The mechanisms between disadvantaged social circumstances and low psychosocial functioning and psychiatric comorbidity were not explored in the current study. However, the increased risk of low psychosocial functioning and psychiatric comorbidity among adolescents with low parental education and low household income, could partly be explained by delayed care-seeking as well as environmental and gene-environment interaction (Hannigan et al., 2017; Kwong et al., 2019). Many take the step to seek care only when symptoms become more comprehensive (Doblyte and Jimenez-Mejias, 2017), a behavior possibly more common among groups with lower socioeconomic status. This is supported by findings that indicate that people with lower socioeconomic status know less about symptoms of depression (von dem Knesebeck et al., 2013) and that higher education indicate better mental health literacy, such as appraisal of health information and ability to navigate in the health care system and manage disease (Holman, 2015; Jansen et al., 2018), although there are some studies that do not confirm this (Leighton, 2010). Also, even though children's psychiatric care is free in Sweden, lower household income is related to occupations with reduced possibility to manage your time. Care seeking behavior can also partly explain the larger magnitude of social differences found for comorbid externalizing disorders compared to comorbid internalizing disorders since symptoms of externalizing character are easier to detect by the caregiver. Delayed care-seeking can also explain increased risk of depression with comorbidity related to having foreign born parents. It has for example been found that mental health literacy can be lower and that parents' experiences from the home country and adapting to a new country can impact on mental health (Hollander, 2013). These issues can further affect their children. However, having foreign born parents was not associated with low psychosocial functioning.

Another explanation to social differences in psychosocial functioning and psychiatric comorbidity among adolescents with depression is that groups with lower socioeconomic status can mirror a more disadvantaged home environment. A disadvantaged environment can possibly uphold less support which can increase the possibility of additional mental health problems such as psychiatric comorbidity. In other studies it has been shown that a tough family and housing situation, such as disruptions in the home environment (Storksen et al., 2005), neighborhood characteristics (Butler et al., 2012), neighborhood effects (Sundquist et al., 2015), and less support (Eisman et al., 2015) increases the risk of poor mental health. It has also been found that experience of violence and conflict in the family can increase the risk of depression

**Table 2b**
Odds Ratios (OR) for social circumstances and comorbidity among girls with depression.

| Girls | Internalizing disorders $n = 1102$ | | | | Externalizing disorders $n = 227$ | | | | Developmental disorders $n = 562$ | | | | Other disorders $n = 773$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % | OR (95% CI) | | | % | OR (95% CI) | | | % | OR (95% CI) | | | % | OR (95% CI) | | |
| | | Crude | Adjusted for parental country of origin | Adjusted for parental country of origin and education | | Crude | Adjusted for parental country of origin | Adjusted for parental country of origin and education | | Crude | Adjusted for parental country of origin | Adjusted for parental country of origin and education | | Crude | Adjusted for parental country of origin | Adjustedfor parentalcountry oforigin andeducation |
| **Parental country of origin** | | | | | | | | | | | | | | | | |
| Sweden | 81.0 | 1.0 | | | 80.6 | 1.0 | | | 77.7 | 1.0 | | | 82.2 | 1.0 | | |
| Nordic | 4.2 | 1.2 (0.7–1.9) | | | 3.6 | 0.7 (0.2–2.7) | | | 6.3 | 2.3 (1.3–4.0) | | | 2.9 | 0.5 (0.2–1.2) | | |
| Outside Nordic | 12.7 | 1.0 (0.7–1.3) | | | 14.0 | 1.2 (0.7–2.2) | | | 14.6 | 1.5 (1.1–2.2) | | | 13.2 | 1.2 (0.9–1.6) | | |
| Missing | 2.1 | | | | 1.8 | | | | 1.4 | | | | 1.8 | | | |
| **Parental education** | | | | | | | | | | | | | | | | |
| High | 45.3 | 1.0 | 1.0 | | 37.8 | 1.0 | 1.0 | | 42.2 | 1.0 | 1.0 | | 49.2 | 1.0 | 1.0 | |
| Medium | 43.0 | 1.0 (0.8–1.2) | 1.0 (0.8–1.2) | | 46.0 | 1.5 (1.0–2.3) | 1.5 (1.1–3.8) | | 45.1 | 1.2 (0.9–1.6) | 1.3 (0.9–2.1) | | 40.2 | 0.8 (0.5–1.2) | 0.8 (0.7–1.1) | |
| Low | 9.3 | 1.0 (0.7–1.3) | 1.0 (0.7–1.3) | | 14.0 | 2.1 (1.1–3.8) | 2.0 (1.0–2.3) | | 11.0 | 1.5 (1.0–2.3) | 1.2 (0.9–1.6) | | 8.4 | 0.8 (0.7–1.1) | 0.8 (0.5–1.2) | |
| Missing | 2.4 | | | | 2.3 | | | | 1.8 | | | | 2.2 | | | |
| **Household disposable income** | | | | | | | | | | | | | | | | |
| High | 16.0 | 1.0 | 1.0 | 1.0 | 11.7 | 1.0 | 1.0 | 1.0 | 15.0 | 1.0 | 1.0 | 1.0 | 18.4 | 1.0 | | |
| Medium high | 20.2 | 1.3 (1.0–1.8) | 1.3 (1.0–1.8) | 1.3 (1.0–1.8) | 19.8 | 1.7 (0.8–3.6) | 1.7 (0.8–3.6) | 1.6 (0.8–3.4) | 20.9 | 1.2 (0.8–1.9) | 1.2 (0.7–1.8) | 1.1 (0.7–1.8) | 19.5 | 1.1 (0.8–1.5) | 1.1 (0.7–1.5) | 1.1 (0.8–1.6) |
| Medium | 21.2 | 1.3 (1.0–1.7) | 1.3 (1.0–1.7) | 1.3 (1.0–1.7) | 23.4 | 1.8 (0.9–3.7) | 1.8 (0.9–3.7) | 1.6 (0.8–3.3) | 19.3 | 1.1 (0.7–1.8) | 1.1 (0.7–1.7) | 1.0 (0.7–1.6) | 19.9 | 1.0 (0.7–1.5) | 1.0 (0.7–1.4) | 1.1 (0.7–1.5) |
| Medium low | 23.7 | 1.3 (1.0–1.7) | 1.3 (1.0–1.7) | 1.3 (1–0–1.8) | 24.3 | 1.7 (0.8–3.4) | 1.6 (0.8–3.4) | 1.4 (0.7–3.1) | 28.1 | 1.7 (1.1–2.5) | 1.6 (1.0–2.4) | 1.5 (1.0–2.3) | 23.8 | 1.2 (0.8–1.7) | 1.2 (0.8–1.7) | 1.3 (0.9–1.8) |
| Low | 16.9 | 1.2 (0.9–1.6) | 1.2 (0.9–1.6) | 1.2 (0.9–1.7) | 18.9 | 1.9 (0.9–4.1) | 1.9 (0.9–4.1) | 1.7 (0.8–3.6) | 15.3 | 1.2 (0.8–2.0) | 1.1 (0.7–1.8) | 1.0 (0.6–1.7) | 15.6 | 1.1 (0.8–1.6) | 1.1 (0.7–1.6) | 1.2 (0.8–1.7) |
| Missing | 2.1 | | | | 1.8 | | | | 1.4 | | | | 1.8 | 1.0 | | |
| **Parental receipt of unemployment benefits** | | | | | | | | | | | | | | | | |
| Not received | 85.0 | 1.0 | 1.0 | 1.0 | 86.9 | 1.0 | 1.0 | 1.0 | 88.1 | 1.0 | 1.0 | 1.0 | 87.7 | 1.0 | | |
| Received | 6.6 | 1.1 (0.8–1.6) | 1.1 (0.8–1.6) | 1.1 (0.8–1.6) | 5.9 | 1.2 (0.6–2.4) | 1.1 (0.5–2.4) | 1.1 (0.5–2.3) | 5.2 | 0.7 (0.4–1.3) | 0.6 (0.3–1.1) | 0.6 (0.3–1.1) | 5.1 | 0.8 (0.5–1.2) | 0.7 (0.4 1.2) | 0.8 (0.5 1.3) |
| Missing | 8.4 | | | | 7.2 | | | | 6.7 | | | | 7.2 | | | |

**Table 2c**
Odds Ratios (OR) for social circumstances and comorbidity among boys with depression.

| Boys | Internalizing disorders $n = 350$ | | | | Externalizing disorders $n = 140$ | | | | Developmental disorders $n = 333$ | | | | Other disorders $n = 247$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % | OR (95% CI) Crude | Adjusted for parental country of origin | Adjusted for parental country of origin and education | % | OR (95% CI) Crude | Adjusted for parental country of origin | Adjusted for parental country of origin and education | % | OR (95% CI) Crude | Adjusted for parental country of origin | Adjusted for parental country of origin and education | % | OR (95% CI) Crude | Adjusted for parental country of origin | Adjusted forparentalcountry oforigin andeducation |
| **Parental country of origin** | | | | | | | | | | | | | | | | |
| Sweden | 75.4 | 1.0 | | | 74.1 | 1.0 | | | 83.1 | 1.0 | | | 75.7 | 1.0 | | |
| Nordic | 3.5 | 1.8 (0.8–4.1) | | | 2.2 | 0.7 (0.1–5.5) | | | 1.8 | 1.0 (0.4–2.5) | | | 4.9 | 3.1 (1.4–7.0) | | |
| Outside Nordic | 19.1 | 1.9 (1.3–2.8) | | | 21.6 | 2.5 (1.4–4.5) | | | 13.6 | 1.0 (0.6–1.5) | | | 18.2 | 1.8 (1.1–2.9) | | |
| Missing | 2.0 | | | | 2.2 | | | | 1.5 | | | | 1.2 | | | |
| **Parental education** | | | | | | | | | | | | | | | | |
| High | 48.4 | 1.0 | 1.0 | | 36.0 | 1.0 | 1.0 | | 49.9 | 1.0 | 1.0 | | 48.6 | 1.0 | 1.0 | |
| Medium | 36.5 | 1.0 (0.7–1.4) | 1.0 (0.7–1.4) | | 43.9 | 1.4 (0.8–2.5) | 1.4 (0.8–2.5) | | 38.1 | 0.9 (0.6–1.2) | 0.9 (0.6–1.2) | | 38.5 | 1.1 (0.8–1.7) | 1.1 (0.7–1.7) | |
| Low | 11.9 | 3.0 (1.9–4.9) | 2.6 (1.6–4.7) | | 16.7 | 3.8 (1.8–8.1) | 3.1 (1.4–6.8) | | 9.4 | 1.4 (0.8–2.5) | 1.4 (0.8–2.6) | | 11.3 | 2.3 (1.2–4.3) | 1.9 (1.0–3.7) | |
| Missing | 3.2 | | | | 3.6 | | | | 2.7 | | | | 1.6 | | | |
| **Household disposable income** | | | | | | | | | | | | | | | | |
| High | 15.7 | 1.0 | 1.0 | 1.0 | 13.0 | 1.0 | 1.0 | 1.0 | 15.7 | 1.0 | 1.0 | 1.0 | 11.3 | 1.0 | | |
| Medium high | 20.3 | 1.4 (0.8–2.5) | 1.4 (0.8–2.4) | 1.3 (0.8–2.3) | 16.6 | 1.5 (0.6–3.8) | 1.4 (0.6–3.7) | 1.3 (0.5–3.3) | 21.5 | 1.5 (0.9–2.4) | 1.5 (0.9–2.4) | 1.4 (0.9–2.3) | 23.9 | 3.1 (1.4–6.8) | 3.0 (1.3–6.6) | 2.8 (1.3- 6.4) |
| Medium | 20.0 | 1.4 (0.8–2.3) | 1.3 (0.7–2.2) | 1.2 (0.7–2.0) | 18.7 | 0.8 (0.3–2.2) | 0.7 (0.3–2.1) | 0.6 (0.2–1.8) | 26.0 | 1.2 (0.7–1.9) | 1.2 (0.7–1.9) | 1.1 (0.7–1.9) | 24.3 | 2.6 (1.2–5.8) | 2.5 (1.1–5.5) | 2.3 (1.0–5.2) |
| Medium low | 23.2 | 1.8 (1.1–3.1) | 1.7 (1.0–2.9) | 1.5 (0.8–2.6) | 24.5 | 2.0 (0.8–4.9) | 1.9 (0.8–4.6) | 1.5 (0.6–3.7) | 19.9 | 1.0 (0.6–1.6) | 1.0 (0.6–1.6) | 1.1 (0.6–1.6) | 21.1 | 2.5 (1.1–5.7) | 2.3 (1.0–5.3) | 2.1 (0.9–4.9) |
| Low | 18.8 | 1.9 (1.1–3.4) | 1.6 (0.9–2.8) | 1.4 (0.8–2.5) | 25.2 | 3.2 (1.3–7.7) | 2.6 (1.1–6.6) | 2.2 (0.8–5.5) | 15.4 | 1.1 (0.7–2.0) | 1.1 (0.7–2.0) | 1.1 (0.6–2.0) | 18.2 | 2.9 (1.3–6.8) | 2.4 (1.0–5.7) | 2.2 (0.9–5.3) |
| Missing | 2.0 | | | | 2.2 | | | | 1.5 | | | | 1.2 | | | |
| **Parental receipt of unemployment benefits** | | | | | | | | | | | | | | | | |
| Not received | 85.8 | 1.0 | 1.0 | 1.0 | 84.9 | 1.0 | 1.0 | 1.0 | 86.7 | 1.0 | 1.0 | 1.0 | 81.4 | 1.0 | | |
| Received | 6.7 | 1.0 (0.5–1.7) | 0.9 (0.5–1.5) | 0.8 (0.4–1.4) | 10.1 | 1.7 (0.8–3.7) | 1.5 (0.7–3.2) | 1.3 (0.6–3.0) | 5.4 | 0.9 (0.5–1.7) | 0.9 (0.5–1.7) | 0.9 (0.5–1.7) | 10.5 | 2.2 (1.3–3.9) | 2.0 (1.1–3.6) | 2.0 (1.1–3.5) |
| Missing | 7.5 | | | | 5.0 | | | | 7.9 | | | | 8.1 | | | |

among adolescents living in disadvantaged contexts (Eisman et al., 2015). Furthermore, the group of comorbid externalizing disorders, where social differences were more prominent, includes substance related disorders (risk estimates for comorbid substance related disorders alone, point in the same direction, results not shown) known to be more prominent among groups with lower socioeconomic status (Gauffin et al., 2013).

The explanation of a more disadvantaged home environment can also be applied to the findings that the risk of depression with comorbid externalizing disorders was increased for those with parents born outside the Nordic countries. It has for example been found that perceived family support in relation to depression varies depending on cultural and situational factors (Khallad and Jabr, 2016). Another possible explanation is that parents may have high academic expectations for their children which have shown to increase the risk of depression for girls (Khallad and Jabr, 2016; Ochi et al., 2014). Parents that move to another country can possibly have even higher such expectations. For comorbid internalizing disorders among girls and for low psychosocial functioning among both boys and girls, however, no increased risk was found among those with foreign born parents which highlight the complex relationship between country of birth and poor mental health.

Parental unemployment has been found to increase the risk for depression (Pirkola et al., 2005) which was confirmed in the study on the total population from SYC (Wirback et al., 2018). This increased risk was however not evident for low psychosocial functioning and psychiatric comorbidity among adolescents with depression, possibly due to lack of power. Åslund et al. (2007) found that experiences of shame can mediate the association between parental unemployment and depression in adolescence. Possibly these experiences are not the same in people that have sought care and have more severe mental problems.

### 6.3. Sex differences

Boys with depression were found to have a higher risk of low psychosocial functioning compared to girls (this was even more prominent when low CGAS was defined as 40 or less instead of 60 or less). This is in line with another study that showed that psychosocial functioning is lower among boys with self-reported symptoms of depression, compared to girls with self-reported symptoms of depression (Derdikman-Eiron et al., 2011). This can to some extent reflect that girls get more, or more suitable support, than boys.

Patterns of psychiatric comorbidity can differ between adolescent boys and girls (Avenevoli et al., 2015; Hoffmann et al., 2012; Spady et al., 2001; Gallerani et al., 2010). In the current study ADHD is included in the group of developmental disorders and anxiety in the group of internalizing disorders. Despite this discrepancy the current study supports the finding that girls with depression have a higher risk of concurrent anxiety compared to boys with depression but contradict the finding that girls with depression have a more increased risk of concurrent ADHD than boys with depression (Avenevoli et al., 2015). In the current study it was also found that boys with depression had a slightly higher risk of externalizing disorders, compared to girls with depression. In the study by Avenivoli et al. (2015) the risk for substance use disorders (included in externalizing disorders in the current study) was substantially increased for those with depression but without strong differences between boys and girls.

The findings of the larger magnitude of social differences among boys and that they are at higher risk of presenting comorbidities can yet again be explained by delayed care-seeking - boys who eventually are detected with poor mental health have greater problems than girls at the time of diagnose. Twenge and Nolen-Hoeksema (2002) further suggest that causes to differences between boys and girls can differ for different levels of depression severity. It should also be noted that the magnitude of social differences were larger in depression with comorbidity and low psychosocial functioning among adolescents with depression than in diagnosed depression among adolescents overall, as found in the study conducted by the same research team as the current study, including the total population of SYC (Wirback et al., 2018).

Parental depression only marginally affected the results also in the current study, which is in line with findings from Modin et al. (2011). Childhood adversities and psychosocial factors were considered mediators in the current study as they are within the causal pathway between social circumstances and depression. The association between low household income and comorbid externalizing disorders was however found to partly be explained by parental country of birth and education.

Lastly, mechanisms behind social differences can vary by mental disorder (Dohrenwend et al., 1992). Some comorbid conditions can possibly be more socially determined than others. Depression can for example be due to economic stress whereas ADHD have a larger genetic component, which is not affected by social circumstances. The expression of different mental disorders can moreover be socially different. In reality mental disorders can be hard to separate from each other (SBU 2004). Mental disorders can also be distinctly different disorders, or, indicate limitations in the current diagnostic procedures (SBU 2004). Anxiety and depression have for example often shown to be coherent and difficult to separate. Olino et al. (2008) explain that comorbidity by the combination of similar and diagnose specific causes. Some has found that each different mental disorder have a different relation to socioeconomic status (Miech et al., 1999), some highlight the need to shift focus from specific diseases to become better able to prevent disease that arise from the social structure (Berkman et al., 2014).

### 6.4. Strengths and limitations

This study contributes with a robust design that handles some common methodological shortcomings such as recall bias and reversed causality. It stems from a large register-based population-based cohort study including both in- and outpatient care.

The study is based on the usual care procedures at CAMHS with clinical assessment of diagnoses thus nothing has been changed for the purpose of this particular study. The diagnostics is based on professional assessment and not on structured instruments to measure depressive symptoms. This can be argued to increase diagnostic validity. However, it can also lead to misclassification (due to differences between clinicians), especially in relation to the value given for psychosocial functioning (CGAS). CGAS have been widely used (National Board of Health and Welfare 2009) but the reliability has been found to be moderate (ICC=0.73) (Lundh, 2012). Misclassification can also apply to comorbidity. Clinicians have in general been found reluctant to diagnose children (Wasserman, 2010) and this can be especially true when it comes to diagnosing children or adolescents with more than one diagnose, or in diagnosing more problematic externalizing disorders like conduct disorders. This indicates a probable underestimation of comorbidity, however there is no reason to believe that this bias the result as it is not likely to differ between social groups.

Misclassification of social circumstances is also possible. Children can only be registered at one address, thus only one social context is considered for those with alternate living arrangements, which applies to around 30% of the children. Furthermore, in the current study the second parent was excluded if he or she was not a biological/adoptive parent, since information for those was differential due to housing conditions, which in turn can be related to social circumstances. This misclassification is not likely to be large but can classify some adolescents to more disadvantaged social circumstances than the accurate one, and thus may lead to an underestimation of the associations.

In this study comorbidity was defined as having depression and at least one additional diagnose +/- 14 days in relation to the diagnostic date of depression. If still relevant, a diagnose set earlier should be re-registered in relation to the de-pression diagnosis. However, there is a risk that in some cases developmental diagnoses such as ADHD that the patient may have received several years ago are not registered.

Frequencies of diagnoses did however not vary much when using 30 days instead and results concerning social differences remained.

Information on CGAS was partially missing. This missing data is likely to be random in relation to the patient's social circumstances but impacted on the statistical power. It should also be kept in mind that the analytical base was relatively small in the analyses of comorbid externalizing disorders (boys, $n = 140$, girls $n = 227$) which can imply somewhat more imprecise results.

The findings of the current study can be generalized to adolescents that have sought care for and received a depression diagnose, within a similar setting.

### 6.5. Implications

The positive findings are overall modest, and the information is of limited value for the clinician facing the individual patient. However, adolescents with depression and more disadvantaged social circumstances are more prone to also have low psychosocial functioning and psychiatric comorbidity which can indicate a lengthy clinical course and poorer response to treatment. It is important to highlight groups with psychiatric comorbidity as they have a higher risk of social exclusion (Todd et al., 2004), unemployment, and lower income in the future (Dagher and Green, 2015). Research to further understand factors underlying the social differences in psychosocial functioning and psychiatric comorbidity among adolescents with depression are needed.

## Author statements

### *Contributors*

TW participated in the design of the study, performed the statistical analyses, interpreted the results and drafted the manuscript. JM participated in the design of the study, interpretation of the results and reviewed the manuscript. J-O L contributed with expertise in psychiatrics and reviewed the manuscript. KE participated in the design of the study, interpretation of the results, supported in drafting the manuscript and reviewed the manuscript. All authors read and approved the final manuscript

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## Declaration of Competing Interest

The authors declare no conflict of interest

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## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jad.2020.12.179.

## References

SBU, 2004. *Treatment of Depression. A Systematic Review* Stockholm. The Swedish Council on Technology Assessment in Health Care (SBU).
FM, Gore, Bloem, P.J.N., Patton, G.C., 2011. Global burden of disease in young people aged 10-24 years: a systematic analysis (vol 377, pg 2093, 2011). Lancet 378 (9790), 486-486.
Avenevoli, S., Swendsen, J., He, J.P., Burstein, M., Merikangas, K.R., 2015. Major depression in the national comorbidity survey-adolescent supplement: prevalence, correlates, and treatment. J. Am. Acad. Child Adolesc. Psychiatry 54 (1), 37–44 e32.
Hoffmann, F., Petermann, F., Glaeske, G., Bachmann, C.J., 2012. Prevalence and comorbidities of adolescent depression in Germany. An analysis of Health Insurance Data. Z. Kinder Jugendpsychiatr. Psychother. 40 (6), 399–404.
Ezpeleta, L., Domenech, J.M., Angold, A., 2006. A comparison of pure and comorbid CD/ODD and depression. J. Child Psychol. Psychiatry 47 (7), 704–712.
Lundh, A, 2012. On the Children's Global Assessment Scale (CGAS). Dept of Clinical Neuroscience, Karolinska Institutet.
Pirkola, S., Isometsa, E., Aro, H., et al., 2005. Childhood adversities as risk factors for adult mental disorders: results from the Health 2000 study. Soc. Psychiatry Psychiatr. Epidemiol. 40 (10), 769–777.
Melartin, T.K., Rytsala, H.J., Leskela, U.S., Lestela-Mielonen, P.S., Sokero, T.P., Isometsa, E.T., 2004. Severity and comorbidity predict episode duration and recurrence of DSM-IV major depressive disorder. J. Clin. Psychiatry 65 (6), 810–819.
McLaughlin, K.A., Breslau, J., Green, J.G., et al., 2011. Childhood socio-economic status and the onset, persistence, and severity of DSM-IV mental disorders in a US national sample. Soc. Sci. Med. 73 (7), 1088–1096.
Miech, R.A., Caspi, A., Moffitt, T.E., Wright, B.R.E., Silva, P.A., 1999. Low socioeconomic status and mental disorders: a longitudinal study of selection and causation during young adulthood. Am. J. Sociol. 104 (4), 1096–1131.
Paananen, R., Ristikari, T., Merikukka, M., Gissler, M., 2013. Social determinants of mental health: a Finnish nationwide follow-up study on mental disorders. J. Epidemiol. Community Health 67 (12), 1025–1031.
Salom, C.L., Williams, G.M., Najman, J.M., Alati, R., 2014. Does early socio-economic disadvantage predict comorbid alcohol and mental health disorders? Drug Alcohol Depend. 142, 146–153.
Spady, D.W., Schopflocher, D.P., Svenson, L.W., Thompson, A.H., 2001. Prevalence of mental disorders in children living in Alberta, Canada, as determined from physician billing data. Arch. Pediatr. Adolesc. Med. 155 (10), 1153–1159.
Reiss, F., 2013. Socioeconomic inequalities and mental health problems in children and adolescents: a systematic review. Soc. Sci. Med. 90 (0), 24–31.
Roberts, R.E., Roberts, C.R., Xing, Y., 2007. Rates of DSM-IV psychiatric disorders among adolescents in a large metropolitan area. J. Psychiatr. Res. 41 (11), 959–967.
Gallerani, C.M., Garber, J., Martin, N.C., 2010. The temporal relation between depression and comorbid psychopathology in adolescents at varied risk for depression. J. Child Psychol. Psychiatry 51 (3), 242–249.
Derdikman-Eiron, R., Indredavik, M.S., Bratberg, G.H., Taraldsen, G., Bakken, I.J., Colton, M., 2011. Gender differences in subjective well-being, self-esteem and psychosocial functioning in adolescents with symptoms of anxiety and depression: findings from the Nord-Trondelag Health Study. Scand. J. Psychol. 52 (3), 261–267.
Wirback, T., Moller, J., Larsson, J.O., Engstrom, K., 2018. Social differences in diagnosed depression among adolescents in a Swedish population based cohort. BMC Psychiatry 18.
Dalman, C., Wicks, S., 2006. Vilkagrupper sökervårdinompsykiatri? Stockholm.
Statistics Sweden, 2011. Background facts, Labour and Education Statistics 2011: 4 - Integrated database for Labour Market Research. Stockholm.
Shaffer, D., Gould, M.S., Brasic, J., et al., 1983. A Childrens Global Assessment Scale (Cgas). Arch. Gen. Psychiatry 40 (11), 1228–1231.
Beardslee, W.R., Keller, M.B., Lavori, P.W., Staley, J., Sacks, N., 1993. The impact of parental affective disorder on depression in offspring: a longitudinal follow-up in a nonreferred sample. J. Am. Acad. Child Adolesc. Psychiatry 32 (4), 723–730.
Wang, J.L., Schmitz, N., Dewa, C.S., 2010. Socioeconomic status and the risk of major depression: the Canadian National Population Health Survey. J. Epidemiol. Community Health 64 (5), 447–452.
Masi, G., Favilla, L., Mucci, M., Millepiedi, S., 2000. Depressive comorbidity in children and adolescents with generalized anxiety disorder. Child Psychiatry Hum. Dev. 30 (3), 205–215.
Hannigan, L.J., McAdams, T.A., Eley, T.C., 2017. Developmental change in the association between adolescent depressive symptoms and the home environment: results from a longitudinal, genetically informative investigation. J. Child Psychol. Psychiatry 58 (7), 787–797.
Kwong, A.S.F., Lopez-Lopez, J.A., Hammerton, G., et al., 2019. Genetic and environmental risk factors associated with trajectories of depression symptoms from adolescence to young adulthood. JAMA Netw. Open 2 (6), e196587.
Doblyte, S., Jimenez-Mejias, E., 2017. Understanding help-seeking behavior in depression: a qualitative synthesis of patients' experiences. Qual. Health Res. 27 (1), 100–113.
von dem Knesebeck, O., Mnich, E., Daubmann, A., et al., 2013. Socioeconomic status and beliefs about depression, schizophrenia and eating disorders. Soc. Psychiatry Psychiatr. Epidemiol. 48 (5), 775–782.
Holman, D., 2015. Exploring the relationship between social class, mental illness stigma and mental health literacy using British national survey data. Health (London, England: 1997) 19 (4), 413–429.
Jansen, T., Rademakers, J., Waverijn, G., Verheij, R., Osborne, R., Heijmans, M., 2018. The role of health literacy in explaining the association between educational attainment and the use of out-of-hours primary care services in chronically ill people: a survey study. BMC Health Serv. Res. 18 (1), 394.
Leighton, S, 2010. Using a vignette-based questionnaire to explore adolescents' understanding of mental health issues. Clin. Child Psychol. Psychiatry 15 (2), 231–250.
Hollander, A.C, 2013. Social inequalities in mental health and mortality among refugees and other immigrants to Sweden - epidemiological studies of register data. Glob. Health Action 6, 1–11.

Stockholm County Council, Riktlinjer till stöd för bedömning och behandling, 2015. Stockholm: Barn- och ungdomspsykiatri. Stockholms läns landsting (Stockholm County Council).
Storksen, I., Roysamb, E., Moum, T., Tambs, K., 2005. Adolescents with a childhood experience of parental divorce: a longitudinal study of mental health and adjustment. J. Adolesc. 28 (6), 725–739.
Butler, A.M., Kowalkowski, M., Jones, H.A., Raphael, J.L., 2012. The relationship of reported neighborhood conditions with child mental health. Acad. Pediatr. 12 (6), 523–531.
Sundquist, J., Li, X., Ohlsson, H., et al., 2015. Familial and neighborhood effects on psychiatric disorders in childhood and adolescence. J. Psychiatr. Res. 66-67, 7–15.
Eisman, A.B., Stoddard, S.A., Heinze, J., Caldwell, C.H., Zimmerman, M.A., 2015. Depressive symptoms, social support, and violence exposure among urban youth: a longitudinal study of resilience. Dev. Psychol. 51 (9), 1307–1316.
Gauffin, K., Hemmingsson, T., Hjern, A., 2013. The effect of childhood socioeconomic position on alcohol-related disorders later in life: a Swedish national cohort study. J. Epidemiol. Community Health 67 (11), 932–938.
Khallad, Y., Jabr, F., 2016. Effects of perceived social support and family demands on college students' mental well-being: a cross-cultural investigation. Int. J. Psychol. 51 (5), 348–355.
Ochi, M., Fujiwara, T., Mizuki, R., Kawakami, N., Grp, WMHJS., 2014. Association of socioeconomic status in childhood with major depression and generalized anxiety disorder: results from the World Mental Health Japan survey 2002-2006. BMC Public Health 14.
Aslund, C., Nilsson, K.W., Starrin, B., Sjoberg, R.L., 2007. Shaming experiences and the association between adolescent depression and psychosocial risk factors. Eur. Child Adolesc. Psychiatry 16 (5), 298–304.
Twenge, J.M., Nolen-Hoeksema, S., 2002. Age, gender, race, socioeconomic status, and birth cohort differences on the children's depression inventory: a meta-analysis. J. Abnorm. Psychol. 111 (4), 578–588.
Modin, B., Ostberg, V., Almquist, Y., 2011. Childhood peer status and adult susceptibility to anxiety and depression. A 30-year hospital follow-up. J. Abnorm. Child Psychol. 39 (2), 187–199.
Dohrenwend, B.P., Levav, I., Shrout, P.E., et al., 1992. Socioeconomic-Status and Psychiatric-Disorders - the Causation-Selection Issue. Science 255 (5047), 946–952.
Olino, T.M., Klein, D.N., Lewinsohn, P.M., Rohde, P., Seeley, J.R., 2008. Longitudinal associations between depressive and anxiety disorders: a comparison of two trait models. Psychol. Med. 38 (3), 353–363.
Berkman, L.F., Kawachi, I., Glymour, M.M, 2014. Social Epidemiology. Oxford University Press, Oxford.
Statistics Sweden: SUN. Swedish standard for classification of individual educational programs 2000.
National Board of Health and Welfare. *Barn- och ungdomspsykiatrins metoder - en nationell inventering. (Methods in child and adolescent psychiatry - a national inventory).*2009.
Wasserman, D., 2010. Depression-en vanlig sjukdom. Natur och Kultur.
Todd, J., Green, G., Harrison, M., et al., 2004. Social exclusion in clients with comorbid mental health and substance misuse problems. Soc. Psychiatry Psychiatr. Epidemiol. 39 (7), 581–587.
Dagher, R.K., Green, K.M., 2015. Does depression and substance abuse co-morbidity affect socioeconomic status? Evidence from a prospective study of urban African Americans. Psychiatry Res. 225 (1–2), 115–121.