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The impact of adolescent psychological distress on access and participation in employer sponsored pension plans in the US

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The impact of adolescent psychological distress on access and participation in employer sponsored pension plans in the US*

Abstract:

A large body of evidence shows that poor mental health early in life reduces income over the lifespan, but a dearth of evidence exists on how early psychological distress affects long-term savings behaviour. By employing a nationally representative cohort panel (NLSY1997) and linear probability models, this paper provides novel evidence that poor mental health early in life can have persistent effects on lifelong financial security via lower retirement savings. Adolescents (16 to 20 years old) with poor mental health are 4.7 percentage points less likely to have access to and 8.9 percentage points less likely to participate in employer sponsored pension plans at age 30-35. There is no significant difference in pension participation rates when individuals with poor mental health have access to plans. The negative association between adolescent mental health and pension participation is mediated by access to a plan, education, income and employment status. These findings suggest that selection into less favourable employment conditions perpetuated by early mental health problems lowers access to and participation in employer sponsored pension plans.

Keywords: Mental health; psychological distress; pensions; retirement savings; financial security; longitudinal studies; cohort studies

JEL Codes: J32, D91, G41

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1. Introduction

Common mental health conditions such as depression and anxiety disorders entail large economic costs for governments, individuals and families (Knapp and Wong 2020).¹ These costs include direct healthcare and benefit costs, as well as indirect costs incurred in the labour market through lower productivity and higher unemployment (OECD 2015).² The prevalence of mental health conditions is especially high among young individuals in the US at almost 30 percent (National Survey of Drug Use and Health, 2019) and has increased steadily in the past decade (e.g. Twenge et al. 2019). The magnitude of mental health conditions among young people necessitates a thorough understanding of the long-term economic impacts of early psychological distress.

This paper contributes novel evidence on the effect of early mental health conditions on savings behaviour in adulthood, in particular, access to and participation in employer sponsored pension plans or retirement plans. Research shows that children and adolescents with poor mental health have lower income as adults (Fletcher 2010; Smith and Smith 2010), but evidence is scarce on how early mental health problems can affect financial security later in life. Those who struggle with mental health problems may be at risk of retirement poverty since they earn less income (Fletcher 2010; Smith and Smith 2010), experience poorer employment conditions such as reduced hours and greater job insecurity (OECD 2015) and face higher levels of unemployment in adulthood (Egan, Daly, and Delaney 2016). If individuals with early mental health conditions are also less likely to have access to and participate in employer sponsored pension plans (such as 401k plans), which are a significant source of retirement income in the US, they face a heightened risk of financial vulnerability and poverty in retirement.³

There are three key mechanisms that could lead to lower access and participation in pensions among individuals with poor mental health – selection into adverse

¹ Common mental health disorders include depression, generalised anxiety disorder (GAD), panic disorder, phobias, social anxiety disorder, obsessive-compulsive disorder (OCD) and post-traumatic stress disorder.

² The US spends 2.5 per cent of its GDP on costs associated with mental health issues. 28.3 per cent of disability benefit caseloads are due to mental ill-health. The employment-population ratio is 45.9 per cent and 71.2 per cent for those with severe and moderate mental health issues compared with 77.8 per cent for those with no mental health issues (OECD 2015).

³ In 2019, approximately 8.9 per cent of individuals aged 65 and older had income below the poverty threshold. This amounts to 4.9 million people aged 65 and older living in poverty. Poverty among the population aged 65 and older are highest among those aged 80 and older, women, those less educated, those not married and those who identify as Black (Li and Dalaker 2021).

employment conditions, cognitive burden, and present bias. The first potential explanation for lower participation in employer sponsored pension plans may be attributed to employment in occupations that do not provide access to these plans. As individuals with mental health issues tend to have lower educational attainment (Cornaglia, Crivellaro, and McNally 2015; Fletcher 2010), lower job productivity (Bubonya, Cobb-Clark, and Wooden 2017) and higher unemployment (Egan, Daly, and Delaney 2015; 2016), they are potentially more likely to be employed in lower income and part time jobs that do not provide access to employer sponsored pension plans. Indeed, part time and low paid employees have the lowest pension participation rates in the US (eg. Bureau of Labour Statistics 2019).⁴ A second factor potentially playing a role is cognitive burden. Individuals experiencing mental health conditions may face greater cognitive difficulties through impaired concentration, memory, psychomotor speed, visual learning and executive functioning (Cella, Dymond, and Cooper 2010; Maloney, Sattizahn, and Beilock 2014). These symptoms are likely to affect the ability to navigate the complexity of pension decisions. A final potential mechanism is present bias. Individuals with common mental health conditions are more likely to focus on smaller rewards today as opposed to larger rewards in the future (Bayer et al. 2019; Pulcu et al. 2014; (Rounds, Beck, and Grant 2007; Xia et al. 2017; Zhao et al. 2015). Present bias has been found to be a key predictor of retirement savings in the US controlling for cognitive ability, financial literacy and demographic variables (Goda et al. 2019). This bias could affect the capacity of individuals with poor mental health to put off immediate consumption for delayed savings that can only be withdrawn after many years.⁵

Previously, Bogan and Fertig (2018) document that psychological distress measured in adulthood is associated with a lower probability of holding employer sponsored and individual retirement accounts by as much as 24 percentage points in the US. The authors suggest that a combination of risk preferences and time discounting may be at play. Arulsamy and Delaney (2020) also find a mental health

⁴ For example, part time employees have a 40 per cent access rate and a 24 per cent participation rate, while full time employees have an 80 per cent access rate and a 66 per cent participation rate for all employer provided retirement benefits. Employees who earn the lowest 25 per cent of average wages have a 46 per cent access rate and a 27 per cent participation rate. In contrast, employees who earn the highest 25 per cent of average wages have a 90 per cent access rate and an 81% participation rate (Bureau of Labour Statistics 2019).

⁵ The greater tendency for present bias among individuals with poor mental health can also lead to more procrastination which will further increase their propensity to delay the decision to participate in a workplace pension scheme. The complexity of pension decisions may compound the effect of present bias as complexity of tasks have been shown to increase the tendency to put off the task (Iyengar and Lepper 2000; Tversky and Shafir 1992).

gap in workplace pension participation among private sector employees in the UK which is eliminated after automatic enrolment is implemented. Compared to these studies that use psychological distress measured in adulthood, an innovation of this paper is to use adolescent mental health measured prior to full participation in the labour market. Employing an early life measure of distress addresses potential confounding that may arise during the important transition from education into the labour force. Further, by using an early measure of mental health, this paper examines the role of selection into poor employment conditions, cognitive ability and present bias in influencing access and pension participation.

By employing a nationally representative cohort panel (NLSY97) and linear probability models, this paper demonstrates that poor mental health early in life predicts lower access to and participation in employer sponsored pension plans among private sector employees in the US.⁶ Mental health is assessed using a clinically validated scale when respondents are 16 to 20 years old, while access and pension participation is captured at age 30-35. Mediation analysis based on Imai, Keele, and Tingley (2010; 2010) is then used to elucidate the pathways between adolescent mental health and the outcome variables at age 30-35 via factors captured at various points in adulthood that are likely to be affected by poor mental health. These factors are captured between the ages of 24-35 and include educational attainment, wages and salary, industry, part time status, marital status, subjective general health, personality traits and time discounting. Access to a plan is also examined as a potential mediator in the relationship between poor adolescent mental health and later pension participation.

I find that adolescents with poor mental health are 4.7 percentage points less likely to have access to an employer sponsored pension plan and 8.9 percentage points less likely to participate in these plans when they are 30-35 years old. These models account for the effects of sex, race, year of birth and childhood cognitive ability. There is no significant difference in pension participation rates when individuals with poor mental health have access to a plan at age 30-35.⁷ The mediation analysis suggests that poor adolescent mental health severely impacts educational attainment and employment conditions, particularly in regards to access to a plan, which then exacerbates the mental health gap in pension participation in adulthood. Hence, early mental health conditions are linked to

⁶ These employer sponsored pension plans include both defined benefit and defined contribution plans.

⁷ Note, in the US, employees could still participate and have savings in an employer pension plan without access from their current employer if a previous employer had provided access.

lifelong gaps in long-term financial security largely due to selection into less favourable employment conditions in adulthood.

The rest of the paper is organised as follows. Section 2 describes the retirement savings landscape in the United States. Section 3 outlines details of the data, provides information on main measures and outlines the econometric methodology. Section 4 presents the main results and robustness tests. Section 5 concludes.

2. Retirement savings in the US

There are four main sources of retirement income in the US: (1) Social Security benefits, (2) individual retirement accounts, (3) employer-sponsored defined benefit (DB) pension plans, and (4) employer-sponsored defined contribution (DC) plans (Beshears et al. 2009).⁸ This paper focuses specifically on employer sponsored pension plans (DB and DC plans) since these plans are crucial for retirement preparedness yet a large proportion of employees do not participate or have access to these plans.

Social security benefits replace about 40 per cent of past earnings on average, therefore they are not sufficient to fully finance retirement. These benefits are provided by the government and funded by contributions of current workers. Social Security benefits are based on the earnings on which employees pay Social Security payroll taxes so that higher earnings correspond to higher benefits up to the maximum benefits cap (Center on Budget and Policy Priorities, 2020).

Individual savings or retirement accounts are not linked to an employer or the government. Direct contributions largely come from individuals whose employers do not provide a pension plan, who are not eligible for their employer's savings plan or who are not working. To encourage retirement savings, thirteen states in the US have legislated, or are in the process of implementing, automatic enrolment into individual retirement accounts.⁹ As of 2019, only a quarter of

⁸ Social Security is the most important source of retirement income with 82 per cent of people aged 65 and older receiving benefits with a median of \$14,400 per year. 61 per cent of seniors receive interest or other asset income which is the next most common source of income in retirement but amounts are very small with a median of \$325. Earned income is a major source of income, but only for the 22 per cent of seniors who have earnings. Public (12 per cent) and private (22 per cent) sector pensions which include DB and DC plans are a much more important source of income than distributions from retirement accounts (8 per cent) with a median of \$16,800, \$900 and \$5,400 respectively (Economic Policy Institute, 2016).

⁹ Under these plans, workers without access to a workplace retirement plan would see regular deductions from their pay checks sent to an individual retirement account (IRA) managed by a

American households owned individual retirement accounts (Myers 2020). These accounts represent a considerably smaller source of retirement income than social security and employer sponsored pension plan accounts (Center on Budget and Policy Priorities, 2020).

Approximately 72 per cent of all US employees have access to employer sponsored pension plans and 56 per cent participate in these plans (both DB and DC plans) (Topoleski and Myers 2021).¹⁰ When employees have access to a plan, 78 per cent choose to participate (Bureau of Labour Statistics National Compensation Survey 2020). Employer-sponsored defined benefit (DB) pension plans are determined by a worker's compensation, age and tenure. Public sector employees are more likely to have access to DB plans compared to private sector employees (86 vs. 15 per cent) (Topoleski and Myers 2021). Over the past decades, private sector employers have been moving away from DB plans to DC plans (Poterba, Venti, and Wise 2008).¹¹

The most common DC plan is the 401(k). In the private sector, 65 per cent of employees have access to DC plans and 47 per cent participate. In the public sector 38 per cent of employees have access and 18 per cent participate (Topoleski and Myers 2021). Typically, employees decide on their savings rate (unless employees are opted into a specific savings rate) and investment portfolio allocations. Employers can provide matching contributions up to a certain level of employee contributions. Retirement savings from DC plans depend on how much employees choose to save while working, how generous their employer matching is and the performance of their chosen investment portfolio. The transition to DC plans means that employees have a greater responsibility to ensure that they save, invest and decumulate their retirement wealth optimally. To make these decisions optimally, employees require decent financial knowledge and literacy which are generally lacking in the US (Lusardi and Mitchell 2011).

private financial services firm. Workers could opt out, and the employers' role would usually be limited to setting up the payroll deduction and perhaps distributing information materials. Typically, the state's role would be limited to choosing the firm to manage the funds.

¹⁰ Employers are generally not required to offer their employees retirement benefits. However, the Employee Retirement Income Security Act of 1974 (ERISA) requires that employers who establish plans must meet certain minimum standards.

¹¹ The proportion of employees who have access to both defined benefit and defined contribution plans are small at 15 per cent, with 45 per cent of employees having access to defined contribution plans only and 11 per cent of employees having access to defined benefit plans only (Bureau of Labour Statistics 2019).

Public sector employees have relatively high access to and participation in DB plans, therefore the risk of insufficient retirement savings is greater in the private sector. In addition, participation in individual retirement accounts are small in the US (approximate household participation is 25 per cent). Hence, this paper analyses the impact of poor mental health on employer sponsored pension plans (both DB and DC) among private sector employees as these plans form a notable proportion of retirement savings in the US.

3. Data and empirical strategy

3.1. Data

This paper employs data from the National Longitudinal Survey of Youth (NLSY97) which is a nationally representative cohort panel of respondents born between 1980 and 1984. The respondents are interviewed in person or via telephone every year since 1997 and biennially since 2011. The analyses are limited to respondents who are employed in the private sector at age 30-35 when the outcome variables are measured. A comparison of the overall mental health gap in employer sponsored pension plans between public and private sector employees, as well between employed and unemployed employees, is provided in the Supplementary Materials in Table S2.

3.1.1. Access to, participation in and the take up rate of employer sponsored pension plans

The main outcome variables of interest capture (i) whether the respondent has access to an employer provided retirement plan at age 30-35, (ii) whether the respondent or their spouse has savings in a pension or retirement plan sponsored by an employer or a union at age 30-35, (iii) whether the respondent participates in an employer sponsored pension plan if they have access to a plan at age 30-35 i.e. the take up rate, and (iv) whether the respondent participates in an employer sponsored pension plan if they do not have access to a plan at age 30-35. For (iv), respondents could still participate without current access if a previous employer had provided access.¹²

¹² There are 3,099 observations for Outcome (i) and (ii), 1751 (57 per cent) observations for Outcome (iii), and 1348 (43 per cent) observations for Outcome (iv). The take-up rate for DC plans, which are predominantly offered in the private sector, is approximately 70 per cent (Topoleski and Myers 2021). This is higher than the take-up rate (57 per cent) captured in this dataset possibly because it only covers individuals aged 30-35. Indeed, younger workers (44-25 years old) are

The ‘access’ to an employer sponsored pension plan question is asked in every survey year as part of a broader set of questions on access to fringe benefits. The ‘participation’ in an employer sponsored pension plan question is only asked in the survey year in which the respondents turn 25 and 30 years old. I employ the most recent ‘participation’ data collected when respondents are 30 years old. Although the majority of respondents are 30 years old when they answer this question, some are older as they skipped previous interviews – this yields a sample of respondents aged 30-35.¹³ I use responses provided at age 25 for individuals who report no changes in participation since their last interview. I recode the ‘access’ variable so that the responses match the interview round in which respondents answer the ‘participation’ question. For example, if the respondent answered the ‘participation’ question at age 32, then their ‘access’ is captured in the survey year when the respondent is 32 years old. Outcome (iii) and (iv) are derived variables obtained by restricting the sample to respondents who report currently having or not having access to an employer sponsored pension plan at age 30-35. The sample primarily captures access and participation in defined contribution plans as it is limited to the private sector.

3.1.2. Adolescent mental health

The NLSY97 captures mental health using the 5-item version of the Mental Health Inventory which is an established predictor of depression and anxiety disorders (Rumpf et al. 2001). When the respondents were aged 16 to 20 years old inclusive in 2000, they were asked to rate on a four point scale from ‘none of the time’ to ‘all of the time’ how often they felt nervous, calm and peaceful, downhearted and blue, happy and depressed over the previous month.¹⁴ These responses were coded so that a higher score indicated worse mental health and then summed to generate a composite mental health variable with a score range of 0 to 15 (Mean = 4.7, Standard deviation = 2.5). There is no single validated cut off score for the MHI-5. Following other papers (e.g. Evans-Lacko et al. 2013), respondents are

generally less likely to participate in employer sponsored pension plans than older workers (45-64 years old) (Purcell 2009).

For Outcome (iv), respondents could technically also participate in a plan if a current employer provided access and later terminated the plan or stopped making contributions.

¹³ The age distribution for the ‘participation’ variable is available in the Supplementary Materials in Table S3.

¹⁴ The MHI-5 questions are provided in Table S1 in the Supplementary Materials.

classified as experiencing high psychological distress (poor mental health) if they score 1 standard deviation above the mean. Individuals who score below this cut off point are classified as having low psychological distress (good mental health). The use of adolescent mental health addresses concerns that labour market experiences such as prolonged unemployment or poor working conditions impact mental health (e.g. Egan, Daly, and Delaney 2016). This approach results in approximately 13 per cent of respondents being classified as having high psychological distress. This corresponds to prevalence estimates of mental health disorders obtained between the late 1990s and early 2000s among adolescents aged 13 to 19 years old in the US (Costello, Copeland, and Angold 2011).

3.2. Econometric Methodology

3.2.1. Main analysis

The following equations are estimated in the main analysis:

- i. $Y_{iA} = \alpha_{1i} + \beta_1 PD_i + \delta_1 X_i + \varepsilon_{1i}$
- ii. $Y_{iP} = \alpha_{2i} + \beta_2 PD_i + \delta_2 X_i + \varepsilon_{2i}$
- iii. $Y_{iPA} = \alpha_{3i} + \beta_3 PD_i + \delta_3 X_i + \varepsilon_{3i}$
- iv. $Y_{iPNA} = \alpha_{4i} + \beta_4 PD_i + \delta_4 X_i + \varepsilon_{4i}$

Y_{iA} and Y_{iP} captures access to and participation in employer sponsored pension plans at age 30-35 respectively. Y_{iPA} captures participation in employer sponsored plans when respondents have access to a plan, while Y_{iPNA} captures participation when respondents do not have access to a plan. The explanatory variable of interest, PD_i , is adolescent psychological distress or adolescent mental health when the respondents are aged 16 to 20 years old. X_i captures sex, ethnicity, year of birth and childhood cognitive ability i.e., controls captured before the mental health measure.¹⁵ Childhood cognitive ability is measured when the respondents

¹⁵ Childhood cognitive ability could have been impacted by psychological distress if the distress began before cognitive ability was measured. Although, in this dataset, psychological distress is captured after cognitive ability, we cannot be certain when the respondent began experiencing distress. If the distress began earlier, then the associations between adolescent psychological distress and the outcomes are potentially mediated by cognitive ability.

are aged 13 to 18 years old using the computer adaptive Armed Services Vocational Aptitude Battery (ASVAB) which combines math and verbal scores from four key subtests (Mathematical Knowledge, Arithmetic Reasoning, Word Knowledge and Paragraph Comprehension).¹⁶ A comparison of these controls by low and high adolescent psychological distress is provided in Table 1.

3.2.2. Mediation analysis

Mediation analysis based on Imai, Keele, and Tingley (2010) is conducted to obtain an understanding of the potential mechanisms leading from mental health conditions early in life to lower access and participation rates in employer sponsored pension plans. Prior research documents that poor mental health can affect educational attainment (e.g. Fletcher 2010; Cornaglia, Crivellaro, and McNally 2015), income (e.g. Smith and Smith 2010), working hours (e.g. OECD 2015), general health (e.g. Stanley and Laugharne 2014), marital status (e.g. Butterworth and Rodgers 2008), time discounting (e.g. Pulcu et al. 2014; Xia et al. 2017) and personality traits (e.g. Karsten et al. 2012). These factors could then influence whether an individual has access to and participates in an employer sponsored pension plan. As these factors could operate indirectly on the outcome variables through poor mental health, they are considered as potential mediators and can be identified and quantified using mediation analysis. This method separates the total effect into an indirect effect, which estimates the contribution of the mediator to the total effect, and a direct effect by simulating potential values of the outcome and mediator variables.¹⁷

¹⁶ The ASVAB scores are reported in NLS97 in 1999 but the tests were administered in 1997 and 1998.

¹⁷ The mediation analysis is implemented using medeff on Stata.

The following equations are estimated for each potential mediator (M_i) with controls X_i :

i. $Y_i = \alpha_1 + \beta_1 PD_i + \theta_1^T X_i + \varepsilon_{1i}$

ii. $M_i = \alpha_2 + \beta_2 PD_i + \theta_2^T X_i + \varepsilon_{2i}$

iii. $Y_i = \alpha_3 + \beta_3 PD_i + \gamma M_i + \theta_3^T X_i + \varepsilon_{3i}$

β_1 estimates the total effect of adolescent mental health on the outcome variables. β_3 estimates the direct effect of adolescent mental health on the outcome variables after netting out the effect of the mediator. β_3 will also capture all other mechanisms through which PD_i affects Y_i . $\beta_2\gamma$ captures the indirect effect. If the indirect effect is present without a direct effect, then the relationship between adolescent psychological distress and the outcome is fully mediated. If both the indirect and direct effects are present, then the relationship between adolescent psychological distress and the outcome is partially mediated. X_i denotes sex, race, year of birth and childhood cognitive ability. Informed by the literature, the potential mediators (M_i) that are examined are educational attainment, total wages and salary in the previous year, industry, full time vs. part time status, subjective general health, marital status, personality traits, and time discounting. Access to a plan is also evaluated as a mediator in the relationship between adolescent mental health and pension participation at age 30-35.

The assumptions required to identify and estimate unbiased direct and indirect effects include temporality between adolescent mental health, mediators and outcomes; no measurement error; no unaccounted for confounding; no variables that affect both the mediator and outcome are affected by adolescent mental health itself; correct form and specification of the model; and no multiplicative interactions between adolescent mental health, mediators, controls and outcomes (Imai, Keele, and Tingley 2010; Imai, Keele, and Yamamoto 2010; MacKinnon 2012; Sheikh, Abelsen, and Olsen 2017). Although the use of adolescent mental health can support temporality between psychological distress, mediators and outcomes, it is not possible to establish temporality between the mediators and outcomes. As measurement error, unaccounted for confounding, and interactions between variables cannot be ruled out, the results of the mediation analysis are purely suggestive and do not represent causal relationships. A further explanation of the mediation analysis is provided in S4 in the Supplementary Materials.

Educational attainment, total wages and salary in the previous year, industry, full time vs. part time status, subjective general health and marital status are captured when the respondents are 30-35 years old.¹⁸ Full time vs. part time status is derived based on weekly employment status arrays in the dataset. A respondent is considered a part time employee if they work less than 35 hours in a week (Bureau of Labour Statistics, 1986). Personality traits are captured in adulthood when the respondents are 24 to 28 years old using the Ten Item Personality Inventory (TIPI) which is a 10-item measure of the Big Five personality dimensions (extraversion, agreeableness, conscientiousness, emotional stability, openness).¹⁹ Educational attainment, total wages and salary, industry, subjective general health and personality traits are converted into binary variables for easier interpretation. Whether or not the respondent smoked in the last month at age 30-35 is utilised as a proxy for time discounting; did not smoke refers to low time discounting while smoked at all refers to high time discounting. Smoking behaviour is chosen as a proxy measure for time discounting as it is highly correlated with financial planning horizon (Khwaja, Silverman, and Sloan 2007).

All the variables used in the main and mediation analyses are listed in Table 1. The sample employed in these analyses excludes respondents who are employed in the public sector, non-profit sector, working without pay in a family business or farm, and members of the armed forces.²⁰ After imputation for missing values on childhood cognitive ability, personality traits, total wages and salary, industry and subjective general health, there is a total of 3,099 out of 4,349 observations available for analysis.²¹ Within this sample, 12.7 per cent of respondents experienced high psychological distress during adolescence.

¹⁸ The total wages and salary variable captures wages, salary, commissions or tips received from all jobs before deductions for taxes or anything else in the past year.

¹⁹ Each dimension is measured by two items on the TIPI of which one is reverse-scored. To derive these dimensions, the reverse-scored items are recoded so that 7 equals a 1 and so on. Then, the average of the two items that make up each dimension are obtained.

²⁰ Adolescents with high psychological distress are equally as likely to work in the private sector as adolescents with low psychological distress (84.0 per cent vs. 84.6 per cent, p-value = 0.685)

²¹ Previous values on the same measures are used to impute missing values in subjective general health, total wages and salary and industry, while the mean values of the sample are used to impute missing values in childhood cognitive ability and personality traits.

Table 1: Descriptive Statistics among adolescents with low and high psychological distress in the estimation sample

Variables	Low adolescent psychological distress	High psychological distress	Test of difference (p-value)
Adolescent Psychological Distress (16-20 years)	87.4%	12.7%	0.000
Sex			
Female	43.7%	59.7%	0.000
Race			
Black, Hispanic, Asian, Others	38.5%	39.5%	0.412
Adolescent Cognitive Ability (Below the mean)	38.9%	43.1%	0.111
Personality Traits (24-28 years)			
Low Agreeableness	40.2%	39.8%	0.881
Low Conscientiousness	48.2%	54.3%	0.023
Low Emotional Stability	34.0%	55.6%	0.000
Low Openness	36.4%	38.5%	0.413
Low Extraversion	55.2%	64.0%	0.024
Age 30			
Education – Less than a 4 year college degree	66.6%	74.7%	0.001
Total wages and salary in the previous year (Bottom 25 th percent)	19.1%	28.6%	0.000
Part Time Employment	28.7%	37.0%	0.001
Industry – Services (vs. Goods)	82.0%	86.7%	0.020
Smoked in the past 30 days (proxy for time discounting)	30.7%	34.4%	0.131
Marital Status – Not married	56.6%	64.0%	0.024
Subjective General Health (Fair & Poor)	9.1%	17.1%	0.000
Access to a retirement plan	57.2%	51.5%	0.034
Participation in an employer sponsored pension plan	46.7%	37.5%	0.001
N	2,707	392	

Notes: Data is unweighted. All variables are in binary format. The differences between the high and low adolescent psychological groups are tested using a t-test. Standard errors are shown in parentheses. Cognitive ability is measured in 1997 & 1998 (13 to 17 years old) using the computer adaptive Armed Services Vocational Aptitude Battery (ASVAB) which combines math and verbal scores from four key subtests (Mathematical Knowledge, Arithmetic Reasoning, Word Knowledge and Paragraph Comprehension). Personality traits are classified as low if respondents score below the mean. Education is classified as at least having a 4 year college degree or more vs. all other respondents. Total wages and salary are classified as 0 if respondents earn in the bottom 25th percentile and 1 otherwise. Industry type is re-classified according to the BLS breakdown of goods vs. service industries. Goods-producing industries cover natural resources and mining, construction and manufacturing. Service-producing industries cover trade, transportation and

utilities, information, financial activities, professional and business services and education and health services (and social assistance). Previous values are used to impute missing values in subjective general health, total wages and salary and industry, while the mean values of the sample are used to impute missing values in childhood cognitive ability and personality traits.

Missing values in the outcome variables, in particular access to a plan, due to wave non-response results in a considerable loss in sample size.²² A comparison of the estimation sample used in Table 1 with the sample available with no missing values on the psychological distress measure is provided in Table S5 in the Supplementary Materials. There are minor differences by the proportion of respondents reporting adolescent psychological distress across the samples, with the estimation sample reporting slightly lower psychological distress. There are very small differences in other characteristics, but these differences suggest that the associations between adolescent psychological distress and the outcome variables in the estimation sample are potentially downward biased as the responses that are missing are correlated with characteristics that are associated with higher psychological distress and lower access and participation.

²² The 'participation' variable has a larger sample size than the 'access' variable as the 'participation' variable also captures whether a spouse participates or not. Also, since the access question is captured in every round, there is a higher number of wave non-response compared to the 'participation' question which is collected over several rounds.

4. Results

4.1. Main analysis

Table 2 shows results from linear probability models.²³ Adolescents with high psychological distress are 4.7 percentage points less likely to have access to a plan at age 30-35 when sex, year of birth, race and childhood cognitive ability are accounted for. Adolescents with high psychological distress are 8.9 percentage points less likely to participate in an employer sponsored pension plan at age 30-35. Lower childhood cognitive ability and non-White backgrounds are negatively correlated with access and participation in an employer provided pension plan.

Table 2: The relationship between adolescent (16-20) psychological distress and access to, participation in and the take up rate of employer sponsored pension plans

	Access to a plan at age 30-35	Participation in a plan at age 30-35	Participation in a plan at age 30 with access at age 30-35	Participation in a plan at age 30 without access at age 30-35
Adolescent psychological distress	-0.047* (0.027)	-0.089*** (0.027)	-0.029 (0.035)	-0.106*** (0.029)
Female	-0.028 (0.018)	0.022 (0.018)	-0.008 (0.023)	0.090*** (0.021)
Non-White	-0.043** (0.019)	-0.109*** (0.019)	-0.091*** (0.024)	-0.082*** (0.021)
Lower cognitive ability	-0.145*** (0.019)	-0.151*** (0.018)	-0.109*** (0.024)	-0.053** (0.021)
Year of Birth	√	√	√	√
N	3,099	3,099	1,751	1,348
R-squared	0.001	0.044	0.026	0.042

Notes: These results are based on the sample of private sector employees and excludes respondents who are employed in the public sector, non-profit sector, working without pay in a family business or farm, and members of the armed forces.

The analysis employs baseline mental health captured in 2000 (16 to 20 years old) and access to and pension participation in an employer's provided plan in an employer at age 30-35.

Cognitive ability is measured in 1997 & 1998 (13 to 17 years old) using the computer adaptive Armed Services Vocational Aptitude Battery (ASVAB) which combines math and verbal scores from four key subtests (Mathematical Knowledge, Arithmetic Reasoning, Word Knowledge and Paragraph.

Comprehension). Missing values on cognitive ability are imputed based on the mean of the sample.

The reference categories are as follows: female vs. male, non-White vs. White, lower cognitive ability vs. higher cognitive ability, 1981-1984 vs. 1980.

Standard errors are shown in parentheses. *, **, *** indicates significance at the 10, 5 and 1 percent levels respectively.

²³ Results from probit models are similar.

The negative association between adolescent psychological distress and participation is driven by respondents who do not have access to an employer sponsored pension plan at age 30-35. Adolescents with psychological distress are 10.6 percentage points less likely to participate in a plan when they do not have access. Lower childhood cognitive ability and non-White backgrounds are correlated with lower pension participation when respondents do not have access to a plan. Being female is positively correlated with participation without current access to a plan. However, gender differences cannot be interpreted in a straightforward way as the 'participation' variable also captures whether a spouse or partner participates.

There is no significant difference in participation rates by mental health states when respondents have access to a plan.²⁴ If poor mental health exacerbates the role of behavioural factors such as cognitive burden and present bias, we would still expect a negative association between adolescent psychological distress and pension participation among respondents who have access to an employer sponsored pension plan. As defined contribution plans account for the majority of employer provided plans in the private sector, respondents would have to choose their contribution rates and investment portfolios which require significant mental effort and a focus on larger later rewards. The absence of a significant negative association between psychological distress and participation among those who have access suggests that barriers to access plays a stronger role in determining participation than differences in decision-making capabilities among those with poor mental health. The relationships between particular employment conditions and access, as well as their importance in contributing to the mental health gap in pension participation will be examined more closely in the next section.

²⁴ There is only a 2.6 percentage point difference between the proportion of respondents who experienced high adolescent psychological distress who have and do not have access to an employer sponsored plan. 14.1 per cent of respondents who report no access to a plan have high adolescent psychological while 11.5 per cent of respondents who report access to a plan have high adolescent psychological distress. The proportions of respondents who report high and low adolescent psychological distress by access to a plan are provided in Table S6 in the Supplementary Materials.

4.2. Mediation Analysis

The mediation results are presented in Table 3-5 with separate tables for access to a plan, participation in a plan and participation in a plan without current access. Participation in a plan with current access is excluded as there is no significant association between adolescent mental health and this outcome. Each table reports the indirect effect (including the percent of the total effect mediated), direct effect and total effect based on the estimation models in Section 3.2. Each row corresponds to a separate model with 90% bootstrapped confidence intervals.

Column 1 of Table 3 shows that all the factors examined are significant mediators in the relationship between adolescent psychological distress and access to a plan at age 30-35, except for industry, agreeableness and openness. The strongest mediators are total wages and salary in the previous year, educational attainment and employment status (full time vs. part time). Emotional stability and marital status are the next strongest mediators. The result for emotional stability could potentially reflect the adverse effects of early mental health conditions on mental health later in life. More generally, the relationship between adolescent mental health and access is largely driven by other factors, with limited direct effects.

Based on Column 1 in Table 4, access to a plan, total wages and salary in the previous year, educational attainment and part time vs. full time status are the strongest mediators in the relationship between adolescent psychological distress and participation at age 30-35. Emotional stability and marital status are the next strongest mediators. Time discounting is a comparatively less important mediator suggesting that the role of present bias in deciding whether to participate in an employer sponsored pension plan is not as important as employment conditions and educational attainment. Based on Column 1 in Table 5, educational attainment, marital status, emotional stability, total wages and salary in the previous year, and part time vs. full time status are the most important mediators in the relationship between adolescent psychological distress and participation without current access at age 30-35.

With the caveat that these results are associational, the relationships between adolescent psychological distress and the outcomes are considerably mediated by educational attainment and employment conditions such as total wages and salary and part time vs. full time status. Access to a plan, in particular, is a key mediator between adolescent psychological distress and pension participation at 30-35. This evidence suggests that the mental health gap in pension participation

is largely driven by a lack of access to employer sponsored pension plans among individuals with poor mental health rather than active decisions to not participate in these plans. This is consistent with Arulsamy and Delaney (2020) who find that employers with poor mental health were less likely to report that their employer provided access to plans prior to pensions automatic enrolment.

Table 3: Mediation results for access to a plan at age 30-35

	Indirect Effect & % of Total effect mediated	Direct Effect	Total Effect
Education (College Degree vs. No College Degree)	-0.018 (-0.027, -0.009) [35.6%]	-0.030 (-0.071, 0.015)	-0.047 (-0.089, -0.004)
Total wages and salary in the previous year (75 th percentile and above vs. 25 th percentile and below)	-0.029 (-0.043, -0.015) [57.8%]	-0.019 (-0.059, 0.024)	-0.047 (-0.089, -0.004)
Industry (Services vs. Goods)	-0.001 (-0.003, 0.001)	-0.047 (-0.088, -0.002)	-0.048 (-0.090, -0.002)
Full time vs. part time	-0.016 (-0.028, -0.005) [32.5%]	-0.031 (-0.072, 0.012)	-0.047 (-0.090, -0.004)
Time discounting (Low vs. High)	-0.006 (-0.012, -0.001) [11.4%]	-0.042 (-0.083, 0.003)	-0.047 (-0.088, -0.003)
Agreeableness (High vs. Low)	0.000 (-0.001, 0.001)	-0.048 (-0.089, -0.002)	-0.048 (-0.090, -0.002)
Extraversion (High vs. Low)	-0.002 (-0.005, 0.001) [29.5%]	-0.046 (-0.088, -0.001)	-0.047 (-0.089, -0.003)
Openness (High vs. Low)	0.000 (-0.001, 0.002)	-0.048 (-0.090, -0.003)	-0.048 (-0.090, -0.003)
Conscientiousness (High vs. Low)	-0.004 (-0.008, -0.001) [6.9%]	-0.043 (-0.085, 0.002)	-0.047 (-0.089, -0.004)
Emotional Stability (High vs. Low)	-0.011 (-0.018, -0.004) [21.4%]	-0.037 (-0.079, 0.009)	-0.047 (-0.088, -0.004)
Marital Status (Married vs. Not Married)	-0.010 (-0.016, -0.004) [19.0%]	-0.038 (-0.080, 0.007)	-0.047 (-0.088, -0.004)
General Health (Good, very good, excellent vs. fair, poor)	-0.004 (-0.009, -0.001) [8.1%]	-0.043 (-0.085, 0.002)	-0.047 (-0.089, -0.004)
N	3,099	3,099	3,099

Notes: All variables are in binary format.

These results are based on the sample of private sector employees and excludes respondents who are employed in the public sector, non-profit sector, working without pay in a family business or farm, and members of the armed forces.

Bold font denotes significant mediators. Confidence intervals (90 percent) are shown in parentheses. % of total effect mediated are shown in square brackets for significant mediators.

Table 4: Mediation results for pension participation at age 30-35

	Indirect Effect & % of Total effect mediated	Direct Effect	Total Effect
Education (College Degree vs. No College Degree)	-0.024 (-0.037, -0.012) [27.1%]	-0.065 (-0.105, -0.021)	-0.089 (-0.131, -0.046)
Total wages and salary in the previous year (75 th percentile and above vs. 25 th percentile and below)	-0.024 (-0.036, -0.012) [27.1%]	-0.065 (-0.105, -0.021)	-0.089 (-0.131, -0.046)
Industry (Services vs. Goods)	-0.000 (-0.002, 0.001)	-0.089 (-0.130, -0.044)	-0.089 (-0.131, -0.044)
Full time vs. part time	-0.015 (-0.026, -0.004) [16.6%]	-0.074 (-0.115, -0.030)	-0.089 (-0.131, -0.046)
Time discounting (Low vs. High)	-0.006 (-0.013, -0.001) [7.2%]	-0.083 (-0.124, -0.038)	-0.089 (-0.130, -0.046)
Agreeableness (High vs. Low)	0.000 (-0.001, 0.001)	-0.089 (-0.131, -0.045)	-0.089 (-0.131, -0.044)
Extraversion (High vs. Low)	-0.001 (-0.004, 0.002)	-0.088 (-0.130, -0.044)	-0.089 (-0.131, -0.045)
Openness (High vs. Low)	0.000 (-0.001, 0.001)	-0.089 (-0.131, -0.044)	-0.089 (-0.131, -0.044)
Conscientiousness (High vs. Low)	-0.004 (-0.008, -0.001) [4.6%]	-0.085 (-0.127, -0.040)	-0.089 (-0.130, -0.045)
Emotional Stability (High vs. Low)	-0.012 (-0.019, -0.005) [12.8%]	-0.078 (-0.120, -0.032)	-0.089 (-0.130, -0.046)
Marital Status (Married vs. Not Married)	-0.136 (-0.022, -0.005) [15.3%]	-0.075 (-0.116, -0.031)	-0.089 (-0.130, -0.046)
General Health (Good, very good, excellent vs. fair, poor)	-0.009 (-0.015, -0.005) [10.5%]	-0.080 (-0.121, -0.035)	-0.089 (-0.129, -0.046)
Access to a plan	-0.023 (-0.045, -0.001) [25.0%]	-0.067 (-0.103, -0.027)	-0.089 (-0.133, -0.045)
N	3,099	3,099	3,099

Notes: All variables are in binary format.

These results are based on the sample of private sector employees and excludes respondents who are employed in the public sector, non-profit sector, working without pay in a family business or farm, and members of the armed forces. Bold font denotes significant mediators. Confidence intervals (90 percent) are shown in parentheses. % of total effect mediated are shown in square brackets for significant mediators.

Table 5: Mediation results for pension participation without access at age 30-35

	Indirect Effect & % of Total effect mediated	Direct Effect	Total Effect
Education (College Degree vs. No College Degree)	-0.016 (-0.028, -0.005) [14.9%]	-0.090 (-0.136, -0.042)	-0.106 (-0.153, -0.058)
Total wages and salary in the previous year (75 th percentile and above vs. 25 th percentile and below)	-0.009 (-0.016, -0.003) [8.2%]	-0.098 (-0.153, -0.040)	-0.106 (-0.162, -0.048)
Industry (Services vs. Goods)	0.000 (-0.001, 0.002)	-0.107 (-0.153, -0.057)	-0.106 (-0.153, -0.057)
Full time vs. part time	-0.007 (-0.014, -0.002) [6.6%]	-0.099 (-0.145, -0.050)	-0.106 (-0.151, -0.058)
Time discounting (Low vs. High)	-0.005 (-0.011, -0.001) [4.8%]	-0.101 (-0.147, -0.052)	-0.106 (-0.152, -0.057)
Agreeableness (High vs. Low)	-0.000 (-0.002, 0.002)	-0.106 (-0.153, -0.057)	-0.106 (-0.153, -0.057)
Extraversion (High vs. Low)	-0.005 (-0.011, 0.001)	-0.102 (-0.148, -0.052)	-0.106 (-0.152, -0.058)
Openness (High vs. Low)	-0.000 (-0.003, 0.002)	-0.106 (-0.152, -0.056)	-0.106 (-0.153, -0.057)
Conscientiousness (High vs. Low)	-0.002 (-0.006, 0.002)	-0.105 (-0.151, -0.055)	-0.106 (-0.152, -0.058)
Emotional Stability (High vs. Low)	-0.011 (-0.019, -0.004) [10.0%]	-0.096 (-0.142, -0.046)	-0.106 (-0.151, -0.058)
Marital Status (Married vs. Not Married)	-0.012 (-0.021, -0.004) [11.3%]	-0.094 (-0.140, -0.045)	-0.106 (-0.151, -0.059)
General Health (Good, very good, excellent vs. fair, poor)	-0.007 (-0.013, -0.002) [6.2%]	-0.100 (-0.146, -0.050)	-0.106 (-0.151, -0.058)
N	1,348	1,348	1,348

Notes: All variables are in binary format.

These results are based on the sample of private sector employees and excludes respondents who are employed in the public sector, non-profit sector, working without pay in a family business or farm, and members of the armed forces.

Bold font denotes significant mediators. Confidence intervals (90 percent) are shown in parentheses. % of total effect mediated are shown in square brackets for significant mediators.

4.3. Robustness Tests

4.3.1. The impact of worse psychological distress

I explore the robustness of the main results to using a higher cut-off point on the adolescent psychological distress measure. Individuals who score two standard deviations (5.1) above the mean (4.7) are classified as having high psychological distress, instead of one standard deviation (2.55) above the mean. This results in 4.1 per cent of the sample having high psychological distress, compared to 12.7 per cent when using the lower cut-off point. Table S7 in the Supplementary Materials show that the negative associations between psychological distress and access and participation at age 30-35 are larger compared to the main results in Table 2. This finding supports the hypothesis that individuals with worse mental health problems experience poorer educational and career outcomes which then reduce access to a plan. Similar to before, there is no significant difference in pension participation by mental health states when respondents have access to a plan.

4.3.2. The role of regular savings

It is possible that individuals with poor mental health are less likely to participate in employer sponsored pension plans if they have regular savings. To check whether this is the case, I examine whether the respondent has any checking accounts, savings accounts or money market accounts and funds by early mental health states. As the framing of this particular question may include savings in an employer sponsored pension plan, I run the tests of differences separately for those who report and do not report savings in a pension plan. As shown in Table S8 there is no significant difference in regular savings participation between individuals with and without poor adolescent mental health who have savings in an employer provided pension plan.²⁵ Importantly, adolescents with poor mental health are 5.9 percentage points less likely to report regular savings compared to those with good mental health when they do not have savings in an employer provided pension plan.

4.3.3. The role of risk preferences

Systematic differences between risk preferences among individuals with and without poor mental health could potentially affect retirement savings decisions.

²⁵ An alternative method is to combine participation in an employer provided pension plan and presence of regular savings into one dependent variable. In this case, adolescents with high psychological distress are 9.5 percentage points (significant at the 0.1 percent level) less likely to participate in an employer provided plan or have regular savings.

Economic risk preferences are captured in NLSY97 when the respondents are 26 to 30 years old employing two sequential questions that ask respondents to make hypothetical choices.²⁶ I exclude risk preferences in the mediation analysis due to the large amount of missing values (17%) in this set of variables which further reduce the sample size. As shown in Table S9 however, there is no significant difference in risk preferences between adolescents with high and low psychological distress and no mediation effect. This may be counterintuitive as poor mental health tends to be associated with a range of risky behaviours; however, this finding supports a recent paper that documents no association between poor mental health and revealed (vs. self-reported) economic risk preferences obtained through incentivised money lotteries (Cobb-Clark, Dahmann, and Kettlewell 2020).

5. Discussion

This paper demonstrates a link between poor mental health early in life and retirement savings behaviour in the United States. By employing a nationally representative cohort panel (NLSY1997), this paper provides evidence that adolescent psychological distress predicts lower access to and participation in employer sponsored pension plans among private sector employees. Adolescents (16 to 20 years old) with poor mental health are 4.7 percentage points less likely to have access to and 8.9 percentage points less likely to participate in employer sponsored pension plans when they are 30-35 years old. These results account for the effects of sex, race, year of birth and childhood cognitive ability.

²⁶ In the first question, respondents are asked to choose between two new jobs; the first job will guarantee the respondents' current family income for life while the second job has a 50-50 chance of doubling the respondents' current family income for life and a 50-50 chance of cutting the respondents' current family income by a third for life. If respondents select the first job in this scenario, they are then asked to choose between the first job and another job which has a 50-50 chance of doubling their current family income for life and a 50-50 chance that it would only cut their family income by 20 percent. However, if respondents choose the second job in the first scenario, they are asked to compare the original first job and another job which has a 50-50 chance of doubling their current income and a 50-50 chance of cutting their family income in half. To measure risk preferences, a variable with two categories are created where 1 denotes the lowest risk preference (the respondent chooses the first job with guaranteed current family income in both scenarios) and 0 denotes the highest risk preferences (the respondent chooses the remaining scenarios).

The second category consists of those who choose the first job in the first scenario and the second job in the second scenario. The third category consists of those who choose the second job in the first scenario and the first job in the second scenario.

Poor mental health in adolescence decreases access to a plan which then lowers the probability of participating in an employer sponsored pension plan. There is no significant difference in pension participation rates when individuals with poor mental health have access to plans. If individuals with poor mental health are actively taking the decision to not participate in a pension, we would expect to see a negative association between psychological distress and pension participation even with access to a plan. Moreover, the difference in the proportion of individuals with adolescent psychological distress with and without access to a plan is only 2.6 per cent. This suggests that adolescents with poor mental health are selecting into jobs that are less likely to provide access to retirement benefits later in adulthood. Indeed, the relationship between adolescent mental health and access to a pension plan is largely mediated by educational attainment and employment conditions such as total wages and salary and part time vs. full time status.²⁷ The importance of selection into adverse employment conditions in predicting lower pension participation rates among private sector employees with poor adolescent mental health in the US is a novel contribution of this paper. This finding expands on the work of Bogan and Fertig (2018) by demonstrating that adverse life circumstances, rather than differences in decision-making capabilities, perpetuated by early mental health problems, affects retirement savings.

This paper has some limitations. As mental health is not randomly assigned, the results are largely observational in nature and cannot provide a causal interpretation, however the use of mental health measured before labour force participations helps to address this issue. The pension participation question also captures whether a spouse participates in an employer sponsored pension plan. Hence, for married respondents, the measure captures household participation in plans. Further, the measure of participation in employer sponsored plans is self-reported and I lack objective data about whether and how much respondents save in these plans. Future work could potentially address some of these limitations through the use of administrative-data linkage to provide objective data on pension participation including data on contribution rates. Moreover, further

²⁷ Part-time employee eligibility to participate in a company's retirement plan must comply with the *Employee Retirement Income Security Act (ERISA)* "1,000-hour rule." Employees who have completed 1,000 hours of service in a 12-month period are eligible to participate in any retirement plan that is offered to other employees. This requirement applies to both full-time and part-time employees (Purcell and Staman 2008). For plan years beginning after Dec. 31, 2020, the Setting Every Community Up for Retirement Enhancement (SECURE) Act of 2019 requires employers to allow long-term part-time workers to make elective deferrals to the employer-sponsored 401(k) plan, except in the case of collectively bargained plans. Eligible employees will have completed at least 500 hours of service each year for three consecutive years and are age 21 or older (VanDerhei 2020).

research can investigate how higher unemployment among individuals with poor mental health affects retirement savings participation. Finally, state data through NLSY1997 was inaccessible, but future studies could also understand how pension policy differences across states such as autoenrolment policies affect the mental health gap in pension participation.

Poor adolescent mental health continues to have large and persistent effects on retirement savings behaviour mainly operating through lower levels of education and less favourable employment conditions. Adolescents with poor mental health appear to be at a greater risk of working in jobs that do not provide access to retirement benefits later in life, leading to potentially lower retirement savings and greater financial insecurity in retirement. The role of poor mental health in adolescence as a predictor of lifelong gaps in financial stability has implications on policies that aim to increase the retirement preparedness and financial security of Americans. As the mental health gap in pension participation is largely due to lack of access to plans, policies that encourage employers to set up and expand access to pension plans could potentially address this inequality. Policies such as auto-IRAs for example, require employers to auto-enrol employees into individual retirement accounts but do not require matching contributions from employers so they are less costly for employers to set up.²⁸ However, since employees lose out on matching contributions, auto-IRAs may be particularly disadvantageous for employees with mental health issues who earn less income over their lifespan. Universal occupational pension auto enrolment such as the UK auto enrolment policy which had high compliance rates has been shown to close the mental health gap in pension participation (Arulsamy and Delaney 2020).

²⁸ Auto-IRAs are being implemented in Oregon (OregonSaves), Illinois (Secure Choice), California (Cal Savers), Colorado, Connecticut, Maryland and New Jersey.

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Supplementary Materials

S1: Mental Health Inventory 5 Questions in NLS97

The next questions ask about how often you felt things during the past month. For each statement, please indicate whether you have felt this way all, most, some or none of the time.

How much of the time during the last month have you been a very nervous person?

- 1 All of the time
- 2 Most of the time
- 3 Some of the time
- 4 None of the time

How much of the time during the last month have you felt calm and peaceful?

- 1 All of the time
- 2 Most of the time
- 3 Some of the time
- 4 None of the time

How much of the time during the last month have you felt downhearted and blue?

- 1 All of the time
- 2 Most of the time
- 3 Some of the time
- 4 None of the time

How much of the time during the last month have you been a happy person?

- 1 All of the time
- 2 Most of the time
- 3 Some of the time
- 4 None of the time

How much of the time during the last month have you felt so down in the dumps that nothing could cheer you up?

- 1 All of the time

- 2 Most of the time
- 3 Some of the time
- 4 None of the time

S2: The difference in access and participation by low and high psychological distress states among employed vs. unemployed and public sector vs. private sector groups.

	Low psychological distress	High psychological distress	Difference High – Low [P-value]
Access			
Employed	59.7% (4152)	55.2% (612)	4.5% [0.034]
Unemployed	29.4% (109)	20.0% (20)	9.4% [0.391]
Private sector	55.2% (3008)	48.2% (449)	6.9% [0.006]
Public sector	79.2% (568)	73.0% (89)	6.2% [0.187]
Participation			
Employed	46.0% (4859)	37.6% (718)	8.4% [0.000]
Unemployed	23.6% (754)	10.7% (169)	13.0% [0.000]
Private Sector	42.9% (3453)	33.4% (515)	9.5% [0.000]
Public Sector	64% (619)	52% (98)	12.1% [0.022]

Number of observations are shown in parentheses.

The table does not show differences in pension participation rates specific to those respondents who are employed in the public sector, non-profit sector, working without pay in a family business or farm, and members of the armed forces.

This sample does not reflect the sample used in the main and mediation analyses as it does not account for missing values in the control and potential mediator variables.

The differences between the high and low adolescent psychological groups are tested using a t-test. Standard errors are shown in square brackets.

S3: Age distribution for the 'participation' variable

Age	Observations	Percent %
30	1,359	43.9
31	1,189	38.4
32	448	14.5
33	54	1.7
34	38	1.2
35	11	0.4
	3,099	100

S4: Further explanation on the mediation analysis

The indirect effect for each unit i is estimated

$$\delta_i(t) \equiv Y_i(t, M_i(1)) - Y_i(t, M_i(0)), \text{ for each treatment status } t = 0, 1.$$

This quantity equals the change in the outcome variable corresponding to a change in the mediator from the value, $M_i(0)$ to the value, $M_i(1)$, holding the treatment status at t . The treatment status in this case is whether a respondent experienced high adolescent psychological distress. $M_i(0)$ is the value that would be realised under low psychological distress and $M_i(1)$, is the value that would be observed under high psychological distress. If poor mental health does not have any influence on the mediator, the effect of mediation is zero.

The direct effect of the treatment can be defined as:

$$\vartheta_i(t) \equiv Y_i(1, M_i(t)) - Y_i(0, M_i(t)), \text{ for each treatment status } t = 0, 1.$$

The direct effect of the mediation analysis is considered as the change in the outcome variable corresponding to a change in the treatment status (i.e., $t = 0$ vs. $t = 1$) while holding the mediator constant at $M_i(t)$. The direct effect indicates all other mechanisms from the treatment to the outcome, except the one through the specific mediator, M_i . Since we cannot observe the actual outcome and counterfactual outcome at the same time as adolescent mental health is not randomised, the *average* causal mediation effect (ACME) $\bar{\delta}(t)$ and the *average* direct effect (ADE) $\bar{\vartheta}(t)$ are estimated, which are the population average of the causal mediation (indirect) and direct effect as follows:

$$\text{ACME: } \bar{\delta}(t) \equiv E(Y_i(t, M_i(1)) - Y_i(t, M_i(0))),$$

$$\text{ADE: } \bar{\vartheta}(t) \equiv E(Y_i(1, M_i(t)) - Y_i(0, M_i(t))),$$

S5: A comparison of key characteristics by psychological distress in the estimation sample and the sample available with no missing values on psychological distress

Variables	Estimation Sample	Sample available for psychological distress	Test of Difference (p-value)
High Adolescent Psychological Distress (16-20 years)	12.7%	13.5% [8,019]	0.025
Sex			
Female	45.7%	49.1% [8,019]	0.000
Race			
Black, Hispanic, Asian, Others	38.6%	41.8% [8,019]	0.000
Adolescent Cognitive Ability (1 SD below the mean)	39.4%	42.1% [8,019]	0.000
Personality Traits (24-28 years)			
Low Agreeableness	40.1%	36.6%	0.000
Low Conscientiousness	49.0%	52.5%	0.000
Low Emotional Stability	36.8%	36.2%	0.275
Low Openness	36.7%	34.0%	0.367
Low Extraversion	56.3%	60.0% [8,019]	0.000
Age 30			
Education – Less than a 4 year college degree	67.6%	67.8% [7,056]	0.759
Total wages and salary in the previous year (Bottom 25 th percent)	20.3%	25.5% [6,094]	0.000
Part Time Employment	29.7%	36.0% [6,098]	0.000
Industry – Services (vs. Goods)	17.4%	15.2% [7,256]	0.000
Smoked in the past 30 days (proxy for time discounting)	31.1%	30.3% [7,076]	0.144
Marital Status – Not married	57.5%	60.0% [7,099]	0.000
Subjective General Health (Fair & Poor)	10.1%	11.5% [7,114]	0.000
Access to a retirement plan	56.5%	58.3% [4,905]	0.011
Participation in an employer sponsored pension plan	45.5%	40.9% [6,943]	0.000
N	3,099		

All variables are in binary format.

Column 1 is the analyses' sample based on the sample of private sector employees and excludes respondents who are employed in the public sector, non-profit sector, working without pay in a family business or farm, and members of the armed forces. Column 2 captures the sample in the dataset with no missing values on the psychological distress measure.

The 'participation' variable has a larger sample size than the 'access' question as the 'participation' variable is not limited to respondents who had or have a valid employer and also captures whether a spouse participates or not. Also, since the access question is captured every round, there is a higher number of non-interviews as opposed to the 'participation' question which is collected over several rounds.

Cognitive ability is measured in 1997 & 1998 (13 to 17 years old) using the computer adaptive Armed Services Vocational Aptitude Battery (ASVAB) which combines math and verbal scores from four key subtests (Mathematical Knowledge, Arithmetic Reasoning, Word Knowledge and Paragraph. Comprehension). Personality traits are classified as low if respondents score below the mean.

Education is classified as at least having a 4 year college degree or more vs. all other respondents.

Total wages and salary are classified as 0 if respondents earn in the bottom 25th percentile and 1 otherwise.

Industry type is re-classified according to the BLS breakdown of goods vs. service industries. Goods-producing industries cover natural resources and mining, construction and manufacturing. Service-producing industries cover trade, transportation and utilities, information, financial activities, professional and business services and education and health services (and social assistance).

Previous values are used to impute missing values in subjective general health, total wages and salary and industry, while the mean values of the sample are used to impute missing values in childhood cognitive ability and personality traits. Differences between the analysis sample without imputation and full sample with the analysis sample are shown in parentheses. Square brackets denote the sample size available for each variable in Column 2 with available data on the psychological distress measure.

S6: The proportion of respondents with high and low adolescent psychological distress by access to a plan

	Low psychological distress	High psychological distress
All	87.4% (2,707)	12.7% (392)
Access to a plan	88.5% (1,549)	11.5% (202)
No access to a plan	85.9% (1,158)	14.1% (190)

Number of observations are shown in parentheses.

These results are based on the sample of private sector employees and excludes respondents who are employed in the public sector, non-profit sector, working without pay in a family business or farm, and members of the armed forces.

S7: The relationship between adolescent (16-20) psychological distress (employing a higher cut off point) and access to, participation in and the take up rate of employer sponsored pension plans

	Access to a plan at age 30-35	Participation in a plan at age 30-35	Participation in a plan at age 30 with access at age 30-35	Participation in a plan at age 30 without access at age 30-35
Adolescent psychological distress	-0.118*** (0.044)	-0.125*** (0.044)	-0.022 (0.063)	-0.111*** (0.046)
Female	-0.029 (0.018)	0.019 (0.018)	-0.010 (0.023)	0.086*** (0.021)
Non-White	-0.043** (0.019)	-0.108*** (0.019)	-0.090*** (0.024)	-0.083*** (0.021)
Lower cognitive ability	-0.145*** (0.018)	-0.153*** (0.018)	-0.110*** (0.024)	-0.056*** (0.021)
Year of Birth				
1981	0.009 (0.028)	-0.003 (0.028)	0.012 (0.036)	-0.028 (0.032)
1982	0.011 (0.028)	0.018 (0.028)	0.028 (0.037)	-0.002 (0.032)
1983	0.037 (0.028)	0.018 (0.028)	0.010 (0.036)	-0.009 (0.032)
1984	0.056** (0.028)	0.014 (0.028)	0.011 (0.036)	-0.048 (0.033)
N	3,099	3,099	1,751	1,348
R-squared	0.030	0.043	0.030	0.037

These results are based on the sample of private sector employees and excludes respondents who are employed in the public sector, non-profit sector, working without pay in a family business or farm, and members of the armed forces.

The analysis employs baseline mental health captured in 2000 (16 to 20 years old) and access to and pension participation in an employer's provided plan in an employer at age 30-35.

Cognitive ability is measured in 1997 & 1998 (13 to 17 years old) using the computer adaptive Armed Services Vocational Aptitude Battery (ASVAB) which combines math and verbal scores from four key subtests (Mathematical Knowledge, Arithmetic Reasoning, Word Knowledge and Paragraph. Comprehension). Missing values on cognitive ability are imputed based on the mean of the sample.

The reference categories are as follows: Female vs Males, Non-White vs. White, Lower cognitive ability vs. Higher cognitive ability, 1981-1984 vs. 1980.

Standard errors are shown in parentheses. *, **, *** indicates significance at the 10, 5 and 1 percent levels respectively.

S8: Test of difference for overall savings participation

	Low psychological distress	High psychological distress	Difference High – Low) P-value)
All	86.1%	80.0	-6.1 % (0.002)
Participates in an employer sponsored pension plan	96.7%	95.1%	-1.6 % (0.332)
Does not participate in an employer sponsored pension plan	76.3%	70.4%	-5.9 % (0.054)

These results are based on the sample of private sector employees and excludes respondents who are employed in the public sector, non-profit sector, working without pay in a family business or farm, and members of the armed forces.

S9: Mediation results for economic risk preferences

Economic risk preferences (Low vs. High)	Indirect Effect & % of Total effect mediated	Direct Effect	Total Effect	N
Access to a plan at age 30-35	-0.000 (-0.001,0.001)	-0.047 (-0.090,-0.001)	-0.047 (-0.090,-0.001)	2,954
Pension participation in a plan at age 30-35	-0.000 (-0.002,0.001)	-0.085 (-0.128,-0.039)	-0.086 (-0.129,-0.040)	2,954
Pension participation in a plan without current access at age 30-35	-0.001 (-0.003,0.001)	-0.112 (-0.159,-0.061)	-0.0112 (-0.160,-0.061)	1,280

Bold font denotes significant mediators. Confidence intervals (90 percent) are shown in parentheses. % of total effect mediated are shown in square brackets for significant mediators.

Economic risk preferences are captured in NLSY97 when the respondents are 26 to 30 years old (i.e. 2010) employing two sequential questions that ask respondents to make hypothetical choices.

In the first question, respondents are asked to choose between two new jobs; the first job will guarantee the respondents' current family income for life while the second job has a 50-50 chance of doubling the respondents' current family income for life and a 50-50 chance of cutting the respondents' current family income by a third for life. If respondents select the first job in this scenario, they are then asked to choose between the first job and another job which has a 50-50 chance of doubling their current family income for life and a 50-50 chance that it would only cut their family income by 20 percent. However, if respondents choose the second job in the first scenario, they are asked to compare the original first job and another job which has a 50-50 chance of doubling their current income and a 50-50 chance of cutting their family income in half. To measure risk preferences, a variable with two categories are created where 1 denotes the lowest risk preference (the respondent chooses the first job with guaranteed current family income in both scenarios) and 0 denotes the highest risk preferences (the respondent chooses the remaining scenarios). The second category consists of those who choose the first job in the first scenario and the second job in the second scenario. The third category consists of those who choose the second job in the first scenario and the first job in the second scenario.