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Netspar

Network for Studies on Pensions, Aging and Retirement

NETSPAR ACADEMIC SERIES

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DP 05/2022-016

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April 2022

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Highlights

- We exploit longitudinal data on subjective job loss expectations to estimate the causal effect of job loss on health in the short run.
- A wide variety of health measures is analyzed, including mental and physical health as well as subjective and more objective measures.
- Unexpected job loss does not lead to health deterioration and even improves mental health measured by headaches, sleeping, and anxiety.
- The results suggest that reduced stress from work is bigger than the increased financial stress upon job loss in the Netherlands.

[1] We thank Joshua Keet for great research assistance. Been and Knoef gratefully acknowledge financial support from Instituut Gak. Suari-Andreu gratefully acknowledges financial support from Netspar. We thank seminar participants at the Netspar Online Pension Day 2020, the Dutch Economists Week 2020, the Society of Economics of the Household 2021, the Spanish Health Economics Association 2021, the European Society for Population Economics 2021, the American Society for Health Economists 2021, the European Association of Labour Economists 2021, and the IZA Workshop "Economics of Time Use and Mental Health: Stress, Sleep, Fatigue and Employment". We benefitted from discussions with Alexander Ahammer, Rob Alessie, Michele Belot, Wiljan van den Berge, Sonia Bhalotra, Joan Costa-Font, Pilar García Gómez, Osea Giuntella, Jan Kabátek, Ana Moreno-Maldonado, Astrid Pape, Meghan Skira, Judit Vall Castelló, Katharina Werner, Yi Zhang, Mariana Zerpa, and Eelco Zijlstra.
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Abstract

This paper provides new evidence on the effect of job loss on health. Using unique micro level panel data from the Netherlands with detailed information on health measures, employment, and job loss expectations, we estimate the immediate effect of unexpected job loss on health. We find no evidence for decreases in health, either physical or mental, upon job loss, but clear evidence for immediate reductions in headaches and fatigue. Our results suggest that the immediate effects of reduced work stress are larger than the immediate increase in financial stress from job loss.

JEL-codes: D84, I10, J22, J60

Keywords: Health, Job loss, Expectations

1 Introduction

It has been well-documented that job loss often has a detrimental effect on income (e.g. Stevens, 1997). Individuals usually suffer an immediate income drop upon job loss which, depending on the persistence of the job loss and the scarring effect, may also lead to permanent effects (e.g. Arulampalam, 2001). A vast amount of literature has studied the effect of job loss on consumption and generally finds substantial drops in consumption upon job loss.[5] Parallel to analyzing the consequences of job loss on income and consumption, studies have started analyzing the consequences of job loss on health. This is important as potential detrimental effects of job loss on health may further exacerbate the problems of employability of the unemployed and their general well-being. Furthermore, this may have severe consequences for the public finances as deteriorating health may increase the costs of job loss beyond the increase in expenditure on unemployment insurance and the decrease in tax receipt and contributions (Kuhn et al., 2009). This has become even more important since the COVID-19 pandemic, which has a large joint impact on unemployment, public costs of healthcare, and social insurance.

Job loss is a disruptive life event which can have far reaching consequences on people's lives. Previous research has shown effects on short- and long-term income (Arulampalam, 2001), consumption (Stephens, 2004), time use (Krueger & Mueller, 2012b), human capital (Mroz & Savage, 2006), children's human capital (Stevens & Schaller, 2011), fertility decisions (Currie & Schwandt, 2014), and divorces (Charles & Stephens, 2004). In addition, there is a large strand of literature that shows the consequences of job loss for health. It is generally found that the unemployed have worse health compared to those who are employed.[6] However, it is hard to interpret these results causally due to potential issues regarding reverse causality and omitted variable bias (Burgard, 2007). For example, employers may lay off unhealthy employees first which raises issues with reverse causality. Similarly, omitted variables bias may be an issue in the presence of a sick family member which affects both own health and effort at work.

More recent studies have tried to estimate the causal effect of unemployment on health. This literature generally exploits variation in unemployment from exogenous events such as firm

[5] Dynarski & Sheffrin (1987), Gruber (1997), Browning & Crossley (2001, 2008, 2009), Stephens (2004), Aguiar & Hurst (2005), Krueger & Mueller (2012), Aguiar et al. (2013), Michelacci & Ruffo (2015), Kroft & Notowidigdo (2016), and Hendren (2017).
[6] Clark and Oswald, 1994; Blanchflower, 1996; Korpi, 1997; Winkelmann and Winkelmann, 1998; Laporte, 2004; Hamilton, Merrigan & Dufresne, 1997.

closures and mass lay-offs.[7] A drawback from this approach is that conclusions may not be generalizable to the population as the firms analyzed may have very specific characteristics and types of workers. Also, workers may anticipate a mass layoff up to some extent which is especially problematic if the healthy workers leave the firm prematurely. Other studies estimate effects using matching (e.g. Browning et al., 2006; Marcus, 2014), instrumental variables (IV) (e.g. Gathergood, 2013), or exploit the longitudinal nature of the data (e.g. Björklund, 1985; Böckerman & Ilmakunnas, 2008; Romeu Gordo, 2009; Popovici & French, 2013). However, all three approaches rely on strong assumptions.[8] A different strand in the literature does not focus on actual job loss but on job insecurity and shows that possible job loss already induces negative effects on health (Green, 2011; Caroli & Godard, 2016; Suari-Andreu et al., 2021). However, also here strong assumptions are required to estimate causal effects.[9]

Complementary to the identification strategies in the existing literature, in the current paper we exploit unique Dutch micro panel data on employment, health, and people's subjective job loss expectations to estimate the causal effects of job loss on health. Compared to the existing literature, we make three substantive contributions. Firstly, we differentiate between expected and unexpected job loss by building upon the method by Stephens (2004). By estimating the effects of unexpected job loss we exploit exogenous variation and thus overcome issues related with reverse causality. To that end, we exploit the longitudinal nature of our data which, in addition, allows controlling for a potential omitted variables bias. To our knowledge, the only existing paper that raises the issue of the importance of differences in the expectancy of job loss is Michaud et al. (2016), who estimate the effect of job loss on health while controlling for job loss expectations. Different from Michaud et al. (2016), we build upon the approach of Stephens (2004) and measure job loss shocks by subtracting the job loss expectation from the actual job loss outcome. This is the is the first paper to apply this method to estimate the health effects of unemployment. This approach allows us to analyze the immediate short-run health effects of a job loss, which have so far been understudied in the literature. Aforementioned studies that analyze the effect of job loss on health

[7] Eliason & Storrie, 2009; Kuhn et al., 2009; Böckerman & Ilkmakunnas, 2009; Kassenboehmer & Haisken-DeNaw, 2009; Deb et al., 2009; Salm, 2009; Schmitz, 2011; Browning & Heinesen, 2012; Classen & Dunn, 2012; Bratsberg et al., 2013; Riumallo-Herl et al., 2014; Schiele & Schmietz, 2016.

[8] Matching studies assume that individuals are similar based on observed characteristics. Studies using fixed effects for causal inference assume that it is sufficient to condition on unobserved heterogeneity. The IV study assumes that lags of unemployment is a valid and relevant instrumental variable.

[9] Both Caroli & Godard (2016) and Suari-Andreu et al. (2021) use an IV-strategy assuming that cross-country heterogeneity in employment protection legislation and the extent to which this heterogeneity explains cross-country differences in job insecurity can be used to estimate causal effects of job loss on health.

focus most often on medium- and long-run effects. Moreover, the method of Stephens (2004) allows us to analyze both unexpectedly losing a job and unexpectedly keeping a job. The latter has never been studied in the literature and can potentially provide important insights in the mechanism of job loss and health.

Secondly, although a wide variety of health measures is analyzed in the literature, including both subjective and objective health measures as well as physical and mental health measures, many studies focus only on one or few particular health outcomes.[10] This may be an important determinant of the lack of consensus in the literature on the effects of unemployment. A recent meta-study on the causal effect of retirement on health indicates that much of the different conclusions drawn in the literature can be explained by the use of different types of health indicators (Knoef et al., 2020). Also, many studies use health measures that only identify severe changes in health, such as hospitalization, doctor diagnoses, and mortality (see footnote 10). Such measures are unable to identify smaller changes in health that are nonetheless important to people's day-to-day wellbeing. Especially when studying short run effects, such as in this paper, doctor diagnoses and hospital visits may not be evident. Therefore, we study a wide array of health measures available in our data in order to investigate how results change depending on the measure considered. This includes health measures that are able to describe finer and less severe changes in health than measured by hospitalization and mortality, such as headaches and fatigue. We use a combination of health measures including physical, mental, doctor diagnoses, medication, doctor visits, and health behavior. Since we are interested in immediate effects of job loss on health, we focus on non-chronic diseases.

A final contribution of our paper is that the effect of job loss on health has not been studied for the Netherlands before. Therefore, we add to the variety of institutional contexts studied in the

[10] Several studies use only a general health measure that includes both physical and mental health (i.e. Romeu Gordo, 2006; Salm, 2009; Böckerman & Ilmakunnas, 2009; Schmitz, 2011; Schaller & Stevens, 2015; Schiele & Schmitz, 2016). Other studies focus on physical health and exploit the availability of more objective measures analyzing the consequences of unemployment for BMI (Ruhm, 2000; Böckerman et al., 2007; Charles & DeCicca, 2008; Jónsdóttir & Ásgeirsdóttir, 2014), BMI in combination with smoking behavior (Ruhm 2005; DeCicca & McLeod 2008; Marcus, 2014; Falba et al., 2005; Deb et al., 2011), cholesterol and blood pressure (Black et al., 2015), illegal drug use (Platt, 1995; French, 2001; DeSimone, 2002; Compton et al., 2014), hospitalization or visiting a GP/specialist (Browning et al., 2006), or, more recently, biomarkers (Michaud et al., 2016). Additionally, several consider mortality as an objective physical health outcome (Sullivan & von Wachter, 2009; Eliason & Storrie 2009; Browning & Heinesen 2012). Studies focusing on mental health usually depend on more subjective measures such as stress (Fenwick and Tausig, 1994), social identity (Kasl & Jones, 2000), feelings of shame and guilt (Björklund et al., 2015), or anxiety and depression scales (Frese & Mohr, 1987; Stankunas et al., 2006; Gathergood, 2013; Álvaro et al., 2019). Some studies have attempted to analyze the effect of unemployment on more objective measures of mental health using sleeping behavior (Van Cauter & Spiegel, 1999; Ferrie et al., 2007; Gangwisch et al., 2007; Patel & Hu, 2008; King et al., 2008; Antillón et al., 2014), hospitalization for stress-related diseases (Browning et al., 2006), or internet search behavior (Tefft, 2011).

literature. In contrast with the study most similar to ours, *i.e.* Michaud et al. (2016), who analyze US households that are above 50 years of age, we analyze the consequences of unexpected job loss for those under and above the age of 50 in a framework of relatively high unemployment benefits and high health insurance coverage. This is a particularly interesting context since, different from the US, lack of healthcare insurance is unlikely to explain a potential effect of job loss.

Our estimations results indicate no significant immediate drops in health following an unexpected job loss. However, we find an immediate decrease in headaches and fatigue upon job loss. These results suggest that the stress from work may be larger than the negative health effects of a job loss. Ancillary empirical analyses shows that those who become unemployed report less work satisfaction the year prior to job loss on average, which is in line with our suggested mechanism of the effect of job loss on health. Finding no immediate adverse effects of job loss on health is consistent with the literature that suggests that recessions are good for (mental) health (Ruhm, 2000; Miller et al., 2009; Ariizumi & Schirle, 2012; Avdic et al., 2021) although evidence is mixed (Ruhm, 2015). Avdic et al. (2021) explain show that worries about potential future job loss and associated income drops are generally bigger than the actual income drops from unemployment.

Two points should put our results in perspective. Firstly, the effect of job loss on health may be different if mid- and long-run consequences of a job loss are taken into account, i.e. including chronical diseases. For instance, evidence form Avdic et al. (2021) suggests that recessions have long-run consequences on mental health, even after the economy has recovered. Secondly, the results are likely to be driven by the relatively generous social insurance programs in the Netherlands. This is in line with prior literature suggesting that the consequences of job loss on health are more severe in the US than in European countries with more generous social insurance programs (i.e. Jäntti et al., 2000; Rodriguez, 2001; Bambra & Eikemo, 2009; McLeod et al., 2012; Riumallo-Herl et al., 2014). These cross-country differences suggest that welfare state institutions, in particular generous unemployment insurance and universal health care access, can mitigate the effect of job loss on health.

The remainder of the paper is structured as follows. We outline the institutional framework regarding unemployment- and health insurances in the Netherlands in Section 2. We present the data in Section 3. In Section 4, we describe our econometric model. The estimation results are

presented in Section 5. Finally, we conclude our paper in Section 6 and explain why our results are of interest for future socioeconomic policy.

2 Institutional framework

2.1 Unemployment benefits

People who become unemployed usually have the right to claim unemployment insurance (UI) benefits in the Netherlands. There is a right to claim UI benefits if a person worked at least 26 of the last 36 weeks and if the job loss is not culpable to the employee. Culpable reasons to become unemployed are mostly instant dismissals by the employer and voluntary quits. Every paid employee is automatically covered by UI benefits.

The duration of UI benefits depends on work history. The minimum duration is three months. This is extended by one month for every year worked up to a maximum of 38 months for those who worked at least 4 out of the last 5 years. As from 2016, the maximum of 38 months has been reduced to 24 months. The accumulation of months has also been made less generous: one month for every of the first 10 years of work and half a month for every year of work beyond 10 years.

The first two months, the UI benefits replace 75% of the last earnings with an absolute maximum of about 3,100 euros. From the third month on, the replacement rate is reduced to 70% of the last earnings with an absolute maximum of about 2,900 euros. Prior to 2016, replacement rates were 70% for the total duration of UI benefits. In some specific sectors (e.g. agriculture, industry, construction), collective agreements require employers to complement UI benefits to a 100% replacement rate. The duration of the employer's supplement depends on the collective agreement in the sector. Upon job loss, contributions to occupational pensions are automatically stopped or reduced, depending on the sector's collective agreement.

When UI benefits are exhausted, people can claim asset- and income-based means-tested welfare benefits that guarantee a minimum standard of living (about 1,100 euros per month). In addition, older unemployed have two extra options to receive extended benefits during unemployment. First, those born before January 1st 1965, who become unemployed after the age of 50 may be eligible for IOAW benefits after the exhaustion of regular UI benefits. These benefits complement household income up to the subsistence level for those households that fall below this level. Hence, eligibility is means-tested based on household income, but assets are not taken into account (that

is the main difference compared to welfare benefits). Second, persons who become unemployed after the age of 60, and received UI benefits for a minimum of 3 months, can receive IOW benefits after the exhaustion of regular UI benefits. These benefits are at most 70% of the minimum wage, depending on the level of income before unemployment. Compared to IOAW benefits, IOW benefits do not take into account household income, but only personal income. IOW was initially introduced in 2009 as a temporary arrangement to alleviate job finding difficulties among older unemployed during the Great Recession. However, in 2014 and 2019 the arrangement has been extended for four years.

The right to claim benefits comes with the obligation to apply for jobs. Mandatory job-search requirements apply to claimants regardless of age in order to increase the probability of finding a job. Exemptions are made for those who are within one year of their statutory retirement age, informal caretakers, voluntary workers (under some conditions), and starting entrepreneurs. Exceptions are made because they may increase the probability to find a job. Not abiding by the mandatory job-search requirements can have severe consequences that can range from financial sanctions to losing the right to claim UI benefits. After some time, people even have to accept all job offers irrespective of their educational level.

From an international perspective, Dutch UI benefit may appear relatively generous. OECD (2019a) shows that the net replacement rate for the first 2 months of job loss is one of the highest in the OECD and is about 30, 40, and 15 percentage points higher than in the U.S., U.K., and Germany, respectively. Despite the relative generosity of UI benefits, Been et al. (2021) show that total non-durable consumption drops significantly following a job loss in the Netherlands although the effect is small (about 5%).

2.2 Health insurance

The Netherlands has a relatively high per capita spending on health from an international perspective. In Europe, only Norway, Germany, Austria, and Sweden spend more on health per capita than the Netherlands, according to the OECD (2019b). In 2017, 10.1% of the GDP was spent on health, which is slightly above the EU average of 9.8%. The absolute spending is € 3,79 per person in 2017, which is, again, above the EU average of €2,884.

All Dutch citizens are required to at least purchase a basic package of statutory health insurance from a private insurer. The price of the basic insurance package is the same for everyone (premium differentials are prohibited) and insurers are required to accept all applicants for the basic package in order to avoid cream skimming. The negative financial effect of insurers of accepting applicants with more risk is ex-post financed by a fund regulated by the government. The health insurance standardly includes physician/general practitioner, home nursing, hospital and mental health care, as well as prescription drugs. Specialists are not included in the basic health insurance. The insured pay premiums, annual deductibles which can be chosen *a priori* (the minimum deductible is max. €385 per year and can be deliberately increased by a €100 per year with a maximum deductible of €885 per year), and coinsurance or copayments on selected services and drugs. The government finances the coverage for children up to age of eighteen. The financing of the health care system is primarily public, through premiums, tax revenues, and government grants. Hence, the accessibility of health care is relatively high in this system and out-of-pocket health spending is internationally relatively small. Therefore, job loss should have little to no effect on the access to health care in the Netherlands and access to health care is unlikely to be an explanation of potentially negative effects of job loss, and income loss more generally, on health.

Those households with a relatively low income can receive a monthly subsidy for their health insurance (i.e. *zorgtoeslag*). This subsidy is means-tested and households should have a gross income below €35,116 per year (2017) and household wealth (including wealth accumulated through homeownership) of no more than €132,752 (2017). The exact amount of the subsidy depends on the households' gross income. Those households with a gross income of less than €20,000 per year, receive the maximum subsidy of €170 per month (2017). The average price of basic health insurance with a maximum deductible of €385 was €109.62 per month in 2017.[11] This means that low-income households can fully finance their basic health insurance premium plus (part of) the premium for extra health insurance through the subsidy. This ensures high accessibility of health care in the Netherlands, including low-income households.

3 Potential mechanisms

Due to the particular institutions regarding unemployment insurance and health insurance, financial stress from job loss and lack of access to health care are less likely to explain negative effects of

[11] https://www.zorgwijzer.nl/zorgverzekering-2017/zorgverzekering-2017-premies-bekend-overzicht

job loss on health in the Netherlands. This is in line with Wanberg et al. (2020) who show that the perceived generosity of UI benefits are associated with lower time pressure and better mental health in the US, Germany, and the Netherlands. However, there are still a few mechanisms that can potentially explain both negative and positive effects of job loss on health.

Firstly, job loss might negatively affect mental health if searching for a job induces stress (Price et al., 1992). Since, job search is mandatory and monitored by the Work Office UWV in the Netherlands some unemployed might face an increased level of stress. However, this level of stress is likely to be higher with less generous unemployment benefits in terms of replaced income and duration of the benefits. Secondly, job loss might negatively affect mental health if there are certain mental health benefits from work (Modini et al., 2016). Loosing such mental health benefits from work upon job loss can reduce mental health. For example, explained by losing the daily structure of working, losing self-confidence of having work, and the stigma associated with unemployment. Thirdly, job loss might negatively affect physical health if there are certain positive physical aspects to the job such as the necessity to walk and/or exercise (Penedo & Dahn, 2005). However, such effects are likely to be very particular and depending on the nature of the lost job.

Contrasting these potential mechanisms for negative effects of job loss on health, an improvement in health upon job loss is possible if job loss leads to a reduction in work-related stress. Such job stress is common and often related to burn-outs and bore-outs and can have multiple triggers related to (lack of) motivation, supervision, rewards, interpersonal relations, working conditions, achievement, recognition, responsibility, advancement, and autonomy (Bakker & Demerouti, 2014). Also, job loss implies an increase in leisure time which can be devoted to healthy behavior such as increases in sleeping/resting and exercising. Although there is some empirical evidence that unemployment is related to more exercising, most evidence indicates that much of the additional non-work time available is spent on sleeping/resting and watching TV. For empirical evidence on US households, see Burda & Hamermesh (2010), Krueger & Mueller (2012a), and Aguiar et al. (2013). For empirical evidence on households from 14 different countries (the Netherlands not included), see Krueger & Mueller (2012b). For empirical evidence on Dutch households, see Been et al. (2021). Krueger & Mueller (2012a; 2012b) combine time use information with measures of subjective well-being and find that unemployment decreases (increases) fatigue (time spent on resting/sleeping).

Aforementioned mechanisms can also differ by the degree of expectedness of the job loss. For example, if the job loss is foreseen, households may use precautionary savings to smooth consumption (consistent with the Permanent Income Hypothesis) which would ease the financial stress from job loss. Similarly, if job loss is foreseen, households may already adjust their behavior regarding stress from work prior to losing the job by, for example, use up spare days, work fewer extra hours, take up fewer new projects. Hence, the degree of expectedness of job loss determines the smoothing of both consumption and work hours which make the effect of job loss on health through financial stress and work stress potentially smaller.

4 Econometric model

We largely follow the empirical framework of Stephens (2004) and estimate the following regression equation for individual *i* at time *t*:

$$\Delta y_{it} = \beta_0 + \beta_1 jobloss_{it} + \Delta \boldsymbol{X'}_{it}\beta_2 + \boldsymbol{t'}_t\beta_3 + \varepsilon_{it}, \qquad (1)$$

where y_{it} is a health outcome, $jobloss_{it}$ is a dummy variable that takes value 1 if the individual suffers an involuntary job loss between $t-1$ and t,[12] $\boldsymbol{X'}_{it}$ is a vector of control variables, $\boldsymbol{t}_t$ is a vector of time dummies and ε_{it} is the corresponding error term. Following Stephens (2004), $\boldsymbol{X}_{it}$ includes marital status and number of children in the household. As in Stephens (2004), we include age dummies in levels. β_1 estimates the change in health upon job loss. In our baseline analysis we estimate Equation (1) using a linear estimator. Standard errors are clustered at the individual level. We use non-linear estimators to check the sensitivity of the results (see Section 6.3).

Equation (1) does not differentiate between expected and unexpected job loss. Therefore, we re-estimate it by substituting $jobloss_{it}$ by:

$$shock_{it} = [jobloss_{it} - E_{it-1}jobloss_{it}], \qquad (2)$$

where E_t is an operator denoting the expectations an individual forms conditional on the information available at $t-1$. Therefore, $shock_{it}$ measures the job loss shock, *i.e.* the extent to which a job loss outcome differs from the expectation generated in the previous period. This shock

[12] Job loss is defined as having paid employment at time *t-1* and being in unemployment at time t after involuntary job loss. Therefore, job loss does not include persons who stopped working because of health issues as these persons report to be sick or disabled. Especially, since sickness and disability benefits are more generous than unemployment benefits, respondents who are in fact sick or disables are more likely to receive such benefits and report being in sickness/disability. This ensures that we do not capture reverse causality from health shocks to job loss shocks. Also, voluntary job loss is exempted from our data.

takes the values in the interval [0, 1] if $jobloss_{it} = 1$ and in the interval [-1, 0] if $jobloss_{it} = 0$. In the first case it measures unexpected job loss while in the second it measures unexpected job stay. Since we are particularly interested in the effects of job loss, we also estimate Equation (1) using the shock as a regressor but considering job losers only, i.e. setting $shock_{it} = 0$ if $jobloss_{it} = 0$ and thus only considering the interval [0,1] for the shock variable. Additionally, we separately estimate the effects of unexpected job stay which allows analyzing the symmetry between unexpected job loss and unexpected job stay.

Applying the approach of Stephens (2004) has the advantage of solving identification problems related with reverse causality and omitted variables bias. Reverse causality between job loss and health may be present because a deteriorating health may be a reason to lay off a worker. However, by estimating Equation (1) using (2), we look at the unexpected component of the layoff. Job loss due to a declining health status is likely to be foreseen and therefore would not affect the estimation results. Additionally, the institutional framework in the Netherlands limits the possibility of contemporaneous effects of health on job loss. Upon facing a health shock, employees are granted a maximum of 2 years of sickness benefits (in most collective employment agreements income is fully replaced during the first year) in the Netherlands. During this period, employers are legally not allowed to get rid of the sick employee and need to pay (part of) the sickness benefits. Sick employees have no incentive to quit the job before recuperating and/or finding a new job. Therefore, we expect that such potential reverse causality from health shocks to unexpected job loss does not pose a threat to our identification. Moreover, Garcia-Gomez et al. (2013) empirically show that sudden (unforeseen / unexpected) health shocks decrease the probability of employment by only 7% in the Netherlands.

Regarding omitted variables bias, Equation (1) is estimated in first-differences (FD) which controls for all unobserved time-invariant within-person heterogeneity that could cause an omitted variable bias. This is specifically important in our case, as both the dependent variables (i.e. health) as well as job loss expectations might be affected by the degree of optimism/pessimism of the individual. Using within-person estimation we control for such optimism or pessimism as long as it is constant over time. Regarding time variant shocks that may influence both job loss and health (e.g. a serious sickness of a child), we argue that it is difficult to fire employees suddenly. If an employee

disfunctions because of these kinds of shocks, there will be warnings and we assume this is incorporated in the job loss expectations.

A final potential threat to the causal interpretation of our results is potential non-random attrition in survey data. Attrition is found to be relatively small in the LISS panel compared to other survey-based panels (Lugtig, 2014). In our case, attrition may be problematic if more unhealthy persons leave the data thereby underestimating the effect of job loss on health. To empirically test the existence of attrition, we perform an empirical check by re-estimating Equation (1) with a selectivity dummy that indicates whether a person remains in the data for at least one more wave. We find this dummy to be non-significant in virtually all estimates of health measures (not reported, but available upon request) indicating that our approach does not suffer from non-random attrition in health measures.[13]

5 Data

5.1 Sample selection

We use data from the LISS panel (Longitudinal Internet Studies for the Socia sciences) provided by CentERdata. The LISS Core Study consists of about 4,500 households representative of the Dutch population and it is run every year since 2008. The LISS Core Study is available for every month of the year and includes information on job status. We supplement the LISS core data with an additional health module that contains detailed information on numerous measures of health, including both subjective and more objective measures of health. This module is available for the years 2008-2020 and is fielded each year in the month of November. The information on subjective job loss expectations are taken from the Income module which is a yearly survey available 2008-2020 and fielded in July. We align the Core Study with the Income study by using the July questionnaire for the Core Study. This introduces a small time lag of three months between the point at which we measure a job loss and the point at which we measure health. Since this is a small time lag, it still allows us to capture the short-term health effects of a job loss.

To implement our empirical strategy, we make the following selection: we keep persons who are aged 25 to 64, who are observed for at least two periods, who are employed or report to be unemployed after involuntary job loss since the previous wave, and who have no missing data on

[13] We only find a small negative effect for smoking of -0.01 which is significant at the 10%-level.

health. This selection leaves out persons who report receiving sickness or disability benefits after job loss which rules out reverse causality running from health to job loss. This leaves us with about 28,000 individuals in the sample and about 17,000 wave-to-wave observations after taking first differences, which we use to calculate changes in employment status. For a detailed overview of summary statistics for the variables used in the paper, we refer to Table 1.

5.2 Health measures

Out of the wide range of health measures available in the LISS data, we select only those health measures that are likely to be immediately affected by job loss. This means that we do not report health measures related to chronic diseases. To analyze the full spectrum of health effects, we consider both objective and subjective measure of health as well as measures of physical and mental health. Our list of health variables includes thus a measure of subjective overall health, self-reported measures of physical and mental health, as well as doctor's diagnoses, medicine intake, medical visits, and two behavioral variables (smoking and drinking). Summary statistics for all health variables are reported in Table 1, and for a detailed overview of the questions used to elicit health measures we refer to Appendix A.

To describe health differences between employed and unemployed individuals, Table 2 shows OLS estimates of unemployment on the different health measures. Column 1 does not include control variables. Column 2 includes the control variables gender, age, having a partner, number of children, educational level, and year. We only consider health measures that can be directly affected by unemployment in the short-tun. The results suggest that health is significantly worse for those unemployed compared to those in employment. This applies to all health measures considered except headaches and fatigue. These results cannot be read causally but are indicative of a strong correlation between employment status and health. The correlations between unemployment and health do not differentiate between effects upon job loss and effects once unemployed. In the remainder of the paper, we focus on short-run causal effects of job loss on health.

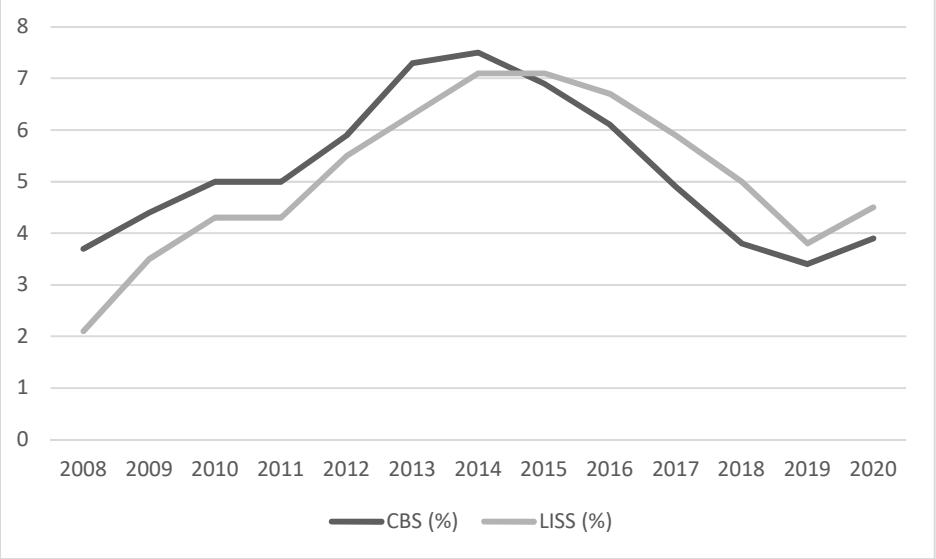
5.3 Job loss

We consider that an individual transits to unemployment if at period *t-1* he/she reports to be employed, while at period *t* he/she reports to have lost his/her job due to layoff, plant closure, or

contract ending,[14] and he/she reports to be looking for a new job. For the sake of simplicity, we consider unemployment to be an absorbing state and drop individuals from the sample once they have transited to unemployment and have been observed to be unemployed for one period. In that way, we do not have to deal with re-employment and we compare individuals who become unemployed only with those who remain employed.

The data show that, for all years, out of all individuals employed at *t-1*, about 2% have lost their job at *t*. This percentage is larger for the years after the financial crisis, reaching a maximum of 2.8% in 2014, and smaller during upturns with a minimum of 0.9% in 2019. If we consider the stock of unemployed individuals, that is regardless of when they lost their job, we see that they represent 4.9% of all observations. This percentage is highest in 2015 (7.1%) and lowest in 2008 (2.1%). In Figure 1 we show that the deviation of this percentage of unemployed is relatively small compared to official unemployment statistics from Statistics Netherlands (CBS). Most importantly, the figure shows that trends in unemployment are similar in the CBS and LISS data.

Figure 1. Unemployment rate (%) of Statistics Netherlands and LISS sample.



[14] Unfortunately, we do not observe the actual cause of job loss. However, we know that job loss is not due to health reasons as those leaving their job for health reasons report to be in sickness benefits or disability insurance and not to be in unemployment and looking for a job.

Table 1. Summary statistics.

Variables	Obs.	Mean	S.D.	Min.	Max.
Health measures					
Subjective health	28,153	3.21	0.72	1	5
Headache	27,852	0.17	0.38	0	1
Fatigue	27,852	0.28	0.45	0	1
Insomnia	27,852	0.17	0.38	0	1
Anxiety	28,115	2.08	0.98	1	6
Depression	28,115	1.99	0.99	1	6
Hypertension	27,064	0.10	0.30	0	1
High cholesterol	27,064	0.05	0.22	0	1
Hypertension meds.	28,034	0.11	0.31	0	1
High cholesterol meds.	28,034	0.06	0.24	0	1
Pain meds.	28,034	0.08	0.27	0	1
Sleep meds.	28,034	0.03	0.16	0	1
Anxiety/depression meds.	28,034	0.03	0.18	0	1
Physician	28,030	1.59	2.35	0	61
Psychiatrist	28,030	0.54	2.93	0	100
Smoking	28,092	0.19	0.39	0	1
Alcohol	28,088	4.47	2.07	1	8
Background variables					
Age	28,155	45.38	10.65	25	64
Female	28,155	0.50	0.50	0	1
Partner	28,155	0.74	0.44	0	1
Number of children	28,155	0.96	1.11	0	6
Education	28,155	2.92	0.78	1	6
Year	28,155	2013.76	3.92	2008	2020
Job loss and expectations					
Unemployed	28,155	0.05	0.22	0	1
Job loss	16,959	0.02	0.14	0	1
Job loss expectation	22,638	0.17	0.25	0	1
Shock	14,220	-0.14	0.25	-1	1
Job loss shock	14,220	0.01	0.09	0	1
Job keep shock	14,220	-0.15	0.23	-1	0

Wage satisfaction	23,069	6.75	1.82	0	10
Hours satisfaction	23,240	7.52	1.61	0	10
Job-type satisfaction	23,276	7.59	1.54	0	10
Colleagues satisfaction	21,207	7.56	1.48	0	10

Table 2. Differences in health between employed and unemployed.

	Independent variable: Unemployment	
Dependent variables:	No controls	Including controls
Health	(1)	(2)
Overall		
Subjective health[1]	-0.224***	-0.173***
	(0.031)	(0.031)
Physical		
Headaches[2]	0.007	0.010
	(0.017)	(0.017)
Fatigue[2]	0.017	0.012
	(0.020)	(0.020)
Insomnia[2]	0.111***	0.087***
	(0.020)	(0.019)
Mental		
Anxiety[3]	0.175***	0.208***
	(0.043)	(0.042)
Depression[3]	0.291***	0.304***
	(0.046)	(0.045)
Diagnoses		
Hypertension[2]	0.055***	0.029*
	(0.017)	(0.016)
High cholesterol[2]	0.045***	0.031**
	(0.013)	(0.012)
Medication		
Hypertension[2]	0.053***	0.019
	(0.017)	(0.016)

High cholesterol[2]	0.048***	0.028**
	(0.013)	(0.013)
Pain[2]	0.045***	0.039***
	(0.015)	(0.015)
Sleep[2]	0.033***	0.028***
	(0.010)	(0.010)
Anxiety/depression[2]	0.037***	0.033***
	(0.011)	(0.011)
Medical visits		
Physician[4]	0.654***	0.491***
	(0.120)	(0.135)
Psychiatrist[4]	0.469***	0.459***
	(0.146)	(0.148)
Behavior		
Smoking[2]	0.105***	0.092***
	(0.021)	(0.021)
Alcohol[5]	0.273**	0.104
	(0.119)	(0.114)

Notes: *** significant at 1%-level, ** significant at 5%-level, * significant at 10%-level. Standard errors are presented within parentheses.

[1] An indicator ranging from 1 (very bad health) to 5 (very good health).

[2] A binary variable that is 1 for YES, and 0 for NO.

[3] An indicator ranging from 1 (not at all) to 6 (extremely).

[4] A continuous variable indicating the number of times.

[5] Alcohol is an indicator measuring the alcohol use in the past week. The indicator has the following categories: 1 (almost every day), 2 (five or six days per week), 3 (three or four days per week), 4 (once or twice a week), 5 (once or twice a month), 6 (once every two months), 7 (once or twice a year), 8 (not at all over the last 12 months).

5.4 Job loss expectations

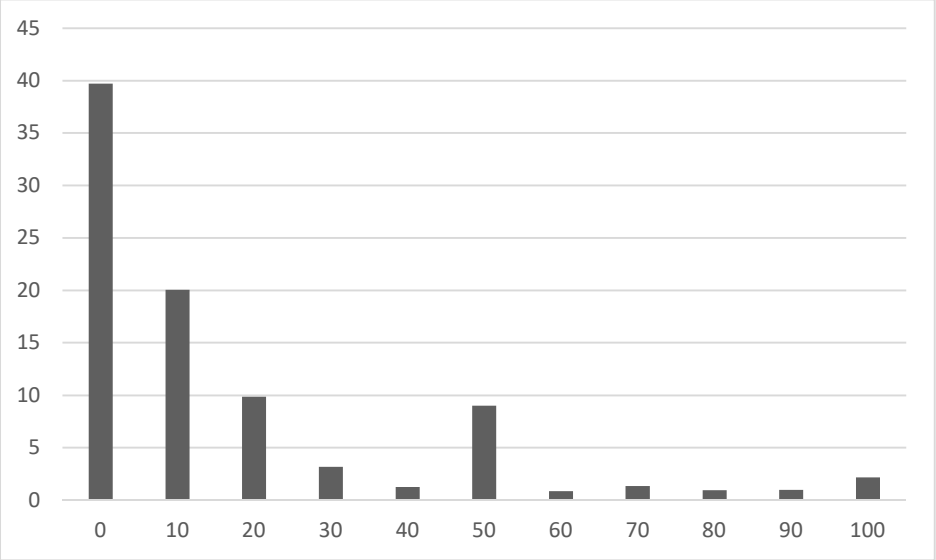
Through the Work and Schooling module, the LISS provides information about subjective job loss expectations. We rely on the following question to assess to what extent transitions into unemployment are unexpected:

What is the probability of losing your job in the next 12 months on scale from 0 to 100? 100 is absolutely certain that you lose your job.

and divide the responses by a 100. In Figures 2 and 3 we show how the job loss expectations are distributed. Figure 2 suggests that most people do not expect to lose their job. Those who do most often report small probabilities close to 0.1 ad 0.2. We observe some bunching of reported job loss

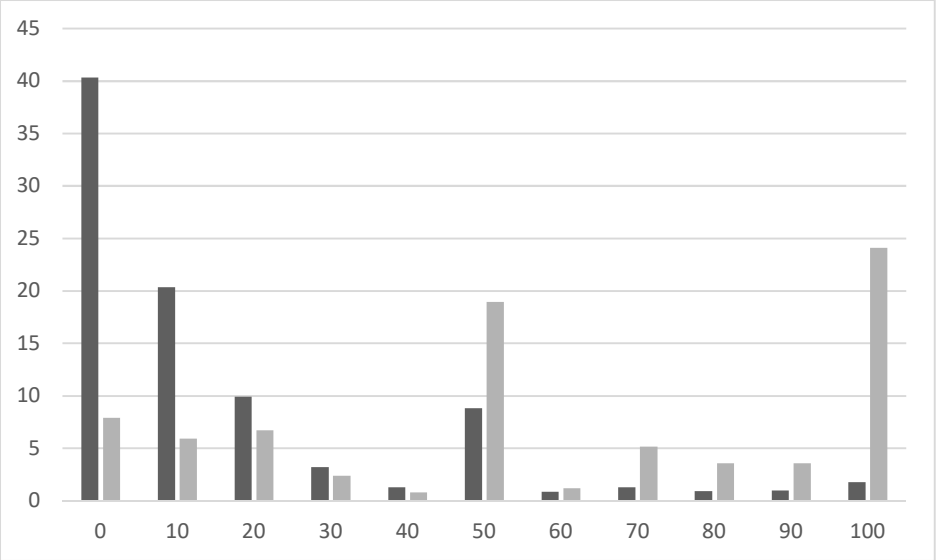
probabilities at 0.5 which could reflect a genuine underlying probability but could also be due to rounding or a tendency to give focal point answers.[15] However, the distributions in Figure 2 suggest that the expectations reported in Figure 1 do actually have predictive power for job loss since it shows that those actually losing their job at *t* clearly report higher probabilities of job loss at period *t-1*.

Figure 2. The distribution of job loss expectations, 0-100 (in %).



[15] A robustness check in which we do not include 50/50 answers shows a similar predictive power of subjective job loss expectations.

Figure 3. The distribution of job loss expectations at t-1 in % by actual job loss outcome at t [1][2].



[1] Dark grey – Job at time *t-1* and *t*.

[2] Light grey – Job at time *t-1* and job loss at *t*.

Table 3. Predictive power of job loss expectations.

	Job-loss between *t-1* and *t*	
	(1)	(2)
Job loss expectation *t-1*	0.09***	0.09***
	(0.01)	(0.01)
Controls	No	Yes
Obs.	14,220	14,220

Notes: *** significant at 1%-level, ** significant at 5%-level, * significant at 10%-level. Standard errors are presented within parentheses. The selection of controls follows Stephens (2004) and includes dummies for age, gender, being couple/single, educational level, sector, and occupation.

As Stephens (2004) argues, job loss expectations should be able to predict income expectations. In Table 4 we show that job loss expectations are related with income expectations. Here, we measure expected income by a 5-point scale indicating the extent to which people expect their finances to improve or worsen.[16] Regardless of taking into account background characteristics, we

[16] 1 = worsens a lot, 2 = worsens somewhat, 3 = no change, 4 = improves somewhat, 5 = improves a lot.

find that a 100% chance of job loss is associated with a drop of about 0.50-0.60 on a 5-point scale, which indicates a worsening of income expectations.

Table 4. Job loss and income expectations.

	Expected income (*t*) [1]	
	(1)	(2)
Job loss expectation (*t*)	-0.56***	-0.52***
	(0.04)	(0.04)
Controls	No	Yes
Obs.	21,993	21,993

Notes: *** significant at 1%-level, ** significant at 5%-level, * significant at 10%-level. Standard errors are presented within parentheses. The selection of controls follows Stephens (2004) and includes dummies for age, gender, being couple/single, educational level, sector, and occupation.

[1] An indicator ranging from 1 (worsens a lot) to 5 (improves a lot).

6 Estimation results

6.1 Baseline linear regressions

The estimation results of our econometric model are presented for all health measures in Table 5.[17] In column 1, we present the estimation results of job loss expectations on health outcomes and find that job loss expectations itself do not have strong health effects. The only exception is that those who report a higher probability of job loss visit physicians and psychiatrists more frequently and report to drink relatively more alcohol on average. In column 2, we estimate the effect of job loss without accounting for expectations. We find very few immediate health effects of job loss. Job loss significantly decreases the probability of suffering from headaches (4%), fatigue (4.5%), and the degree of anxiety (0.16 on a 6-point scale). Job loss also tends to reduce alcohol consumption by 0.06 on an 8-point scale of alcohol consumption. Apart from these effects, we find no significant short-run effects on other health measures of job loss.

[17] We use linear estimators in our baseline regressions in Table 3. However, our results are robust to using non-linear estimators for binary and ordered dependent variables. This is shown in Appendix B.

We present the effects of an unexpected shock in job status on health measures in column 3 of Table 5 and we explicitly focus on unexpected job loss in column 4. These results largely confirm the general lack of effects of job loss on health whilst also confirming the few significant effects reported in column 2. Column 4 shows that unexpected job loss significantly decreases the probability of suffering from headaches (7.3%), fatigue (11.5%), and the degree of anxiety (0.22 on a 6-point scale). Additionally, we find that unexpected job loss leads to a reduction in the probability to use sleeping medication by 2.7 percentage points. As for health behavior, alcohol consumption decreases by 0.08 on an 8-point scale. This indicates that the degree of expectancy of a job loss is an important driver of our results. Compared to the OLS estimates in Table 2, our results are quite striking since they show that suffering a job loss actually improves mental health. This may be due to short term versus long term effects and/or to selection effects into unemployment.

For a better understanding of the underlying mechanisms, we present the results for unexpected job keep in column 5 of Table 5 which provides us with information on the symmetry of the effects of unexpectedly losing versus keeping one's job. Contrasting the results for unexpected job loss, we find no effects of unexpected job keeping on headaches, fatigue, and anxiety. This result suggests that the reduction in headaches, fatigue, and anxiety at unexpected job loss is likely the effect of being relieved from work stress. In addition, unexpected job keep tends to decrease the degree of depression somewhat (0.06 on a scale of 6) as well as the number of GP visits (0.18). However, unexpected job keep also decreases the probability of using of pain killers (0.01%), the probability of using of sleep medication, and the probability of smoking (0.01%). Therefore, we conclude that health effects are largely asymmetric when comparing unexpected job loss and unexpected job keep.[18]

Altogether, our results show that job loss primarily leads to a short-run decrease in headaches, fatigue, and anxiety. This result seems counterintuitive due to the strong correlation between unemployment and poor health that we report in Table 2. However, it is very much in line with prior descriptive evidence by Krueger & Mueller (2012a; 2012b) who show that unemployment is positively associated with time spent on resting/sleeping and negatively associated with fatigue. These results suggest that the immediate effect of an unexpected job loss on health are likely driven

[18] A test on the coefficients of job loss and job keep shocks suggest that the coefficients are statistically different for outcomes such as headaches, fatigue, anxiety, and depression.

by the relief from stress associated with work. This reduction in stress appears to be larger than the possible increase in financial stress due to reduced income or the direct (detrimental) effect of job loss on health.

This result is likely to be partially driven by the relatively generous unemployment insurance benefits, in both terms of level and duration. This is consistent with prior cross-country evidence indicating that health deterioration following job loss is worse in the US than in European countries with more generous social insurance systems (i.e. Riumallo-Herl et al., 2014). These cross-country differences suggest that welfare state institutions, in particular generous unemployment insurance and universal health care access which are both prevalent in the Netherlands, could weaken the effect of job loss on health. Recent evidence from Been et al. (2021) shows that unemployment leads to significant but only small decreases (about 5%) in consumption spending among Dutch households which confirms the relatively minor reduction in income and well-being at job loss. Additionally, Been et al. (2021) show that leisure time, including time spent on sleep, increases significantly upon unemployment. This is consistent with prior evidence for US households from Burda & Hamermesh (2010), Krueger & Mueller (2012a; 2012b), and Aguiar et al. (2013) who show that about half of the increase in non-work time during unemployment is allocated to watching TV and sleeping/resting.

Apart from the health measures shown in Table 5, which out of all measures provide by the LISS they are the most likely to be affected in the short run, we find no significant effects of job loss on additional health measures such as BMI, heart-, lung-, and stomach diseases, diabetes, cancers, Alzheimer's, arthritis, and osteoporosis.[19] However, we cannot rule out longer term (positive of negative) effects of job loss on all aforementioned health measures.

[19] Estimation results are not reported in the paper, but are available upon request.

Table 5. Estimation results of the effect of (unexpected) job loss on health.

Dependent variables	Independent variables				
	Expectation	Job loss	Job status shock	Job loss shock	Job keep shock
	(1)	(2)	(3)	(4)	(5)
Overall					
Subjective health[1]	0.006	0.022	-0.011	0.074	-0.024
	(0.021)	(0.035)	(0.018)	(0.054)	(0.019)
Physical					
Headaches[2]	0.001	-0.040***	-0.008	-0.073**	0.000
	(0.007)	(0.015)	(0.008)	(0.029)	(0.008)
Fatigue[2]	-0.010	-0.045**	-0.024***	-0.115***	-0.013
	(0.009)	(0.018)	(0.009)	(0.037)	(0.009)
Insomnia[2]	0.001	0.003	0.001	-0.017	0.003
	(0.009)	(0.016)	(0.008)	(0.028)	(0.009)
Mental					
Anxiety[3]	0.009	-0.157**	-0.015	-0.216*	0.013
	(0.034)	(0.063)	(0.031)	(0.117)	(0.031)
Depression[3]	0.022	0.057	0.043	-0.076	0.062*
	(0.036)	(0.066)	(0.032)	(0.112)	(0.033)
Diagnoses					
Hypertension[2]	-0.008	0.002	-0.002	0.020	-0.005
	(0.005)	(0.010)	(0.005)	(0.021)	(0.005)
High cholesterol[2]	0.001	-0.004	-0.005	0.006	-0.007
	(0.005)	(0.009)	(0.005)	(0.019)	(0.005)
Medication					
Hypertension[2]	-0.003	-0.005	-0.003	-0.005	-0.003
	(0.004)	(0.006)	(0.004)	(0.011)	(0.004)
High cholesterol[2]	0.010**	-0.002	0.004	-0.002	0.005
	(0.004)	(0.006)	(0.003)	(0.009)	(0.004)
Pain[2]	-0.004	0.004	-0.009*	0.001	-0.011*
	(0.006)	(0.008)	(0.005)	(0.015)	(0.006)
Sleep[2]	-0.003	-0.011	-0.012***	-0.027*	-0.010**
	(0.004)	(0.009)	(0.004)	(0.015)	(0.004)
Anxiety/depression[2]	-0.001	0.014	0.001	0.001	0.001
	(0.004)	(0.009)	(0.004)	(0.012)	(0.004)
Medical visits					

Physician[4]	0.164*	-0.164	0.128	-0.172	0.178*
	(0.094)	(0.168)	(0.089)	(0.239)	(0.096)
Psychiatrist[4]	0.225**	0.072	0.127	0.058	0.145
	(0.106)	(0.194)	(0.087)	(0.235)	(0.096)
Behavior					
Smoking[2]	-0.001	0.006	-0.005	0.035	-0.011*
	(0.007)	(0.012)	(0.006)	(0.025)	(0.006)
Alcohol[5]	-0.091***	0.060**	0.031**	0.084*	-0.069**
	(0.033)	(0.029)	(0.015)	(0.046)	(0.032)

Notes: *** significant at 1%-level, ** significant at 5%-level, * significant at 10%-level. Standard errors are presented within parentheses. All regressions include control variables as described in Equation (1) .

[1] An indicator ranging from 1 (very bad health) to 5 (very good health).

[2] A binary variable that is 1 for YES, and 0 for NO.

[3] An indicator ranging from 1 (not at all) to 6 (extremely).

[4] A continuous variable indicating the number of times.

[5] Alcohol is an indicator measuring the alcohol use in the past week. The indicator has the following categories: 1 (almost every day), 2 (five or six days per week), 3 (three or four days per week), 4 (once or twice a week), 5 (once or twice a month), 6 (once every two months), 7 (once or twice a year), 8 (not at all over the last 12 months).

6.2 Non-linear effects of unexpected job loss

To further understand our results in Section 5, we analyze the extent to which the results in Section 5 are driven by extremes and/or non-linear effects in job loss expectations. This follows Stephens (2004) who investigates the non-linear effect of job loss expectation on consumption by splitting up the value of the job loss expectation into 10 dummy variables each of them covering one tenth of the job loss expectation measure. We take a similar approach and use five dummies to ensure we have a sufficient number of observations in each category. We define:

$$D1=1 \text{ if } 0.0 < [jobloss_{it} - E_{it-1}jobloss_{it}] < 0.2$$

$$D2=1 \text{ if } 0.2 \leq [jobloss_{it} - E_{it-1}jobloss_{it}] < 0.4$$

$$D3=1 \text{ if } 0.4 \leq [jobloss_{it} - E_{it-1}jobloss_{it}] < 0.6$$

$$D4=1 \text{ if } 0.6 \leq [jobloss_{it} - E_{it-1}jobloss_{it}] < 0.8$$

$$D5=1 \text{ if } 0.8 \leq [jobloss_{it} - E_{it-1}jobloss_{it}] \leq 1.0$$

and use *D1-D5* instead of $[jobloss_{it} - E_{it-1}jobloss_{it}]$ in Equation (1). The number of observation is 23, 21, 64, 29, and 88 for *D1-D5*, respectively. The estimation results are shown in Table 6 and indicate that much of the effects of job loss on headaches, fatigue, and anxiety we find in Table 5 are mostly driven by those persons who suffer the most unexpected shocks (*D4*, *D5*). However, one should note that more unexpected shocks also have relatively more observations and, hence, there is more statistical power to estimate their effect. Furthermore, the results in Table 6 show that dissecting $[jobloss_{it} - E_{it-}\ jobloss_{it}]$ into dummies indicates that shocks lead to health improvements measured by cholesterol and hypertension, although these results are not driven by more unexpected shocks.

Table 6. Non-linearities in the effect of unexpected job loss on health.

	Independent variables				
Dependent variables	D1	D2	D3	D4	D5
Overall					
Subjective health[1]	-0.120	-0.033	-0.004	0.065	0.046
	(0.093)	(0.083)	(0.064)	(0.122)	(0.059)
Physical					
Headaches[2]	-0.046	-0.000	-0.019	-0.053	-0.058*
	(0.043)	(0.004)	(0.016)	(0.054)	(0.035)
Fatigue[2]	-0.012	-0.007	-0.010	-0.061	-0.123***
	(0.061)	(0.004)	(0.032)	(0.055)	(0.045)
Insomnia[2]	0.079	-0.055	0.039	-0.065	-0.018
	(0.059)	(0.047)	(0.027)	(0.055)	(0.031)
Mental					
Anxiety[3]	-0.033	-0.034	-0.240	-0.376*	-0.088
	(0.193)	(0.221)	(0.149)	(0.194)	(0.131)
Depression[3]	0.106	0.460**	-0.037	0.013	-0.075
	(0.197)	(0.208)	(0.162)	(0.191)	(0.123)
Diagnoses					
Hypertension[2]	-0.051	-0.008***	0.008	-0.007***	0.030
	(0.045)	(0.002)	(0.016)	(0.002)	(0.027)
High cholesterol[2]	-0.005***	-0.005***	-0.006***	-0.059	0.020

	(0.002)	(0.002)	(0.001)	(0.054)	(0.024)
Medication					
Hypertension[2]	-0.009***	-0.012***	-0.011	-0.009***	0.001
	(0.002)	(0.002)	(0.022)	(0.002)	(0.011)
High cholesterol[2]	-0.008***	-0.009***	-0.009***	-0.007***	0.004
	(0.002)	(0.002)	(0.001)	(0.001)	(0.011)
Pain[2]	-0.006***	-0.005**	0.009	-0.004	-0.004
	(0.002)	(0.002)	(0.027)	(0.003)	(0.016)
Sleep[2]	-0.003**	-0.001	-0.018	-0.003**	-0.025
	(0.001)	(0.001)	(0.027)	(0.002)	(0.016)
Anxiety/depression[2]	0.042	0.047	-0.018	-0.059	0.009
	(0.043)	(0.046)	(0.015)	(0.054)	(0.011)
Medical visits					
Physician[4]	-0.040	1.046	-0.844*	0.329	-0.006
	(0.299)	(0.943)	(0.464)	(0.528)	(0.204)
Psychiatrist[4]	-0.556	0.281	-0.547	-0.058	0.275
	(1.140)	(0.534)	(0.365)	(0.040)	(0.245)
Behavior					
Smoking[2]	0.014***	-0.080	-0.034	0.064	0.056**
	(0.002)	(0.064)	(0.034)	(0.055)	(0.027)
Alcohol[5]	0.088	-0.035	0.073	0.013	-0.140
	(0.144)	(0.096)	(0.107)	(0.187)	(0.111)

Notes: *** significant at 1%-level, ** significant at 5%-level, * significant at 10%-level. Standard errors are presented within parentheses. All regressions include control variables as described in Equation (1) .

[1] An indicator ranging from 1 (very bad health) to 5 (very good health).

[2] A binary variable that is 1 for YES, and 0 for NO.

[3] An indicator ranging from 1 (not at all) to 6 (extremely).

[4] A continuous variable indicating the number of times.

[5] Alcohol is an indicator measuring the alcohol use in the past week. The indicator has the following categories: 1 (almost every day), 2 (five or six days per week), 3 (three or four days per week), 4 (once or twice a week), 5 (once or twice a month), 6 (once every two months), 7 (once or twice a year), 8 (not at all over the last 12 months).

6.3 Evidence for reduced stress from work

Our baseline results in Section 5.1 indicate that job loss improves mental health. We interpret this result as job loss leading to the relieve from work stress more than it increases financial stress. This interpretation is very much in line with the results of Avdic et al. (2021) who explain the procyclical nature of health by showing that worries about potential future job loss and associated income drops are generally bigger than the actual income drops from unemployment. This

mechanism is partially confirmed by Been et al. (2021) who show that the decrease in total consumption upon unemployment is only 5%[20] in the Netherlands, which suggests that increased financial stress from unemployment is likely to be small.

To show empirical evidence of this mechanism further, we use additional data from LISS regarding job satisfaction. Respondents are asked about their satisfaction regarding wage, working hours, type of job, and the general atmosphere among colleagues on a scale from 0-10. Here, 10 means that the respondent is very satisfied and 0 means that the respondent is not satisfied at all. We hypothesize that job losers have higher stress from work than non-job losers which would suggest that job losers have a high potential to reduce stress upon job loss. We measure work stress by the four types of work satisfaction regarding wages, hours, job type, and colleagues. To quantify this, we estimate

$$worksat_{it-1} = \beta_0 + \beta_1 jobloss_{it} + \Delta \boldsymbol{X}'_{it}\beta_2 + \boldsymbol{t}'_t\beta_3 + \varepsilon_{it}, \qquad (3)$$

Here, *worksat* is a measure of work satisfaction on a scale from 0-10. For summary statistics, we refer to Table 1. Other variables and parameters are as in Equation (1). The estimation results of β_1 are presented in Table 7 below.

[20] Part of this decline are transportation expenses, which may even be work related.

Table 7. Relation between work satisfaction and job loss.

Independent variable	Dependent variables: Satisfaction at *t-1*[1]			
	Wages	Hours	Job-type	Colleagues
	(1)	(2)	(3)	(4)
Job loss[2]	-0.320***	-0.107	-0.719***	-0.464***
	(0.118)	(0.111)	(0.122)	(0.107)
Job status shock[3]	0.674***	0.572***	0.719***	0.640***
	(0.087)	(0.074)	(0.076)	(0.075)
Unexpected job loss[4]	-0.285	-0.135	-0.786***	-0.487***
	(0.188)	(0.186)	(0.206)	(0.171)

Notes: *** significant at 1%-level, ** significant at 5%-level, * significant at 10%-level. Standard errors are presented within parentheses. All regressions include control variables as described in Equation (1). .

[1] On a scale from 0-10.

[2] A binary variable that is 1 for YES, and 0 for NO.

[3] A continuous variable with range [-1, 1].

[4] A continuous variable with range [0, 1].

Our results in Table 7 suggest that those who lose their job at time *t* already reported a lower job satisfaction at time *t-1*. In particular, job losers report job satisfaction that is about 0.32, 0.72, and 0.46 point lower on an 11 point scale than those who do not lose a job regarding wages, job-type, and colleagues, respectively. We do not find a significant correlation between job loss and satisfaction with working hours. These results suggest that job losers are already less satisfied with their job prior to job loss. Hence, job loss is likely to decrease stress from a relatively dissatisfying job. Additionally, Table 7 shows the relation between work satisfaction and (un)expected job loss. These relations indicate that particularly those individuals who did not expected a change in job status reported higher satisfaction. Hence, individuals who will lose their job (and know that they will) already report lower work satisfaction prior to the actual job loss.

6.4 Heterogeneity analyses

To analyze the heterogeneity of the effect of unexpected job loss on health measures by person- and household characteristics, we use the specification as in column 4 of Table 5 and interact unexpected job loss with a dummy for the specific group that we are interested in. We differentiate by marital status (couples vs. singles), position in the household (main earner vs. partner), gender

(male vs. female), education (low vs. high educated), age (individuals above and below 50 years of age), and contract type (temporary vs. voluntary).

We find little to no evidence for heterogeneous effects by marital status, position in the household, gender, education, and age. The only exception is for heterogeneity by position in the household and gender when estimating the effect of job loss on headaches (see Table 8 for regression analyses with a significant interaction effect). The effect of job loss on headaches for main earners is 11.2%, while we find no effect for other household members. Similarly, we find that being a male decreases the probability of headaches by 12.3% (significant at the 1%-level), while we find no effect for females.

Table 8. Heterogeneous effects by gender and position in the household.

		Independent variables[1]		
Dependent variables	Job loss shock	Job loss shock * Head	Job loss shock	Job loss shock * Women
		(1)		(2)
Physical				
Headache[2]	-0.005	-0.200***	-0.123***	0.105*
	(0.033)	(0.073)	(0.047)	(0.057)
	[0.003]		[0.567]	

Notes: *** significant at 1%-level, ** significant at 5%-level, * significant at 10%-level. Standard errors are presented within parentheses. All regressions include control variables as described in Equation (1) plus a dummy for HH head (1) or gender (2).

[1] P-value of the linear combination of the effect of job loss plus the interaction is presented in [].

[2] A binary variable that is 1 for YES, and 0 for NO.

Unsurprisingly, being a main income earner and being a male correlate strongly with each other, and we therefore conclude that our results are mainly driven by male main income earners. These persons are more likely to work full-time and perceive stress from work. This finding strengthens the interpretation stating that job loss reduces work stress more than it increases financial stress. However, we should note that the lack of statistical significance in the estimation of the interaction effects does not imply the absence of heterogeneity per se. Most interaction effects are not very precisely estimates given the standard errors, which is most likely a consequence of the relatively low statistical power because of the small number of observations that show a year-to-year job loss (330 observations).

Interestingly, we find substantial heterogeneity in job loss effects on health between those with a permanent and temporary employment contract. 12.8% of the respondents who report job loss probabilities are in a temporary contract.[21] Their average subjective probability of job loss is 34.25%, which is significantly higher than the average reported by those in permanent contracts: 15.44%.[22] Similarly, the average job loss shock is 0.52% and 3.28% for those in permanent and temporary contracts, respectively.[23] Despite reporting higher job loss probabilities, those with temporary contracts also report that job loss is more unexpected, on average. In Table 9, we report the heterogeneous effects of permanent versus temporary contracts for those health measures with a significant interaction effect and find that our main conclusion, i.e. job loss leads to improved health, most likely applies to persons with a permanent contract in particular. Whereas we find some health improvements for those with a permanent contract, we find no real effects of job loss on health among those with a temporary contract. Nonetheless, our results show that permanent versus temporary contracts matter for both the degree of expectancy of a job loss as well as its effect on health measures. More specifically, individuals with permanent contracts are the ones who suffer smaller job loss shocks and who face health improvements upon job loss.

Table 9. Heterogeneous effects of permanent and temporary contracts.

	Independent variables	
Dependent variables	Job loss shock	Job loss shock * Temporary
Physical		
Fatigue[2]	-0.122**	0.194**
	(0.058)	(0.090)
	[0.300]	
Mental		
Anxiety[3]	-0.095	0.472*
	(0.151)	(0.279)
	[0.106]	
Depression[3]	-0.108	0.469*
	(0.159)	(0.274)

[21] We exclude on-call employees, temp-staffers, self-employed/freelancers, and independent professionals from this definition and only keep those temporary workers with a labor contract for a positive number of hours.
[22] A t-test shows that these averages are significantly different with a p-value = 0.00.
[23] A t-test shows that these averages are significantly different with a p-value = 0.00.

	[0.104]	
Medical visits		
Physician[4]	-0.133	1.130**
	(0.314)	(0.530)
	[0.018]	

Notes: *** significant at 1%-level, ** significant at 5%-level, * significant at 10%-level. Standard errors are presented within parentheses. All regressions include control variables as described in Equation (1) plus a dummy for temporary contracts.

[1] P-value of the linear combination of the effect of job loss plus the interaction is presented in [].

[2] A binary variable that is 1 for YES, and 0 for NO.

[3] An indicator ranging from 1 (not at all) to 6 (extremely).

[4] A continuous variable indicating the number of times.

6.4 Macroeconomic conditions

Next to individual- and household characteristics, effects might be heterogeneous over the business cycle Therefore, we add the unemployment rate and the interaction between the unemployment rate and unexpected job loss to our specification in column 4 of Table 5. For most of the health measures reported in Table 3 we do not find heterogeneous effects with respect to the unemployment rate (see Table 10 for regression analyses with a significant interaction effect). However, we find differential effects for depression and sleep medication. We find that a 1%-point higher unemployment rate decreases the reduction in the probability of using sleep medication if job loss is totally unexpected by about 2.7%. Similarly, we find that a 1%-point higher unemployment rate decreases the reduction in depression if job loss is totally unexpected by about 0.17 on a 6-point scale. These differential effects of the unemployment rate suggest that the positive effect of job loss on health especially exists in periods of low unemployment. In periods of high unemployment, job loss does not reduce the use of sleep medication and the extent of anxiety. However, we find no clear differential effects of the unemployment rate on headaches, fatigue, anxiety, and sleep which all show significant effects in Table 5.

Table 10. Heterogeneous effects over the unemployment rate.

Dependent variables	Independent variables[1]	
	Job loss shock	Job loss shock * UR
Mental		
Depression[3]	-0.960**	0.170*
	(0.483)	(0.092)
	[0.045]	
Medication		
Sleep[2]	-0.168**	0.027**
	(0.077)	(0.013)
	[0.029]	

Notes: *** significant at 1%-level, ** significant at 5%-level, * significant at 10%-level. Standard errors are presented within parentheses. All regressions include control variables as described in Equation (1) plus a variable for the unemployment rate.

[1] P-value of the linear combination of the effect of job loss plus the interaction is presented in [].

[2] A binary variable that is 1 for YES, and 0 for NO.

[3] An indicator ranging from 1 (not at all) to 6 (extremely).

Our results suggest that the unemployment rate matters for the effect of job loss on health which may be explained by the fact that the unemployment rate negatively affects the job finding rate (a 1%-point increase in the unemployment rate decreases the subjective job finding probability as reported by currently unemployed (N = 1,170) by about 11%; significant at the 5%-level). Therefore, the positive effect of job loss on health may in part be determined by people's beliefs about the ease of reemployment. Unfortunately, the number of unemployed people reporting subjective job finding probabilities is too small in our data to do further econometric analyses.

Additionally, as our data spans the period 2008-2020, we can empirically test if our results differ in times of COVID-19. The 2020 survey is elicited in November 2020, which means that the Netherlands had been in lockdown, including a rise in layoffs consistent with Figure 1, for about 8 months at the time of the 2020 survey. Except for headaches, we find no significant differences in unexpected job loss on health in 2020 compared to 2008-2019 (see Table 11 for regression analyses with a significant interaction effect). Interestingly, whereas we find a significantly negative effect of unexpected job loss on headaches in the period 2008-2019, we find no negative effect of

unexpected job loss on headaches in 2020. Instead, we find what seems a null-effect for 2020 (p-value = 0.320). Although we should be careful in interpreting this result as we find no differential effects for fatigue, insomnia, anxiety, etc., the absence of a negative effect on headaches may imply that losing a job during the COVID-19-recession is less stress relieving than normal, suggesting that macroeconomic conditions matter for the effect of job loss on health.

Table 11. Heterogeneous effects for 2020.

	Independent variables[1]	
Dependent variables	Job loss shock	Job loss shock * Y2020
Physical		
Headache[2]	-0.090***	0.170**
	(0.031)	(0.086)
	[0.320]	

Notes: *** significant at 1%-level, ** significant at 5%-level, * significant at 10%-level. Standard errors are presented within parentheses. All regressions include control variables as described in Equation (1) .

[1] P-value of the linear combination of the effect of job loss plus the interaction is presented in [].

[2] A binary variable that is 1 for YES, and 0 for NO.

7 Conclusion

Prior studies have shown that the unemployed have worse health compared to those who are employed. More recent studies have tried to estimate the causal effect of unemployment on health exploiting firm closures, matching techniques, panel data analyses, and instrumental variables regression. However, these techniques all have important limitations regarding the assumptions of generalizability, the effect of non-observed characteristics, and finding a valid instrument.

Compared to this existing literature, we make three contributions. Firstly, we estimate the effect of unexpected job loss building forth on the method of Stephens (2004) using subjective expectations. Since the availability of expectations allows measuring job loss shocks, we can estimate the causal effect of job loss on health for a representative sample of households. Moreover, this approach allows us to estimate immediate effects on health upon job loss which contrasts with most previous literature that does not analyze the effect on health upon job loss per se. Secondly, whereas most

literature has focused on a particular health outcome, we study a wide array of health measures available in our data to get a broader view of the short-run effects of (unexpected) job loss on health. More specifically, compared to most of the earlier literature we include lighter health problems, such as headaches and fatigue. This is especially important in the study of short term effects, as doctor diagnoses, hospital visits, and mortality may not be evident yet. Thirdly, we are the first to study the effects of job loss on health in the Netherlands. The generous unemployment benefits and high access to health care in the Netherlands are important to show how the institutional context matters for the effect of job loss on health.

Our results suggest that unexpected job loss does not result in a short-run deterioration of health. Instead, we find that headaches and fatigue decrease upon job loss. Given the relatively generous social insurance programs in the Netherlands, this suggests that the immediate relieve from work stress is bigger than the immediate increase in financial stress upon job loss. Ancillary empirical analyses confirm that job satisfaction was smaller among those who would lose their job. This finding is consistent with prior analyses showing the procyclical effects on mental health (Avdic et al., 2021) and cross-country analyses that suggest that the effect of job loss on health is less strong in countries with more generous social insurance programs (i.e. Riumallo-Herl et al., 2014). These cross-country differences suggest that welfare state institutions, in particular generous unemployment insurance and universal health care access which are both prevalent in the Netherlands, could weaken the effect of job loss on health. Our findings of the effect of job loss on health are consistent with Been et al. (2021) who show that unemployment decrease consumption by only a small amount and increases leisure time, i.e. sleep, substantially among Dutch households.

Our results are interesting as they show that much of the detrimental effects of unemployment on health that have been found in the literature are likely to come from effects in the mid- to long run and/or from financial stress from job loss with limited social insurance programs. For future research it is interesting to analyze the effects of unemployment benefits exhaustion on health to further explain the mechanism of financial stress in the relationship between unemployment and health. This is a relevant question even in countries with relatively generous social insurance programs.

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Appendices

Appendix A – Definitions of health variables

Subjective health:

How would you describe your health, generally speaking?

1 poor

2 moderate

3 good

4 very good

5 excellent

Headaches / Fatigue / Insomnia:

Do you regularly suffer from:

headache

fatigue

sleeping problems

0 no

1 yes

Anxiety / Depression:

The following questions are about how you felt over the past month.

Please choose the answer that best describes how you felt during this past month.

This past month ....

1 = never

2 = seldom

3 = sometimes

4 = often

5 = mostly

6 = continuously

I felt very anxious

I felt depressed and gloomy

Hypertension / High cholesterol:

Has a physician told you this last year that you suffer from one of the following diseases / problems?
high blood pressure or hypertension
high cholesterol content in blood

High cholesterol / Hypertension / Pain / Insomnia / Anxiety:
Are you currently taking medicine at least once a week for:
More than one answer possible
high blood cholesterol
high blood pressure
other pains (such as headache, backache, etc.)
sleeping problems
anxiety or depression
0 no
1 yes

Physician / Psychiatrist:
How often did you use the following health services over the past 12 months?
When you did not use the service, please enter 0.
family physician
psychiatrist/psychologist/psychotherapist
0..999

Smoking:
Have you ever smoked (even if it was long ago)?
1 yes
2 no

Alcohol:
Now think of all the sorts of drink that exist. How often did you have a drink containing alcohol over the last 12 months?
1 almost every day
2 five or six days per week

3 three or four days per week
4 once or twice a week
5 once or twice a month
6 once every two months
7 once or twice a year
8 not at all over the last 12 months

Appendix B – Non-linear estimator

Many of the health measures we use in Table 5 are non-continuous. Most of the variables are measured as a binary indicator. Since we estimate the model in FD, we implicitly transform the binary health indicators into an ordered indicator consisting of -1, 0, and 1. In Table 4 we present the estimation results for all binary health variables using the ordered probit estimator which may better fit the data than the linear models in FD.

Firstly, the ordered probit estimator leads to similar results as in Table 5. This means that our conclusions are robust with respective to estimation method. Secondly, the estimation results in Table 6 reveal interesting additional information for the effect of unexpected job loss on headaches, fatigue, sleep medication, and alcohol consumption. For headaches, fatigue, and sleep medication our results show that the positive effects of unexpected job loss on these health measures stem from both people reporting less frequent increases and more frequent decreases in the health measure. For example, those unexpectedly losing their job are 6% less likely to transition from no fatigue to fatigue and 5% more likely to transition from fatigue to no fatigue. This symmetry is also found for the effects on headaches and sleep medication. For smoking, which was not find to be affected significantly in the linear estimator, we find job losers are both more likely to stop smoking (-1) and to start smoking (1). Apparently, these contradicting effects cancel out in the linear regression.

Table 6. Ordered probit results of the effects of unexpected job loss on binary health measures.

	Outcome		
Dependent variables	= -1	= 0	= 1
	(1)	(2)	(3)
Physical			
Headaches	0.03***	0.00	-0.03***
	(0.01)	(0.00)	(0.01)
Fatigue	0.05***	0.01***	-0.06***
	(0.01)	(0.00)	(0.01)
Insomnia	0.01	0.00	-0.01
	(0.01)	(0.00)	(0.01)
Diagnoses			
Hypertension	0.01	0.00	-0.01
	(0.01)	(0.00)	(0.01)
High cholesterol	0.00	0.00	0.00
	(0.01)	(0.00)	(0.01)
Medication			
Hypertension	0.00	0.00	0.00
	(0.01)	(0.00)	(0.01)
High cholesterol	0.00	0.00	0.00
	(0.01)	(0.00)	(0.01)
Pain	0.00	0.00	0.00
	(0.01)	(0.00)	(0.01)
Sleep	0.01**	0.00*	-0.01**
	(0.01)	(0.00)	(0.01)
Anxiety/depression	0.00	0.00	0.00
	(0.01)	(0.00)	(0.01)
Behavior			
Smoking	-0.02*	0.01*	0.01*
	(0.01)	(0.01)	(0.01)

Notes: *** significant at 1%-level, ** significant at 5%-level, * significant at 10%-level. Coefficients yield marginal effects. Standard errors are presented within parentheses. All regressions include control variables as described in Equation (1).