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The effects of job loss on health[1]

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Abstract

This paper provides new evidence on the effect of job loss on health. Using a unique combination of detailed micro level panel data on information on health measures, employment, and job loss expectations, we estimate the effect of (unexpected) job loss on health. We find significant drops in self-perceived health following a job loss. This effect is stronger for unexpected job loss. We find little to no evidence for decreasing physical health, but clear evidence for mental health problems in the short run. Our results suggest costs of job loss to society beyond the direct costs of unemployment as job loss may lead to increases in (mental) health care costs.

JEL-codes: D84, I10, J22, J60

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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 a permanent shock by a decline in future income (e.g. Arulampalam, 2001). A vast amount of literature has studied the effect of the income drop due to job loss on consumption and generally finds substantial drops in consumption upon job loss.[5] Parallel to analyzing the monetary consequences of job loss, studies have started analyzing the consequences of job loss for health. This is important as potential detrimental effects of job loss on health may further exacerbate the problems of employability of the unemployed. This can have severe consequences for the public finances as deteriorating health in job loss increases the costs of job loss beyond a measures of increased unemployment insurance benefits and decreased taxes and benefits contributions (Kuhn et al., 2009). This has become all the more important since the 2020 COVID-19 pandemic which has a big joint impact on public costs of healthcare and social insurances.

Many early studies show 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 variables. More recent studies have tried to estimate the causal effect of unemployment on health. This literature generally exploits exogenous variation in unemployment from exogenous events such as firm closures and mass lay-offs.[7] A drawback from this approach is that conclusions mat not be generalizable to the population as firms may have very specific characteristics and types of workers. Other papers infer causal estimates from matching (e.g. Browning et al., 2006; Marcus, 2014), instrumental variables (IV) (e.g. Gathergood, 2012; Caroli & Godard, 2016), or exploit the longitudinal nature of the data (e.g. Björklund, 1985; Böckerman & Ilmakunnas, 2008; Romeu Gordo, 2009; Popovici & French, 2013). The matching studies assume that individuals are similar based on observed characteristics. The IV paper assumes that cross-country heterogeneity in employment protection legislation and the extent to which this heterogeneity explains cross-country differences in job loss can be used to estimate causal effects

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

of job loss on health. Causal inference from using panel data and fixed effects assume that it is sufficient to condition on unobserved heterogeneity to infer causal effects.

Compared to the existing literature, we make two contributions to the current literature. Firstly, we exploit panel data to estimate causal effects of job loss on retirement. Compared to the existing literature, we differentiate between expected and unexpected job loss building forth on the method of Stephens (2004). Analyzing unexpected job loss is important as the unforeseen shock may have more severe health effects. In part, due to the fact that unexpected job loss induces bigger drops in consumption than foreseen job loss. The only existing paper that raises the issue of the importance of differences in the expectancy of job loss and condition on job loss expectations is Michaud et al. (2016). Compared to Michaud et al. (2016), we follow the approach of Stephens (2004) and calculate job loss shocks using both job loss expectations and the actual job loss outcome. Also, we analyze both the 50- and 50+ population as effects can substantially differ between the 50- and 50+ population. The former may face life-long effects of job loss whereas the latter are found to have significantly more difficulties finding a job after unemployment (Chan and Stevens, 2001). Being less employable increases the negative effects of job loss on health (Green, 2011). Contrasting Michaud et al. (2016) who analyze US households, we analyze the consequences of unexpected job loss in a framework of relatively high unemployment benefits and high health insurance coverage. It is interesting to analyze the effects of job loss on health in such an institutional framework as the financial accessibility to health care is unlikely to explain a potential effect.

Secondly, whereas most literature has focused on a particular health outcome, we study a wide array of health measures available in our data. A wide variety of health measures is used in the literature including both subjective and objective health measures as well as physical and mental health measures. This may be an important determinant of the lack of consensus in the literature on the effects of unemployment. Many studies use a general health measures that includes both physical and mental health (a.o. Romeu Gordo, 2006; Salm, 2009; Böckerman & Ilmakunnas, 2009; Schmitz, 2011; Schaller & Stevens, 2015; Schiele & Schmitz, 2016). Many studies focusing on physical health can exploit the availability of objective measures and analyze 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, studies 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). However, 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 (Teftt, 2011). We use a combination of aforementioned dependent variables used in the literature by using a selection of physical, mental, subjective, and more objective health measures. This should give us an idea of how job loss affects health and the extent to which health deterioration from job loss is primarily a consequence of mental health issues.

Using unique micro panel data with detailed information on health categories, employment, and job loss expectations from LISS, a representative sample of the Dutch population, we are able to estimate the causal effect of job loss on health exploiting the degree of expectancy of the job loss shock. To do so, we follow the approach in Stephens (2004) who estimated the effect of unexpected job loss on food spending.

We find significant drops in subjective health following a job loss. This effect is stronger for unexpected job loss. Effects are largely asymmetrical in unexpectedly staying on the job, except for subjective health measure. These results suggest that job loss anticipation is an important driver of subjective health which suggests that the changing self-perception of health is an important direct effect of job loss. We find little to no evidence for decreasing physical health, such as BMI and blood pressure, but find clear evidence for mental health problems. This becomes especially apparent in finding increases in smoking, drug use, and anxiety/depression drug use following a

job loss. We should note, however, that these mental health problems expressed by smoking behavior and drug use can lead to physical health issues in the long-run.

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. In addition, older unemployed have two extra

options to receive extended benefits during unemployment. 1) 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). 2) 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 seem 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. (2020) show that total non-durable consumption drops significantly following a job loss in the Netherlands. This result suggests that job loss induces a big enough income shock to have potential effects for (mental) health in the Netherlands.

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 spend on health, which is slightly above the EU average of 9.8 %. The absolute spending is € 3,791 per person, which is, again, above the EU average of €2,884.

All Dutch citizens are required to purchase statutory health insurance from private insurers. The insurers are required to accept all applicants. The financing of the health care is primarily public, through premiums, tax revenues, and government grants. The health insurance standardly include physician, home nursing, hospital and mental health care, as well as prescription drugs. The insured pay premiums, annual deductibles, and coinsurance or copayments on selected services and drugs. The government finances the coverage for children up to age of eighteen. Hence, health insurance coverage 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. Accessibility of health care is unlikely to be an explanation of potentially negative effects of job loss, and income loss more generally, on health.

3 Data

3.1 Description

We use data from the LISS panel (Longitudinal Internet Studies for the Social sciences) of CentERdata. The LISS Core Study consists of about 4,500 households representative of the Dutch population and it is run every year since 2007. We supplement the LISS core data with an additional module. The Health module contains detailed information on numerous measures of health, including both subjective measure and more objective measures of health. This module is available for the years 2008-2018.

To implement our empirical strategy, we make the following selection: we keep persons who are aged 25 to 64 (XX obs.), who are observed for at least two periods (XX obs.), who are employed or became unemployed since the previous wave (XX obs.), and who have no missing data on health (XX obs.). This leaves us with XX persons and 18,266 person-year observations, which we use to calculate wave-to-wave changes in employment status and health and time use. For a detailed overview of summary statistics for the variables used in the paper, we refer to Table 1.

Table 1. Summary statistics.

Variable	Observations	Mean	Std. Dev.	Min	Max
Job loss variables from t-1 to t					
Job loss	18,266	0.021	0.145	0	1
Unexpected job loss	15,215	0.007	0.073	0	1
Unexpected job stay	15,215	-0.162	0.239	0	1
Health variables					
Subjective health	31,423	3.116	0.758	1	5
BMI-score	31,035	25.66	4.086	15.321	40.999
High blood pressure	30,014	0.127	0.333	0	1
High cholesterol level	30,014	0.076	0.265	0	1
Smoking	31,361	0.575	0.494	0	1
Alcohol use	31,357	4.491	2.172	1	8
Drug use	31,425	0.061	0.234	0	1
Medication for sleeping problems	31,286	0.043	0.203	0	1
Medication for anxiety or depression	31,286	0.052	0.223	0	1
Family physician visits	31,287	1.952	3.186	0	100
Medical specialist visits	31,289	1.129	3.06	0	100
Life satisfaction	35,619	7.388	1.411	0	10
Walking 100 meters	31,409	1.168	0.552	1	5
Control variables					
Age	41,893	46.599	11.248	25	64
Being female	33,420	0.547	0.498	0	1
Having a partner	33,438	0.825	0.38	0	1
Being high educated	36,225	0.629	0.483	0	1
Being fifty plus	41,893	0.443	0.497	0	1
Main income earner	41,893	0.583	0.493	0	1

We consider thus 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, and he/she reports to be looking for a new job. The data show that, for all years, out of all individuals employed at *t-1*, only about 2% have become unemployed at *t*. This

percentage is larger for the years around the financial crisis, reaching a maximum of 2.82% in 2010, and a minimum of 1.59% in 2017.

3.2 Job loss expectations

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.

In Table 2 we further investigate the relation between job loss and subjective job loss probabilities and the extent to which job loss expectations have predictive power for actual job loss. In the first column we observe that primarily females, couples, and main income earners have a lower probability of losing their job. In the second column we show that an additional decimal point in the subjective probability of job loss increases the chance of actual job loss by 1.28%. Therefore, individuals who report a 100% chance of losing their job are 12.8% more likely to actually lose it compared to those who report a zero chance. This effect is highly similar when we control for the background information in the regression as used in column 1 as we show in column 3. Therefore, we conclude that subjective job loss probabilities have substantial predictive power to explain actual job loss. Hence, we argue that a discrepancy between the actual outcomes and the expectation can be interpreted as an unforeseen unemployment shock.

Table 2. Predictive power of job loss expectations.

	Job-loss between waves		
	(1)	(2)	(3)
Age between 35-44	-0.003		-0.004
	-0.004		-0.004
Age between 45-54	-0.002		-0.004
	-0.004		-0.004
Age between 55-64	0.000		0.002
	-0.005		-0.006
From single to couple	0.013		0.007
	-0.010		-0.010
From couple to single	0.005		0.001
	-0.013		-0.012
Couple: I don't know	0.008		0.004
	-0.008		-0.008
Δ Household children	-0.003		-0.001
	-0.004		-0.004
Female	-.007**		-.008**
	-0.003		-0.003
High-educated	-0.001		0.000
	-0.002		-0.002
Couple	-.018***		-.010*
	-0.005		-0.004
Age 50+	0.004		0.004
	-0.004		-0.004
Main income earner	-.011***		-.006*
	-0.004		-0.003
Job loss expectation at t-1		.128***	.125***
		-0.009	-0.010
Observations	15,862	15,215	13,208

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

3.3 Descriptive statistics

To get a first impression of how job loss affects different health outcomes, we present the means of health outcomes by employment and unemployment in Table 3. The results suggest that the employed have significantly better health and health behavior than the unemployed regardless of

health measure. However, it should be noted that these differences only capture cross-sectional differences between the employed and unemployment and no within-person effects of job loss. This issue is solved in our econometric model described in Section 4.

Table 3. Mean health differences for employed and unemployed.

Variables	Mean employed	Mean unemployed	Difference	Observations (employed / une
Subjective health[1]	3.212	2.982	-0.230***	22,056 / 1,178
BMI-score	25.503	25.931	0.428***	21,835 / 1,154
High blood pressure	0.099	0.150	0.051***	21,018 / 1,141
High cholesterol level	0.052	0.092	0.040***	21,018 / 1,141
Ever smoked[2]	0.554	0.624	0.070***	22,016 / 1,174
Alcohol use[3]	4.409	4.666	0.257***	22,014 / 1,174
Drug use	0.046	0.084	0.038***	22.058 / 1,178
Medication for sleeping problems	0.024	0.054	0.030***	21,959 / 1,176
Medication for anxiety or depression	0.033	0.070	0.037***	21,959 / 1,176
Family physician visits	1.622	2.289	0.667***	21,974 / 1,171
Medical specialist visits	0.894	1.107	0.213***	21,976 / 1,170
Life satisfaction[4]	7.514	6.666	-0.848***	23,072 / 1,248
Walking 100 meters	1.083	1.151	-0.068***	21,942 / 1,169

Notes: *** significant at 1%-level, ** significant at 5%-level, * significant at 10%-level. All regressions include control variables as described in Equation 1 and 2.

[1] Subjective health is an indicator ranging from 1 (very bad health) to 5 (very good health).

[2] Smoking, drugs and using medication for sleeping problems or anxiety or depression are indicators in the form of dummy variables ranging from 0 (no) to 1 (yes).

[3] Alcohol is an indicator measuring the alcohol use in the past 1, this indicator hold these 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).

[4] Satisfied with life is an indicator measuring how satisfied a person is with his/her life at this moment, on a 11 point-scale ranging from 0 (not at all satisfied) to 10 (completely satisfied).

4 Econometric model

We following the empirical framework of Stephens (2004) and estimate the following regression equations for individual *i* at time *t*. The first includes both expected and unexpected job loss

$$\Delta y_{it} = \gamma_0 + \gamma_1 jobloss_{it} + \boldsymbol{age'}_{it}\gamma_2 + \Delta \boldsymbol{X'}_{it}\gamma_3 + \boldsymbol{t'}_{t}\gamma_4 + \varepsilon_{it} \qquad (1)$$

The second includes unexpected job loss, e.g. job loss shocks, only.

$$\Delta y_{it} = \gamma_0 + \gamma_1[jobloss_t - E_{t-1}jobloss_t] + \boldsymbol{age'}_{it}\gamma_2 + \Delta\boldsymbol{X'}_{it}\gamma_3 + \boldsymbol{t'}_t\gamma_4 + \varepsilon_{it} \qquad (2)$$

with y_{it} being a vector of health measures such that γ_1 measures the marginal effect of job loss on health. $jobloss_{it}$ is a dummy variable that takes value one if an individual suffers an involuntary job loss between periods $t-1$ and t;[8] E_t is an operator denoting the expectations an individual forms conditional on the information available at t; $[jobloss_{it} - E_{it-1}jobloss_{it}]$ is the unemployment shock at time t, which takes the values in the interval [0,1] if $jobloss_{it} = 1$, and takes values in the interval [-1,0] if $jobloss_{it} = 0$; age_{it} is a vector of age dummies; X_{it} is a vector of control variables including marital status and number of children in the household ; t_t is a vector of year dummies; ε_{it} is the error term assumed to be NID. Equation 1 and 2 are estimated using a linear estimator. The first-differencing of y_{it} and X_{it} should capture all unobserved time-invariant within-person heterogeneity.

5 Estimation results

5.1 Baseline

The estimation results of our econometric model are presented for a wide variety of health measures in Table 3. In column 1, we estimate the effect of job loss regardless of the extent to which the job loss was foreseen. We find that losing a job significantly decreases subjective health (0.15 on a 5-point scale; an increase of about 5% compared to workers' average), increases the probability of drug use (3.3%-point), increases the probability of using prescription drugs against anxiety/depression (3.1%-point), and decreases life satisfaction (0.74 on an 11-point scale; an increase of about 10% compared to workers' average). Therefore, it seems that job loss primarily seems to reduce subjective observations of health and increased subsistence use to feel less anxiety/depression. It is likely that the observed decreases in subjective health measure are related to more pessimism stemming from anxiety/depression. We find no evidence for direct effects of job loss on physical health or health behaviors related to drinking.

The estimation results in column 1 include both expected and unexpected job loss. To analyze to what extent heath shocks from job loss are driven by unexpected job loss, we present the effects of unexpected job loss on health measures in column 2 of Table 3. These results confirm the effects

[8] Job loss is defined as having paid employment at time t-1 and being unemployed at time t. So, job loss does not include persons who stopped working because of health issues as these persons report to be disabled. This makes sure that we do not capture reverse effects of health shocks on job loss shocks.

of job loss on health from column 1 whilst showing more prominent effects of unexpected job loss. This leaves us to believe that the degree of expectancy of a job loss is an important driver of health consequences of job loss. Additionally, the results in column 2 suggest that unexpected job loss also changes health behavior. We find that unexpected job loss leads to a significant increase in smoking (an increase in the probability to smoke of about 11%) and alcohol use (0.62 on an 8-point scale; an increase of about 14% compared to workers' average). The latter result is quite alarming as we observe increases in the use of (prescription) drugs which are not to be mixed with alcohol.

Since $[jobloss_{it} - E_{it-1}jobloss_{it}]$ contains both unexpected job loss as well as unexpected job stay, we separate the two explicitly in Equation 2. We present the unexpected job stay, those who expect to lose their job but actually get to keep their job, in column 3 of Table 3. Interestingly, we find that unexpected job stay significantly increases self-perceived health and life satisfaction. Most likely, this can be explained by job loss anticipation which in itself reduces self-perceived health. Unexpected job stay significantly decreases physician visits and medication against sleeping disorders. However, those who expect to lose their job report a higher probability of using prescription drugs against anxiety/depression regardless of staying on the job or losing it. The effect is slightly smaller if one stays on the job despite expectations of losing it (1.7%-point versus 6.1%-point). This result suggests that the anticipation of job loss already cause anxiety/depression no matter the outcome. We find no effects of unexpectedly keeping a job on health behavior related to drinking, smoking, and illegal substances.

Altogether, our results suggest that job loss primarily leads to a change in self-perceived health and mental health status. Much of the effect comes from unexpectantly losing a job. However, our results also suggest that the anticipation of a potential job loss leads to a drop in mental health which are again reduced if one unexpectedly keeps his/her job. We find no evidence for any short-term effects of job loss on physical health. However, we should note that changing mental health and health behaviors following job loss can ultimately lead to physical health problems. Such long-term effects are an interesting lead for future research.

Our results are robust to using non-linear estimators for binary and ordered dependent variables (no reported here). A probit estimator was used for high blood pressure, high cholesterol, smoking, drug use, medication for sleeping disorders, and medication against anxiety/depression. An ordered

probit estimator was used for subjective health, alcohol use, life satisfaction, and walking 100 meters.

Table 3. Estimation results of the effect of (unexpected) job loss on health.

	Independent variables			
Dependent variables	Job loss	Unexpected job loss	Unexpected job stay	Observations
	(1)	(2)	(3)	
Subjective health[1]	-0.150***	-0.214**	0.224***	11,163
	(0.049)	(0.085	(0.035)	
BMI-score	0.257	0.144	-0.355	11,050
	(0.259)	(0.440)	(0.222)	
High blood pressure	0.012	0.002	-0.014	10,948
	(0.024)	(0.039)	(0.017)	
High cholesterol level	0.010	-0.017	-0.012	10,948
	(0.019)	(0.026)	(0.013)	
Smoking[2]	0.052	0.107*	0.029	11,150
	(0.035)	(0.063)	(0.028)	
Alcohol use[3]	-0.201	-0.624***	-0.153	11,150
	(0.133)	(0.231)	(0.115)	
Drug use	0.033*	0.059*	0.004	11,165
	(0.018)	(0.035)	(0.009)	
Medication for sleeping problems	0.008	0.026	-0.028***	11,133
	(0.013)	(0.025)	(0.010)	
Anxiety or depression medication	0.031*	0.061*	0.017**	11,133
	(0.018)	(0.034)	(0.008)	
Family physician visits	0.180	0.242	-0.242*	11,138
	(0.150)	(0.254)	(0.124)	
Medical specialist visits	-0.014	-0.073	-0.177	11,138
	(0.183)	(0.208)	(0.120)	

Life satisfaction[4]	-0.737***	-0.856***	0.501***	11,100
	(0.104)	(0.187)	(0.063)	
Walking 100 meters	0.002	0.013	-0.016	11,111
	(0.023)	(0.038)	(0.017)	

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 and 2.

[1] Subjective health is an indicator ranging from 1 (very bad health) to 5 (very good health).

[2] Smoking, drugs and using medication for sleeping problems or anxiety or depression are indicators in the form of dummy variables ranging from 0 (no) to 1 (yes).

[3] Alcohol is an indicator measuring the alcohol use in the past 1, this indicator hold these 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).

[4] Satisfied with life is an indicator measuring how satisfied a person is with his/her life at this moment, on a 11 point-scale ranging from 0 (not at all satisfied) to 10 (completely satisfied).

5.2 Heterogeneity analyses

To include: heterogeneous effects with respect to Main income earner, Female, Education, Age 50+. Conclusions:

- Effects largely similar for singles and couples, except that those in a couple have smaller increases in subjective health when unexpectedly keeping their job.
- Women are more likely to use anxiety/depression medication, more likely to visit the GP, and have smaller increases in subjective health among those unexpectedly keeping their job.
- Effects of 50+ largely similar.
- Effects of main income earner largely similar, except for bigger increase in subjective health and life satisfaction for those unexpectedly keeping their job.
- Effects high-educated largely similar, except that they are less likely to visit the GP than lower educated.

6 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. Compared to this existing literature, we make two contributions. Firstly, we exploit panel data to estimate causal effects of job loss on retirement. Compared to the existing literature, we differentiate between expected and unexpected job loss building forth on the method of Stephens (2004). Secondly, whereas most literature has focused on a particular health outcome, we study a wide array of health measures available in our data.

We find significant drops in subjective health following a job loss. This effect is stronger for unexpected job loss. Effects are largely asymmetrical in unexpectedly staying on the job, except for subjective health measure. These results suggest that job loss anticipation is an important driver of subjective health which suggests that the changing self-perception of health is an important direct effect of job loss. We find little to no evidence for decreasing physical health, such as BMI and blood pressure, but find clear evidence for mental health problems consistent with the effects on self-perceived health. This becomes especially apparent in finding increases in smoking, drug use, and anxiety/depression drug use following a job loss. We should note, however, that these mental health problems expressed by smoking behavior and drug use can lead to physical health issues in the long-run. Finally, we conclude that it is important to analyze the effects of unemployment on health from a within-person perspective as cross-sectional analyses may overexaggerate the effect of unemployment.

Our results are important as they show that job loss has negative external effects to society. The costs of job loss for society are likely to be go beyond the costs of unemployment with increases in health care costs. These costs are not taken into account by employers who decide about to let go of employees. Therefore, in crises such as the COVID19-pandemic, introducing (temporary) short-time work arrangements, which were widely used in countries such as Germany (*Kurzarbeitergeld*) and the Netherlands (*NOW, Noodmaatregel Overbrugging voor Werkgelegenheid*) as opposed to the US where such arrangements do not exist and where companies largely depended on furlough, may be less costly to society than reducing the number of employees per firm as this is likely to result in less (mental) health problems.

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