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Health and Unemployment in Norway:

Selection or Causation?

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Doctoral thesis

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Norwegian University of Science and Technology
Faculty of Medicine and Health Sciences
Department of Public Health and Nursing

NTNU
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Come gather 'round people

Wherever you roam

And admit that the waters

Around you have grown

And accept it that soon

You'll be drenched to the bone

If your time to you is worth savin'

Then you better start swimmin'

Or you'll sink like a stone

For the times they are a-changin'

[…]

~Bob Dylan
(*The Times They Are A-Changin'*, 1964)

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Sammendrag:

Helse og arbeidsledighet i Norge: Seleksjon eller årsak?

Hvis vi sammenlikner helsa til folk som er arbeidsledige med helsa til folk som er i jobb, vil det nesten alltid være slik at de arbeidsledige har dårligere helse. En plausibel forklaring kan være at stress og dårligere økonomi i forbindelse med arbeidsledigheten i seg selv er årsaken til at de arbeidsledige har fått dårligere helse, men det kan også være slik at arbeidstakere med dårlig helse i utgangspunktet har større risiko for å bli arbeidsledige (helseseleksjon). Internasjonal litteratur støtter begge disse hypotesene, men det er fortsatt mye vi ikke vet om hvordan det å gå gjennom nedbemanninger og arbeidsledighetsprosesser påvirker helsa vår. Disse sammenhengene har i liten grad vært studert med norske data. I Norge har vi et inkluderende arbeidsliv med gode velferdsordninger, en sterk arbeidsmiljølov og tradisjonelt lav arbeidsledighet. Vi var derfor nysgjerrige på i hvilken grad det er slik at norske arbeidstakere med dårlig helse selekteres til arbeidsledighet (studie I), og om vi ville finne tegn til at å oppleve nedbemanning og arbeidsledighet gir dårligere helse hos norske arbeidstakere (studie II og III).

I søken etter årsakssammenhenger i dette forskningsfeltet er en av hovedutfordringene å ta tilstrekkelig hensyn til en eventuell helseseleksjon av arbeidstakere med dårlig helse inn til arbeidsledighet. Den første studien vår hadde som mål å utforske helseseleksjon i en norsk kontekst. Vi koblet selvrapporterte helseopplysninger fra voksne deltakere i Helseundersøkelsen i Nord-Trøndelag fra 1995-97 (HUNT2) med trygderegisterdata (FD-trygd), og fulgte deltakernes arbeidsmarkedstilknytning i 14 år, fram til 2008. Det viste seg at de med symptomer på angst og depresjon og de med kroniske somatiske tilstander hadde en nesten doblet risiko for å bli arbeidsledig, sammenliknet med dem som ikke rapporterte slike helseplager. Vi fant også økt risiko for arbeidsledighet hos de med muskel- og skjelettplager, mage/tarm-problemer, søvnproblemer, problematisk alkoholforbruk og generelt dårlig selvopplevd helse. Det var ikke store kjønnsforskjeller, men kvinner som rapporterte alkoholproblemer hadde større risiko for å bli arbeidsledige enn tilsvarende sammenheng for menn. Vi undersøkte også om arbeidstakere med helseproblemer i større grad ble sykmeldte heller enn arbeidsledige, sammenliknet med de med mindre helseproblemer. Dette fikk vi bekreftet for de med somatiske tilstander, mens de som rapporterte psykiske problemer hadde en større relativ økning i risiko for arbeidsledighet, sammenlignet med sykmelding.

For å ta hensyn til den potensielle konfunderingen (helseseleksjonen) avdekket i den første studien, undersøkte vi resultatene fra en form for naturlig eksperiment ved hjelp av observasjonsdata fra flere norske register på hele den norske arbeidspopulasjonen i perioden 2004 til 2012. Vi antok at de som ble rammet av store nedbemanninger (minst 25 % reduksjon i antall ansatte

mellom år) i liten grad ble rammet av nedbemanning på grunn av helsa si. Ved hjelp av individdata fra Reseptregisteret og opplysninger om hvilke private virksomheter som nedbemannet i denne perioden, kunne vi undersøke endringer i medikamentuthenting i årene før og etter at gruppen med ansatte ble eksponert for nedbemanning. Sammenliknet med medikamentuthenting tre år før nedbemanningen, fant vi en økt sannsynlighet i årene rett etter nedbemanning for uttak av antidepressiva (medisiner mot depresjon), hypnotika/sedativa (sovemedisin), anxiolytika (medisiner mot angst) og antipsykotika (medisiner mot psykose og andre alvorlige psykiske tilstander). Det var også økt uttak av insulin, samt medikamenter mot lavt stoffskifte, hjerte- og karsykdom, og til en viss grad smertestillende, i årene etter nedbemanning. Alle analysene ble justert for kjønn, alder, utdanning og potensielle tidstrender. Vi konkluderte med at å eksponeres for nedbemanning i Norge ser ut til å ha klare negative effekter på den psykiske helsa til de som blir rammet. Det ser også ut til at nedbemanning kan utløse eller føre til at kardiovaskulære tilstander oppdages. I tillegg tror vi at hjelpsøking i helsevesenet i forbindelse med nedbemanning fører til at somatiske tilstander som diabetes og hypotyreose blir utredet og avdekket.

I den tredje studien ønsket vi å se nærmere på *når* i en arbeidsledighetsprosess helsa til arbeidstakerne eventuelt påvirkes mest. Mens det i den andre studien kun var mulig å studere årlige effekter av jobbusikkerhet på helse, benyttet vi i studie III informasjon om eksakte datoer for medikamentuttak og arbeidsledighet i den norske arbeidspopulasjonen i perioden 2005 til 2010. Igjen var det viktig å kunne ta høyde for helseseleksjon i den analytiske tilnærmingen for å kunne nærme oss kausale slutninger, og det ble benyttet et såkalt case-crossover design der arbeidstakerne var sin egen kontroll over tid. Slik kunne vi studere sammenhengen mellom tidspunktet for førstegangs-uthenting av medikamenter og tidspunktet for arbeidsledighetsperioder, innen samme person, for de som i løpet av observasjonsperioden både hentet ut medikamenter og var arbeidsledige. Sammenliknet med tidligere perioder i en arbeidstakers liv, viste resultatene en klar stigning i relativ risiko 1-3 måneder før arbeidsledighetsdatoen for uthenting av både antidepressiva, sovemedisin, angstmedikamenter, antipsykotika, medikamenter mot lavt stoffskifte og kardiovaskulære tilstander, samt smertestillende. For de fleste medikamentene var det en topp én måned før arbeidsledighetsdatoen, og estimatene holdt seg høye gjennom arbeidsledighetsperioden.

Tidspunktet 1-3 måneder før arbeidsledighet sammenfaller med tidspunktet da de fleste norske arbeidstakere som er i ferd med å miste jobben, mottar et varsel om oppsigelse. Studiedesignet gjør at alle observerte og uobserverte forhold ved individet som er kontante eller endrer seg sakte over tid (f.eks. kjønn og tidligere sykehistorie) ikke vil konfundere estimatene. Vi tolker resultatene som at jobbusikkerhet og stress i månedene før og under arbeidsledighet har en klar negativ effekt på helsa. Seks måneder etter at arbeidsledighetsperioden var over, var risikoen for å starte opp på medikamenter omtrent like høy som seks måneder før arbeidsledigheten rammet. I

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både studie II og III så mennenes helse ut til å rammes noe hardere enn kvinners av nedbemanning og arbeidsledighet. Vi konkluderte med at arbeidsledighetsprosesser påvirker arbeidstakeres helse allerede i månedene før arbeidsledighet, og at forebyggende helsetiltak bør iverksettes senest i forbindelse med at arbeidstakerne mottar varsel om oppsigelse.

Forskningsfunnene i avhandlingen har gitt ny kunnskap om forholdet mellom arbeidsledighet, nedbemanning og helse i Norge. Til tross for et arbeidsliv med fokus på inkludering, medisinske rehabiliteringstiltak i sykefraværsperioder, en sterk arbeidsmiljølov som skal beskytte de svakeste, samt generelt gode trygdeordninger, er det fortsatt slik at de med dårlig helse i større grad enn friske ender opp som arbeidsledige. Dette kan og bør forebygges. Videre ser nedbemanning og arbeidsledighet ut til å ha en negativ effekt på både psykisk og somatisk helse rundt tidspunktet for nedbemanning eller arbeidsledighet. Samtidig kan sykdommer som kanskje ikke ville blitt oppdaget før på et senere tidspunkt, i større grad bli oppdaget i forbindelse med nedbemanning og arbeidsledighet. Dette kan skyldes at folk som står i fare for å miste jobben i større grad oppsøker helsevesenet enn de ville gjort ellers. Resultatene fra denne doktorgradsavhandlingen tilsier at det kan være noe å hente på å styrke forebyggende helsetiltak i forbindelse med at folk får beskjed om at de kommer til å miste jobben. Framtidig forskning bør studere hvilke mekanismer det er som utløser, forårsaker eller forverrer arbeidstakeres helse i forbindelse med nedbemanning og arbeidsledighet, og om for eksempel lavterskel nettbaserte selvhjelpsprogrammer, større involvering av primærhelsetjenestene, og et bedre samarbeid mellom bedriftshelsetjenesten, arbeidsgivere og arbeidstakere, NAV og fastlegen kan forebygge forringelse av arbeidstakeres helse i nedbemanningsprosesser.

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Summary

Background

The empirical literature shows a well-documented association between unemployment and health, where those unemployed at any given time seem to suffer more from ill health than the employed. However, the mechanisms behind this relationship are complex. With regard to the link between health and unemployment over time, it is highly possible that unemployment will induce ill health or that ill health will lead to unemployment, thus introducing confounding due to health selection. The potential confounding resulting from ill workers having an increased risk of future unemployment needs to be accounted for in order for causal inferences to be made about the effect of unemployment on health. In this research project, we had access to high-quality panel data on the Norwegian working population over a relatively long time span, which enabled us to investigate health selection into unemployment, the effect of organisational downsizing on health, and the timing of health deterioration in relation to unemployment in the Norwegian working population.

Aims

The main objective of the research for this thesis was to reveal causal effects of organisational downsizing and unemployment on a broad range of health outcomes in the Norwegian working population. First, we aimed to study the association between ill health and future unemployment, and sick leave as a competing risk of unemployment, in order to detect potential confounding by health selection. Second, we aimed to detect the causal effects of exposure to organisational downsizing on employees' mental and physical health, measured as changes in prescribed drugs before and after exposure to a major workforce reduction. Third, we aimed to investigate the timing of initiation of psychotropic medication in relation to unemployment in the months before, during, and after job loss to detect the period of greatest risk. For all three papers, we explored potential effect measure modification by sex, age, and education.

Methods

Confounding by health selection was explored in a prospective cohort study based on adults (≥ 20 years) who participated in HUNT2 (1995–1997), and were followed in administrative registers from 1995 to 2008 (N = 36,249). Cox proportional hazard models were set up, estimating hazard ratios of time-to- registered unemployment (outcome). The effect of job insecurity on health was investigated in a natural experiment on the Norwegian working population by using individual-level panel data. By identifying those exposed to major organisational downsizing in the period 2004–2012 (N = 144,089), we could follow potential changes in prescribed drug purchases in this group from five years before

to five years after the downsizing took place. Psychotropic drugs and drugs for somatic conditions and pain were analysed. A random effects logistic regression estimator, which took repeated measures at the individual level into account, was used to estimate odds ratios with 95% confidence intervals. Finally, the timing of initiation of antidepressants (N =34,111), hypnotics and/or sedatives (N = 32,570), anxiolytics (N = 26,838), and antipsychotics (N = 12,495) in relation to unemployment in the months before, during, and after job loss was investigated by using a case-crossover design for the period 2005–2010 in order to detect the period of greatest risk. Drugs for somatic conditions and pain were investigated in supplementary analyses. We used a conditional fixed-effects estimator and odds ratios with 95% confidence intervals to measure the relative risk of being unemployed at the time of drug purchase (case period) compared with being in the same state of unemployment 12, 24, and 36 months (control periods) before the drug purchase took place.

Results

Those with high baseline (1995–1997) symptom levels of anxiety and depression or a number of chronic somatic conditions had almost twice the risk of becoming unemployed in the period 1995–2008 compared with their healthier peers. Other health measures associated with an increased risk of future unemployment were musculoskeletal pain, gastrointestinal symptoms, insomnia, high alcohol consumption and/or problematic drinking, and poor self-rated health. We found no profound gender differences regarding health selection into unemployment, except for the problematic use of alcohol showing stronger associations in women. The relative risk ratio of becoming unemployed was generally higher than the risk of having a sick-leave certificate for those suffering from symptoms of mental illness, while those reporting somatic conditions or pain had a higher relative risk ratio of sick leave than unemployment.

We found a substantial negative effect of exposure to organisational downsizing on health in the Norwegian working population. The following drugs showed an increase in the years close to the downsizing event: antidepressants, anxiolytics, hypnotic and/or sedative drugs, antipsychotics, antidiabetic drugs, cardiovascular drugs, thyroid drugs, and to some extent opioids. Men and women responded similarly to major downsizing, with somewhat higher point estimates for men. Stratifying by age and education groups did not reveal profound differences.

The results showed either a twofold to threefold increase in the risk of first-time purchase of psychotropic drugs during the month *before* the date of unemployment, with an increasing trend in the three months ahead of unemployment. The rises were greater for males than for females. The estimated risk decreased steadily during the first three months of unemployment, but stayed on a higher level compared with the six months before unemployment. In the six months after the end of unemployment, the odds ratios were close to those of six months before job loss. The same trends

were present for drugs prescribed for somatic and pain conditions, but with substantially lower risk estimates than for psychotropics.

Conclusions

The generous welfare regime, extensive vocational rehabilitation programmes, and the inclusive working life agreement in Norway could be expected to buffer negative consequences of health-related problems before they lead to unemployment. However, we found that a range of mental and somatic symptoms was associated with future unemployment in a Norwegian labour market context. Further, being exposed to job insecurity in terms of organisational downsizing led to an increase in the likelihood of purchases of a range of prescribed drugs, compared with the situation before the downsizing took place. Our investigations into when a person's health was most likely to be affected in an unemployment process revealed a substantial increase in the odds ratios of purchasing psychotropic drugs 1–3 months before unemployment, with a peak 1 month before unemployment. This coincides with the notice period for most employees in Norway.

Based on the previous literature we hypothesised that downsizing and unemployment would have a negative effect on mental health outcomes. Hypotheses regarding the different somatic symptoms and conditions studied were more explorative, as the previous literature was, and is, scarce. All three papers showed strong associations between job loss and/or unemployment and common mental health problems like anxiety and depression. Additionally, the associations with several somatic conditions and pain were surprisingly strong, and future research should investigate these associations further.

Our findings may suggest a strengthening of preventive health initiatives around the time of notification of unemployment or downsizing processes. In addition to welfare benefits that alleviate some of the financial strain in relation to job loss and unemployment, such initiatives could be a stronger involvement from primary healthcare services, enhanced and more systematic cooperation between occupational health services, employers, employees, organisers of public re-employment programmes, and general practitioners, and cost-effective web-based self-help programmes that efficiently reaches those at risk.

Acknowledgements

and Bente Prytz Mjølstad, are also thanked for their time spent and valuable contributions to what eventually ended up as my PhD.

Further, I thank those who make sure I have a private life. They contribute to my work in their own special ways. First, my dear Torstein, the pedagogue (and hunk), for being such a good father to our children and for *not* proposing to me during the PhD-years. If you ever read this in something that looks like a book, it means I'm done (with the PhD, not you). My beloved children deserve my thanks for turning me into a mother, my favourite role in life. My parents, Inger & Lorents, at home on the beautiful island Kvaløya, are thanked for teaching me and genetically predisposing me to always to look on the bright side of life. My sporty brother Jim is thanked for his fantastic (sarcastic) humour and ironic comments (when I call him and complain about my life). The best 'mother-in-law' a girl could have, Gunn, is thanked very much for all her help with looking after our children and running our household during busy periods. Aunts, uncles, cousins, and all my beautiful friends – I'm so lucky to have you in my life.

Last, but not least, I thank my beloved grandmother, Ranveig Kaspersen (photo), for her unconditional support over the years. In 1948, she was the first woman from Kvaløya to attend secondary school in Tromsø. She wanted to become a teacher, but as the oldest of five sisters, she had to take on other responsibilities. This thesis is dedicated to her, for the education she desperately wanted but did not receive. Times have changed.

List of Papers

Three papers are included in the thesis. Hereafter, they are referred to as Paper I, Paper II, and Paper III respectively:

Paper I:

Silje L. Kaspersen, Kristine Pape, Gunnhild Åberge Vie, Solveig Osborg Ose, Steinar Krokstad, David Gunnell, Johan Håkon Bjørngaard. Health and unemployment: 14 years of follow-up on job loss in the Norwegian HUNT Study. *European Journal of Public Health*, 2016;26: 312–7.
doi: 10.1093/eurpub/ckv224. Epub 2015 Dec 29.

Paper II:

Silje L. Kaspersen, Kristine Pape, Fredrik Carlsen, Solveig Osborg Ose, Johan Håkon Bjørngaard. Employees' Drug Purchases Before and After Organisational Downsizing: A natural experiment on the Norwegian working population (2004 - 2012). *Scandinavian Journal of Work, Environment & Health*, 2017 Jul 1;43(4):307-315. doi: 10.5271/sjweh.3637. Epub 2017 Mar 28.

Paper III:

Silje L. Kaspersen, Kristine Pape*,* Solveig Osborg Ose, David Gunnell, Johan Håkon Bjørngaard. Unemployment and initiation of psychotropic medication: A case-crossover study of 2 348 552 Norwegian employees. *Occupational and Environmental Medicine*, 2016;73: 719-726. doi: 10.1136/oemed-2016-103578. Epub 2016 May 10.

Each paper has an appendix, which is referred to in this thesis as the supplementary file following Paper I, II, or III.

List of Abbreviations

AKU	Arbeidskraftundersøkelsen, Labour Force Survey (Statistics Norway)
ATC	Anatomical Therapeutic Chemical
BMI	Body Mass Index
CI	Confidence interval
DAG	Directed acyclic graph
DDD	Defined daily dose
EE-register	Register of Employers and Employees (Aa-registeret, Arbeidsgiver- og arbeidstakerregisteret)
FD-Trygd	Forløpsdatabase Trygd (social security event database)
GP	General practitioner
HADS	Hospital Anxiety and Depression Scale
HR	Hazard ratio
HUNT	Helseundersøkelsene i Nord-Trøndelag, The Nord-Trøndelag Health Study
HUNT2	The Nord-Trøndelag Health Study, second wave (1995–1997)
ILO	International Labour Organization
IA Agreement	Inclusive Working Life Agreement
NAV	Norwegian Labour and Welfare Administration
NorPD	Norwegian Prescription Database
NSD	Norwegian Centre for Research Data
NTNU	Norwegian University of Science and Technology
NUDB	National Education Database
OECD	Organisation for Economic Co-operation and Development
OR	Odds ratio
RR	Relative risk
RRR	Relative rate ratio
SSB	Statistisk sentralbyrå, Statistics Norway

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1 Introduction

This thesis aims to address whether unemployment and organisational downsizing affects health (the causation hypothesis) and how health is associated with future unemployment (the selection hypothesis). Health selection out of employment, whereby precarious workers with health problems systematically are more likely to be excluded from working life and end up as unemployed, has a cost for the individual and for society and should be prevented. The detection of such selection mechanisms is important in order to address potential confounding by health selection when studying the effect of job loss and unemployment on health. It is clinically and politically relevant to know whether, how, and when unemployment and organisational downsizing affect peoples' health. Employees, employers, organisers of re-employment programmes and general practitioners should benefit from knowing more about what type of health-related problems might be triggered, worsened, or caused by job loss and unemployment, and when in the process such problems are most likely to occur.

Given the demographic challenges most European countries are likely to face in the near future (e.g. due to aging populations and reduced labour forces), initiatives that prevent people from exiting the labour market and that help the unemployed to stay fit for re-employment should be given high priority. One example of such an initiative is the system-level approach taken in the Nordic countries in response to the financial crisis in 2008, by expanding active labour market policies, making adjustments to the unemployment and social benefits system, and facilitating education for the unemployed.[1][2] According to Caroli & Godard (2016), long-term employer–employee relationships are declining and increased levels of job insecurity have been perceived in most OECD (Organisation for Economic Co-operation and Development) countries since the 1990s.[3] It is of importance to monitor how these changes might affect public health.

The generous welfare benefits scheme in Norway is meant to buffer social, economic, and health deprivation for the individual during times of weakened labour market attachment. We were therefore curious about the extent to which ill health could predict future unemployment in a Norwegian labour market context, and whether we could establish a link between health and unemployment or organisational downsizing. Health selection into unemployment potentially confounds the relationship between unemployment and health,[4][5] and must be taken into account in order to make causal inferences. Some previous systematic reviews and meta-analyses have suggested that unemployment has a causal negative effect on mental health,[6-8] while several studies of cause-specific mortality have concluded that economic downturns may lead to a decline in mortality. [9][10] However, the literature also shows that health selection effects and effects of unemployment on health are context-sensitive and time-sensitive, [9][11-13] and hence there is a need to

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investigate this topic in different populations and labour markets over time. Policies recognising the health consequences of workforce reduction and unemployment have been advocated, especially in the wake of the Great Recession that followed the financial crisis in 2007 and 2008. [12 14-16]

We started our research project by exploring to what extent ill health was associated with a future risk of unemployment, in order to show how health might confound the unemployment and health relationship in a Norwegian context. We then investigated whether annual drug-consumption trends changed in private-sector employees exposed to major organisational downsizing. Finally, we tried to disentangle the timing of the initiation of psychotropic medication from the timing of unemployment by studying monthly drug consumption by individuals in the Norwegian working population who were both medicated and unemployed during the period 2005–2010. The thesis intended to provide further insight into the well-documented association between unemployment and deteriorated mental health, and to shed light on the seldom studied relationship between downsizing, unemployment and objectively measured physical health outcomes.

The thesis includes three papers. Paper I investigated the health selection hypothesis through a survival analysis of data from the second wave of The HUNT Study (1995–1997) linked to data from administrative labour market registers up to 2008 (N = 36,249). In Paper II, we investigated how exposure to organisational workforce reduction (i.e. downsizing) changed the odds of purchasing prescribed drugs over time. We did this by linking Norway's Register of Employers and Employees (EE-register) to the Norwegian Prescription Database (NorPD) for the entire Norwegian working population (N= 3,159,196) from 2004-2012. Paper III is based on the linkage between the social security event database (FD-Trygd) and NorPD. We performed case-crossover analyses of the initiation of psychotropic medication in relation to unemployment to detect the period of greatest risk (N = 2,348,552). To the best of my knowledge, to date, the timing of incident drug purchase in relation to unemployment has not been studied by using such detailed, diverse and objective data.[17]

Chapter 2 introduces the characteristics of the Norwegian welfare system and labour market, the theories on which the hypotheses were built, and a summary of the literature. The aims of the studies are described in chapter 3, and the ethics, separate study designs, study variables, and statistical analyses are presented in chapter 4. Chapter 5 (briefly) presents the results from the three papers, and both the results and implications of the findings are discussed in chapter 6. The overall conclusions are presented in chapter 7. The three papers and their supplementary files are included after the References.

2   Background

The financial crisis in 2008 and the following economic recession in Europe and the USA reduced the demand for labour substantially and cost millions of people their jobs. As shown in Figure 2.1, unemployment increased between 2008 and 2009, and for several years it remained on a higher level than before the crisis. As with previous economic downturns, a consequence of the mass layoffs has been that researchers have shown a growing interest in investigating the potential unemployment effects on health.[18]
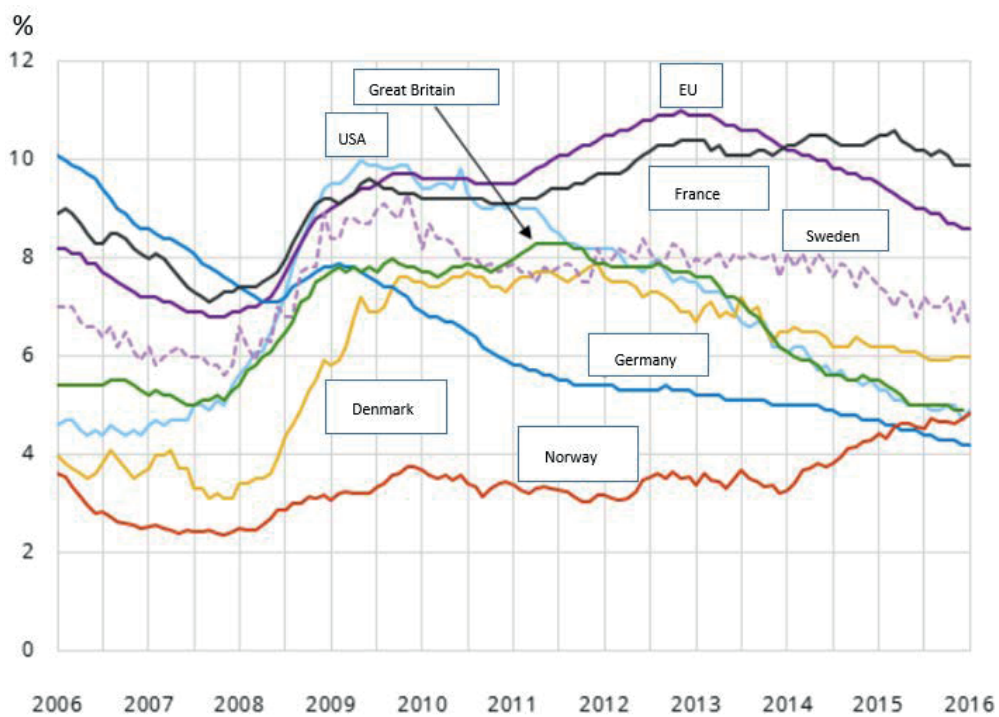
Figure 2.1   Seasonally adjusted unemployment and percentage of the labour force out of work in Norway in the period 2006–2016 (Data source: Statistics Norway)

When we started the research project in 2012, few researchers were concerned with unemployment in Norway. While most other European countries and the USA were facing an economic recession following the financial crisis, Norway was relatively unaffected. One example from manufacturing and production shows that between 2008 and 2009, production in Finland and Sweden was reduced by 20%, in Denmark by 17%, and in Norway by only 6%.[1] National unemployment varied in the range of 2–4% of the workforce in the period 2007–2012, with a peak in 2010 after the financial crisis,

which was still considerably lower than corresponding numbers in other Scandinavian countries and the EU.

In recent decades, Norwegian labour market policies have focused on reducing the relatively high incidences of sick leave and disability pension awarded among the working-age population and including more disabled persons and elderly persons in the workforce. Accordingly, only a few studies have addressed the unemployment and health relationship using Norwegian data.[19-22] In 2014, unemployment in Norway started to increase, and the oil price dropped, leading to major organisational downsizing in the Norwegian petroleum industry with spillover to other business sectors. By July 2016, the number of unemployed in Norway was at its highest level since 1996; according to Statistics Norway, 5.0% of the labour force was out of work.[I] The current situation in the Norwegian labour market means that research on the relationship between unemployment and health is highly relevant.

This chapter includes a description of the Norwegian labour market, health and welfare systems, a brief theoretical background to this research project, and an overview of the previous literature relating to our hypotheses and findings.

2.1   The Norwegian context

The association between unemployment and health will vary over time and between different labour markets and health care and welfare regimes. A comprehensive meta-analysis found that the negative effect of unemployment on mental health was stronger in countries with a weak level of economic development, unequal income distributions, or weak unemployment protection systems.[7]
In order to frame the project and make the reader aware of some characteristics that may affect the generalisability of our results, it is necessary to introduce the Norwegian context. A relevant place to start is the OECD's Economic Survey of Norway 2016,[II] which examined recent economic developments, policies, and prospects. The results of the survey show that Norway's gross domestic product per capita has been higher than in other European and Scandinavian countries since the mid-1970s. Petroleum-related offshore operations have contributed significantly in this respect (Figure 2.2). It should be noted that Norway has a modest number of inhabitants: 3.9 million in 1970, 4.4 million in 2000, and 5.2 million in 2016, according to Statistics Norway's population data[III].

[I] http://www.ssb.no/en/arbeid-og-lonn/statistikker/aku
[II] http://www.oecd.org/eco/surveys/economic-survey-norway.htm
[III] http://www.ssb.no/en/befolkning
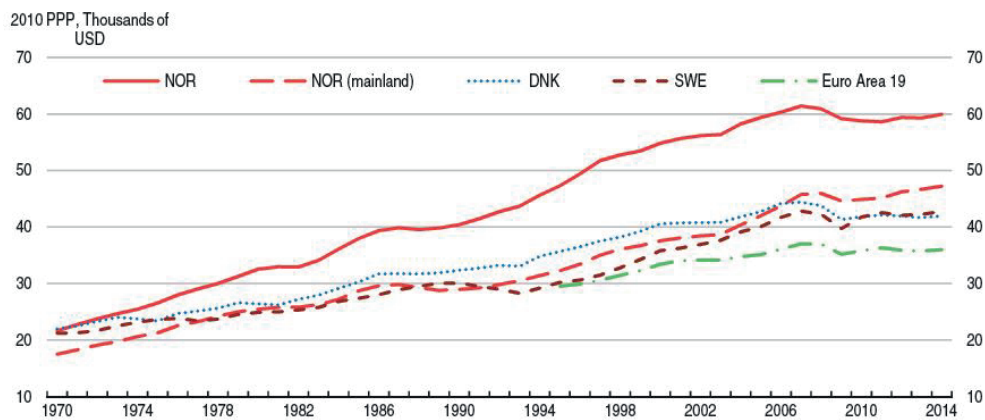
Figure 2.2   Norway's gross domestic product per capita in the period 1970–2014 (Data source: OECD[IV])

Since the discovery of the Ekofisk oilfield in 1969, the oil industry, which is partly owned by the Norwegian state, has had a dominant role in developing the Norwegian society and Norway's generous welfare regime. For example, the Government decided to spend more oil-money in order to generate more jobs (especially public sector jobs and investments in the petroleum industry) and prevent bankruptcies in Norway during the financial crisis in 2009. The production of oil reached a historical peak around the year 2000, making Norway the world's third largest exporter of oil and gas. In 2012, 52% of Norway's total exports were from the petroleum sector.

Over the years, the petroleum sector has provided high-income jobs for engineers (approximately 40% of employees in the petroleum sector have higher education (college/university)), but working offshore has also been an income-friendly option for people with little or no education. When the oil price dropped in 2014 and unemployment started to rise, both engineers and less educated employees lost their jobs. However, those with low education would have more difficulties finding a new job onshore with the same wage level – compared to those with higher education. This is an example on how downsizing and unemployment may hit different groups of employees working in the same sector differently. It is plausible that an individual's re-employment prospects affect the levels of distress and potential health consequences related to job loss and unemployment.[23-25]

The Labour Party (Arbeiderpartiet) formed the largest party in Parliament (Stortinget) from 1927 to 2009. In the same period, a social democratic mind-set dominated Norwegian politics,

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focusing on the importance of work and an allocation of resources in terms of income and wealth taxes. The term *arbeidslinja* (the working line, my translation) is well-known in Norway and refers to a social policy of welfare benefits designed to encourage people to work rather than living on welfare or social assistance, yet sufficiently generous to enable people to live decent lives. The term is linked to positive values such as social inclusion, active participation, dignity, and self-respect, with employment as a constitutive factor representing the normal situation.[26] This is worth mentioning because the role of work in a society may give some indication of the social stigma and stress related to the opposite state, namely being out of the labour force and/or unemployed.

The OECD's Better Life Index[V], summarises the basic characteristics of Norwegian society compared with the OECD countries and an average measure of the results from Denmark, Finland, and Sweden. Each well-being dimension is measured by between one and three indications from the OECD's Better Life Index (set with equal weights). The indicators are normalised by rescaling to go from 0 (worst) to 10 (best). In 2015, Norway and Australia had the highest scores of all participating countries (Table 2.1). As we can see from the table, Norwegians have higher scores than their European and Nordic peers when it comes to income, job & earnings, work-life balance, health status, personal security and subjective well-being. These differences might affect the generalisability of our research results, as I will come back to in chapter 6 when discussing external validity.

Table 2.1   The OECD's Better Life Index 2015 for Norway, all OECD countries, and Nordic countries

	Norway	All OECD countries	Nordic countries*
Income	7.4	5.4	5.5
Jobs & earnings	9.0	6.7	6.5
Housing	7.6	5.8	7.6
Work-life balance	8.7	5.5	8.4
Health status	8.2	6.8	7.7
Education & skills	7.1	6.0	8.3
Social connections	8.9	6.6	9.2
Civic engagement and governance	6.5	5.1	7.3
Environment	8.7	6.3	9.1
Personal security	9.1	8.2	8.8
Subjective well-being	9.8	6.6	9.5

*Average measure of results from Denmark, Finland and Sweden.

2.1.1 The labour market

In general, a labour market can be described by the total supply of and demand for labour within a geographical area. In Norway, such demand typically comes from the state, municipalities, and private companies, while the supply consists of jobseekers: young recent graduates, employees wanting a new job or to work more hours, and other people who for various reasons are unemployed. The labour force is the sum of the employed and the unemployed, whereas the workforce typically is calculated from the total population in a relevant age group (often in the age group 15–64 years).[27]

The relationship between the numbers of job vacancies and numbers of applicants expresses the tightness of the labour market. Supply and demand determines employment and unemployment, and influences the wage levels negotiated by unions and employers' organisations. To shorten the time taken for an employee to change workplace or an unemployed person to become an employee, governments in many countries, including Norway, have created public employment programmes that aim to match jobseekers to job vacancies. Private companies provide similar services. Given that potential negative consequences of unemployment on mental health is mitigated when an unemployed person is re-employed (as indicated in our Paper III and previous research[21]), the effectiveness of employment programmes may play a role in the health and unemployment relationship.

Employment and gender equality

The number of people working expressed as a percentage of working-age inhabitants in Norway is one of the highest in the OECD. According to data from Statistics Norway[VI], more than 75% of people in the age group 15–64 years had a paid job in 2015, which was a high proportion compared with the OECD average of 66%, and approximately 77% of the men and 73% of the women were in employment. Increasing women's labour market participation and thereby making women economically independent has been an official policy in Norway since the 1970s. The high percentage of women in the labour market is due to generous parental leave policies and state-funded kindergartens, although findings on the effect of maternity leave on labour market attachment are mixed.[28][29] By 2014, 90.2% of all children in the age group 1–5 years living in Norway attended kindergarten. The birth rate in Norway is one of the highest in Europe: on average 1.73 children per woman in 2015 (Statistics Norway[VII]).

[VI] If not otherwise specified, the numbers were generated by me, using official data in Statistics Norway's "StatBank": https://statbank.ssb.no/en/statistikkbanken
[VII] https://www.ssb.no/en/befolkning/statistikker/fodte

Figure 2.3 shows the employment figures for the period 2005–2015 in Norway. The figures show a declining trend since 2008, with a steeper decrease for men following the dip in the oil price in 2014, which led to collective dismissals in the petroleum sector. According to Statistics Norway, approximately 3% of the employed work in the primary sector (e.g. agriculture, forestry, and fishing), 22% work in the secondary sector (e.g. industry, production, and construction.), and 75% work in the tertiary sector (service sector, information technology and knowledge-based jobs)[VI].

Figure 2.3   Percentages of men and women employed in Norway in the period 2005–2015
                 (Source: Statistics Norway)

Historically, the percentage of employed women increased from about 45% in 1970 to about 60% in 1990, while the percentage of employed men declined in the same period from about 77% to 70%. Norway and the other Scandinavian countries are often seen as pioneers in gender equality because of the high percentage of women working. Paradoxically, Norway has some of the most gender segregated labour markets of all the industrialised countries.[30] As will be presented in chapter 2.3, and discussed later on in relation to the results in papers I-III (chapter 6), some previous research has found that men and women respond differently to unemployment.[7][31-37] Most often, men seem more likely than women to be destressed by unemployment. Suggested reasons for this are for instance that masculine identity in Western societies is linked to having a job (breadwinner-culture),

while women may take on other roles that substitutes employment, without experiencing the same levels of stigmatization as men (for further references see Paul and Moser's meta-analyses[7]).

According to Næsheim & Villund,[38] the Labour Force Survey (Arbeidskraftundersøkelsen, AKU) conducted in 2011 revealed that 41% of women and 13% of men worked part-time. In economic terms, working part-time has some negative implications and part-time work implies lower future payments for those who need unemployment or disability benefits or an old-age pension. However, for those with health problems, working part-time may be a strategy to enable them to participate in working life.[38] Table 2.2 presents key figures on gender equality in Norway for the period 2014-2016, provided by Statistics Norway[VIII]. For more information and resources on gender equality and gender research in Norway, see www.gender.no.

Table 2.2   Key figures on gender equality in Norway in the period 2014–2016 (Source: Statistics Norway)

Indicator		Five years earlier than 'Year' %	%	Year
Share of employees working part-time (20–66 years)				
	Men	13.8	14.2	2014
	Women	35.7	34.7	2014
Leadership (20–66 years)				
	Men	66.9	64.2	2014
	Women	33.1	35.8	2014
Public sector employees (20–66 years)				
	Men	29.3	29.6	2014
	Women	70.7	70.4	2014
Private sector employees (20–66 years)				
	Men	63.0	63.4	2014
	Women	37.0	36.6	2014
Sickness absence (medical certificate)				
	Men	*	4.1	2016
	Women	*	7.6	2016
Students in higher education (universities, colleges)				
	Men	39.8	40.2	2015
	Women	60.2	59.8	2015

Notes: Percentage (%) of men/women of the population aged 20–66 years in the relevant year and five years earlier. Sickness absence (medical certificate) has a new time series from 2015, no data available five years earlier with the same definition and data

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[VIII] https://www.ssb.no/befolkning/nokkeltall/likestilling

The gender differences between the public sector and private sector are large and mainly due to women having education and jobs related to the health and social services, which are mainly found in the public sector in Norway. In 2014, more than 80% of the employees in the health and social services were women. The corresponding percentage in the educational sector was 66% (the second largest sector in terms of women employees). Women are still paid lower wages than men in Norway and the differences are mainly explained by men and women working in different occupations. Further, part-time employees experience slower advancement in their careers and hence in their wages. Possible ways to overcome these differences would be to increase wages in female-dominated occupations or try to influence young people's choices with regard to their education.[30]

Protectionism and the Inclusive Working Life Agreement

Compared with other European countries, Norway has a long tradition of strong unions and high levels of employment protection, with rather restrictive regulations for temporary employment (fixed-term contracts). Further, social dialogue in a tripartite cooperation at the central level between unions, employers' organisations, and the Government is an essential part of Norwegian labour politics.[39][40] This tripartite cooperation was formalised in the Inclusive Working Life Agreement (IA Agreement)[IX] in 2001, whereby national authorities, employers, and employees agreed upon a shared responsibility to promote a more inclusive working life for everyone (see letter of intent in English regarding the IA Agreement[X]). Norwegian labour market policies include several aspects associated with the flexicurity model described by the European Commission (e.g. life-long learning perspectives, active labour market policies and programmes, and increasing focus on activation to qualify for social benefits).[41] However, the relatively strict regulations of fixed-term contracts and strong employment protectionism contributes to Norway (and Sweden) being characterised by a secure but less flexible model compared to the one found in, for example, Denmark.[42]

In 2013, the Inclusive Working Life Agreement covered about 60% of all Norwegian employees (up to 70% in some counties). All state and municipality jobs are included in the agreement, whereas the proportion of private companies committed to the IA Agreement is lower. While reduction and follow-up of sick leave has been the main aim of the IA Agreement, there has been an increasing focus on safety and health prevention strategies over the years.[40] Commitment to the IA Agreement gives companies access to a range of counselling services from specialised

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[IX] St.prp nr. 1 Tillegg nr. 1 (2001-2002): Intensjonsavtale om et inkluderende arbeidsliv: https://www.regjeringen.no/no/dokumenter/stprp-nr-1-tillegg-nr-1-2001-2002-/id435755/

[X] https://www.regjeringen.no/globalassets/upload/aid/temadokumenter/velferd/ia/a_more_inclusive_working_life_2006-2009.pdf

departments (Arbeidslivssenter) within the Norwegian Labour and Welfare Administration (NAV) and to economic incentives (facilitation grants) to keep employees with health problems and elderly people in employment, and to include people outside the labour market. Together with strong unions and the generous benefits for welfare in Norway, the IA agreement can probably be seen as a protective factor against health selection into unemployment, although it contributes to more vulnerable people being included in the labour market and thereby increases the proportion of people with health-related problems in employment.

Job loss versus unemployment

De Witte et al.[43] argues that the threat of involuntary job loss, job insecurity (anticipating job loss), actual job loss, and eventually unemployment, can be described as substantially different experiences for the individual. A recent study using data from the Living Conditions Survey in Finland[44] compared the association between short- and long-term unemployment, and perceived job insecurity, with different health and well-being indicators. They found that short-term unemployed and secure permanent employees experienced fewer psychological complaints and lower subjective complaints load, reported a higher self-rated health, and were generally more satisfied with their life compared to long-term unemployed and insecure permanent workers. Insecure employment was generally found to be more detrimental than unemployment in terms of psychological complaints.[44] As we write in Paper III it is relevant to distinguish between the acute effects (shock) related to the job loss per se; stress caused by job insecurity and an anticipation of lowered income, and the effect of actually being unemployed, with its economic and social consequences.

Furthermore, employees might quit their job voluntarily or they might lose their job involuntarily. It is plausible that the reason behind the job departure, and whether this reason is to be found on the individual-, firm- or macro-level, influences the potential effect job loss and unemployment have on the employee's health. If someone quit their job and become unemployed voluntarily, it is probably less shocking and stressful than being laid off involuntarily. Furthermore, employees losing their job because of factors related to themselves, might perceive their job loss differently compared to employees losing their job because of poor firm management or macroeconomic market failures. It also seems plausible that the experience and anticipation of job loss is perceived differently dependent on involuntary/voluntary, but that the unemployment period that may follow a job loss might have more homogenous effects, at least for long-term unemployment spells.

When I use the term job loss in this thesis and in the papers, I refer to a situation where the worker is laid off or fired involuntarily. Job displacement is another term used to express involuntary

job loss not initiated by the worker, but rather happening because of external factors (e.g. workforce reduction because of market fluctuations). Sometimes, an involuntary job loss might be worker intended (for instance if a worker has health problems and must change occupation or receive disability pension). For some people, even involuntary job loss is not necessarily perceived as a negative thing. It may be looked upon as an opportunity to do something else and get a more interesting job. Job loss or job displacement may be followed by a short or long period of unemployment. Whereas job loss and job displacement are isolated events (limited in time), unemployment is a state that typically lasts for weeks, months or years. For most workers, unemployment will have negative economic and social consequences for the individual and their families.

In Norway, official unemployment figures can be accessed from two different data sources: Statistics Norway's Labour Force Survey and The Labour and Welfare Administration (NAV) (see the International Labour Organization's definitions of terms relating to employment[XI]). NAV keeps records of those *registered* as jobseekers and those participating in job-creation programmes; we use this measure of unemployment in Papers I and III. Unemployment is defined as being registered at NAV as 100% unemployed (job-seeking) or participating full-time in a job-creation programme (see chapter 4 for further details). It should be noted that, according to our definition, unemployed persons did not necessarily have to qualify for unemployment benefits. Figure 2.4 shows the percentages of men and women *reported* in the Labour Force Survey as unemployed in the period 2000–2015). Figure 2.5 and Figure 2.6 show the percentages of men and women *registered* by NAV as unemployed in the period (2000–2013).

[XI] https://stats.oecd.org/glossary/detail.asp?ID=2791

Figure 2.4 Percentage of men and women reported as unemployed in Norway according to the Labour Force Survey (using the ILO definition of unemployment) in the period 2000-2015 (Data source: Statistics Norway)

Figure 2.5 Unemployed men and women in Norway in the period 2000–2013. (Data source: NAV)
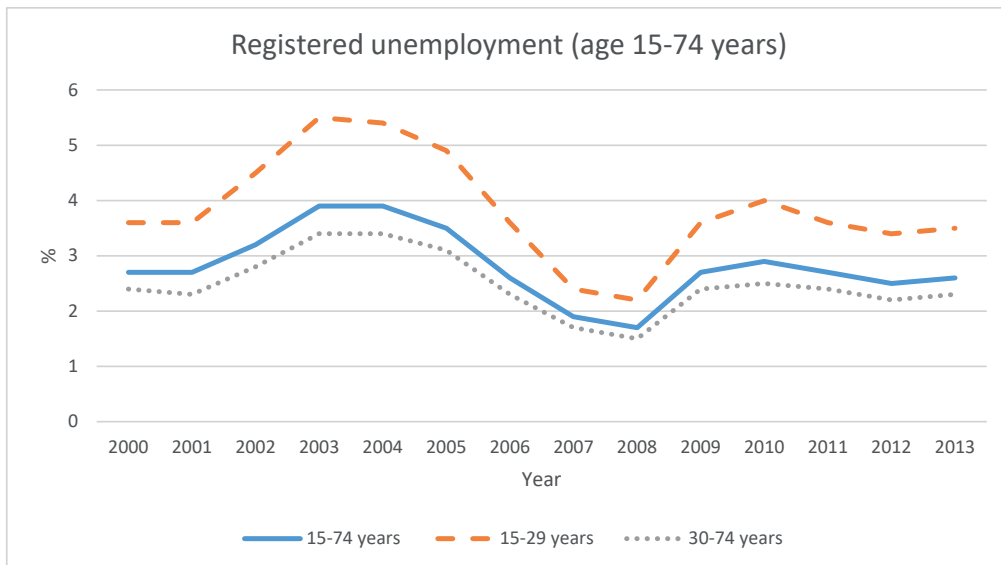
Figure 2.6 Unemployment by age groups in Norway in the period 2000–2013. (Data source: NAV)

As seen from the figures, the unemployment measure based on those *registered* as unemployed is lower than the measure based on those *reporting* to be unemployed in the survey. According to Statistics Norway this is mainly due to the youngest group of jobseekers that do not qualify for unemployment benefits and hence do not have incentives to register as unemployed, and/or they define themselves as jobseekers before holidays, but do not register at NAV.

Organisational downsizing

In this thesis, I have used the term organisational downsizing about situations where companies reduce their workforce substantially from one year to the next. The causes behind organisational downsizing may range from macroeconomic downturns, local market conditions, poor management, technological change, relocation of companies to other (typically low-wage) countries, immigrants replacing the local workforce (lower wages), weakening of labour unions and so on. It is also possible that high sick leave numbers or unproductive workers can lead to downsizing. As mentioned above, it is possible that the reason behind an organisational downsizing process may influence the employees' (health) response to the process. Further, some causes for downsizing (e.g. economic recessions and negative expectations to future economy) may affect peoples' health beyond the downsizing or unemployment *per se*.[9]

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In Norway, according to the Workers Protection Act of 2006 (arbeidsmiljøloven), an employee cannot be displaced unless this is objectively justified on the basis of circumstances relating to the undertaking, the employer or the employee.[1] If a company needs to displace employees due to reorganisation and/or restructuring, the employer first has to consider whether other tasks in the company can be offered to the employee. The rules and regulations concerning dismissals in the Nordic countries are described by Svalund et al. (2013).[1]

In 1998, an EU directive on mass redundancies[XII] stated that employers must involve workers' representatives before deciding on group redundancies. Collective working agreements may also regulate dismissals in detail. According to Svalund et al.,[1] Norway lacks specified selection criteria for those being made redundant, but the seniority principle (those with the longest tenure being prioritised to stay in the firm) is dominant. By contrast, in Sweden, the last-in-first-out principle is mandatory according to law.[45] In Norway, employees have the right to be re-employed in the company during the first year after dismissal, if there are suitable vacant positions. The notice period may vary according to collective agreements, but the most common notice period in Norway is 1–3 months. Those with long tenure in a company typically have a longer notice period (e.g. six months) (detailed information about dismissals in Norway are provided by Arbeidstilsynet[XIII]). In times of high unemployment in Norway, the possibility to make temporary layoffs instead of collective dismissals has been extended.

As seen from the unemployment figures above, there was an increased risk of becoming unemployed during the financial crisis between 2008 and 2010, this trend was also found in our downsizing calculations for Paper II; more companies reduced their workforce in this period than earlier on. I this case, organisational downsizing can act as a proxy for job loss and unemployment and an indicator of a period where workers are likely to perceive job insecurity. As argued in Paper II, the more exogenous the reason for a downsizing process is (e.g. financial crisis), the less likely it probably is that job loss/displacement and potential unemployment following the job loss is caused by ill health in the employees (i.e. health selection out of employment). Correspondingly, workers displaced due to plant closure in times of economic recessions are probably less likely than workers displaced during times of economic growth, to be displaced because of their ill health or low productivity. However, health selection cannot be ruled out, as it is possible that managers choose to displace the weakest workers first, despite quite strict regulations for this in Norway (described above).

[XII] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31998L0059
[XIII] http://www.arbeidstilsynet.no/fakta.html?tid=78229

A report from the European Commission[46] assessed the labour market response to the financial crisis from an international perspective, acknowledging that the size of the labour market adjustment and its composition was significantly different across countries. The differences may be due to domestic and external imbalances, as well as to the characteristics of the workforce in those industries and sectors mostly affected by the crisis. The authors also point to the burden of the recession being unevenly spread in different socioeconomic groups. Less qualified workers, the youngest and less experienced and those with weaker work contracts were hit more than those with higher qualifications and stronger initial labour market attachment.

There are many ways of measuring labour market shocks (employment, unemployment, closures, organisational downsizing, vacancies, job finding rate etc.), but in this thesis and the papers I have only measured downsizing and unemployment. In Paper II, we defined major downsizing as a situation where at least ¼ of the workforce in a company was laid off from one year to the next. To reduce the risk of health selection issues to confound our estimates, we studied average changes in drug purchases in all employees working in a downsizing company (as a group), regardless of whether they lost their job, changed job or stayed in the company.

2.1.2   The welfare system

The Norwegian welfare model is characterised by a universal social security system, with provisions settled under the National Insurance Act of 1967[XIV]. All persons living in Norway are compulsory members of the National Insurance Scheme.[47] In the following, I briefly describe the social security benefits available to Norwegian employees. The information is publicly available on the Norwegian Labour and Welfare Administration's web pages for the benefit schemes and employment services[XV]. Social welfare benefits are administered by the municipalities.

Unemployment benefits

Unemployment benefits are a partial replacement for lost earnings when an individual becomes unemployed. To be eligible for such benefits in Norway, a person has to meet the following requirements:

- be living or staying in Norway
- have had their working hours reduced by at least half (50%)

[XIV] https://lovdata.no/dokument/NL/lov/1997-02-28-19
[XV] https://www.nav.no/en/Home

- have had a minimum income from paid work amounting to at least 1.5 times the National Insurance basic amount (often abbreviated as 'G'[XVI]) during the last year or at least three times the basic amount during the previous three calendar years
- be registered as a jobseeker and submit their employment status form every 14 days

Those who are laid off for a limited period may qualify for unemployment benefits during that period. The benefits are calculated on the basis of earned income and other national insurance benefits that the employee has received in the last year (or the average of the last three years) prior to applying for unemployment benefits. The payments cover approximately 62.4% of the employees' gross income. Any income in excess of 6G is not included in the calculation. An unemployed person may receive unemployment benefits for two consecutive years. In chapter 2.3 (previous findings) there will be referred to studies showing that unemployment protection can mitigate deterioration of health in the unemployed.[7]

Sickness benefits

If an employee has worked the preceding four weeks and had a minimum income of 0.5 G, he or she is eligible for sickness benefits in the case of an illness or injury that implies occupational disability. Loss of income is compensated by 100% for a maximum of one year. The first 16 days of the period of sick leave is paid by the employer and thereafter by the state. Companies cannot dismiss employees who are receiving sickness benefits unless the dismissal is part of a major downsizing process. Unemployed persons may receive sickness benefits, but with compensation proportional to their unemployment benefits. For Paper I and Paper III, sickness benefits were used as an outcome variable and a left censor variable in supplementary analyses, respectively. In supplementary analyses in Paper II we used sick leave benefits as an indicator of previous health problems. Sick leave will be further discussed in chapter 2.1.3.

Disability pensions and other long-term medical benefits

Disability pensions compensate for loss of income for those with a permanently impaired possibility to work due to illness or injury (minimum 50% impairment). In order to qualify for a disability pension, a person has to be between 18 and 67 years old, to have paid national insurance for a minimum of three years, and have tried different return-to-work programmes. The coverage is in the range of 50–90% of their previous income. For Papers I and III, the date of disability pension was

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[XVI] G = basic amount, adjusted annually; on 1 May 2016, G was NOK 92,576

used as a right censor variable. Previous research from Norway on plant closure and workers' health has shown a positive association between major organisational downsizing and disability pensions, suggesting that plant closures and major downsizing may not only imply increased unemployment numbers, but also workers leaving the labour force in terms of disability pension.[19]

Long-term temporary medical benefits are oriented towards those in the age group 18–67 years who have at least 50% impaired work ability due to illness or injury, and for whom re-employment seems possible after work training or medical treatment. Up to a maximum of 6G, these benefits cover 66% of a person's previous income for up to four years. Subgroups of long-term medical benefits are medical and vocational rehabilitation benefits (1992–2010) and temporary disability pension (only provided between 2004–2010), all of which have been included in the work assessment allowance (Arbeidsavklaringspenger, AAP) since 2010. For Papers I and III, the dates of long-term medical benefits were used as right censor variables.

Old-age pensions

The Norwegian pension system is made up of three levels: old age pensions from the social security scheme, pensions from employers, and pensions from private pension savings. In order to submit application for an old age pension from the National Insurance Scheme (folketrygden), the applicant has to be insured for at least three years. The age limit for retirement in Norway is 67 years, but under certain conditions persons can start receiving a state old-age pension at 62 years, which is classed as early retirement. For Papers I and III, the date of retirement was used as a right censor variable.

2.1.3   Work and health

Workers' health is an important prerequisite for household income, productivity and economic development. According to the World Health Organisation, economically active people spend on an average about one third of their time working.[XVII] Employment and working conditions have an important impact on health equity, and work can provide social protection, improved social relations, self-esteem and status, personal development opportunities, and protection from physical and psychosocial hazards. Basically, work and good working conditions may lead to positive health effects. Van der Noordt et al. did a systematic review of prospective studies on work and health.[48] They reported strong evidence that employment reduces the risk of depression and improves general mental health. There was insufficient evidence for the effect on other health outcomes, due to a lack of studies of the association between work and physical health. The rest of this thesis will be

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[XVII] http://www.who.int/mediacentre/factsheets/fs389/en/

about what happens to mental and physical health if people experience threat of job loss and/or become unemployed, and what poor health might do to their labour market attachment, in terms of unemployment and sick leave.

Health, employment and work disability

Whether employees with impaired health are able to stay in work largely depend on the context within which they live and work. In her paper on unemployment and health in 1988, Bartley wrote that it is the characteristics of a person's job, more than the degree of functional impairment, which determine whether he or she will have to give up work.[5]

People with poor health might have a higher risk of job loss and longer periods of unemployment following job loss, since health could influence the individual's employability. Also, people with poor health could be more prone to unstable jobs or they might lose their job more often because they are regarded less valuable to the employers.[49]

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One way of observing the relationship between work and health, is to study descriptive statistics from aggregated data on work disability in terms of medical benefits. Since the early 2000s, there has been a growing awareness of the role of mental ill health as an important driver of labour market outcomes with enormous costs for individuals, employers, and society as a whole. According to the OECD, mental ill health is responsible for one-third to one-half of all long-term sickness and disability in the working population.[50] Furthermore, people with mental illness are less likely to be employed and they experience unemployment more often than people without mental health problems. Figure 2.7 illustrates the percentage of days lost to (prescribed) sickness absence in Norway from year 2000 to 2014.
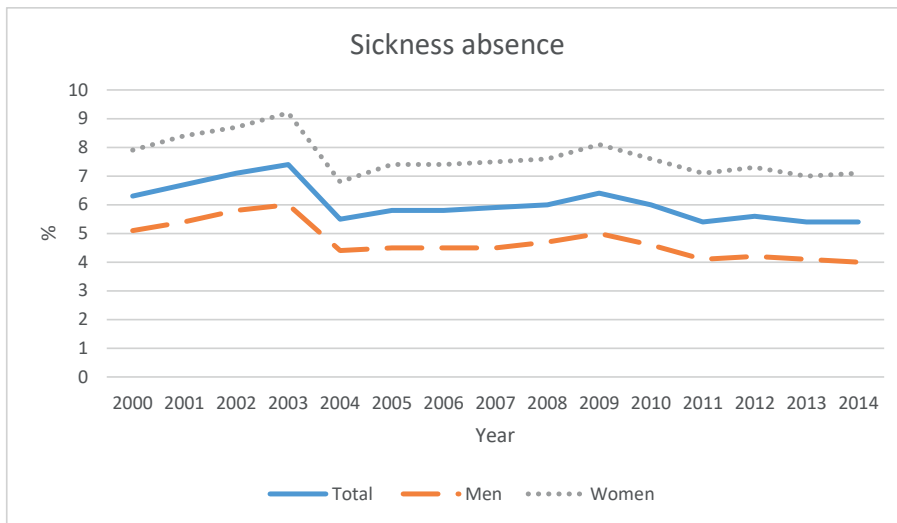
Figure 2.7   Percentage of days lost to sickness absence in Norway, for men and women in the period 2000–2014 (4th quarter in each year) (Data based on medical certificates prescribed by doctors; Source: Statistics Norway)

Numbers from the Norwegian Labour and Welfare Administration show that the proportion of people on sick leave due to mental health problems increased from 13.4% to 15.3% from 2007 to 2016 (data not shown). In the same period, sickness absence due to musculoskeletal diagnoses decreased from 37.5% to 35.1% of all sick leave cases. The third largest sick leave diagnosis group is respiratory diseases showing a one percentage point decrease from 2007 (13.8%) to 2016 (12.8).

The differences between unemployment and work disability are not always obvious, and seems context sensitive. There is evidence to suggest interchanging substitution between medical and non-medical benefit schemes. For instance, a Norwegian study has suggested that sickness absence increases when unemployment decreases.[30] This finding might be related to increased pressure on the workers in periods with low unemployment, and high production levels may be a plausible explanation for increasing sickness absence. Furthermore, when unemployment increases, the demand for goods is reduced, companies' incomes are reduced, and the threat of downsizing increases. This may lead to ill workers being reluctant to signalise that they are less productive than their colleagues, which may make them go to work when they should report that they are sick. This effect was supported in a natural experiment on Norwegian public sector employees.[51] Yet another explanation for the Norwegian study's findings could be that in times of economic growth and low unemployment, more vulnerable workers with health problems are included in the labour market, thus increasing their risk of sick leave compared with the same group of workers employed in times

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of high unemployment.[30] In Paper I, we investigated whether sick leave was a competing risk of unemployment in one of the sensitivity analyses (see results in chapter 5.1).

2.1.4 Health services and prescription of drugs

The Norwegian government is responsible for providing health care to the population. The responsibility for primary health care and social care is delegated to the municipalities, while the Ministry of Health and Care Services (Helse- og omsorgsdepartementet) has an active role as owner of the specialist health care services. The general practitioners (GPs) are an important part of the primary health care system and they act as gatekeepers for specialised health care as well as medical welfare benefits (sickness benefits, disability pension, long term medical benefits etc.). All Norwegian citizens are enrolled in the GP scheme (fastlegeordningen), which assigns them to a particular GP. GPs are consulted in about 70% of all new sick leave episodes.[52]

An extensive description of the Norwegian health care system can be found in the Commonwealth Fund's International Health Care System Profiles.[XVIII] As described in Norway's system profile, an important safety net mechanism is the annual caps for out-of-pocket expenditure, set by Parliament. Such expenditures include outpatient doctor's appointments, physiotherapy, and most medications prescribed for chronic conditions offered within the public health care system. For 2016, the cost-sharing ceiling for most health services is NOK 2,185 (EUR 239), above which a health care exemption card (frikort) is provided. Children aged < 16 years receive free treatment and pregnant women receive free medical examinations during pregnancy. Also, all inpatient hospital treatment is free of charge.

Drug prescription and drug consumption

The Norwegian Medicines Agency (Statens Legemiddelverk[XIX]) is in charge of classification, pricing, reimbursement, marketing authorisation, and information regarding medications provided to prescribers and the public. Only community and hospital pharmacies are allowed to dispense drugs in Norway. Since 2004, all prescribed drugs dispensed at Norwegian pharmacies are registered in the Norwegian Prescription Database (NorPD[XX]). The database contains information on the person's national identification number, date of purchase, and a range of specifications relating to the drug purchased. In Norway, general and/or pre-approved reimbursement to a large extent ensures that the expenses for drugs related to long-standing chronic conditions are covered by the state. This

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[XVIII] http://international.commonwealthfund.org/countries/norway/
[XIX] https://legemiddelverket.no/english/about-us/the-norwegian-health-care-system-and-pharmaceutical-system
[XX] http://www.norpd.no/

information is relevant because we investigated prescribed drug purchase as an outcome variable (for Papers II and III). The relationship between personal finances and medication prices might be expected to affect the demand for drugs, especially in cases when a household's economy is under pressure during unemployment. In countries where the prices of drugs are high, personal finances and market forces could confound the relationship between drug consumption and unemployment. Due to the exemption card and general reimbursement schemes in Norway, we do not consider this a problem in our analyses.

GP's were the main prescribers of the drugs studied in Papers II and III, although start of medication could have been initiated by specialised health services. Table 2.3 lists the consumption of these drugs in the Norwegian population in the period 2005–2010 and in 2015, measured as defined daily doses per 1000 inhabitants per day. Table 2.3 is based on statistics from the report *Legemiddelforbruket i Norge* (Drug consumption in Norway)[XXI] . The report is based on total drug sales from wholesalers and contains details on the consumption of each drug, and published annually.

Table 2.3   Medications discussed in Papers II and III: defined daily doses (DDD) per 1000 inhabitants per day in the Norwegian population in the period 2005–2015

ATC	ATC level name	DDDs/1000 inhabitants/day						
		2005	2006	2007	2008	2009	2010	2015
N05A	Antipsychotics	8.4	8.7	8.9	8.9	9.0	9.1	10.9
N05B	Anxiolytics	19.6	19.2	19.1	19.3	18.9	18.0	14.5
N05C	Hypnotics and sedatives	39.5	41.2	43.1	44.2	44.6	44.3	44.5
N06A	Antidepressants	48.4	49.0	51.0	51.7	51.6	52.8	56.5
A08A	Anti-obesity preparations, excl. diet products	2.6	2.3	2.7	3.0	3.1	0.9	0.4
A10A	Insulins and analogues	17.1	17.5	17.8	18.5	18.5	18.7	19.4
C01	Cardiac therapy	19.6	18.7	17.5	16.4	14.9	14.7	10.4
C02	Antihypertensives	4.5	4.6	4.5	4.4	4.4	4.2	3.9
C03	Diuretics	47.4	50.2	51.4	53.1	52.8	47.5	33.7
C07	Beta blocking agents	40.4	40.7	41.2	41.4	40.4	39.9	35.3
C08	Calcium channel blockers	48.9	50.3	52.6	54.7	55.2	55.8	57.1
C09	Agents acting on the renin-angiotensin system	106.2	112.3	117.9	124.6	128.7	133.1	143.8
C10	Lipid modifying agents	67.9	76.1	86.5	97.2	104.0	112.7	127.9
H03A	Thyroid therapy	19.0	19.6	20.4	21.2	21.5	22.3	24.3
M01A	Antiinflammatory and antirheumatic products, Nonsteroids	44.1	45.3	46.5	46.3	46.0	45.5	47.1
N02A	Opioids	19.6	19.9	20.0	20.5	20.6	17.7	19.1
N02B	Other analgesics and antipyretics	29.8	30.9	32.5	35.5	33.5	34.6	38.6

[XXI] see annual reports at http://www.legemiddelforbruk.no/

Purchasing a prescribed drug at a pharmacy does not necessarily mean that the patient takes the drug, but the information can still be interpreted as an indication of illness. We did not study the amount of drugs purchased in relation to downsizing or unemployment, but used information about the date of purchase to compute dichotomous variables on purchase/no purchase on an annual (Paper II) and monthly (Paper III) basis. As shown in Table 2.3, the consumption levels varied between years. We also learned from our data that drug purchases rise towards the end of each year (probably due to the reimbursement system), and therefore it was necessary to adjust for time-trends in the regression analyses.

To summarise, some characteristics of the Norwegian labour market pull in different directions in the unemployment and health relationship. The generous sick leave benefits and disability pensions, the IA Agreement with its focus on preventive strategies to keep people working, and a protective worker policy and strong unions should potentially reduce the risk of ill people entering unemployment. Conversely, the high demand for workers (with subsequent low unemployment), and the 'inclusive' mind-set, probably leads to the employment of a higher proportion of people with ill health and a weaker labour market attachment in Norway compared with other countries, and an increased likelihood of health selection into unemployment. Generous unemployment benefits should mitigate some of the economic concerns in relation to unemployment and help the unemployed to live decent and healthy lives despite their labour market situation. Conversely, in a country with low unemployment and a high standard of living (financed by high mortgages), the stigma and stress related to unemployment might be higher than in countries where unemployment is more common.[53][54] Further, it might be easier for companies to lay people off when they know that the unemployed will receive generous benefits and help from NAV. These potentially conflicting aspects made us curious about what we would find when investigating the health selection and causation hypotheses in the Norwegian context.

2.2 Theoretical perspectives

The official definition of health has been redefined several times by the World Health Organization; from a static state of normal function sometimes disrupted by disease, to *"physical, mental, and social well-being, not merely the absence of disease and infirmity"* in 1958[55] and to seeing health as a resource for everyday life (positive concept; resilience) in the 1980's and onwards.

The theoretical concept and measurement of health is complex. A differentiation between the terms *illness*, *disease* and *sickness* has been suggested as a fruitful way to disentangle different aspect of ill health.[56] Illness is a wide concept based on the person's perception of own health. Disease is a

narrower concept, contingent on a diagnose set by a health professional. Sickness, on the other hand, is related to the social role a person with a disease or illness take or is given in various aspects and arenas of life. Although these three health concepts will be strongly associated, they would still be only partly overlapping. When studying the relationship between work and health, there will necessarily be a trade-off between available health information of the participants and what parts of these health concepts that will be captured. Most of the previous literature on the unemployment and health relationship (see chapter 2.3) has investigated mental health outcomes with the use of self-reported measures. In the present work, I wanted to contribute to the existing knowledge by investigating the relationship with a broad perspective on health, and in particular by including both mental and somatic health issues. Such a broad approach could be relevant in a public health perspective, knowing that different aspects of health often are intertangled and correlated within persons. In addition, associations with different relevant measures of various health issues may be used to contrast each other. In the end, the choice of health measures in a study needs to be done with regards to the study question, and to the availability of data. Below, I present some of the considerations related to selection of health variables for the papers/research questions in the thesis.

Health assessment

In the study of health selection into unemployment in Paper I, we wanted to capture health in a 'broad' sense; including self-perceived symptoms and health behaviour. It was necessary to have information on health collected before participants became unemployed. This was possible by the use of self-reported health data from the Nord-Trøndelag Health Study (HUNT). Based on previous research, we expected health selection to be present in people with common symptoms of anxiety and depression. However, few studies had investigated the risk of unemployment following somatic disorders and symptoms. We selected the relevant health factors for the study based on existing knowledge and previous research on related topics; chronic somatic conditions (e.g. cardiovascular conditions, diabetes, cancer, asthma etc.), musculoskeletal pain, gastrointestinal symptoms, insomnia, alcohol consumption and self-rated health. These factors represent common health issues in the population, and their measures from the HUNT Study (or equivalent studies) have already been included in many population-based studies. In particular, the association between each of these factors and work disability/sickness absence is well established.[57] They have also been shown to predict school-dropout and receipt of medical and non-medical benefits in young adulthood.[58] Musculoskeletal pain is a frequently used sick leave diagnosis (35-40% of all sick leave cases the last ten years have had a diagnosis related to the musculoskeletal system), and particularly multisite pain has been shown to affect work ability.[59 60] Sleeping problems and gastrointestinal complaints are

common symptoms that often co-occur with other health problems and are (independent) predictors of work disability.[61-64] Alcohol consumption and problem drinking have been found likely to affect both work ability and risk of unemployment.[4 65] Finally, self-rated health status is a frequently used overall measure of health which has been shown to capture various mental and physical health domains and to be predictive of work outcomes, use of health services and mortality.[66 67]

Aiming to address the effect of downsizing and unemployment on health in papers II and III, we used data on purchases of prescribed drugs from the Norwegian Prescription Database for the entire Norwegian working population from 2004 to 2012 (further explained in chapter 4). Purchases of prescribed drugs requires a medical assessment from a physician (mostly a general practitioner), and could be seen as an objective measure of health.   The choice of using register-based data on prescribed drugs was made for two main reasons: First, the measure was available for the same individuals over time so that it could be assessed repeatedly before and during the downsizing/ unemployment process. This was important in order to assess the trajectories over time. Second, the measure was available for a sufficiently number of people. Also, compared to running randomized controlled trials or population studies, high quality administrative data is relatively cheap to access. Based on existing evidence and theories (see chapter 2.2 and 2.3), we expected periods of downsizing (Paper II) or unemployment (Paper III) to be associated with changes in drugs prescribed for mental health problems (antidepressants, hypnotics/sedatives, anxiolytics and antipsychotics (see chapter 4.4)).

In addition, we wanted to contribute to existing literature by using data on purchases of commonly prescribed drugs for more physical symptoms and diseases, and in particular for cardiovascular disease where previous studies of downsizing/unemployment and cardiovascular outcomes show mixed results. We also selected drugs prescribed for diabetes, obesity, thyroid disease and pain conditions. Again, the choice of these measures was made according to availability and with regard to including medications given for medical conditions which could be triggered (cardiovascular disease, pain), worsened (diabetes, pain) or possibly not affected (we initially hypothesised thyroid disease, severe obesity and diabetes not likely to be affected) by job loss, unemployment and downsizing. The operationalisation of study variables included in this thesis will be described in detail in chapter 4.4.

Theoretical models of work and health
The unemployment and health literature mainly originates from economics, psychology, sociology, and social epidemiology. Janlert & Hammarström identified three important employment and health traditions: the *biomedical tradition* (physiological and biological mechanisms explaining the

relationship between physical health and employment), the *sociological tradition* (material conditions influenced by the lack of employment and how this affects health), and the *psychological tradition* (unemployment effect on mental health).[68] Creed & Bartrum started their review of unemployment and health theories with presenting a list of potential moderator variables identified to influence the health and unemployment relationship: age, gender, length of unemployment, ethnic and racial origins, attribution of cause of job loss, family unemployment, local levels of unemployment, social class, the nature of the welfare system, personality traits, values and beliefs and so on.[23] The theoretical framework of this thesis includes several theoretical models that all have in common that they assume that there is a negative relationship between unemployment and the individual's well-being. These theories are for instance the Grossman Model,[69] human capital theory,[28 70 71] stress models,[72 73] social support models,[74-76] economic deprivation models,[77] non-financial benefits of work models/latent deprivation model,[78 79] and models linked to health related behaviour[80]. With reference to Avendano & Berkman's description of these theories,[18] in Table 2.4 I briefly outline the relevant theories behind the selection and causation hypotheses in relation to health and unemployment.

Table 2.4   Theories that can be used to understand the relationship between employment, unemployment, and health

Model	Author(s)	Theory
The Grossman Model; model of the demand for health capital itself	Grossman (1972)[69][81]	Individual as both producer and consumer of health. Health = stock or consumption and/or investment good that enable the individual to work and/or earn a living, increase productivity, and reduce duration of ill health. Trade-off between time invested in health (e.g. exercise) versus work and other goals. The Grossman Model has also been called "The human capital model" and is closely related to Becker's human capital theory mentioned below.[81]
Human capital theory and employment protection policies	Becker (1962)[70] Ruhm (2011)[28] Brugiavini et al. (2013)[71]	Gary Becker claimed that individuals (rational actors) invest in human capital based on rational benefits and costs, including returns on investment. Social protection helps economic actors overcome market failures in human capital formation, resulting in better health and increased labour market attachment. Especially, parental leave policies are important, as they yield human capital benefits (cognitive and educational outcomes) for children whose parents may have better long-term earnings and a stronger labour market attachment.
Economic deprivation models	Jackson & Warr (1984)[77]	Unemployment -> less income -> less ability to accumulate wealth –> less material resources relevant to obtain better health outcomes. Financial strain as the main consequence for ill health. Unemployment benefits as the main solution. However, extending the benefit period has been found to increase the duration of unemployment spells.[82]

Nonfinancial benefits of work – latent functions – latent deprivation model	Jahoda (1982)[78] Warr (1987)[79]	Theory of latent functions: work no longer only provides wages, but has a number of non-financial benefits (latent functions): time structuring, regular activity, social contact, self-esteem, status formation, and collective contribution feelings. Warr (1987) expanded on this by adding benefits for mental health - use of skills, decision-making, interpersonal contact, and a motivation to go on in life. According to this theory, income benefits programmes may be insufficient for mitigating the impact of unemployment on health.
Stress models	Vinokur et al. (1991)[83], Hintikka et al. (2009)[73]	Unemployment as psychosocial stimulus triggering stress mechanisms, acting as precursors for the development of disease. Stress levels depend on *coping*, referring to the ability of the individual to handle stress caused by unemployment. Unemployment might lead to chronic disease through triggering chronic stress-related distress, withdrawal, lower motivation and lack of control, which in turn may lead to loss of self-esteem, loss of confidence, helplessness, and depression.
Social support, social networks	Barnes (1954)[74] Bott (1957)[75] Cobb (1976)[76]	Being out of the labour market (unemployed, retired, or parental leave) may lead to loss of social support and networks, which may negatively influence health. However, it may also lead to more time spent on social activities and act as a moderator of better health.
The healthy worker effect, precariousness, health selection and health-related behaviour	McMichael (1974)[84] Li & Sung (1999)[85] Bartley (1988; 1994)[51] Ruhm (2005;2015)[9][86] McKee et al. (2017)[6]	The healthy worker effect reflects that an individual must be relatively healthy in order to be employable in the workforce. Hence, workers have lover morbidity and mortality within the workforce, compared to the general population. As a result of this, real excesses in both morbidity and mortality due to harmful exposures at work might be wholly or partially masked.
		Many of the employees who experience job loss and unemployment are found in insecure, precarious, and heavy jobs. These people may already carry a certain burden of illness, which again lowers their chances in the labour market: "selection 'is' causation" according to Bartley (1988:53).[5]

People who smoke, drink and are physically inactive are more likely to become unemployed than their healthier peers. Unemployment have been found to both increase and decrease alcohol consumption and smoking. Several convincing studies show that mortality decreases during times of national recessions through for instance lower accident-rates and healthier lifestyle at the population level.

In addition to the theories listed in Table 2.4, how people cope with traumatic events is of importance for how they respond to for instance job loss and unemployment. According to Westin,[19] coping is defined as the psychological, physical, and social activities a person engages in to overcome a strain. While some people actively try various coping strategies to handle change or a traumatic event, others feel uncomfortable with change and resist efforts to find coping strategies. Smári et al. argue that the coping style in unemployment and mental health studies has been largely neglected.[87] They studied the role of coping style in unemployed people in Iceland who suffered from anxiety and depression (N = 233). Their results indicated that coping style was important for depression and anxiety in the unemployed, and interestingly, perceived social support seemed to have a buffering function for women with regard to depression and anxiety, but not for men.[87] In a meta-analytical review of coping flexibility and psychological adjustment to stressful life events, Cheng & Lau[88] identified individualism, socio-economic status, age, and gender as possible moderators of the relationship between coping and psychological adjustment, with age and individualism as the two most important characteristics.[88]

Some of the theories briefly outlined in Table 2.4 were tested earlier by Janlert & Hammarström[68] in an empirical setting, with the aim of finding the most relevant theories for describing the relationship between unemployment and health. They surveyed a cohort of more than 1000 school leavers (aged 16 years) in Sweden in 1981 with a follow-up in 1995 (aged 30 years), and asked questions related to economic deprivation models, control models, stress models, social support models, and latent function models, as well as questions about unemployment, somatic symptoms, depressive symptoms, self-perceived health, and nervous problems. Janlert & Hammarström concluded that the model of latent functions was the most successful model, followed by the economic deprivation model and the social support model. The work involvement scale and the stress model had the smallest explanatory power.[68]

A considerable amount of the unemployment and health literature comes from the Nordic countries, where unemployment is relatively low and social benefits are generous. In an early review of the unemployment and health literature, Bartley[80] refers to the studies conducted in countries

with generous welfare regimes as providing evidence of the non-financial benefits of work for psychological health and claims that social stigma and social isolation play an important role in these countries. Fryer[89] criticised Jahoda's latent functions (explained in the table above), arguing that poverty aspects were underestimated due to the assumption that social welfare and unemployment benefits would minimise the economic effects of unemployment.

In a large multinational study, Huijts et al.[90] studied the impacts of job loss and job recovery on self-rated health and tested the mediating role of financial strain and household income. Job loss was associated with an increased risk of self-rated poor health in men and women, also after controlling for potential confounding factors such as previous health status, previous chronic illness and/or health limitations, age, marital status, and educational level. Further, including financial strain in the follow-up year attenuated the estimates, and Huijts et al. concluded that perceived financial strain mediated about one third of the relationships between job loss and poor health. Total disposable income did not have the same attenuating effect.[90]

I have not yet seen longitudinal studies in the health and unemployment field with Norwegian data that take into account the degree of financial debt of individuals (i.e. personal debt), which may have an impact on health responses to job insecurity or unemployment. Norway is one of the leading countries in the world when it comes to the amount of personal debt (mainly mortgages), which has been influenced by low interest rates and high housing prices since the early 2000s.[91] For many young Norwegians today, receiving only 62% of their previous wage (unemployment benefit level) would probably mean that they would be unable to pay their mortgage and still have money for food. According to an austerity investigation conducted in the UK by the *BMJ*, GPs increasingly have to tackle patients' debt and housing problems.[92] If better register data on individuals' personal debts (including credit card debts) become available in the future, new empirical studies would be able to test the above-mentioned theories.

2.2.1 Health selection

Bartley[49] gave two definitions of health selection: *Direct health selection* is defined as "the idea that people come to be unemployed, or remain unemployed, because of a disease." (Bartley, 2001:778)[49]. Given the Norwegian welfare context and the relatively low levels of flexicurity and fixed-termed contracts described above, this type of health selection is less relevant in Norway, although it still occurs for example when individuals with impaired functioning tries to enter the labor market.[40] *Indirect health selection* is defined as "the theory that people come to be unemployed because of a factor that also makes them susceptible to illness or mortality" (Bartley, 2001:778)[49]. What this factor might be is seldom spelt out in exact terms. It may include socioeconomic status, depression or other psychological traits (such as low intelligence), or a set of

specific attitudes.[49] [93] Indirect health selection is theoretically highly relevant in this thesis, and is a type of confounding that we try to minimize with our study designs.

Research done on the working population has to deal with the *healthy worker effect*, acknowledging that those who are healthy enough to be employable will have an initially lower risk of morbidity and mortality on average than the general population.[85] Rothman et al.[94] describe the healthy worker effect as having derived from some form of screening process, with self-selection of those who are relatively healthy to become or remain workers. Further, they note that the healthy worker effect has traditionally been defined as selection bias, but since it does not stem from conditioning on participation in a study but rather from a factor that influences both health and the worker status, it should be classified as confounding (i.e. confounding bias). A similar argumentation may apply to the selection of ill workers into unemployment, which is referred to as *confounding by health selection* or *reverse causality*, and not as selection bias, as in this thesis.

2.2.2   The concept of causality

A model is in the mind. As a consequence, causality is in the mind.

Heckman (2005:2)[95]

Causal inference is a fundamental topic in observational epidemiology. How can we gain insight into the causal relationship between exposure and outcome, when, for practical or ethical reasons, experiments and randomised controlled trials are impossible? The main approaches used so far in the literature to secure comparability and avoid confounding from common causes of both health and unemployment have typically been restriction, matching or using statistical models with multivariable adjustment for measured confounders. However, since it is rarely possible to gather all confounding information, such analytical strategies have their set of limitations. Acknowledging the fact that it is very difficult to identify, and obtain data on, all possible confounders; Kendler[96] concluded:

With observational data, we can never be certain about causal processes. We can only seek for increased confidence that causal effects are likely present.

Kendler (2017: E2)[96]

Bearing the above-mentioned challenges in mind, the current PhD project had an overall vision of seeking that increased confidence concerning the associations between organisational downsizing and unemployment and health in the Norwegian working population. The mechanisms behind the downsizing/unemployment and health relationships are complex. Besides common confounders such

as previous labour market attachment, age, sex and socioeconomic status, the potential confounding resulting from ill workers (or vulnerable/precarious workers) having an increased risk of future unemployment, needs to be accounted for in order for inferences to be made. In the next section I describe the idea of counterfactual outcomes as a theoretical framework to define causal effects, and how we in papers II and III tried to account for potential confounding by design.

Counterfactual outcomes

In their book 'Causal Inference', Hernán & Robins[97] define a causal effect for an individual (*i)* as a situation where the outcome variable (Y) has a different value when the treatment variable (A) equals 1 ($Y^{a=1}$), compared to a situation with no treatment, where the treatment variable equals 0 ($Y^{a=0}$):

$$Y_i^{a=1} \neq Y_i^{a=0}$$

The two outcome variables (Y) can be referred to as counterfactual outcomes, assuming that we actually know the outcome both if a = 1 and if a = 0 (an unrealistic, hence "counterfactual" situation).[97] In other words: if the cause had not occurred, the effect would not have occurred either. The counterfactual approach to causation can be traced back to philosopher David Lewis' paper, "Causation", from 1973.[98] However, missing data will often prevent us from being able to detect individual causal effects, and average causal effects in a population of individuals is the closest we get in practice. Hernán & Robins define the average effects as:

$$E[Y^{a=1}] \neq E[Y^{a=0}]$$

where E refers to the 'E'xpected population average. The authors further remind us that this average causal effect $E[Y^{a=1}] - E[Y^{a=0}]$ is always equal to the average $E[Y_i^{a=1} - Y_i^{a=0}]$ of the individual causal effects $Y_i^{a=1} - Y_i^{a=0}$, and that when there is no causal effect for any individual in the population $Y_i^{a=1} = Y_i^{a=0}$, the 'sharp causal null hypothesis' is true (no average effect). However, average causal effects can, under certain circumstances, be identified from data. Randomisation may result in convincing causal inferences by letting missing data on the counterfactual outcomes occur by chance.[97]

Counterfactual inference could be seen as a tool to understand and predict what would happen under different types of possible or hypothetical interventions. The strict counterfactual framework for causal inference have been criticised as being too narrow to capture important public health topics.[99] However, no single study can prove causality, regardless how perfect the design might be. Causal triangulation has been suggested as another fruitful way for causal inference.[100] That is, combining evidence from diverse study designs, involving different methodological assumptions and biases. In my project, I have chosen different designs to investigate different

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aspects of the associations between health, unemployment and job loss. Inference from the evidence provided in the present thesis' studies has again been performed in light of a wide range of previous literature.

Rather than performing an ethically challenging randomised controlled trial on a group of employees either treated with organisational downsizing/unemployment, or not, we used individual level panel data from administrative registers to design studies where the timing of exposure and outcomes within groups of employees was used to handle some of the selection issues (confounding by health selection, see chapter 2.3.1) that we knew were likely to be present from our results in paper I.

In a natural experiment (paper II) and a case-crossover study (paper III), we exploited the time-dimension in our data to mimic counterfactual states. We did this by comparing the odds of purchasing a prescribed drug around the time of exposure (downsizing or unemployment) to the odds of purchasing the same type of drug prescription at previous time points in the employees' lives when they were less likely to be exposed to downsizing or unemployment. The natural experiment was based on an exogenous event that to a high degree assured that being selected to treatment (downsizing) was not related to the employees' health characteristics. Natural experiments on observational data do not provide such strong evidence for causal relations as randomised controlled trials. To achieve a situation that was as close to a counterfactual comparison as possible, we compared employers exposed to organisational downsizing with themselves. That is, we used the downsizers as their own controls. Since the downsizing exposure happened at different time points, we could also account for time trends in the outcome.

The case-crossover design in paper III also compared individuals with themselves at three given time-points before the event. In such a design, we could avoid confounding that arises as a result of different distribution of causal determinants of the outcome between exposure groups. However, although we could take into account all time-invariant confounding with this design, the case-crossover design is still susceptible to time varying confounding. The high number of participants included in all three studies (see chapter 4) secured a low possibility of results occurring by chance. In the next section, we present a directed acyclic graph to illustrate the conceptual model and potential confounding factors to the unemployment and health relationship.

2.2.3   Conceptual model

In the search for potential causal relationships, directed acyclic graphs (DAGs) can be used to explore and describe the assumptions related to the associations between an exposure and an outcome and their related variables.[101] A DAG is a tool for illustrating of theories, hypotheses, potential biases, and

existing knowledge on a particular topic. Given a set of assumptions and rules, one may draw *causal* DAGs.[97 102] The theory underlying the use of DAGs is within the counterfactual framework. In an attempt to illustrate the most important theories and hypotheses explored in the current thesis, the following simplified DAG summarises the core of this research project:
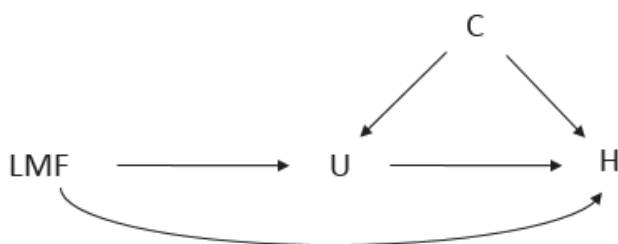
Figure 2.8   Directed acyclic graph (DAG) of the downsizing and/or unemployment and health relationship; U = Unemployment (exposure), H = Health (outcome), C = Confounding (e.g. previous health, previous unemployment, age, sex, socio-economic status, occupational factors, and workplace characteristics), LMF = Labour market fluctuations

For Papers II and III, we aimed to identify the effect of downsizing and unemployment on health. In both cases, the outcome variable was health, measured as purchases of prescribed drugs, while downsizing and unemployment were exposure variables (downsizing can also be seen as a proxy for unemployment). Labour market fluctuations may affect health through unemployment, but as the curved arrow in the DAG (Figure 2.8) indicates, there might also be an effect on health beyond unemployment. For Paper II, the downsizing and health relationship was studied by using information about exposure to job insecurity from organisational downsizing processes, regardless of unemployment. It is reasonable to assume that major downsizing processes are more likely to be caused by labour market fluctuations, than the employees' health status. This provided us with exogenous variation in the reason why employees ended up being exposed to job insecurity and downsizing (not likely to be confounded by health selection). For Paper III, we went on to capture the effect of actual unemployment on health, and particularly *when* in the unemployment process employees seemed to be affected. Previous studies have shown that unemployment may have a causal effect on mental health, while the results from studies of somatic health outcomes are to a greater extent mixed.[7 11] For Paper III, the case-crossover design eliminated all time-invariant

confounding. The panel data allowed us to study the effects on a monthly basis, so that we could explore employees' health in the months before, during, and after the end of unemployment.

Together with age and sex, a well-known and often measurable confounder of the unemployment and health relationship is the socio-economic status of the individual. Education, occupation, and income are examples of variables that may indicate socio-economic status. Since socio-economic position can be seen as a common cause of unemployment and health, we took this into account in various ways for all three papers. Previous ill health and previous unemployment are other potential confounders of the unemployment and health relationship, as ill health and unemployment are likely to affect future health status and employment or unemployment prospects. For Paper III, we accounted for previous health and other time-invariant confounders by studying incident cases for the same person over time, while the experimental study design used for Paper II should have accounted for some of the potential confounding by health selection. We also adjusted all analyses for sex, age, and educational level.

In a DAG illustrating the hypotheses in Paper I, studying health selection into unemployment, unemployment (outcome), and health (exposure) would change place, while the potential confounders would be more or less the same. If we assume that unemployment leads to deterioration in health and that ill health increases the risk of future unemployment, previous unemployment would become a confounder of the health and unemployment relationship. This potentially reinforcing spiral of negative effects over time makes this a very complex field with regard to causal inferences. The theoretical framework, confounders, and potential biases are discussed further in chapter 6.

2.3 Previous findings

As noted in the beginning of this chapter, the unemployment and health literature has been growing during the Great Recession. The studies can often be classified according to whether they focus on mortality, physical health, or mental health, and whether they are based on survey data or on linked administrative data. As time-series data availability, computer capacity, and statistical methods have all improved, study designs have changed from mostly cross-sectional to mostly longitudinal, making it possible to design studies that better control for confounding factors such as health selection into unemployment. One way of dealing with the health selection issue has been to study those who become unemployed or laid off because of 'exogenous' factors that are not likely to be closely related to their previous health status or work performance. This will typically be the case in times of economic recessions, when companies are forced to close down or go through major workforce reductions because of business cycles. Although most of the recent studies in the unemployment and

health research field have been longitudinal, they differ in the degree to which they claim to detect causal relationships.

Berkman et al. (2014: 191–210)[18] give an extensive critical review of the unemployment and/or job insecurity and health literature, distinguishing studies based on their methodological approach. In the following, I have chosen to take a thematic approach when describing important contributions to the literature on health selection into unemployment (Paper I), the effect of job insecurity and downsizing on health (Paper II), and the effect of unemployment on health (Paper III). Early in the research project (autumn 2012), I performed a broad literature search on terms such as ('health' OR 'mental health' OR 'drugs' OR 'medication') AND ('unemployment' OR 'job insecurity' OR 'job loss' OR 'downsizing' OR 'selection'), mainly using PubMed, Web of Science, and Google Scholar. I updated the searches regularly throughout the project period, and supplemented them with more specific search terms in relation to each of the three papers. However, I considered it beyond the scope of this thesis and project to present a systematic review for each paper.

2.3.1 What is known about health selection into unemployment

Studies of the health selection hypothesis have investigated to what extent ill health predicts future unemployment (as done for Paper I). The results of such analyses are interesting in themselves, as health selection out of employment can be prevented in many cases. Further, the results contribute important information about confounding in studies of the opposite hypothesis – how job loss affects health. Although some studies from different countries have found a selection of workers with ill health into unemployment,[103-110] an extensive meta-analysis found that the selection effects were weak.[6]

Systematic reviews and meta-analyses

Paul & Moser's[7] meta-analyses of how unemployment impairs mental health included 273 cross-sectional studies and 87 longitudinal studies, and they tested a range of moderator variables (gender, age, socio-economic status, minority status, marital status, age, duration of unemployment, year of data collection, economic development, income inequality, unemployment protection, labour market opportunities, and collectivism and/or individualism in society). They found that individuals with psychological problems accounted for 34% of the unemployed, compared with 16% of employees. The health measures that showed differences between these groups included mixed symptoms of distress, anxiety, depression, psychosomatic symptoms, subjective well-being, and self-esteem. Men with blue-collar-jobs were more likely than women and white-collar-workers to be distressed. The deteriorating effect of unemployment on health for the long-term unemployed was

stronger than on health for the short-term unemployed. The negative effects of unemployment on mental health were stronger in countries with a weak economy, unequal income distribution, and low unemployment benefits compared with other countries. Further, having conducted one of the first meta-analyses to study the selection hypothesis, Paul & Moser concluded that people with impaired mental health have an elevated risk of losing their job, but although their results were statistically significant, the effect sizes were weak and the authors questioned the practical importance of health selection.[7]

Van Rijn et al.[111] performed a systematic review (with random effect analyses to estimate pooled effects) of the association between poor health and exit from paid employment, with unemployment as one of several outcome variables. They included 29 studies and found that the likelihood of future unemployment increased with self-perceived poor health (relative risk (RR) 1.44; 95% CI 2.44–5.35), mental ill-health (RR 1.61; 95% CI 1.14–2.31), and chronic disease (RR 1.31; 95% CI 1.14–1.50). Van Rijn et al. concluded that primary preventive interventions promoting good health may lead to sustained employability and that health-promotion activities should be integrated with occupational health and safety initiatives.[111]

Other relevant studies (mostly with Nordic data)

Mastekaasa[20] conducted the first study of health selection effects in Norway, using panel data from 1989 to 1993 based on self-reported survey data (interviews) from 2,119 employees. While people with psychological problems were found to be more likely to be laid off than others, long-standing physical health problems did not increase health selection into unemployment. Mastekaasa explains this finding in relation to the strong legislation and union power traditionally found in Norway.[20] In another Norwegian study, Claussen[22] compared health recovery after re-employment with health recovery during long-term unemployment, and found that the unemployed with previous ill health had the most deteriorated health status at follow-up (medical check-ups in 1988 and 1990, with a questionnaire in 1993). Claussen concluded that mental health problems among the unemployed was mainly explained by the causal hypothesis.[22]

A considerable amount of empirical evidence on the health selection hypothesis has been produced on Nordic data, especially Finnish data, over the years. Böckerman & Ilmakunnas[105] examined the relationship between unemployment and self-assessed health based on analyses of the European Community Household Panel conducted in Finland in the period 1996–2001. They concluded that unemployment did not affect self-assessed health in Finland, although some evidence of deteriorated health after long-term unemployment was detected. Rather, the Finnish analyses showed that persons with poor self-assessed health were more likely to become unemployed than their healthier peers, and that health selection explained the observed association between

unemployment and ill health. The same conclusion had been reached following an earlier Finnish study of health selection effects among health care professionals, when Heponiemi et al.[112] found evidence for health selection into unemployment related to mental diseases and digestive system diseases. In later studies, Virtanen et al.[113] found that suboptimal self-rated health, sense functioning, and sleep quality in women and suboptimal mood in men predicted non-permanent employment in a Finnish labour market context. Virtanen et al.[113] followed a population cohort every second year from they were 18 to 42 years and found health-related selection into unemployment, especially in the age range 31–42 years, irrespective of previous unemployment spells. Suboptimal health predicted prolonged unemployment. Böckerman & Illmakunnas[105] and Virtanen et al.[113] emphasise that an allocation of resources to improve health amongst the unemployed is insufficient, and that one should also invest in those who are currently employed but have an increased likelihood of future unemployment. One of the most recent studies on health selection analysed Finnish register data to examine changes in antidepressant medication before and after incident unemployment and re-employment. The study concluded that these associations appear to be largely driven by health selection, and that potential causal associations remains unresolved.[114]

The existing literature on the influence of poor health on the risk of unemployment has mainly been limited to studies of poor mental health and overall self-rated health measures, whereas somatic conditions and lifestyle have received less attention. High alcohol consumption as a predictor of unemployment has been studied in various settings, with mixed results. For Paper I, we investigated alcohol consumption as an exposure variable and a covariate, as it may affect health and risk of future unemployment, as well as be affected by unemployment. Backhans et al.[115] investigated more than 13,000 residents in the age group 20–59 years in Stockholm, Sweden, who responded to a survey in 2002, with follow-up in 2007. They analysed associations between the frequency of binge drinking and the total duration of unemployment in the period 2003–2006, and were able to adjust for previous binge drinking and previous unemployment. In the fully adjusted models, they found a statistically significant association between binge drinking (≥ 1 per week) and long-term unemployment for women, but not for men.[115]

One of the most recent studies to include an evaluation of the health selection hypothesis was Vågerö & Garcy's[116] impressive study of whether unemployment caused mortality in the period 1992–1996, when Sweden was in a deep recession. They examined all-cause and cause-specific mortality in the six-year period after the recession for the 3.4 million individuals who had been employed in 1990. Health selection was analysed as a risk of unemployment by previous medical history (hospitalisation in the period 1981–1991). Vågerö & Garcy found that unemployment predicted excess male, but not female, mortality from circulatory disease (ischemic heart disease and stroke). Adjustment for social characteristics attenuated the estimates considerably, but adjusting for

38

prior medical history did not. Mortality from external and alcohol-related causes was raised in unemployed men and women, also after adjustment for social characteristics and previous medical history. The most vulnerable were those with a low level of education, low income, who were not married, or were in urban employment. The authors conclude that direct selection by medical history explains only a modest fraction of any increased mortality following unemployment, and that mass unemployment leads to long-term mortality for a considerable part of the population.[116]

Job insecurity and social determinants of health

A range of social determinants influence in what way a given population's health is affected by different exposures throughout the life course. When the World Health Organization's Commission[80] on the Social Determinants of Health concluded in its final report in 2008,[117] it was clear that employment and working conditions had powerful effects of health equity and that workers who perceived job insecurity had significant adverse effects on physical and mental health. Figure 2.9 shows the CSDH's conceptual framework by Michael Marmot & Jessica Allen, as presented by Berkman et al. (2014: 564).[18]
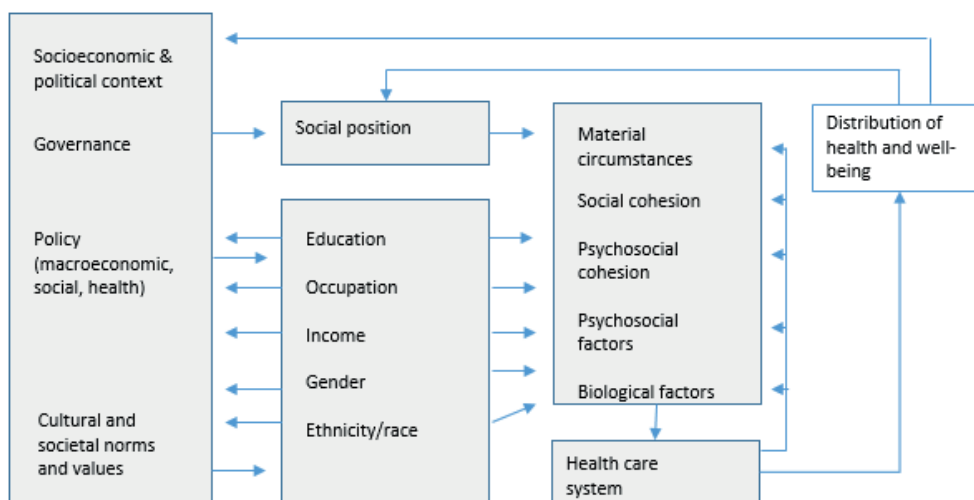
Figure 2.9   Social determinants of health and health inequities – the conceptual approach of the CSDH (Reproduced with permission from Lisa Berkman)

The social determinants of health shown in Fig. 2.9 may confound the association between unemployment and health. Additionally, the strength of the associations may vary over time, as

people age, business cycles change, and the political context changes. Further, the share of young people who are unemployed is often double or triple that of the adult population because they lack experience and often only have temporary jobs. Also, it is plausible that being laid off as an elderly person may have strong detrimental effects on health, as health tends to deteriorate with age and re-employment prospects may be worse for those with fewer years left in the labour market. Puig-Barrachina[82] state:

> *Given that unemployment is unevenly distributed among the working population, disproportionately affecting women, young people, manual workers and ethnic minorities, unemployment might also produce unequal health outcomes. Accordingly, individuals experience varying degrees of vulnerability to the health consequences of unemployment, depending on their social position and other social factors such as unemployment benefit coverage. In other words, different social positions defined along lines of gender, social class, ethnicity, age, migration status, and/or territory lead to different probabilities of being exposed to unemployment, and specific exposures have differential impacts on health, depending on the presence of other risk factors and/or conditions.*

> Barrachina (2011: 461)[33]

Manski & Staub[118] analysed expectations of job insecurity (related to job loss) in 3600 persons interviewed between 1994 and 1998. They found that workers vary considerably in their perceptions of job insecurity. Expectations of job loss decreased markedly with age, higher education and subjective probabilities of good search outcomes (self-employed people saw themselves as facing less job insecurity, than those working for others). Further, job insecurity varied markedly by ethnicity, but not by sex.[118]

Generous benefits have been found to increase employability among those with low education and ill health[119] and to buffer the negative consequences of unemployment.[22] Bambra[42] brings theoretical insight into welfare states as important determinants of health, particularly the social democratic welfare model in Scandinavia. Although most studies comparing population health across welfare regimes in different countries have concluded that generous and universal welfare provision leads to better health outcomes, the health inequalities in these countries are not necessarily minor. Bambra discusses whether public health policy should be about improving health among the most vulnerable individuals (based on an absolute measure of health) or about more

general health promoting strategies that lead to equality (relative health measures). She concludes that the contemporary theories provide little insight into these issues, which in turn may demonstrate methodological and conceptual limitations in comparative social epidemiology.[42]

The authors of a number of studies have reported different findings for men and women in the unemployment and/or downsizing and health literature. A recent example is Andreeva et al.[34] who used two waves of the nationally representative Swedish Longitudinal Occupational Survey of Health (2008 and 2010) to analyse both health selection and the causal relationship between job loss and health in 196 workers who had lost their jobs due to downsizing, 1462 layoff survivors who remained in downsized companies, and 1845 employees from workplaces that had not been downsized. The two outcomes were depressive symptoms at follow-up and job loss in persons with a history of depressive symptoms. Andreeva et al. found that job loss was a predictor of major depression in men as well as women, but with a greater effect size for men. For those surviving the downsizing process, women, but not men, had an increased risk of major depression. Regarding the health selection hypothesis, previous major depression in women, but not men, predicted future unemployment when exposed to organisational downsizing.[34]

Another interesting finding that may be relevant for interpretation of the results of this thesis has come from a study of how egalitarian gender norms may modify the relationship between economic recessions and suicidality.[35] The study, conducted by Reeves & Stuckler, was based on data from 20 European Union countries in the period 1991–2011. They first established the relation between unemployment and suicide, and then tested effect modification by different levels of gender equality, labour force participation, gender pay gap, and women's representation in parliament. Although there did not appear to be a direct relationship between gender equality and suicide rates during the observation period, Reeves & Stuckler found that gender equality might protect against suicidality in times of economic hardship. Further, in countries with high levels of gender equality, the relationship between increasing unemployment and suicide in men disappeared. The authors speculated that one explanation for the observed relationship might be a reduction in the male breadwinner culture in countries with egalitarian gender norms, thus mitigating the impact of unemployment on suicide in men. Likewise, men have a lower threshold for seeking help during periods of psychological stress under egalitarian gender norms, and this may also reduce the likelihood of problematic drinking (i.e. alcohol consumption) when men are laid off.[35] In this thesis, gender differences are discussed further in chapter 6.

Sick leave as a competing risk factor of unemployment

For Paper I, we explored whether sick leave is a competing risk of unemployment in Norway. An extensive research programme on sickness absence, work, and health, led by the Research Council of Norway (Norges forskningsråd)[XXII] recently concluded that the relatively high number of days lost to sickness absence in Norway is unlikely to be due to Norwegians being sicker than other Europeans. However, public health and life-expectancy measures in Norway are better than in many other OECD countries, as can be seen from the Better Life Index presented in Table 2.1 above. The most important sickness absence diagnoses in Norway are not of serious or life-threatening illnesses but related to musculoskeletal pain and mental disorders such as depression and anxiety. Further, there is no reason to believe that the Norwegian labour market is more hazardous than in other countries. Rather, work regulations and employee protection are strict in Norway. As Askildsen[120] argues in his editorial on the findings from the research programme on sickness absence, the high labour market participation and low unemployment in Norway may lead to a higher proportion of workers with poorer health and weak labour market attachment in the labour force, compared with other countries. He further points to the high labour market participation for women in Norway, and that registered sick leave is and always has been considerably higher for women than men.

Full compensation for loss of earnings from the first day of sick leave, with no co-payment for the employee, is a unique feature of the Norwegian sickness benefit insurance scheme. This does not discourage the temptation to abuse the scheme or weaken the incentives to avoid sick leave, either for the employee in the short run or for the employer (who only compensates for the first 16 days of the sick leave spell) in the long run. Empirical research has revealed that lower compensation, stricter gate-keeping, and privatisation of insurance will lead to reduced work absence, but with vulnerable groups with a higher risk of exiting the labour market paying the price.[120] [121]

2.3.2   What is known about organisational downsizing, job insecurity and health

In addition to economic fluctuations and recessions imposing job insecurity and job loss on workers internationally, the proportion of workers with fixed-term contracts has increased in many countries since the mid-1980s, affecting job security worldwide. While the number of fixed-term contracts in Spain was about one-third of all employment contracts in 2014, the corresponding number in Germany was 8%, indicating that the differences are substantial within European countries.[18] Statistics Norway's time series on fixed-term contracts in Norway show a declining trend since the mid-1990s (13% in 1996, 10% in 2006, and 8% in 2015), thus underlining the fact that Norway has strong regulations for worker protection.

[XXII] http://www.forskningsradet.no/prognett-sykefravaer/Home_Page/1226993895541

Disentangling the relationship between job insecurity and health is challenging, but may have important policy implications. If selection into insecure jobs or unemployment is a dominant mechanism, initiatives that help less healthy workers keep their jobs and provide them with stable working conditions could be a good investment. If there is a negative effect of job insecurity on health, policies should lead to stricter regulations concerning, for example, fixed-term contracts or public social protection programmes to insure precarious workers and protect them from the risk of job insecurity.

Precarious employment is a term broadly used in sociology, economics and political sciences to define insecure jobs, typically with temporary contracts. Precariousness has been used to describe the overall global trend with an increase of flexible employment relations due to globalization, more service-sector jobs and the spread of information technology. In recent years, it has also been used in public health research and social epidemiology. Hadden et al. defined precarious employment to be located on a continuum, with the standard of social security provided by a standard (full-time, year-round, unlimited-duration, with benefits) employment contract at one end and a high degree of precariousness at the other.[122]

Precarious employment is now considered a social determinant of health, and an employment condition affecting the health of workers, their families and whole communities.[123] Benach et al. argue, although there is no full consensus on its definition, precarious employment encompasses for instance employment insecurity, individualized bargaining relations, low wages and economic deprivation and limited workplace rights and social protection.[123]

In this thesis, precariousness is relevant for all three papers, particularly with regard to Paper II on potential health effects of exposure to major organisational downsizing. It is also relevant for Paper I on health selection into unemployment, and Paper III on health effects of unemployment, as those being in a precarious employment situation will have an increased risk of becoming downsized or unemployed, and stay unemployed. When I use the term job insecurity in my work on this thesis, it is related to the subjectively perceived anticipations of job loss in relation to downsizing processes and to insecurity during unemployment. Bartley & Ferrie described it as the discrepancy between the level of security a person experiences and the level she/he might prefer.[49] Topics like flexibility and temporary employment are not covered in the papers and the thesis in terms of measurements or data, but is indirectly relevant because it increases the risk of job loss and unemployment. While some researchers limit job insecurity to the treat of total job loss, others extend it to include loss of any valued condition of employment. Bartley & Ferrie suggested that:

The depth of the job insecurity experience will be dependent on the perceived probability and perceived severity of losing one's job. Thus, job insecurity has a large subjective appraisal element that will be highly context dependent, and the job insecurity experience may affect employees who, ultimately, are not made redundant as much as those who are. Job insecurity arising from the threat to a particular job may lead to loss of employment security if subsequent jobs prove hard to find.

Bartley & Ferrie (2001:778)[49]

As described in a commentary by De Witte,[43] job insecurity, just like unemployment, may potentially harm health and well-being later in life. It has a so-called 'scarring' effect. The author refers to papers showing that an experience of unemployment in the past makes workers more insecure about their jobs once they find employment – becoming afraid of losing their job again.[43][124] Typically, organisational downsizing and health studies are based on information about relatively large groups of employees exposed to major workforce reduction, or policy changes, and calculations of the changes in their health status (e.g. mortality, morbidity, hospitalisation, and self-reported health) pre- and post-downsizing. Many of these studies follow the 'stayers', or 'survivers' – those who did not lose their job, but still experienced job insecurity and increasing workloads.[123][125] An early review of the literature on workplace closure found that nearly all of the included 15 studies showed adverse effects on physical and psychological health during the phases of anticipating and experiencing workplace closure – as well as during the first year of unemployment.[126] Cobb & Kasl[127] presented one of the first epidemiological studies of job insecurity and health in a research report edited by the US National Institute for Occupational Safety and Health. For two years, they followed 100 male workers from two plants that were closing, by sending public health nurses to their homes to assess the men's health status. On average, the men were unemployed for 15 weeks during the study period. At follow-up, the study participants reported experiences of a sense of deprivation, mood changes, and self-identity problems, while physical health complaints were most prominent prior to the plant closing down. Further, physiological changes that increased the risk of coronary disease were found, while changes in blood sugar, pepsinogen, and uric acid might have indicated increased risk of diabetes, peptic ulcers, and gout. In their conclusion, Cobb & Kasl stated that companies, unions, and government agencies did not prepare adequately in order to handle human problems that resulted from job termination.[88] In a literature review, Bartley[80] noted that one of the most consistently replicated findings was that health seemed to be affected by the length of time that employees anticipated unemployment while still working.

Systematic reviews

Parmar et al.[128] carried out a systematic review of the 2008 financial crisis and health literature. Their review covered outcomes such as mental health and suicide, self-rated health, maternal health, and mortality. Of the 41 studies meeting their inclusion criteria, 30 (73%) were classified as having a high risk of bias. Only two studies were classified as having a low risk of bias. The findings on self-rated health were mixed. The results showed some indication that suicides increased and mental health deteriorated during the financial crisis, while the declining trend of lower overall mortality was confirmed. Ferrie et al.[129] performed a meta-analysis of individual-level data on self-reported job insecurity and the risk of diabetes (N = 140,825) and found a modest increased risk (odds ratio 1.19, 95% CI 1.09–1.30) of incident diabetes related to job insecurity.[129]

De Witte et al.[124] included 57 studies on the association between job insecurity and health and well-being in their (review) search for causal evidence. Their results showed strong evidence for what they call 'normal causation', in which job insecurity was found to influence both psychological well-being and somatic health over time. Reverse causality was rarely studied, and when studied, rarely found. They concluded that job insecurity influences health and well-being over time, rather than the other way around.[124]

Bamberger et al.[12] performed a systematic review of the impact of organisational change on mental health. Out of 17 studies, 11 of which had downsizing as the exposure variable, the majority showed an association between organisational change and elevated risk of mental illness. Bamberger et al. noted that the relationship between change and mental illness was weaker in longitudinal studies, possibly explained by an observed acute short-term effect that levels off and normalises over time. Only three of the studies included information on the employees' individual perception of change or job insecurity. Further, Bamberger et al. discuss potential confounding factors that may have influenced the estimates, such as coping strategies, personality type, temperament, intelligence, negative affectivity, stress prior to change, perceived social support, or length of employment. They conclude that they were unable to provide convincing evidence of an association between organisational change and elevated risk of mental health problems.[12]

Virtanen et al.[130] performed a systematic review and meta-analysis of perceived job insecurity as a risk factor for incident coronary heart disease. They included 13 cohort studies with more than 174,000 participants and 1,892 incident cases of coronary heart disease. Only a modest association between incident coronary heart disease and job insecurity was found, but it was partly attributable to poorer socio-economic position and elevated risk factor profiles among people experiencing job insecurity.[130] Another study that is worthy of attention is Browning & Heinesen's[131] study of the effect of job loss due to plant closure on mortality and hospitalisation in Denmark. They follow all persons in Denmark in the period 1980–2006 and estimated the causal effects of job

displacement due to plant closure for male workers in private sector firms with an initially strong labour market attachment. They found that job loss increased the risk of overall mortality and mortality caused by circulatory disease, of suicide and suicide attempts, and of death and hospitalisation due to traffic accidents, alcohol-related disease, and mental illness.[131] In a somewhat similar study published in 2006, Browning et al. concluded that job insecurity due to plant closure did not cause hospitalisation for stress-related disease (i.e. circulatory and digestive systems).[132] These findings were later supported by Eliason & Storrie's[133] findings relating to Swedish data on firm closure and the risk of cardiovascular disease (i.e. infarction and/or stroke). Eliason & Storrie found there was an increased risk of hospitalisation for alcohol-related conditions (for both sexes) and due to traffic accidents and self-harm among men.

Studies based on *Nordic data*

Kivimäki et al.[134] aimed to find the underlying mechanisms between organisational downsizing and deterioration of health. They set up a natural experiment, linking self-reported survey data from 764 municipal employees (measured in 1990 and 1993) to employers' registers in Finland. The main outcome measure was records of absences from work (all causes, medical certificates). Being exposed to downsizing was associated with negative changes in work, less support from spouses, and increased smoking. The sickness absence rate from all causes was 2.17 (95% CI 1.54–3.07) times higher after major downsizing compared with minor downsizing. Controlling for physical job demands, job control, and job insecurity reduced the relation between downsizing and sickness absence by 49% in men and women, regardless of their income levels. Kivimäki et al. concluded that the job insecurity from downsizing increased morbidity, and that this increase was not only explained by job insecurity, but also by change in other psychosocial work characteristics such as job demand and control.[134] Similar findings are highlighted in an article by Vahtera & Virtanen.[135]

Martikainen et al.[53] estimated the effects of unemployment and organisational downsizing on mortality during periods of low unemployment (1989) and high unemployment (1994) in Finland, using register data on two cohorts in the age group 35–64 years (N = 87,317 in 1989 and N = 72,419 in 1994). The individuals were followed up for mortality in the periods 1990–1997 and 1994–2002. Unemployment was found to give a 2.38-fold increase in the hazard of mortality in the first period, and a 1.25-fold increase in the second period. The association between unemployment and mortality was weaker in companies with major downsizing compared with those going through minor downsizing. Martikainen et al. concluded that high levels of unemployment or rapid and/or extensive downsizing might produce modest health effects for unemployment due to confounding, and they

suspected that individual-level studies, which they argue are unable to control fully for health selection into unemployment, would overestimate the causal effects of unemployment on mortality.

In Norway, Westin[19] did a 10-year prospective follow-up study of 85 employees (72 women, 13 men) exposed to plant closure in 1975 and compared them with 87 employees (controls) at a 'sister-factory' that did not close down. The study showed that job-loss affected the long-term careers of the former employees, their health, and health-related behaviour. Compared with the controls, the cases exposed to closure had more than a threefold increased risk of receiving disability pension after exposure, while the average amount of sick leave within the first year of follow-up showed a twofold increase.[19] However, a study using Norwegian register data on more than 2.4 million employees for the period 2000–2003, found no evidence of increased sickness absence in relation to organisational downsizing.[136] Further, a recent study comparing Denmark, Norway, and Sweden and using European survey data (European Union Statistics on Income and Living Conditions, EU-SILC) found a negative relationship between unemployment and health in Denmark, but only scant evidence in Sweden and Norway.[137]

Østhus[21] used annual panel data from the Norwegian Panel Survey of Living Conditions (1997–2002) and the 2003 European Survey on Income and Living Conditions (EU-SILC) to study the effects of job displacement and downsizing survival on psychological distress, musculoskeletal pain, and chest pain. The results showed no substantial associations with health outcomes for those staying with their company after downsizing, and no strong indications of workers having adverse mental health symptoms in the period before the downsizing happened (i.e. no anticipation effects). The workers who lost their jobs as a result of the downsizing were more prone to experiencing symptoms of psychological distress, but the effects were not long-lasting.[21]

Black et al.[138] used health survey data linked to Norwegian administrative registers (1986–1999), and found evidence that job displacement had an influence on markers for cardiovascular health. Further, they suggested that this finding could almost entirely be explained by changes in individual health behaviour, with a substantial increase in smoking for men and women immediately after job displacement. There was some evidence that those working in downsizing firms but who did not lose their jobs had better health in the long run, although in common with those who were displaced they smoked more around the time of downsizing.[138]

Recessions

How health changes during varying business cycles and especially recessions have been tested in several studies in recent years. Studies using aggregated data often reveal that mortality declined during recessions,[9 139] with the exception of suicide,[140-142] whereas individual-level studies of typical recession-related exposures (unemployment, job loss, job insecurity) show negative health

consequences.[143] In their literature review, Burgard et al.[143] illustrate the possible pathways linking recessions to health on aggregate and individual levels. Figure 2.10 and Figure 2.11 show a summary of the hypotheses and theories in the recession and health literature.
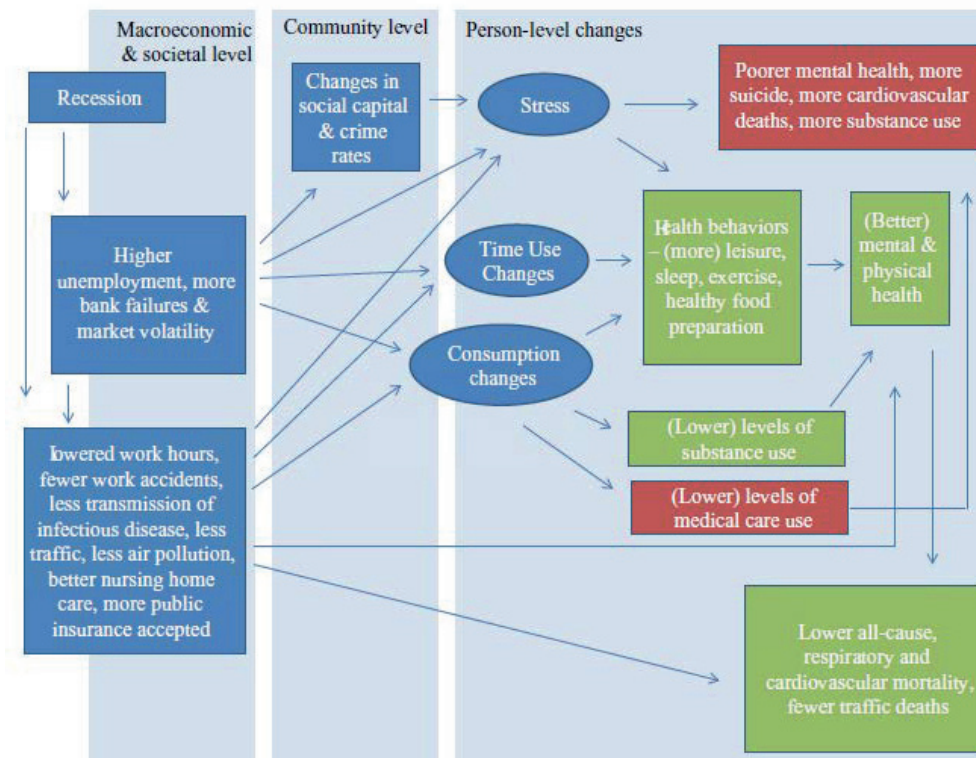
Figure 2.10   Selected aggregate-level hypothesised pathways linking recessions to health presented by Burgard et al.[104] (Reproduced with permission from Sage)
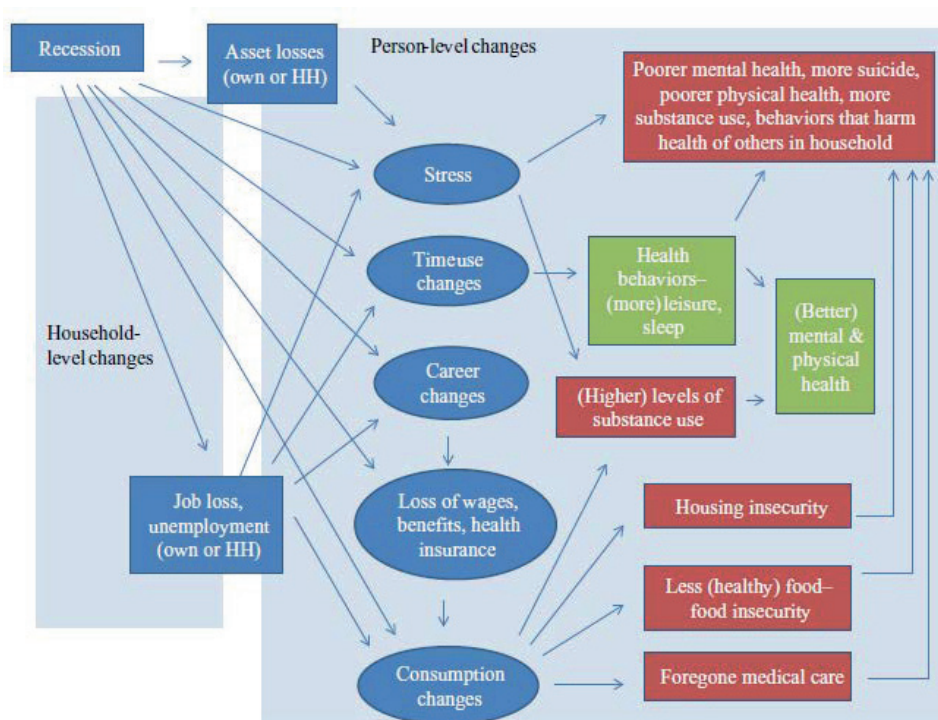
Figure 2.11   Selected individual and household-level hypothesised pathways linking recessions to health presented by Burgard et al.[104] (Reproduced with permission from Sage)

Burgard et al.)[143] also discuss the implication of recessions for health disparities, referring to studies that suggest that socio-economic status is an important modifier of the aggregate relationship between recessions and mortality, with the most vulnerable individuals not benefiting as much as the more advantaged individuals from this procyclical relationship. Further, age is a probable modifier, as recessionary shocks may strike differently among the elderly who have paid off their mortgages and are no longer dependent on their employability, in contrast to working-aged individuals who have mortgages and years of working life ahead of them, and are more vulnerable to unemployment. Stuckler & Basu[22] and Karanikolos et al.[144] discuss how different fiscal policy responses to recessions (mainly fiscal austerity as opposed to increased social protection) may cause different population health outcomes. The result of an updated multilevel analysis of 23 European welfare states, based on the 2012 wave of the European Social Survey, indicated that governments could mitigate unemployment-related health inequalities by investing in social protection.[145]

Snorradóttir et al.[146] followed the collapse of the three main Icelandic banks during the financial crisis, when 20% of the employees were laid off during the first six months after the event in

October 2008. They compared survey responses in a group of leavers (N = 759) and stayers (N = 1880) and found a substantial difference in health between the two groups. Stayers were worse off than those laid off immediately after the downsizing event. Male and female workers who were laid off but subsequently found steady employment had the best health outcomes. Snorradóttir et al. explain this as the positive effect of re-employment on health.[146]

Other relevant studies

Kivimäki et al.[147] set up a prospective cohort study following 4783 Finnish municipal employees who worked in downsized units but kept their job, 4271 employees who lost their jobs during downsizing, and 17,599 employees who did not experience downsizing. Their objective was to investigate whether remaining in employment in a downsized company predicted the use of psychotropic drugs (antidepressants, anxiolytics, and hypnotics). Compared with those not exposed to downsizing, those remaining in employment (i.e. stayers) after downsizing had a higher risk of being prescribed psychotropic drugs. The association was strongest for hypnotics among men and for anxiolytics among women. Men who lost their jobs had the highest rate ratio estimates (1.64, 95% CI 1.19–2.25).[147]

Caroli & Godard[3] used an innovative approach to the job insecurity and health research question in their study of a sample of men from 22 European countries participating in the 2010 European Working Conditions Survey answering questions about self-rated health, back pain, muscular pain, headaches and/or eyestrain, stomach ache, depression or anxiety, fatigue, and insomnia). They took an instrument variable approach based on the idea that workers in countries with highly protected employment perceive less job insecurity and that those employed in industries with higher natural dismissal rate perceive more job insecurity. The results showed that when potential confounding by job insecurity was accounted for in the instrumental variable model, only two specific health outcomes seemed to relate to job insecurity: headache and/or eyestrain and skin problems. On all other outcomes measured, job insecurity did not show any statistically significant impact. Caroli & Godard called for more data on employability for future research, which they regard as a potential key determinant of the influence that job insecurity has on job satisfaction and thereby on health.[3]

Hanson et al.[125] accessed data on all Swedish residents in the period 2004–2010 in the age group 22–54 years in 2006. They had individual-level information on exposure to major organisational downsizing in the periods 2006–2007, 2007–2008, and 2008–2009, and purchases of antidepressants. More than 632,000 persons were exposed to downsizing, while slightly more than 1 million individuals served as controls (unexposed). When controlling for previous health status in

terms of sickness absence and disability pension, Hanson et al. found an increase in the odds of purchasing antidepressants for those exposed compared with those not exposed, mainly one year before to one year after downsizing.[125][110]

In their critical review of the literature on downsizing, Avendano & Berkman[18] argue that most longitudinal studies are susceptible to bias due to selection or confounding, as changes in job security may happen at the same time as other relevant factors associated with health changes. As previously discussed with regard to health selection issues (chapter 2.2), it might be the case that less healthy employees have an increased risk of ending up in less secure jobs. In their summary of the downsizing literature, Avendano & Berkman[18] conclude that although many job insecurity studies show a negative effect of job insecurity and health (some of them with strong designs regarding the ability to make causal inferences), there is still much contradiction in them studies, and a number of them found no clear effects of downsizing. Berkman et al. further state that more research is needed to identify under what conditions downsizing may be detrimental to health.[18]

2.3.3   What is known about unemployment and health

A substantial number of longitudinal, methodically strong, studies of unemployment and health have been conducted and mostly have been reported by social epidemiologists and labour economists. Many of the findings described in the subsection above could also have been presented in this subsection, as job insecurity in terms of downsizing can be seen as a proxy for unemployment or the expectations of losing one's job. In addition to job insecurity, unemployment may cause financial strain, carry stigma, lead to social exclusion (or inclusion) and decreasing human capital, and probably stronger health selection issues than seen in groups of employees exposed to major downsizing. The negative effects of unemployment on health have been found to increase with unemployment duration.[148]

Systematic reviews

Jin et al.[149] systematically reviewed 46 studies of the impact of health on unemployment published in the 1980s and 1990s. They found a positive association between unemployment and overall mortality, specific causes of death (cardiovascular disease and suicide), incidences of physical and mental disorders, and health care usage. They concluded by suggesting a strong, positive association between unemployment and a range of health outcomes, but they remind readers of the likelihood of many mediating and confounding factors (social, economic, or clinical) not being taken into account in many studies, such that causal inference cannot be made.[149]

Roelfs et al.[36] performed a systematic review and meta-analysis of unemployment and all-cause mortality among more than 20 million work-age individuals. They extracted 235 estimates from 42 studies, and estimated an adjusted mean hazard ratio for mortality of 1.63, with a higher effect for men than women. The mortality following unemployment was higher for those who were either early or in the middle of their careers, but lower for those late in their careers. The risk of death was highest in the first 10 years of follow-up, and thereafter decreased. A subset of studies controlling for health-related behaviours showed a mean hazard ratio that was 24% lower than that of studies not controlling for previous health, indicating reverse causality issues.[36]

Milner et al.[8] performed a meta-analytic conceptual review of five population-based cohort studies of cause and effect relating to unemployment, mental health, and suicide. The results showed that the relative risk (RR) of suicide in those exposed to unemployment was RR 1.58 (95% CI 1.33–1.83), reduced by 37% to RR 1.15 (95% CI 1.00–1.30) when adjusting for mental health as a common cause of unemployment and suicide. The longer the unemployment spells, the higher the RR of suicide, and the relative risk was higher for males than females.[8]

Norström et al.[11] performed a systematic review of studies of unemployment and self-assessed health, that focused on subgroups (gender, age, and marital status). A total of 41 papers were included and they showed there was a context-specific effect on health due to unemployment and that the effect differed between the sexes, age, geographical location, income and/or socio-economic position, and educational level. An important finding from the Norström et al. review was the need for researchers to investigate how unemployment causes ill health in different contexts and different subgroups, and to not only deal with population-level estimates of the effect size.[11]

Moore et al.[150] did a systematic review on how job loss, debt and financial difficulties are associated with mental health problems in the general population. They included eleven RCTs (n = 5303) where all the participants were unemployed. The study found that 'Job-Club' interventions may be effective in reducing depressive symptoms in unemployed people, while interventions involving cognitive behavioural therapy had mixed findings and need further trials.[150]

Unemployment and substance use

A considerable number of studies of the relationship between alcohol or substance use and unemployment have been carried out. Henkel[151] performed a review of the literature investigating the selection effects of substance use into unemployment and effects of unemployment on substance use, published between 1990 and 2010. More than 130 studies were included, and the main results were:

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1. Risky alcohol consumption (associated with hazardous, binge, and heavy drinking) was more prevalent among the unemployed. The unemployed were also more likely to be smokers, to use illicit and prescription drugs, and to have alcohol and drug disorders (abuse or dependence).

2. Problematic substance use increased the likelihood of unemployment and decreased the chance of finding and keeping a job.

3. Unemployment was a risk factor for substance use and the subsequent development of substance use disorders. However, the reviewed studies provided only limited information about which individuals were more likely to be affected.

4. Unemployment increased the risk of relapse after alcohol and drug addiction treatment.

5. The exact nature of the relationship between unemployment and smoking cessation remained unclear due to the mixed results observed in the literature review.

6. Drinking and smoking patterns appeared to be procyclical. The patterns were weaker when the economy declined and the unemployment rate increased. By contrast, a countercyclical trend was observed amongst adolescent drug users. However, these studies did not provide any convincing or additional information about substance use amongst the unemployed.

In a recent systematic review, de Goeij et al.[37] investigated how economic crises affect alcohol consumption and alcohol-related health problems. They included 35 papers and concluded that the net impact of economic crises would be an increase in harmful drinking among men, but not among women. de Goeij et al. note that the gender gap could contribute to growing gender-related health inequalities during recessions.[37]

Other relevant studies

Schmitz[107] analysed health information in the German Socio-Economic Panel from 1991 to 2008, utilising plant closures as exogenous entries to unemployment. He did not find any negative effect of unemployment due to plant closure on health satisfaction, mental health, and hospital visits. Schmitz concluded that for the subgroup of unemployed exposed to plant closure, unemployment did not seem to deteriorate the health and selection effects of ill individuals into unemployment and that this finding probably explained the observed correlation between poor health and unemployment.[107]

Gathergood[54] took an innovative instrumental variable approach in his study of unemployment, psychological health, and social norm effects using survey-based UK data. Using an instrument variable approach based on the likelihood of an individual becoming unemployed (based on industry, age, and year unemployment rates), he found that although those entering unemployment had worse mental health prior to the unemployment event (i.e. health selection), the

instrumented estimates showed that the onset of unemployment led to a worsening of mental health. Interestingly, and in line with the findings by Martikainen et al.,[53] Gathergood found that local unemployment rates had an attenuating effect on the estimates, indicating that becoming unemployed in times of high unemployment has a dampening effect on mental health outcomes.[54]

In a longitudinal study covering varying business cycles, Bradford & Lastrapes[152] estimated the relationship between psychotropic drug prescriptions and employment and/or unemployment in the USA. They used aggregated data from the National Ambulatory Medical Care Survey (collected annually between1973 and 1981, in 1985, and annually since 1989), and found that mental health drug prescriptions (antidepressants and anxiolytics) increased by about 10% when employment fell by 1% and unemployment increased. However, this finding only related to the Northeast Region in the USA, and Bradford & Lastrapes speculate that this might have been due to greater health insurance coverage in that region.[152]

Lundin & Hansson[153] did a similar study using Swedish data and analysed monthly data on aggregated unemployment levels and dispensed antidepressants among the 1.9 million inhabitants of Stockholm County in the period 1998–2008. They found the opposite effect to that found by Bradford & Lastrapes[152]: an increase in unemployment was associated with a *decrease* in prescribed antidepressants. Rugulies et al.[154] drew a random sample of 10% of the Danish population and did a prospective study (2000–2003) of job insecurity and unemployment on dispensed antidepressants in more than 5000 Danish employees. They found that job insecurity was associated with use of antidepressants before (OR 1.43) but not after (OR 1.15) adjustment for depressive symptoms at baseline, while those reporting both job insecurity and unemployment (OR 1.79) had a much higher risk of purchasing antidepressants compared with other groups.[154]

To summarise briefly, the existing literature on unemployment and health cannot be said to fully agree on the health effects of unemployment and vice versa. Methodologically strong papers studying the same outcomes and more or less the same exposures (e.g. downsizing) have differing conclusions. Berkman et al.[18] comment that part of this inconsistency may be due to the fact that we have not captured the long-term effects, only short-term fluctuations in health during periods of unemployment. In terms of unemployment protection and social security, social context is a factor that may have contributed to the polarised results. As Ruhm[9] argues, we know very little about whether the patterns observed during 'normal' economic conditions are weakened, reinforced, or reversed during times of crises.

3 Aims

The aim of this thesis is to address the association between health and future unemployment (the selection hypothesis) and whether organisational downsizing and unemployment affects health (the causation hypothesis). The mechanisms linking health and unemployment are complex. As shown in the literature review presented in chapter 2.3, it is highly possible that ill health will induce or worsen unemployment or vice versa. The labour market and the social, political, and demographic contexts within which we live and work are dynamic features that rapidly change over time. Furthermore, it is not straight forward to conduct randomised controlled trials in the field of social epidemiology, hence approaching causal relationships in this field is challenging (see chapter 2.2.2 on the concept of causality). Nevertheless, the overall vision of this thesis was to go beyond associations and approach the effects of organisational downsizing and unemployment on health, by using different (and unconventional) study designs that accounted for confounding in a social epidemiological context.

We wanted the analyses in paper I to provide new knowledge on health selection effects into unemployment in a Norwegian context. Paper II focused on potential health effects in the years before and after exposure to organisational downsizing in private sector employees. In paper III, we went on to study potential health effects of unemployment in the months before, during and after an unemployment period. The hypotheses and objectives for the three papers are presented below:

Paper I:

Based on previous findings (see literature review in chapter 2.3) we hypothesised that employees with mental health problems would have an increased risk of becoming unemployed in Norway. We assumed that this would apply for somatic health problems as well, although the existing literature on somatic health problems as a risk factor for unemployment was, and still is, sparse. Furthermore, we hypothesised that the future risk of unemployment would be lower if sick leave was taken into account simultaneously. Our objectives were:

- To investigate whether, to what degree, and with regard to what type of health problems, health selection into unemployment has been present in the Norwegian labour market, by studying the association between ill health and future unemployment

To explore potential competing risks of unemployment and sick leave, by analysing whether the risk of subsequent unemployment would be reduced if sick leave were considered in a simultaneous analysis

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Paper II:

Referring to the previous literature,[43 125] including stress theories, economic deprivation models and other relevant theories listed in Table 2.4, job insecurity and the treat of job loss and unemployment could be expected to trigger or worsen a number of health conditions.[72 73 124] We hypothesised that organisational downsizing would increase the risk of purchasing prescribed drugs for mental illness and somatic symptoms around the time of exposure to downsizing. Our objectives were:

- To detect the effects of exposure to organisational downsizing on employees' mental health, measured as changes in prescribed psychotropic drugs before and after workforce reduction
- Similarly, to explore other outcomes; drugs for cardiovascular disease, diabetes, obesity, thyroid disorder, pain, and musculoskeletal conditions, all of which are health conditions that have seldom studied in relation to unemployment
- To explore how the potential effects of downsizing on health varied by sex, age, and education

Paper III:

While paper II followed a group of employees exposed to downsizing over years, regardless of whether they lost their job or not in this process, we wanted to go deeper into the short-term effects (months, not years) of job loss and unemployment on health in paper III. Based on the previous literature presented in chapter 2.3 and theories of stress, economic deprivation, social support and latent functions presented in Table 2.4, we hypothesised that mental distress related to an upcoming and ongoing unemployment spell would increase the likelihood of initiating treatment with psychotropic drugs before and during unemployment, and then decrease when the unemployment spell ended. Furthermore, we hypothesised that the increase in the likelihood of initiating drug treatment would be more pronounced for psychotropic drugs compared with drugs used for somatic conditions and pain. The objectives were:

- To investigate the timing of initiation of psychotropic medication in relation to unemployment in the months before, during, and after job loss in order to detect the period of greatest risk
- To explore how the relationship between incident purchases of drugs and unemployment varied by sex, age, and education
- To explore the timing of incident medication in relation to unemployment concerning the same somatic medications as mentioned above in the objectives for Paper II

4   Material and methods

Since 1964, all Norwegian citizens have been assigned a personal identification number (ID). The IDs appears in all administrative and medical registers, and have been used in a number of large population-based health studies, making it possible to link data on each person resident in Norwegian over time. All three papers in this thesis report population-based studies using longitudinal individual-level data to perform a prospective cohort-study (Paper I), a natural experiment (Paper II), and a case-crossover study (Paper III) respectively. Table 4.1 provides an overview of the materials and methods used in the studies.

This chapter contains a detailed presentation of data provision, the separate study designs, and study variables, as well as statistical analyses and ethics. I start with the latter (ethics), since in Norway an ethical committee must consider all ethical aspects of health-related research projects in the country before any data can be ordered or analysed.

Table 4.1   Summary of material and methods used for Papers I–III

	Paper I	Paper II	Paper III
Topic	Health selection into unemployment	Effect of job insecurity on health	Timing of incident medication in relation to unemployment
Data source*	HUNT2 + SSB	SSB/NAV and NorPD	SSB/NAV and NorPD
Observation period	1995–2008	2004–2012	2005–2010
Study design	Prospective cohort study	Natural experiment	Case-crossover study
N	36,249	3,159,196	2,348,552
Outcome	Incident unemployment spell (> 90 days)	Prescription drug purchases	Incident prescription drug purchases
Exposure	Health status	Organisational downsizing	Unemployment
Statistical analysis	Cox proportional hazard Multinomial logistic regr.	Logistic regression Random effects	Conditional logistic regression Fixed effects
Statistical measure	Hazard ratio	Odds ratio	Odds ratio

*HUNT2 was a population-based health study; SSB, NAV, and NorPD manage population-based administrative registers

4.1 Ethics

The Norwegian Health Research Act of 2009[XXIII] regulates all health-related research in Norway. The protocol and variable list must be reviewed and pre-approved by the Regional Committees for Medical Research Ethics.[XXIV] Further, if information about individuals (i.e. personal data) obtained through interviews, questionnaires, observations, or other means is gathered, registered, processed, or stored, the researcher is obligated to notify the data protection officer for research at the Norwegian Centre for Research Data (NSD).[XXV] Additionally, many health-related research projects, particularly those using data from NorPD or other medical registers, have to obtain a licence from the Norwegian Data Protection Authority (Datatilsynet)[XXVI]. In addition, all data owners must approve the research protocol and all research project members must sign a confidentiality declaration.

The project on which this thesis is based was reviewed and approved by the following agencies:

- Regional Committee for Medical Research Ethics (reference 2012/1941b)
- Norwegian Centre for Research Data (reference 31914)
- Norwegian Data Protection Authority (reference 13/00023-2/EOL)
- Norwegian Prescription Database (reference PDB 1292)
- Statistics Norway (reference 12/1775)
- NAV (reference 12/8340)
- Norwegian Tax Administration (Skatteetaten) (mail correspondence)

The Regional Committees for Medical Research Ethics and the Norwegian Data Protection Authority approved The HUNT study. Written informed consent from all HUNT participants was obtained at the time of participation, so that the survey data could be used in research and linked to medical and administrative registers. Given approval from the agencies listed above, there was no need for informed consent from individuals enrolled in observational studies through administrative and medical register data. In our case, the data were completely anonymised before delivery to us.

The three papers were written in accordance with the Vancouver rules, a standardised set of criteria for authorship established by the International Committee of Medical Journal Editors (ICMJE).[XXVII]

[XXIII] https://lovdata.no/dokument/NL/lov/2008-06-20-44
[XXIV] https://helseforskning.etikkom.no/ikbViewer/page/forside?_ikbLanguageCode=us
[XXV] http://www.nsd.uib.no/nsd/english/index.html
[XXVI] https://www.datatilsynet.no/English/
[XXVII] http://www.icmje.org/

4.2 Data provision

Paper I is based on a linkage between the second wave (1995–1997) of the Nord-Trøndelag Health Study,[XXVIII] Statistics Norway's social security event database,[XXIX] and the Norwegian National Education Database (NUDB)[XXX]. The data used for Paper I were requested in September 2012 and delivered from the HUNT databank two months later. Papers II and III are based on a comprehensive linkage of administrative register data, including FD-Trygd, NUDB, the NAV State Register of Employers and Employees (EE-register[XXXI]), and the Norwegian Prescription Database[XXXII]. The data for Papers II and III were requested in November 2012 and delivered in February 2015.

Table 4.2   The project's data sources and time series available in our studies

Data owner	Database	Time series available	Paper I	Paper II	Paper III
HUNT/NTNU	The HUNT2 Study*	1995–1997	X		
SSB	FD-Trygd (event database)	1992–2012	X	X	X
SSB	Norwegian Education Database	1992–2012	X	X	X
SSB/NAV	Register of Employers and Employees	1992–2012		X	
NorPD	Norwegian Prescription Database	2004–2012		X	X

*HUNT2 linked to FD-Trygd (Paper I) only covered FD-Trygd-data up to 2008

4.2.1 The HUNT Study

The Nord-Trøndelag Health Study (The HUNT Study) is a large population-based health survey, covering about 120,000 people (≈ 90% of the population) living in the county of Nord-Trøndelag in central Norway. The surveys have been repeated approximately every tenth year for three decades. The first HUNT study was of the adult population (HUNT1, 1984–1986), the second wave (the data used in this thesis) was completed between 1995 and 1997 (HUNT2), and the third wave in the period 2006–2008 (HUNT3).

The HUNT Study includes data from personal interviews, clinical measurements, biological samples and a number of questionnaires, and the data are available to researchers worldwide. The personal IDs make it possible to link The HUNT study to national registers. General information about the study is available at http://www.ntnu.edu/hunt and a detailed description of the data, results,

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[XXVIII] http://www.ntnu.edu/hunt
[XXIX] http://www.ssb.no/omssb/tjenester-og-verktoy/data-til-forskning/fd-trygd
[XXX] https://www.ssb.no/a/metadata/om_datasamlinger/nudb/nudb_variabelliste.html
[XXXI] https://www.nav.no/en/Home/Employers/NAV+State+Register+of+Employers+and+Employees
[XXXII] http://www.norpd.no/default.aspx

and the instruments used is available in the HUNT Databank, which managers the data gathered in The HUNT Study (http://www.ntnu.edu/hunt/databank). A detailed description of the cohort profile in The HUNT Study has been published elsewhere.[155]

The HUNT2 survey

All residents of Nord-Trøndelag County aged 20 years or older were invited to participate in HUNT2 (see Paper I). The objectives, contents, methods, and participation have been described by Holmen et al.[156] Approximately 94,000 adults were invited to HUNT2 and about 70% of them agreed. For the project on which this thesis is based, we used the extensive baseline health questionnaires (Questionnaires 1 and 2), downloadable from the HUNT Databank[XXXIII] and reproduced in the supplementary file following paper I. A detailed presentation of the study variables from HUNT2 used in this thesis is given below.

4.2.2   Statistics Norway – population-based registers

The Statistics Act of 1989 regulates Statistics Norway,[XXXIV] which is the central institution for the collection, processing, coordination, and dissemination of official data in Norway. SSB's Department of Social Statistics, which provides microdata, performed all data linkages between HUNT2, FD-Trygd, NUDB, and the EE-register for the project, before sending them over to the NorPD to be linked to the prescription database and to be anonymised. The procedure for obtaining microdata is given in English on SSB's website.[XXXV] SSB collaborates closely with The Norwegian Labour and Welfare Administration (NAV) regarding registered data on different types of benefits, unemployment spells, and participation in labour market programmes.

Statistics Norway's social security event database (FD-Trygd)

Since 1992, whenever a Norwegian citizen is employed, job-seeking and/or unemployed, on parental leave, in receipt of sick leave, unemployment, or social benefits, or receives a disability or old-age pension, every start and stop date of these events is registered in the social security event database FD-Trygd. The database also contains information on demographic data (e.g. residence, migration, emigration, and date of death). Additionally, information on annual income is available.

[XXXIII] https://hunt-db.medisin.ntnu.no/hunt-db/
[XXXIV] https://www.ssb.no/en/
[XXXV] http://www.ssb.no/en/omssb/tjenester-og-verktoy/data-til-forskning

Most of the variables available in FD-Trygd were used in the project as outcome variables (Paper I), exposure variables (Paper III), or censor and/or adjustment variables (Papers I–III). A list (in Norwegian) with detailed information about each variable can be found on the following webpage: http://www.ssb.no/omssb/tjenester-og-verktoy/data-til-forskning/fd-trygd

The National Education Database (NUDB)

NUDB was established in 1970 and contains information about the educational events in a citizen's life: enrolment, type of education, grades, and the highest attained level of education. Every autumn (on the 1st of October), information on completed education from the previous academic year is registered in the database. For our project, we used information about the highest attained level of education at baseline.

Register of Employers and Employees (EE-register)

The NAV State Register of Employers and Employees (EE-register) provides an overview of employment in Norway. The Norwegian Labour and Welfare Administration (NAV) owns and manages the database. EE-register data are subject to confidentiality rules, as defined in Paragraph 7 of the Labour and Welfare Administration Act. Employers are obliged to report information to the register on a regular basis and whenever a new employee is hired. Data on a company's organisation number, the start and termination date of an employment contract, occupation, working hours or working hour arrangement, and type of pay, among other variables, can be accessed from the register. For Paper II, we used information about organisation numbers from the ER-register to calculate the number of employees in each company over time and to determine whether an individual had been exposed to organisational downsizing from one year to the next. Statistics Norway handled all the data linkages to NAV's registers.

4.2.3 The Norwegian Prescription Database (NorPD)

The Norwegian Prescription Database, established 1 January 2004, is managed by the Norwegian Institute of Public Health. Regulations concerning the collection and processing of prescription data are available online.[xxxvi] NorPD uses pseudonyms in its register for monitoring all prescription drugs dispensed from Norwegian pharmacies. Non-prescribed drugs bought over the counter are not

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[xxxvi] http://www.norpd.no/Regulations.aspx

included in the register, nor are medications taken during hospitalisation. Time-series data showing prevalence numbers from 2004 an onwards can be calculated online on NorPD's website.[XXXVII]

When linked to other data sources, including those held by Statistics Norway, NorPD administers the final data linkage. NorPD anonymises the data and keeps the identifier, so that the data remain anonymous to the researcher. For Papers II and III, we used information about exact dates of drug purchases and the corresponding ATC (Anatomical Therapeutic Chemical) code to compute the outcome variables.

The Anatomical Therapeutic Chemical Classification System with Defined Daily Doses (ATC/DDD)
The ATC/DDD system is defined by WHO[XXXVIII] and divides drugs into different groups according to the organ and/or system on which they act as well as their chemical, pharmacological, and therapeutic properties. There are five levels of classification. For Papers II and III, the following drugs listed in Table 4.3 were analysed as outcome variables.

Table 4.3   ATC and ATC-level name of drugs analysed for Papers II and III

ATC	ATC level name
N05A	Antipsychotics
N05B	Anxiolytics
N05C	Hypnotics and sedatives
N06A	Antidepressants
A08A	Anti-obesity preparations, excl. diet products
A10A	Insulins and analogues
C01+C02+C03 +C07+C08+C09 +C10	Cardiac therapy; Antihypertensives; Diuretics; Beta blocking agents; Calcium channel blockers; Agents acting on the renin-angiotensin system; Lipid modifying agents
H03A	Thyroid therapy
M01A +M02A	Antiinflammatory and antirheumatic products, nonsteroids; Topical products for joint and muscular pain
N02A	Opioids
N02B	Other analgesics or Antipyretics

Notes: N05A-N06A = psychotropic drugs, A08A-N02B = drugs for somatic conditions and pain

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[XXXVII] http://www.norpd.no/Prevalens.aspx
[XXXVIII] http://www.who.int/classifications/atcddd/en/

4.3 Study design and study population

As shown in Table 4.1, the analyses for Paper I were based on a linkage between survey data from HUNT2 participants measured in the period 1995–1997 and their social security data obtained from FD-Trygd (1992–2008). Statistics Norway identified all individuals (age group 18–67 years) who had been employed and resident in Norway during the period 2004–2012, and represented the Norwegian working population in the same period (Papers II and III). Separate overviews of the study design and the study population reported in each paper are given below.

4.3.1 Paper I – Survival analysis of health selection into unemployment

For Paper I, we investigated whether ill health was associated with future episodes of unemployment using self-reported survey data on mental and physical health from participants in HUNT2 (1995–1997) and spells of incident unemployment (≥ 90 days) registered in FD-Trygd up until 2008. The FD-Trygd data covered the period 1992–2008 with entry or exit dates for a range of working life events for each HUNT2-participant. As a supplementary analysis, we investigated whether sick leave was a competing risk of unemployment in Norway, using the same study population as in the main analysis. By competing risk, we meant that a person might have a sick leave spell, instead of an unemployment spell, since due to dismissal regulations it was very unlikely that persons would have gone from sick leave directly into unemployment, although a person might have gone on sick leave after they have become unemployed.

Of the 94,194 invited to participate in HUNT2, 65,600 (70%) agreed. For our project, 36,249 were included in the analysis (Figure 4.1). The inclusion criteria were: in the age group 20–66 years, not pensioned before baseline or within the first year after baseline, completion of the HUNT2 questionnaire, and non-missing on exposures.
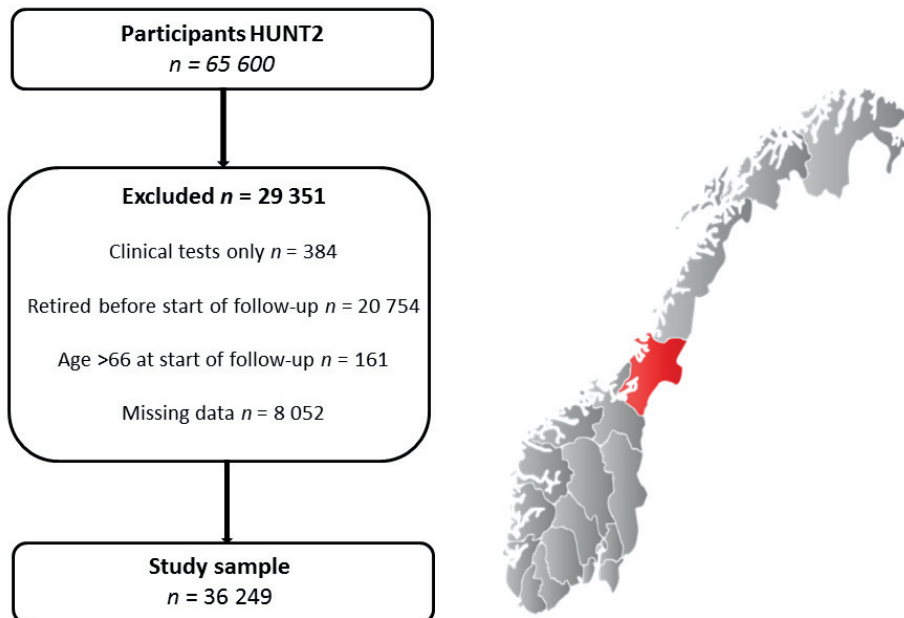
Figure 4.1   Study sample used for Paper I: Participants in HUNT2 (1995–1997), linked to FD-Trygd by their personal ID (1992–2008) (Map of Nord-Trøndelag sourced from Wikimedia commons)

4.3.2   Paper II – A natural experiment investigating the effect of organisational downsizing on health

Performing randomised controlled trials in the unemployment and health field is challenging and can often be ethically impossible. Traditional observational studies of unemployment and health often suffer from unmeasured and/or time-varying confounding as well as reverse causality issues interfering with causal inferences. Increasingly, researchers have used natural and quasi-natural experiments exploiting exogenous sources of variation in the data in their search for effects (see chapter 2.2.).[157]

For Paper II, the target population comprised all employees in the age group 18–67 years who were resident in Norway between 2004 and 2012 (N = 3,159,196). The Norwegian Prescription Database provided exact dates of purchased drugs from Norwegian pharmacies during the observation period (2004–2012). By combining this information with information about exposure to major organisational downsizing, we created a natural experiment allowing comparison of health within the group of exposed employees before and after downsizing (N = 144,089).

We combined information about years of major downsizing in companies with individual-level register data on drug purchases, allowing comparison of drug purchases by exposed employees before and after downsizing. A panel data set was set up with annual observations of each individual on company affiliation, drug purchases, age, sex, educational level, and income. For each individual, the panel data set also included information on number of employees, and downsizing and upsizing rates between years for the company to which the individual was affiliated.

In order to utilise as much of the dataset as possible, individuals were enrolled in the study throughout the observation period if they were eligible for analysis (see the eligibility criteria in Paper II). Approximately 8,000 companies with just over 144,000 employees met the eligibility criteria, and were included in the analysis around the time of downsizing.

4.3.3   Paper III – A case-crossover analysis of incident psychotropic medication in relation to unemployment

The relationship between timing of unemployment and incident use of psychotropic medications was analysed using a case-crossover design.[158] Instead of finding a representative control for each case (conventional case-control design), each individual serves as his or her own control over time in the case-crossover design. Consequently, the threat of control selection bias and all time-invariant or slow-varying confounding (e.g. by sex; past psychiatric illness, or educational level) is eliminated.

For our Paper III the target population included the 2,348,552 employees in the age group 18–67 years who were employed and resident in Norway in 2004. From this target population, we selected case-crossover samples for each group of psychotropic drugs studied: antidepressants (N = 34,111), anxiolytics (N = 32,570), hypnotics and/or sedatives (N = 26,838), and antipsychotics (N = 12,495). Each sample consisted of employees exposed to at least one spell of unemployment *and* having a prescribed psychotropic drug (outcome) dispensed during the observation period (1 Jan 2005 to 31 December 2010). In order to capture incident medication, we excluded those who had purchased a psychotropic drug in 2004 (N = 307,622).

We defined 16 different exposure states of unemployment according to timing of the unemployment spell: 1–6 months before unemployment, 1, 2, 3, or 4 or more months during unemployment, and 1–6 months after the end of an unemployment spell. Further, each individual's unemployment state was recorded on the date of their first drug purchase (case period). Control periods were chosen 12, 24 and 36 months before the incident drug purchase took place, and we recorded each individual's unemployment state in these control periods. The study design is illustrated in S-Figure 1 in the supplementary file following Paper III. A flowchart of the study population for the main analysis of psychotropic medication is shown in Figure 4.2.
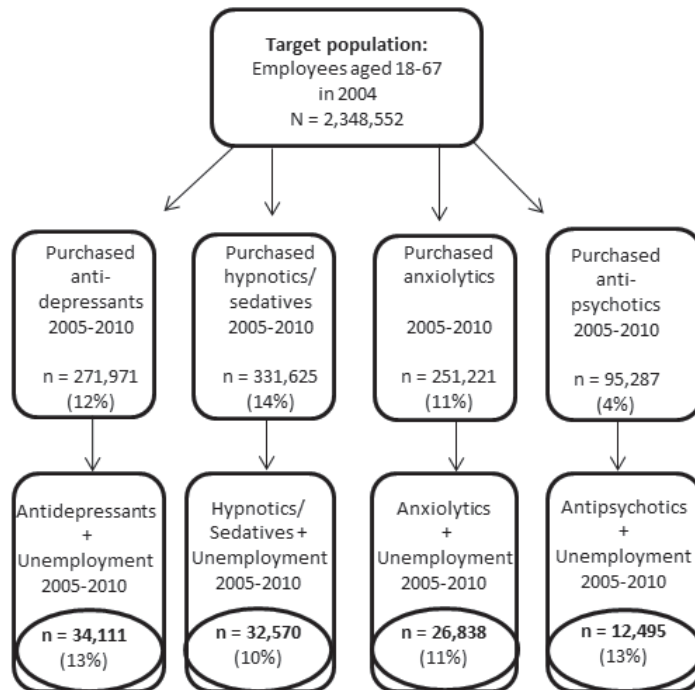
Figure 4.2   Study population reported in Paper III. Those with at least one purchase of prescribed psychotropic drugs (outcome) and one or more spells of unemployment lasting for > 90 consecutive days (exposure) during the observation period 2005–2010 were included in the case-crossover samples (within the oval lines).

We also performed supplementary analyses of subsamples of the population purchasing prescribed drugs for somatic conditions and pain. The number of individuals studied regarding each of these drugs is described in S-Table 2 in the supplementary file following Paper III.

4.4   Study variables

The independent variables in the multivariable regression analysis included the exposure variable of interest and potentially several covariates and/or adjustment and/or control variables. I have used the terminology outcome, exposure, or covariate and/or adjustment variables in this thesis and in the following descriptions of the papers.

4.4.1 Paper I – Baseline health (HUNT2) and incident unemployment (1995–2008)

In survival analysis, the outcome variable represents the time that passes until the future event of interest (also called failure) happens. Time is modelled from baseline or start of follow up and up to the event or the end of the study or other events that make it necessary to censor and/or exclude an individual from the study. Such censoring variables typically indicate events that prevent the study participant from experiencing the outcome or reach the end of follow up (e.g. death, emigration, or receipt of pension).

Outcome variables

For Paper I, the outcome variable of the main analysis was defined as *time to the first date of an unemployment spell lasting more than 90 days*. Unemployment was defined as being registered at the Norwegian Labour and Welfare Administration (NAV) as 100% unemployed (job-seeking) or participating full-time in a job-creation programme. It should be noted that, according to our definition, unemployed individuals did not necessarily receive unemployment benefits. We chose a 90-days cut-off to avoid seasonal unemployment and students who were short-term unemployed during the summer-holidays or after finishing their studies. The median length of an unemployment spell was 99 days. We also defined two alternative outcome variables used in sensitivity analyses: time to unemployment lasting > 180 days (long-term unemployment) and any unemployment (regardless of duration).

In supplementary analyses, we explored whether the risk of unemployment was reduced if we considered sick leave in a simultaneous analysis. We divided follow-up time into 28 six-month periods from baseline to end of follow-up, and used multinomial regression analysis to compare *time to first sick leave spell* (≥ 8 weeks) with *time to first period of unemployment* (> 90 days). The outcome variable had three values: 0 (no unemployment and/or no sick leave), 1 (unemployment), or 2 (sick leave). Sick leave was measured as periods receiving sickness benefits. To investigate health selection according to duration of unemployment, we performed a survival analysis of time to *end* of unemployment.

Censor variables

Participants were censored at the date of *death, emigration, or permanent labour market exit* in terms of early or old age pension receipt or temporary or permanent disability pension, whichever occurred first. The end of follow up was 31 December 2008.

Exposure variables – health status at baseline

We investigated the association between several health measures reported by participants in HUNT2 and future risk of unemployment. An overview of the health variables and their specification is listed in the supplementary file following Paper I (S-Table 1).

The 14-item Hospital Anxiety and Depression Scale (HADS), a four-point Likert scale scored 0–3,[159] was used to measure symptoms of anxiety and depression during the last week, each with a seven-item subscale. The item 'Have you ever felt tense or "wound up"' was asked regarding the last two weeks. The total sum of each subscale in HADS varied from 0 to 21. In line with validation studies, the clinical caseness cut-off was set to > 8/21, providing sensitivity and specificity of ≈ 0.8.[160] Further, we categorised the variable into four subcategories: No symptoms (< 8/21 on both subscales); Anxiety only (≥ 8 on HADS-A, < 8/21 on HADS-D); Depression only (≥ 8/21 on HADS-D, < 8/21 on HADS-A), and Anxiety and depression (≥ 8/21 on both subscales). We replaced missing values by multiplying existing scores by 7/5 or 7/6 if one or two items were missing, respectively.

Based on the number of *chronic somatic conditions* reported by the HUNT2 participants, we computed a categorical variable measuring somatic disease (coded 0, 1, 2, or ≥ 3). The participants were asked whether or not (yes/no) they had had asthma, cardiovascular diseases (stroke, myocardial infarction or angina pectoris), diabetes, thyroid diseases, rheumatic conditions diagnosed by a doctor (rheumatoid arthritis, osteoarthritis or ankylosing spondylitis – Bekhterev's disease), osteoporosis, epilepsy, cancer, other longstanding diseases (lasting at least 12 months), traumas (hip fractures or other trauma necessitating hospital admission, or physical handicap (vision, hearing, or motor handicapped).

The following somatic symptoms were measured as self-reported:

- *Musculoskeletal pain* (lasting for at least 3 months during the last year, categorical; coded 0, 1, 2, or ≥3 depending on the number of affected joints (neck, shoulder, elbows, wrist, chest and/or stomach, upper back, low back, hips, knees, ankles and/or feet)
- *Gastrointestinal complaints,* with the responses 'somewhat bothered' or 'bothered a lot' by nausea, dyspepsia, diarrhoea, or constipation (the last 12 months)
- *Insomnia,* with the responses 'about once a week or more than once a week' to the question 'How often do you suffer from insomnia?', often or almost every night having had difficulties falling asleep or waking early during the last month, and having insomnia to such a degree that it affected work (yes/no)). The question 'How is your health at the moment?' (dichotomised into poor/not so good versus good/very good) measured *self-rated health*.[161]

Alcohol consumption was considered likely to affect work ability and the risk of unemployment, and was included both as an exposure and adjustment variable (in contrast to the other lifestyle measures described below under 'Adjustment variables'). Questions about frequency of alcohol consumption per month ('How many times a month do you normally drink alcohol) and whether teetotaller or not (yes/no) were combined into a categorical variable: teetotaller, zero times per month (but not teetotaller), 1–4 times, 5–8 times, and > 8 times per month. Further, the CAGE questionnaire[162] was used as an instrument to detect *problematic alcohol use*. Four questions are included in the instrument: 1) Have you ever felt that you should reduce your alcohol intake? 2) Have other people ever criticised your use of alcohol? 3) Have you ever felt bad or guilty because of your use of alcohol? and 4) Have you ever had a drink first thing in the morning as a pick-me-up or to calm your nerves or to cure a hangover? The caseness cut-off was set to ≥ 2, concordant with validation studies.[163]

Adjustment variables

Age was categorised in the following groups: 20–29, 30–39, 40–49, 50–59, and 60–66 years. *Marital status* and *educational level* measured socio-economic position at baseline. Education was measured in three categories at the start of follow up: 1) compulsory education (primary school, lower secondary school, or less (no education)), 2) intermediate education (upper secondary school and post-secondary non-tertiary education), and 3) tertiary education (undergraduate, graduate, and postgraduate education). *Occupation* (HUNT2 questionnaire) was another measure of socio-economic position considered a potential confounder and therefore we performed a separate analysis adjusting for occupation. Occupation was based on the following categories: 1) 'Management position in public or private enterprise'; 2) 'Self-employed professional (e.g. dentist or lawyer)'; 3) 'Lower professional occupation (e.g. nurse, technician, or teacher)'; 4) 'Non-professional occupation (e.g. shop, office, or public service)'; 5) 'Farmer or forest owner'; 6) 'Self-employed businessman'; 7) 'Skilled worker, artisan, foreman'; 8) 'Driver, chauffeur'; 9) 'Fisherman'; and 10) 'Semi-skilled, unskilled worker'. The variable had a relatively high missing rate (11%).

Additionally, we adjusted for the following lifestyle-related variables:

- *Body mass index* (BMI), indicating weight-for-height (kg/m^2) and commonly used to classify underweight, overweight, and obesity in adults. BMI was defined as a four-level categorical

variable based on the WHO standard[XXXIX]: Normal range 18.5–24.99 (reference category), Underweight < 18.5, Overweight ≥ 25, Obese ≥ 30

- *Physical activity,* defined as a categorical variable in three categories: 1) *high* = vigorous activity for more than one hour per week, 2) *moderate* = vigorous for less than one hour or light exercise more than one hour per week, and 3) *low* = less active than moderate

- *Smoking status,* assessed with the questions 'Do you smoke?' and 'If you previously smoked, who long has it been since you stopped'. Those reporting they smoked cigarettes, cigars, or a pipe daily were categorised as current smokers, those who indicated the time since they stopped smoking were categorised as previous smokers (unless they simultaneously reported smoking daily; some reported illogical combinations), and those who reported never having smoked were classified as never smokers

- *Alcohol consumption,* included as both an exposure and an adjustment variable, as described and defined above.

As unemployment is likely to affect health,[7 11 36] we also adjusted one of the regression models for previous unemployment measured as *accumulated days of unemployment* from 1992 until baseline.

4.4.2   Paper II –Organisational downsizing and change in drug purchase (2004–2012)

In the natural experiment set up on observational data, we studied 11 different outcome measures (drugs), several exposure cut-offs (downsizing), and adjusted all analyses for sex, age, and education.

Outcome variables – purchases of prescribed drugs

Based on the exact date of drug purchase, the outcome variable was dichotomised into whether (1) or not (0) an employee purchased the drug in each year during the observation period 2004–2012. Four ATC groups (see Table 4.3 above) of prescribed psychotropic drugs were analysed: N05A Antipsychotics; N05B Anxiolytics; N05C Hypnotics and sedatives, and N06A Antidepressants. Further, we also explored how downsizing related to change in purchases of drugs for the following somatic conditions and pain: N08A Anti-obesity preparations; A10A Insulins; any cardiovascular medication available in the data (C01/C02/C03/C07/C08/C09/C10 Cardiac therapy/Antihypertensive drugs/Diuretics/Beta blocking agents); H03A Thyroid therapy; M01A+M02A Anti-inflammatory and Anti-rheumatic products, whichever occurred first; N02A Opioids; and N02B other analgesics and antipyretics. A list specifying the names of the drugs included in each ATC group is given in the

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supplementary file following Paper II (Table A). Based on previous findings,[164] we hypothesised that analyses of psychotropic drugs would show an increase after exposure because of psychosocial stress related to job insecurity, and would produce higher estimates than drugs for somatic and pain conditions.

Exposure variable – job insecurity in terms of exposure to organisational downsizing

In our research project protocol, we had planned to use the Norwegian Bedrifts- og foretaksregisteret (businesses and enterprise register) to access information about plant closure. We thought that working in a company that eventually had to close would provide a reliable measure of job insecurity – our exposure variable of interest. However, the data quality turned out to be too poor and hence the risk of misclassification would have been too large. Instead, we decided to use information from the Register of Employers and Employees (EE-register) and explore whether and how exposure to organisational downsizing resulted in changes in prescribed drug purchases.

To identify individuals exposed to downsizing, we counted the number of employees in each company annually and calculated the net workforce reduction between years 2004 to 2005, 2005 to 2006, and 2011 to 2012. We defined being exposed to downsizing as working in a company with a workforce reduction ≥ 25% between two consecutive years. Employees were defined as exposed to major downsizing regardless of whether they actually lost their job, changed job, or stayed in the same company, since our aim was to identify employees likely to perceive job insecurity. As a sensitivity analysis, and following Martikainen et al.[5336] and Rege et al.[165], we also studied those exposed to a 50–100% workforce reduction between two consecutive years.

An employee could be exposed to downsizing several times during the observation period. In that case, he or she was considered exposed only the first time it happened. To identify when an individual was exposed to downsizing, we calculated a time-from-exposure variable for each observation to indicate the interval in years from the downsizing exposure, ranging from maximum minus eight to plus seven. For a person working in a company going through major downsizing between 2006 and 2007, the time variable took the values (-3) in 2004, (-2) in 2005, (-1) in 2006, (0) in 2007, (1) in 2008, (2) in 2009, (3) in 2010, (4) in 2011, and (5) in 2012.

Adjustment variables and stratified analyses

We adjusted the analyses for age, sex, and educational level. In addition, a set of dummies (calendar years) was added to account for time-trends. Age was modelled with a restricted cubic spline with five knots to account for non-linear associations with age. In subgroup (stratified) analyses, age was categorised into 25–39 years, 40–54 years, and 55–66 years. Education was measured in three

categories: 1) compulsory education (primary school, lower secondary school, or less) 2) intermediate education (upper secondary school and post-secondary non-tertiary education), and 3) tertiary education (undergraduate, graduate, and postgraduate education).

4.4.3   Paper III –Unemployment and incident psychotropic medication (2005–2010)

While for Paper II we investigated change in prescribed drugs due to job insecurity in a *group of employees* experiencing potential job loss, for Paper III, we aimed to reveal the risk of initiating prescribed medication around the time of unemployment, *within individuals* who experienced unemployment and purchased medication during the observation period.

Outcome – incident psychotropic medication

The outcome variable was defined as having a first-time registered purchase of a psychotropic drug during the observation period 2005–2010. Separate analyses of antidepressants, anxiolytics, hypnotics and/or sedatives, and psychotropics were performed. In supplementary analyses, we also investigated the same drugs for somatic conditions and pain as done for Paper II. The outcome variables were dichotomous: for each drug, we split the observation period (2005–2010) into 30-days-intervals with a maximum of 73 periods (also referred to as months). For each of these periods, we generated a dichotomous variable indicating in what month and/or period the person made his or her first-time drug purchase.

Censoring variables

Right censoring was done at the date of death, emigration, retirement (early or old age) or long-term work disability (vocational rehabilitation programme participation or any type of disability pension), whichever occurred first.

Exposure – unemployment spells lasting for more than 90 days

An employee was considered unemployed from the date he or she was registered as completely out of income-generating work at the Norwegian Labour and Welfare Administration (NAV) and signed up as 100% actively job-seeking for > 90 days. Those registered as participating full-time in re-employment programmes were also considered unemployed. Since we had information about the exact date of each unemployment spell, we split the observation period into 30-days-intervals. We then generated a dichotomous variable indicating how far (in time) the person was from a spell of unemployment. The dichotomous unemployment variables identified episodes of ongoing

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unemployment (1, 2, 3, and 4 or more months) as well as the 6-month period before and the 6-month period after the end of each unemployment spell.

Subgroup analyses

Since the analyses for Paper III were done with a case-crossover design, within person over time, slow or non-varying confounding factors (i.e. sex and education) were eliminated, and thus it was unnecessary to control for them. However, we stratified analyses by sex, age, and education to see whether the associations differed in the different groups. The generalised Hausman specification test was used to test the statistical differences between groups.[166] Age was categorised in three groups: 18–29, 30–49, and 50–67 years. Educational level was measured in the same way as for Paper II: 1) compulsory education (primary school, lower secondary school, or less), 2) intermediate education (upper secondary school and post-secondary non-tertiary education), 3) tertiary education (undergraduate, graduate, and postgraduate education).

Additionally, we explored the effect of having several unemployment spells during the observation period (2005-2010) by comparing individuals with multiple unemployment spells (> 90 days) with those only experiencing one episode of unemployment (> 90 days).

4.5 Statistical analyses

We used the following statistical approaches in the three papers: descriptive statistics (Papers I–III), Cox proportional hazard models and multinomial logistic regression analysis (Paper I), random effects logistic regression analysis (Paper II), and conditional logistic regression (Paper III). The Cox analyses produced output as hazard ratios (HRs), the results from multinomial analyses were presented as relative rate ratios (RRR), while the results of random effects and conditional logistic regression analyses were presented as odds ratios (ORs). Data preparation and statistical analyses were performed using Stata MP 13.1 (StataCorp LP, Texas, USA).

4.5.1 Paper I – Cox proportional hazard modelling and multinomial logistic regression

Main analyses

The association between health and risk of future unemployment was investigated using survival analysis (Cox's proportional hazard models) on time-to-event (unemployment) data.[167] This semi-parametric method combines non-parametric and parametric features. It does not assume any particular statistical distribution or baseline hazard, but the estimated hazard ratio between the hazard rates in the exposed versus control group is assumed to be constant over the time period

studied (known as the proportional hazard assumption). The hazard rate is assumed an instantaneous rate, as it measures the likelihood of the event to happen in the next time interval, divided by the length of that interval (typically intervals are very short, hence the description 'instantaneous rate').[168] In our case, the hazard ratio can be seen as the relative risk of incident unemployment based on a comparison of event rates in HUNT2 participants exposed to different baseline health status. We evaluated the proportional hazard assumption for each of the exposure variables graphically, and likelihood ratio-tested interaction terms by sex, age, and education.[167]

The time axis counted days from date of participation in HUNT2 (1995–1997). As we were concerned with reverse causality – for instance, that some people might already have been depressed because of a known impending job loss – the start of follow-up was set 90 days after participation in HUNT2. Similarly, those who became unemployed 90 days before or after participation in the study were left censored (excluded) at the date of participation, so that none of the participants included in our analyses were close to an unemployment spell at start of follow-up. We decided to perform the statistical analyses on participants with complete data on exposure variables, and therefore the number of participants (N) varied between models. The proportion of missing on each variable is given in Paper I (Table 1).

We analysed three different models for each of the health measures. Model 1 was adjusted for age, sex, education, and marital status. Additional adjustment variables that could have a status as both confounders and mediators were included in Model 2: physical activity, body mass index, smoking, and alcohol consumption (i.e. variables that could possibly cause unemployment but also to some extent could be caused by unemployment). In Model 3 we adjusted for cumulative length (days) of previous unemployment. We also investigated possible effect measure modification by age and sex for each of the health indicators, and performed age-stratified analyses (<> 50 years). The proportional hazards assumptions were tested based on Schoenfeld residuals. The results were reported as hazard ratios (HRs) with 95% confidence intervals (CI).

Supplementary- and sensitivity analyses

We were concerned that sick leave might be a competing risk factor of unemployment. It is plausible that a known impending redundancy might trigger or cause ill health, making the employee seek help and receive sick leave benefits. There are also economic incentives for individuals to receive sick leave benefits (100% wage coverage up to one year) instead of unemployment benefits (≈ 62.4% coverage for a maximum of two years). To explore the probabilities of the different outcomes, we performed multinomial regression analyses (two or more possible discrete outcomes) in which the outcome variable took on three values: 0 = no unemployment or sick leave, 1 = unemployment (> 90

days), or 2 = sick leave (> 60 days). We divided the follow-up time into 6-month-periods after participation in HUNT2 (28 periods at end of follow-up on 31 December 2008), indicating the different statuses for each case.

The fully adjusted model was adjusted for sex, age, education, marital status, physical activity, body mass index, smoking status, and alcohol consumption. We also added a continuous time variable (1–28) to each regression equation, counting the number of periods until the event (unemployment or sick leave) happened, thus making it possible to adjust for time trends.

Another approach to the health selection hypothesis was to look at the duration of an unemployment spell. We hypothesised that study participants with several conditions or symptoms would have a higher risk of being unemployed for a longer period of time, compared with their healthier peers. We performed a Cox proportional hazard analysis of time to *end* of unemployment, instead of start date of the unemployment spell, in order to explore the duration hypothesis. We defined robust standard errors, taking clustering of individuals with several spells of unemployment into account.

4.5.2   Paper II – Natural experiment using observational data

Main analyses

The outcome variables in the natural experiment were dichotomised into whether or not an employee purchased a specific drug each year between 2004 and 2012. Further, we defined the exposure variable as the number of observational years before and after the downsizing event. The year of downsizing was given the value 0, the year before downsizing -1, the year after downsizing +1, and so forth. Given the binary outcome variable, we used a random effects logistic regression estimator (taking into account repeated measures for each individual), estimating the odds ratios (OR) with 95% confidence intervals (CI) of exposure to downsizing on drug purchases.

We presented the estimates of the exposed group from year -5 to year +5 in relation to the downsizing experience. Year -3 before downsizing was defined as the reference time, so that the ORs in other years were related to the odds of purchasing drugs in year -3. We chose year -3 because it was not too far in time from the downsizing in year 0, but at the same time not so close to the downsizing event that reverse causality was very likely to be an issue (i.e. that the major impending downsizing process was already affecting the employees' health).

All analyses were conditioned on fulfilment of the eligibility criteria defined in chapter 4, and all analyses were adjusted for age, sex, and educational level. Further, we included a set of dummies for each calendar year in the observation period (2004–2012) to account for time trends.

Subgroup- and sensitivity analyses

We did subgroup analyses on the four psychotropic drugs by sex, age, and educational level. We also changed the downsizing exposure cut-off from ≥ 25% to ≥ 50% and changed the reference time point from year -3 to a collapse of years -2, -3, and -4 before downsizing.

Following an article using Swedish data on exposure to major downsizing and purchases of antidepressant drugs,[125] we investigated health selection effects by accounting for previous health status measured by sick leave spells and drug purchases. We identified employees having 30 days or more of sickness absence in 2004 or 2005 and employees purchasing any psychotropic drug in 2004 or 2005. We then excluded those exposed to major downsizing between 2004 and 2005, and ran the analyses on each of the four psychotropic drugs in the period 2006–2012.

4.5.3   Paper III – Case-crossover analysis

Main analyses

While studying downsizing as a proxy for job insecurity and possible unemployment for Paper II, we investigated actual unemployment (> 90 days) as the exposure for Paper III. For Paper II the outcome variable was defined as purchase (1) or no purchase (0) of the different prescribed drugs each year, while for Paper III we focused on the month in which an incident (first-time) purchase of a prescribed drug took place. As illustrated in Figure 4.3, the case period included 16 time states in relation to unemployment around the time of drug purchase with three control periods earlier in life. We compared the risk of being close to an unemployment spell in the case period (when the psychotropic drug treatment was initiated) with the risk of being in that same unemployment state 12, 24, and 36 months before the drug purchase happened (control periods). Defining the control periods in this way also accounted for exposure trends over time, as the same months in each year were used as controls.
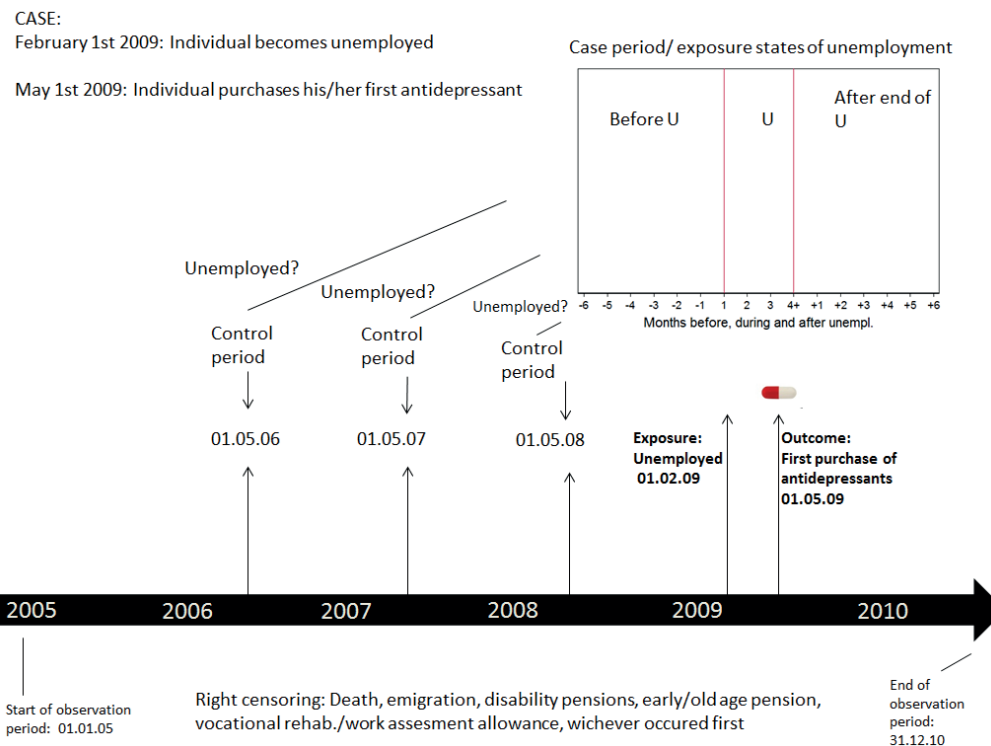
Figure 4.3   Case-crossover study design indicating the time of the event (drug purchase) and the exposure states of unemployment 1–6 months before the date of unemployment, the months during unemployment, and 1–6 months after end of unemployment

We used a conditional logistic regression estimator, also known as a fixed effects estimator or within-estimator, for comparison of the risk of being unemployed within each individual's case and control periods. This gave us a measure of estimated relative risk based on odds ratios with 95% confidence intervals and eliminated measured and unmeasured confounding that was fixed or slow-varying over time. In panel data, there are two types of variation in the data: within individuals over time, and between individuals over time. The fixed effects estimator uses only the first type of variation. The case-crossover design with self-matching of cases eliminates the possibility of selection bias among controls and increases efficiency.

Subgroup and supplementary analyses

To investigate whether associations differed between groups, we performed subgroup (stratified) analyses by sex, age, and educational level. The differences were tested using a generalised Hausman

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specification test.[166] Further, we explored the effect of having several unemployment spells during the observation period by comparing employees with only one episode of unemployment with those experiencing two or more episodes of unemployment during the observation period (2005–2010). As supplementary analyses, we also investigated purchases of drugs related to somatic conditions and pain based on the same working population and methods as the main analysis of psychotropic drugs. Overall, we expected lower estimates on the somatic and pain-related drugs. Since the literature on outcomes beyond mental health and to some extent cardiovascular disease is limited, we were very curious about the results of the supplementary analysis of incident purchases of medication for diabetes, thyroid disorders, cardiovascular disease, opioids and other analgesics, anti-inflammatory medication, and painkillers.

5 Results

In this chapter, I summarize the results presented in Papers I–III. The results are mainly described or referred to in tables and figures in the papers or by their supplementary file notations.

5.1 Paper I

In the Cox proportional hazard modelling of time-to-incident unemployment, the maximum follow-up time was 13.8 years with 312,279 person-years. Each HUNT2 participant was followed in the register for 8.6 years on average. The baseline characteristics of the study sample are given in Paper I (Table I).

The results of the Cox's regression analyses are presented in Paper I (Table 2). The total number of study participants was 36,249, with a maximum number of unemployment events equal to 3,065, but as we ran complete case analyses, the number varied depending on the exposure studied. In Model 1, adjusting for age, sex, education, and marital status, those with symptoms of both depression and anxiety (HR 1.87, 95% CI 1.62–2.16) had almost twice the risk of having an (incident) unemployment spell compared with those without those symptoms. When controlling for lifestyle variables (Model 2) and previous unemployment (Model 3), the associations were moderately attenuated. The risk of job loss increased with increasing numbers of chronic somatic conditions, and was highest amongst the 4% reporting three or more conditions (fully adjusted HR 1.78, 95% CI 1.462.17). An elevated risk of unemployment was also found for musculoskeletal pain, gastrointestinal symptoms, insomnia, poor self-rated health, and high and/or problematic alcohol consumption.

The results of sensitivity analysis of changing the outcome variable from > 90 days to > 180 days of unemployment are presented in the supplementary file following Paper I (S-Table 2). The results were generally quite similar to the original 90-days regression. Further adjustment for occupation did not change the estimates profoundly. Baseline characteristics describing the number of complete cases in each occupational category are presented in the supplementary file S-Table 3, whereas hazard ratio estimates with adjustment for occupation are presented as Model 2 in S-Table 4.

Effect measure modification

We found no strong evidence indicating that associations differed for men and women on most of the health measures investigated (p interaction 0.06–0.82). An exception was the variable indicating problematic use of alcohol, assessed using the CAGE questionnaire with a p interaction = 0.01, where

the associations were stronger in women (adjusted HR 1.84 (1.28-2.30) than men (adjusted HR 1.16 (1.01-1.33)). Also, a likelihood ratio test indicated effect measure modification by age (p interaction < 0.001–0.016). Age-stratified analysis showed that those > 50 years had a weaker association between health and unemployment compared with those < 50 years on almost all of the health measures (see S-Table 5 in the supplementary file following Paper I).

Supplementary analyses – studying competing risk between sick leave and unemployment
In the multinomial regression analyses comparing time to first sick leave period (≥ 8 weeks) with time to first period of unemployment (≥ 90 days), a total of 1,735 participants experienced unemployment as the first event after baseline, 14,684 participants had a sick leave period as the first event, and 14,883 participants had no unemployment or sick leave period during follow-up. The results of the multinomial logistic regressions are presented as relative risk ratios (RRRs) in the supplementary file following Paper I (S-Table 6a–6g). The relative risk ratio (RRR) for a one unit increase in HADS for those unemployed and/or on sick leave relative to those not unemployed or on sick leave, given that the other variables in the model are held constant. Compared with subjects with no symptoms, the relative risk of being in the unemployed (sick leave) group would be 1.95 (1.60) times more likely for those with symptoms of both depression and anxiety. Generally, the supplementary analysis gave close to similar results as the main analysis regarding unemployment. The risk of sick leave was typically higher than the risk of unemployment for all somatic conditions, while those reporting symptoms of both anxiety and depression had a higher risk of unemployment than sick leave in all three models.

The Cox analysis of unemployment duration (time-to-end of unemployment) showed that those with several ill-health conditions or symptoms had a higher risk of having longer unemployment spells compared with those with fewer or no symptoms. The estimates are presented in S-Table 8 in the supplementary file following Paper I.

5.2   Paper II

In the observation period 2004–2012, the Norwegian working population constituted 3,159,196 employees in 467,142 different companies (including self-employed persons). The study population comprised a maximum of 144,089 individuals (who met the eligibility criteria at some point in the observation period), employed in 7,813 private companies that underwent major downsizing (≥ 25%). Of these, 1,295 private companies and 24,946 employees were involved in downsizing ≥ 50% and eligible for analysis. Since the employees contributed to the analysis at different stages in the

observation period, depending on when they were included and eligible for analysis, the number of individual observations at year -5 (N = 81,823) and +5 (N = 44,889) were lower than in the years closer to downsizing (144,089 at year -1 and year 0).

Baseline characteristics for the whole population in 2004 and at the year of inclusion for those eligible for analysis and exposed to major downsizing are presented in Paper II (Table 1). As the analyses were done for the private sector only, the share of women was relatively low 35–37%. The mean number of days with registered unemployment per year among those exposed to downsizing was 15.6 three years before exposure, 14.1 days at the year of exposure, increasing to 21.3 and 22.5 days respectively one and two years after exposure.

Figure 5.1 shows the odds ratios of purchasing psychotropic drugs for each year in the period from five years before to five years after exposure to major downsizing. The odds ratio for purchasing antidepressant drugs increased from around 1 in the years before downsizing to an OR 1.12 (CI 1.06–1.20) at year -1, OR 1.27 (CI 1.19–1.36) in year 0, and OR 1.44 (CI 1.34–1.55) at year +1 after downsizing. The estimates remained at a higher level after downsizing than before downsizing. Similar trends were observed for the other psychotropic drugs studied; anxiolytic drugs showed approximately the same estimates as antidepressants. Somewhat higher effect estimates were observed for hypnotic and/or sedative drugs and higher relative changes for antipsychotic drugs. Exact point estimates are given in the supplementary file following Paper II (Table B).
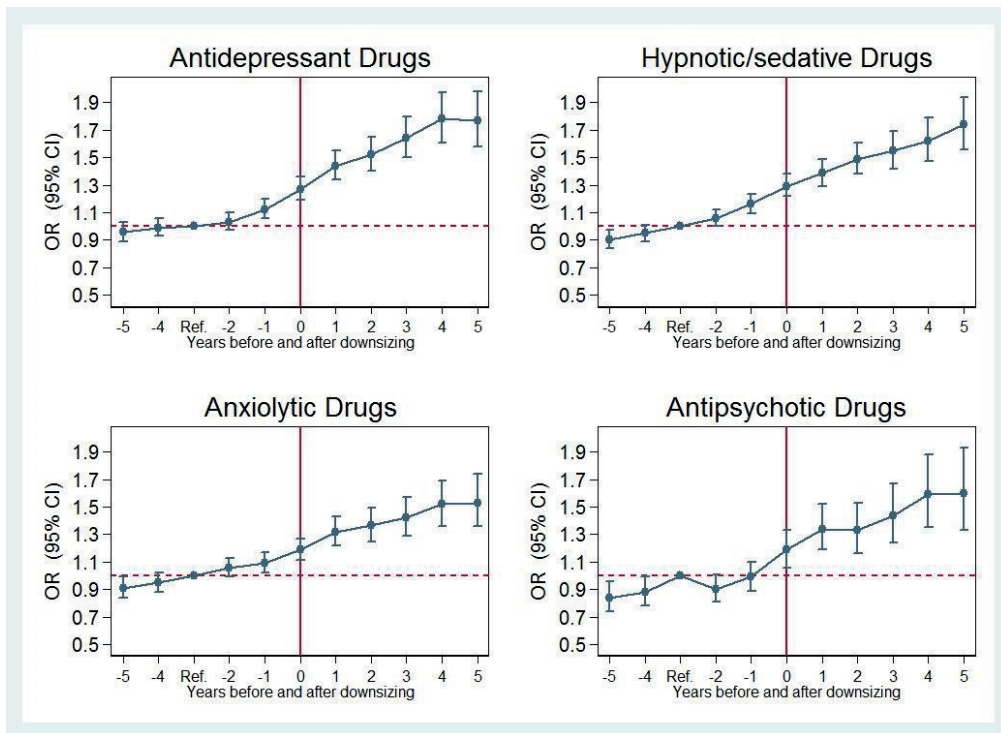
Figure 5.1   Odds ratio with 95% confidence intervals for purchased antidepressants, hypnotic and/or sedative drugs, anxiolytic drugs, and antipsychotic drugs in the years before and after exposure to major downsizing (year 0, red line), with year -3 as the reference year; the dashed line indicates OR =1; observation period: 1 January 2004 to 31 December 2012

The results from the analyses of prescribed drugs for somatic conditions and pain are presented in Figure 5.2. Antidiabetic drugs showed an OR of 1.34 (CI 1.13–1.59) at year -1 and OR 1.69 (CI 1.40–2.03) at year 0, and OR 2.11 (CI 1.72–2.60) at year +1. For thyroid drugs, the increase in odds ratios was similar to that seen in antidepressants in the years -1 to +3 in relation to downsizing. Cardiovascular drugs showed a steady increase throughout the observation period: OR 1.12 (CI 1.05–1.19) in year -1, OR 1.21 (CI 1.13–1.30) in year 0, and OR 1.31 (CI 1.20–1.42) in year +1. Obesity drugs, anti-inflammatory medication, opioids and other analgesics and/or antipyretics had ORs close to 1 throughout the observation period, with a small increase in odds ratios from year -1 and onwards for opioid drugs (OR 1.13 (CI 1.09–1.17) in year +1).

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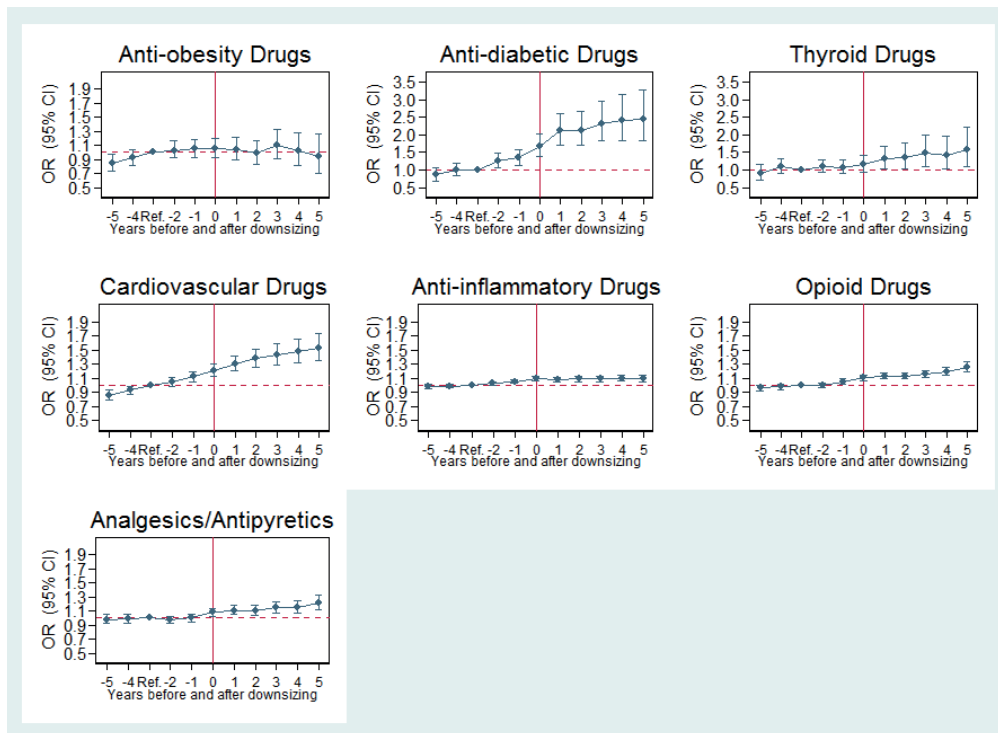
Figure 5.2   Odds ratio with 95% confidence intervals of purchasing drugs for somatic conditions and pain in the years before and after exposure to major downsizing (year 0, red line), with year -3 as the reference year; the dashed line indicates OR = 1 (note that antidiabetic drugs and thyroid drugs have a different scale); observation period: 1 2004 to 31 December 2012

Stratified and supplemental analyses

The odds ratios of purchasing psychotropic drugs showed the same trends in men and women, with somewhat elevated odds ratios in men. Regarding somatic drugs, men had higher odds ratios than women on antidiabetic drugs and cardiovascular drugs from the time of downsizing. Women had higher odds ratios than men for thyroid drugs: at year +1 the OR in women was 1.32 (CI 1.06–1.64) compared with OR 1.10 (CI 0.78–1.66) in men. The results for other somatic and pain medications showed only minor differences between the sexes. Stratifying the analyses by three age groups did not reveal profound differences, but the oldest age group had slightly higher estimates in antidepressants and anxiolytic drugs. Analyses stratified by educational level showed a tendency towards a gradient from compulsory (highest estimates) to tertiary education (lowest estimates) in

the odds of purchasing psychotropic drugs in the years after exposure (see Figure A-D in the supplementary file following Paper II). Confidence intervals were generally wider in the stratified analyses and therefore the observed differences in trends should be interpreted with caution.

Supplemental analyses in the period 2006–2012, taking previous health status into account (Figure E in the supplementary file following Paper II), indicated that compared with their situation three years before downsizing, those with no previous sickness absence or psychotropic drug purchases were more likely to have antidepressants by the time of downsizing compared with those with previous sickness absence or psychotropic drug purchase. Hypnotic and/or sedative drugs, anxiolytic drugs, and antipsychotic drugs gave somewhat weaker estimates in those without previous health problems.

Sensitivity analyses

Results from analyses of more extensive (heavy) downsizing processes (≥ 50%) are given in Figure F in the supplementary file following Paper II. Compared with the main analysis (≥ 25%), the heavy downsizing estimates were less heavy around the time of downsizing for antidepressants, hypnotics and/or sedatives and antipsychotics, while ORs in anxiolytic drugs were more or less the same in the two groups. We also performed sensitivity analyses on a subset of the working population that experienced 5-10% organisational downsizing. A 5-10% workforce reduction could be seen as within normal fluctuations (i.e. minor/no real downsizing). Figure G and H in the supplementary file following paper II shows that there were almost flat trend-lines on all drugs, strengthening the story in the main analysis. When we changed the reference time point from -3 to a collapse (mean) of time points -2, -3, and -4, the estimates did not change much (see Table B in the supplementary file following Paper II).

5.3   Paper III

In the case-crossover approach for Paper III, we started out with the Norwegian working population in 2004 (N = 2,348,552), then identified how many of these purchased the relevant drugs for the first time during the observation period (2005–2010), and finally identified how many of these drug-purchasers became unemployed one or more times during the observation period. Descriptive statistics at baseline (2004) for 1) everyone in the target population making first-time-purchases of the prescribed drugs studied, and 2) the study subsamples (i.e. those purchasing drugs and having an unemployment spell during the observation period) are given in Paper III (Table 1) and in the supplementary file following Paper III (S-Table 2). A list of drugs included in each group is presented in the supplementary file following Paper III (S-Table 1).

Of the 271,971 (12%) individuals in the working population who purchased antidepressants for the first time during the observation period, 34,111 (13%) had at least one unemployment spell during the observation period. Similarly, of the 331,625 (14%) incident purchasers of hypnotics and/or sedatives, 32,570 (10%) had one spell of unemployment. A total of 251,221 individuals (11%) bought anxiolytic drugs in the observation period and 26,838 (11%) of them experienced unemployment. Antipsychotic medication was less commonly used: 95,287 (4%) individuals purchased antipsychotics for the first time between 2005 and 2010, and 12,495 (13%) of them were unemployed at some point during the observation period.

There was an increasing trend in psychotropic drug purchase in all medication groups 1–3 months ahead of the first registered day of unemployment, with the peak one month before unemployment (more than twice the risk), and a decrease during the unemployment spell and particularly after the end of unemployment (Figure 5.3). Antidepressants had the highest estimated odds ratios (ORs) in the month before unemployment (OR 2.68, 95% confidence interval (CI) 2.39–3.01), followed by hypnotics and/or sedatives (OR 2.21, 95% CI 1.97–2.48), anxiolytics (OR 2.18, 95% CI 1.91–2.48) and antipsychotics (OR 2.09, 95% CI 1.76–2.48). There was a tendency towards an increased risk of first-time psychotropic drug purchase in longer unemployment spells.
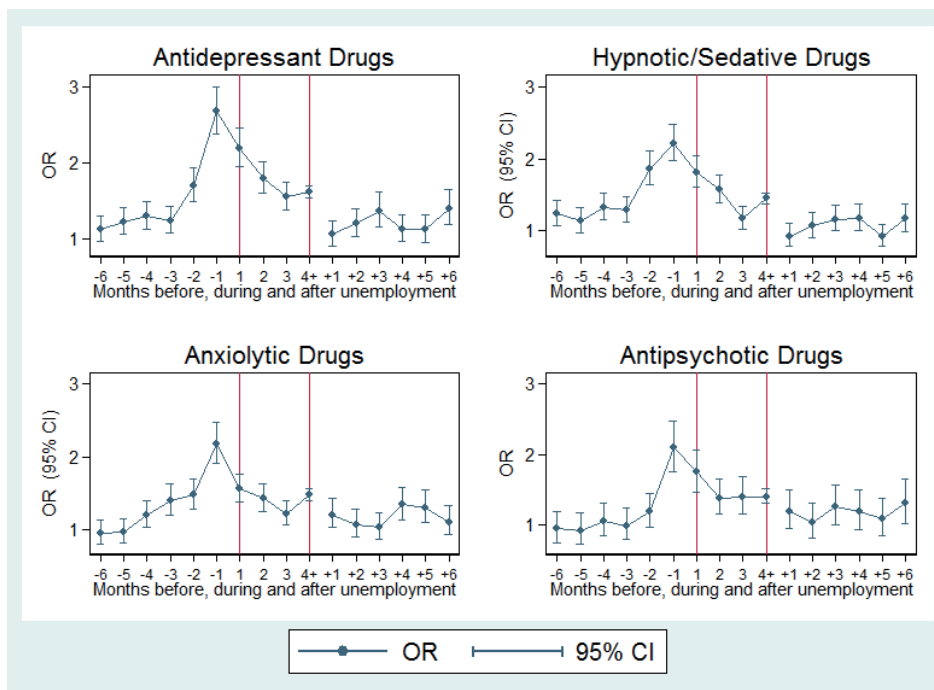
Figure 5.3   Odds ratios (OR) with 95% confidence intervals (CI) of a first purchase of psychotropic drugs while being unemployed (1–6 months before, during (between vertical lines), and after the end of unemployment); control periods = 12, 24, and 36 months before the date of drug purchase; the observation period was 1 January 2005 – 31 December 2010

Subgroup analyses

Analyses stratified by sex (Paper III, Figure 3) gave slightly higher risk estimates for men, especially in the months before and during unemployment. The results of the age-stratified analyses (S-Figure 2 in the supplementary file following Paper III) showed no large differences between age groups in the months before and during unemployment. The analyses stratified by educational level (S-Figure 3 in the supplementary file following Paper III) also gave similar results as the main analysis.

Supplementary analyses and robustness checks

Of the employees included in the case-crossover samples, about 25% experienced more than one spell of unemployment, regardless of which psychotropic drug was studied. We performed separate analyses of employees with only one unemployment spell and those with two or more spells during the observation period. The results showed that those experiencing only one unemployment spell

generally had higher odds ratios for purchasing psychotropic medication in the three months before and during unemployment compared with those experiencing two or more spells (S-Figure 4 in the supplementary file).

The supplementary analyses of drugs related to more somatic conditions and symptoms are presented in Figure 5.4. As expected, the associations between unemployment and first-time purchase of these drugs were fewer than between unemployment and psychotropic drug purchase. However, first-time purchases of several of these drugs showed similar patterns to those found for psychotropic drugs in the months before unemployment. We observed an increased risk of first-time purchases in the months before unemployment for antidiabetic drugs (association in the month before job loss (OR 1.44, 95% CI 1.10–1.89)), cardiovascular drugs (OR 1.48, 95% CI 1.32–1.66), drugs for thyroid disorders OR 1.22, 95% CI 0.88–1.69), opioids (OR 1.77, 95% CI 1.66–1.89), and other analgesics and/or antipyretic drugs (OR 1.46, 95% CI 1.34–1.60). The risk of purchasing anti-obesity and anti-inflammatory drugs were quite similar (OR ≈ 1) when the case and control periods were compared.
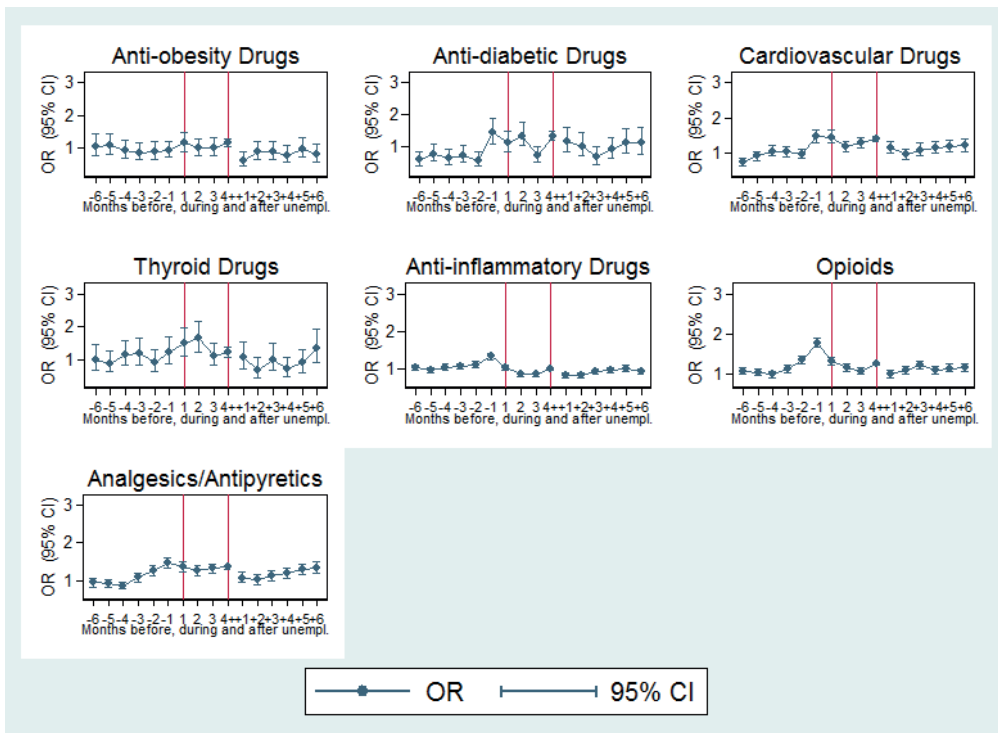
Figure 5.4   Odds ratios (OR) with 95% confidence intervals (CI) of a first purchase of anti-obesity drugs, antidiabetic drugs, cardiovascular drugs, thyroid drugs, anti-inflammatory drugs, opioids, and other analgesics and antipyretics while unemployed (1–6 months before unemployment, during unemployment (between vertical lines), and 1–6 months after the end of unemployment); control periods = 12, 24, and 36 months before the date of drug purchase; the observation period was 1 January 2005 – 31 December 2010

6 Discussion

6.1   Main findings

This thesis aims to address the association between health and future unemployment, whether organisational downsizing and unemployment affects health, and when health is most likely to be affected in the unemployment process. We found evidence of health selection into unemployment and negative associations with downsizing and unemployment on health. Although one should be careful using the term causation in observational studies, our overall vision was to reduce confounding to a minimum regarding the downsizing/unemployment and health relationship. We did this by designing studies on observational data that mimicked some of the features of randomised controlled trials within a counterfactual framework, as described in chapter 2.2.2. We used the time-line in a group's (paper II) or person's (paper III) life to detect whether associations between downsizing and/or unemployment and health changed by the time of exposure, compared to times in the same group's or person's life when they were less likely to be exposed.

In Paper I we report a strong association between a number of health dimensions and future unemployment, indicating that people with poor health are at higher risk of unemployment. Following more than 36,000 participants in HUNT2, those with high baseline (1995–1997) symptom levels of anxiety and depression or a number of chronic somatic conditions had almost twice the risk of becoming unemployed in the period 1995–2008 compared with their healthier peers. There was an increased risk of unemployment following musculoskeletal pain, gastrointestinal symptoms, insomnia, high alcohol consumption and/or problematic drinking, and poor self-rated health. An investigation of sick leave as a competing risk factor of unemployment showed that the relative risk ratio of becoming unemployed was generally higher than the risk of having a sick leave certificate for those suffering from symptoms of mental illness, while those reporting somatic conditions or pain had a higher relative risk ratio of sick leave than unemployment.

For Paper II, we set up a natural experiment based on register panel data for the entire Norwegian working population (2004–2012). The aim was to address a possible effect of job insecurity on health by using a study design that dealt with the confounding by health selection detected in Paper I. We assumed that employees exposed to a major organisational downsizing process were unlikely to be exposed as a result of their health status (health selection), but rather because of strategic decisions based on market forces, economic stagnation or poor firm management, leaving us with exogenous variation in the reason why people experienced downsizing. We included 144,089 private sector employees exposed to major downsizing during the observation period (2004–2012). By analysing annual changes in prescribed drug purchases, we found a substantial negative effect of job insecurity on health. The following drugs showed an increase in the

years close to the downsizing event: antidepressants, anxiolytics, hypnotic and/sedative drugs, antipsychotics, antidiabetic drugs, cardiovascular drugs, thyroid drugs, and to some extent opioids. Men and women responded similarly to major downsizing, with somewhat higher point estimates for men. Stratified analyses did not reveal profound differences across age and education groups, but there was a tendency for the elderly and those with lower educational attainment having higher increases in odds ratios for psychotropic drugs after downsizing.

One of the main strengths of Norwegian administrative data is the availability of exact dates of events (e.g. death, emigration, unemployment spells, pensions, sick leave spells, and drug purchases). However, calculations of organisational downsizing from the Register of Employers and Employees used for Paper II, only allowed us to study the effect of job insecurity on health on an annual basis. Some previous studies have found that the effects of unemployment on health seemed transitory and might level off in longitudinal studies.[12 21] Hence, for Paper III, we designed a study in which we could use the exact information on dates of unemployment and incident drug purchases, to study the possible short-term effects of unemployment on health. In order to reduce confounding, we turned to a study design mostly used in pharmaco-epidemiology; case-crossover analysis. We included employees experiencing both the outcome (incident drug purchase) and the exposure (unemployment spells) as cases, serving as their own controls over time. This design eliminates all time-invariant or slow varying confounding like sex, previous health problems and indirect health selection capturing potential vulnerability in individuals.

Accordingly, for Paper III, we analysed the initiation of psychotropic drugs in the months before, during, and after the exact dates of unemployment in the Norwegian working population from 2005 to 2010. From studying prevalent drug consumption (all users) for Paper II, we now concentrated on incident drug consumption (first-time users) for Paper III. The results showed a twofold to threefold increase in the risk of first-time purchases of psychotropic drugs during the month before the date of unemployment, with an increasing trend in the three months ahead of unemployment. The increases were greater for males than for females. The estimated risk decreased steadily during the first three months of unemployment, but stayed on a higher level compared with six months before unemployment. Six months after end of unemployment, the odds ratios were close to those of six months before job loss, indicating that re-employment prevents further deterioration of health. Analyses of a number of drugs prescribed for somatic and pain conditions showed some of the same trends as psychotropic drug purchase, but with substantially lower risk estimates.

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6.2   Strengths and limitations

Although the studies reported in Papers I–III were all population-based studies using longitudinal individual-level data, they had different designs and methodological approaches, which should be borne in mind when interpreting our findings. The intention behind the mix of designs was to address the health consequences of downsizing and unemployment at different levels and with different time horizons. As described in chapter 3 (Aims), while paper II followed a group of employees exposed to downsizing over *years* and looked at prevalent drug consumption before and after exposure, we wanted to go deeper into the short-term effects (*months*) of job loss and unemployment on incident drug consumption in paper III. However, the differences in the measures of drug consumption in Paper II and III (prevalent vs. incident) must be borne in mind when interpreting and comparing the figures in the two papers. With prevalent numbers on drugs for longstanding illnesses like for instance cardiovascular drugs, insulins or thyroid drugs, we would not expect the associations to be reduced over time.

An appealing feature that distinguishes administrative panel data from cross-sectional data is the possibility to follow the same individuals with repeated measures over a given observation period. This approach allowed us to control certain unobserved characteristics that were more or less constant over time, which would have been almost impossible in a cross-sectional dataset.[169] In the following, I discuss the most important methodological considerations in this thesis.

6.2.1   Precision and validity

Errors in estimation are traditionally classified as either random errors or systematic errors. An estimate with little random error is said to be *precise*, whereas an estimate that is not biased by systematic error is said to be *valid*. A random error will be reduced towards zero if the sample size goes to infinity.[94]

Due to the large sample sizes in the studies reported in all three papers - HUNT2 data covering the adult population of Nord-Trøndelag County (HUNT2) and register data on the entire Norwegian working population (2004–2012), our results were precise and not likely to have been due to chance alone. Following suggestions in the epidemiological literature (see for example chapter 10 in *Modern Epidemiology* by Rothman at al.),[94] we refrained from dividing findings into those that were statistically significant and those that were not, except when testing statistical interactions in our models. Accordingly, precision was measured with a 95% confidence interval (all studies reported in the respective papers), making it possible to interpret the size and precision of the estimates.

Validity is often separated into *internal validity* and *external validity*, where internal validity relates to the study population and external validity relates to the generalisability of results from the study population to people outside the study, target, or source population. In order to make causal

inferences, internal validity is a prerequisite of external validity.[94] Internal validity (i.e. lack of systematic error) is mainly influenced by three factors: confounding, selection bias, and information bias. These factors are discussed below.

Confounding

Confounding refers to the bias that arises when the exposure and the outcome share a common cause.[170] Possible ways of accounting for confounding include an adjustment variable in the regression equation, the study design per se (e.g. randomised controlled trials, natural experiments, and case-crossover analysis and/or fixed effects-analyses), matching of cases and controls, stratification, and restriction.[170] We accounted for potential confounding mainly by adjustment (Paper I) and by design (Papers II and III), while we explored effect measure modification by statistical tests and stratified analyses.

There is a substantial body of evidence to suggest that unemployment may cause health problems, and that health problems may increase the risk of becoming unemployed in the future – either directly or indirectly through vulnerability in individuals and precarious working conditions (see chapter 2.2 and 2.3). This relationship turns into a loop of causality between unemployment and health, called confounding by health selection or reverse causality (see chapter 2.2.1). In the simplified directed acyclic graph presented in chapter 2.2.3, socio-economic status is mentioned as a classic potential confounder of the unemployment and health relationship. Although it is almost impossible to obtain data on all factors contributing to a person's socio-economic position, some factors may be captured through data on educational level and occupation. For Paper 1, controlling for age, sex, marital status, and educational level attenuated the crude estimates, indicating that we had accounted for some residual confounding. Further, we made an additional adjustment for occupation, but this hardly changed the estimates. We interpreted this as a result of education capturing most of the potential confounding by occupation in a Norwegian context. For the same paper, we also ran models with adjustment for variables that could have status as both confounders and mediators: physical activity, body mass index, smoking, and alcohol consumption (i.e. variables that could cause unemployment (the outcome) but also be caused by unemployment).

The purpose of running the natural experiment for Paper II and the case-crossover analysis for Paper III was to use study designs that accounted for potential confounding by design. We assumed that the natural experiment accounted for confounding by health selection since the downsizing decision was not very likely to have been caused by the employees' poor health, but rather by strategic decisions and market forces. We adjusted these analyses for age, sex, education, and a set of dummies capturing potential time-trends (e.g. in drug consumption) during the observation period. Further, the random effect estimator accounted for repeated measures within

person, and the time-invariant characteristics of the exposed group were controlled for by analysing the differences within the exposed group over time.

We assumed that the health of employees was unlikely to be the cause of major organisational downsizing. However, the decision of a firm to downsize may be associated with an underlying stressful market situation and economic stagnation in certain sectors that *per se* may affect workers' health.[2][143] If this stressful situation leads to for instance high levels of sick leave among employees, it might lead to economic problems and an unhealthy work environment in the company, and eventually a need for organisational downsizing. In that case, a stressful market situation (like the financial crisis in 2008 which spread insecurity and negative expectations to the world economy) could confound the downsizing, unemployment and health relationship (see Figure 2.10 and Figure 2.11 in chapter 2.3.2 for a summary of the hypotheses and theories in the recession and health literature). When there was an increased risk of being exposed to downsizing by the end of the observation period, this means that many of the downsizers had a reference period (year -3) *before* the financial crisis. However, we tried to account for potential bias related to time-trends by adding a dummy variable for each year. Further, the Norwegian government reacted by expanding active labour market policies, making adjustments to the unemployment and social benefits system, and facilitating education for the unemployed, instead of austerity which has been found to reinforce health consequences of the recession.[1][2]

In the case-crossover design, we compared the distribution status of the exposure (unemployment) in three control periods before the incident drug purchase took place with the same individual's distribution status in the case period when the drug purchase happened. Using 12, 24, and 36 months before the event as control periods, implied controlling for period and/or time trends. We took advantage of a fixed effects estimator, using participants as their own control and thereby eliminating all time-invariant or slow-varying potential confounding factors (e.g. sex, education, and previous health). However, the design assumes that the risk of exposure (unemployment) and confounding within a person over time is constant, so that person-time in case periods (around the time of drug purchase) is exchangeable with the same individual's person-time during control periods.[94][171] In cases of economic shocks, like the financial crisis in 2008, it could imply that the exchangeability assumption was violated in our case-crossover design – at least if the consequences for health beyond the health effect of downsizing and unemployment happened immediately. However, we do not consider this to have affected our estimates considerably, given the relatively dampened effect of the crisis in Norway, the Norwegian welfare context and the government's response to the crisis (described in the introduction).

Selection bias

Selection bias[XL] typically arises when the relation between the exposure and the outcome is different between the participants and non-participants of those eligible for study participation.[94]

The study reported in Paper I was based on survey data from HUNT2, for which the participation rate was high (70% of the population aged 20 years or above in Nord-Trøndelag County participated). Krokstad et al.[155] describe all non-responder investigations done in relation to The HUNT Study. A 2.5% random sample of non-attendants (N = 685) in HUNT2 were analysed and the results showed that the prevalence of cardiovascular diseases, diabetes mellitus, and psychiatric disorders was higher among non-participants and a control group of patients in general practice, compared with the HUNT2 participants. By obtaining information on non-participants from register data, they also found that non-participants had lower socio-economic status and a higher mortality than participants did. Krogstad et al. conclude that possible selection bias should be taken into account when interpreting the results from the HUNT2 analyses.[155]

The analyses for Paper I were based on complete-case analysis with non-missing on the different exposures (health measures) studied. In general, there was little missing on exposures, except for the alcohol measures with 8% missing on the CAGE instrument and 4% missing on questions about drinking frequency. A total of 2% of the study population had missing on the Hospital Anxiety and Depression Scale. Demissie et al. argued that when missing was dependent only on the exposure (as reported in Paper I), there was a negligible bias (2–3%) that was similar to the difference between the estimate in the full data set with no missing data and the true parameter.[172]

For Paper II, we used complete registry information on the same individuals over time, and possible selection bias could be expected to have been reduced to a minimum. The case-crossover design for Paper III may have been prone to selection bias by factors that varied over time. In particular, selection bias may occur if the exposure (unemployment) in reference periods is not identically representative of exposure in the case period (drug purchase).[173] To reduce this potential selection bias, we chose control periods independent of exposure (12, 24, and 36 months ahead of the case period and/or drug purchase), so the exposure distribution in control periods was assumed to be representative of exposure distribution in the case period. Time trends in exposure and/or outcome may also induce selection bias, but this was accounted for in our case by the choice control periods (described above).[171]

[XL] See also chapter 2.2.1, in which the healthy worker effect is described

Information bias

Information bias is a type of systematic measurement error that may occur if the information retrieved on study participants is incorrect. For categorical variables, this is often called misclassification. The misclassification of study subjects may be differential or non-differential, where the latter refers to a situation when the misclassification of exposure is not related to the presence of the outcome. If the misclassification of exposure is different for those with and without the outcome it is called differential misclassification. Likewise, misclassification of the outcome is non-differential if it is unrelated to the exposure; otherwise, it is differential. The bias caused by differential misclassification can either overestimate or underestimate an effect or association, while non-differential misclassification of a binary variable will produce a bias towards the null (with more categories, the estimates can go either way).[94]

Of the studies reported in the papers included in this thesis, the one on which Paper I is based was probably most vulnerable to information bias. Exposures, covariates, and potential confounders and mediators were measured by self-reported survey data from HUNT2. Self-reported data is sensitive to misclassification.[94] The Hospital Anxiety and Depression Scale used in the study has been validated by Bjelland et al.[160], while Skogen et al.[163] validated the CAGE questionnaire (on problematic drinking) and excessive alcohol consumption in HUNT2, indicating high validity, particularly for women, and adequate psychometric properties of the CAGE instrument. However, a diagnostic interview with the subjects would have provided more reliable diagnostic information than the questionnaire data. Especially alcohol measures are known to suffer from underreporting.[174]

Our censoring variables (e.g. death, emigration, disability pension, old age pension, and work assessment allowance) and outcome variable (registered unemployment) for Paper I and all variables for Papers II–III were based on register data collected by the Norwegian Labour and Welfare Administration and Statistics Norway. We consider a purchase of prescribed drugs is a valid proxy for moderate to severe health problems, even though it does not cover all individuals with health problems in the working population. In order to be included in the Norwegian Prescription Database, an individual must first have symptoms that make him or her seek help. Further, a medical doctor (most often the person's GP) will evaluate the symptoms before a prescription is given, and the patient then has to visit a pharmacy to have the drugs dispensed. The Norwegian Directorate of Health does not recommend drug treatment for people with mild symptoms of, for example, depression; rather, the symptoms should be at least moderate.[XLI] Hence, we expected that those receiving psychotropic medication in our data set would have moderate to severe symptoms of

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[XLI] https://helsedirektoratet.no/retningslinjer/nasjonal-retningslinje-for-diagnostisering-og-behandling-av-voksne-med-depresjon-i-primer-og-spesialisthelsetjenesten#voksne-med-moderat-til-alvorlig-depresjon-

mental illness. The same rationale holds for prescribed painkillers, while symptoms of cardiovascular disease, thyroid disease, and diabetes are easier to measure with their 'objective' normal ranges that need to be exceeded to lead to a prescription of drugs.

We based the downsizing measures for Paper II on workforce reduction within companies with the same organization numbers between years. There was a risk of misclassification if companies changed their organisation numbers if, for example, they were absorbed into other companies. We tried to account for this by ignoring downsizing processes in which ≥ 30% of the employees continued to work together as a group in another company. However, in the case where a company decided to move one or more departments to other parts of the country (while keeping the same organisation number), we would not necessarily have captured the job insecurity experienced by the employees who were not able to move with their company but had to find a new job. New employees at the new location would mask the downsizing exposure, if the number of employees in the company was held constant (or increased) with newly-hired employees. In this case, exposed individuals would be treated as unexposed, which would make our effect estimates conservative.

In general, we expected the register data to provide valid information at the individual level. An important feature of Norwegian register data is that they cover the whole population, to my knowledge they have no systematic drop-out/missing (although errors and missing records may occur in registers), and the information collected share common, transparent, definitions that cannot be interpreted differently, which can be the case with survey questions. We expected the systems for collecting, cleaning, and processing the data at the Norwegian Labour and Welfare Administration, Statistics Norway and the Norwegian Prescription Database to be adequate, given the long time series and documentation reports available. However, errors and logical flaws sometimes occur. For instance, we requested data on the entire Norwegian working population in the period 2004–2012, namely all inhabitants in the age group 18–67 year, who were resident and employed in Norway at some point in that period. In total, 21 of those included in this population of more than 3.1 million people were registered as having died before 2004. A major part of the PhD project was about cleaning, linking, and facilitating all the different data sets received from Statistics Norway and the Norwegian Prescription Database, so that we could run the analyses we had planned. Even when dealing with register data, misclassification and information bias may occur, but hopefully more randomly than with survey data.

Generalisability – external validity

Some of the characteristics constituting the Norwegian context (presented in chapter 2) that may influence the generalisability of our results are the relatively low unemployment figures, the

generous social insurance- and unemployment benefits, the high degree of unionisation, the strong support of workers' rights (particularly the most vulnerable groups), and the comprehensive vocational rehabilitation system. Furthermore, the time-series in papers II and III include a period of economic stagnation in many western societies, namely the financial crisis and the following recession. All of these aspects may influence health, the risk of becoming unemployed, and the risk of having negative health consequences of unemployment. The public health effects of economic crisis are well described in several publications published in the wake of the Great Recession.[2 15 16 90 141 144 175 176] As mentioned in chapter 2.1.1, although the financial crisis had relatively mild consequences in Norway (mainly because we had (oil)money to spend on an expansive fiscal policy), there was an increased risk of becoming unemployed during the financial crisis between 2008 and 2010. A corresponding trend was observed in our downsizing-data in Paper II; more companies reduced their workforce in this period than earlier on. It is plausible that the overall stressful market situation and insecurity in relation to the economic recession might have affected health negatively beyond the consequences of exposure to downsizing, job loss and unemployment. However, an advantage with our study designs is that we study those actually exposed, not the entire population.

Previous research indicates that a generous welfare state may buffer the negative consequences of unemployment on health.[11 177 178] With references to human capital theory[70] and employment protection policies[28 71] we know that employment protection policies can help people overcome periods with potentially low investments in human capital, and provide better health and increased labour market attachment in the long run. Papers I–III all report population-based studies: one with a representative sample of the adult population in Nord-Trøndelag County[155 156] and two based on the entire Norwegian working population (2004–2012). We therefore expect our findings to be representative in a Scandinavian and Nordic setting. However, those who are healthy enough to be employable will initially have a lower risk of morbidity and mortality than the average general population, so comparisons with the general population can be problematic.[85] This is why we only included people initially in the labour force in all three papers.

A generous welfare state that buffers some of the negative effects on health from financial strain during unemployment could imply that our estimates were modest in an international context.[177] A comprehensive study of workers in the USA followed in death records from 1980 to 2006 showed that those who suffered larger losses of earnings from job displacement tended to suffer a greater risk of mortality. This result is in line with economic deprivation models,[77] where financial strain is presented as the main consequence of unemployment on health.[179] However, to date there has been little research on stigma and the loss of status related to unemployment in Norway. Previous research has found that mortality for the unemployed tend to be lower in regions with high unemployment, suggesting a higher degree of health selection effects when

unemployment rates are low.[53] It seems plausible that the theory of latent functions and nonfinancial benefits of work (see table 2.4) is highly relevant in Norway, where unemployment benefits are generous. However, debts from mortgages are among the highest in the world in Norway.[91] This could imply a strong standing for the economic deprivation model, as generous benefits in many cases will not prevent the individual to experience a considerable economic downturn compared to the living standard before unemployment. The study performed by Janlert and Hammarström[68] on Swedish data, where they analysed the usefulness of a range of theoretical models related to the health and unemployment relationship, showed that the model of latent functions was the most successful, followed by the economic deprivation model and social support model.[68]

It is plausible that stigma related to unemployment is reduced during recessions or in geographical areas with high unemployment and that the burden of becoming unemployed when everyone else has a job is heavier. In Paper II, we report our finding that the increases in odds ratios when being exposed to extensive downsizing processes (≥ 50%) were lower than the increases in odds ratios in the main analysis (25% workforce reduction). Similar results have been reported on Finnish data.[53] Findings from Ireland showed that anticipated stigma in relation to unemployment had a direct effect on psychological distress, which in turn predicted somatic symptoms.[180] However, in general, the prospects of re-employment are worse during economic downturns. We expected the study designs for Papers II–III to account for much of the potential health selection regarding the trend effects observed, but the effect size of these relative measures might have been susceptible to underlying differences in the composition of the employees studied.

6.2.2 Missing data

Information on missing data on each of the variables is given in Table 1 in each of Papers I–III papers. As discussed in the section on selection bias above, the analyses for Paper I were based on complete-case analyses with complete cases on exposure variables. Since the likelihood of being a complete case did not depend on the outcome variable (unemployment, which had no missing values), it is reasonable to suggest that the estimates were valid.[94] For Papers II and III, based on register data, we had non-missing on outcomes (drug purchases) and exposures (job insecurity and/or unemployment) and the covariates sex and age. Data on educational level contained some missing values, which were included as a separate category in the education variable, so that individuals with missing data still contributed in the analyses.

6.3   Interpretation of main findings

In the following, the main findings are interpreted in the light of existing literature and theories presented in chapter 2, and discussed thematically with respect to the aims of the thesis (see chapter 3).

6.3.1   Health selection

As presented in the literature review in chapter 2, health selection effects have been found to influence not only employment status, but also educational attainment, income levels, and the likelihood of receiving medical benefits, and they may be present from early adolescence.[58 181] Bartley argued that the relationship between health and unemployment is a continuously iterative process in which deterioration of health worsens by the stress and psychosocial and socio-economic disadvantages of unemployment. Thus, precariousness and marginalization in the labour market is accelerated by health-related selection, typically in combination with low reserves of human, economic and social capital.[5 80 182]

When we measured health in the HUNT 2 Study (1995-97) with a follow-up time for 14 years in administrative registers, we probably also measured some kind of latent vulnerability in many of the workers reporting to have chronic diseases and/or high symptom loads. This vulnerability is difficult to measure directly and control for in the analyses, but the combination of a direct measure of self-reported symptoms and disease and a prospective study design with a long time-series, probably helped us approach a measure of indirect health selection, as defined in chapter 2.2.1. The health problems and the vulnerability may be related to an increased risk of ending up in precarious employment, which increases the risk of being exposed to downsizing and unemployment – that may deteriorate their health further. This is also how I understand Bartley with her statement "selection 'is' causation" (Bartley 1988:51)[5]. The author argues that it is not necessarily the factor by which selection is performed, but the fact that selection *is* performed which explains the long-term health outcomes in people who experience downsizing and unemployment.[5]

The mechanisms operating between health, socio-economic position, precariousness and employment are complex, with pathways that are still open to debate. The theoretical framework presented in chapter 2.2 illustrates the complexity in this field, with a range of models that all contribute with explanatory components to the associations found between health and unemployment. My work on this thesis has led me to think that health may be undervalued as an explanatory variable for several labour market outcomes, not only those in which ill health is a prerequisite (e.g. sickness absence and disability pension). In the unemployment and health literature, the health selection hypothesis has been given little attention compared with the

causation hypothesis. Perhaps because direct health selection has been defined as less relevant and indirect health selection can be hard to assess. In their article "Glossary: unemployment, job insecurity, and health", Bartley & Ferrie[49] describes the theory of direct health selection: *"At one time this was a popular theory to explain the relation of unemployment to ill health and mortality. No longer believed because of work on the wearing off of selection".* (Bartley & Ferrie, 2001: 778)[49] But maybe the recent trends with increased job insecurity from flexible employment relations, combined with increased requirements for efficiency in the workplace (and hence, workers that invest in health according to the theories and models of Gary Becker and Michael Grossman presented in Table 2.4) might contribute to elements of direct health selection becoming more relevant again. Especially in times of economic recession and excess labour supply where only the fittest workers survive. Although we anticipated to find some health selection effects in Norway, in line with recent findings on Finnish data[113], the previously published literature was mixed and we were genuinely curious about what we would find.

Our results showing positive associations between a number of mental and somatic health measures and subsequent unemployment are concordant with systematic reviews and meta-analyses.[7 111] Health selection into unemployment has been found in, for example, Sweden,[32 106 116] Finland[105 112 114 183] Germany,[107] Netherlands,[8] Australia,[109 110] Canada,[7] New Zealand,[103] and Norway[20]. One of the most comprehensive reviews of unemployment and mental health concluded that although people with impaired mental health lost their jobs more often than their healthier peers, the effect size of health selection seemed to be small and probably of little practical relevance.[7] To the best of my knowledge, Paper I reports the most comprehensive study of health selection into unemployment done on Norwegian data to date. Even in fully adjusted models, also taking into account the 'scars' of previous unemployment, the effect sizes were fairly large (and precise) on several of the health exposures studied. Therefore, I assume health selection into unemployment to be of practical relevance in Norway, and consider confounding by health selection a potential issue when analysing unemployment effects on health with Norwegian data. Future research in the field of unemployment and health should look into the possibility of identifying the consequences of direct versus indirect health selection.

6.3.2   The association between downsizing, unemployment and health

The reviews of the literature published by Berkman et al.[18] and Bamberger et al.[12] concluded that there was insufficient evidence about the effect of organisational downsizing and job insecurity on health. Given certain arguable assumptions, and the two different study designs that both account for important confounding factors, our results support the causation hypothesis, especially in

relation to the period when companies downsize, before actual unemployment takes place. Paper II is the first to explore the effect of downsizing on such a broad range of commonly prescribed drugs. Similar effects of job insecurity on other health outcomes (e.g. self-reported health and hospitalisation) have been documented in systematic reviews and meta-analyses,[12] [129] [130] as well as recent studies from other Scandinavian countries like Denmark[131] [184] and Sweden.[34] [133] [125] A study from 2012 using Norwegian data found no effects of job insecurity on physical health measures, but those who lost their job in relation to downsizing had higher probability of experiencing symptoms of psychological distress.[21] Our results on downsizing and antidepressants confirm the findings from a recent Swedish study of antidepressant purchases.[125] The findings can be understood within the framework of stress models and coping referred to in chapter 2.2, where unemployment is seen as a psychosocial stimulus triggering stress mechanisms and acting as precursors for the development of disease.[72] [73] As Hintikka et al.[73] point out, dependent on the individuals coping strategies, unemployment might lead to chronic disease and depression through triggering for example chronic stress-related distress, withdrawal, motivational problems and loss of self-esteem.[73]

For most labour force participants, unemployment is potentially a temporary state replaced by re-employment after a few weeks or months. If the aim is to identify when health is most likely to be affected in an unemployment process, annual data (used for Paper II) are not necessarily the optimal level of analysis. One clear strength of the study reported in Paper III was the use of exact dates of unemployment and drug purchases combined in a case-crossover design, which eliminated time-invariant confounding by letting each study participant serve as his or her own control over time. The increasing trends in drug consumption one month ahead of unemployment coincided with the notice period for a majority of workers in Norway, and are probably a more precise indication of the job insecurity and expectations of job loss studied in relation to downsizing in Paper II. That health seems to be most affected around the time employees anticipate unemployment but are still working, was noted in an early review of the literature by Bartley.[80]

Study designs and the causation hypothesis
The panel data enabled us to set up the natural experiment with an 'intention-to-treat' (layoff) approach, studying average effects on all employees working in companies undergoing downsizing (Paper II). As mentioned above, the design was set up within a counterfactual framework and minimises reverse causality problems and confounding by factors being common causes of both job loss and prescriptions for drugs.[157] Displacement of several employees at the same time is more likely to happen because of external factors, rather than the individual employees' health status prior to displacement. This was the main mechanism reducing the likelihood of confounding by health

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selection biasing our results. Although we adjusted for time trends in Paper II, we cannot fully rule out intricate confounding related to macroeconomic or branch specific conditions that we did not fully capture in our analyses. That is, conditions that simultaneously affect people's health and the risk of becoming unemployed. In that case, our estimates regarding downsizing and unemployment could imply overestimation.

While we assumed that the employees were not exposed to the downsizing process at the reference time point three years before the downsizing actually happened, some companies may have reduced their workforce gradually over several years. This could have caused job insecurity already at our reference time point. In that case, our effect estimates might have been conservative, since initial increase in drug consumption could have started earlier than the reference year in some cases. We also found that estimates of psychotropic drug purchases in those experiencing heavier downsizing processes (50–100%) were weaker than for the downsizing cut-off of 25%. We did not anticipate this, as we considered it likely that those exposed to the greatest risk of potential job loss would have more adverse outcomes than those with less heavy processes. However, Martikanen et al.[53] found the same results on Finnish data when studying the association between unemployment and mortality; the association was weaker in companies going through major downsizing, compared to those going through minor downsizing. The authors concluded that in times of high unemployment and rapid downsizing, the modest health effects of unemployment might be due to uncontrolled confounding from health selection.[53] Other explanations could be reduced stigma of unemployment when unemployment figures are high and the majority of employees lose their jobs at the same time. It is also possible that more resources were being allocated to health prevention strategies in the heaviest downsizing and/or closure processes, although we have no references of previous research regarding such an explanation.

The case-crossover design used for Paper III compared the same individual with herself/himself over time, but it does not rule out the possible influence of time varying ill health as a possible cause of job loss (i.e. selection into unemployment). Still, given the detailed information on time, the results from the study reported in Paper II, and incident measures of both outcome and exposure, we interpreted the steadily increasing trend with a peak one month ahead of unemployment as stress related to the unemployment process affecting workers' mental health.

Outcome measures

The unemployment and health literature is dominated by studies of self-reported health outcomes and exposures. Hospitalisation is a frequently used outcome measure, while most studies of individual-level data on prescribed drugs have been done in the Nordic countries. Although

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physicians' prescriptions of drugs are based on clinical indications, purchase of prescription drugs is not fully equivalent to the health status of the individual: it is a mix of health-seeking behaviour and response from the physician.[17] Also, the drugs assessed in this thesis differed in their use characteristics: some may be prescribed for short-term use (such as sleeping pills and painkillers), while others may be prescribed for longer periods (e.g. antidepressants, antipsychotics, and anti-obesity drugs) or often for life-long use (e.g. thyroid therapy, insulins, and heart medication) and any inferences must be made with these aspects in mind. The rise in antidiabetic drugs and thyroid drugs might have been due to detection of new cases, since employees in a downsizing process visit their doctors more often, due to increases in their mental and somatic symptoms. An initial assessment of unspecific symptoms and fatigue in general practice will often include tests of blood sugar levels and thyroid function, thereby increasing the possibility to detect dysfunction, which would otherwise not be detected or would be detected at a later stage. These mechanisms were mentioned in an early review of the unemployment and health literature.[149]

No data on drug prescriptions before 2004 are available in Norway, hence the mentions of 'incident' or 'first-time purchases' in Paper III refer to the observation period, not to life-time purchases. Some of the employees defined as incident drug purchasers in our study probably had prescriptions before 2004. Nevertheless, their drug purchases can be considered incident in relation to the specific unemployment periods studied.

Prescription of psychotropic medication is only one of several potential treatments for mental illness. Those in our study population (Papers II and III) suffering from mental illness but who were not on medication and those receiving medications while hospitalised or receiving prescriptions that were never dispensed could not be identified in the data. Likewise, some people may have been unemployed (outcome in Paper I), but for various reasons did not register as unemployed and therefore did not become a study participant (Paper III). By July 2016, the difference between those registered as unemployed and those reporting they were unemployed in labour force survey interviews had never been bigger (3.1% registered as unemployed, 5% reported as unemployed).[XLII] One explanation is that several employees in the petroleum sector received generous severance packages when they lost their jobs and by July 2016 their need for unemployment benefits was still not present and they had few incentives for registering as unemployed. Another explanation may be that a high proportion of young people were unemployed but did not necessarily qualify for unemployment benefits.

[XLII] See article in Norwegian: http://e24.no/makro-og-politikk/arbeidsledighet/ledighetstallene-spriker-grafene-som-faar-ekspertene-til-aa-kloe-seg-i-hodet/23799967

Mechanisms: worsen, trigger, or component cause?

Are the observed changes in prescribed drug purchases around the time of downsizing and/or unemployment an indication of a causal effect of job insecurity and/or unemployment on health? Under certain strong assumptions and due to lack of other plausible explanations,[134] we believe that job insecurity (hereunder unemployment) worsens, triggers, or causes symptoms of mental illness and possibly cardiovascular disease and pain, and leads to the detection of somatic conditions such as diabetes and thyroid disease in the Norwegian working population. Further research is needed in order to be more specific about the mechanisms behind the effects observed.

Stress related to job insecurity could be expected to trigger, worsen, and/or lead to detection of somatic diseases,[72][73] but the literature on somatic health outcomes, especially concerning cardiovascular disease, is mixed and inconclusive. A systematic review and meta-analysis by Virtanen et al.[130] suggested that perceived job insecurity is at best a modest risk factor for coronary heart disease, with an association partly due to lower socio-economic position and worse health profiles among those exposed to job insecurity.[130] In Paper II, we report our finding that cardiovascular drug purchases increased steadily throughout the observation period, with no clear breakpoint by the time of downsizing. In Paper III, we report our finding of an increase in odds ratios for cardiovascular drugs 1–3 months before unemployment. The linear relationship reported in Paper II might reflect that the drugs were prescribed for long-term illnesses that required substantial rises in incident cases to reveal long-term annual average effects and breakpoints within employees exposed to downsizing.

The recent review by Ferrie et al.,[129] described in chapter 2.3, speculates that the association found between job insecurity and diabetes possibly relates to weight gain (a risk factor for diabetes) and coronary artery disease (a complication of diabetes), while detection issues, which I consider being of importance, are not discussed.

6.3.3 Subgroup findings by sex, age, and education

We did not find profound gender differences in the three studies. However, men seemed to be somewhat more affected than women from job insecurity and unemployment, especially regarding mental health outcomes. However, as our estimates were produced on a relative scale (odds ratios), there would have needed to be a weaker increase in drug purchases by those with initially low levels of drug purchase to have had a profound response in their odds ratios. Hence, the stratified analyses should be interpreted with caution. For instance, men had a higher increase in antidepressant purchases around the time of downsizing and unemployment, yet women traditionally have higher consumption of antidepressants than men.

Concordant with a French longitudinal study of job loss due to poor health, smoking, and obesity,[185] we found no profound gender differences in the health-related risk of future unemployment in HUNT2 participants (Paper I), with one exception: the results for problematic drinking of alcohol showed a more pronounced risk increase in women than in men. The latter result is consistent with the results from a follow-up study on Swedish data.[115]

Although overall trends were in the same directions, men showed a stronger response than women to downsizing and unemployment, especially concerning psychotropic drugs, antidiabetic drugs, and cardiovascular drugs. These findings are in keeping with international studies of suicides during the Great Recession[176] and studies from Eastern Europe and Spain[11], while two recent Swedish studies found no gender differences in the effect of unemployment on mental health.[186][187] The systematic review by Norström et al.[11] concludes that the effects of unemployment on health differ between studies, with no clear pattern as to who benefitted or suffered more among the different groups studied. However, among the studies with sex-stratified analyses, it was more common to find a more negative health effect of unemployment on health for men.[11] One example is the study of downsizing and purchases of antidepressants, anxiolytics, and hypnotics in Finland in the period 1994–2000 (N = 26,653), conducted by Kivimäki et al.[147] The highest rate of psychotropic prescriptions was found in men who had lost their job. Further, Kivimäki et al. found that employees, especially men, who had kept their job after downsizing had an increased risk of being prescribed drugs (particularly hypnotics for men) than a comparable group of employees that had not been exposed to downsizing. For women, exposure to organisational downsizing gave a slightly increased risk of being prescribed psychotropic drugs (particularly anxiolytics).[147] In paper II, men had higher estimates than women on all psychotropic drugs studied around the time of downsizing. However, men had lower initial psychotropic drug consumption levels, and the results reported in Paper II might have been different if we had included employees in the public sector, in which the proportion of women is much higher. I suspect that some of the generally higher estimates in men could be explained within the theoretical framework of nonfinancial benefits of work (latent functions, see table 2.4). Although Norwegians have come far when it comes to gender equality (see references in chapter 2.1.1), the masculine identity of Norwegian men is still, to a certain extent, linked to having a job. However, the differences between men and women were not very profound, probably helped by the strong labour market attachment in Norwegian women (described in chapter 2.1, and further discussed below).

Reeves & Stuckler[35] refer to Durkheim, who argued that the well-known association between economic recession and suicidality is a status effect, rather than stemming from financial strain and material deprivation. After finding that gender equality seemed to protect against suicidality (the relationship between increasing unemployment and suicide in men disappeared altogether with high

levels of gender equality in the country), they suggested that the finding supports Durkheim's explanation of status linking unemployment to suicide, not material mechanism. Further, Reeves & Stuckler mention high labour market participation among women (resulting in greater economic equality) and a reduction in the prevalence of the male breadwinner culture as possible explanations for the unemployment and suicide link.[35] In light of the Norwegian context described in chapter 2 of this thesis, Reeves & Stuckler's[35] findings and discussion might help to explain why we did not find very strong gender differences in our studies of the Norwegian working population.

In the age-stratified analyses, we found that older workers with health problems had a lower risk of future unemployment compared with their younger peers. This may partially be explained by the healthy worker effect, described in chapter 2.2.1, whereby the healthiest employees or those who cope well with their problems survive in the labour market. Further, the employment legislation in Norway protects the elderly and vulnerable people from being laid off, and seniority principles are often followed in organisational downsizing processes. This could also be related to the fact that older people have skills and experience that are highly valued by their employers. Stratified analyses of psychotropic drugs by age groups and educational level did not reveal any profound differences, but for the years after downsizing, there was a tendency for older employees and employees with compulsory education to have higher estimates than the young employees and those with higher education, which is in line with Vågerö & Garcy's findings.[116] In the review by Norström et al.,[11] articles that present the results of stratified analyses of different age and educational groups are reported as being in the minority, and the results were mixed and depended on the reason for unemployment, country, and period of measurements, and therefore no clear conclusions could be drawn.[11] There were no substantial differences between different age groups in the months before or during unemployment in our paper III, but the oldest employees (age group 50–67 years) had an elevated risk of starting to take psychotropic medications, also in the months after ending an unemployment spell. Similar analyses stratified by educational level showed no profound differences in the different groups.

6.3.4   Selection and causation – despite or because of the Norwegian context?

According to the empirical findings and human capital theory[70] presented in chapter 2, one could expect the Norwegian context to buffer health-related problems before they lead to unemployment and to buffer the negative effects of unemployment on health (also, see the discussion of generalisability above). However, we found evidence of both health selection into unemployment and job loss having a causal negative effect on health In particular, job insecurity from the treat of

downsizing and job loss was found to increase the likelihood of employees receiving (Paper II) and/or starting up with (Paper III) drug treatment for a range of mental and somatic health problems.

Vulnerable individuals who lose their job may experience a worsening of their health problems (and hence their re-employability) due to financial strain and distress during unemployment. Clearly, this has individual costs, but it also has societal costs in terms of a weakening of the workforce, increased social spending, and lower incomes from taxes that could otherwise have been invested in public goods. People with illnesses might be selected into precarious jobs or they might lose their jobs more often because they are regarded less valuable to employers (experiencing the reinforced negative effects on their health from unemployment over time). The main analysis of health selection effects and the supplementary analyses of sick leave as a competing risk factor of unemployment (Paper I) showed that particularly those with symptoms of anxiety and depression were vulnerable to selection into unemployment. When I first gave this PhD-project a working title including the term "selection or causation", I was not aware of the Bartley-paper from the late 1980's called "Unemployment and health: selection or causation – a false antithesis?".[5] In this paper, she argues that "selection 'is' causation" and that:

> *"(…) an alternative way of explaining these findings is to consider the spell of unemployment in which a respondent or sample member is found as part of a work history, and that it is the characteristics of this history over the long term which may reveal more about the relationship between unemployment and health"*

Bartley (1988:52)[5]

As I have mentioned in my discussion of generalisability (chapter 6.2.1), the Norwegian labour market context contains both pull and push factors, including a high proportion of vulnerable individuals in the labour force. The mechanisms behind the adverse health effects found in this thesis are not clear and should be investigated further. The quote referred above is just as relevant today as it was 30 years ago. Although several longitudinal studies of this relationship (see chapter 2.3.1) have been conducted in recent years, there are still more pieces to add to this puzzle. I discuss some of them below.

6.4 Implications and future research

In times of economic hardship, a fiscal policy that responds with austerity has been found to increase mortality and lead to deterioration of public health. Government spending in health, job creation and social protection will improve health equity and social stability, and boost economic growth.[2 16] The

research project on which this thesis is based serves as a reminder that job insecurity and unemployment may lead to deterioration of health, even in a context in which welfare benefits are amongst the most generous in the world and in which labour unions and legislation relating to employment is very strong. A study of the impacts of job loss and job recovery on self-rated health 27 European countries concluded that perceived financial strain mediated about one third of the relationships between job loss and poor health, and suggested that unemployment benefits are insufficient in alleviating financial strain, and that not just material, but perceived strain may be most relevant.[90]

With regard to the health selection found in Paper I, it is important to understand labour market processes and to see unemployment and precariousness as factors that may produce and maintain social-class inequalities in health. As mentioned above, Bartley's arguments in the 1980's about unemployment being an indicator of general patterns of labour force participation which puts the vulnerable unemployed at risk of cumulating disadvantages over time, is just as relevant today. To fight unemployment is therefore per se an important preventative public health initiative, but we need to come up with interventions and policies that at the same time fight social inequalities. The increased risk of ill health in the months before unemployment might imply potentially high returns of investments in preventive health care interventions during that period. One implication of the findings presented in this thesis could be a strengthening of preventive health initiatives early in the unemployment process. Cooperation between employees, employers, occupational health services, organisers of public reemployment programmes, and general practitioners around the time of notification would probably prevent deterioration of health, both for those surviving in the company and those who become unemployed. Web-based low threshold self-help programmes distributed to those exposed to unemployment or at risk of downsizing may be one alternative. Primary healthcare services in the communities, in addition to the GPs, could also be thought to have a more active role when it comes to the unemployed and precarious workers. Results from an ongoing project in several Norwegian communities have found that low-threshold services providing courses in coping strategies and cognitive behavioural therapy for the inhabitants in several Norwegian communities show promising results – both in terms of recovery and return-to-work.[188]

Of those in the Norwegian working population in 2004 who later registered with one or more spells of unemployment during the observation period (2005–2010), almost 100,000 individuals started to take antidepressants, hypnotics and/or sedative drugs, anxiolytics, or antipsychotics in the same period. Many of these persons started up with medication in relation to an unemployment spell, resulting in a twofold to threefold increase in their likelihood of starting to take, for instance, antidepressants around the time of unemployment compared with other periods in their life. These were initially workers with no psychotropic prescriptions in 2004. We had no data on other possible

treatments (e.g. cognitive therapy, sleep treatment, self-help groups, or programmes for life-style changes, physical activity, and training) initiated around the time of downsizing or unemployment, but it could be questioned whether the number of working-age people receiving psychotropic drug treatment in relation to unemployment could and should be reduced. Norwegian employees seem to visit their GP when their labour market attachment is threatened, making the GP a key figure for preventive strategies, together with employers who convey the message about organisational downsizing and/or unemployment processes, the occupational health services, and those who organise public re-employment programmes.

Health interventions for the unemployed have seldom been studied. This is probably partly due to the fact that benefit schemes for health and unemployment are seen as entirely separate features. Audhoe et al., the authors of a systematic review published in 2010, concluded that the evidence supporting the use of vocational interventions to improve reemployment and reduce mental distress was weak.[189] However, evidence from the USA[72] and Finland[190] indicated that psychological interventions targeting the unemployed effectively improved mental health and were positively associated with reemployment. In light of our findings presented in Paper III, interventions should probably start before people become unemployed, and no later than around the time when employees are notified about their impending redundancy. Moreover, since the risk of starting medication remained higher during unemployment, preventive health initiatives should also be targeted at the group of unemployed. Occupational health services (bedriftshelsetjenesten) and the Working Environment Act (arbeidsmiljøloven) could provide clearer recommendations to companies on how to conduct organisational downsizing processes in ways that safeguard employees' health. A recent study from Norway found beneficial effects on the psychosocial work environment and employees' health from implementation of a method for managing psychosocial risks during change in the oil and gas sector.[191]

As mentioned above, more use could be made of web-based guided self-help interventions for employees exposed to organisational downsizing and/or unemployment, given that research is starting to show the positive results of such interventions in relation to, for example, depression.[155] However, more research is needed to find suitable methods for evaluating the effect of such interventions.[192] Finally, system-level labour market initiatives that prevent health selection, especially amongst the young, stimulate employment, promote an inclusive working life, and reduce unemployment would lead to better public health and probably constitute the most cost-effective prevention strategy for health deterioration from unemployment and job insecurity.

6.4.1   Future research

In addition to the interventions discussed above, future research should focus on the unemployment and health relationship in differing business cycles and different welfare regimes to identify the specific conditions under which unemployment and downsizing may cause people's health to deteriorate. There is substantial evidence of health selection and negative effects of unemployment and job insecurity on health, particularly mental health and suicide. New approaches to capture the effects of precariousness and indirect health selection should be explored. Furthermore, researchers in this field should be aware of their responsibility to communicate this knowledge to the public (including both employers and employees), to the health services (GPs), to occupational health services, and to policymakers. When I have presented my work to researchers, policy makers, and health personnel in Norway, many are surprised to see that we are able to study health response on a monthly, or even weekly, basis (like in paper II), providing potentially valuable information with regard to timing of preventive strategies.

A recent systematic review of health outcomes in relation to the 2008 financial crisis concluded that the majority of studies in this field suffer from biased estimates.[128] The use of natural experiments and instrumental variable approaches on existing observational data is an efficient way of dealing with confounding by health selection. A prerequisite for such studies is the availability of individual-level panel data. Today, access to high-quality administrative data is relatively good in the Scandinavian countries compared with the rest of the world. However, there are new regulations on the protection of individuals with regard to the processing of personal data and on the free movement of such data that may imply future restrictions on the use of register data in research (Regulation (EU) 2016/679 and Directive (EU) 2016/680[XLIII]). In particular, people now have a right to ask for deletion of records of personal information to a greater extent than before (referred to as 'the right to be forgotten'). The regulation ((EU) 2016/679 and Directive (EU) 2016/680) will come into force in Norway in 2018,[XLIV] but it is still unclear as to what implications this will have for future research.

Given the substantial contribution of analyses on Scandinavian data, it is tempting to suggest there should be developed comparative intervention studies of the job insecurity, downsizing, unemployment and health relationship in the Scandinavian countries. Preferably, they should include data on personal financial debt, so that financial strain in relation to unemployment could be controlled for and economic deprivation models could be explored.[77] The results of a recent

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[XLIII] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L:2016:119:FULL
[XLIV] Article in Norwegian regarding Regulation (EU) 2016/679: https://www.datatilsynet.no/Regelverk/EUs-personvernforordning/hva-betyr/alle-ma-kunne-oppfylle-borgernes-nye-rettigheter/?showContentList=true&showDetailedContentList=false&readMode=false

laboratory experiment involving undergraduates in the USA (N = 84) suggest that companies going through organisational downsizing should focus on dealing with the emotional aftermath of downsizing first, instead of the traditional outplacement activities such as writing CVs and developing skills in how to search for a new job. Similar evidence has been found in Norway.[191] [193] Furthermore, future research should dig deeper into the mechanisms that trigger, worsen, or causes ill health in relation to job insecurity and unemployment, so that targeted preventive initiatives can be implemented.

7   Conclusions

The title of this thesis is formulated as a question: *Health and Unemployment in Norway – Selection or Causation?* The findings presented in the thesis suggest that the answer is *both*.

We found evidence of health selection into unemployment in Norway, indicating that vulnerable employees, especially those with mental health problems and chronic somatic conditions, have a higher risk of being laid off in one of the most inclusive labour markets in the world. Further, employees who experienced organisational downsizing were more likely to purchase psychotropic drugs, and several medications for somatic conditions and pain, in the first years after the downsizing event, compared to their situation prior to exposure. We also found an increased likelihood of initiating treatment with psychotropics, thyroid drugs, cardiovascular drugs, and painkillers in the months prior to, and during, unemployment. Six months after end of unemployment, the estimates were close to those of six months before job loss, indicating that re-employment might prevent further deterioration of health.

The results from this thesis are based on large study sizes, high quality data and triangulation of study designs - of which two were designed to minimise confounding by health selection and eliminating time-invariant confounding. Overall, these results suggest a negative effect of downsizing and unemployment on health in the Norwegian working population. Via the increased likelihood of purchasing prescription drugs around the time of job loss and unemployment, we indirectly observed symptom loads at levels that made employees visit a medical doctor. Given that not everyone exposed to downsizing or unemployment that visit their GP end up with a drug prescription, the magnitude of self-perceived health problems under these circumstances is probably considerable. Based on the previous literature we hypothesised that downsizing and unemployment would have a negative effect on mental health outcomes. Hypotheses regarding the different somatic symptoms and conditions studied were more explorative, as the previous literature was, and is, scarce. All three papers showed strong associations between job loss and/or unemployment and common mental health problems like anxiety and depression. Additionally, the associations with several somatic conditions and pain were surprisingly strong, and future research should investigate these associations further.

While health selection to unemployment in Norway seems to be similar in men and women, male employees seem to show a stronger response than female employees to downsizing and unemployment, but the differences were not profound. This is in line with other studies from the Nordic countries, and is likely to be related to the Norwegian labour market context with high labour market participation among women. Age-stratified analyses of health selection showed lower risk of future unemployment amongst the oldest age-groups. This may be explained by the healthy worker

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effect, seniority principles being followed and/or the employment legislation in Norway protecting elderly and vulnerable employees from being laid off. Stratified analyses of prescribed drugs by age groups and educational level did not suggest any profound differences between the groups.

Future research should aim to reveal the mechanisms that trigger, worsen, or cause ill health in relation to precarious working conditions, organisational downsizing and unemployment. More knowledge on these mechanisms may prevent the negative loop between unemployment and health that seems to exist in labour markets worldwide. Future research should also investigate how best to prevent deterioration of health in relation to organisational downsizing and unemployment – periods in peoples' lives when it is crucial to be fit for re-employment. Policies, programs and interventions in this field should always have an ambition to fight social inequalities – in general, and in health. As a concluding remark, the results from the present thesis underscores the need of preventive initiatives implemented to mitigate the deterioration of health observed in employees experiencing organisational downsizing and unemployment. In addition to welfare benefits that alleviate some of the financial strain in relation to job loss and unemployment, such initiatives could be a stronger involvement from primary healthcare services, enhanced and more systematic cooperation between occupational health services, employers, employees, organisers of public re-employment programmes, and general practitioners, and cost-effective web-based self-help programmes that efficiently reaches those at risk.

8 References

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Paper I

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Health and unemployment: 14 years of follow-up on job loss in the Norwegian HUNT Study

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Background: Many studies have investigated how unemployment influences health, less attention has been paid to the reverse causal direction; how health may influence the risk of becoming unemployed. We prospectively investigated a wide range of health measures and subsequent risk of unemployment during 14 years of follow-up. **Methods:** Self-reported health data from 36 249 participants in the Norwegian HUNT2 Study (1995–1997) was linked by a personal identification number to the National Insurance Database (1992–2008). Exact dates of unemployment were available. Cox's proportional hazard models were used to estimate hazard ratios (HR) for the association of unemployment with several health measures. Adjustment variables were age, gender, education, marital status, occupation, lifestyle and previous unemployment. **Results:** Compared to reporting no conditions/symptoms, having ≥3 chronic somatic conditions (HR 1.78, 95% CI 1.46–2.17) or high symptom levels of anxiety and depression (HR 1.57, 95% CI 1.35–1.83) increased the risk of subsequent unemployment substantially. Poor self-rated health (HR 1.36, 95% CI 1.24–1.51), insomnia (HR 1.19, 95% CI 1.09–1.32), gastrointestinal symptoms (HR 1.17, 95% CI 1.08–1.26), high alcohol consumption (HR 1.17, 95% CI 0.95–1.44) and problematic use of alcohol measured by the CAGE questionnaire (HR 1.32, 95% CI 1.17–1.48) were also associated with increased risk of unemployment. **Conclusion:** People with poor mental and physical health are at increased risk of job loss. This contributes to poor health amongst the unemployed and highlights the need for policy focus on the health and welfare of out of work individuals, including support preparing them for re-employment.

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Introduction

Following the Great Recession, concerns have been raised regarding possible health effects of millions of people losing their jobs. There is a growing body of evidence suggesting adverse effects on health of the crisis, especially concerning higher rates of suicide and mental illness.[1–6] Furthermore, evidence from different countries has indicated an association between unemployment and several health outcomes, including cardiovascular mortality, cancer mortality, poorer general health, somatic complaints, altered alcohol consumption and increased use of health services and prescription drugs.[7–12] However, the causal direction between unemployment and health is not straight forward.

While health effects of unemployment (causation hypothesis) have been extensively studied[13,14] less attention has been paid to whether poor health increases the risk of job loss (health selection hypothesis). If people with impaired health are more likely to lose their jobs, i.e. 'selected' into unemployment, this is an important public health issue *per se* and should be considered in preventive health care and the design of vocational rehabilitation programs. Further, health selection may confound the association between unemployment and health.

Although some studies have found a selection of workers with ill health into unemployment,[15–18] a recent meta-analysis found the selection effects to be weak.[19] However, the existing literature on the influence of poor health on the risk of unemployment has mostly been limited to studies on poor mental health[8,14,18] and overall self-rated health measures,[16,20] whereas somatic conditions and lifestyle have received little attention. High alcohol consumption as a predictor of unemployment has been studied with mixed results.[21] Many previous studies in this field have used survey data

only[18] or had short periods of follow-up.[22] The aim of our study was to prospectively investigate the associations between health and lifestyle and subsequent risk of unemployment in a Norwegian labour market context.

Methods

The HUNT Study

All residents of Nord-Trøndelag County in Norway aged ≥20 were invited to participate in the second wave of the HUNT Study (1995–1997, http://www.ntnu.edu/hunt/databank). The study procedures and a non-participation study are described elsewhere.[23,24] Participants were asked to fill in questionnaires and undergo a physical examination. Of the 94 194 invited, 65 600 (70%) participated. In the present study, 36 249 were included in the analysis (figure 1). Inclusion criteria were age 20–66, not pensioned before baseline or within the first year after baseline, having filled in the HUNT2 questionnaire and non-missing on exposures.

The Norwegian Insurance Database (FD-trygd)

Statistics Norway's National Insurance Database covers the entire Norwegian population since 1992 and provided entry/exit dates on all working life events for each HUNT2-participant: unemployment (registered and benefits), sick leave benefits, supplementary benefits, pensions, emigration and death.

Outcome ascertainment

The dependent variable *time to unemployment* was defined as time to first date of an unemployment period lasting for more than 90 days.
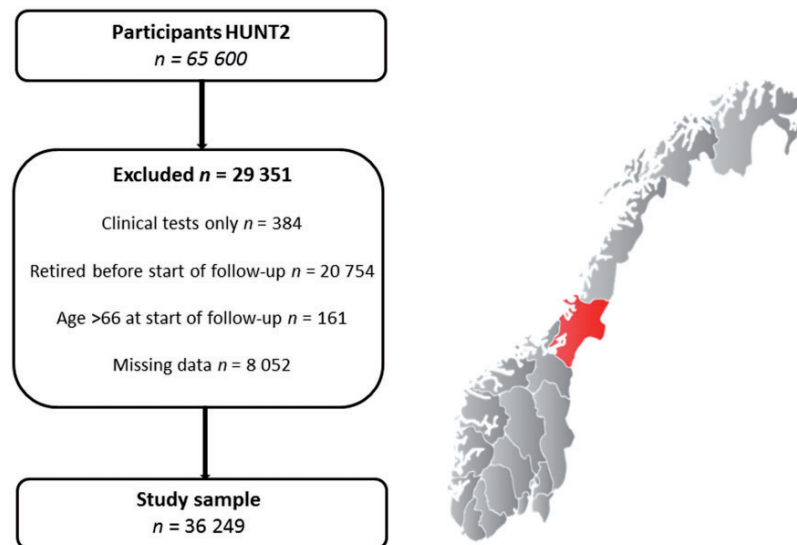
Figure 1 Participants in the second wave of the Nord-Trøndelag Health Study (HUNT2 1995–1997), study sample and map—Norway, Nord-Trøndelag County. Map source: Wikimedia commons

We defined unemployed as being registered as 100% unemployed (actively job seeking, not necessarily on benefits) or fulltime participating in job creation programs. Duration of more than 90 days was chosen to avoid seasonal unemployment and students being short-term unemployed in summer holidays or after finishing studies. The median length of an unemployment episode was 99 days. We also created (i) an alternative outcome variable defined by time to unemployment lasting for >180 days, in order to capture health selection to long-term unemployment and (ii) an outcome variable measuring any unemployment, regardless of duration.

Health status at baseline

A detailed presentation of the health measures is given in appendix (Supplementary Ttable 1). Symptoms of common mental disorders were measured using the 14-item Hospital Anxiety and Depression Scale (HADS, four-point Likert scale scored 0–3).[25] Seven items measured symptoms of depression and anxiety, respectively. Clinical caseness cut-off score was set to ≥8/21, concordant with validation studies reporting sensitivity and specificity for both anxiety and depression to be between 0.80 and 0.90.[25] Anxiety and depression symptoms were then combined into: No problems, anxiety only, depression only and comorbid anxiety and depression.

Chronic somatic conditions were measured as a categorical variable (0, 1, 2 and ≥3) reflecting the number of conditions reported. Participants were asked about presence of: (i) asthma; (ii) cardiovascular diseases (stroke, myocardial infarction or angina pectoris); (iii) diabetes; (iv) thyroid diseases; (v) rheumatic conditions (rheumatoid arthritis, osteoarthritis or ankylosing spondylitis); (vi) osteoporosis; (vii) epilepsy; (viii) cancer; (ix) other longstanding diseases; (x) traumas (hip fractures or other trauma necessitating hospital admission and (xii) physical handicap (vision, hearing, motor handicapped).

Somatic symptoms were measured as self-reported musculoskeletal pains (categorical, 0, 1, 2 and ≥3 depending on the number of affected joints), gastrointestinal complaints (dyspepsia, nausea, constipation or diarrhoea) and insomnia ('How often do you suffer

from insomnia?' (about once a week or more than once a week), difficulty falling asleep or waking early (often or almost every night), insomnia to such a degree that it affected work (yes/no)).

The question 'How is your health at the moment?' (poor/not so good vs. good/very good) measured self-rated health.

Alcohol consumption was considered as likely to affect work ability and risk of unemployment and was included both as exposure and adjustment variable (in contrast to the other lifestyle measures). Questions of drinking frequency per month and whether teetotaller or not were combined into a categorical variable (teetotaller, 0 times (but not teetotaller), 1–4, 5–8, >8). The CAGE questionnaire was used to measure problematic alcohol use, with caseness cut-off ≥2, concordant with validation studies.[26]

Adjustment variables

Age was categorized at 20–29; 30–39; 40–49; 50–59 and 60–66. Marital status and educational level measured socioeconomic position at baseline. Education was measured in three categories at start of follow-up; (i) compulsory education (primary school, lower secondary school or less), (ii) intermediate education (upper secondary school and post-secondary non-tertiary education), (iii) tertiary education (undergraduate, graduate and postgraduate). Occupation (HUNT2-questionnaire) was another measure of socioeconomic position that was considered a potential confounder, and we did a separate analysis adjusting for occupation (Supplementary tables 3 and 4).

We also adjusted for lifestyle related variables: Body mass index—categorical variable (kg/m², WHO standard: Normal range 18.5–24.99 (ref.), Underweight <18.5, Overweight ≥25, Obese ≥30). Physical activity—categorical variable (*high* = vigorous activity for more than 1 h/week, *moderate* = vigorous for less than 1 h or light exercise more than 1 h/week, *low* = less active than moderate). Smoking status—categorical variable (never, previous, current) and alcohol consumption (described above).

As unemployment is likely to affect health, we adjusted for previous unemployment, measured as accumulated days (from 1992 to baseline).

Analysis

The association between health and risk of unemployment was investigated using Cox's proportional hazard models with time from participation in the HUNT Study as the time axis. Start of follow-up was 90 days after participation in HUNT2, as we were concerned that some individuals may have been depressed as a result of a known upcoming redundancy (reverse causality). Similarly, those who became unemployed 90 days before or after participation in the study were left censored at the date of participation, so that none of the participants were unemployed at start of follow-up.

The participants were followed until date of first unemployment, emigration, death or permanent exit from the labour market (early/old age pension or temporary/permanent disability pension), whichever occurred first. For all main analyses the first date of unemployment was set to the first day of an unemployment episode lasting >90 days. In addition, sensitivity analyses were performed with the first day of an employment episode lasting >180 days. The statistical analyses were performed on participants with complete data on exposure variables (thus N varied between models).

Three models were analysed for each of the health indicators. Model 1 was adjusted for age, gender, education and marital status. Additional adjustment variables that could have status as both confounders and mediators were included in model 2: physical activity, body mass index, smoking and alcohol consumption (i.e. variables that could possibly be causing unemployment but also to some extent could be caused by unemployment). In model 3, we adjusted for cumulative length (days) of previous unemployment. We also investigated possible effect measure modification by age and sex for each of the health indicators, and did age-stratified analyses (< >50 years). The proportional hazards assumptions were tested based on Schoenfeld residuals. Results were reported as hazard ratios (HR) with 95% confidence intervals (CI). Statistical software: Stata 13.1.

Supplementary analyses

It is possible that individuals with underlying health problems experiencing job insecurity or job loss would go to their doctor and get a sickness absence certificate, instead of register as unemployed. Thus, sick leave could be a possible competing risk factor of unemployment and 'mask' a potential health selection process related to unemployment, especially in the Norwegian welfare state context with generous benefits. Unemployment benefits covers on average 62.4% of earned income the previous year and are granted conditional on several terms, the most important being that earned income the previous year exceeded €14132 (2014), and that working time is reduced by 50% or more. In contrast, Norwegian sickness benefits cover 100% of the income loss up until 1 year after first day of sick leave.

To explore potential competing risk, we analysed whether the risk of subsequent unemployment was reduced, if we took sick leave into account in a simultaneous analysis. Multinomial regression analysis was performed, comparing time to first sick leave period ($\geq$ 8 weeks) with time to first period of unemployment ($\geq$ 90 days). We divided follow-up time in 28 six-month periods from baseline to end of follow-up. The dependent variable took on three values; 0 = no unemployment or sick leave, 1 = unemployment (>90 days) or 2 = sick leave (>60 days). We investigated the same health and lifestyle variables as in the Cox's proportional hazard models, and added a continuous time variable (1–28) indicating how many periods the participant contributed with data.

To explore health selection according to duration of unemployment, we performed a Cox proportional hazard analysis on time to *end* of unemployment with robust standard errors taking into account clustering of individuals with several unemployment periods. We hypothesized that those with several conditions or symptoms would have a lower risk of ending their unemployment spell quickly, compared to their healthier peers.

Ethics approval

The study was approved by the Regional Committee for Medical Research Ethics (ref. 2012/1941b). Written consent was given by all HUNT2 participants.

Results

Baseline characteristics are listed in table 1. Maximum follow-up time was 13.8 years with 312 279 person-years, each person being followed for 8.6 years on average.

Multivariable analyses

Over the follow-up period 3065 (8.4%) participants experienced one or more episodes of unemployment lasting more than 90 days; 1991 (5.4%) had periods of over 180 days unemployment. Results of the Cox's regression analyses are presented in table 2.

In the age, gender, education and marital status-adjusted model there was nearly a double risk of unemployment in those having symptoms of both depression and anxiety [HR 1.87, 95% confidence interval (CI) 1.62–2.16] compared with those without such symptoms. Further adjustment for lifestyle and previous unemployment moderately attenuated the associations. The risk of job loss increased with increasing numbers of chronic somatic conditions, and was highest amongst the 4% reporting three or more conditions [fully adjusted (a) HR 1.78, 95% CI 1.46–2.17]. Elevated risk of unemployment was also found for musculoskeletal pain, gastrointestinal symptoms, insomnia, poor self-rated health and high/problematic alcohol consumption.

Results of the analysis replacing the outcome >90 days with >180 days of unemployment are presented in the appendix (Supplementary table 2). It generally showed similar results compared to the original 90 days regression. As expected, the hazard ratios were slightly higher among those unemployed for a longer period of time. Adjusting for occupation did not change the results profoundly (Supplementary tables 3 and 4).

We found no strong evidence that associations differed in males versus females on most of the health measures investigated (*P* interaction 0.06–0.82); the exception was problematic use of alcohol assessed using CAGE (*P* interaction 0.01); associations were stronger in women (aHR 1.84 (1.28–2.30) than men [aHR 1.16 (1.01–1.33), data not shown]. Likelihood-ratio tests indicated effect measure modification by age (*P* interaction <0.001–0.016). Age-stratified analysis showed that those >50 had a weaker association between health and unemployment compared to those <50 years on almost all of the health measures (Supplementary table 5).

Supplementary analyses

Results of the multinomial logistic regressions are presented as relative risk ratios (RRR), see Supplementary tables 6a–6g. This supplementary analysis gave close to similar results as the main analysis. The risk of sick leave were generally higher than the risk of unemployment for all the somatic conditions, while those reporting symptoms of both anxiety and depression had a higher risk of unemployment than of sick leave in all three models. The Cox analysis on unemployment length showed that those with several ill health conditions or symptoms had a higher risk of having longer unemployment spells, compared to those with fewer or no symptoms (Supplementary table 8).

Discussion

We found evidence of health selection to unemployment. High symptom levels of anxiety and depression or having chronic somatic conditions nearly doubled the risk of subsequent unemployment. Having musculoskeletal pain, gastrointestinal symptoms, insomnia, high/problematic alcohol consumption or poor self-rated

Table 1 Characteristics at baseline (HUNT2, 1995–1997); study population (*N*, %) and participants experiencing an unemployment period lasting for more than 90 and 180 consecutive days, respectively (*n*, %). Missing values on each variable (%)

	Missing	Total study population		Unemployment >90 days		Unemployment >180 days	
	%	*N*	%	*n*	%	*n*	%
Study population		36 249	100	3065	8	1991	5
Women	0.0	19 345	53	1559	51	1102	55
Mean age (SD)	0.0	42	(11.3)	38	(11.5)	39	(11.6)
Days of previous unemployment, mean (SD)	0.0	74	(216)	218	(361)	213	(371)
Mean drinking frequency per month (SD)	3.8	2.7	(2.9)	2.7	(3.3)	2.5	(3.6)
Mean BMI (SD)	0.2	25.9	(3.9)	28.8	(4.2)	25.8	(4.3)
Education	0.2						
Compulsory education (or less)		7715	21	889	29	612	31
Intermediate education		20 450	57	1782	59	1134	57
Tertiary education		8004	22	375	12	231	12
Marital status	0.3						
Not married		10 928	30	1472	48	882	44
Married		22 228	62	1274	42	884	45
Widow(er)		331	1	19	1	15	1
Divorced/separated		2669	7	287	9	203	10
Anxiety and depression (HADS)	1.6						
No anxiety/depression symptoms		29 425	82	2342	78	1507	78
Anxiety symptoms only		3521	10	352	12	222	11
Depression symptoms only		1137	3	96	3	67	3
Anxiety and depression symptoms		1604	5	212	7	151	8
Chronic somatic conditions	0.9						
No conditions		20 853	57	1665	54	1067	54
1 condition		11 057	31	987	32	660	33
2 conditions		3290	9	293	10	194	10
≥3 conditions		1049	3	120	4	70	3
Musculoskeletal pain	0.0						
No symptoms		12 788	35	1135	37	716	36
1 symptom		14 107	39	1147	37	272	37
2 symptoms		4165	11	330	11	215	11
≥3 symptoms		5180	14	452	15	314	16
Gastrointestinal complaints	1.8	17 549	49	1626	54	1085	56
Frequent insomnia symptoms	0.5	5708	16	585	19	399	20
Not so good/poor self-rated health	0.7	5497	15	540	18	354	18
Physical activity	3.1						
Low physical activity		5831	17	578	20	364	19
Moderate physical activity		17 971	51	1407	47	946	49
High physical activity		11 330	32	985	33	612	32
Smoking	0.4						
Never smoker		17 172	47	1252	41	787	40
Previous smoker		8268	23	596	20	414	21
Current smoker		10 682	30	1203	39	778	39
CAGE—problematic use of alcohol	8.2	2902	9	362	13	221	12

health were all factors associated with an increased risk of unemployment. Adjusting for lifestyle and previous unemployment slightly attenuated the estimates.

Strengths and limitations

The main strengths of this study are the detailed data on unemployment and the prospective design with longitudinal (18 years) register data on labour market status through record linkage. The analyses of sick leave as competing risk are, to the best our knowledge, a new contribution to the literature. Limitations are the lack of follow-up information on health, and potential biases related to non-response and self-reporting.[27] Further, although the assessment of anxiety and depression was based on a valid questionnaire, a (semi)structured psychiatric diagnostic interview would have given more reliable diagnostic information.

Context

The degree to which welfare benefits buffer reduced earning abilities in the unemployed is of importance for population health.[28] There are several aspects of Norway's state benefits system that may influence the generalizability of the results to other settings.

Norway has a high GDP/capita (86% above the average of EU28 in 2013, www.ssb.no/en/ppp), generous social insurances, high degree of unionization, strong support of worker's rights (with focus on the most vulnerable groups) and a comprehensive vocational rehabilitation system. The unemployment rate in Norway has been low for decades, and was relatively unaffected by the recession in 2007 (Supplementary figure 1). However, sickness absence (7% of agreed working hours) and disability rates (10% of working age adults), both possible competing risk factors of unemployment, were reported the highest in OECD in 2014 (Organization for Economic Cooperation and Development).[29]

Previous studies

A comparative study of the Scandinavian countries found no evidence of (self-reported) health selection to unemployment in Norway.[30] In keeping with our findings a systematic review and meta-analysis on health selection found that self-rated poor health was a risk factor for unemployment (RR 1.34, 95% CI 1.26–1.65).[20] Other studies have found evidence of mental health selection to unemployment in cohorts in Finland[8,31] and Australia.[18]

Table 2 Hazard ratio (HR) for unemployment (>90 days) according to baseline symptoms of anxiety and depression, chronic somatic conditions, musculoskeletal pain, gastrointestinal symptoms, insomnia, self-rated health, alcohol consumption and problematic use of alcohol (CAGE)

	Model 1[a]		Model 2[b,c]		Model 3[d]	
	HR	95% CI	HR	95% CI	HR	95% CI
Anxiety and depression (HADS)						
No symptoms (78%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
Anxiety only (12%)	1.23	1.10-1.38	1.29	1.06-1.34	1.13	1.01-1.27
Depression only (3%)	1.33	1.08-1.63	1.25	1.01-1.55	1.20	0.98-1.49
Anxiety and depression (7%)	1.87	1.62-2.16	1.72	1.48-1.99	1.57	1.35-1.83
Chronic somatic conditions						
0 (54%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
1 (32%)	1.20	1.10-1.29	1.19	1.10-1.30	1.17	1.07-1.27
2 (10%)	1.31	1.16-1.49	1.30	1.15-1.48	1.29	1.13-1.46
≥3 (4%)	1.93	1.60-2.32	1.86	1.53-2.26	1.78	1.46-2.17
Musculoskeletal pain						
No symptoms (37%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
1 symptom (37%)	1.08	0.99-1.18	1.05	0.96-1.14	1.05	0.96-1.15
2 symptoms (11%)	0.99	0.88-1.12	0.98	0.86-1.12	0.97	0.85-1.10
≥3 symptoms (15%)	1.13	1.01-1.27	1.07	0.94-1.19	1.03	0.91-1.15
Gastrointestinal symptoms						
No (46%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
Yes (54%)	1.25	1.16-1.34	1.20	1.12-1.30	1.17	1.08-1.26
Insomnia						
Not frequent (81%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
Frequent (19%)	1.37	1.25-1.50	1.27	1.15-1.40	1.19	1.09-1.32
Self-rated health						
Good/very good (82%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
Poor/not so good (18%)	1.51	1.37-1.66	1.43	1.29-1.58	1.36	1.24-1.51
Alcohol consumption						
1–4 (59%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
Teetotaller (5%)	1.02	0.86-1.20	1.16	0.98-1.37	1.11	0.93-1.32
0 (but not teetotaller) (22%)	1.07	0.98-1.18	1.09	0.99-1.20	1.07	0.97-1.17
5–8 (11%)	1.13	0.99-1.27	1.09	0.96-1.23	1.08	0.95-1.22
>8 (3%)	1.09	1.00-1.51	1.20	0.98-1.48	1.17	0.95-1.44
CAGE (problematic use of alcohol)						
No (87%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
Yes (13%)	1.43	1.27-1.59	1.37	1.22-1.54	1.32	1.17-1.48

Notes: Total *N* = 36 249 with a maximum of 3065 unemployment episodes (failures). Percentage of unemployment episodes given in parenthesis. Complete case analysis with 95% confidence intervals (CI). Total *N* in the analyses varies according to missing values on exposures.
a: Adjusted for gender, age, education and marital status.
b: Adjusted for gender, age, education, marital status, physical activity, body mass index, smoking and alcohol consumption.
c: Model 2 with CAGE as exposure exclude alcohol consumption as adjustment variable.
d: Same as Model 2 + additional adjustment for accumulated days of previous unemployment (1992 to baseline).

There have been few studies on the association between unemployment and specific symptoms like musculoskeletal pain, gastrointestinal symptoms and insomnia, even though these are frequent causes of medical consultation and reduced work ability.[32] Also, gender differences in health selection are scarcely investigated.[13] Concordant to a French longitudinal study on health selection,[33] we did not find profound gender differences in the health related risk of unemployment. Our results on alcohol consumption and higher risk of subsequent unemployment, especially in women, are consistent with the results in a Swedish follow-up study.[21]

Interpretation and possible mechanism

One could expect sickness benefits in Norway to filter health-related problems before they lead to unemployment. Still, those with ill health seem to have a higher risk of job loss and longer periods of unemployment following job loss, also shown in previous studies.[34] People with illness might be selected to more unstable jobs or they might lose their job more often because they are regarded less valuable to the employers. The unemployment rate will to some

extent vary by socioeconomic position and occupation. However, adjusting for occupation did not alter the estimated risk of unemployment much. We interpret this as a result of educational level capturing most of these variations in a Norwegian labour market context.

We found that older workers with health problems were at lower risk of unemployment. This may be explained by a healthy worker effect—those 'surviving' in the labour force are the healthiest people (or they cope well with their health problems), while those with health impairment are more likely to exit earlier. It could also relate to the fact that older people have acquired skills and experience that are valued by their employers over and above health problems. Also, Norway's employment legislation offers strong protection to older workers.

Introducing sick leave benefits as a competing risk factor of unemployment (Supplementary analysis) did not greatly alter our estimates of risk factors for unemployment. However, compared to participants reporting ill health on other health measures, those with symptoms of common mental disorders were somewhat more likely to lose their jobs than have periods of sick leave. This may indicate under-treatment, stigma and social exclusion in relation to

mental health problems, as discussed in a recent review on mental health stigma,[35] and should be further investigated.

To conclude, the present study finds that poor health increases the risk of job loss. This evidence of health selection highlights the need for policy focus on the welfare of unemployed individuals, including support preparing them for re-employment.

Supplementary data

Supplementary data are available at *EURPUB* online.

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Conflicts of interest: None declared.

Key points

- Health effects of unemployment have been extensively studied, while less attention has been paid to whether poor health increases the risk of job loss (selection hypothesis).
- The existing literature on the influence of health on unemployment has mostly been limited to studies on poor mental health and overall self-rated health, whereas somatic conditions and lifestyle have been scarcely investigated.
- This study found evidence of health selection to unemployment in Norway by linking baseline self-reported health data (1995–1997) to 14 years of follow-up in national registers.
- Having chronic somatic conditions nearly doubled the risk of subsequent unemployment. Anxiety and depression, musculoskeletal pains, gastrointestinal symptoms, insomnia, high/problematic alcohol consumption or poor self-rated health were all factors associated with an increased risk of unemployment.
- Our findings suggest a call for health perspectives in public employment programs.

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SUPPLEMENTARY FILE

PAPER I

Self-reported health measures constructed from the HUNT2 survey data. Variable name, conditions/content included in each variable and measure/operationalization in the present study

Variable:	Conditions/content:	Measure:
Hospital Anxiety and Depression Scale ((HADS-A & HADS-D), four point Likert scale)	HADS-A (anxiety subscale; item 1,3,5,7,9,11,13), HADS-D (depression subscale; item 2,4,6,8,10,12,14)	
HADS		Categorical: 1-4
	None (HADS<8/21 on both subscales), Anxiety only (≥8/21 on HADS-A, <8/21 on HADS-D), Depression only (≥8/21 on HADS-D, <8/21 on HADS-A), Anxiety and depression (≥8/21 on both subscales)	
Chronic somatic conditions	Asthma (yes/no)	Categorical: 0, 1,2,≥ 3 conditions
	Cardiovascular conditions (stroke, myocardial infarction or angina pectoris) (yes/no)	
	Diabetes (yes/no)	
	Thyroid disease (hyperthyroidism, hypothyroidism, goitre or other thyroid diseases) (yes/no)	
	Rheumatic conditions (rheumatoid arthritis, osteoarthritis or ankylosing spondylitis) (yes/no)	
	Osteoporosis (yes/no)	
	Epilepsy (yes/no)	
	Cancer (yes/no)	
	Other long-standing diseases (yes/no)	
	Traumas (hip fractures or other trauma necessitating hospital admission) (yes/no)	
	Physical handicap (vision, hearing, motor hand - dichotomous variable) (yes/no)	
Musculoskeletal pain	During the last year, have you had pain and/or stiffness in your muscles and limbs that has lasted for at least 3 consecutive months, or diagnoses of fibromyalgia (yes/no)?	Categorical: 0, 1,2,≥ 3 symptoms
	Where did you feel this pain? (yes/no): Neck pain and/or stiffness >3months Shoulder pain and/or stiffness >3months Elbow pain and/or stiffness >3months Wrist, hand pain and/or stiffness >3months Chest/stomach pain and/or stiffness >3months Upper back pain and/or stiffness >3months Lumbar region pain and/or stiffness >3months Hip pain and/or stiffness >3months Knee pain and/or stiffness >3months Ankle, feet pain and/or stiffness >3months	
Gastrointestinal complaints	To what degree have you had nausea in the last 12 months? (Not at all vs. slightly/very much) To what degree have you had heartburn/acid regurgitation in the last 12 months? To what degree have you had diarrhea in the last 12 months? To what degree have you had constipation in the last 12 months?	Dichotomous
Insomnia	How often do you suffer from insomnia? Never or a few times a year, 1-2 times a month vs. About once a week, More than once a week	Dichotomous

	During the last year, have you been troubled by insomnia to such a degree that it affected your work? (yes/no) Have you had difficulty falling asleep in the last month? Almost every night, Often vs. Now and again, Never During the last month, have you woken too early and not been able to get back to sleep? Almost every night, Often vs. Now and again, Never	
Self-rated health	How is your health at the moment? (Poor/not so good vs. good/very good)	Dichotomous
Body mass index (BMI)	Kg/m^2. WHO-standard: Underweight <18.5, Normal range 18.5-24.99, Overweight ≥25, Obese ≥30.	Categorical: 1-4
Physical activity	*High* = vigorous activity for more than one hour/week, *moderate* = vigorous for less than one hour or light exercise more than one hour per week, *low* = less active than moderate .	Categorical:1-3
Smoking status	Current, previous, never	Categorical
Alcohol consumption	Drinking frequency per month – How many times a month do you usually drink alcohol? (0, 1-4, 5-8, >8 occasions) and question whether teetotaler or not (yes/no)	Categorical: 1-5
CAGE (problematic use of alcohol)	1) Have you ever felt that you should reduce your alcohol intake? 2) Have other people ever criticized your use of alcohol? , 3) Have you ever felt bad or guilty because of your use of alcohol? 4) Have you ever had a drink first thing in the morning as a pick-me-up or to calm your nerves or to cure a hangover? Caseness/cut-off: Two or more affirmative answers	Dichotomous
Occupation	1) 'Management position in public or private enterprise'; 2) 'Self-employed professional (e.g. dentist, lawyer)'; 3) 'Lower professional occupation (e.g. nurse, technician, teacher)'; 4) 'Non-professional occupation (shop, office, public service)'; 5) 'Farmer or forest owner'; 6) 'Self-employed businessman'; 7) 'Skilled worker, artisan, foreman'; 8) 'Driver, chauffeur'; 9) 'Fisherman' and 10) 'Semi-skilled, unskilled worker'	Categorical: 1-10
Previous unemployment	Number of days with unemployment from 1992 (first year of information from registry) to baseline (participation in HUNT2).	Continuous

(Unemployed = 1,991 (5%))	Model 1[1]		Model 2[2,3]		Model 3[4]	
	HR	95% CI	HR	95% CI	HR	95% CI
Anxiety and depression						
No symptoms (78%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
Anxiety only (11%)	1.17	1.02-1.35	1.15	0.99-1.33	1.13	0.97-1.31
Depression only (3%)	1.39	1.08-1.77	1.29	0.99-1.67	1.25	0.96-1.62
Anxiety and depression (8%)	1.97	1.66-2.33	1.82	1.52-2.17	1.72	1.44-2.06
Chronic somatic conditions						
0 (54%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
1 (33%)	1.25	1.14-1.38	1.25	1.13-1.39	1.24	1.12-1.37
2 (10%)	1.35	1.16-1.58	1.35	1.15-1.58	1.35	1.15-1.58
≥3 (3%)	1.76	1.38-2.24	1.70	1.31-2.19	1.63	1.26-2.11
Musculoskeletal pain						
No symptoms (36%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
1 symptom (37%)	1.05	0.95-1.17	1.03	0.92-1.15	1.04	0.94-1.16
2 symptoms (11%)	0.98	0.84-1.15	0.98	0.84-1.16	0.98	0.83-1.15
≥ 3 symptoms (16%)	1.15	1.00-1.32	1.09	0.94-1.26	1.07	0.93-1.23
Gastrointestinal complains						
No (44%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
Yes (56%)	1.28	1.17-1.40	1.24	1.13-1.36	1.29	1.15-1.45
Insomnia						
Not frequent (80%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
Frequent (20%)	1.41	1.26-1.57	1.33	1.18-1.49	1.34	1.20-1.50
Self-rated health						
Good/very good (82%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
Poor/not so good (18%)	1.46	1.30-1.64	1.37	1.21-1.56	1.36	1.20-1.54
Alcohol consumption						
1-4 (58%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
Teetotaler (5%)	1.02	0.84-1.26	1.15	0.93-1.42	1.12	0.90-1.38
0 (but not teetotaler) (24%)	1.14	1.01-1.27	1.14	1.01-1.28	1.10	0.98-1.24
5-8 (10%)	1.08	0.92-1.26	1.0.5	0.90-1.23	1.04	0.89-1.22
>8 (3%)	1.16	0.88-1.51	1.14	0.87-1.49	1.16	0.88-1.51
CAGE (problematic drinking)						
No (88%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
Yes (12%)	1.43	1.23-1.65	1.38	1.19-1.60	1.34	1.16-1.55

[1]Adjusted for sex, age, education and marital status. [2]Adjusted for sex, age, education, marital status, physical activity, body mass index, smoking and alcohol consumption. [3]Model 2 with CAGE as exposure is not adjusted for alcohol consumption.

[4]Same as model 2 + additional adjustment for accumulated days of previous unemployment (1992-baseline).

Adjusting for occupation as a potential confounder

We investigated occupation as a potential confounder, and did supplementary analyses including occupation as a categorical adjustment variable. Occupation was self-reported in the HUNT2 questionnaire. It was based on the following categories; 1) 'Management position in public or private enterprise'; 2) 'Self-employed professional (e.g. dentist, lawyer)'; 3) 'Lower professional occupation (e.g. nurse, technician, teacher)'; 4) 'Non-professional occupation (shop, office, public service)'; 5) 'Farmer or forest owner'; 6) 'Self-employed businessman'; 7) 'Skilled worker, artisan, foreman'; 8) 'Driver, chauffeur'; 9) 'Fisherman' and 10) 'Semi-skilled, unskilled worker'. The variable has a relatively high missing rate.

Approximately 8 % of our study population reported two or more occupations. In order to assign only one occupation to each respondent, we chose the category telling us the most about what kind of work this person performed. For instance, someone ticking off both "Fisherman" and "Semi-skilled, unskilled worker" was assigned the occupation "Fisherman". A "Self-employed businessman" and "Farmer or forest owner" was assigned the occupation "Farmer or forest owner" and so on.

S-Table 3   Characteristics at baseline (HUNT2, 1995-97) on the occupation variable, study population (N, %)

	Total population (complete cases)	
Occupation	**N**	**%**
Management position in public/private enterprise	2 809	9
Self-employed professional (dentist, lawyer...)	250	1
Lower professional occupation (nurse, teacher...)	6 004	19
Non-professional occupation (shop, office...)	6 555	20
Farmer or forest owner	4 412	13
Self-employed businessman	1 693	5
Skilled worker, artisan, foreman	4 364	13
Driver, chauffeur	1 052	3
Fisherman	162	1
Semi-skilled, unskilled worker	5 135	16
Total	32 436	100
Missing	3 813	11

(Unemployed 3,065 (7%))	Model 1[1]		Model 2[2]	
	HR	95% CI	HR	95% CI
Anxiety and depression				
No symptoms (78%)	1.00	Ref.	1.00	Ref.
Anxiety only (12%)	1.13	1.01-1.27	1.09	0.96-1.25
Depression only (3%)	1.20	0.98-1.49	1.26	1.00-1.59
Anxiety and depression (7%)	1.57	1.35-1.83	1.58	1.35-1.86
Chronic somatic conditions				
0 (54%)	1.00	Ref.	1.00	Ref.
1 (32%)	1.17	1.07-1.27	1.16	1.06-1.27
2 (10%)	1.29	1.13-1.46	1.26	1.09-1.45
≥3 (4%)	1.78	1.46-2.17	1.81	1.47-2.22
Musculoskeletal pain				
No symptoms (37%)	1.00	Ref.	1.00	Ref.
1 symptom (37%)	1.05	0.96-1.15	1.05	0.95-1.16
2 symptoms (11%)	0.97	0.85-1.10	0.97	0.84-1.12
≥ 3 symptoms (15%)	1.03	0.91-1.15	1.03	0.90-1.16
Gastrointestinal complains				
No (46%)	1.00	Ref.	1.00	Ref.
Yes (54%)	1.17	1.08-1.26	1.15	1.05-1.25
Insomnia				
Not frequent (81%)	1.00	Ref.	1.00	Ref.
Frequent (19%)	1.19	1.09-1.32	1.24	1.12-1.37
Self-rated health				
Good/very good (82%)	1.00	Ref.	1.00	Ref.
Poor/not so good (18%)	1.36	1.24-1.51	1.32	1.18-1.47
Alcohol consumption				
1-4 (59%)	1.00	Ref.	1.00	Ref.
Teetotaler (5%)	1.11	0.93-1.32	1.07	0.88-1.30
0 (but not teetotaler) (22%)	1.07	0.97-1.17	1.09	0.98-1.22
5-8 (11%)	1.08	0.95-1.22	1.04	0.91-1.18
>8 (3%)	1.17	0.95-1.44	1.12	0.90-1.39
CAGE (problematic drinking)				
No (87%)	1.00	Ref.	1.00	Ref.
Yes (13%)	1.32	1.17-1.48	1.27	1.12-1.44

[1]Adjusted for sex, age, education, marital status, physical activity, body mass index, smoking, alcohol consumption and previous unemployment. Models with CAGE as exposure were not adjusted for alcohol consumption. [2]Same as model 1 + additional adjustment for occupation.

Age-stratified analyses

S-Table 5 Hazard ratio (HR) for unemployment (>90 days) according to baseline symptoms of anxiety and depression, chronic somatic conditions, musculoskeletal pain, gastrointestinal symptoms, insomnia, self-rated health and alcohol consumption. Stratified on age < 50 years and > 50 years. Percentage of unemployment episodes given in parenthesis. Complete case analysis with 95 % confidence intervals (CI). Total N in the analyses varies according to missing values on exposures, see table 1 in paper.

	<50 years old[1,2]		>50 years old[1,2]	
(Unemployed = 3,065 (8%))	HR	95% CI	HR	95% CI
Anxiety and depression (HADS)				
No symptoms (78%)	1.00	Ref.	1.00	Ref.
Anxiety only (12%)	1.21	1.07-1.37	0.75	0.52-1.08
Depression only (3%)	1.03	0.78-1.36	1.28	0.91-1.80
Anxiety and depression (7%)	1.56	1.32-1.84	1.30	0.92-1.81
Chronic somatic conditions				
0 (54%)	1.00	Ref.	1.00	Ref.
1 (32%)	1.19	1.09-1.30	1.07	0.87-1.31
2 (10%)	1.24	1.07-1.44	1.34	1.04-1.74
≥3 (4%)	1.83	1.46-2.31	1.63	1.11-2.39
Musculoskeletal pains				
No symptoms (37%)	1.00	Ref.	1.00	Ref.
1 symptom (37%)	1.05	0.96-1.16	0.85	0.69-1.04
2 symptoms (11%)	1.00	0.87-1.15	0.64	0.45-0.89
≥ 3 symptoms (15%)	1.03	0.91-1.18	0.81	0.62-1.06
Gastrointestinal symptoms				
No (46%)	1.00	Ref.	1.00	Ref.
Yes (54%)	1.25	1.15-1.36	0.86	0.73-1.03
Insomnia				
Not frequent (82%)	1.00	Ref.	1.00	Ref.
Frequent (18%)	1.30	1.17-1.45	0.83	0.65-1.07
Self-rated health				
Good/very good (82%)	1.00	Ref.	1.00	Ref.
Poor/not so good (18%)	1.46	1.30-1.63	1.02	0.82-1.27
Alcohol consumption				
1-4 (59%)	1.00	Ref.	1.00	Ref.
Teetotaler (5%)	1.28	1.05-1.55	0.76	0.53-1.09
0 (but not teetotaler) (22%)	1.06	0.95-1.18	0.89	0.71-1.11
5-8 (11%)	1.08	0.94-1.24	1.00	0.76-1.32
>8 (3%)	1.17	0.92-1.49	0.87	0.58-1.31
CAGE (problematic drinking)				
No (87%)	1.00	Ref.	1.00	Ref.
Yes (13%)	1.42	1.26-1.61	0.82	0.58-1.15

[1]Adjusted for sex, education, marital status, physical activity, body mass index, smoking, alcohol consumption and previous unemployment. [2]The models with CAGE as exposure were not adjusted for alcohol consumption.

Dealing with competing risk using multinomial logistic regression analysis

Considering sick leave as a competing risk of unemployment, we did multinomial regression analysis comparing time to first sick leave period (≥ 8 weeks) with time to first period of unemployment (≥ 90 days). We divided follow-up time in 6-month-periods after participation in HUNT2 (28 periods at end of follow-up 31.12.2008). The dependent variable took on three values; 0 = no unemployment or sick leave, 1 = unemployment (>90 days), or 2 = sick leave (>60 days). The fully adjusted model was adjusted for sex, age, education, marital status, physical activity, body mass index, smoking status and alcohol intake. We also added a continuous time-variable (1-28) to each equation, counting the number of periods until the event (unemployment or sick leave) happened. Thus, a participant being unemployed/on sick leave in period 9 had a time-variable ranging from 1-8.

A total of 1 735 participants experienced unemployment as first event after baseline, 14 684 participants had a sick leave period as first event. 14 883 participants had no unemployment or sick leave period during follow-up.

S-Table 6a   Multinomial logistic regression of competing risk between unemployment and sick leave. Symptoms of common mental disorders measured by the Hospital Anxiety and Depression Scale (HADS). Complete case analysis. Number of participants not unemployed or on sick leave = 14 883. Number of unemployed (>90 days) = 1 735, number of participants on sick leave = 14 684. Relative risk ratios (RRR) with 95 % confidence intervals (CI).

		Model 1[1]		Model 2[2]		Modell 3[3]	
		RRR	95% CI	RRR	95% CI	RRR	95% CI
0 = no unemployment or sick leave (base outcome, n = 14 883)			Ref.		Ref.		Ref.
1 = unemployment	**Anxiety and depression (n = 1 735)**						
	No symptoms (1 388)	1.00	Ref.	1.00	Ref.	1.00	Ref.
	Anxiety only (192)	1.29	1.11-1.51	1.24	1.07-1.45	1.20	1.03-1.40
	Depression only (52)	1.42	1.07-1.88	1.32	1.00-1.75	1.26	0.96-1.67
	Anxiety and depression (103)	1.95	1.59-2.38	1.73	1.41-2.12	1.62	1.32-1.98
2 = sick leave	**Anxiety and depression (n = 14 684)**						
	No symptoms (11 781)	1.00	Ref.	1.00	Ref.	1.00	Ref.
	Anxiety only (1 640)	1.33	1.26-1.40	1.31	1.24-1.38	1.29	1.23-1.36
	Depression only (495)	1.35	1.23-1.48	1.32	1.21-1.45	1.27	1.16-1.39
	Anxiety and depression (768)	1.60	1.48-1.72	1.53	1.42-1.65	1.48	1.36-1.58

[1] Adjusted for sex and age. [2] Adjusted for sex, age, education and marital status. [3] Adjusted for sex, age, education, marital status, physical activity, body mass index, smoking status and alcohol intake.

The RRR is the relative risk ratio for a one unit increase in HADS for the unemployed/on sick leave relative to those not unemployed or on sick leave, given that the other variables in the model are held constant. Compared to subjects with no symptoms, the relative risk of being in the unemployed (sick leave) group would be 1.95 (1.60) times more likely for those having symptoms of both depression and anxiety.

S-Table 6b   Multinomial logistic regression of competing risk between unemployment and sick leave. Chronic somatic conditions. Complete case analysis. Number of participants not unemployed or on sick leave = 14 883. Number of unemployed (>90 days) = 1 735, number of participants on sick leave = 14 684. Relative risk ratios (RRR) with 95 % confidence intervals (CI).

		Model 1[1]		Model 2[2]		Modell 3[3]	
		RRR	95% CI	RRR	95% CI	RRR	95% CI
0 = no unemployment or sick leave (base outcome, n = 14 883)			Ref.		Ref.		Ref.
1 = unemployment	Chronic somatic conditions (n = 1 735)						
	0 (974)	1.00	Ref.	1.00	Ref.	1.00	Ref.
	1 (541)	1.19	1.07-1.33	1.19	1.07-1.32	1.17	1.05-1.30
	2 (164)	1.48	1.25-1.75	1.43	1.21-1.69	1.37	1.16-1.62
	≥3 (56)	1.92	1.46-2.52	1.86	1.42-2.44	1.78	1.36-2.34
2 = sick leave	Chronic somatic conditions (n = 14 684)						
	0 (7 967)	1.00	Ref.	1.00	Ref.	1.00	Ref.
	1 (4 668)	1.30	1.25-1.35	1.30	1.25-1.35	1.29	1.24-1.34
	2 (1 541)	1.72	1.63-1.82	1.71	1.61-1.81	1.67	1.58-1.77
	≥3 (508)	2.08	1.90-2.29	2.08	1.89-2.28	2.02	1.84-2.22

[1] Adjusted for sex and age. [2] Adjusted for sex, age, education and marital status. [3] Adjusted for sex, age, education, marital status, physical activity, body mass index, smoking status and alcohol intake.

S-Table 6c   Multinomial logistic regression of competing risk between unemployment and sick leave. Musculoskeletal pain measured as no symptoms (No) and 1 or more symptoms (Yes). Complete case analysis. Number of participants not unemployed or on sick leave = 14 883. Number of unemployed (>90 days) = 1 735, number of participants on sick leave = 14 684. Relative risk ratios (RRR) with 95 % confidence intervals (CI).

		Model 1[1]		Model 2[2]		Modell 3[3]	
		RRR	95% CI	RRR	95% CI	RRR	95% CI
0 = no unemployment or sick leave (base outcome, n = 14 883)			Ref.		Ref.		Ref.
1 = unemployment	Musculoskeletal pain (n = 1 735)						
	No (668)	1.00	Ref.	1.00	Ref.	1.00	Ref.
	Yes (1 067)	1.13	1.02-1.25	1.09	0.99-1.21	1.05	0.95-1.16
2 = sick leave	Musculoskeletal pain (n = 14 684)						
	No (3 835)	1.00	Ref.	1.00	Ref.	1.00	Ref.
	Yes (10 849)	1.80	1.73-1.87	1.77	1.70-1.84	1.73	1.66-1.79

[1] Adjusted for sex and age. [2] Adjusted for sex, age, education and marital status. [3] Adjusted for sex, age, education, marital status, physical activity, body mass index, smoking status and alcohol intake.

S-Table 6d   Multinomial logistic regression of competing risk between unemployment and sick leave. Gastrointestinal complaints. Complete case analysis. Number of participants not unemployed or on sick leave = 14 883, number of unemployed = 1 735, number of participants on sick leave = 14 684. Relative risk ratios (RRR) with 95 % confidence intervals (CI).

		Model 1[1]		Model 2[2]		Modell 3[3]	
		RRR	95% CI	RRR	95% CI	RRR	95% CI
0 = no unemployment or sick leave (base outcome, n = 14 883)			Ref.		Ref.		Ref.
1 = unemployment	**Gastrointestinal complaints (n = 1 735)**						
	No (831)	1.00	Ref.	1.00	Ref.	1.00	Ref.
	Yes (904)	1.29	1.17-1.41	1.22	1.11-1.34	1.17	1.06-1.29
2 = sick leave	**Gastrointestinal complaints (n = 14 684)**						
	No (6 729)	1.00	Ref.	1.00	Ref.	1.00	Ref.
	Yes (7 955)	1.38	1.34-1.43	1.35	1.31-1.40	1.31	1.27-1.36

[1] Adjusted for sex and age. [2] Adjusted for sex, age, education and marital status. [3] Adjusted for sex, age, education, marital status, physical activity, body mass index, smoking status and alcohol intake.

S-Table 6e   Multinomial logistic regression of competing risk between unemployment and sick leave. Insomnia. Complete case analysis. Number of participants not unemployed or on sick leave = 14 883, number of unemployed = 1 735, number of participants on sick leave = 14 684. Relative risk ratios (RRR) with 95 % confidence intervals (CI).

		Model 1[1]		Model 2[2]		Modell 3[3]	
		RRR	95% CI	RRR	95% CI	RRR	95% CI
0 = no unemployment or sick leave (base outcome, n = 14 883)			Ref.		Ref.		Ref.
1 = unemployment	**Insomnia (n = 1 735)**						
	Not frequent (1 441)	1.00	Ref.	1.00	Ref.	1.00	Ref.
	Frequent (294)	1.37	1.21-1.55	1.29	1.14-1.47	1.24	1.09-1.41
2 = sick leave	**Insomnia (n = 14 684)**						
	Not frequent (11 964)	1.00	Ref.	1.00	Ref.	1.00	Ref.
	Frequent (2 720)	1.51	1.45-1.58	1.49	1.43-1.55	1.46	1.40-1.52

[1] Adjusted for sex and age. [2] Adjusted for sex, age, education and marital status. [3] Adjusted for sex, age, education, marital status, physical activity, body mass index, smoking status and alcohol intake.

S-Table 6f Multinomial logistic regression of competing risk between unemployment and sick leave. Global self-rated health. Complete case analysis. Number of participants not unemployed or on sick leave = 14 883, number of unemployed = 1 735, number of participants on sick leave = 14 684. Relative risk ratios (RRR) with 95 % confidence intervals (CI).

		Model 1[1]		Model 2[2]		Modell 3[3]	
		RRR	95% CI	RRR	95% CI	RRR	95% CI
0 = no unemployment or sick leave (base outcome, n = 14 883)			Ref.		Ref.		Ref.
1 = unemployment	**Global self-rated health (n = 1 735)**						
	Good/very good (1 510)	1.00	Ref.	1.00	Ref.	1.00	Ref.
	Poor/not so good (260)	1.57	1.37-1.80	1.44	1.25-1.65	1.37	1.19-1.57
2 = sick leave	**Global self-rated health (n = 14 684)**						
	Good/very good (12 089)	1.00	Ref.	1.00	Ref.	1.00	Ref.
	Poor/not so good (2 912)	2.07	1.98-2.16	2.01	1.93-2.10	1.94	1.86-2.03

[1] Adjusted for sex and age. [2] Adjusted for sex, age, education and marital status. [3] Adjusted for sex, age, education, marital status, physical activity, body mass index, smoking status and alcohol intake.

S-Table 6g Multinomial logistic regression of competing risk between unemployment and sick leave. Alcohol consumption. Complete case analysis. Number of participants not unemployed or on sick leave = 14 883, number of unemployed = 1 735, number of participants on sick leave = 14 684. Relative risk ratios (RRR) with 95 % confidence intervals (CI).

		Model 1[1]		Model 2[2]		Modell 3[3]	
		RRR	95% CI	RRR	95% CI	RRR	95% CI
0 = no unemployment or sick leave (base outcome, n = 14 883)			Ref.		Ref.		Ref.
1 = unemployment	**Alcohol consumption (n = 1 735)**						
	1-4 (1 025)	1.00	Ref.	1.00	Ref.	1.00	Ref.
	Teetotaler (93)	1.03	0.83-1.27	1.08	0.87-1.34	1.21	0.97-1.50
	0 (but not teetotaler) (359)	1.11	0.98-1.25	1.07	0.94-1.21	1.09	0.97-1.24
	5-8 (203)	1.12	0.96-1.30	1.20	1.03-1.40	1.17	1.00-1.36
	>8 (55)	1.02	0.78-1.34	1.13	0.85-1.49	1.09	0.83-1.44
2 = sick leave	**Alcohol consumption (n = 14 684)**						
	1-4 (8 395)	1.00	Ref.	1.00	Ref.	1.00	Ref.
	Teetotaler (918)	1.02	0.95-1.09	1.03	0.96-1.11	1.11	1.03-1.19
	0 (but not teetotaler) (3 410)	1.06	1.02-1.11	1.05	1.00-1.09	1.05	1.01-1.10
	5-8 (1 461)	0.88	0.84-0.94	0.91	0.86-0.96	0.90	0.84-0.95
	>8 (500)	0.92	0.84-1.01	0.96	0.87-1.05	0.94	0.86-1.03

[1] Adjusted for sex and age. [2] Adjusted for sex, age, education and marital status. [3] Adjusted for sex, age, education, marital status, physical activity, body mass index and smoking status.

The impact of a cut-off at >90 days of consecutive unemployment

In the main analysis, the cut-off was set at >90 days of consecutive unemployment in order to avoid seasonal unemployment and students registering as short-term unemployed in summer holidays and after finishing studies. We wanted to explore whether the results changed if we did the analysis on all lengths of unemployment. S-Table 7 shows the fully adjusted model (adjusted for sex, age, education, marital status, physical activity, body mass index, smoking, alcohol consumption and previous unemployment) in the >90 days group (as presented in Table 2 in the paper), any unemployment (all ages) and any unemployment (aged >29 years old). In the last model stratified on those aged 30 and above, there will presumably be few students.

S-Table 7   Hazard ratio (HR) for unemployment >90 days, any unemployment and any unemployment in those >29 years of age according to baseline symptoms of anxiety and depression, chronic somatic conditions, musculoskeletal pain, gastrointestinal complains, insomnia, self-rated health, alcohol consumption and problematic drinking (CAGE). Failures (unemployed) among those with >90 days = 3,065, failures among those with any unemployment = 4,218, failures among those >29 years with any unemployment = 2,833. Percentage of unemployed (>90 days) given in parenthesis. Complete case analysis with 95 % confidence intervals (CI). Total N in the analyses varies according to missing values on exposures, see table 1 in the paper.

	Unemployed >90 days[1]		Any unemployment[1]		Any unemployment >29 years old[1]	
	HR	95% CI	HR	95% CI	HR	95% CI
Anxiety and depression						
No symptoms (78%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
Anxiety only (12%)	1.13	1.01-1.27	1.15	1.05-1.28	1.10	0.97-1.25
Depression only (3%)	1.20	0.98-1.49	1.26	1.05-1.51	1.18	0.97-1.43
Anxiety and depression (7%)	1.57	1.35-1.83	1.45	1.27-1.67	1.45	1.24-1.69
Chronic somatic conditions						
0 (54%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
1 (32%)	1.17	1.07-1.27	1.16	1.08-1.24	1.17	1.07-1.27
2 (10%)	1.29	1.13-1.46	1.22	1.09-1.37	1.14	0.99-1.30
≥3 (4%)	1.78	1.46-2.17	1.54	1.28-1.85	1.56	1.27-1.91
Musculoskeletal pain						
No symptoms (37%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
1 symptom (37%)	1.05	0.96-1.15	1.05	0.98-1.13	1.05	0.96-1.15
2 symptoms (11%)	0.97	0.85-1.10	0.95	0.85-1.06	0.94	0.82-1.07
≥ 3 symptoms (15%)	1.03	0.91-1.15	0.99	0.90-1.10	0.97	0.86-1.09
Gastrointestinal complains						
No (46%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
Yes (54%)	1.17	1.08-1.26	1.13	1.06-1.20	1.10	1.01-1.18
Insomnia						
Not frequent (81%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
Frequent (19%)	1.19	1.09-1.32	1.23	1.13-1.34	1.19	1.08-1.32
Self-rated health						
Good/very good (82%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
Poor/not so good (18%)	1.36	1.24-1.51	1.29	1.17-1.41	1.22	1.10-1.36

Alcohol consumption						
1-4 (59%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
Teetotaler (5%)	1.11	0.93-1.32	1.10	0.95-1.27	1.08	0.91-1.29
0 (but not teetotaler) (22%)	1.07	0.97-1.17	0.98	0.90-1.07	0.99	0.90-1.09
5-8 (11%)	1.08	0.95-1.22	1.02	0.92-1.13	0.92	0.81-1.05
>8 (3%)	1.17	0.95-1.44	1.05	0.88-1.27	1.04	0.85-1.27
CAGE (problematic drinking)						
No (87%)	1.00	Ref.	1.00	Ref.	1.00	Ref.
Yes (13%)	1.32	1.17-1.48	1.33	1.20-1.47	1.33	1.18-1.50

[1]Adjusted for sex, age, education, marital status, physical activity, body mass index, smoking, alcohol consumption and previous unemployment. The models with CAGE as exposure were not adjusted for alcohol consumption.

Duration of unemployment

Comparing health selection to (the first) unemployment spell lasting for >90 days and >180 days, respectively, the analyses showed higher hazard rates in the long term unemployed. To explore the effect of duration of unemployment, we did a Cox proportional hazard analysis on *time to end of any unemployment* as the dependent variable, instead of time to the first unemployment >90 or >180 days. The participants were entered into the study at any date(s) of unemployment (regardless of length); those with multiple spells contributed with data from each spell. Total N and number of failures varied according to missing values on exposure variable (maximum number of failures = 12,485). We hypothesized that those with ill health would have longer unemployment spells, and therefore lower hazard rates (because of longer time to event) than the more healthy groups. The result of the Cox analysis is presented in S-Table 8, and shows that ill health generally implies longer unemployment spells.

S-Table 8   Hazard ratios (HR) estimated on time to end of any unemployment according to baseline symptoms of anxiety and depression, chronic somatic conditions, musculoskeletal pain, gastrointestinal complains, insomnia, self-rated health, alcohol consumption and problematic drinking (CAGE). Complete case analysis with 95 % confidence intervals (CI). Total N in the analyses varies according to missing values on exposures, see table 1 in the paper.

	Model 1[1]		Model 2[1]		Model 3[1]	
	HR	95% CI	HR	95% CI	HR	95% CI
Anxiety and depression						
No symptoms	1.00	Ref.	1.00	Ref.	1.00	Ref.
Anxiety only	0.96	0.88-1.04	0.97	0.89-1.06	0.98	0.89-1.06
Depression only	1.01	0.86-1.20	1.04	0.88-1.23	1.04	0.87-1.23
Anxiety and depression	0.84	0.75-0.94	0.83	0.74-0.93	0.84	0.75-0.93
Chronic somatic conditions						
0	1.00	Ref.	1.00	Ref.	1.00	Ref.
1	0.94	0.88-1.00	0.94	0.88-1.00	0.94	0.88-1.00
2	0.93	0.84-1.02	0.91	0.83-1.00	0.91	0.83-1.00
≥ 3	0.94	0.82-1.07	0.92	0.80-1.06	0.93	0.81-1.07
Musculoskeletal pain						
No symptoms	1.00	Ref.	1.00	Ref.	1.00	Ref.
1 symptom	1.00	0.94-1.07	0.99	0.92-1.05	0.98	0.92-1.05
2 symptoms	0.99	0.91-1.08	0.98	0.89-1.07	0.98	0.90-1.07
≥ 3 symptoms	0.98	0.90-1.07	0.98	0.91-1.08	0.98	0.90-1.07
Gastrointestinal complains						
No	1.00	Ref.	1.00	Ref.	1.00	Ref.
Yes	0.93	0.88-0.98	0.94	0.89-0.99	0.94	0.89-0.99
Insomnia						
Not frequent	1.00	Ref.	1.00	Ref.	1.00	Ref.
Frequent	0.92	0.86-0.99	0.92	0.85-0.99	0.92	0.85-0.98
Self-rated health						
Good/very good	1.00	Ref.	1.00	Ref.	1.00	Ref.
Poor/not so good	0.94	0.87-1.00	0.92	0.85-0.99	0.92	0.86-1.00

Alcohol consumption						
1-4	1.00	Ref.	1.00	Ref.	1.00	Ref.
Teetotaler	0.84	0.74-0.97	0.83	0.72-0.95	0.83	0.73-0.96
0 (but not teetotaler)	0.89	0.83-0.96	0.89	0.83-0.96	0.90	0.83-0.97
5-8	0.93	0.85-1.01	0.93	0.85-1.02	0.93	0.85-1.01
>8	0.91	0.77-1.08	0.90	0.76-1.07	0.90	0.76-1.06
CAGE (problematic drinking)						
No	1.00	Ref.	1.00	Ref.	1.00	Ref.
Yes	1.02	0.94-1.11	1.03	0.95-1.12	1.04	0.96-1.13

[1]Adjusted for sex, age, education, marital status, physical activity, body mass index, smoking, alcohol consumption and previous unemployment. The models with CAGE as exposure were not adjusted for alcohol consumption.
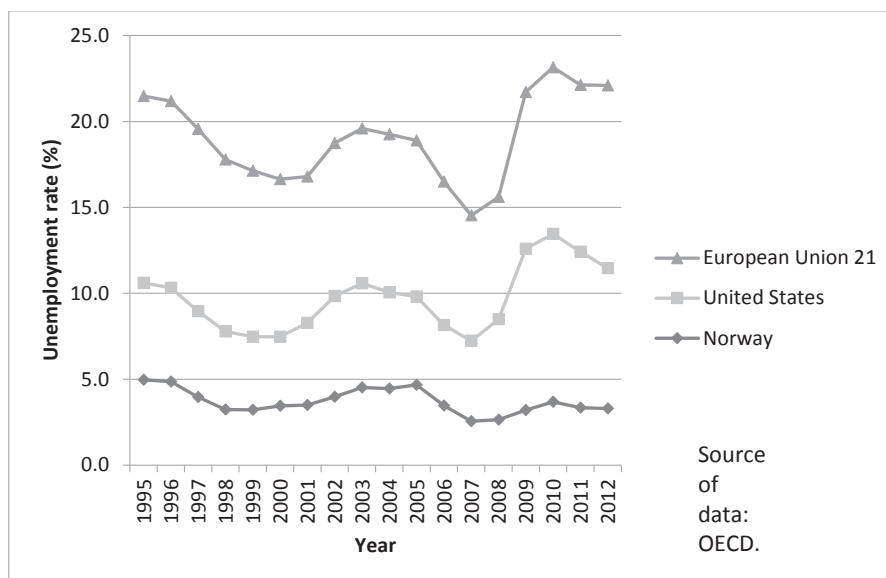
S-Figure 1   Annual unemployment rate (percent) in the European Union (EU 21), US and Norway, age group 15-64, 1995-2012

HUNT2 STUDY:

QUESTIONNAIRES 1 and 2

Available from: https://www.ntnu.no/hunt/skjema

Also, see the HUNT databank: https://hunt-db.medisin.ntnu.no/hunt-db/#studyp5 for responses on all questions (English and Norwegian).

Information from the HUNT databank:

Questionnaire 1 was sent together with the invitation to participate to the second HUNT survey. It was sent to everyone aged 20 years and older in the Nord-Trøndelag County. This represents the baseline questionnaire in HUNT2. The questionnaire was mainly returned when the respondent showed up at the screening station, however some returned it by mail. Time frame and context: Autumn 95-Spring 97. The questionnaire was manually punched into a data file by the former Norwegian Health investigation (1985-2001), now called the Norwegian Institute of Public Health.

Questionnaire 2 is differentiated by sex and age (men 20-69, women 20-69, men 70+ and women 70+) and the content varies a bit between sexes and the age-groups. It was given to everyone, based by sex and age, when meeting at the screening stations and should be returned by mail. The Q2 were mainly optical read at HUNT, however a few (about 6000) were manually punched by the earlier Norwegian Health investigation (1985-2001), now called the Norwegian Institute of Public Health. Time frame and context: There are two versions of the baseline questionnaire Q2 for Women Age 20-69 and Age 70+ and Men Age 20-69. The second version was first introdused in January 1996 while the first version was gradually fased out from January until June1996. Known challenges: If the sample for the study is participants responding to questionnaire 1, there might be a higher number reported for the specific study part than found in the data files. This is because there are some participants who only participated in the follow-up study parts without completing questionnaire 1.

In order to save space in the supplementary file of the current thesis, questionnaire 1 (all participants) and questionnaire 2 for women is included in the supplementary file. The questions used from questionnaire 2 in paper I were the same for men and women.

HELSEUNDERSØKELSEN
I NORD-TRØNDELAG

«JA, nå er det min tur!»

Personlig innbydelse

S pørreskjemaet er en viktig del av Helseundersøkelsen. Her finner du spørsmål om tidligere sykdom og om andre forhold som har betydning for helsa.Vennligst fyll ut skjemaet på forhånd og ta det med til Helseundersøkelsen. Dersom enkelte spørsmål er uklare, lar du dem bare stå ubesvarte til du møter fram, og drøfter dem med personalet som gjennomfører undersøkelsen. Alle svar vil bli behandlet strengt fortrolig.

Flere steder i skjemaet ber vi deg oppgi din alder da eventuell sykdom inntrådte. Hvis du ikke husker nøyaktig hvor gammel du var, skriver du et tall som er nærmest det du antar er korrekt.

Når resultatene fra undersøkelsen foreligger, vil det være enkelte som trenger ny undersøkelse hos egen lege. Dette vil du få beskjed om i det brevet som vi sender deg om dine resultater. Samtidig sender vi melding om resultatene dine til legen din. Det er derfor om å gjøre at du i rubrikken helt til slutt i skjemaet oppgir navnet på den allmennpraktiserende lege, kommunelege eller det helsesenter som du ønsker skal ta hånd om eventuell etterundersøkelse, og som vi skal sende resultatene til.

Med vennlig hilsen

Helsetjenesten i Nord-Trøndelag ● Statens helseundersøkelser ● Statens Institutt for Folkehelse

DET HANDLER OM HELSA DI

Hvordan er helsa di nå?

Bare ett kryss

Dårlig .... 12 ☐ 1
Ikke helt god .... ☐ 2
God .... ☐ 3
Svært god .... ☐ 4

LUFTVEGSPLAGER

	JA	NEI
Hoster du daglig i perioder av året?		

Hvis JA:

	JA	NEI
Er hosten vanligvis ledsaget av oppspytt? .. 14		
Har du hatt hoste med oppspytt i minst 3 mnd. sammenhengende i hvert av de to siste åra?		

	JA	NEI
Har du hatt noe anfall med pipende eller tung pust de siste 12 måneder? 16		

	JA	NEI	Alder første gang
Har du eller har du hatt astma? 17			år

	JA	NEI
Har du brukt eller bruker du astmamedisiner? 20		

HJERTE-KARSYKDOMMER, DIABETES

Har du, eller har du hatt:	JA	NEI	Alder første gang
Hjerteinfarkt 21			år
Angina pectoris (hjertekrampe) 24			år
Hjerneslag/hjerneblødning 27			år
Diabetes (sukkersyke).................. 30			år

Hva ble resultatet siste gang du målte blodtrykket ditt?

Bare ett kryss

Begynne med/fortsette med blodtrykksmedisin.... 33 ☐ 1
Komme til kontroll, men ikke ta blodtrykksmedisin ☐ 2
Ingen kontroll og ingen medisin nødvendig .... ☐ 3
Har aldri fått målt blodtrykket............................... ☐ 4

Bruker du medisin mot høyt blodtrykk?

Bare ett kryss

Nå .... 34 ☐ 1
Før, men ikke nå .... ☐ 2
Aldri brukt... ☐ 3

Har en eller flere av foreldre eller søsken hatt hjerteinfarkt (sår på hjertet) eller angina pectoris (hjertekrampe)?	JA	NEI	VET IKKE

149

STOFFSKIFTE

Har du noen gang fått påvist:	JA	NEI	Alder første gang
for høyt stoffskifte 36			år
for lavt stoffskifte 39			år
struma 42			år
annen sykdom i skjoldbruskkjertelen			år

Bruker du eller har du brukt noen av disse medisinene:

	JA	NEI	
Thyroxin 48			år
Neo-Mercazole 51			år

	JA	NEI	
Er du operert i skjoldbruskkjertelen			år
Har du fått radiojodbehandling 57			år

MUSKEL/SKJELETT-PLAGER

Har du i løpet av det siste året vært plaget med smerter og/eller stivhet i muskler og ledd som har vart i minst 3 måneder sammenhengende? 60	JA	NEI

Hvis NEI, gå videre til neste side øverst.
Hvis JA, svar på følgende:

Hvor har du hatt disse plagene?

	JA	NEI
Nakke 61		
Skuldre (aksler)...		
Albuer..		
Håndledd, hender..		
Bryst/mage 65		
Øvre del av ryggen.....................................		
Korsryggen..		
Hofter		
Knær		
Ankler, føtter... 70		

Hvis du har hatt plager i flere områder i minst 3 mnd. det siste året, setter du ring rundt det ja-krysset hvor plagene har vart lengst

Hvor lenge har plagene vart sammenhengende?

Svar for det området hvor plagene har vart lengst

Hvis under 1 år, oppgi antall mnd. . 71   Antall mnd.

Hvis 1 år eller mer, oppgi antall år.. 73   Antall år

Har plagene redusert din arbeidsevne det siste året?

Gjelder også hjemmearbeidende. Bare ett kryss

Nei/ubetydelig ☐   I noen grad ☐   I betydelig grad ☐   Vet ikke ☐

Har du vært sykmeldt pga. disse plagene det siste året? 76	JA	NEI	IKKE I ARBEID

Har plagene ført til redusert aktivitet i fritida?	JA	NEI

Har lege noen gang sagt at du har/har hatt noen av disse sykdommene:

	JA	NEI
Beinskjørhet (osteoporose) 78		
Fibromyalgi (fibrositt/kronisk smertesyndrom)		
Leddgikt (reumatoid artritt)		
Slitasjegikt (artrose)		
Bechterews sykdom 82		
Andre langvarige skjelett- eller muskelsykdommer		

Har du noen gang hatt:

	JA	NEI	Alder *siste* gang
Lårhalsbrudd 84			år
Brudd i håndledd/underarm 87			år
Nakkesleng (whiplash) 90			år
Skade som førte til sykehusinnleggelse			år

ANDRE PLAGER

I hvilken grad har du hatt disse plagene i de siste 12 månedene?

	Ikke plaget	Litt plaget	Mye plaget
Kvalme... 96	☐	☐	☐
Brystbrann/sure oppstøt	☐	☐	☐
Diaré	☐	☐	☐
Treg mage	☐	☐	☐
Hjertebank	☐	☐	☐
Åndenød 101	☐	☐	☐

ANDRE SYKDOMMER

Har du eller har du noen gang hatt:

	JA	NEI	Alder første gang
Epilepsi 102			år
Psykiske plager hvor du har søkt hjelp			år
Kreftsykdom 108			år
Annen langvarig sykdom 111			

DAGLIGE FUNKSJONER

Har du noen langvarig sykdom, skade eller lidelse av fysisk eller psykisk art som nedsetter dine funksjoner i ditt daglige liv? ... 112

JA	NEI

Langvarig: minst ett år

Hvis JA:

Hvor mye vil du si at dine funksjoner er nedsatt?

	Litt nedsatt	Middels nedsatt	Mye nedsatt
Er bevegelseshemmet 113	☐	☐	☐
Har nedsatt syn	☐	☐	☐
Har nedsatt hørsel	☐	☐	☐
Hemmet pga. kroppslig sykdom.	☐	☐	☐
Hemmet pga. psykiske plager... 117	☐	☐	☐

MENN fortsetter øverst neste spalte

BESVARES BARE AV KVINNER

Antall barn

Hvor mange barn har du født?......... 118
Sett 0 hvis du ikke har født barn

Hvis du har født barn, besvar:

Alder

Hvor gammel var du da du fødte ditt første barn? 120   år

Hvor gammel var du da du fødte ditt siste barn? 122   år
Besvares ikke hvis du har født bare ett barn

Hvor gammel var du da du fikk menstruasjon? 124   år
Sett 0 hvis du ikke noen gang har hatt menstruasjon

Fortsett neste spalte øverst

RØYKING

Røykte noen av de voksne hjemme da du vokste opp? 126

JA	NEI

Bor du, eller har du bodd, sammen med noen dagligrøykere etter at du fylte 20 år? 127

JA	NEI

Hvor lenge er du vanligvis daglig til stede i røykfylt rom? 128

Antall timer

Sett 0 hvis du ikke oppholder deg i røykfylt rom

Røyker du selv?

JA	NEI

Sigaretter daglig? 130
Sigarer/sigarillos daglig? ....
Pipe daglig?.. 132
Aldri røykt daglig .... *(Sett kryss)* ☐

Hvis du har røykt daglig tidligere, hvor lenge er det siden du sluttet?............. 134

Antall år

Hvis du røyker daglig nå eller har røykt tidligere:

Hvor mange sigaretter røyker eller røykte du vanligvis daglig? 136

Antall sigaretter

Hvor gammel var du da du begynte å røyke daglig?..................................... 140

Alder

år

Hvor mange år tilsammen har du røykt daglig? 142

Antall år

KAFFE/TE/ALKOHOL

Hvor mange kopper kaffe/te drikker du daglig?
Sett 0 hvis du ikke drikker kaffe/te daglig

Antall kopper

Kokekaffe 144
Annen kaffe 146
Te 148

Alkohol:
Er du total avholdsmann/-kvinne? 150

JA	NEI

Hvor mange ganger i måneden drikker du vanligvis alkohol? 151

Antall ganger

Regn ikke med lettøl. Sett 0 hvis mindre enn 1 gang i mnd.

Hvor mange glass øl, vin eller brennevin drikker du vanligvis i løpet av to uker?

Øl	Vin	Brennevin
glass	glass	glass

Regn ikke med lettøl.
Sett 0 hvis du ikke drikker alkohol   153

FYSISK AKTIVITET

I FRITIDA
Hvordan har din fysiske aktivitet i fritida vært det siste året? *Tenk deg et ukentlig gjennomsnitt for året.*

Arbeidsveg regnes som fritid

		Timer pr. uke		
	Ingen	Under 1	1-2	3 og mer
Lett aktivitet *(ikke svett/andpusten)* 159	☐	☐	☐	☐
Hard fysisk aktivitet *(svett/andpusten)* 160	☐ 1	☐ 2	☐ 3	☐ 4

UNDER ARBEID
Hvis du er i lønnet eller ulønnet arbeid:

Hvorledes vil du beskrive arbeidet ditt?
Bare ett kryss

For det meste stillesittende arbeid
(f.eks. skrivebordsarbeid, montering) 161   ☐ 1

Arbeid som krever at du går mye
(f.eks. ekspeditørarb., lett industriarb., undervisning) ....   ☐ 2

Arbeid hvor du går og løfter mye
(f.eks. postbud, pleier, bygningsarbeid) ....   ☐ 3

Tungt kroppsarbeid
(f.eks. skogsarbeid, tungt jordbruksarb.,tungt bygningsarb.)   ☐ 4

Bla om!

HVORLEDES FØLER DU DEG?

Har du de siste to ukene følt deg:

	Nei	Litt	En god del	Svært mye
Trygg og rolig? 162	☐	☐	☐	☐
Glad og optimistisk?	☐	☐	☐	☐
Har du følt deg:				
Nervøs og urolig?	☐	☐	☐	☐
Plaget av angst? 165	☐	☐	☐	☐
Irritabel?	☐	☐	☐	☐
Nedfor/deprimert?	☐	☐	☐	☐
Ensom? 168	☐	☐	☐	☐
	1	2	3	4

*Her kommer noen flere spørsmål om hvorledes du føler deg. For hvert spørsmål setter du kryss for ett av de fire svarene som best beskriver dine følelser **den siste uka**. Ikke tenk for lenge på svaret - de spontane svarene er best*

Jeg gleder meg fortsatt over ting slik jeg pleide før 169
Avgjort like mye .... ☐1   Bare lite grann .... ☐3
Ikke fullt så mye .... ☐2   Ikke i det hele tatt .... ☐4

Jeg har en urofølelse som om noe forferdelig vil skje 170
Ja, og noe svært ille .... ☐1   Litt, bekymrer meg lite . ☐3
Ja, ikke så veldig ille ... ☐2   Ikke i det hele tatt .... ☐4

Jeg kan le og se det morsomme i situasjoner 171
Like mye nå som før .... ☐1   Avgjort ikke som før .... ☐3
Ikke like mye nå som før ☐2   Ikke i det hele tatt ...... ☐4

Jeg har hodet fullt av bekymringer 172
Veldig ofte .... ☐1   Av og til .... ☐3
Ganske ofte .... ☐2   En gang i blant .... ☐4

Jeg er i godt humør 173
Aldri .... ☐1   Ganske ofte .... ☐3
Noen ganger .... ☐2   For det meste .... ☐4

Jeg kan sitte i fred og ro og kjenne meg avslappet 174
Ja, helt klart .... ☐1   Ikke så ofte .... ☐3
Vanligvis .... ☐2   Ikke i det hele tatt .... ☐4

Jeg føler meg som om alt går langsommere 175
Nesten hele tiden .... ☐1   Fra tid til annen .... ☐3
Svært ofte .... ☐2   Ikke i det hele tatt .... ☐4

Jeg føler meg urolig som om jeg har sommerfugler i magen 176
Ikke i det hele tatt .... ☐1   Ganske ofte .... ☐3
Fra tid til annen .... ☐2   Svært ofte .... ☐4

Jeg bryr meg ikke lenger om hvordan jeg ser ut 177
Ja, har sluttet å bry meg ☐1   Kan hende ikke nok .... ☐3
Ikke som jeg burde ...... ☐2   Bryr meg som før .... ☐4

Jeg er rastløs som om jeg stadig må være aktiv 178
Uten tvil svært mye ..... ☐1   Ikke så veldig mye .... ☐3
Ganske mye .... ☐2   Ikke i det hele tatt .... ☐4

Jeg ser med glede frem til hendelser og ting 179
Like mye som før .... ☐1   Avgjort mindre enn før . ☐3
Heller mindre enn før ... ☐2   Nesten ikke i det hele tatt ☐4

Jeg kan plutselig få en følelse av panikk 180
Uten tvil svært ofte ...... ☐1   Ikke så veldig ofte .... ☐3
Ganske ofte .... ☐2   Ikke i det hele tatt .... ☐4

Jeg kan glede meg over gode bøker, radio og TV 181
Ofte .... ☐1   Ikke så ofte .... ☐3
Fra tid til annen .... ☐2   Svært sjelden .... ☐4

UTDANNING

Hvilken utdanning er den høyeste du har fullført?

Grunnskole 7-10 år, framhaldsskole,
folkehøgskole .... 182 ☐1

Realskole, middelskole, yrkesskole, 1-2 årig
videregående skole... ☐2

Artium, øk.gymnas, allmennfaglig retning
i videregående skole .... ☐3

Høgskole/universitet, mindre enn 4 år .... ☐4

Høgskole/universitet, 4 år eller mer .... ☐5

ARBEID

Hva slags arbeidssituasjon har du nå?
Ett eller flere kryss

Lønnet arbeid .... 183 ☐
Selvstendig næringsdrivende............................. ☐
Heltids husarbeid .... ☐
Utdanning, militærtjeneste .... ☐
Arbeidsledig, permittert...................................... ☐
Pensjonist/trygdet.. 188 ☐

Hvor mange timer lønnet arbeid har du i uka? 189

Antall timer

JA	NEI

Har du skiftarbeid, nattarbeid eller går vakt?

ALT I ALT

Når du tenker på hvordan du har det for tida, er du stort sett fornøyd med tilværelsen eller er du stort sett misfornøyd?
Bare ett kryss

Svært fornøyd .... 192 ☐1
Meget fornøyd .... ☐2
Ganske fornøyd... ☐3
Både/og.. ☐4
Nokså misfornøyd .... ☐5
Meget misfornøyd.. ☐6
Svært misfornøyd.. ☐7

DIN LEGE

Hvis denne helseundersøkelsen viser at du bør undersøkes nærmere, hvilken allmennpraktiserende lege/kommunelege ønsker du skal foreta undersøkelsen?
Skriv navnet på legen her: 193

	Ikke skriv her

Takk for utfyllingen!

Nok en gang:

Velkommen til undersøkelsen!

NORD-
TRØNDELAG

hunt

Helseundersøkelsen i Nord-Trøndelag

Takk for frammøtet til undersøkelsen!
Vi vil også be deg fylle ut dette spørreskjemaet. Opplysningene vil bli brukt i større forskningsarbeider om fore-
byggende helsearbeid. Noen av spørsmålene likner på spørsmål du har svart på i det skjemaet du fylte ut
heime og leverte ved frammøte til helseundersøkelsen. Det er likevel viktig at du svarer på alle spørsmålene
også i dette skjemaet. Det utfylte skjemaet returneres i vedlagte svarkonvolutt. Porto er betalt.
Alle opplysningene er underlagt streng taushetsplikt.

Vennlig hilsen
Helsetjenesten i Nord-Trøndelag
Statens Institutt for Folkehelse Statens helseundersøkelser

> *Hvis du ikke ønsker å besvare spørre-*
> *skjemaet, sett kryss her og returner*
> *skjemaet. Da slipper du purring.*
> **Jeg ønsker ikke å besvare skjemaet** ○

UTFYLLING

Dato for utfylling av skjema: / 19 19

OPPVEKST

I hvilken kommune bodde du da du fylte 1 år?
*Hvis du ikke bodde i Norge, oppgi **land** i stedet for kommune.*

24

ARBEID

Nåværende eller tidligere arbeid:
Hva slags inntektsgivende arbeid har du og event. din
ektefelle/samboer? *Hvis du/dere ikke har inntektsgivende arbeid*
nå: Oppgi det siste yrket.

	Deg selv	Ektefelle/ samboer
Spesialarbeider eller ufaglært arbeider	25 ☐	36 ☐
Fagarbeider, handverker, formann	☐	☐
Underordnet funksjonær (f.eks. butikk, kontor, off. tjenester)	☐	☐
Fagfunksjonær (f.eks. sykepleier, tekniker, lærer)	☐	☐
Overordnet stilling i off. eller privat virksomhet	☐	☐
Sjåfør	30 ☐	41 ☐
Gårdbruker eller skogeier	☐	☐
Fisker	☐	☐
Selvstendig i akademisk erverv (f.eks. tannlege, advokat)	☐	☐
Annen selvstendig næringsvirksomhet	☐	☐
Har ikke vært i inntektsgivende arbeid	35 ☐	46 ☐

> *Hvis du NÅ ikke har inntektsgivende arbeid eller du ikke*
> *har heltids husarbeid: Gå til BOLIG.*

Har du i løpet av de siste 12 månedene
hatt sykefravær: Ja Nei
med egenmelding   47 ☐ ☐
med sykmelding fra lege   48 ☐ ☐

Hvis «Ja»: **Hvor lenge *tilsammen*?** *Bare ett kryss*
2 uker eller mindre   49 ☐ 1
2-8 uker   ☐ 2
Mer enn 8 uker   ☐ 3

Har du i løpet av de siste 12 månedene   Ja Nei
vurdert å skifte yrke eller arbeidsplass?   50 ☐ ☐

Er arbeidet ditt så fysisk anstrengende at du ofte er sliten
i kroppen etter en arbeidsdag? *Bare ett kryss* 51
Ja, nesten alltid   ☐ 1 Ganske sjelden   ☐ 3
Ganske ofte   ☐ 2 Aldri, eller nesten aldri   ☐ 4

Krever arbeidet ditt så mye konsentrasjon og oppmerk-
somhet at du ofte føler deg utslitt etter en arbeidsdag? 52
Ja, nesten alltid   ☐ 1 Ganske sjelden   ☐ 3
Ganske ofte   ☐ 2 Aldri, eller nesten aldri   ☐ 4

Hvordan trives du alt i alt med arbeidet ditt? 53
Veldig godt   ☐ 1 Ikke særlig godt   ☐ 3
Godt   ☐ 2 Dårlig   ☐ 4

BOLIG

Hvem bor du sammen med?
Ett kryss for hver linje og angi antall   Ja Nei
Ektefelle/samboer   54 ☐ ☐ Antall
Andre personer over 18 år   55 ☐ ☐
Personer under 18 år   58 ☐ ☐ Antall

Hvor mange av barna har plass i barnehage? 61

Hvilken type bolig bor du i? *Bare ett kryss*
Enebolig/villa   63 ☐ 1
Gårdsbruk   ☐ 2
Blokk/terrasseleilighet   ☐ 3
Rekkehus/2-4 mannsbolig   ☐ 4
Annen bolig   ☐ 5

Hvor stor er din boenhet?   64 kvm

   Ja Nei
Er det heldekkende tepper i stua?   67 ☐ ☐
Er det heldekkende tepper på ditt soverom?   ☐ ☐
Er det katt i boligen?   69 ☐ ☐
Er det hund i boligen?   ☐ ☐
Er det andre pelskledde dyr eller fugler i boligen?   ☐ ☐

ØKONOMI

Mottar du noen av følgende *offentlige* ytelser? Ja Nei
Sykepenger/sykelønn/rehabiliteringspenger   72 ☐ ☐
Ytelser under yrkesrettet attføring   ☐ ☐
Uførepensjon   74 ☐ ☐
Alderspensjon   ☐ ☐
Sosialstøtte   ☐ ☐
Arbeidsløshetstrygd   ☐ ☐
Overgangsstønad   ☐ ☐
Etterlattepensjon   79 ☐ ☐
Andre ytelser   ☐ ☐

Har det i løpet av det siste året hendt at husholdningen
har hatt vansker med å klare de løpende utgifter til mat,
transport, bolig og liknende? *Bare ett kryss* 81
Ja, ofte   ☐ 1 Ja, en sjelden gang   ☐ 3
Ja, av og til   ☐ 2 Nei, aldri   ☐ 4

VENNER

Hvor mange gode venner har du?   Antall
Regn med de du kan snakke fortrolig med og
som kan gi deg god hjelp når du trenger det   82
Tell ikke med de du bor sammen med, men regn med andre
slektninger

   Ja Nei
Føler du at du har mange nok gode venner?   84 ☐ ☐

Hvor ofte tar du vanligvis del i foreningsvirksomhet som
f.eks. syklubb, idrettslag, politiske lag, religiøse eller
andre foreninger? 85
Aldri, eller noen få ganger i året ☐ 1 Omtrent en gang i uka ☐ 1
1-2 ganger i måneden ☐ 2 Mer enn en gang i uka ☐ 2

DER DU BOR

Svar ut fra nærmiljøet, dvs. nabolaget/grenda:
Ett kryss for hvert spørsmål

Jeg føler et sterkt fellesskap med de som bor her 86
Helt enig ☐1   Delvis enig ☐2   Usikker ☐3   Delvis uenig ☐4   Helt uenig ☐5

Selv om noen tar initiativ, er det ingen som blir med på det som settes i gang her 87
Helt enig ☐   Delvis enig ☐   Usikker ☐   Delvis uenig ☐   Helt uenig ☐

Hvis jeg flytter herfra, vil jeg lengte tilbake 88
Helt enig ☐   Delvis enig ☐   Usikker ☐   Delvis uenig ☐   Helt uenig ☐

Man kan ikke stole på hverandre her 89
Helt enig ☐   Delvis enig ☐   Usikker ☐   Delvis uenig ☐   Helt uenig ☐

Når noe skal gjøres her, er det lett å få folk med 90
Helt enig ☐   Delvis enig ☐   Usikker ☐   Delvis uenig ☐   Helt uenig ☐

Det er vanskelig å få kontakt med folk her 91
Helt enig ☐   Delvis enig ☐   Usikker ☐   Delvis uenig ☐   Helt uenig ☐

Det er godt samhold her 92
Helt enig ☐   Delvis enig ☐   Usikker ☐   Delvis uenig ☐   Helt uenig ☐

Ingen orker å ta initiativ til noe lenger her 93
Helt enig ☐   Delvis enig ☐   Usikker ☐   Delvis uenig ☐   Helt uenig ☐

Folk trives godt her 94
Helt enig ☐   Delvis enig ☐   Usikker ☐   Delvis uenig ☐   Helt uenig ☐

Folk her kan ha store problemer uten at naboen vet noe 95
Helt enig ☐   Delvis enig ☐   Usikker ☐   Delvis uenig ☐   Helt uenig ☐

Det er alltid noen som tar initiativ til å løse nødvendige oppgaver her 96
Helt enig ☐   Delvis enig ☐   Usikker ☐   Delvis uenig ☐   Helt uenig ☐

Folk snakker lite med hverandre her 97
Helt enig ☐1   Delvis enig ☐2   Usikker ☐3   Delvis uenig ☐4   Helt uenig ☐5

SYKDOM I FAMILIEN

Kryss av for de slektningene som har eller har hatt noen av sykdommene. Kryss av for "ingen" hvis ingen av slektningene har hatt denne sykdommen: *Evt. flere kryss på hver linje*

	Mor	Far	Bror	Søster	Barn	Ingen
Hjerneslag eller hjerneblødning 98	☐	☐	☐	☐	☐	☐
Hjerteinfarkt før 60 års alder 104	☐	☐	☐	☐	☐	☐
Astma 110	☐	☐	☐	☐	☐	☐
Allergi 116	☐	☐	☐	☐	☐	☐
Kreftsykdom 122	☐	☐	☐	☐	☐	☐
Høyt blodtrykk 128	☐	☐	☐	☐	☐	☐
Psykiske plager 134	☐	☐	☐	☐	☐	☐
Osteoporose (benskjørhet) 140	☐	☐	☐	☐	☐	☐
Diabetes (sukkersyke) 146	☐	☐	☐	☐	☐	☐
Alder da de fikk diabetes 152	år	år	år	år	år	

Har du *selv* høysnue eller neseallergi? 162   Ja ☐ Nei ☐

BRUK AV HELSETJENESTER

Har du i løpet av de siste 12 månedene vært hos:
Ett kryss på hver linje   Ja Nei

allmennpraktiserende lege (kommunelege, privatpraktiserende lege, turnuskandidat) 163 ☐ ☐
bedriftslege ☐ ☐
lege ved sykehus (uten at du var innlagt) ☐ ☐
annen lege ☐ ☐
fysioterapeut ☐ ☐
kiropraktor ☐ ☐
homøopat 169 ☐ ☐
annen behandler (naturmedisiner, fotsoneterapeut, håndspålegger, "healer", "synsk", e.l.) ☐ ☐

Ja Nei
Har du vært innlagt i sykehus de siste 5 åra? 171 ☐ ☐

ALKOHOL

Hvis du er totalavholdskvinne: Gå til KOSTHOLD.

Ett kryss for hver spørsmål

Har du noen gang følt at du burde redusere alkoholforbruket ditt? 172   Ja ☐ Nei ☐

Har andre noen gang kritisert alkoholbruken din? 173   Ja ☐ Nei ☐

Har du noen gang følt ubehag eller skyldfølelse pga. alkoholbruken din? 174   Ja ☐ Nei ☐

Har det å ta en drink noen gang vært det første du har gjort om morgenen for å roe nervene, kurere bakrus eller som en oppkvikker? 175   Ja ☐ Nei ☐

KOSTHOLD

Hvor mange måltider spiser du vanligvis daglig (middag og brødmåltid)? 176   Antall ☐

Hvor mange dager i uka spiser du varm middag?

Hva slags type brød (kjøpt eller hjemmebakt) spiser du vanligvis? *Inntil to kryss*

Brødtypen ligner mest på 178	Loff	Fint brød	Kneipp- brød	Grov- brød	Knekke- brød
	☐	☐	☐	☐	☐

Hva slags *fett* blir vanligvis brukt i din husholdning?
Ett kryss for matlaging og ett kryss for brød

	Til matlaging	På brød
Bruker *ikke* smør eller margarin	183 ☐1	184 ☐1
Meierismør	☐2	☐2
Hard margarin	☐3	☐3
Bløt (soft) margarin	☐4	☐4
Smør/margarin blanding	☐5	☐5
Lettmargarin	☐6	☐6
Oljer	☐7	

MEDISINBRUK

Har du i deler av de siste 12 måneder brukt noen medisiner daglig eller nesten daglig? 185   Ja ☐ Nei ☐

Hvis «Ja»:
Angi hvor mange måneder du brukte følgende medisiner: *Sett 0 hvis du ikke har brukt medisinene*

	Antall mndr.		Antall mndr.
smertestillende 186		hjertemedisin (ikke blodtrykksmedisin)	
sovemedisin 188			
beroligende medisin		annen medisin	
medisin mot depresjon		*Kosttilskudd:*	
allergimedisin 194		jerntabletter 202	
astmamedisin 196		vitamintilskudd	
		tran/fiskeoljer 206	

Hvor ofte har du brukt avslappende/beroligende medisin eller sovemedisin den siste måneden? 208
Daglig ☐1   Sjeldnere enn hver uke ☐3
Hver uke, men ikke hver dag ☐2   Aldri ☐4

HODEPINE

Har du vært plaget av hodepine i løpet av de siste 12 måneder? 209
Ja, anfallsvis (migrene)........ ☐ 1
Ja, annen slags hodepine.... ☐ 2
Nei .... ☐ 3

Antall anfall siste 12 mndr. 210
☐

> *Hvis «Nei»: Gå til MUSKEL-/SKJELETTPLAGER*

Omtrent hvor mange dager i pr. måned har du hodepine?
Mindre enn 7 dager ☐ 1   7 til 14 dager ☐ 2   Mer enn 14 d. ☐ 3

Hvor lenge varer hodepinen vanligvis hver gang? 213
Mindre enn 4 timer ☐ 1   4 timer–3 døgn ☐ 2   Mer enn 3 døgn ☐ 3

Hvor ofte er hodepinen preget av eller ledsaget av:
Ett kryss på hver linje

	Sjelden eller aldri	Av og til	Ofte
bankende/dunkende smerte 214	☐	☐	☐
pressende smerte	☐	☐	☐
halvsidighet, alltid samme side	☐	☐	☐
halvsidighet, vekselvis h. og v. side	☐	☐	☐
smerter i «hele hodet»	☐	☐	☐
kvalme 219	☐	☐	☐
lys- og/eller lydskyhet	☐	☐	☐
forverring ved fysisk aktivitet...........	☐	☐	☐
synsforstyrrelser *før* hodepine 222	☐	☐	☐

Hvor mange tabletter/stikkpiller har du eventuelt brukt av disse medisinene *alt i alt i løpet av den siste måneden?*
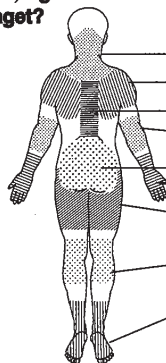*Skriv 0 hvis du ikke har brukt medisinen.*
Cafergot ☐ 223   Anervan ☐ 225   Imigran ☐ 227

MUSKEL-/SKJELETTPLAGER

Har du hatt plager (smerter, verk, ubehag) i muskler og/eller ledd i *den siste måneden?* 229   Ja Nei ☐ ☐

Hvis «Ja»: **Hvor har du hatt disse plagene** *(ett eller flere kryss)* **og omtrent hvor mange dager tilsammen var du plaget?**

Plager (Sett kryss)	Antall dager
Nakke 230	
Skuldre/aksler.....233	
Øvre del av ryggen	
Albuer 239	
Korsryggen 242	
Handledd/hender 245	
Hofter...................248	
Knær....................251	
Ankler/føtter 254	

Dersom flere kryss: Sett ring rundt krysset der plagen var verst

Har plagene hindret deg i å utføre daglige aktiviteter den siste måneden?   Ja Nei
I arbeidet...257 ☐ ☐
I fritida ....258 ☐ ☐

SMERTER I BEINA

Har du sår på tå, fot eller ankel som ikke vil gro? 259   Ja Nei ☐ ☐

Har du smerter i det ene eller i begge beina når du går? ....260 ☐ ☐
Har du oppsøkt lege p.g.a. smerter i beina? ....261 ☐ ☐

> *Hvis «NEI» på disse spørsmålene: Gå til MENSTRUASJON*

Ja Nei
Kan du gå lenger enn 50 meter? ....262 ☐ ☐
Forsvinner smerten når du står stille en stund? 263 ☐ ☐
Må du sette deg for at smerten skal gå over? 264 ☐ ☐

Hvor gjør det mest vondt? *Ett kryss* 265
Fot ☐   Legg ☐   Lår ☐   Hofte ☐

Ja Nei
Har du smerter i beina når du er i ro? ....266 ☐ ☐
Er smertene verst når du ligger i senga? ....267 ☐ ☐
Blir søvnen forstyrret av smertene? ....268 ☐ ☐
Får du mindre vondt når beinet ligger høyt? ....269 ☐ ☐
Får du mindre vondt når beinet ligger lavt, f.eks. om beinet henger utfor sengekanten? ....270 ☐ ☐
Bedres smertene når du står opp og går litt? ....271 ☐ ☐

MENSTRUASJON

Ja Nei
Har du menstruasjon fremdeles?........................... 272 ☐ ☐

Hvis «Nei»: **Hvor gammel var du da den sluttet?** 273 ☐ år

Ja Nei Vet ikke
Er du gravid nå? .... 275 ☐ ☐ ☐

Ja Nei
Har du innsatt spiral nå? .... 276 ☐ ☐

Når hadde du siste menstruasjon? 277   Dag Måned År ☐
Husker du ikke dag, bare angi måned og år, husker du bare år, angi år.

> Menstruasjonen din de siste 12 måneder:

Har du det siste året hatt regelmessige menstruasjoner?
At menstruasjonen har vart omtrent like lenge hver gang med omtrent like lange mellomrom 283   Ja Nei Usikker ☐ ☐ ☐

Hvor mange dager hadde du blødning siste gang du hadde menstruasjon? 284   Antall dager ☐

Hvor mange dager var du uten blødning mellom nest siste og siste menstruasjon? ... 286   Antall dager ☐

Har menstruasjonen din det siste året uteblitt i mer enn 3 måneder uten at du var gravid? 289   Ja Nei ☐ ☐

Hvis «Ja»: **Hvor mange måneder i trekk har du vært uten menstruasjonsblødninger?** 290   Antall mndr. ☐

Ja Nei
Hvis «Ja»: **Oppsøkte du lege?** .... 292 ☐ ☐

> Menstruasjonen tidligere (dvs. før de siste 12 månedene):

Har menstruasjonen din tidligere uteblitt uten at du var gravid? 293   Ja Nei ☐ ☐

Hvis «Ja»: **Hvor lenge og hvor ofte var den borte sammenhengende?** *Sett kryss eventuelt flere steder*

	1 gang	2 ganger	Oftere
3–6 måneder.............................. 294	☐	☐	☐
6–12 måneder............................	☐	☐	☐
Over ett år................................. 296	☐	☐	☐

OPERASJONER I UNDERLIVET

	Ja	Nei	Vet ikke
Har du noen gang blitt operert i underlivet?... 297	☐	☐	☐

Hvis «Ja»: **Kryss av for hver operasjon:**

	Ja	Nei	Vet ikke
Fjernet deler av eller bare én eggstokk......298	☐	☐	☐
Fjernet begge eggstokkene (totalt) 299	☐	☐	☐

Hvis du har fjernet begge eggstokkene, hvor gammel var du da? .... 300 ☐ år

	Ja	Nei	Vet ikke
Operert for endometriose 302	☐	☐	☐
Sterilisert	☐	☐	☐
Utskraping fra livmor (sykehus)	☐	☐	☐
Fjernet hele livmoren 305	☐	☐	☐

Hvis du har fjernet hele livmoren, hvor gammel var du da? .... 306 ☐ år

P-PILLER

Har du noen gang brukt p-piller, minipiller inkludert? 308   Ja ☐ Nei ☐

Hvis «Ja»: **Hvor gammel var du første gang du brukte p-piller?** .... 309 ☐ år

Hvor lenge har du brukt p-piller i alt? .... 311 ☐ år

Hvis under ett år, antall måneder 313 ☐ mndr.

Bruker du p-piller nå? .... Ja ☐ Nei ☐

Hvilket merke bruker du? 316 [_____]

HORMONBEHANDLING

Utenom p-piller
Har du noen gang brukt medisiner som inneholder østrogen? Vanlige navn på slike medisiner er: Cyclabil, Estraderm, Kilogest, Ovesterin, Progynova, Trisekvens.

	Nå	Før	Aldri
Tabletter eller plaster 318	☐	☐	☐
Krem eller stikkpiller 319	☐	☐	☐

Hvis «Ja»: **Hvor gammel var du første gang du fikk østrogenmedisin, og omtrent hvor mange år brukte du slik medisin?**

	Din alder	Antall år
Tabletter eller plaster 320	☐	☐
Krem eller stikkpiller 324	☐	☐

Hvis du bruker østrogenmedisin nå, hvilket merke bruker du? 328 [_____]

PROBLEMER MED Å BLI GRAVID

Har du noen gang prøvd i mer enn ett år å bli gravid? 329   Ja ☐ Nei ☐

Hvis «Ja»: **Hvor gammel var du første gang du hadde problemer med å bli gravid?** .... 330 ☐ år

Har du noen gang oppsøkt lege fordi du hadde problemer med å bli gravid? 332   Ja ☐ Nei ☐

GRAVIDITETER, FØDSLER OG AMMING

Hvor mange ganger har du vært gravid totalt?
Regn med alle svangerskap, spontane eller selvbestemte aborter, så vel som fødsler (også dødfødsler) 333 ☐ ganger

Hvor mange barn har du født? .... 335 ☐ barn

Fyll ut for hvert barn (de første 7) opplysninger om fødselsår og omtrent antall måneder du ammet hvert barn og antall måneder menstruasjonen din var borte etter fødselen (fylles ut også for dødfødte eller for barn som er døde senere i livet).

Barn	Fødselsår	Antall måneder med amming	Antall blødningsfrie måneder
1 336	19	☐	☐
2 342	19	☐	☐
3 348	19	☐	☐
4 354	19	☐	☐
5 360	19	☐	☐
6 366	19	☐	☐
7 372	19	☐	☐

URINLEKKASJE

	Ja	Nei
Har du ufrivillig urinlekkasje? 378	☐	☐

| *Hvis «Nei»: Gå til KALK I KOSTEN ...* |

Hvor ofte har du urinlekkasje? 379
sjeldnere enn en gang pr. måned .... ☐
en eller flere ganger pr. måned .... ☐
en eller flere ganger pr. uke .... ☐
hver dag og/eller natt .... ☐

Hvor mye urin lekker du vanligvis hver gang? 380
dråper eller lite ☐ små skvetter ☐ større mengder ☐

	Ja	Nei
Har du lekkasje av urin i forbindelse med hosting, nysing, latter, tunge løft 381	☐	☐
Har du lekkasje av urin i forbindelse med plutselig og sterk vannlatingstrang? 382	☐	☐

Hvor lenge har du hatt urinlekkasje? 383
0-5 år ☐   5-10 år ☐   Over 10 år ☐

	Ja	Nei
Har du søkt lege på grunn av urinlekkasje? 384	☐	☐

Hvordan opplever du lekkasjeplagene dine? 385 *Ett kryss*
ikke noe problem ☐   mye plaget ☐
en liten plage ☐   svært stort problem ☐
en del plaget ☐

KALK I KOSTEN OG KOSTTILSKUDD

Hvor mange glass melk (alle sorter, også drikkeyoghurt) drikker du vanligvis daglig? *Bare ett kryss* 386
Ingen ....☐ 1   1–2 glass ......☐ 3
Mindre enn ett ...☐ 2   3 eller mer ....☐ 4

Hvor mange brødskiver med kvitost spiser du vanligvis daglig? *Bare ett kryss*
Ingen ....☐ 1   1–2 skiver ....☐ 3
Mindre enn en ...☐ 2   3 eller mer ...☐ 4

Bruker du vanligvis noen av disse kosttilskuddene?

	Ja	Nei
vitamin D-tilskudd 388	☐	☐
kalktabletter eller benmel	☐	☐

HUMØR OG TRIVSEL

Ett kryss på hver linje

Angi hvordan du har følt deg den siste måneden:

	Aldri	Noen ganger	Ganske ofte	For det meste
i godt humør 390	☐	☐	☐	☐
i dårlig humør 391	☐	☐	☐	☐

	Svært treg	Ganske treg	Ganske rask	Svært rask
Er du rask til å oppfatte et humoristisk poeng? 392	☐	☐	☐	☐

Er du enig i at det er noe ansvarsløst over folk som stadig prøver å være morsomme? 393

Nei, slett ikke ....☐1   Ganske enig ....☐3
I noen grad ....☐2   Ja, absolutt ....☐4

Er du en munter person? 394

Nei, slett ikke ....☐1   Ganske munter ....☐3
I noen grad ....☐2   Ja, absolutt ....☐4

SINNE

Sett kryss på det svaret som best beskriver deg i forhold til de to påstandene nedenfor:

Jeg gir uttrykk for mitt sinne, og andre mennesker vet at jeg er sint 395

Nesten aldri ....☐1   Ganske ofte ....☐3
Noen ganger ....☐2   Nesten alltid ....☐4

Jeg koker av sinne, men jeg viser det ikke til andre 396

Nesten aldri ....☐1   Ganske ofte ....☐3
Noen ganger ....☐2   Nesten alltid ....☐4

HVILE OG AVSLAPPING

Hvor mange timer tilbringer du *vanligvis* i *liggende* stilling i løpet av et døgn?
(nattesøvn, middagshvil) 397   [Antall timer]

Hvor mange timer tilbringer du *vanligvis* i *sittende* stilling i løpet av et døgn?
(arbeid, måltider, TV, bil etc.) 399   [Antall timer]

Hvor ofte er du plaget av søvnløshet? 401

Aldri, eller noen få ganger i året ....☐1
1–2 ganger i måneden ....☐2
Omtrent 1 gang i uka ....☐3
Mer enn en gang i uka ....☐4

Har du siste år vært plaget av søvnløshet slik at det har gått ut over arbeidsevnen?...........402   Ja ☐ Nei ☐

Har du i løpet av siste måned hatt innsovnings-problemer? *Bare ett kryss* 403

Nesten hver natt ....☐1   Av og til ....☐3
Ofte ....☐2   Aldri ....☐4

Har du i løpet av siste måned våknet for tidlig og ikke fått sove igjen? *Bare ett kryss* 404

Nesten hver natt ....☐1   Av og til ....☐3
Ofte ....☐2   Aldri ....☐4

Har du i løpet av siste måned vært plaget av nervøsitet (irritabel, urolig, anspent eller rastløs)? 405

Nesten hele tida ....☐1
Ofte ....☐2
Av og til ....☐3
Aldri ....☐4

HVORDAN DU HAR HATT DET

Har det noen gang i løpet av ditt liv vært *sammenhengende perioder på 2 uker eller mer* da du:

	Ja	Nei
følte deg deprimert, trist og nedfor........................406	☐	☐
hadde problemer med matlysten eller spiste alt for lite	☐	☐
var plaget av kraftløshet eller mangel på overskudd	☐	☐
virkelig bebreidet deg selv og følte deg verdiløs ...	☐	☐
hadde problemer med å konsentrere deg eller vanskelig for å ta beslutninger	☐	☐
hadde minst tre av de problemene som er nevnt ovenfor samtidig..411	☐	☐

HVORDAN DU SER PÅ DEG SELV

Folk ser på seg selv på ulike måter. Kryss av for hvert utsagn hvor enig eller uenig du er. *Ett kryss på hver linje*

	Svært enig	Enig	Uenig	Svært uenig
Jeg har en positiv holdning til meg selv 412	☐	☐	☐	☐
Jeg føler meg virkelig ubrukelig til tider..413	☐	☐	☐	☐
Jeg føler at jeg ikke har mye å være stolt av..............................414	☐	☐	☐	☐
Jeg føler at jeg er en verdifull person, i allefall på lik linje med andre......................................415	☐	☐	☐	☐

	Ja	Nei
Synes du at du har funnet et virkelig betydningsfullt innhold i livet ditt? 416	☐	☐
Føler du at du lever fullt ut?...................................417	☐	☐

HVORDAN DU FØLER DEG NÅ

*Sett kryss i den ruta utenfor det svaret som best beskriver dine følelser **den siste uka**. Bare ett kryss*

Er du vanligvis glad eller nedstemt? 418

Svært nedstemt ....☐1
Nedstemt..☐2
Nokså nedstemt ....☐3
Både – og ....☐4
Nokså glad ....☐5
Glad..☐6
Svært glad ....☐7

Har du i det store og hele en rolig og god følelse inne i deg? 419

Nesten hele tida ....☐1
Ofte ....☐2
Av og til ....☐3
Aldri..☐4

Føler du deg stort sett sterk og opplagt, eller trøtt og sliten? 420

Meget sterk og opplagt ....☐1
Sterk og opplagt ....☐2
Ganske sterk og opplagt ....☐3
Både – og ....☐4
Ganske trøtt og sliten ....☐5
Trøtt og sliten ....☐6
Svært trøtt og sliten ....☐7

Legg det utfylte spørreskjemaet i den vedlagte svarkonvolutten og postlegg den så snart som mulig!
Porto er betalt.
Hjertelig takk for hjelpa!

Paper II

Paper III