PUBLIC HEALTH 179 (2020) 127–134

Available online at www.sciencedirect.com

Public Health

journal homepage: www.elsevier.com/puhe

Original Research

Self-reported health versus biomarkers: does unemployment lead to worse health?

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ARTICLE INFO

Article history:
Received 31 May 2019
Received in revised form
13 September 2019
Accepted 8 October 2019

Keywords:
Unemployment
Self-assessed health
Biomarkers

ABSTRACT

Objectives: This paper examines the relationship between unemployment and health using both subjective and biometric information on health status.
Study design: Longitudinal panel data.
Methods: We compare the results of regressions of unemployment on self-reported health with those of regressions of unemployment on health as measured with biomarkers (hypertension and levels of blood glucose and C-reactive protein). Using the panel structure of our data, we account for selection bias with respect to unemployment by controlling for health before exposure to unemployment.
Results: We observe a striking pattern. Using self-reported health as the outcome variable, we find a link between unemployment and worse health. By contrast, we are unable to establish the same link using biometric information on health.
Conclusion: In conclusion, our results indicate a substantial discrepancy between self-reported health and health as measured by biomarkers.

Introduction

A sizeable empirical literature documents that adverse labour market outcomes negatively affect individuals' health.[1,2] In many research settings, the health outcome used is self-reported health, as self-assessed health is less costly to obtain and readily available in well-known panel data sets, such as the British Household Panel Survey.[3] However, regarding the connection between labour market status and health, research shows that results obtained using health measurements performed by health professionals differ systematically from individuals' self-reported health.[4–6] One reason for this pattern is what is called justification bias, that is, individuals consciously or subconsciously misreport on their health compared with their 'objective' health status.

This paper re-examines the relationship between unemployment and (bad) health. Our contribution to the literature is based on the use of both subjective and objective biometric measures of individuals' health in a panel data setting. We first use self-reported health data to investigate whether there

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https://doi.org/10.1016/j.puhe.2019.10.005

is a negative link between unemployment and health. We then use the standard biometric measures of health, i.e., hypertension and levels of blood glucose and C-reactive protein, which are prominent biomarkers related to prevalent chronic health conditions in industrialised countries to examine the same relationship. If no difference in the relationship exists between self-reported health and unemployment on the one hand and health measured by biomarkers and unemployment on the other hand, the coefficients for unemployment in both types of regressions should be negative.

The earlier empirical evidence on the link between unemployment and biomarkers is sparse. However, one study used cross-sectional UK data to examine the relationship between inflammatory biomarkers and unemployment and another analysed the effects of job loss on biomarkers in the US context.[7,8]

Methods

Study design and sample

The data that we use in this study come from the panel based on the Health in Finland 2000 and the Health in Finland 2011 data sets. The Health 2000 in Finland Survey comprehensively represents the Finnish population aged 30 years and older. The methods and base results of the 2000 survey have been previously described in detail.[9] Briefly, the survey had a two-stage, stratified cluster sampling design, with double sampling of people older than 80 years.[10] Data were collected between August 2000 and July 2001. Of the original sample of 8028 people, 93% participated in at least one part of the study.

In 2011, the data for a follow-up to this survey, the Health in Finland 2011, were collected. A total of 72.9% of the sample of people aged 30 and older (n = 7964) took part in at least one of the phases of the data collection, while 58.6% took part in the health examination. The National Institute for Health and Welfare in Finland, in collaboration with a broad-based network of experts, coordinated the planning and implementation of the survey.[11] Thus, the follow-up sample that we are using in this study consists of individuals aged 41 years or older in 2011. The same type of stratified cluster sampling that was used in the 2000 survey was also applied in the 2011 survey. Because the sample used in the analysis consists of individuals employed in 2000 who also participated in the 2011 survey, it is possible that some fraction of very unhealthy individuals will be left out of the analysis because of the sample restriction. Consequently, the results do not apply to individuals in the very low end of the health distribution. Self-reported health is measured as follows: 1, 'very good'; 2, 'good'; 3, 'average'; 4, 'rather bad' and 5, 'bad'. We observe that for those working in 2000 and who were thus included in our sample, the average self-reported health was 1.78, whereas for those who were younger than 66 years and who were not working the average self-reported health was 2.10.

Measures

We use two main explanatory variables. The first variable is current unemployment, and the second variable is the number of months of unemployment the individual has experienced during the last five years. The unemployment measures are based on interviews, which, for this question, were performed in the same way in both waves of the data. The unemployment measures that we use in the analysis refer specifically to individuals in the labour force who are available for work but are currently without it (the standard International labour organization (ILO) definition of unemployment).

As already indicated, we use four different dependent variables that measure health status in this article. The first one, which was briefly discussed in the previous section, is self-reported health, which was gathered in the health interviews in both 2000 and 2011. Respondents were asked to answer the following standard question: 'How is your current health?' The five answer categories were as follows: 1, 'very good'; 2, 'good'; 3, 'average'; 4, 'rather bad' and 5, 'bad'. The second dependent variable is hypertension. In the Health 2000 and Health 2011 data sets, systolic and diastolic blood pressure measurements were taken twice by trained health professionals with a standard mercury manometer (Riester Diplomat Presameter Desk Set), and from the mean of those measurements, we constructed a dichotomous variable that had a value of 1 if the person had hypertension and a value of 0 if otherwise. A person was considered to have hypertension if the systolic pressure was 140 mmHg or higher or if the diastolic blood pressure was 90 mmHg or higher.[12] Furthermore, individuals who were treated with drugs for high blood pressure were also categorised as having high blood pressure. The reason for using hypertension as a biomarker in this context is that hypertension is the most prevalent chronic health condition in Western countries and is a major risk factor for cardiovascular diseases.[13] The third dependent variable is C-reactive protein, measured by an immunoturbidimetric method. C-reactive protein is a general marker for inflammation and infection in the body.[14] The level of C-reactive protein has been linked in previous research to perceived levels of chronic stress, which can be triggered by unemployment.[15] As measurements of C-reactive protein display a highly skewed distribution, we used a log transformation in all regressions. The fourth dependent variable is serum glucose, measured by enzymatic hexokinase. An elevated blood glucose level is an early indicator of diabetes and is also related to an elevated risk of cardiovascular diseases.[16] As this measure can be sensitive to the length of time spent fasting before measurement, individuals who had fasted for less than 4 h before measurement were excluded from that regression. As a result, a total of 41 cases (2.05%) were removed.

Furthermore, health is obviously also dependent on a host of other variables. In accordance with previous literature, we add age, a gender dummy, education indicators, variables

measuring household composition and several variables measuring individual risky health behaviours, such as alcohol consumption, diet, smoking, and physical exercise as control variables. We also add regional control variables to account for large permanent differences in health outcomes in Finland.

Regarding age, it is likely that the effects on health are non-linear. Therefore, we construct age dummies that correspond to five-year intervals. Education is also measured by dummy variables representing levels of education instead of a linear variable measuring years of education. Household composition is measured by a dummy, indicating whether an individual is married or cohabiting and by a variable measuring household size.

Alcohol consumption is measured by two variables. The first variable measures how many times in a week an individual drinks alcohol, and the second variable measures how many servings of alcohol an individual consumes while drinking. Smoking is measured by the number of cigarettes an individual smokes per week. Diet is measured by two variables: the number of times an individual consumes fruit per week and the number of times an individual consumes vegetables per week. Finally, exercise is measured by how many times an individual exercises for at least 30 min per week.

Statistical methods

We analyse why there are health differences between individuals and how unemployment is linked to those differences. To capture as much of the causal effect of unemployment on health status as possible, we first include in our sample only those people who were employed in 2000. Some of these individuals either experienced unemployment during the period of 2006–2011 (when we were able to measure unemployment) or were unemployed in 2011, when the follow-up data were collected. We then start with a simple regression model with the measures of health as the dependent variable and individuals' experiences of unemployment as the main independent variable. However, earlier research has shown that there is a selection bias in unemployment, such that individuals with worse health are more likely to experience unemployment.[17] Therefore, as an additional independent variable, we add the individuals' health status in 2000 to the models. Thus, in essence, we are estimating health change models, such that health in 2011 is dependent on health in 2000. As a starting point, we use ordinary least squares techniques in all regressions, as the coefficients of such regressions are easier to interpret and it is possible to quantitatively interpret the estimated coefficients. However, when the dependent variable is self-reported health, we also supplement those regressions with ordered probit models. Importantly, we account for the two-stage stratification of the data in all regressions. The calibrated weights alleviate the potential bias related to attrition in panel data.

Results

Table 1 provides descriptive statistics for our sample. The descriptive statistics clearly conveys the representativeness of the data for the Finnish population in 2011. Five percent of the individuals are currently unemployed, which is slightly lower than the national average at that time, but the difference is a consequence of the focus on older people and because we have selected only individuals who were employed in 2000. On average, individuals in the sample smoke 5.56 cigarettes per week, drink alcohol 1.26 times per week and consume 2.96 drinks per occasion. It is noticeable that individuals are moderately overweight on average, as the average body mass index (BMI) is slightly less than 27 kg/m^2.

Table 1 also reports the descriptive statistics broken down by employment status. We find that most health measures are much better for those who are employed. In addition, there are systematic differences between employed and unemployed people in the data in terms of background characteristics. For example, employed people have higher education levels than unemployed people.

In Table 2, we first present the estimates when the dependent variable is (bad) self-reported health. In the first column, we only have age and the male dummy together with our unemployment variable as independent variables, and the result is very much as expected. Both current unemployment and months of unemployment are linked to worse health, measured as (bad) self-reported health. In the second column, we add our education, risky health behaviours and family composition variables. Again, the result is as expected, with physical exercise associated with better self-reported health and overweight associated with worsened self-reported health. The education variables are also very much as expected, as individuals who are more educated have better self-reported health. Our unemployment variables are attenuated to some extent but are still statistically significant. In the third column, we add individual self-reported health in 2000, which is highly significant, implying that those who had lower self-reported health in 2000 also have lower self-reported health in 2011. Thus, health is a durable good to a large extent, and the within-person correlation of health status over time is high. This finding is important for our empirical strategy to identify the effect of poor health on individuals' selection into unemployment because it accounts for the fact that individuals who had worse health in 2000 may be more likely to experience unemployment during the coming years. This finding also attenuates the coefficients to some extent, albeit somewhat more for the variables other than the unemployment variables, implying that some of the lifestyle and education variables in 2000 are correlated with better health in 2000. Finally, in the fourth column, we add regional dummies to the regression model. This addition does not alter the results very much, although regional health differences in Finland are evidently very large. In general, health is worse in northern and eastern Finland and better in the southern and western parts of the country, with a 3-year difference in life expectancy at birth between the healthiest region of Pohjanmaa in the western part of the country and the least healthy region of Etelä-Savo in the eastern part of the country.[18,19]

The quantitative magnitude of the estimates regarding the link between unemployment and health is considerable. For example, the estimates show that being currently unemployed increases the probability of reporting worse health by 24% (column 4 of Table 2). In Supplementary material, we

Table 1 – Descriptive statistics, Health 2000 and Health 2011 surveys in Finland.

Variable	Whole sample		Always employed		Any unemployment	
	Mean	Standard deviation.	Mean	Standard deviation	Mean	Standard deviation
Months of unemployment	1.15	5.20	0	0	10.76	14.35
Currently unemployed	0.06	0.23	0	0	0.26	0.44
Self-reported health, 2000	1.65	0.79	1.63	0.77	1.79	0.84
Self-reported health, 2011	1.68	0.82	1.65	0.79	1.91	0.97
Hypertension, 2000	0.29		0.29		0.34	
Hypertension, 2011	0.49		0.48		0.56	
Log of C-reactive protein, 2000 (mg/l)	−1.29	2.45	−1.29	2.44	−1.19	2.47
Log of C-reactive protein, 2011 (mg/l)	0.08	1.06	0.05	1.03	0.11	1.14
Log of glucose, 2000 (mmol/l)	1.66	0.12	1.65	0.12	1.65	0.11
Log of glucose, 2011 (mmol/l)	1.66	0.14	1.65	0.14	1.66	0.12
Male	0.49		0.49		0.54	
Age: 40–44 years	0.23		0.23		0.17	
Age: 45–49 years	0.25		0.24		0.22	
Age: 50–54 years	0.23		0.23		0.18	
Age: 55–59 years	0.22		0.20		0.26	
Age: 60–99 years	0.07		0.07		0.15	
No. of times eating vegetables per week	4.91	2.12	4.94	2.12	4.59	2.12
No. of times eating fruit per week	4.06	2.53	4.10	2.51	3.72	2.60
No. of times drinking alcohol per week	1.04	1.15	1.03	1.13	1.02	1.18
No. of alcoholic drinks per occasion	2.44	2.36	2.42	2.31	2.57	2.69
Exercise frequency per week	2.40	2.06	2.38	2.02	2.34	2.13
Family size	2.60	1.28	2.64	1.27	2.24	1.12
Married or cohabiting	0.78		0.80		0.70	
Divorced	0.11		0.10		0.11	
No. of cigarettes per week	4.76	8.03	4.43	7.82	6.15	8.80
BMI (kg/m^2)	26.92	4.65	26.98	4.63	27.04	4.86
Primary education	0.02		0.01		0.03	
Lower secondary education	0.06		0.04		0.09	
Higher secondary education	0.06		0.05		0.07	
Postsecondary non-tertiary education	0.38		0.36		0.45	
Bachelor's or equivalent education	0.33		0.34		0.24	
Master's or equivalent education	0.13		0.13		0.07	
Doctoral or equivalent education	0.03		0.03		0.01	
Hospital region: Helsinki	0.33		0.33		0.34	
Hospital region: Turku	0.14		0.14		0.11	
Hospital region: Tampere	0.22		0.22		0.24	
Hospital region: Kuopio	0.16		0.16		0.15	
Hospital region: Oulu	0.13		0.13		0.15	

Notes: The table values represent the mean (or proportion) and standard deviation.
BMI = body mass index.

rerun the regressions presented in Table 2 but instead use an ordered probit model. The results are not qualitatively different compared with those in Table 2.

In Table 3, we report the results when health is measured by biomarkers. In the table, the specification is the same as the specification used in the rightmost specification in Table 2, i.e., with all controls included. As seen from the table, the results look markedly different compared with the results in Table 2. In column 2 of Table 3, when health is measured by hypertension, the variable measuring neither months of unemployment nor current unemployment is significant. Furthermore, the lagged dependent variable is highly significant. Thus, there is a substantial selection effect, such that those who already have hypertension in 2000 are much more likely to have hypertension in 2011. The other control variables offer expected results; for example, a high BMI increases the incidence of hypertension, whereas eating fruit often, as well as physical exercise, often decreases the incidence of hypertension, which is in line with research in the field.[20] We also found that smoking is associated with a lower incidence of hypertension. *A priori*, one would envisage that smoking would increase the probability of hypertension. However, this result may be due to underlying correlation with other explanatory variables that is unaccounted for in the current empirical setup. As it is not the specific topic of this article, we will not probe further into that question. In Supplementary material, we present the results of regressions in which the dependent variables are diastolic and systolic blood pressure measured in 2011. Regarding the coefficients for the unemployment variables in those Supplementary material, we see that there are no qualitative differences compared with Table 3. In column 2 of Table 3, we use C-reactive protein as our dependent variable. Again, we observe that our unemployment variables are not significant, and regarding the lagged outcome variable, we can see that it is highly significant, indicating that those who had an elevated level of C-reactive

Table 2 – The relationship between unemployment and 'bad' self-reported health, Health 2000 and Health 2011 surveys in Finland.

Self-reported health	Self-reported health	Self-reported health	Self-reported health	Self-reported health
Months of unemployment	0.013*** (0.004)	0.009** (0.004)	0.008** (0.003)	0.008** (0.003)
Currently unemployed	0.306*** (0.091)	0.248*** (0.085)	0.238*** (0.081)	0.241*** (0.081)
Male	0.030 (0.039)	−0.038 (0.040)	−0.044 (0.039)	−0.044 (0.039)
Age: 45–50 years	0.117** (0.050)	0.103** (0.047)	0.079* (0.047)	0.080* (0.047)
Age: 50–55 years	0.237*** (0.059)	0.155*** (0.060)	0.104* (0.057)	0.106* (0.057)
Age: 55–60 years	0.245*** (0.049)	0.163*** (0.056)	0.084 (0.054)	0.087 (0.055)
Age more than 60 years	0.126 (0.081)	0.046 (0.084)	−0.029 (0.079)	−0.033 (0.079)
No. of times eating vegetables per week		0.007 (0.010)	0.004 (0.009)	0.003 (0.009)
No. of times eating fruit per week		−0.009 (0.010)	−0.006 (0.009)	−0.006 (0.009)
No. of times drinking alcohol per week		−0.015 (0.017)	−0.019 (0.016)	−0.020 (0.016)
No. of alcoholic drinks per occasion		0.010 (0.010)	0.007 (0.009)	0.006 (0.009)
Exercise frequency per week		−0.080*** (0.010)	−0.067*** (0.010)	−0.067*** (0.010)
Family size		−0.040** (0.017)	−0.035** (0.016)	−0.035** (0.016)
Married or cohabiting		−0.095 (0.075)	−0.045 (0.066)	−0.042 (0.066)
Divorced		−0.022 (0.096)	0.041 (0.092)	0.041 (0.092)
No. of cigarettes per week		0.003 (0.003)	0.002 (0.002)	0.002 (0.002)
BMI (kg/m^2)		0.028*** (0.004)	0.021*** (0.004)	0.021*** (0.004)
Higher secondary education		−0.095 (0.095)	−0.106 (0.091)	−0.109 (0.091)
Postsecondary non-tertiary education		−0.081 (0.075)	−0.076 (0.070)	−0.079 (0.070)
Bachelor's or equivalent level		−0.201*** (0.073)	−0.179*** (0.066)	−0.182*** (0.067)
Master's or equivalent level		−0.197** (0.083)	−0.160** (0.079)	−0.164** (0.079)
Doctoral or equivalent level		−0.286** (0.142)	−0.198 (0.140)	−0.201 (0.140)
(Bad) self-reported health, 2000			0.302*** (0.028)	0.302*** (0.028)
Regional dummies	No	No	No	Yes
Constant	1.501*** (0.040)	1.325*** (0.159)	0.959*** (0.148)	0.977*** (0.147)
R-squared	0.033	0.136	0.214	0.215
N	1994	1991	1989	1989

Note: The dependent variable is an indicator for having 'bad' self-reported health. The numbers in the tables are regression coefficients, and the numbers in brackets are the corresponding standard errors.
The reference category for the age dummies is being 41–44 years old in 2000.
The reference category for the male dummy is female.
The reference category for the age dummies is 41–44 years old. The reference category for the married or cohabiting dummy is not being married or cohabiting. The reference category for the divorced dummy is not divorced. Statistical significance: *P < 0.1, **P < 0.05, ***P < 0.01.
BMI = body mass index.

protein in 2000 also had it in 2011. Regarding the control variables, we observe that neither drinking and smoking nor having a high BMI is favourable for health measured in this way. Physical exercise is associated with lower levels of C-reactive protein.

Finally, in the rightmost column of Table 3, the results in which glucose is used as the dependent variable are presented. The unemployment variables show some unexpected results here, with more months of unemployment actually being associated with lower levels of glucose. Although unexpected, this finding does not alter our general message in this article. Again, regarding the control variables, having a high BMI is associated with higher glucose, as is how many times a week the individual drinks alcohol. The lagged dependent variable is again highly significant. Related to our findings, it has been observed that unemployed people are not necessarily heavier than employed people.[21]

As robustness checks, we present in Supplementary material the results of regressions in which we have rerun the regressions presented in Table 3 but without the lifestyle and health behaviour variables. Again, the results remain unchanged. Finally, Supplementary material confirms that there is a statistically significant link between self-reported health and all three biometric measures of health that we are using in the models. This finding is in line with previous research that has established a link between self-reported health and objective health measures.[22]

Discussion

Employment is a key determinant of an individual's material and mental well-being. When we use self-reported health as the outcome variable, we find a well-established link between unemployment and bad health. Strikingly, current unemployment and months of unemployment during the last five years are not linked to individuals' biometric health measures. We account for selection bias into unemployment by using the follow-up (panel) structure of our data. As expected, there is substantial selection based on health status into unemployment, such that individuals with worse health are much more likely to experience unemployment.[17]

Table 3 – The relationship between unemployment and biomarkers, Health 2000 and Health 2011 surveys in Finland.

	Hypertension	C-reactive protein	Glucose
Months of unemployment	−0.000 (0.002)	−0.001 (0.005)	−0.001** (0.000)
Currently unemployed	0.017 (0.047)	0.058 (0.106)	0.018 (0.016)
Male	0.070*** (0.020)	−0.189*** (0.046)	0.021** (0.009)
Age: 45–50 years	0.059** (0.026)	0.035 (0.069)	0.008 (0.008)
Age: 50–55 years	0.082*** (0.029)	0.038 (0.081)	0.020** (0.009)
Age: 55–60 years	0.094*** (0.030)	0.143* (0.082)	0.023** (0.012)
Age more than 60 years	0.105** (0.048)	0.166 (0.105)	0.036** (0.014)
No. of times eating vegetables per week	−0.002 (0.005)	0.014 (0.013)	−0.000 (0.002)
No. of times eating fruit per week	−0.040*** (0.005)	−0.022 (0.014)	−0.001 (0.002)
No. of times drinking alcohol per week	−0.019* (0.010)	−0.007 (0.019)	0.007** (0.003)
No. of alcoholic drinks per occasion	−0.008* (0.005)	0.018* (0.010)	0.001 (0.001)
Exercise frequency per week	−0.030*** (0.006)	−0.033*** (0.013)	−0.000 (0.002)
Family size	0.001 (0.010)	−0.046** (0.022)	−0.003 (0.003)
Married or cohabiting	−0.017 (0.034)	0.211*** (0.077)	−0.007 (0.013)
Divorced	−0.025 (0.040)	0.097 (0.092)	−0.016 (0.014)
No. of cigarettes per week	−0.002* (0.001)	0.012*** (0.003)	−0.000 (0.000)
BMI (kg/m^2)	0.011*** (0.002)	0.086*** (0.005)	0.004*** (0.001)
Higher secondary education	−0.042 (0.053)	0.046 (0.129)	−0.006 (0.026)
Postsecondary non-tertiary education	−0.006 (0.044)	0.050 (0.104)	−0.033* (0.018)
Bachelor's or equivalent level	0.004 (0.044)	0.022 (0.099)	−0.044** (0.018)
Master's or equivalent level	−0.077 (0.053)	0.047 (0.112)	−0.050** (0.020)
Doctoral or equivalent level	−0.044 (0.065)	−0.103 (0.170)	−0.051** (0.021)
('Bad') self-reported health, 2000			
Hypertension, 2000	0.287*** (0.021)		
Log of C-reactive protein, 2000 (mg/l)		0.114*** (0.011)	
Log of glucose, 2000 (mmol/l)			0.532*** (0.087)
Constant	0.326*** (0.082)	−2.104*** (0.220)	0.694*** (0.133)
R-squared	0.260	0.316	0.287
N	1993	1565	1526

Note: The dependent variables are biomarkers.
Included in regressions but not reported are five regional dummies.
The reference category for the age dummies is being 41–44 years old in 2000.
The reference category for the male dummy is female.
The reference category for the age dummies is 41–44 years old. The reference category for the married or cohabiting dummy is not being married or cohabiting. The reference category for the divorced dummy is not divorced.
The reference category for the educational dummies is lower secondary education or less.
Statistical significance: *P < 0.1, **P < 0.05, ***P < 0.01.
BMI = body mass index.

A plausible explanation for the results obtained may be justification bias. Another could be that unemployment is an unpleasant experience but mainly affects mental health and that mental health is uncorrelated with the biomarkers we are using in this study. However, we consider this explanation to be unlikely, as substantial evidence suggests that mental health problems are correlated with abnormal values in biomarkers.[23–25]

Furthermore, it is possible that we are not conceptualising health in a meaningful manner with the biomarkers we are using. However, as elevated levels in any of the biomarkers we are using encompass a substantial portion of the total burden of disease in society, we also consider this explanation to be unlikely. In addition, our results confirm that subjective and objective health measures are significantly correlated with each other. However, further research may be needed with respect to this point: What biomarkers would capture the link between unemployment and bad health, if not the ones evaluated in this article?

Another possibility is that the unemployment measures used in the empirical specifications are not sufficient in measuring unemployment experiences accurately, although we find this possibility unlikely. Experience of unemployment during the last five years captures considerable burden stemming from poor labour market attachment, and we find it unlikely that the results would be biased owing to the fact that we are not using, for instance, ten years of employment history. On balance, our results point to a substantial discrepancy between self-reported health and health measured by standard biomarkers.

Two other issues are relevant for the interpretation of our results. First, our sample includes only those people who were employed in 2000. There is potential health selection regarding participation in the labour force and being employed in 2000. Those who had worst health in 2000 were most likely out of the labour force,[26] which may lead to conservative estimates. Second, it is possible that the country context is relevant for the interpretation of the results. The

impact of unemployment on physical health may be lower in Finland than in some other country contexts because of differences in policies, for example, welfare provisions for unemployed people. For example, the coverage of earnings-related unemployment benefits among unemployed individuals is higher in Finland than in many other industrialised countries.[27]

Our results indicate that using exclusively self-reported health data may lead to biased results in research on important relationships in social sciences. Therefore, research has the potential to improve by increasingly using more objective and more precise measures of health status instead of subjective evaluations and outcomes.[28] In terms of policy design, the use of resources and funding may be misallocated in social and health services if the proper health effects of, for instance, unemployment are not identified. More empirical research using both subjective and objective health measures regarding the impacts of unemployment is clearly needed to make conclusive policy recommendations.

Conclusion

In this article, we studied the relationship between unemployment and health. We compared the results of regressions of unemployment on self-reported health with those of regressions of unemployment on health as measured with biomarkers. Using panel data, we accounted for selection into unemployment by accounting for health before exposure to unemployment. We find striking differences when comparing the effect of unemployment on self-reported health with the effect of unemployment on biomarkers. For self-reported health, we observe a link between unemployment and worse health, but we are unable to detect the same effect for health as measured with biomarkers. We conclude that the allocation of health-care resources using solely subjective measures may lead to non-optimal policy designs.

Author statements

Acknowledgements

Böckerman acknowledges financial support from the Academy of Finland Strategic Research Council project Work, Inequality and Public Policy (number 293120 and 314208).

Ethical approval

Ethical approval was not obtained for this study because the data used were collected by the National Institute of Health and Welfare in Finland, and ethical approval for the collection of the data was obtained at the time of data collection.

Funding

None declared.

Competing interests

None declared.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.puhe.2019.10.005.

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