

# BMJ Open Future marginalisation and mortality in young Swedish men with non-psychotic psychiatric disorders and the resilience effect of cognitive ability: a prospective, population-based study

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## ABSTRACT

**Objective:** Large-scale studies examining future trajectories of marginalisation and health in adolescents with mental illness are scarce. The aim of this study was to examine if non-psychotic psychiatric disorders (NPDs) were associated with future indicators of marginalisation and mortality. We also aimed to determine whether these associations might be mediated by education level and attenuated by high cognitive ability.

**Design:** This is a prospective cohort study with baseline data from the Swedish Conscription register.

**Setting:** The study was carried out in Sweden from 1969 to 2005.

**Participants:** All of the participants were 18-year-old men at mandatory conscription in Sweden between 1969 and 2005 (n=1 609 690).

**Measures:** NPDs were clinically diagnosed at conscription. Cognitive ability was measured by a standardised IQ test at conscription. National register data covered information on welfare support, long-term unemployment, disability pension (DP) and mortality over a period of 1–36 years.

**Results:** NPD at the age of 18 years was a predictor of future welfare support, OR 3.73 (95% CI 3.65 to 3.80); long-term unemployment, OR 1.97 (95% CI 1.94 to 2.01); DP, HR 2.95 (95% CI 2.89 to 3.02); and mortality, HR 2.45 (2.33–2.52). The adjusted models suggested that these associations were not confounded by fathers' educational level, cognitive ability had only a minor attenuating effect on most associations and the mediating effect of own educational level was small.

**Conclusions:** The present study underlines a higher prevalence of future adversities in young men experiencing NPDs at the age of 18 years. It also indicates that higher cognitive ability may work as a potential resilience factor against future marginalisation and mortality.

## INTRODUCTION

Depressive disorders are identified as a leading cause in the global burden of

## Strengths and limitations of this study

- This study is based on a nearly total population sample of young men in Sweden between 1969 and 2005 (n=1 609 690).
- Clinical psychiatric diagnoses were determined by a physician during mandatory conscription examination.
- The study has a follow-up period of up to 36 years based on high-quality Swedish national registers.
- A main drawback is that data on symptom severity, duration and level of psychosocial functioning at baseline were lacking, as was diagnostic information prior to conscription.

disease.<sup>1</sup> The cumulative prevalence of fulfilling the criteria for at least one psychiatric disorder in accordance with the Diagnostic and Statistical Manual of Mental Disorders (DSM) between the ages of 9 and 21 years has been estimated to 60%.<sup>2</sup> In a study focusing on adolescents in the rural USA, as many as 29% of the boys and 54% of the girls displayed symptoms of depression and anxiety (>12 points on the Revised Clinical Interview Schedule, CIS-R) at some point during adolescence.<sup>3</sup> Although the bulk of these conditions seem to resolve in young adulthood, a substantial proportion do face future adversities.<sup>4</sup> In addition to adverse health trajectories, mental disorders in childhood and adolescence may also predict future life chances in other areas, including educational attainment,<sup>5</sup> work participation<sup>6</sup> and welfare dependence.<sup>7</sup> However, many studies rely on self-reports of mental health, have fairly short follow-up periods and use study samples with specific characteristics. Hence, large-scale prospective studies employing adolescent clinical diagnoses and long

observation periods are scarce. Furthermore, studies that tease out the potential resilience effect of cognitive ability are needed. The latter is important as performance on tests of cognitive ability in childhood/early adulthood has been shown to predict morbidity<sup>8–11</sup> and mortality<sup>12</sup> in adulthood. Marmot and Kivimäki<sup>13</sup> suggest three potential pathways. First, cognitive ability may lead to a greater knowledge on how to pursue healthy behaviours. Second, it may determine socioeconomic position (SEP), that is, individuals with a high cognitive ability attain a higher education and a higher occupational position. Third, cognitive ability may be a marker of something else that in turn predicts subsequent health.<sup>13</sup> Furthermore, poorer performance on tests of cognitive ability may also reflect adverse childhood conditions such as illness and abuse.<sup>14</sup>

Swedish national registers provide the opportunity to follow marginalisation and mortality in young persons with and without mental disorders. The Swedish conscript register includes diagnostic data as well as results of standardised IQ testing. Given the well-established risk of adverse trajectories in persons with psychotic illness, the current study focuses on non-psychotic psychiatric disorders (NPDs). Men with and without NPD at baseline were followed over an observation period of 1–36 years. Three hypotheses were tested: (1) NPD at the age of 18 years is associated with a higher prevalence of disability pension (DP), welfare support, long-term unemployment and mortality than in a reference group without these diagnoses; (2) if such associations are present, they will be mediated by education level; and (3) the strength of all four associations will be attenuated when adjusting for cognitive ability.

## METHODS

### Study sample

Data were compiled from the Swedish Military Service Conscript Register. During 1969–2005, Swedish

law required all 18-year-old men to enlist. Exceptions were granted only for men who were incarcerated or had severe chronic medical or mental conditions or disabilities documented by a medical certificate (~2–3% of the yearly 18-year-old male population). The present study sample consisted of 18-year-old men (n=1 609 690) who enlisted for military service between 1969 and 2005 at 1 of 6 national conscription centres. Of the study sample, 66 836 (4.2%) were found to have any of the non-psychotic mental disorders (NPDs) listed in table 1 at baseline. The study sample minus conscripts with NPDs and conscripts diagnosed with a psychotic mental disorder at conscription (n=252) was used as reference group (n=1 542 854) in the analyses. The Ethics Committee of the University of Gothenburg and Confidentiality Clearance at Statistics Sweden approved this study in 2005.

### Baseline assessments

Psychiatric symptoms were assessed during a structured interview with a psychologist. The psychological examination included also an assessment of the conscript's potential ability to cope with wartime stress. During this assessment, the conscripts met the psychologist for a semistructured interview with an average duration of 20–25 min. The interview included questions about predisposition to anxiety, ability to control and channel nervousness, and stress tolerance. It also covered areas relevant to everyday life, including psychosocial dimensions (interests, recreational activities, psychological motivation, social maturity and emotional stability). To ensure consistent evaluation over time and between different test centres, a central authority supervised the instruction and training of participating psychologists, supported by a written manual. A physician further evaluated symptoms, when present, and psychiatric disorders were diagnosed according to the International Classification of Diseases (ICD). The psychologist administered an IQ test using a standard manual. This test,

**Table 1** Distribution of non-psychotic mental disorders recorded at conscription (age 18) in all Swedish men enlisting for military service between 1969 and 2005

Diagnostic category	ICD-8	No. of conscripts		No. of conscripts		Total no.
		ICD-8 (n)	ICD-9	ICD-9	ICD-10	
Depressive disorders	296.0	1	298.0	0	F32–F34	320
	296.2	32	300.4	130	F38–F39	1
	298.0	11	311	27		
	300.4	1960				2482
Neurotic/adjustment disorders	300 (excl. 300.4)	27 336	300 (excl. 300.4)	4790	F40–F48	4041
			306	2675		
	305	11 443	308	2		
	307	357	309	8		50 652
Personality disorders	301	9524	301	559	F60–F69	4
Alcohol-related disorders	291, 303	3036	291, 303, 305.0	145	F10	7
Other SUDs	294.3, 304	4466	292, 304, 305.1–305.8	679	F11–F19	53

SUDs, substance use disorders.

which has been employed in numerous studies,<sup>15–17</sup> included a logical performance test, a verbal test of synonyms and opposites, a test of visuospatial/geometric perception and a test of technical/mechanical skills, including mathematical/physics problems. Combined performance on all four tests yielded a global score indicating level of cognitive ability.<sup>18</sup> The test scores were then converted to a 9-point standard scale (Stanine) with a mean of 5 and an SD of 2.

### Marginalisation and mortality

Three markers of marginalisation were employed: DP, welfare support and long-term unemployment. Information was collected from the longitudinal integration database for health insurance and labour market studies (Swedish acronym—LISA). The LISA register covers the years from 1990 to 2005. Linking data to the multigenerational register ([http://www.scb.se/Pages/List\\_\\_\\_257501.aspx](http://www.scb.se/Pages/List___257501.aspx); website in Swedish) enabled the use of full brothers. DP was a dichotomised variable; individuals were censored at first year of receiving DP. Welfare support was a dichotomised variable identifying all individuals receiving financial welfare support at any point in time between 1990 and 2005. Long-term unemployment was a dichotomised variable identifying individuals with at least one spell of long-term unemployment (>180 days in 1 year) between the years 1992 and 2005. Information about all-cause mortality was provided from the national cause of death register with data based on physicians' death certificates.

### Covariates

LISA data were used to characterise the highest level of education (as noted in the LISA register in 2005): (1) mandatory education (9–10 years) or less, (2) secondary education and (3) post-secondary education (2-year or longer) or doctoral degree. Fathers' education level (1–3, as defined above) served as a proxy measure of childhood SEP.

### Statistical analyses

Using a two-sample test of proportions (ie, z-test), proportional differences between the NPDs and the reference group were calculated for DP, welfare support, long-term unemployment and mortality. Mean difference in IQ between the NPDs and the reference group was examined using a t-test ( $p < 0.05$ ). To examine the association between NPD at the age of 18 years and subsequent welfare support and long-term unemployment logistic regression models were used, computing ORs and 95% CIs for the whole cohort with the reference group used as statistical reference. Logistic regression analyses were chosen since welfare support and long-term unemployment were dichotomised measures (described above). Cox proportional hazards modelling was used to examine the risk of DP for men diagnosed with NPD at the age of 18 years. HRs and 95% CIs were

computed with the reference group as statistical reference. The follow-up period began at the date of conscription (baseline), and participants were censored at the time of (1) DP, (2) emigration, (3) death or (4) at the end of follow-up, that is, on 31 December 2005 (maximum 36 years follow-up). Cox proportional hazards modelling was also used to examine the risk of mortality for men receiving diagnosis of an NPD at the age of 18 years. HRs and 95% CIs were computed, and again the reference group was used as statistical reference. The follow-up period began at the date of conscription (baseline), and participants were censored at the time of (1) death, (2) emigration or (3) at the end of follow-up, that is, on 31 December 2005 (maximum 36 years follow-up). To challenge our results and to adjust for unobserved or unobservable confounding by factors shared by siblings (such as family income, parental mental health and social adversity), sibling comparisons were performed by conditional logistic regression and stratified Cox proportional hazards models. For these models, only groups of brothers differing in NPD status and outcome contribute to the analyses.

To eliminate potential systematic differences in enlistment procedures between 1969 and 2005 and between different enlistment centres, all analyses were adjusted for decade of enlistment (ie, 1960, 1970, etc) and for enlistment centre. To investigate potential confounding, fathers' educational level and own IQ were adjusted for in different models for all outcomes. Own level of education was included as a covariate to investigate potential mediation.

To investigate the potential resilience effect of higher cognitive ability, separate analyses for individuals with NPD and the reference group in relation to all four outcomes were performed treating IQ as an ordinal variable (ie, 1–9) with score 1 as reference. An interaction term (IQ×NPD) was also introduced.

Potential multicollinearity between covariates was assessed with Pearson's correlation coefficients ( $>0.70$ ). To examine the possibility that age at outcome may affect the associations, all analyses were also performed when stratifying for <30, 30–40 and >40 years at outcome. In order to examine the possibility that observed associations were driven by alcohol use disorders (AUDs) or other substance use disorders (SUDs), sensitivity analyses were performed for all analyses where alcohol-related disorders or other SUDs were excluded. In order to avoid misclassification of conscripts with prodromal episodes of psychotic disorder sensitivity analyses excluding individuals with hospital admissions for schizophrenia, analyses for other non-affective psychoses and bipolar disorder with onset at any time after conscription were also carried out. Statistical calculations were performed with SAS V.8.1 (SAS Institute, North Carolina, USA) and STATA V.13 (STATA Corp, Texas, USA).

## RESULTS

**Non-psychotic psychiatric disorders at baseline**

At least one NPD diagnosis was recorded at conscription for 66 836 men (4.2%). A single diagnosis was recorded in 78.6%, 2 diagnoses were specified in 17.6% and 3 or more in 3.8%. The largest diagnostic group was neurotic and adjustment disorders (70.7%) followed by personality disorders (14.0%), SUD (7.3%), AUD (4.5%) and depressive disorders (3.5%) (see [table 1](#)). There was some variance in the prevalence of NPDs at baseline over time. Of the study sample, 6.0% (n=773) received at least 1 diagnosis in 1969, 8.5% (n=40 339) in the 1970s, 4.4% (n=21 366) in the 1980s, 0.6% (n=2820) in the 1990s and 0.9% (n=1538) in the period between 2000 and 2005.

**Prevalence of markers of marginalisation and mortality**

Almost a quarter of the group with NPDs at baseline (23.2%, n=15 491) received financial welfare support at least once during follow-up. This figure can be compared with 13.9% (n=214 687) in the reference group ( $p<0.0001$ ). Long-term unemployment was experienced at least once during the follow-up by 37.0% (n=24 581) vs 23.4% (n=359 499) ( $p<0.0001$ ). Owing to death and migration, and DP, 77.5% (n=51 771) of the individuals with NPD and 94.2% (n=1 411 538) of the individuals without NPD at the age of 18 years were eligible for outcome in 2005. DP was granted to 16.2% (n=10 805) at some point during the follow-up period. The same figure for the reference group was 3.0% (n=45 876) ( $p<0.0001$ ). Mean follow-up time for DP was 28.4 years (SD 5.5). There was some variance in the prevalence of DP over time with 11.0% (n=1420) of the study in the

1960s, 7.4% (n=35 028) in the 1970s, 3.1% (n=15 180) in the 1980s, 1.0% (n=4702) in the 1990s and 0.2% (n=351) in the period between 2000 and 2005. Deaths were recorded during follow-up for 4.3% (n=2 899) of the men diagnosed with NPD at baseline. This figure was four times higher than what was observed in the reference group (1.1%, n=17 470) ( $p<0.0001$ ). Mean follow-up time for death was 25.9 years (SD 8.0).

**Cognitive ability**

The proportional distribution of IQ on the Stanine scale in the group with non-psychotic disorders was slightly skewed towards the lower scores with a mean of 4.01 and an SD of 2.1. This was lower ( $p<0.05$ ) than in the reference group with a mean of 5.14 and an SD of 2.0. See [table 2](#) for distributional details.

**Educational level and fathers' educational level (SEP)**

Educational level was lower ( $p<0.0001$ ) in the group with NPDs compared with the reference group ([table 2](#)). Among those with NPD, 30.1% had elementary school, 53.1% secondary school and 16.8% post-secondary education of 2 years or longer. Fathers' educational level was lower ( $p<0.0001$ ) in the NPDs, with 12.5% having a post-secondary education or higher, compared with 21.5% in the reference group.

**Non-psychotic psychiatric disorder at the age of 18 years as a predictor of future marginalisation**

Having an NPD at the age of 18 years was associated with all three indicators of future marginalisation with an OR of 3.73 (95% CI 3.65 to 3.80) for welfare support, OR 1.97 (95% CI 1.94 to 2.01) for long-term

**Table 2** Proportion and frequency of educational level, level of IQ and fathers' educational level in male conscripts diagnosed with non-psychotic disorders (NPD, N=66 836) and reference group (N=1 542 854)

	Conscripts with NPDs (N=66 836)		Reference group (N=1 542 854)	
	Frequency (n)	Per cent (%)	Frequency (n)	Per cent (%)
<b>Educational level</b>				
Elementary school	19 343	30.1	210 201	14.7
Secondary education	34 107	53.1	812 008	53.7
Post-secondary	10 784	16.8	479 430	31.7
<b>IQ</b>				
1	6768	10.1	46 680	3.0
2	8859	13.3	99 272	6.4
3	9963	14.9	162 214	10.5
4	11 015	16.5	237 603	15.4
5	11 305	16.9	334 654	21.7
6	7719	11.6	267 202	17.3
7	5011	7.5	200 237	13.0
8	2555	3.9	121 435	7.9
9	1293	1.9	66 125	4.3
<b>Fathers' educational level</b>				
Elementary school	24 935	54.7	511 224	38.9
Secondary education	14 947	32.8	520 084	39.6
Post-secondary	5711	12.5	281 890	21.5

Varying numbers of participants due to internal missing.



**Table 3** ORs with 95% CI for welfare support and long-term unemployment and HRs with 95% CI for DP and mortality, in relation to NPD in a national cohort of 18-year-old male conscripts (n=1 609 690)

	n	ORs (95% CI)			
		Model 1	Model 2	Model 3	Model 4
Welfare support	230 178				
NPD		3.73 (3.65 to 3.80)	3.62 (3.53 to 3.71)	3.36 (3.28 to 3.45)	3.01 (2.93 to 3.09)
Long-term unemployment	384 081				
NPD		1.97 (1.94 to 2.01)	1.96 (1.92 to 2.00)	1.89 (1.85 to 1.93)	1.84 (1.80 to 1.88)
		HRs (95% CI)			
		Model 1	Model 2	Model 3	Model 4
DP	56 681				
NPD		2.95 (2.89 to 3.02)	3.08 (3.00 to 3.17)	2.23 (2.17 to 2.91)	2.16 (2.10 to 2.23)
Mortality	20 369				
NPD		2.45 (2.33 to 2.52)	2.45 (1.32 to 2.58)	2.03 (1.93 to 2.14)	1.79 (1.65 to 1.95)

Model 1: adjusted for decade of enlistment and enlistment centre.

Model 2: +fathers' educational level.

Model 3: +IQ.

Model 4: +education.

DP, disability pension; NPD, non-psychotic psychiatric disorder.

unemployment and an HR of 2.43 (95% CI 2.33 to 2.53) for DP (adjusted for decade and enlistment centre, Model 1, table 3). Adjustment for fathers' educational level did not attenuate the associations (Model 2), cognitive ability only had a minor confounding effect (Model 3) and the mediating effect of educational level was small (Model 4).

When re-analysing the association between NPD and the three indicators of marginalisation stratified for age at outcome (<30, 30–40 and >40 years), no major disparities from the overall result were observed. In relation to welfare support, the point estimates for the fully adjusted models (see description of Model 5 above) ranged from OR 2.97 (95% CI 2.89 to 3.05) for age <30 years at outcome to OR 3.00 (95% CI 2.92 to 3.08) for age >40 years at outcome. The corresponding figures for long-term unemployment were OR 1.84 (95% CI

1.84 to 1.80) for age <30 years at outcome to OR 1.84 (95% CI 1.80 to 1.88) for age >40 years at outcome, and for DP HR 2.87 (95% CI 2.81 to 2.94) for age <30 years to HR 2.16 (95% CI 2.10 to 2.22) for age >40 years at outcome (complete figures not shown). In subanalyses within brothers associations between NPD at the age of 18 years and each of the three indicators of marginalisation remained stable (see table 4).

#### Non-psychotic psychiatric disorder at the age of 18 years as a predictor of mortality

Having an NPD at the age of 18 years displayed a two and a half-fold risk of mortality in analyses adjusted for decade of enlistment and enlistment centre (table 3). Paralleling findings from the analyses of marginalisation, there was almost no effect of fathers' educational level and only small attenuating effect of cognitive ability and education.

**Table 4** Subanalyses within brothers (n=35 503): ORs with 95% CIs for welfare support and long-term unemployment, and HRs with 95% CIs for DP and mortality, in relation to NPD

		ORs (95% CI)		
		Model 1	Model 2	Model 3
Welfare support				
NPD	3.44 (3.33 to 3.55)		3.19 (3.08 to 3.30)	2.86 (2.76 to 2.96)
Long-term unemployment				
NPD	1.93 (1.88 to 1.99)		1.86 (1.81 to 1.91)	1.83 (1.78 to 1.88)
		HRs (95% CI)		
		Model 1	Model 2	Model 3
DP				
NPD	2.77 (2.68 to 2.88)		2.03 (1.95 to 2.10)	2.00 (1.93 to 2.08)
Mortality				
NPD	2.38 (2.23 to 2.55)		1.99 (1.85 to 2.13)	1.77 (1.59 to 1.97)

Model 1: adjusted for decade of enlistment, enlistment centre and at least one full brother with NPD.

Model 2: +IQ.

Model 3: +education.

DP, disability pension; NPD, non-psychotic psychiatric disorder.

When stratifying for age at death, NPD remained a predictor in individuals dying at the age of 30–40 years with a HR of 2.19 (95% CI 1.78 to 2.71) and at the age of >40 years with a HR of 1.79 (95% CI 1.63 to 1.96) but not at the age of <30 years with an HR of 0.53 (95% CI 0.24 to 1.18), fully adjusted in line with Model 4 in table 3. Subanalyses within brothers did not eliminate the association between NPD and mortality (see table 4).

### Higher IQ: a resilience factor for marginalisation and mortality

In the NPDs, there was a graded association where each increasing level of IQ displayed a lower OR (welfare support and long-term unemployment) or HR (ie, DP and mortality). In relation to welfare support, the associations (ie, adjusted for decade of enlistment, enlistment centre and education) between IQ score 9 in comparison to 1 was OR 0.30 (95% CI 0.24 to 0.37). Corresponding figures for long-term unemployment was OR 0.37 (95% CI 0.32 to 0.43) (see online supplementary table 1); for DP, HR 0.26 (95% CI 0.21 to 0.33); and for mortality, HR 0.29 (95% CI 0.14 to 0.63) (see online supplementary table 2). To examine effect modification of IQ at the age of 18 years on the associations between NPD at the age of 18 years and welfare support, long-term unemployment, DP and mortality, we included IQ as an interaction term (NPD×IQ) in the models described above. The interaction term for IQ for welfare support was statistically significant ( $p<0.0001$ ), and corresponding data were found for long-term unemployment ( $p<0.0001$ ), and DP ( $p<0.0001$ ). No statistically significant interaction was found in relation to mortality,  $p=0.048$ .

No multicollinearity ( $>0.70$ ) was observed between the covariates in any of the above analyses. Correlation (Pearson) between IQ and education was 0.39 in the NPDs and 0.45 in the reference group ( $p<0.0001$ ). Sensitivity analyses excluding all conscripts with AUD or SUD did not change the associations. Neither did the exclusion of conscripts with hospital admissions for schizophrenia, other non-affective psychoses and bipolar disorder with onset any time after conscription (figures not shown).

## DISCUSSION

Having an NPD at the age of 18 years was associated with a higher prevalence of subsequent welfare support, long-term unemployment, DP as well as increased mortality starting at the age of 30 years. High cognitive ability seemed to work as a resilience factor for all outcomes in individuals with and without NPD at the age of 18 years. There was only a small mediating effect of attained educational level on the associations between NPD and future adversities. Consequently, hypotheses 1 and 3 in the present study were fully supported, whereas the second hypothesis received only minor support. Strengths of the study include the use of a national cohort examined with clinical diagnostics and standardised IQ testing at

baseline, and the long follow-up period for outcomes defined in national registers of high quality. Considering the multidimensional nature of marginalisation, a further strength was the use of three different markers of this phenomenon (ie, triangulation).

The present study adds to the literature by providing support for the association between NPDs in 18-year-old men and three indicators of marginalisation, as well as mortality. The fact that there was no association with death before the age of 30 years may indicate that the pathway from experiencing NPD at age 18 to death may take longer time. In order to elucidate this pathway, future studies should investigate the relation between NPDs and cause-specific mortality. The results also show that high cognitive ability acts as a resilience factor of future adversities in a group already exposed to mental ill health in adolescence. Our finding that fathers' educational level did not account for the association between IQ and future adversities is in line with most previous research.<sup>12 19</sup> More unexpected was the small mediation effect of attained education. In a meta-analysis by Calvin *et al*,<sup>12</sup> adjustment for education resulted in a decrease of HRs of mortality of 54%. This is complex due to the potentially reciprocal relation between IQ and education. The fact that IQ was measured at the age of 18 years may have increased the possibility of educational level already being affected by cognitive ability, and it may also provide a higher risk of IQ being affected by childhood adversities.

The present results identify young men with NPDs and lower cognitive ability as a high-risk group of future adversities and mortality. However, the observed gradient in IQ does not provide us with specific thresholds for such a categorisation, that is, who are most at risk. Such a gradient may instead suggest upstream interventions focusing on increasing cognitive ability by stimulating intellectual processes earlier in life in young men as a group. While the research community has been strongly divided in the question of the malleability of IQ, the notion that IQ measured early in life is fundamentally influenced by experience<sup>20</sup> is increasingly gaining support in epidemiological and experimental literature.<sup>21–25</sup> Also, the potential gains of educational interventions to enhance cognitive ability may be particularly large within lower socioeconomic groups where the relative effect of heritability is smaller.<sup>25</sup>

## Limitations

A main drawback is that we lack diagnostic information prior to conscription, as well as data on symptom severity, duration and level of psychosocial functioning at baseline. If individuals with lower IQ scores also experienced more severe symptoms, this could have confounded the results. Furthermore, DP, welfare support and long-term unemployment were treated as dichotomous outcomes when in reality these phenomena may fluctuate over time. Although we stratified by age at outcome and adjusted for enlistment decade, one

should recognise that the examined indicators of marginalisation are highly related to existing welfare policies. Hence, it is possible that the association and the mechanism between NPD and these outcomes may vary over time. The prevalence of conscripts with NPDs declined over time. This was due to an increasing practice of excusing young men with medical certificates from attending conscription. Hence, a potential selection bias may be present where individuals with more severe effects on, for example, psychosocial functioning were excused from conscription in a higher proportion. If so, the present estimations of risk for future adversities in young men with NPDs may be somewhat underestimated. Since the participants were 18 years old at baseline, some had already completed their education, and others were embarking on higher education. This may have affected analyses using education as a mediating factor. Another limitation is the lack of data on social networks, which is important to consider in the context of marginalisation. A final limitation is that the cohort only includes men. Hence, generalising results to women should be avoided.

## CONCLUSIONS

Young men with NPDs had a higher probability of several indicators of subsequent marginalisation (ie, DP, welfare support, long-term unemployment), as well as mortality. The risk of future adversities was graded in relation to cognitive ability, and the mediating effect of education was small. These results emphasise the vulnerability of young men with NPDs. Based on the assumption that cognitive ability is fundamentally influenced by early social experiences, the present results do also indicate the public health relevance of interventions inducing such ability at population level (eg, high-quality schooling).

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