

# Risk and protective factors for psychological distress among adolescents: a family study in the Nord-Trøndelag Health Study

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## Abstract

**Purpose** The study aimed to investigate potential adolescent and parental psychosocial risk and protective factors for psychological distress among adolescents and, in addition, to examine potential gender and age differences in the effects of risk factors on adolescent psychological distress.

**Methods** Data were collected among 8,984 Norwegian adolescents (13–19 years) and their parents in the Nord-Trøndelag Health Study (HUNT). The outcome measure was psychological distress (SCL-5).

**Results** Bivariate regression analysis with generalized estimating equation (GEE) model showed that all parental self-reported variables (mental distress, substance use, social network, economic problems, unemployment and family structure) and adolescents' self-reported variables (leisure activities, social support from friends, school-related problems and substance use) were significantly associated with psychological distress among adolescents. Results revealed that in a multiple regression analysis with a GEE model, adolescent psychosocial variables, specifically academic-related problems and being bullied at school, emerged as the strongest predictors of psychological distress among adolescents after controlling for age, gender,

and all parental and adolescent variables. The following psychosocial risk factors were significantly more important for girl's psychological distress compared to boys: problems with academic achievement, conduct problems in school, frequency of being drunk, smoking, dissatisfaction in school, living alone and seen parents being drunk.

**Conclusion** Academic achievement and being bullied at school were the psychosocial factors most strongly associated with psychological distress among adolescents. Parental factors had an indirect effect on adolescent psychological distress, through adolescents' psychosocial factors.

**Keywords** Adolescence · Psychological distress · Psychosocial factors · Risk factors · School problems

## Introduction

In industrialized countries, depression and anxiety are the most common mental health problems among adolescents. Studies of self-reported depressive symptoms have shown that between 20 and 50% of adolescents report depressive symptoms [26, 37], and studies of Norwegian adolescents have shown that between 15 and 20% have reported depressive symptoms [54]. Co-occurrence of symptoms of depression and anxiety is found regularly and suggests a common vulnerability [1, 27].

Symptoms of depression and anxiety in adolescence result from a complex interplay of multiple biological, social and psychological vulnerability risk factors. Influences from childhood events, psychosocial factors and genetic vulnerability are commonly assumed to be important causal factors [24, 25].

Previous studies found that important psychosocial risk factors for psychological distress among adolescents are

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related to the social arenas of friends, school and leisure activity [6, 21, 23, 57]. Factors within the school arena that are associated with psychological distress among adolescents include social support and network [36, 57], poor school functioning and low commitment to school [3, 55], and poor academic achievement and performance [15, 36].

Structured leisure activities are found to be beneficial to adolescent mental health because it usually offers the presence of supportive adults, peers and clear activity goals [29]. In contrast, the negative relationship between unstructured activities and psychological well-being is suggested to relate to lack of challenge and required skill [43], and fewer settings for parental monitoring that can allow for risk-taking behavior such as abuse of substances [51]. Leisure activities are like school and friends, related to social support, which may play a critical role in people's ability to cope with stress [8, 10]. Prior studies have shown that social support related to family, friends and school was the most important protective factor of adolescent psychological distress [21, 57].

Furthermore, depressive symptoms in adolescence also appear to be associated with the use of substances, including alcohol use and smoking [22, 31]. In one study, it was found that alcohol use was an independent predictor of depressive symptoms among females, but not among males [38]. Depression and anxiety-related symptoms and disorders have been found in many studies to be more common among girls after puberty, and by late adolescence the female to male ratio usually approaches 2:1 [9, 18]. Reasons suggested for the gender difference are that girls are exposed to more risk factors, such as early pubertal timing [2], and have a greater vulnerability to surrounding and interpersonal stress compared to boys [10, 47]. In this study, we further investigate which psychosocial risk and protective factors are more important for girls' psychological distress, compared to boys', and vice versa.

Mental health problems among parents are a strong predictor of symptoms of depression and anxiety among adolescents [7, 30], partly due to a genetic disposition [39, 46]. In addition, other parental factors, such as low socioeconomic status, poor parental social network, parents' substance use/abuse and parental divorce have been found to constitute risk factors for psychological distress among adolescents [4, 40, 45].

An advantage of the present study is that it is based on self-report data from both parents and adolescents in a large sample. Few studies have investigated the influence of adolescent psychosocial risk and protective factors on adolescent psychological distress, controlling for parents' self-report data related to economic problems,

unemployment, mental distress, poor social network, substance use/abuse and parental divorce. Likewise, few studies have investigated the influence of parents' self-report data on adolescent psychological distress, controlling for adolescent psychosocial factors.

#### Aims of the study

In this study, we will address the following research questions:

- (1) Which parental and adolescent risk and protective factors emerge from multivariate analysis as important in predicting adolescent psychological distress?
- (2) Do the adolescents' psychosocial variables operate as a mediator between parental variables and adolescents' psychological distress?
- (3) Are there gender differences in the effects of risk and protective factors on adolescent psychological distress? Which parental and adolescent risk and protective factors are most important for girls compared to boys, and vice versa?
- (4) Which age differences exist between older (16–19 years) compared to younger adolescents (13–15 years) on parental and adolescent risk and protective factors, and which of the risk and protective factors are most important for psychological distress for younger and older adolescents?

## Method

### Participants

The sample used in this paper was part of the Nord-Trøndelag Health Study (HUNT), a large population-based health study in Norway. The entire adolescent and adult population within the county of Nord-Trøndelag was invited to participate. Data from adolescents in the HUNT study (the Young-HUNT study) were collected in 1995–1997, with participants from the 8th to 13th grade (13–19 years). A total of 8,984 adolescents (88.1% of all invited), 4,519 boys and 4,465 girls, participated. Acquisition of the data was mainly organized through the local junior and senior high school. The data from the adolescents' parents were from the adult survey of HUNT in 1995–1997. All 94,194 inhabitants, older than 20 years, in the county of Nord-Trøndelag were invited, and 65,409 (69.4%) participated.

In this study, 80% of the invited mothers ( $n = 7,397$ , mean = 42.4 years and SD = 5.3) and 68% of the invited fathers ( $n = 6,228$ , mean = 45.4 and SD = 5.7) participated; 10% of the adolescents' families were divorced. The

adolescents in the divorced families mainly lived with one of their parents. Separated or divorced families were included in the study. Information about who was related to whom (parents, offspring and children) was obtained for the adult sample and the Young-HUNT sample, permitting registry and self-report data from the parents to be linked with data from the offspring participating in the Young-HUNT.

## Measures

### *Adolescent variables*

We first present measures from the data of the adolescents, the Young-HUNT study.

### *Psychological distress*

The outcome variable, SCL-5, is a five-item scale that is an abbreviation of the SCL-25, and is designed to measure symptoms of anxiety and depression. SCL-5 has been proven reliable and to correlate at 0.92 with the original instrument [50]. A comparison study of several instruments concluded that the reliability of this short version was acceptable [44]. Rather than trying to measure symptoms of anxiety and depression separately with the abbreviated instrument, we chose to treat the sum of the five items as a global measure of mental health, termed psychological distress. Answers were scored according to a scale ranging from (1) “not at all” to (4) “extremely”. The SCL-5 scale is scored as a sum of the item scores, ranging from 5 to 20. Sample items are “worried too much about things” and “felt sad and depressed”. A mean score index was measured of the SCL-5 scale and was subjected to logarithmic transformation to counteract skewness when the variable was used in the regression analysis. Cronbach’s  $\alpha = 0.79$ .

### *Age and gender*

Age was treated as a continuous variable (13–19 years). In the interaction terms, age was coded as a categorical variable: those from 13 to 15 years old were coded 0, and those from 16 to 19 years were coded 1. Gender was constructed as a dummy variable, with boys assigned the value 0 and girls the value 1.

### *Separation or divorce*

To measure parental separation or divorce, the following question was phrased: “Have your parents been separated or divorced, or have they ever moved apart from each other for more than 1 year?” “Yes” was scored 1, and “No” was scored 0.

### *Social support*

Social support from friends was measured by responses to the following questions: “Did you have a best friend through most of your childhood?” (“Yes” and “No”), “How many close friends do you have?” (“None,” “One,” “Two or three” and “Four or more,” scored 1–4), and “Do you feel that you have enough friends?” (“Yes” and “No”). The responses to the first and third items were reversed. A standardized mean score of the three items was calculated (Cronbach’s  $\alpha = 0.51$ ).

### *Leisure activities*

Leisure activities were measured by asking: “Think back to the previous week. If you did any of the ten activities on the list below, how often did you do it?” Answers were scored according to a scale ranging from (1) “None” to (4) “Four times or more”. The leisure activities were differentiated on the dimensions: social versus solitary, and structured versus unstructured [56]. A principal component analysis (PCA) was conducted with oblique rotation of the ten items loaded on three different factors: (1) structured activities: “I was joining a meeting in a club or in an organization or joining a training session in my sport club” and “number of memberships in organizations or clubs”; (2) unstructured and solitary activities: “I read an enjoyable book,” “I worked on my homework for more than an hour”, “I was occupied with a hobby” and “I watched TV”; (3) social activities: “I was hanging out with my friends for more than 2 h at a time”, “I visited someone I know” and “Somebody visited me”. The item “Listened to music” was removed because it loaded low on all three factors. A mean score index was calculated for each of the subscales. Cronbach’s  $\alpha = 0.65$ , 0.59 and 0.66, respectively, for the three factors.

### *School-related stress*

The adolescents were asked to consider 14 statements concerning school-related stress that were generated for the purpose of the HUNT study [49]. Evaluations of the statements were given on a 4-point scale ranging from “never” (1) to “very often” (4). The responses to the scales were reversed so a high score represents school-related stress. A PCA with oblique rotation of the 14 items was conducted. The item “being bullied at school” did not load highly on any of the factors and was therefore treated as a measure with one item. Based on eigenvalues and scree plots three factors were extracted: (1) problems related to concentration and academic achievement; examples of items: “I have difficulties with

concentrating”, “I am not satisfied with results from tests” and “I do not understand the teaching in class”; (2) conduct problems; examples of items: “I quarrel with teacher” and “I have problems being quiet in class”; (3) dissatisfaction in school; examples of items: “I am not looking forward to participating in school” and “I do not have fun during school breaks”. A mean score index was calculated for each of the three subscales. Cronbach’s alpha was 0.67, 0.64 and 0.57, respectively, for the three factors.

#### *Alcohol use*

The adolescents answered the question: “Have you seen your parents being drunk?” Response categories were (1) “Never”, (2) “A few times”, (3) “A few times a year”, (4) “Several times in a month” and (5) “Several times a week”. The variable was used as a continuous variable. Alcohol use among the adolescents was measured by the following question: “Have you ever drunk so much alcohol that you have been drunk?” Response categories ranged from (1) “No, never” to (5) “Yes, more than 10 times”.

#### *Smoking*

We constructed a dummy variable where smoking daily or smoking occasionally were coded as smokers and scored 1, and reporting never having smoked or having smoked earlier but not anymore were coded as non-smokers and scored 0.

#### *Parents’ measures*

In addition to data from the adolescents in the Young-HUNT study, we also used data from their parents, from the adult HUNT study. The measures used in the current study were the same for men and women.

#### *Mother’s and father’s psychological distress*

Psychological distress among the mothers and fathers were measured by CONOR Mental Health Index [48], partly modified from the General Health Questionnaire-GHQ [17] and the Hopkins Symptom Check List (HSCL) [12]. Examples of questions were: Have you, in the course of the last 2 weeks felt: “Troubled by anxiety?” and “Sad/depressed?” The response categories were (1) “No”, (2) “A little”, (3) “Quite a bit” and (4) “Very”. The scaling of the first two items was reversed so a high score represented a high degree of psychological distress. Cronbach’s  $\alpha = 0.85$ , and 0.84, respectively, for mother’s and father’s psychological distress.

#### *Alcohol consumption*

Alcohol consumption was measured according to responses to the following two questions: “How many times per month do you usually drink alcohol?” and “How many glasses of beer, wine or liquor (specified in size to correspond to alcohol units = 35 cl beer) do you usually drink during two regular weeks?” These two items were standardized before being summed together to represent the measure “frequency of alcohol consumption.” The measure was used with a cutoff value of 20 for mothers (have been drinking 20 glasses of alcohol or more) and a cutoff value of 25 for fathers (have been drinking 25 glasses of alcohol or more). In addition, those responding that they abstained entirely (by answering “yes” to the question: “Do you not drink alcohol at all?”) were added to the category “0” in the alcohol consumption measure.

#### *Alcohol abuse*

Alcohol abuse was measured using CAGE (craving, annoyance, guilt and eye-opener) [14], which contains four questions, examples: Have you ever felt guilty because of your alcohol consumption? Do you sometimes take a drink first thing in the morning because of a hangover? Response scales were (1) “Yes” and (0) “No”. The person was defined as abusing alcohol if he answered positively to two or more questions. Those who answered that they were total abstainers were added in the category (0) “No”. The measures CAGE and alcohol consumption, were standardized and summed to one index, “Alcohol use in mother” (Cronbach’s  $\alpha = 0.70$ ). The same procedure was performed for the father (Cronbach’s  $\alpha = 0.70$ ).

#### *Parents’ social network*

The mothers’ and fathers’ social relationships were measured by responses to the following three questions: “How many close friends do you have?”, “Do you feel that you have enough friends?” The response categories were: (1) “Yes” and (2) “No”, and finally for the third question: “How often do you participate in an organized committee or club?”, the response categories ranged from: (1) “Never, or a few times a year” to (4) “More than one times a week”. The responses were reversed, so that a high score represents a high level of social relationships. The measures of mothers’ and fathers’ social relationships were standardized and summed. Cronbach’s  $\alpha = 0.55$ .

The mothers’ and fathers’ neighborhood support was measured by responses to 12 items, an example of a question was: “I feel a high degree of togetherness with those living here.” Response scales ranged from “Strongly agree” (1) to “Strongly disagree” (5). The 12-item scores

from each of the parents were added to one index, and the responses were reversed so a high score represented a high level of neighborhood support. Cronbach's  $\alpha = 0.89$ . Parents' neighborhood support and parents' social relationships were then standardized and summed to form the index "parents' social network". Cronbach's  $\alpha = 0.79$ .

### *Socioeconomic variables*

Education was measured by responses to the question: "What is the highest level of education you have attained?" Response categories were: (1) nine-year secondary school, (2) 1–2 years of high school, (3) technical high school, (4) regional technical college, 4-year university degree, (5) university, technical college, more than 4 years. The responses to the scales were reversed, so a high score represented a low level of education. Unemployment was measured by constructing a dummy variable. If mother or father was unemployed, retirement pensioner or on a national insurance program, they were coded 1. If mother or father was in paid work, self-employed tradesman, under education, in military service or staying at home/housewife, they were coded 0. Economic problems were measured by the question: "During the last year, has your household experienced problems covering the daily expenses?" Response categories varied from: (1) "Yes, it happens quite frequently" to (4) "No, never". The variable was dichotomized with the categories "difficulties last year" and "never or very rarely problems".

### Statistical methods

Generalized estimating equation (GEE) [28] was utilized for the further analysis. GEE is an extension of the standard array of generalized linear models (GLMs) [32] that represent a unified class of regression methods for discrete and continuous outcomes. GLM is inadequate when the data are grouped so that observations within the same group are expected to be correlated. The GEE methodology provides a method of analyzing correlated data that takes into account the within-group correlation. Within-group correlation can arise when measurements cluster, such as when subjects share a common characteristic, for example belonging to the same family. We used GEE to control for correlation among siblings in the data. A potential correlation among siblings might influence the standard error of our estimates [19].

Outcome and independent continuous variables were standardized before we performed the GEE regression analyses. Since the dependent variable is also standardized, the non-standardized and standardized regression coefficients become identical, and for all but the categorical variables, only standardized coefficients will be reported.

We also controlled for multicollinearity among the independent variables in the analysis of the GEE model. Possible interaction effects of gender and age on adolescents' mental health problems were tested by multiplying gender and age with all the other independent variables, and including each interaction term separately in the final step of the GEE regression analysis.

### *Missing*

Few of the data from the participating adolescents were missing on scale level. Among the 8,984 participating adolescents, 3.6% was missing on the outcome variable (SCL-5). Among the independent adolescent variables, i.e., social support, school-related stress, leisure activity, substance use, parental separation or divorce and living alone, 1.4–4.7% of the data were missing per scale. The number of mothers who responded to any one of the seven different items on the mental health problems scale ranged from 6,905 to 6,975. As a result, each item on this scale had between 4.0 and 5.4% of values missing. The number of fathers who responded to any one of the seven items of the mental health problems scale ranged from 5,841 to 5,916. Thus, each item on this scale had between 4.6 and 5.8% of values missing. If more than three items (out of seven) were missing from the maternal and paternal mental health problem scale, the variable was excluded. We used the EM (expectation–maximization) imputation method for all the continuous independent variables in the study [11].

### Ethical considerations

The HUNT and Young-HUNT Studies are approved by The Data Inspectorate of Norway and by the Regional Committee for Medical Research Ethics, and all information from HUNT and Young-HUNT are treated according to the guidelines of the Data Inspectorate of Norway. The study has therefore been performed in accordance with ethical standards laid down in the 1964 Declaration of Helsinki. All the participants gave their written consent. In cases where participants were younger than 16 years of age, the parents also gave their written consent. When the data files are prepared for research purposes, all names and personal ID numbers are removed.

## Results

### Descriptive statistics

Results from descriptive statistics of categorical variables show that 11% of the parents reported that their household had economic problems sometimes or frequently during the



previous year. Furthermore, 8.4% of mothers or fathers of the adolescents reported that they were either unemployed or retired or on a national insurance program, and 10.1% reported parental separation or divorce (see Table 1). Furthermore, 5.9% of the adolescents reported that they were living alone, and 18.1% reported that they smoked daily or occasionally. Range, mean and standard deviations of the continuous variables are reported in Table 1.

#### Correlations between all variables in the study

The largest correlations (see Table 2) were found between the following variables: adolescent frequencies of being drunk and age ( $r = 0.66$ ); mother's alcohol use and father's alcohol use ( $r = 0.53$ ); and dissatisfaction in school and academic achievement ( $r = 0.44$ ).

#### Variables associated with psychological distress among adolescents

The first phase of the generalized estimating equation model (GEE) shows the bivariate associations between

psychological distress among adolescents, and all the independent variables. The results showed that all but two parental and adolescent variables were significantly associated with psychological distress among adolescents (see Table 3, column 1). Parental education and solitary/unstructured leisure activities were not significantly associated with adolescent psychological distress and are therefore not reported in Table 3. In the second phase of the multiple regression analysis with GEE, we entered age, gender and all parental variables. Variables significantly associated with adolescent psychological distress were: gender, age, parents' social network, mother's psychological distress, father's psychological distress, parental separation or divorce, adolescents living alone and having seen their parents drunk (see column 2). Age, gender and parental variables explained 10% of the variance of adolescent psychological distress (see column 3).

In the third phase of the analysis, we included age, gender and all adolescent variables. The variables that showed the strongest associations with psychological distress were problems with concentration and academic achievement, and being bullied at school (see column 4).

**Table 1** Descriptive statistics of the categorical and continuous variables in the study ( $n = 4,526$ )

Variables in the study	Frequency	Range	<i>M</i>	SD
<b>Categorical</b>				
Economic problems	522 (11%)			
Unemployment/retired/national insurance	382 (8.4%)			
Parental separation or divorce	459 (10.1%)			
Living alone	267 (5.9%)			
Smoking	817 (18.1%)			
Gender: girls	2,304 (50.2%)			
<b>Continuous</b>				
Adolescent psychological distress		1–4	1.77	0.34
Age		12–20	16.0	1.78
Mother's psychological distress		7–28	10.5	2.96
Father's psychological distress		7–28	10.3	2.79
Mother's alcohol use frequency		0–20	2.41	3.21
Father's alcohol use frequency		0–25	4.72	4.96
Mother's alcohol use CAGE		0–4	0.13	0.47
Father's alcohol use CAGE		0–4	0.45	0.87
Experienced parental drunkenness		1–5	1.9	0.91
Parental social network		4–111	22.4	9.8
Neighborhood support		35–120	88.0	13.6
Social network of friends		3–8	7.3	0.92
Structured leisure activity		2–7	4.2	1.56
Unstructured leisure activity		2–8	7.0	1.17
Social leisure activity—being with friends		3–12	8.4	2.13
Academic achievement		5–19	9.4	2.08
Dissatisfaction in school		3–12	7.2	1.63
Conduct problems		4–16	5.8	1.59
Frequencies of drunkenness		1–5	2.7	1.73

Alcohol use and parental social network before standardizing and summing these measures

**Table 2** Correlations of all the variables in the study

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. Adolescent psych.distress	-																				
2. Economic problems	0.07**	-																			
3. Unemployment	0.05**	0.19**	-																		
4. Separation or divorce	0.10**	0.18**	0.07**	-																	
5. Living alone	0.08**	0.04*	0.03*	0.03*	-																
6. Smoking	0.19**	0.06**	0.05**	0.11**	0.09**	-															
7. Gender	0.24**	-0.001	0.000	0.02*	-0.01	0.05**	-														
8. Age	0.16**	-0.003	0.02	0.01	0.27**	0.22**	-0.01	-													
9. Parental drunkenness	0.11**	0.09**	0.04*	0.12**	0.08**	0.18**	-0.03*	0.20**	-												
10. Parental social network	-0.08**	-0.16**	-0.11**	-0.14**	0.01	-0.05**	0.01	0.01	-0.02	-											
11. Mother's mental distress	0.09**	0.21**	0.15**	0.13**	0.01	0.05**	-0.01	-0.02*	0.06**	-0.26**	-										
12. Father's mental distress	0.08**	0.15**	0.11**	0.08**	0.01	0.04*	-0.01	-0.01	0.04**	-0.21**	0.14**	-									
13. Mother's alcohol use	0.02*	-0.05**	-0.06**	0.04*	-0.03*	0.05**	-0.01	0.01	0.20**	0.01	0.02	-0.02	-								
14. Father's alcohol use	0.04*	-0.02	-0.04**	0.10**	-0.03*	0.05**	-0.003	0.004	0.26**	0.00	0.004	0.04**	0.53**	-							
15. Social support of friends	-0.12**	-0.03*	-0.05**	-0.02	-0.01	-0.01	0.01	-0.01	0.02	0.05**	-0.04**	-0.03*	0.02	0.03*	-						
16. Structured leisure activity	0.04**	-0.02	-0.03*	0.02	-0.01	0.05**	0.08**	0.07**	0.06**	0.01	-0.01	-0.03*	0.04**	0.04**	0.01	-					
17. Social leisure activity	-0.07**	0.02	-0.001	0.06**	0.02	0.16**	-0.06**	0.01	0.10**	0.02	0.003	-0.01	0.08**	0.10**	0.13**	0.10**	-				
18. Academic achievement	0.40**	0.11**	0.07**	0.15**	0.11**	0.31**	0.03**	0.24**	0.20**	-0.10**	0.08**	0.08**	0.04**	0.04**	-0.07**	0.03**	0.06**	-			
19. Conduct problems	0.13**	0.05**	-0.002	0.09**	0.004	0.20**	-0.13**	-0.08**	0.15**	-0.03**	0.03**	0.05**	0.06**	0.06**	0.01	0.04**	0.17**	0.40**	-		
20. Dissatisfaction in school	0.21**	0.07**	0.04**	0.08**	0.01	0.15**	0.01	0.02	0.09**	-0.08**	0.06**	0.07**	-0.001	0.004	-0.10**	-0.03*	-0.09*	0.44**	0.12**	-	
21. Frequencies of drunkenness	0.18**	0.04**	0.04*	0.11**	0.20**	0.42**	-0.01	0.66**	0.35**	-0.01	0.02	0.02	0.10**	0.11**	0.04**	0.11**	0.20**	0.36**	0.15**	0.10**	-

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

**Table 3** Generalized estimating equations (GEE) analysis: variables predicting psychological distress (SCL-5) among adolescents ( $n = 4,526$ )

	Bivariate correlations	Model 1	Adj. $R^2$	Model 2	Model 3	(95% CI)	$b$	Adj. $R^2$
	$\beta$	$\beta$		$\beta$	$\beta$			
Gender	0.23***	0.23***		0.24***	0.23***	(0.21–0.26)	0.48***	
Age	0.15***	0.13***		0.07***	0.07**	(0.03–0.10)	0.02**	
Parental variables								
Economic problems	0.07***	0.02			–0.01	(–0.04 to 0.03)	–0.02	
Unemployment mother/father	0.05***	0.01			–0.01	(–0.04 to 0.02)	–0.03	
Parents' social network	–0.08***	–0.06***			–0.03*	(–0.05 to –0.003)		
Mother's psychological distress	0.09***	0.04**			0.03*	(0.003–0.06)		
Father's psychological distress	0.08***	0.05**			0.04**	(0.01–0.06)		
Alcohol use of mother	0.03*	0.02			0.03	(–0.003 to 0.06)		
Alcohol use of father	0.04**	0.01			0.02	(–0.02 to 0.04)		
Parental separation or divorce	0.10***	0.05*			0.02	(–0.02 to 0.05)	0.05	
Living alone	0.08***	0.04**			0.03*	(0.001–0.06)	0.10*	
Experienced parents being drunk	0.10***	0.05**			0.01	(–0.03 to 0.03)		
			0.10***					
Adolescent variables								
Social support from friends	–0.20***			–0.08***	–0.06***	(–0.09 to –0.04)		
Structured leisure activities	–0.11***			0.02	0.01	(–0.01 to 0.04)		
Social leisure activities: being with friends	–0.07***			–0.07***	–0.07***	(–0.09 to –0.04)		
Problems with academic achievement	0.40***			0.31***	0.27***	(0.23 to 0.30)		
Dissatisfaction in school	0.15***			0.03**	0.04*	(0.01 to 0.07)		
Conduct problems in school	0.13***			0.02	0.02	(–0.01 to 0.06)		
Bullied in school	0.17***			0.14***	0.13***	(0.10 to 0.17)		
Frequency of being drunk	0.18***			0.02	0.02	(–0.02 to 0.06)		
Smoking	0.19***			0.06***	0.05**	(0.01 to 0.08)	0.12**	
								0.23***

Model 1 adjusted for gender, age and parental variables, Model 2 adjusted for all adolescent variables, and Model 3 adjusted for all independent variables. Mother's and father's education and solitary/unstructured leisure activities were included in the regression analysis of the GEE model, but did not give a significant result and was therefore not reported in the table. Because the dependent and the independent variables are standardized in the GEE analysis, the non-standardized and the standardized regression coefficients of the continuous variables become identical, and therefore the estimates of the non-standardized regression coefficients,  $b$ , are only reported for the categorical variables in the table

\*\*\*  $p < 0.001$ , \*\*  $p < 0.01$  and \*  $p < 0.05$

In the fourth phase of the regression analysis, we included all the independent variables. The results showed that parents' social network, psychological distress among mother and father, and the adolescent living alone were the only parental variables significantly associated with adolescent psychological distress (see column 5). School problems related to concentration and academic achievement, and being bullied at school showed the strongest associations with psychological distress among adolescents. Furthermore, being with friends during leisure time and social support from friends showed the strongest negative association with psychological distress among adolescents. The next column in Table 3 shows the confidence intervals of the betas of the final model (see column 6). Since the dependent variable is also standardized in the

GEE analysis, the non-standardized and the standardized regression coefficients of the continuous variables become identical, and therefore the estimates of the non-standardized regression coefficients,  $b$ , are only reported for the categorical variables and age (see column 7). The last column shows that the final model, including all variables, explained 23% of the variance.

#### Interaction effects

Gender-specific effects were tested as interaction effects between gender and the other independent variables. The following variables had a significant stronger effect on girls' psychological distress compared to boys': age, living alone, father alcohol use/abuse, having seen parents being



drunk, problems related to concentration and academic achievement in school, conduct problems in school, dissatisfaction in school, being with friends during leisure time, smoking daily and high frequency of being drunk (see Table 4). Structured leisure activities such as joining an athletic club were significantly more important for boys' psychological distress compared to girls'. Furthermore, tests of interaction effects between age and the other independent variables showed that economic problems in the family had a significantly stronger effect among older adolescents (16–19 years), compared to the younger adolescents (13–15 years). There was a significantly stronger association between unstructured and solitary leisure activities such as watching television/video, and psychological distress in the youngest age group, compared to the oldest age group. Likewise, being with friends in the leisure time was a significantly stronger protective factor among the youngest age group.

## Discussion

The main findings indicate a strong and consistent association between psychological distress among adolescents and the psychosocial variables academic achievement in school and being bullied at school, which remain strong predictors after adjusting for potentially confounding variables. These results confirm earlier studies, which found that adolescent mental health was associated with academic achievement [15, 36] and mastery of academic tasks [42]. However, few studies have looked at this association and controlled for the self-reported information from parents regarding mental health and psychosocial factors.

Another strong predictor of adolescent psychological distress was being bullied at school. A number of earlier studies have found that this predictor is important for psychological distress among youth [e.g., 34]. In addition, we found that social support from friends and spending time with friends during leisure time were the strongest protective factors for psychological distress among adolescents. These findings are consistent with previous studies, in which friend and peer support was shown to protect against psychological distress among adolescents [21, 23, 57].

The parental variables had a significant direct effect on adolescent psychological distress before adjusting for the adolescent psychosocial variables. The marked reduction of the effects of parental variables—such as parents' social network, mental distress, separation or divorce, and alcohol abuse—after adjusting for adolescent-reported variables indicates that the adolescent psychosocial variables to

**Table 4** Testing interaction effects of gender and age on adolescents' psychological distress ( $n = 4,526$ )

Interaction terms	$\beta$	$p$
<b>Gender*</b>		
Age	0.05*	0.01
Economic problems	0.02	0.62
Unemployment of mother/father	-0.06	0.11
Parents' social network	-0.02	0.36
Mother's psychological distress	0.04	0.18
Father's psychological distress	0.05	0.06
Mother's alcohol use	0.004	0.89
Father's alcohol use	0.03*	0.04
Parental separation or divorce	0.02	0.63
Living alone	0.09*	0.03
Having seen parents being drunk	0.07*	0.01
Social support from friends	0.03	0.36
Structured leisure activities	-0.10***	0.000
Social leisure activities: being with friends	0.07*	0.02
Unstructured and solitary leisure activities	0.06	0.06
Problems with academic achievement	0.11***	0.000
Conduct problems in school	0.11***	0.000
Dissatisfaction in school	0.09**	0.003
Bullied in school	0.02	0.55
Frequency of being drunk	0.12***	0.000
Smoking	0.09***	0.001
<b>Age*</b>		
Economic problems	0.08**	0.01
Unemployment of mother/father	0.04	0.31
Parental social network	-0.01	0.56
Mother's psychological distress	0.01	0.61
Father's psychological distress	0.002	0.92
Mother's alcohol use	0.02	0.41
Father's alcohol use	-0.02	0.12
Parental separation or divorce	-0.06	0.09
Having seen parents being drunk	0.06	0.54
Social network of friends	-0.01	0.74
Structured leisure activities	-0.04	0.17
Social leisure activities: being with friends	-0.08**	0.004
Unstructured and solitary leisure activities	-0.09**	0.003
Problems with academic achievement	0.02	0.62
Conduct problems in school	-0.03	0.35
Dissatisfaction in school	0.04	0.16
Bullied in school	-0.02	0.45
Frequency of getting drunk	0.001	0.98
Smoking	-0.04	0.13

Age was categorized in the following two groups: 13–16 years, coded 0, and 16–19 years, coded 1. Interaction effects were tested by multiplying gender and age with all the other independent variables and including each interaction term separately in the final step of the multiple regression analysis, using a generalized estimating equations (GEE) model. The interaction term, Age\* living alone, was excluded from the analysis because there was too few cases (less than 10) in the youngest age group.

\*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$

some degree mediates the parental effects. Similar findings have been found in studies investigating the effect of the parent–child relationship on adolescent depression. Adolescent psychosocial variables mediated the effect of parental care and control on adolescent depression [e.g., 5].

#### Gender differences

A number of psychosocial risk factors were significantly more important for girls' psychological distress compared to boys. These factors included living alone, father's alcohol use/abuse, having seen their parents being drunk, academic achievement in school, conduct problems in school, dissatisfaction in school, being with friends during leisure time, smoking daily and high frequency of getting drunk. Structured leisure activity, however, was the only predictor that was more important for psychological distress among boys compared to girls. These results are consistent with earlier studies, which found that young females have a greater susceptibility to interpersonal and surrounding stress compared to young males [41, 47].

#### Limitations of the study

The present study has several limitations. First, our data are cross-sectional, which do not allow for causal interpretations to be drawn. For example the causal relationship between problems with academic achievement in school and psychological distress is not clear; it could be that psychological distress in adolescents causes academic-related problems or it could be the other way around. However, it is possible in a cross-sectional design to assume a causal relationship, based on the nature of some of the variables. For example, it might be more likely that parental variables precede adolescent psychosocial variables, rather than the other way around. Second, the measure of the outcome variable, symptoms of depression and anxiety, is rather crude and contains few items. However, the measure has proven to be reliable in earlier studies [44, 50]. Likewise, the measure on alcohol is brief, but the face validity is good and the measure has been used successfully in earlier studies [33]. Another limitation might be that the measures of the study are based on self-report, which may be biased because people have a tendency to give socially desirable answers [16]. Measures based on self-report may also be biased by changed appraisal of exposure in people suffering from depression or anxiety. In addition, some of the measures in this study are particularly subjective, and thus at extra risk of being affected by the mental state of the adolescents. Such a bias may have produced spurious correlations between the predictors and the outcome variable,

implying somewhat inflated effect estimates. The effects of the predictors reported by the parents, however, do not suffer from such a bias. In addition, studies have shown that measurements by self-report usually are reliable [13]. Finally, a limitation may be that measures of the quality of parent–adolescent relationship are not included in the study. For example, previous studies found that parental support was a protective factor for adolescent psychological distress [5, 20, 57]. In addition, some studies found that parental support affected psychological distress through friend support [5, 20].

#### Advantages

An important advantage of this study is that few earlier studies have been based on self-report data from both parents and children in large samples. This gives us an opportunity to provide a better understanding of the impact of parental factors on psychological distress among adolescents.

#### Practical implications

Findings from the present study indicate that practical implications could be implementing effective school-based interventions that are aimed at preventing bullying at school. Programs working with social skills and the social environment at school have been found to be effective in reducing bullying at school [35, 52]. Likewise, school-based programs emphasizing coping strategies related to mastering academic achievement could be effective for improving psychological well-being among adolescents [53]. Furthermore, we found gender differences in our results indicating that boys and girls might need different kinds of interventions.

#### Conclusion

Friendship, academic achievement and being bullied at school were factors strongly associated with psychological distress among adolescents. In addition, parental factors seem to have an indirect effect on adolescent psychological distress, through adolescents' psychosocial factors. Thus, the adolescent psychosocial factors appear to operate as mediators between the parental factors and adolescent psychological distress.

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**Conflict of interest** The authors declare that they have no conflict of interest.

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