ECONOMIC CYCLES, UNEMPLOYMENT AND HEALTH: A CROSS-NATIONAL STUDY

Mauricio Avendano
London School of Economics and Political Science, LSE Health, London
Harvard School of Public Health, Boston, USA

CASE, London, 14 November 2012
Co-authors

- Philipp Hessel, LSE Health, Social Policy
- Pekka Martikainen, University of Helsinki
- Heta Moustgaard, University of Helsinki
Mortality and unemployment in England and Wales, 1940-1975

‘The secular decline in mortality-rate is accounted for by the long-term trend in economic growth, while fluctuations in mortality-rates are largely explained by recessional losses and rapid economic growth’

Brenner, MH, 1979, the Lancet

‘We have argued that his [Brenner’s] statistical model is incorrectly specified, that it omits relevant variables, that better data could have been used, and that his estimates are artefacts arising from his choice of period’

Gravelle, Hutchinson & Stern, the Lancet 1981
Life expectancy at birth, unemployment rate, and economic growth, United States, 1920–1940

Effects of Economic Downturns on Mortality of Wild African Elephants

GEORGE WITTEMEYER*†‡
*Department of Fish, Wildlife and Conservation Biology, Colorado State University, Fort Collins, CO 80523, U.S.A.,
email g.wittemyer@colostate.edu
†Graduate Degree Program in Ecology, Colorado State University, Fort Collins, CO 80523, U.S.A.
‡Save the Elephants, Nairobi, Kenya
Effect of job loss on mortality during mass layoffs in Pennsylvania (1980-1986), United States

A paradox


- **Individual job loss:** Job loss and insecurity associated with poorer individual health and higher mortality (Sullivan et al. 2009; Gallo et al. 2006a, 2006b, 2009)
Why are recessions potentially good for health? (Rhum 2000)

- Leisure time increases during recessions: Flexibility in making consumption and time allocation decisions
- Time-price of medical care drops during recessions, e.g., less working hours lead to more flexibility for medical appointments
- Exposure to Hazardous working conditions, job-related stress, work-environment (e.g., pollution) negative health effects decline during recessions
- External causes of death decline due to reduced overall activity, e.g., traffic accidents
Why are recessions potentially bad for health?

- Psychosocial stress
- Increased unhealthy consumption, e.g., of alcohol, tobacco, and other potentially harmful commodities induced by stress
- Reduced healthy consumption, e.g., expenditure on heating, food, clothing and other ‘healthy consumption’ items
- Job loss or fear of job loss stress, or more stressful work routines in the working population;
- Non-employment mechanisms: shocks to wealth, housing prices fluctuations, reduced access to credit
30-year Lag Time between Smoking and Lung Cancer

Nature Reviews | Cancer
Critical periods: Recessions at birth and mortality, Denmark, births in 1873-1906

10 months longer lifespan if born in a boom than recession

Van den Berg, GJ et al., Social Science & Medicine, 2009
This study

- Do the long-run effects of economic recessions differ from the short-run effects?

- How do economic fluctuations influence the health of both the employed and the unemployed?

- What is the role of unemployment benefit policies in buffering the impact of economic downturns on health?
Aim 1

- To simultaneously examine impact of individual unemployment and macroeconomic fluctuations on long-term illness

- To explore the role unemployment benefit (UB) policies
SHARE Survey

- **Northern:**
  - Sweden
  - Denmark

- **Western:**
  - Germany
  - Belgium
  - Netherlands
  - France
  - Switzerland
  - Austria

- **Southern:**
  - Italy
  - Spain
  - Greece

- **Central:**
  - Czech Republic
  - Poland
SHARE data

- Nationally representative samples of 50+ population and their households in 13 countries
- 16,552 individuals aged 50-74
- Household response rate: 62%
- 2004/5, 2006/7, 2008/9, 2010/11
Childhood health and SES
- Health and health care
- Employment
- Partner Accommodation
- Important life events
Retrospective measures: Health

Periods of long-term illness

- ‘As an adult, how many periods of ill health or disability have you had that lasted for more than a year? 0, 1, 2, 3, >3, most of life’
- Date of entry and exit into each period of illness
- Conditions accounting for each period of illness
Retrospective measures: Unemployment

- **Employment histories: spells and gaps**
  - Loop of questions on work histories from first to last job:
    - Entry and exit date
    - Occupational classification (9 categories), industry (14 categories),
    - Contract type (full- or part-time), employment type (employee, civil servant, self-employed)
    - Spells out of the labour market: reason for job loss, main activity during spell
  - Up to 20 job spells until exit from the labour market or current job (censoring)

- **Unemployment defined in two separate forms:**
  - **Exogenous:** Involuntary unemployment due to plant/office being closed down
  - **Endogenous:** ‘resigned’, ‘laid off’, ‘mutual agreement’, ‘a temporary job had been completed’, ‘retired’, and ‘other reason’
Business cycle: Unemployment rates

- OECD Country-specific unemployment rates as a percentage of the civilian labour force for the period 1970-2008
- Detrended unemployment series using the Hodrick-Prescott-filter (smoothing parameter of 100) to separate cyclical pattern from general trend

Austria
Unemployment benefits

- **Gross replacement rates** from the OECD Benefits and Wages Statistics: Percentage of previous gross earnings (before tax) that would be received during an unemployment spell

- Average for two earning levels, three family situations and three durations of unemployment
Model 1: Cox Proportional Hazard

\[ h_i(t) = \exp(\beta_1 U_{it} + \beta_2 T_{it} + \beta_3 I_i + \beta_4 UR_{jt} + \beta_5 UB_{jt} + \beta_6 C_j + \beta_7 Y_t + \alpha_i) \]

where \( h_0(t) \) is the baseline hazard function;

- **U** is employment status for individual \( i \) at year \( t \)
- **T** is a vector of time-variant covariates
- **I** is a vector of time-invariant covariates
- **UR** is a time-varying indicator for the state of the economy (i.e., country-specific unemployment rate)
- **UB** is the replacement rate for country \( j \) in year \( t \),
- **C** is a fixed effect for country
- **Y** is a vector of year dummies

**Interaction terms**
Total sample: 1+ illness period
Distribution of illness lasting ≥ 1 year

- Heart disease
- Back pain
- Cancer
- Diabes
- Arthritis
- Psychiatric problem
- Eyesight problem
- Respiratory diseases
- Stroke
- Fatigue
- Asthma
- Tuberculosis
- Allergies
- Infectious disease
- Migraines
- Osteoporosis

Distribution of illness lasting > 1 year
Total sample: 1+ involuntary unemployment spell
Free-long-term illness survival by time-varying employment over life-course

![Graph showing survival function for men and women by employment status over age.]

- **Men**
  - Employed
  - Unemployed, other
  - Unemployed, plant closed

- **Women**
  - Employed
  - Unemployed
  - Unemployed, other
  - Unemployed, plant closed
# Hazard ratio of illness

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HR 95% CI</td>
<td>HR 95% CI</td>
</tr>
<tr>
<td>National unemployment rate (deviation)</td>
<td>1.00 ( 0.89 , 1.13 )</td>
<td>0.99 ( 0.88 , 1.11 )</td>
</tr>
<tr>
<td><strong>Work status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Unemployed due to firm closure</td>
<td>2.10 ( 1.21 , 3.64 )</td>
<td>1.06 ( 0.65 , 1.72 )</td>
</tr>
<tr>
<td>Unemployed due to other reasons</td>
<td>4.58 ( 3.52 , 5.97 )</td>
<td>1.37 ( 1.10 , 1.70 )</td>
</tr>
<tr>
<td>Retired</td>
<td>1.95 ( 1.45 , 2.62 )</td>
<td>1.55 ( 1.11 , 2.18 )</td>
</tr>
<tr>
<td>Year of birth</td>
<td>0.86 ( 0.52 , 1.43 )</td>
<td>0.62 ( 0.34 , 1.12 )</td>
</tr>
<tr>
<td><strong>Educational attainment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-secondary education</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Secondary school</td>
<td>1.07 ( 0.80 , 1.42 )</td>
<td>1.09 ( 0.83 , 1.43 )</td>
</tr>
<tr>
<td>Primary school</td>
<td>1.28 ( 0.91 , 1.80 )</td>
<td>1.15 ( 0.85 , 1.55 )</td>
</tr>
<tr>
<td><strong>Childhood health</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No serious illness during childhood</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>1+ physical non-communicable disease</td>
<td>1.08 ( 0.89 , 1.33 )</td>
<td>1.32 ( 1.09 , 1.61 )</td>
</tr>
<tr>
<td>1+ Infectious disease</td>
<td>1.10 ( 0.88 , 1.37 )</td>
<td>1.08 ( 0.83 , 1.40 )</td>
</tr>
<tr>
<td>1+ Mental health condition</td>
<td>0.89 ( 0.46 , 1.74 )</td>
<td>1.81 ( 1.11 , 2.93 )</td>
</tr>
<tr>
<td>1+ other childhood illness</td>
<td>1.66 ( 1.21 , 2.29 )</td>
<td>1.41 ( 1.08 , 1.85 )</td>
</tr>
<tr>
<td>Index of childhood deprivation</td>
<td>0.99 ( 0.91 , 1.07 )</td>
<td>0.93 ( 0.87 , 0.98 )</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Separated/divorced</td>
<td>0.72 ( 0.51 , 1.01 )</td>
<td>1.29 ( 0.90 , 1.85 )</td>
</tr>
<tr>
<td>widowed</td>
<td>0.35 ( 0.19 , 0.65 )</td>
<td>1.05 ( 0.74 , 1.47 )</td>
</tr>
<tr>
<td>unmarried</td>
<td>0.98 ( 0.33 , 2.94 )</td>
<td>0.37 ( 0.14 , 0.99 )</td>
</tr>
<tr>
<td><strong>Number of children</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 children</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>No children</td>
<td>1.09 ( 0.79 , 1.49 )</td>
<td>1.33 ( 1.01 , 1.75 )</td>
</tr>
<tr>
<td>&gt;2 children</td>
<td>1.14 ( 0.93 , 1.40 )</td>
<td>1.06 ( 0.87 , 1.28 )</td>
</tr>
</tbody>
</table>
## Results: interactions (10 countries)

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HR</td>
<td>low</td>
</tr>
<tr>
<td>Unemployment due to firm closure</td>
<td>2.08</td>
<td>(1.14, 3.79)</td>
</tr>
<tr>
<td>National unemployment rate (deviation)</td>
<td>1.13</td>
<td>(0.95, 1.35)</td>
</tr>
<tr>
<td>Unemployment benefit (UB) replacement rate (5%)</td>
<td>0.93</td>
<td>(0.79, 1.09)</td>
</tr>
<tr>
<td>unemployment * national unemployment rate</td>
<td>0.81</td>
<td>(0.45, 1.43)</td>
</tr>
<tr>
<td>Unemployment *UB replacement rate</td>
<td>1.01</td>
<td>(0.97, 1.06)</td>
</tr>
<tr>
<td>UB replacement rate*national unemployment rate</td>
<td>0.82</td>
<td>(0.70, 0.96)</td>
</tr>
</tbody>
</table>
Conclusions paper 1

- Contrasting patterns by gender: involuntary unemployment increases illness risk among men, but not women.
- Overall, national unemployment rates are unrelated to risk of illness, regardless of employment status.
- Increased national unemployment negatively influence men's health only if experienced under low unemployment benefit provisions.
- Individual unemployment and economic downturns unrelated to women’s risk of illness, but higher unemployment benefit provisions over the life-course associated with reduced risk of illness.
Aim 2 (Hessel & Avendano)

- Time lag: Most diseases take long to develop up to old age.
- Studies focus on short-term/contemporaneous effects of economic fluctuations.
- Studies on health-effects of economic conditions around birth (van den Berg et al., 2011; van den Berg et al., 2009), but no studies beyond this period.
Aim 2

Examine if recessions and booms during early- and later-adulthood (16-45) have long-lasting effects on functional health at later-life (50-74)
Health: Disability and physical function

- Activities of Daily Living (ADL): binary if ≥ 1 difficulties
- Instrumental Activities of Daily Living (IADL): binary if ≥ 1 difficulties
- Mobility limitations: binary if ≥ 2 difficulties
- Grip Strength: sex- and country-specific quartiles of GS (in kg)
  - Handheld dynamometer
  - Highest value of four attempts (two in each hand)
  - Objective performance measure, predictor of mobility and mortality
Business cycle: Gross Domestic product

- GDP (per capita) in constant prices from ‘The World Economy: A Millennial Perspective’ (OECD)
- Detrended time series of (log) GDP using the Hodrick-Prescott filter to obtain deviations from trend
- Deviations falling in the highest (country-specific) quartile defined as Booms and those falling in lowest quartile as Recessions
- Exposure: number of Recessions and Booms at ages 16-24, 25-34, 35-44 and 45 to 49
Deviation from trend in long GDP indicating booms and recessions
Model

- Logistic regression to model odds of 1+ limitations in ADL & IADL, 2+ in Mobility and of being in lower quartile of GS (ordered logistic) at ages 50 to 74
- Key right hand-side variable: number of Recessions and Booms at age-intervals between 16 to 49
- Controls for country, sex, age, born before/after WWII, childhood SES, childhood health and education
- Additional controls for household wealth, health behaviours, periods of financial hardship or ill-health as well as BMI
Predicted probability of disability at ages 50-74 by number of recessions and booms at ages 16-49

Adjusted for sex, age and country
## Model 1 results: Disability at ages 50-74 and recessions/booms at ages 16-49

<table>
<thead>
<tr>
<th></th>
<th>ADL +1</th>
<th></th>
<th>IADL +1</th>
<th></th>
<th>Mobility +2</th>
<th></th>
<th>Low GS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>CI</td>
<td>OR</td>
<td>CI</td>
<td>OR</td>
<td>CI</td>
<td>OR</td>
<td>CI</td>
</tr>
<tr>
<td><strong>Recessions 16-24</strong></td>
<td>1.20</td>
<td>(1.10-1.31)</td>
<td>1.10</td>
<td>(1.01-1.20)</td>
<td>1.00</td>
<td>(0.95-1.04)</td>
<td>1.09</td>
<td>(1.03-1.15)</td>
</tr>
<tr>
<td><strong>Recessions 25-34</strong></td>
<td>1.29</td>
<td>(1.18-1.40)</td>
<td>1.20</td>
<td>(1.00-1.43)</td>
<td>1.05</td>
<td>(0.96-1.14)</td>
<td>1.09</td>
<td>(0.93-1.27)</td>
</tr>
<tr>
<td><strong>Recessions 35-44</strong></td>
<td>1.29</td>
<td>(0.82-2.02)</td>
<td>1.24</td>
<td>(1.02-1.50)</td>
<td>1.18</td>
<td>(0.94-1.47)</td>
<td>1.06</td>
<td>(0.89-1.27)</td>
</tr>
<tr>
<td><strong>Recessions 45-49</strong></td>
<td>1.46</td>
<td>(0.86-2.48)</td>
<td>1.17</td>
<td>(1.10-1.25)</td>
<td>1.27</td>
<td>(0.98-1.64)</td>
<td>1.07</td>
<td>(0.96-1.20)</td>
</tr>
<tr>
<td><strong>Booms 16-24</strong></td>
<td>1.05</td>
<td>(0.92-1.19)</td>
<td>0.94</td>
<td>(0.82-1.09)</td>
<td>0.92</td>
<td>(0.83-1.01)</td>
<td>1.03</td>
<td>(0.96-1.10)</td>
</tr>
<tr>
<td><strong>Booms 25-34</strong></td>
<td>0.99</td>
<td>(0.80-1.23)</td>
<td>0.87</td>
<td>(0.81-0.94)</td>
<td>0.93</td>
<td>(0.80-1.07)</td>
<td>0.98</td>
<td>(0.95-1.00)</td>
</tr>
<tr>
<td><strong>Booms 35-44</strong></td>
<td>0.91</td>
<td>(0.78-1.07)</td>
<td>0.82</td>
<td>(0.72-0.94)</td>
<td>0.96</td>
<td>(0.82-1.11)</td>
<td>0.94</td>
<td>(0.87-1.02)</td>
</tr>
<tr>
<td><strong>Booms 45-49</strong></td>
<td>1.00</td>
<td>(0.89-1.13)</td>
<td>0.78</td>
<td>(0.71-0.86)</td>
<td>0.96</td>
<td>(0.84-1.08)</td>
<td>0.99</td>
<td>(0.95-1.03)</td>
</tr>
</tbody>
</table>

Adjusted for sex, age, born before/after WWII, childhood SES, childhood health, education, current smoking and drinking, household net wealth, periods of financial hardship or ill-health and body mass index

Hessel & Avendano
Summary aim 2

- Each additional recession at any age-interval between 16-49 increases risks of disability in later-life
- Each additional boom at ages 25-49 lowers the risks of IADL limitations in later-life
- Results also hold for both levels and changes in functional status at ages 50-74, particularly for recessions at ages 35-49
- Negative long-term effects of less favourable economic conditions may outweigh any positive short-term effects

Hessel & Avendano
General conclusions

- The short-term effects of economic downturns may mask profound, more complex effects operating over the long-term.

- In the long-run, individual unemployment is strongly associated with increased risk of illness.

- In Europe, we find no clear evidence that, in the long-run, economic downturns are good for health.

- Higher unemployment benefit provisions appear to reduce the risk of illness among employed women, and among men during times of high unemployment.

- The protective effect of unemployment benefits may not be confined to a financial benefit but may involve non-financial benefits also affecting the employed, e.g., reduced stress.
Aim 3: Mortality in Finland (Avendano, Moustgaard & Martikainen)

Background

- Finland experienced major economic downturn during the early 1990’s
- Some evidence that the economic downturn reduced alcohol-related mortality (Johansson et al, 2006)
- Finland: Strong and highly developed safety nets

Aim

- To examine whether economic fluctuations influence mortality differently for individuals who experience job loss and those who continue to work
- Hypothesis: Changes in employment induced by economic fluctuations had different effects on mortality by employment status
Unemployment rates in Finland, 1989-2007

Avendano, Moustgaard & Martikainen
Finnish Registry Data

- 11% sample of Finnish residents in 1989-2007 and an oversample of death to cover 80% of all deaths
- Linkage based on individual social security numbers
- Linked Registries:
  - Population
  - Employment and job seeker
  - Income and transfers (Tax Administration and Social Insurance)
  - Mortality: Deaths records by cause (1970-2007)
Employment status change

<table>
<thead>
<tr>
<th>Status</th>
<th>Time$_{-2}$</th>
<th>Time$_{-1}$</th>
<th>Time$_0$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable employment</td>
<td>Employed</td>
<td>Employed</td>
<td></td>
</tr>
<tr>
<td>Newly unemployed</td>
<td>Employed</td>
<td>Unemployed</td>
<td></td>
</tr>
<tr>
<td>Newly employed</td>
<td>Unemployed</td>
<td>Employed</td>
<td>Death</td>
</tr>
<tr>
<td>Long-term unemployed</td>
<td>Unemployed</td>
<td>Unemployed</td>
<td></td>
</tr>
<tr>
<td>Out of the work force</td>
<td>Work/not work</td>
<td>Work/not work</td>
<td></td>
</tr>
</tbody>
</table>

Regional unemployment rate

1987 to 2007
Region fixed effect model

\[ D_{ijt} = \alpha_t + W_{ijt}\gamma + X_{ji}\omega + U_{jt}\beta + R_j + \varepsilon_{ijt} \]

- D is vital status of individual i at region j and time t
- W is time-varying employment status
- X is a vector of time-invariant personal characteristics (year of birth, sex, educational level, occupational status, father’s occupational status and industry)
- U is the regional unemployment
### Hazard ratio: Region fixed effect model, total mortality, 1989-2007

<table>
<thead>
<tr>
<th></th>
<th>MEN</th>
<th>WOMEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.05</td>
<td>1.05</td>
</tr>
<tr>
<td>regional unemployment rate</td>
<td>1.00</td>
<td>0.99</td>
</tr>
<tr>
<td>Newly unemployed</td>
<td>2.31</td>
<td>2.15</td>
</tr>
<tr>
<td>Newly employed</td>
<td>1.89</td>
<td>1.78</td>
</tr>
<tr>
<td>Long term unemployed</td>
<td>3.94</td>
<td>3.65</td>
</tr>
<tr>
<td>Out of workforce</td>
<td>5.04</td>
<td>4.91</td>
</tr>
</tbody>
</table>

*Model includes demographics, year and region fixed effects*

*Avendano, Moustgaard & Martikainen*
Hazard ratio (95% Confidence Interval) for 1-point increase in regional unemployment rate by cause: 1989-2007

- Alcohol
- Cancer
- CVD
- Suicide
- Traffic accident
- Other external
- Total

Avendano, Moustgaard & Martikainen
MEN: Hazard ratio for 1-point increase in regional unemployment rate by cause, 1989-1996

* Significant at the .05 level

Avendano, Moustgaard & Martikainen
Summary aim 3: Finland

- Individual unemployment is consistently associated with increased mortality
- Period 1987-2007: There is no evidence of an effect of economic downturns on overall mortality in men, while there may be a small increase in mortality among women, due to increased cancer mortality
- Recession period (1989-1996): no overall effect of business cycle on mortality, but differential effects by employment status and cause of death

  - Men:
    - Cardiovascular mortality goes down for the employed but it increases for the newly unemployed
    - Suicide mortality increases only for the employed
    - Traffic accidents decrease across most groups

  - Women:
    - No clear effect on suicide, except decreased suicide among those out of the labor force
    - Traffic accident mortality increases sharply for the newly employed and newly unemployed, but it does not change for other groups
General conclusions

- The short-term effects of economic downturns may mask profound, more complex effects operating over the long-term.

- In Europe, we find no clear evidence that economic downturns reduce the risk of illness or death, while there is evidence of negative long-term effects on health and short-term effects on cardiovascular mortality for the newly unemployed.

- In the long-run, individual unemployment is associated with increased risk of illness among men, but not women.

- Higher unemployment benefit provisions appear to reduce the risk of illness particularly among women, and among men during times of high unemployment.

- The protective effect of unemployment benefits may not be confined to a financial buffer but may involve non-financial mechanisms also affecting the employed, e.g., reduced stress.
Back-up slides
What is common to recent studies?

• Causal interpretation – exogenous unemployment or individual-fixed effects
• Studies based on a single country: does the effect of unemployment on health depend on institutions? E.g., unemployment benefits
• Short-term vs. Long-term effects
  • Etiologic period (time lag)
  • Specific health outcomes
• Individual unemployment and macro-economic conditions
Model 2: Cox Proportional Hazard

\[ h_i(t) = \exp(\beta_1 U_{iti} + \beta_2 T_{iti} + \beta_3 l_i + \beta_4 \text{UR}_{jiti} + \beta_5 C_j + \beta_6 Y_t + \beta_7 \text{UB}_{jiti} * U_{iti} + \beta_8 \text{UR}_{jiti} * U_{iti} + \beta_9 \text{UB}_{jiti} * \text{UR}_{jiti} + \alpha_i) \]

- \( \beta_7 \text{UB}_{jiti} * U_{iti} \) Individual unemployment*benefits
- \( \beta_8 \text{UR}_{jiti} * U_{iti} \) Individual unemployment*aggregate unemployment
- \( \beta_9 \text{UB}_{jiti} * \text{UR}_{jiti} \) Aggregate unemployment*benefits
Total sample: Mean, min and max years spent in ‘recession’
Hazard ratio of involuntary unemployment by national unemployment rates, 1970-2008

**Men**

- **Firm closure**
- **Other reasons**

**Women**

- **Firm closure**
- **Other reasons**
Unemployment rates at graduation and log real annual earnings

Unemployment rates at graduation and log real annual earnings by skills group

Model 2 results: Change in disability W1-W2 at ages 50-74 and recessions/booms at ages 16-49

<table>
<thead>
<tr>
<th></th>
<th>ADL +1</th>
<th>IADL +1</th>
<th>Mobility +2</th>
<th>Lower GS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>CI</td>
<td>OR</td>
<td>CI</td>
</tr>
<tr>
<td>Recessions 16-24</td>
<td>1.13</td>
<td>(0.99-1.30)</td>
<td>1.03</td>
<td>(0.96-1.10)</td>
</tr>
<tr>
<td>Recessions 25-34</td>
<td>0.92</td>
<td>(0.68-1.23)</td>
<td>0.92</td>
<td>(0.72-1.19)</td>
</tr>
<tr>
<td>Recessions 35-44</td>
<td>1.14</td>
<td>(1.02-1.28)</td>
<td>1.15</td>
<td>(1.00-1.32)</td>
</tr>
<tr>
<td>Recessions 45-49</td>
<td>1.34</td>
<td>(1.08-1.66)</td>
<td>1.32</td>
<td>(0.91-1.90)</td>
</tr>
<tr>
<td>Booms 16-24</td>
<td>0.83</td>
<td>(0.73-0.95)</td>
<td>0.86</td>
<td>(0.76-0.97)</td>
</tr>
<tr>
<td>Booms 25-34</td>
<td>0.91</td>
<td>(0.79-1.04)</td>
<td>0.91</td>
<td>(0.81-1.02)</td>
</tr>
<tr>
<td>Booms 35-44</td>
<td>0.91</td>
<td>(0.85-0.96)</td>
<td>0.91</td>
<td>(0.82-1.01)</td>
</tr>
<tr>
<td>Booms 45-49</td>
<td>0.78</td>
<td>(0.73-0.83)</td>
<td>0.86</td>
<td>(0.70-1.05)</td>
</tr>
</tbody>
</table>

Adjusted for sex, age, born before/after WWII, childhood SES, childhood health, education, current smoking and drinking, household net wealth, periods of financial hardship or ill-health and body mass index
All-cause mortality and regional unemployment, 1987-2007
WOMEN: Hazard ratio for 1-point increase in regional unemployment rate by cause, 1989-1996

* Significant at the .05 level
Why is individual unemployment bad for health?

• Impact on earnings and wealth accumulation
• Social outcomes: marital disruption, foreclosure/eviction
• Non-financial mechanisms: day structure, self-esteem and recognition of others
• Stress-induced deregulation of physiological systems (autonomic, neuroendocrine and immunological responses)
• Unhealth behaviour, e.g., heavier smoking and drinking, physical inactivity
Lag time: 20-year Lag Time between Smoking and Lung Cancer
Literature gaps


• However, recessions can have long-lasting consequences (Oreopoulos et al., forthcoming).

• Few studies link individual experiences of unemployment with lifetime exposure to business cycles over the life-course.

Step 1: Linkage

Life histories

Panel data

National unemployment rates
Why is this important for policy?

- Long-run consequences of macro-economic shocks underestimated

- Recessions offer opportunity to understand behaviour and identify health policy responses

- Social safety nets may be particularly important in crisis periods, e.g., unemployment benefits
Individual unemployment and health

• Unemployment due to plant/company closure is associated with poorer health and increased mortality (Gallo et al., 2004, 2000, 2001, 2006a, 2009, Sullivan and von Wachter, 2009)

• Recent individual-fixed effect models challenges causal effect hypothesis:
  • Osthus, 2012: Norwegian registry data (downsizing)
  • Salm, 2009: US Health and Retirement Survey (company/plant closure)
  • Schmitz, 2011: German Socio-economic panel (fixed effects)
  • Bockerman and Ilmakunnas, 2009: European Household Panel
  • Browning et al., 2006: Danish registry (PSM, job displacement)
  • Martikainen et al., 2007: Finnish registry data, 8-year mortality
B. Methodology: Census-Mortality linked data, 1960-2005

- NOCCA project:
  - Sweden
  - Denmark
  - Finland
  - Norway
  - Iceland

- PSID: United States

Pukkala et al 2009, Acta Oncologica
Step 2: Long-run effects of business cycles on health

Failure-time or duration models: Cox Proportional Hazards

Natural experiment: To exploit variation across
(a) birth cohorts;
(b) Industries;
(c) countries
Step 3: Testing for mechanisms

Instrumental variable (two-Stage Least Square) approach: Impact of potentially ‘exogenous’ job transitions induced by economic cycles on health

- Business cycle$_{t1}$
- Confounders, e.g., previous health$_{t1}$
- Job loss$_{t2}$
- Non-labour pathways$_{t2}$
- Health$_{t3}$

Time$_1$  Time$_2$  Time$_3$
Step 4: Institutions and policies, 1960-2010

**Interaction** between economic cycles and policies over the life-course in the period 1960-2010

**Education**
- Compulsory schooling reforms
- Access and coverage

**Labour market**
- Employment protection
- Labour market programmes
- Minimum wages
- Trade unions
- Unemployment benefits
- Working & employment conditions

**Public health and healthcare**
- Health prevention policies
- Access to healthcare and insurance
- Healthcare systems

**Public Disability**
- Eligibility
- Maximum and minimum benefits

**Pension and Retirement**
- Age at retirement
- Retirement incentives
- Benefits

Innovation and impact

- Financial crises are an inescapable phenomenon in modern societies; little is known about their **impact on health and society**

- Bridging economics, epidemiology, and sociology to develop a **unifying theory** linking the macro economy to the individual

- The impact of **employment law liberalization**

- A **cross-national comparative** approach

- A **long-run perspective**
Preliminary findings (work in progress)
Objective

- To examine the **contemporaneous** and **long-term** effects of labour market exit on the onset of illness across 13 European countries

- To assess how public policies influence the causal pathways linking health and work, exploiting variations over the last decades across European countries
Data: Long-term illness & work histories

- **Periods of long-term illness:**
  - ‘As an adult, how many periods of ill health or disability have you had that lasted for more than a year? 0, 1, 2, 3, >3, most of life’
  - Date of entry and exit into each period of illness
  - Conditions accounting for each period of illness

- **Work histories:**
  - Loop of questions on work histories starting from first job and related characteristics (entry and exit date, type of work, industry, wages, quality of work), and questions about gaps and their duration
  - Up to 20 job spells until exit from the labour market or current job (censoring)
Model 1: Conditional logistic fixed effects

$$\log\left(\frac{p_{ijt}}{1 - p_{ijt}}\right) = \mu_t + \delta X_{ijt} + \beta E_{jt} + \Theta T_{jt} + \alpha_i$$

- Where $y_{ijt}$ is a dichotomous variable for a period of illness for an individual $i$ at time $t$ in country $j$;
- $p_{ijt}$ is the probability that $y_{ijt} = 1$;
- $X$ is a vector of non-time-variant individual-level covariates;
- $E$ is a measure of time-variant individual level employment status;
- $T$ is a vector of time-variant country-specific covariates; and
- $\alpha$ is the error term.
Model 2: Cox Proportional Hazard

\[ h_{ij}(t) = \exp(X_{ij} \beta_1 + U_{ij} \beta_2 + C_j \beta_3 + P_j \beta_4 + P_j * U_{ij} \beta_5) h_0(t) \]

where \( h_0(t) \) is the baseline hazard function;
\( X \) is a vector of individual covariates;
\( U \) is a dummy indicating a period if unemployment lasting \( \geq \) months;
\( C \) is a country-specific fixed effect
\( P \) is a vector of country level public policy investments
\( \beta_5 \) is an interaction term indicating whether the effect of unemployment differs across different levels of public policy investments
Periods of illness over the life-course

Age-adjusted prevalence of > 1 illness periods before labour market exit
Years out of the labour market before age 65

Mean of years spent out of the labour market before last exit

- Males
- Females

Countries: Austria, Germany, Sweden, Netherlands, Spain, Italy, France, Denmark, Greece, Switzerland, Belgium, Czech, Poland
Illness and ‘unemployment’, 40-55
Illness and ‘unemployment’, 55-64

Illness and ‘unemployment’ in Europe, 55-64

Proportion


- Illness
- Out of labour market
Fixed effects: illness on labour market exit

<table>
<thead>
<tr>
<th>Individual variables</th>
<th>Model 1 (OR, 95%CI)</th>
<th>Model 3 (OR, 95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>'Unemployment'</td>
<td>2.79 (2.47, 3.16)</td>
<td>517.52 (156.58, 1710.47)</td>
</tr>
<tr>
<td>Year</td>
<td>1.21 (1.19, 1.19)</td>
<td>1.20 (1.19, 1.22)</td>
</tr>
<tr>
<td>Year of birth</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Highest education</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Post-secondary</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Secondary</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Primary</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Missing</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Context variables</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Exp. in health (US$PPP, per capita)</td>
<td>1.44 (1.15, 1.80)</td>
<td>1.70 (1.35, 2.14)</td>
</tr>
<tr>
<td>Full medical cover (%)</td>
<td>1.02 (1.01, 1.03)</td>
<td>1.02 (1.01, 1.03)</td>
</tr>
<tr>
<td>Social expenditures (% of GDP)</td>
<td>1.11 (1.08, 1.15)</td>
<td>1.12 (1.09, 1.16)</td>
</tr>
<tr>
<td>Expend. in incapacity benef.(% GDP)</td>
<td>1.43 (1.29, 1.59)</td>
<td>1.47 (1.32, 1.64)</td>
</tr>
<tr>
<td>unemployment rate</td>
<td>1.02 (1.01, 1.04)</td>
<td>1.02 (1.00, 1.03)</td>
</tr>
<tr>
<td>GDP growth</td>
<td>1.05 (1.03, 1.07)</td>
<td>1.04 (1.02, 1.06)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interactions</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Exp. Health*unemployment</td>
<td>0.70 (0.63, 0.78)</td>
<td></td>
</tr>
<tr>
<td>Share medical cover*unemployment</td>
<td>1.00 (0.98, 1.01)</td>
<td></td>
</tr>
<tr>
<td>Social expenditures*unemployment</td>
<td>0.91 (0.87, 0.95)</td>
<td></td>
</tr>
<tr>
<td>Expend. Incapacity*unemployment</td>
<td>1.06 (0.94, 1.19)</td>
<td></td>
</tr>
</tbody>
</table>

Model includes country fixed effects (excluded from table)
Hazard ratio: The impact of ‘unemployment’ on the hazard of illness

Model includes sex, year of birth and education and has age as the X axis.

Hazard ratio
## Cox Proportional Model: Hazard ratios

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Individual variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployment</td>
<td>1.78 1.52 2.09</td>
<td>3.51 1.87 6.60</td>
</tr>
<tr>
<td>Sex</td>
<td>1.22 1.09 1.37</td>
<td>1.23 1.09 1.37</td>
</tr>
<tr>
<td>Year of birth</td>
<td>1.02 1.01 1.04</td>
<td>1.03 1.02 1.04</td>
</tr>
<tr>
<td>Highest education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-secondary</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td>1.11 0.95 1.30</td>
<td>1.11 0.95 1.30</td>
</tr>
<tr>
<td>Primarily</td>
<td>1.27 1.10 1.46</td>
<td>1.27 1.10 1.46</td>
</tr>
<tr>
<td>Missing</td>
<td>1.50 0.85 2.72</td>
<td>1.51 0.84 2.70</td>
</tr>
<tr>
<td><strong>Context variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public Exp. in health (US$PPP, per capita)</td>
<td>0.97 0.84 1.13</td>
<td>1.02 0.94 1.11</td>
</tr>
<tr>
<td>Full medical cover (%)</td>
<td>0.99 0.99 1.00</td>
<td>1.00 0.99 1.00</td>
</tr>
<tr>
<td>Social expenditures (% of GDP)</td>
<td>1.02 0.98 1.05</td>
<td>1.01 0.99 1.02</td>
</tr>
<tr>
<td>Expend. in incapacity benef.(% GDP)</td>
<td>1.02 0.92 1.13</td>
<td>1.01 0.96 1.07</td>
</tr>
<tr>
<td>% employment</td>
<td>1.01 0.99 1.03</td>
<td>0.96 0.93 0.99</td>
</tr>
<tr>
<td>GDP growth</td>
<td>1.00 0.97 1.03</td>
<td>1.00 0.97 1.03</td>
</tr>
<tr>
<td><strong>Interactions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public Exp. Health*unemployment</td>
<td>1.08 1.01 1.14</td>
<td></td>
</tr>
<tr>
<td>Share medical cover*unemployment</td>
<td>0.98 0.97 0.99</td>
<td></td>
</tr>
<tr>
<td>Social expenditures*unemployment</td>
<td>1.05 1.02 1.07</td>
<td></td>
</tr>
<tr>
<td>Expend. Incapacity*unemployment</td>
<td>0.85 0.78 0.91</td>
<td></td>
</tr>
</tbody>
</table>

*Model includes country fixed effects (excluded from table), age as X axis*
Conclusion

- **Contemporaneously**, ‘unemployment spells’ are strongly correlated with illness spells, but higher public health and social spending is associated with a weaker effect of unemployment spells on illness.

- ‘Unemployment spells’ are associated with **long-term** risk of illness, but these effects are (a) stronger when public health and social expenditures are higher, and (b) weaker when medical insurance coverage and investments in incapacity benefits are higher.

- These findings support the hypothesis that experiences of ‘unemployment’ are associated with poor health, and that public health and public policies can influence this link.
Heart disease and wealth in the United States, England and Western Europe, ages 50-74, 2004

C. Methodology: Business cycles, 1960-2010

- National Unemployment rate
- Gross domestic product
- Index of manufacturing production
- Average of weekly hours in manufacturing
- Composite leading indicators from the OECD Business Cycle Analysis Database
# Measures: SHARE, ELSA & HRS

<table>
<thead>
<tr>
<th>MEASURE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
</table>
| **Health** | Life-time health & diagnoses, biomarkers, physical functioning and mortality  
Childhood health and diagnoses history |
| **Employment** | Employment history and transitions for all jobs that lasted 6+ months  
Job security, quality of work, contractual arrangement, labour market exit, unemployment benefit benefit uptake, job satisfaction indexes |
| **Pathways** | Health care history  
Family history  
Residential history  
Behaviour history  
Psychosocial stress & life satisfaction  
Childhood socioeconomic conditions  
Financial history  
Special periods in the life-course |
Approach (1): Short- and long-term effects

- Short-term effects of business cycles on health (fixed effects)
  \[
  \log \left( \frac{p_{ijt}}{1 - p_{ijt}} \right) = \mu + \delta X_{ijt} + \beta E_{jt} + \theta T_{jt} + \alpha_i
  \]

- Short-term effects of cycles on mortality
  \[
  V_{ijt} = \alpha_t + X_{ijt} \gamma + E_{jt} \beta + C_j + C_j * T + \varepsilon_{ijt}
  \]

- Long-term effects of economic cycles on health (Cox Survival)
  \[
  h_{ij}(t) = \exp(X_{ij} \beta + E_{ij}^* \gamma + C_j \omega) h_0(t)
  \]
Approach (2): IV

• First stage

\[ u_{ijt} = \alpha_t + X_{ijt} \gamma + E_{jt} \beta + C_j + C_j * T + \varepsilon_{ijt} \]

• Second stage

\[ h_{ijt} = \alpha_t + X_{ijt} \gamma + \hat{U}_{ijt} \beta + C_j + C_j * T + \varepsilon_{ijt} \]
Research Programme and career

• **Goal:** To develop a **research line** on the social, economic and policy forces that shape population health and health inequalities, integrating macro- and micro-level approaches in the context of cross-national comparative research.

• To exploit cross-national variations in policies and institutions to disentangle their causal effects on relevant social exposures and health outcomes

• To integrate advanced insights and techniques from epidemiology, economics and other social sciences

• Ultimately, to contribute to the development of a unifying theory of the mechanisms that link socioeconomic status and health, with emphasis on the economic and policy forces that drive this association
### Typology of employment policies (Andersen & Jensen, 2002)

<table>
<thead>
<tr>
<th>Category</th>
<th>Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stimulate domestic demand</td>
<td>- Stimulate aggregate demand  &lt;br&gt; - Increase public sector employment</td>
</tr>
<tr>
<td>Competitiveness</td>
<td>- Devaluations  &lt;br&gt; - Wage moderation  &lt;br&gt; - Lower corporate taxes, social contributions, higher subsidies</td>
</tr>
<tr>
<td>Redistribution of labour</td>
<td>- Early exit  &lt;br&gt; - Shorter working hours/longer holidays &amp; leave</td>
</tr>
<tr>
<td>Structural strategies</td>
<td>- Statutory minimum wages  &lt;br&gt; - Trade union membership  &lt;br&gt; - Generous social protection (benefits level, eligibility criteria)  &lt;br&gt; - Work incentives: income tax  &lt;br&gt; - Flexibility of employment protection and time  &lt;br&gt; - ‘Workfare’: duty to work in return for benefits  &lt;br&gt; - Return to work and re-training programmes</td>
</tr>
</tbody>
</table>
Causal Model – economic cycles and health

Tapia Granados J A et al., Demography, 2008
Unemployment, job insecurity and health

- Unemployment is associated with many health outcomes, including mental health, myocardial infarction, stroke and mortality.

- Theory on pathways: (a) financial; (b) manifest and latent functions of work; (c) behaviour; (d) psychosocial.

- Law liberalization since early 1970’s has increased job insecurity, which has been associated with poorer health (Quinlan et al 2009; Gash et al 2007; Rodriguez et al 2007).

- Most observational studies suffer from the classical identification ‘problem’ of simultaneous equation bias.
Median duration of illness over the life-course

Years in illness conditional on at least 1 illness period

- Sweden
- Denmark
- Germany
- Netherlands
- Belgium
- France
- Switzerland
- Austria
- Italy
- Spain
- Greece
- Czech
- Poland
Cancer lag time: multistep process

Evidence is contradictory

- Consensus: Recessions increase suicide, reduce traffic accidents
- Debate for other health outcomes: