

Supplementary Materials for

ADHD, financial distress, and suicide in adulthood: A population study

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SUPPLEMENTARY MATERIALS

Section A

External databases:

S1: Socialstyrelsen (Swedish National Board of Health and Welfare).
<http://www.socialstyrelsen.se/english> (2018).

S2: Statistics Sweden <https://www.scb.se/en/> (2018).

S3: Random credit registry sample (2018).

S4: Kronofogden Swedish Enforcement Authority. <https://www.kronofogden.se/InEnglish.html> (2018).

Variables used for analysis of credit:

<u>Variable</u>	<u>Description</u>
Default risk (%)	A number in the interval 0–100 indicating estimated probability of future default (0 = zero probability of default in next 12 months)
Age	Age at end of the year
Credit arrears	Number of flags of unpaid debt in last three years visible in the credit registry system
Credit requests last 12 months	Number of inquiries to credit registry for individual during the last 12 months
# credit cards	Number of credit cards
# installment loans	Number of installment loans
# credit lines	Number of credit lines
Years of education	Years of education
Labor income (SEK)	Filed labor income on tax return
Diagnosed with ADHD	1 if the individual ever has an F90 code in the diagnosis data; zero otherwise
Anxiety	1 if the individual ever has an F40 or F41 code in the diagnosis data; zero otherwise
Substance	1 if the individual ever has an F10 or F19 code in the diagnosis data; zero otherwise

Depression	1 if the individual ever has an F32 or F33 code in the diagnosis data; zero otherwise
Autism	1 if the individual ever has an F84 code in the diagnosis data; zero otherwise
Respiratory infection	1 if the individual ever has an J069 code in the diagnosis data; zero otherwise
Asthma	1 if the individual ever has an F459 code in the diagnosis data; zero otherwise
Suicide (Self-intentional death)	1 if individual died and the cause of death was in the interval X60–X84; 0 if other cause of death; missing if individual has not died
Sympathomimetic ADHD medication prescriptions	1 if individual is prescribed a central acting sympathomimetic (ICD category N06BA); 0 otherwise
Years in continuous default	1 if individual appears in Kronofogden data in year y (debt can have originated earlier); 0 otherwise
New diagnosis of ADHD	1 if individual received a diagnosis that year; 0 otherwise
New arrears	1 if individual received an arrear that month; 0 otherwise

Section B

Table S1

Means and standard deviations of study variables across the full population, by ADHD status.

Study variable	Participants with ADHD		Control participants	
	full sample (<i>n</i> = 177,336) ^a	> age 18, 2010-13 only (<i>n</i> =104,976) ^b	full sample (<i>n</i> = 11,371,854) ^a	> age 18, 2010-13 only (<i>n</i> =7,962,751) ^b
Demographics				
Age	19.64 (13.42)	<i>30.96 (11.27)</i>	40.86 (23.58)	<i>49.06 (19.07)</i>
Male	61.29%	<i>56.84%</i>	49.55%	<i>49.38%</i>
Years of education	10.65 (1.87)	<i>10.84 (1.90)</i>	11.80 (2.40)	<i>12.01 (2.40)</i>
Income	(SEK)70,133 (11,956)	<i>(SEK)83,117 (23,666)</i>	(SEK)163,382 (222,902)	<i>(SEK)183,764 (237,430)</i>
Suicides within sample period (%)	0.33%	<i>0.40%</i>	0.15%	<i>0.08%</i>
Psychiatric comorbidities (lifetime %)				
Alcohol/substance use disorder	19.10%	<i>29.73%</i>	3.03%	<i>3.37%</i>
Anxiety	32.99%	<i>45.63%</i>	4.58%	<i>5.07%</i>
Autism	18.58%	<i>16.02%</i>	0.46%	<i>0.34%</i>
Depression	30.97%	<i>44.41%</i>	5.30%	<i>5.91%</i>
Sympathomimetic prescriptions	73.26%	<i>50.86%</i>	3.16%	<i>1.66%</i>
Physical health outcomes (lifetime %)				
Asthma	9.70%	<i>4.69%</i>	4.15%	<i>2.33%</i>
Respiratory infection	8.96%	<i>6.78%</i>	3.83%	<i>3.10%</i>

^aNon-italicized columns include all in the Swedish population, including those below age 18 years.

^bItalicized columns include only those who were age 18 years or older between 2010 and 2013. This matches the Swedish Credit and default sample (see text and Table S2 below).

Notes. See text and Supplementary Materials Section A for full descriptions of study variables. Given the very large sample size and broad age range, we do not report confidence intervals or *p*-values in this table. Readers are referred to figures that appear throughout, which include 95% confidence intervals by age.

Table S2

Means and standard deviations of study variables for Swedish credit and default sample, by ADHD status.

Study variable	Participants with ADHD (<i>n</i> = 1,970)		Control participants (<i>n</i> = 187,297)	
	mean	<i>SD</i>	mean	<i>SD</i>
Demographics				
Age	33.03	(11.08)	50.22	(18.43)
Male	55.96%	-	49.05%	-
Years of education	11.14	(1.97)	12.07	(2.40)
Income	(SEK)105,261	(143,603)	(SEK)191,775	(244,829)
Credit data				
Default risk score (%)	17.32	(26.30)	3.66	(13.05)
Credit arrears	4.02	(11.35)	0.79	(6.14)
Credit inquiries (last 12 months)	1.54	2.60	1.00	(1.81)
New arrears (last month)	0.06	(0.24)	0.01	(0.11)
Number of credit cards	0.90	(1.50)	1.52	(1.82)
Number of installment loans	0.05	(0.23)	0.08	(0.30)
Number of credit lines	0.36	(0.77)	0.38	(0.82)
Credit card limit	(SEK)11,713	(23,260)	(SEK)21,626	(34,728)
Installment loan limit	(SEK)3,489	(23,519)	(SEK)6,786	(39,378)
Credit line limit	(SEK)23,289	(74,249)	(SEK)27,701	(162,280)
Credit card balances	(SEK)3,522	(10,895)	(SEK)4,665	(15,128)
Installment loan balances	(SEK)3,471	(23,414)	(SEK)6,764	(39,267)
Credit line balances	(SEK)22,362	(72,590)	(SEK)25,921	(159,585)
Suicides within sample period (%)	0.046%	-	0.0079%	-
Psychiatric comorbidities (lifetime %)				
Alcohol/substance use disorder	28.45%	-	3.29%	-
Anxiety	46.45%	-	5.02%	-
Autism	15.0%	-	0.31%	-
Depression	47.41%	-	6.00%	-
Sympathomimetic prescriptions	49.46%	-	0.02%	-
Physical health outcomes (lifetime %)				
Asthma	6.25%	-	3.10%	-
Respiratory infection	4.63%	-	2.27%	-

Notes. See text and Appendix Section A for full descriptions of study variables. Given the very large sample size and broad age range, we do not report confidence intervals or *p*-values in this table. Readers are referred to figures that appear throughout, which include 95% confidence intervals by age.

Section C

Technical details including regression equations for analyses depicted in Figs. 1–5:

Figure 1A. Rates of new diagnoses per capita for biennia spanning 2002-2015

Plotted: bar graph of the number of new diagnoses per capita

Estimation method: none (raw data)

Data source: Socialstyrelsen (15) for medical data and Statistics Sweden (16) for numbers of people in each cohort

Sample: full Swedish population ($N=11,549,190$)

Years: 2002-2015

of unique individuals: ever diagnosed with ADHD ($n=177,336$), never diagnosed with ADHD ($n=11,371,854$)

Figure 1B. Rates of new diagnoses per capita by age

Plotted: number of first diagnosis of ADHD from ages 0–50 years, by biennia, from 2002 to 2015

Estimation method: none (raw data)

Data source: Socialstyrelsen (15) for medical data and Statistics Sweden (16) for numbers of people in each cohort

Sample: full Swedish population ($N=11,549,190$)

Years: 2002-2015

of unique individuals: ever diagnosed with ADHD ($n=177,336$), never diagnosed with ADHD ($n=11,371,854$)

Figure 2A. Credit requests (e.g., credit cards, credit lines) per month by age (years) and ADHD status

Estimation method: linear regression

Estimation equation:

$$\begin{aligned} \text{Credit requests} = & \beta_i * \text{month} + \hat{\beta}_i * \text{age ADHD} + \hat{\beta}_i * \text{age noADHD} + \\ & + \beta_i * \text{anxiety} + \beta_i * \text{substance} + \beta_i * \text{respiratory infection} + \beta_i * \text{autism} \\ & + \beta_i * \text{depression} + \beta_i * \text{astma} + \beta_i * \text{incomebin} + \beta_i * \text{educationlevel} + \varepsilon \end{aligned}$$

Plotted: $\hat{\beta}_i$ for each age with 95% confidence intervals

Data source: Credit and default data (17) matched with Statistics Sweden (16) data

Sample: random sample ($N=189,267$) of adults *Years:* 2010-2013

of unique individuals: ever diagnosed with ADHD ($n=1,970$), never diagnosed with ADHD ($n=187,297$)

Figure 2B. New consumer credits per month by age (years) and ADHD status

Estimation method: linear regression

Estimation equation:

$$\begin{aligned} \text{New consumer credit} = & \beta_i * \text{month} + \widehat{\beta}_i * \text{age ADHD} + \widehat{\beta}_i * \text{agenoADHD} \\ & + \beta_i * \text{anxiety} + \beta_i * \text{substance} + \beta_i * \text{respiratory infection} + \beta_i * \text{autism} \\ & + \beta_i * \text{depression} + \beta_i * \text{astma} + \beta_i * \text{incomebin} + \beta_i * \text{educationlevel} + \varepsilon \end{aligned}$$

Plotted: $\widehat{\beta}_i$ over age with 95% confidence intervals

Data source: Credit and default sample (17) matched with Statistics Sweden (16) data

Sample: random sample (N=189,267) of adults Years: 2010-2013

of unique individuals: ever diagnosed with ADHD (n=1,970), never diagnosed with ADHD (n=187,297)

Figure 2C. New arrears incurred per month by age (years) and ADHD status

Estimation method: linear regression

Estimation equation:

$$\begin{aligned} \text{New arrears} = & \beta_i * \text{month} + \widehat{\beta}_i * \text{age ADHD} + \widehat{\beta}_i * \text{agenoADHD} \\ & + \beta_i * \text{anxiety} + \beta_i * \text{substance} + \beta_i * \text{respiratory infection} + \beta_i * \text{autism} \\ & + \beta_i * \text{depression} + \beta_i * \text{astma} + \beta_i * \text{incomebin} + \beta_i * \text{educationlevel} + \varepsilon \end{aligned}$$

Plotted: $\widehat{\beta}_i$ over age with 95% confidence intervals

Data source: Credit and default data (17) matched with Statistics Sweden (16) data

Sample: random sample (N=189,267) of adults

Years: 2010-2013

of unique individuals: ever diagnosed with ADHD (n=1,970), never diagnosed with ADHD (n=187,297)

Figure 2D. Elevation in arrear type for those diagnosed with ADHD compared with the full population

Plotted: bar graph of percentage of people ever diagnosed with ADHD for respective score bin

Estimation method: none (raw data)

Data source: Credit and default sample (17) matched with Socialstyrelsen (15)

Sample: random sample (N=189,267) of adults

Years: 2010-2013

of unique individuals: ever diagnosed with ADHD (n=1,970), never diagnosed with ADHD (n=187,297)

Figure 2E. Percentage of people with unpaid claims who are diagnosed with ADHD

Plotted: percentage of people with unpaid claims who are diagnosed with ADHD, by number of years in continued delinquency

Estimation method: none (raw data)

Data source: Kronofogden Swedish Enforcement Authority (22)

Sample: full adult (age 18 and over) Swedish population ($N=9.85$ million)

Years: cross-sectional snapshot of everyone registered in January 2018

Figure 2F. Percentage of people in successive default risk bins with ADHD

Plotted: bar graph of percentage of people ever diagnosed with ADHD across increasing default risk bins (larger bin values reflect worse credit)

Estimation method: none (raw data)

Data source: Swedish Credit and default sample (17) matched with Socialstyrelsen (15)

Sample: random sample ($N=189,267$) of adults

Years: 2010-2013

of unique individuals: ever diagnosed with ADHD ($n=1,970$), never diagnosed with ADHD ($n=187,297$)

Figure 3A. Rates of new prescriptions per capita by age

Plotted: percentage of population receiving medications for ADHD (24), by biennia, from 2006 to 2015

Estimation method: none (raw data)

Data source: Socialstyrelsen (15) for medical data and Statistics Sweden (16) for number of individuals in each cohort

Sample: full Swedish population ($N=11,549,190$)

Years: 2006-2015

of unique individuals: ever diagnosed with ADHD ($n=177,336$), never diagnosed with ADHD ($n=11,371,854$)

Figure 3B. Prescription event time and new arrears

Estimation method: linear regression

Estimation equation:

$$\begin{aligned} \text{New arrears} = & \beta_i * \text{month} + \hat{\beta}_i * \text{eventtime ADHD} + \hat{\beta}_i * \text{eventtiemnoADHD} + \beta_i * \text{anxiety} \\ & + \beta_i * \text{substance} + \beta_i * \text{respiratory infection} + \beta_i * \text{autism} + \beta_i * \text{depression} + \\ & + \beta_i * \text{astma} + \beta_i * \text{incomebin} + \beta_i * \text{educationlevel} + \varepsilon \end{aligned}$$

Plotted: $\hat{\beta}_i$ over age with 95% confidence intervals, over event time t , where $t = 0$ when the individual first receives a prescription for ADHD (17)

Data source: Swedish Credit and default sample (17) matched with Socialstyrelsen (15)

Sample: random sample ($N=189,267$) of adults *Years:* 2010-2013

of unique individuals: ever diagnosed with ADHD ($n=1,970$), never diagnosed with ADHD ($n=187,297$)

Figure 4A. Suicide rate by age and ADHD status

Estimation method: linear regression

Estimation equation:

$$\begin{aligned} \text{Suicide} = & \beta_i * \text{year} + \widehat{\beta}_i * \text{age ADHD} + \widehat{\beta}_i * \text{age noADHD} + \beta_i * \text{anxiety} \\ & + \beta_i * \text{substance} + \beta_i * \text{autism} + \beta_i * \text{respiratory infection} \\ & + \beta_i * \text{astma} + \beta_i * \text{incomebin} + \beta_i * \text{educationlevel} + \varepsilon \end{aligned}$$

Plotted: $\widehat{\beta}_i$, with 95% confidence intervals over age

Data source: Socialstyrelsen (15) and Statistics Sweden (16)

Sample: full Swedish population ($N=11.44$ million)

Years: 2002 to 2015

Figures 4B and 4C replicate analyses for Figure 4A among only men and only women, respectively (see immediately above).

Figure 4D. Suicide rates by default risk score bins and ADHD status

Estimation method: linear regression

Estimation equation:

$$\begin{aligned} \text{Suicide} = & \beta_i * \text{month} + \widehat{\beta}_i * \text{scorebinADHD} + \widehat{\beta}_i * \text{scorebinnoADHD} + \beta_i * \text{anxiety} \\ & + \beta_i * \text{substance} + \beta_i * \text{autism} + \beta_i * \text{respiratory infection} \\ & + \beta_i * \text{astma} + \beta_i * \text{incomebin} + \beta_i * \text{educationlevel} + \varepsilon \end{aligned}$$

Plotted: $\widehat{\beta}_i$, with 95% confidence intervals, over default risk score bins

Data source: Credit and default sample (17) matched with Socialstyrelsen (15)

Sample: random sample ($N=192,043,189,267$) of adults Years: 2010-2013

of unique individuals: ever diagnosed with ADHD ($n=1,763,197$), never diagnosed with ADHD ($n=190,280,187,297$)

Figures 5A and 5B. Growth in debt in the 36 months preceding suicide for those with and without ADHD, run separately for men (5A) and women (5B).

Estimation method: linear regression

$$\begin{aligned} 1(\text{Active debt kronofogden} > 0) = & \beta_i * \text{year} + \widehat{\beta}_i * \text{eventtime ADHD} + \widehat{\beta}_i * \text{eventtimenoADHD} \\ & + \beta_i * \text{anxiety} + \beta_i * \text{substance} + \beta_i * \text{autism} + \beta_i * \text{respiratory infection} \\ & + \beta_i * \text{astma} + \beta_i * \text{incomebin} + \beta_i * \text{educationlevel} + \varepsilon \end{aligned}$$

Plotted: $\widehat{\beta}_i$ over event time with 95% confidence intervals

Boolean starting from the existence of aktiv = 1 in a month until aktiv = 0 for the same individual or the time period ends

Data source: medical records from Socialstyrelsen (15) matched with the Kronofogden (22) active debt dataset

Sample: all individuals with suicide as registry cause of death (codes X59–X85)

Years: 2014-2016

of unique individuals: ever diagnosed with ADHD ($n=190$), never diagnosed with ADHD ($n=2,120$); All individuals suicided.