Chapter 4

# Unemployment and Causes of Hospital Admission Considering Different Analytical Approaches

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Additional information is available at the end of the chapter

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**Abstract**

The association between unemployment and hospital admission is known, but the causal relationship is still under discussion. The aim of the present analysis is to compare results of a cross-sectional and a cohort approach considering overall hospital admission and hospital admission due to cancer and circulatory disease. Register-based data were analysed for the period of 2006–2009. In the cross-sectional analysis, a multiple logistic regression model was conducted based on the year 2006, and cohort information from the same year onward up to 2009 was available for a Cox regression model. Social welfare compensated unemployment and both types of disease-specific hospital admission were associated to be statistically significant in the cross-sectional analysis. With regard to circulatory disease, the cohort approach suggests that social welfare compensated unemployment might lead to hospital admission due to the disease. Given the significant results in the cross-sectional analysis for hospital admission due to cancer, the unfound cohort effect might indicate a reverse causation suggesting that the disease caused joblessness, and finally social welfare compensated unemployment and not vice versa. Comparing different study designs allows for a better causal interpretation, which should be recommended in future quantitative social welfare analysis.

**Keywords:** cross-sectional study, cohort study, study design result interpretation, unemployment, hospital admission

## 1. Introduction

When presenting quantitative social welfare studies, careful interpretation considering correct study designs in different social welfare systems is important. Therefore, the aim of this chapter

is to introduce key concepts for the most frequently used epidemiological study designs in social health inequality (cross-sectional and cohort design) and to explain and discuss different results of these study designs using the association of unemployment and hospital admissions in the Danish social welfare system. We advise the reader to carefully interpret quantitative study results in social welfare considering the relevant problems and pitfalls of the used study design. Furthermore, we suggest to the reader to be open to critical reflection and discussion in order to shed a brighter light on causality.

For causal interpretation, it is important to know the social welfare system of interest like in our case the Danish welfare system. The Danish Labor Market is based on the so-called flexicurity—model. The main focus is on security in employment and income combined with flexibility in relation to the hiring and firing of workers. The model guarantees a high level of benefit security to workers with insurance if they become unemployed. By combining flexibility and social security, both employees and workers may become more willing to take a risk on the labour market [1].

Unemployment benefits on a voluntary paid insurance are used in around 50% of Danish workers. In the case of unemployment, individuals receive up to 85% of their former salary for a period of 2 years independent from the amount of money put aside or property owned. Furthermore, individuals without such a voluntary paid insurance will instead be considered in a social benefit system to maintain a certain minimum standard of living when there is a lack of money [2–4].

The principles of universalism, participation and equity lie at the core of the Danish welfare model. Universal social rights have been one of the core principles of the welfare state in Denmark and the healthcare system is closely related to the core values and developments of the welfare state. In the Danish healthcare system, universalism means that all citizens have free and equal access to available services, for example, hospitals and general practitioners. Some characteristics of the Danish health system are funding predominantly by taxes, existence of a decentralized public governance structure and a public control of the delivery structure. Additionally, it is equity driven, with great focus on geographical and social equity and participation [5, 6].

The main financial source has been general taxation at county and national level, with redistribution mechanisms from central to more decentralized levels. Aside from the public healthcare system, a private health sector is also present. Private health insurance can be given to employees as salary benefit and is becoming more and more popular. It is estimated that nearly 30% of the Danish population has supplementary private health insurance [7].

Unemployment and health inequality have been matters of interest in many studies with different study designs and varying assessment procedures [8–12], which almost always summarize that unemployment adversely affects health. There are plausible explanations as to why unemployment causes illness and later mortality; it disrupts personal social relationships, the situation is associated with stress and it induces bereavement reactions. Each of these situations has potential to cause diseases [13]. Health risks of unemployment might also be caused by an intermittent step, such as risky behaviour. It is proven that alcohol consumption

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and smoking are increased among unemployed individuals [13–15]. It is also plausible that the association might have an inverse direction. Illness, especially severe and chronic diseases, causes unemployment; cancer survivors are shown to have a small but significantly increased risk for unemployment [16]. Furthermore, bidirectional causal associations between long-term unemployment and disease were already discussed [17].

A review [18] and a Danish national study [19] showed that the specific regional situation of employment, political regulation or health service acquisition partly explains overall associations between unemployment and health outcomes. Additionally, underlying study design, used exposure assessment and considered statistical models are discussed as sources that may bias the results [10].

Therefore, the aim of the present analysis is to analyse the short-term association between unemployment and hospital admission in Esbjerg, Denmark. Therewith, the effect of different unemployment compensation, different underlying study designs (cross-sectional or cohort approach) and varying disease-specific hospital admissions (cancer and circulatory diseases) are considered.

## 2. Epidemiological study designs

In analytic epidemiology, the terms exposure and outcome are often used. 'Exposure' (or being exposed or independent variable) describes a situation of having contact with a certain factor or an element in a specific situation we want to investigate. This does not necessarily need to be a harmful factor or a situation such as smoking or exposure to loud noise; it may also be protective, such as physical activity or healthy diet. The 'outcome' (or dependent variable) describes the result we want to investigate. It may also be potentially harmful or positive, depending on the research question. Examples of outcomes can be the development of a disease or the improvement of health.

In a **cross-sectional study**, data are collected on a defined, fixed point in time. Figuratively speaking, the researcher takes a snapshot of the study population with all relevant information at the given point in time. Cross-sectional studies cannot be informative when considering a period of time as they only collect data from a single time point or short period of time. Therefore, they are not suitable for showing cause-effect relationships considering exposure and outcome. Let us take a look at an example: In a cross-sectional study design, is it possible to answer to the research question of whether low socio-economic situation (SES) creates paraplegia in a population? Both low SES and paraplegia are assessed at the same point in time. What happens if the study shows a relationship? Does that mean that low SES causes paraplegia or could it be the other way around where paraplegic patients have difficulties in finding a job and therefore have a potentially lower SES? **Figure 1** displays how cross-sectional studies only allow statements regarding associations. It cannot be concluded which of the factors was present before the other or which one is the exposure and which is the outcome, respectively. Cross-sectional studies are important in descriptive epidemiology as they can be used to describe the distribution of health-related factors, SES and diseases in the population.

The results of cross-sectional studies can be used to describe situations or to answer questions related to health service research. Furthermore, they are used to generate hypotheses as a simple basis to analyse cause-effect relationships. They can be conducted at relatively low costs and are quite robust against deliberate or unintended false information (**Figure 1**) [20].

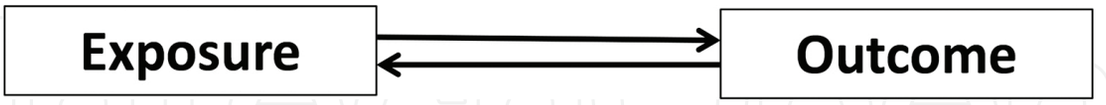


**Figure 1.** Problem in cross-sectional studies: The direction of the association between exposure and outcome cannot be assigned.

**Cohort studies**—or longitudinal studies—deal with data that are collected over a certain period of time. Figuratively speaking, the research starts with a snapshot but it goes forward like a film, collecting information in a time-dependent manner. The exposure in a previous time period can be compared to the probability of disease in a later period and cause-effect relationships can be investigated. With this study type, the shortcomings of cross-sectional studies can be eliminated. Cohort studies begin with a group of people who do not present the health situation or disease that we want to study as the outcome after the follow-up. At the onset, the exposure needs to be estimated and grouping into exposed and non-exposed is required. There is also a possibility that the participant may have a different extent of exposure. Over a fixed or variable period of time, health effects that occur in the participants are assessed. The latency period is particularly important as it considers the time from the exposure to the development of disease. During the latency period, the outcome is not defined as the relevant outcome, since the time from exposure to disease is too short to assess its development. Over the entire study period, one can observe which of the participants develops what kind of disease(s) and when. Usually, it takes quite a long time for an event to occur and thus to have the data available for analysis. Therefore, young people are mostly excluded from cohort studies because the researchers would have to wait too long for the outcome to occur. Nevertheless, it should be mentioned that the age range of choice for a cohort study can vary substantially, depending on the aim and the latency of the disease or pathological condition to be studied. However, if rare diseases such as the development of brain tumours are investigated, a cohort study is not the best design, since it would be very difficult and expensive. Too many individuals would have to be observed until a relevant event (e.g. brain tumour) occurs. To analyse such rare diseases, case-control studies are optimally suited, but are rarely done in social welfare research and therefore not presented here (**Figure 2**) [20, 21].

The biggest **challenge for social epidemiology** is that more attention for causality is required [22]. Sometimes, causalities are discussed even though reverse associations might be present [23]. In an initiated commentary, Oakes [24] defined differences between the roles of the social epidemiologist researcher and scientist. He defined researchers as those who seek the evidence to confirm what they believe is true, and by contrast scientists seek to discover the truth regardless of their hypotheses. These different views may create different opinions, discussions and debates. Therefore, it is important to clarify the research question and scientific aim. But be aware that seeking the truth in terms of science does not necessarily mean finding the truth.

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Let us use a well-known example to discover causes of drunkenness. A young man drank whisky and soda on Friday, gin and soda on Saturday, vodka and soda on Sunday and did not consume alcohol on the other days of the week. When looking at common patterns, the conclusion might easily be drawn that soda was the reason for drunkenness [25]. However, considering complex associations with even more complex situations on causality might increase the potential of misinterpretations. Certainly, it is well known that smoking causes lung cancer. However, when considering smoking, what can be said of causality with regard to one's social network, advertising, social norms and taxation rates [22]?

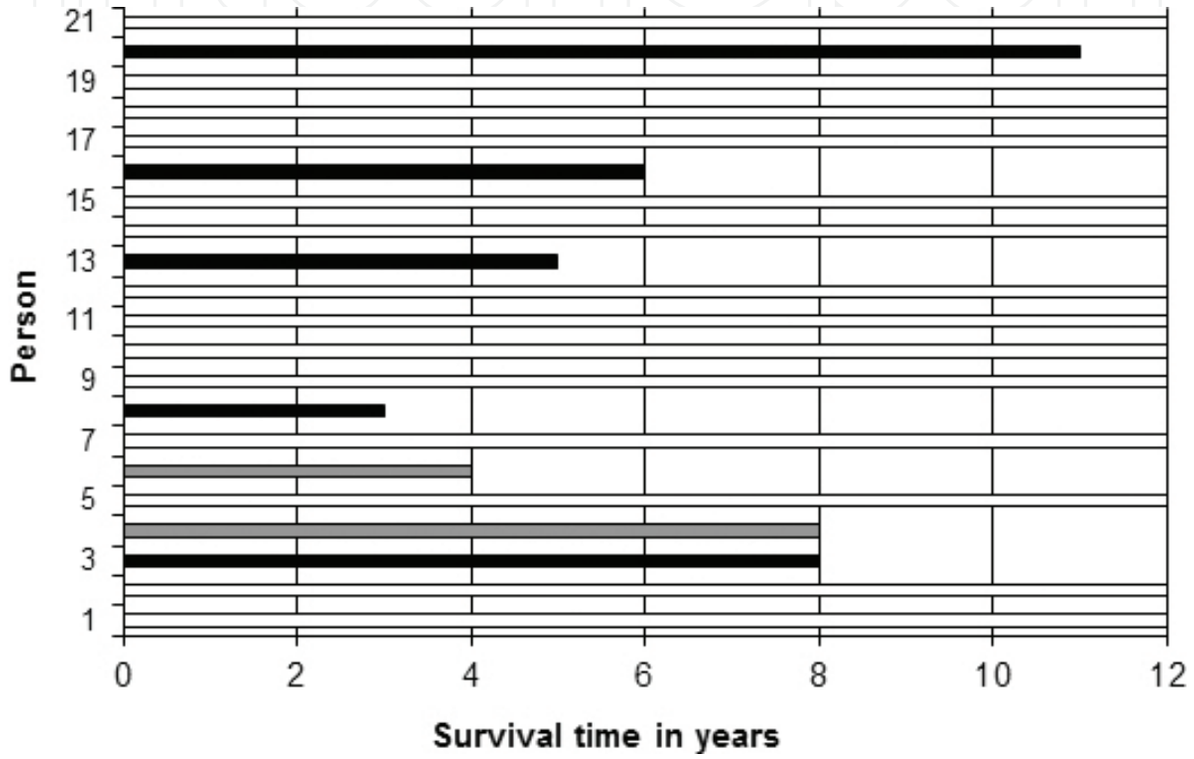


**Figure 2.** Example of a cohort study with 21 participants, who were observed over a period of 12 years. In this example, only exposed participants are displayed. Black bars: deceased persons; white bars: person survived the whole study period; grey bars: 'censored' data (persons that do not have any observation durin the observation time).

Discussion about potential causality is based on in-depth knowledge of scientists and it is necessary to link social conditions and the results in the embodiments of health. For correct interpretation of quantitative studies, it is additionally necessary to identify potential problems and pitfalls in the study design [22]. Causality cannot be developed by quantitative research alone. The collaboration of various disciplines, such as sociology, psychology, medicine and biology, is essential. Furthermore, a combination of different methods and more complex models including life-course epidemiology, mixed methods, diverse study designs, social network analysis, multilevel analysis as well as consideration of directed acyclic graphs or effect modifications allow for a better picture of the overall causal relationship in the social environment [26].

## 3. Methodology

The present analysis is based on register data covering all inhabitants of the Esbjerg municipality. The data are derived from Statistics Denmark (Danmarks Statistik) and the Danish National Patients Registry (Landspatientregisteret). The Esbjerg municipality consists of three cities: Esbjerg, Ribe and Bramming and their surrounding areas. In total, data on the regional population with individual information from the years 2006–2009 were available. The analysis considered a cross-sectional and a cohort approach and hospital admission was defined as an outcome in both study designs. Of particular interest were the overall hospital admissions, hospital admissions due to cancer (ICD10 code C00-D49) and diseases in the circulatory system (ICD10 code I00-I99). The data were derived from the Danish National Patients Registry (Landspatientregisteret). In the cross-sectional analysis, hospital admission was assessed via the overall first individual inpatient hospital admission or due to the disease group in 2006. In the cohort analysis, the first relevant hospital admission was coded time-dependently for the period of 2008–2009.

The exposure of interest was the occupational situation of the citizens in the year 2006, which was drawn from Statistics Denmark. The following categories of employment status were considered:

### 3.1. Workers

(1) Working population (self-employed and working population, employees including pensioners who were still self-employed).

(2) Working citizens with prolonged sick certificates in 2006 (only considered in the cross-sectional approach).

### 3.2. Unemployed

(3) Voluntary-insured unemployment benefit: Individuals who were voluntarily insured in unemployment insurance and received an enhanced unemployment benefit for up to 2 years. It also includes those who worked but additionally obtained benefits.

(4) Social welfare benefit: Individuals who receive a minimum unemployment benefit due to the social benefit system. It ensures that the population studied can maintain a certain minimal standard of living.

### 3.3. Not working

(5) Pensioners without working and invalidity pensioner.

(6) Others (non-working population, e.g. students, parents on maternity leave).

As confounders, the following variables were considered: age, gender, number of individuals in the family, school education, municipality and nationality. Confounder information was drawn from the year 2006 (**Figure 3**).

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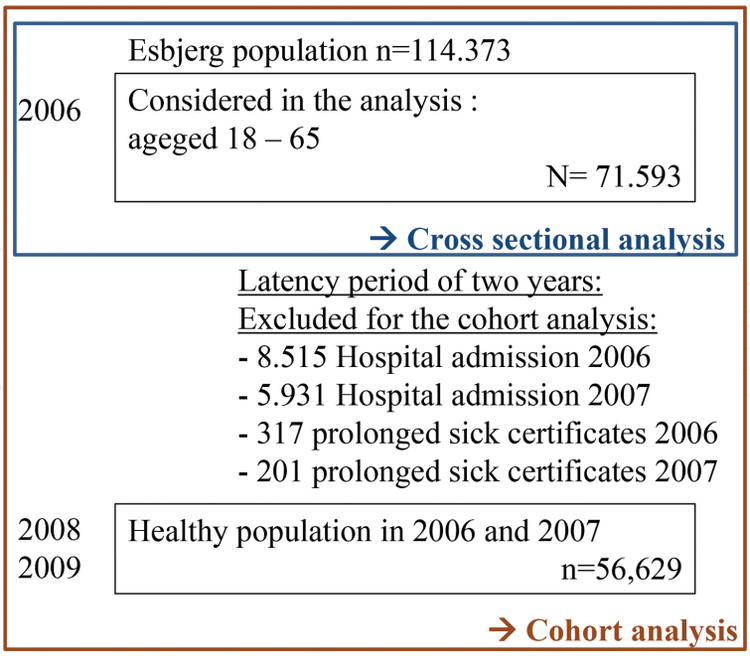


**Figure 3.** Study population for the cross-sectional and cohort analysis.

## 4. Results and discussion

Overall, 71,593 adults were available for the cross-sectional analysis in the year 2006. Of those individuals, 11.9% had at least 1 day of hospital admission in 2006. Of hospital admissions, 0.8% was seen due to cancer disease and 1.0% due to circulatory disease. Of adults, 74.3% was working and only 5.7% of the adult population was unemployed. With regard to completed school education, 30.9% had a basic school education and 22.4% had an advanced school education. Small differences in gender distribution can be seen. In total, there are overall more female hospital admissions in 2006. With regard to the considered diseases, there are more female cancer hospital admissions and more male hospital admissions specific to circulatory diseases. Females had more frequent sick certificates (68.8%) and received social welfare benefits (59.4%) more frequently than men (**Table 1**).

**Table 2** presents the results of the multiple logistic regression models for employment status and hospital admissions. In total, less patients than expected were admitted to the hospital having voluntary-insured unemployment benefits in 2006, if no association was given. Due to the very small numbers, no odds ratios (ORs) were shown and they were omitted in order to interpret the results. Adults with social welfare benefits had a more pronounced overall hospital admission rate in 2006 compared to the working population (OR = 2.86; 95% confidence interval (CI): 2.61–3.14). Considering social welfare benefits and specific diseases, the significant association was most pronounced with cancer (OR: 2.13; 95% CI: 1.37–3.30), followed by circulatory diseases (OR = 1.76; 95% CI: 1.17–2.64).

| | *N* | % | Female part (*N* (%)) |
|---|---|---|---|
| **Total*n:*** | **71,593** | **100.0** | **35,050 (49.0)** |
| **Hospital admission** | | | |
| Yes, overall | 8515 | 11.9 | 4951 (58.1) |
| Yes, due to cancer | 545 | 0.8 | 316 (58.0) |
| Yes, due to circulatory disease | 708 | 1.0 | 253 (35.7) |
| **Employment** | | | |
| Workers | 53,193 | 74.3 | 24,540 (46.1) |
| Sick certificate | 953 | 1.3 | 656 (68.8) |
| Unemployment compensation | | | |
| Voluntary-insured benefit | 1016 | 1.4 | 531 (52.3) |
| Social welfare benefit | 3068 | 4.3 | 1823 (59.4) |
| Not working population: | | | |
| Pensioners | 9155 | 12.8 | 5136(56.1) |
| Others | 4208 | 5.9 | 2364 (56.2) |
| **Education** | | | |
| 1–10 years | 22,094 | 30.9 | 11,234 (50.9) |
| 11–12 years | 31,779 | 44.4 | 14,467 (45.5) |
| >12 years | 16,042 | 22.4 | 8642 (53.9) |
| Not finished | 1678 | 2.3 | 707 (42.1) |
| **Age** | | | |
| 18–25 years | 10,537 | 14.7 | 5126 (48.7) |
| 26–35 years | 14,287 | 20.0 | 6985 (48.9) |
| 36–45 years | 16,943 | 23.7 | 8284 (48.9) |
| 46–55 years | 16,174 | 22.6 | 7939 (49.1) |
| 56–65 years | 13,652 | 19.1 | 6716 (49.2) |
| **Nationality** | | | |
| Danish | 66,350 | 92.7 | 33,527 (49.0) |
| Not Danish | 5243 | 7.2 | 2523 (48.1) |
| **Family** | | | |
| 1 person/family | 21,133 | 29.5 | 8194 (38.8) |
| 2 person/family | 26,174 | 36.6 | 14,167 (54.1) |
| >2 person/family | 49,232 | 68.8 | 12,689 (54.5) |

**Table 1.** Description of the cross-sectional study population.

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The results of the Cox regression with the selected healthy study population are presented in **Table 3**. The case numbers of hospital admission are higher in the cohort analysis and therefore the voluntary-insured unemployment benefit can be interpreted. Overall, there is no association between voluntary-insured unemployment benefits and any considered hospital admission. With regard to those receiving social welfare benefits, a positive association to overall hospital admission compared to the working population was seen. Related to the disease, specific results from the cross-sectional analysis were confirmed for social welfare benefits on hospital admission due to circulatory disease (hazard ratio (HR) = 1.66; 95% CI: 1. 08–2.54). However, social welfare benefits were not associated with hospital admission due to cancer (HR = 0.80; 95% CI: 0.44–1.48).

| | | **Overall hospital admission** | | **Cancer (C00-D49)** | | **Circulatory disease (I00-I99)** | |
|---|---|---|---|---|---|---|---|
| | ***n*** | **Cases** | **OR# (95% CI)** | **Cases** | **OR# (95% CI)** | **Cases** | **OR# (95% CI)** |
| **Overall population** | 71,593 | 8515 | | 545 | | 708 | |
| *Working population:* | | | | | | | |
| Workers | 53,193 | 4970 | Ref. | 309 | Ref. | 362 | Ref. |
| Sick certificate | 953 | 351 | **4.94 (4.31–5.67)*** ** | 19 | **4.46 (2.76–7.15)*** ** | 20 | **4.28 (2.69–6.80)*** ** |
| *Unemployment* | | | | | | | |
| Voluntary insured benefit | 1016 | 98 | 1.01 (0.82–1.26) | 3 | | 3 | – |
| Social welfare benefit | 3068 | 757 | **2.86 (2.61–3.14)*** ** | 24 | **2.13 (1.37–3.30)** ** | 27 | **1.76 (1.17–2.64)*** |
| *Not working population:* | | | | | | | |
| Pensioners | 9155 | 443 | **2.67 (2.48–2.87)*** ** | 177 | **1.87 (1.50–2.33)*** ** | 273 | **2.38 (1.97–2.87)*** ** |
| Others | 4208 | 448 | 1.08 (0.96–1.21) | 13 | 0.84 (0.48–1.50) | 23 | 1.26(0.81–1.95) |

#Adjusted for education, age, gender, nationality and number of persons living in the family. Significant results with * $p < 0.05$; ** $p < 0.001$; *** $p < 0.0001$.

**Table 2.** Multiple logistic regression model of employment and education on overall and specific diseases hospital admission (cross-sectional analyses).

In the present cross-sectional and short follow-up cohort approaches, persons with social welfare benefits had more overall hospital admissions and more hospital admissions due to circulatory diseases compared to the working population. The short-term effect in the cohort as well as in the cross-sectional analysis enables one to argue that social welfare benefits in universalistic welfare states are associated with and cause hospital admission due to circulatory disease even in this short-term follow-up of 4 years. This result is confirmed in a German study of statutory health [27], although unemployment was considered as one category and not separated in different benefit strategies. A Swedish cohort study with ca, 40,000 military conscripts also found a clear causal effect of unemployment on coronary heart disease. In contrast to our results, another cohort study analysing health effects of involuntary job loss in

a meat-processing company using public hospital admission data found no increased risk of circulatory diseases [28].

| | | Overall hospital admission | | Cancer (C00-D49) | | Circulatory disease (I00-I99) | |
|---|---|---|---|---|---|---|---|
| | ***n*** | **Cases** | **OR# (95% CI)** | **Case** | **OR# (95% CI)** | **Case** | **OR# (95% CI)** |
| **Overall population** | 56,629 | 8145 | | 695 | | 730 | |
| *Working population:* | | | | | | | |
| Workers Sick certificate | 44,224 | 5915 | Ref. | 456 | Ref. | 459 | Ref. |
| *Unemployment* | | | | | | | |
| Voluntary insured benefit | 801 | 120 | 1.11 (0.93–1.33) | 13 | 1.21 (0.70–2.12) | 11 | 1.01 (0.56–1.85) |
| Social welfare benefit | 1932 | 375 | **1.45(1.30–1.61)*** ** | 11 | 0.80(0.44–1.48) | 24 | **1.66 (1.08–2.54)*** |
| *Not working population:* | | | | | | | |
| Pensioners | 6196 | 1357 | **1.44 (1.34–1.55)*** ** | 187 | **1.44 (1.18–1.76)** ** | 211 | **1.63 (1.34–1.97)*** ** |
| Others | 3476 | 378 | 0.94 (0.84–1.05) | 28 | 1.36 (0.92–2.01) | 25 | 1.34 (0.88–2.02) |

#Adjusted for education age, gender, nationality, number of persons living in the family, and commune. Significant results with * $p < 0.05$; ** $p < 0.001$; *** $p < 0.0001$.

**Table 3.** Cox regression model of employment on time period for up to the first overall and specific diseases hospital admission (cohort analysis).

The separation between the two study designs reveals controversial results with regard to the association of social welfare benefits and hospital admission due to cancer (see **Table 4**). Different results can only be interpreted when carefully considering aims, considered latency periods and purposes of the study designs (see Chapter 3). The results from a cross-sectional study can only be interpreted as an association between unemployment and hospital admission without knowing the direction of such an association considering that exposure and outcome are collected at the same time without any latency period. With regard to the presented cohort results, the causal relationship given the 2-year latency period cannot affirm that social welfare benefits and hospital admission affect cancer. Similarly, cohort results were seen in the above-mentioned German study [27]. The significant positive association in the cross-sectional analysis and the no effect of social welfare benefits on the cancer hospital admission in the cohort analysis, allow one to logically deduce a reverse causation: disease causes joblessness and ultimately social welfare compensated unemployment (see **Table 4**). This result is confirmed in a cohort study on cancer survivors, which additionally showed an increased unemployment rate [16]. Furthermore, it is well evidenced that return to work is an important health outcome for cancer patients [29, 30] and specific interventions are designed to increase one's return to work after cancer hospitalization [31]. The Danish 'flexicurity' model

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explains the inverse association between hospital admission due to cancer and unemployment, as the barrier to fire individuals in the work environment is low in Denmark. On the other hand, a high level of benefit security is guaranteed if one is unemployed [1]. In future research, longer follow-up periods need to be considered in order to exclude a long-term effect of unemployment on cancer.

| **Disease:** | | **Circulatory disease** | | |
|---|---|---|---|---|
| Design | | Cohort | | Cohort |
| Aim | E↔O | E → O | E↔O | E→ O |
| | **1.76*** | **1.66*** | **2.13**** | 0.80 |
| Interpretation | Association in cross-sectional design, and directed (E → O) effect in cohort design leads to conclude: | | Association in cross-sectional design, and no directed (E → O) effect in cohort design indicate reverse causation | |
| Conclusion | | E → O | | E ← O |

Significant result with * $p < 0.05$; ** $p < 0.001$; *** $p < 0.0001$.

**Table 4.** Summarized result from the different analysis with regard to the short-term association of social welfare and hospital admission due to cardiovascular, cancer and musculoskeletal disorders.

The results suggest that voluntary insured unemployment benefit is not associated with any hospital admission. One potential explanation could be that particular workers with higher income and therefore more financial power to pay for such voluntary insurance can more easily compensate the unemployed situation compared to low income workers. Furthermore, it might be explained by the specific Danish 'flexicurity' model because short-term unemployment is well accepted [1]. This might only be true if the unemployment rate is rather low and therefore the trust in finding a new job is better secured.

The presented analysis includes some limitations worth mentioning. First of all, even though data from about 100,000 individuals were used and followed up with for 4 years, the number of yearly disease-specific hospitalizations was still small. Therefore, only summarized groups were considered such as cancer (ICD10: C00-D49) and circulatory disease (ICD10: I00-I99). Although results show that the differentiation between these disease groups allows for gaining a better understanding of them, these groups are still heterogeneous. In cancer disease, the effect of unemployment might differ between cancer sites, between malignant or benign tumours, or between primary and recurrent tumours or metastases. As mentioned in the 'Methods' section, the National Patients Registry contains information on private clinics since 2008. Our cross-sectional analysis is based on data from 2006 which might lead to a selection bias as richer workers are generally using such private clinics. Therefore, the results should be discussed with caution. However, this selections bias in the cross-sectional analysis might not explain the full association considering that in the city of Esbjerg only a few private clinics are

available. Loss to follow-up bias is also possible in the cohort approach although no information on the potential loss of follow-up was available. Individuals who were not registered in the municipality within 1 year were excluded from the follow-up from that particular year onwards. It might be possible that the healthy unemployed population would be particularly more likely to leave the region due to job opportunities elsewhere. Thus, the selection of a specifically unhealthy study population, especially in the context of unemployed persons, would be warranted. In the present analysis, the loss to follow-up bias might not distort the results, as we did not find a systematically increased health risk for the unemployed.

## 5. Conclusion

The results derived from different study designs can add an important contribution to interpreting the results. Multidisciplinary methods criticism, results presentation and discussion help to clarify underlying causal mechanisms. There is an association between social welfare benefits and hospital admission in Denmark, but the direction of such an association is still not well established. For causality discussion in social welfare, it is important to be an open-minded scientist and regardless of your hypotheses, critically analyse relationships and reverse causation. As seen in short-term observation periods, hospital admissions due to circulatory diseases show a direction of relationship from social welfare benefits to the disease whereas hospital admission due to cancer or musculoskeletal disorders might cause joblessness and finally social welfare benefit enrolment. These results are particularly important for policy implications in connection with social inequality. For cardiovascular diseases, activities to prevent cardiovascular diseases such as the promotion of physical activity or healthy nutrition are important to implement, particularly for unemployed people. With regard to cancer, more efforts should be exercised in order to prevent job loss as a result of the disease.

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## References

[1] Madsen PK: The Danish labor market model: flexicurity. The J AARP Internat. Winter, 2011:34–37.

[2] Chauvel L, Leist AK: Social Epidemiology. In: International Encyclopaedia of the Social and Behavioural Science, 2nd edition 2015, Ed.: Syme LS: Elsevier, 2015.

[3] OECD: Country synopses Denmark. Breaking out of policy silos: Doing more with less, OECD Publishing 2010.

[4] Madsen PK: Nordic labour market and welfare systems from a flexicurity perspective. In: Berglund, Tomas. I: Labour Market Mobility in Nordic Welfare States. København: Nordic Council of Ministers, 2010. s. 37–60.

[5] Rosdahl A, Petersen KN: Modtagere af kontanthjælp. En litteraturoversigt om kontanthjælpsmodtagere og den offentlige indsats for at hjælpe dem. "Recipients of social benefits." literature review of welfare recipients and government efforts to help." Socialforskningsinstituttet, København 2006.

[6] Magnussen J, Vrangsbæk K, Saltman RB: Nordic Health Care System—Recent Reforms and Current Policy Challenges. European Observatory on Health Systems and Policies Series. Open University Press, 2009.

[7] Tangaard Andersen P, Kronborg Bak C: Sundhed og sygdom "health and disese" p339–359 in Greve B, Jørgensen A, Elm Larsen J: Det Danske samfund "The Danish society" HansReityels Forlag Denmark, 2014.

[8] Andreasen MN, Søgard J, Kjellberg J, Jensen MB: Privat/offentligt samspil i sundhedsvæsenet. Lægeforeningen, Dansk Sundhedsinsitut 2009 Hentet den 27 maj 2015 froma: http://www.kora.dk/media/529730/dsi-2581.pdf [Accessed: 2015-05-27].

[9] Kondo N, Dam RM, Sembajwe G, Subramanien SV, Kawachi I, Yamagata Z: Income inequality and health: The role of population size, inequality threshold, period effects and lag effects. J Epidemiol community Health 2012, 66:e11. doi: 10.1136/jech-2011-200321.

[10] Kroll LE, Lampert T: Changing health inequalities in Germany from 1994-2008 between employed and unemployed adults. Int J Public Health 2011, 56:329–339. doi: 10.1007/s00038-011-0233-0.

[11] MacDonald LA, Cohen A, Baron S, Burchfiel CM: Occupation as socioeconomic or environmental exposure? A survey on practice among population-based cardiovascular studies in the US. Am J Epidemiol 2009, 169:1411–1421. doi: 10.1093/aje/kwp082.

[12] Leclerc A, Pascal P Chastang JF Descatha A: Consequences of musculoskeletal disorders on occupational events: A live long perspective from a national survey. J Occup Rehabil 2014, 24:297–306. doi: 10.1007/s10926-013-9457-6.

[13] Lundin A, Faldsted D, Lundberg I, Hemmingsson T: Unemployment and coronary heart diseases among middle-aged men in Sweden: 39 243 followed for 8 years. Occup Environ Med 2014, 71:183–188. doi: 10.1136/oemed-2013-101721.

[14] Jin LJ, Shah CP, Svoboda TJ: The impact of unemployment on health: A review of evidence. Can Med Assoc 1995, 153:529–540.

[15] Mackenbach: The persistence of health inequalities in modern welfare states: The explanation of a paradox. Soc Sci Med 2012, 75:761–769. doi: 10.1016/j.socscimed. 2012.02.031.

[16] Kriegbaum M, Christensen U, Osler M, Lund R: Excessive drinking and history of unemployment and cohabitation in Danish men born in 1953. Eur J Public Health 2010, 21:444–448. doi: 10.1093/eurpub/ckq152.

[17] Carlsen K, Dalton SO, Diderichsen F, Johansen C: Risk of unemployment of cancer survivors: A Danish cohort study. Eur J Cancer 2008, 44:1866–1874. doi: 10.1016/j.ejca. 2008.05.020.

[18] Chandola T, Conibere R: Social exclusion, social deprivation and health. In: International Encyclopaedia of the Social and Behavioural Science, 2nd edition 2015 Ed.: Syme LS: Elsevier, 2015.

[19] Muntaner C, Bprreææ Borrell C, Vanroelen C, Chung H, Benach J, Kim IH, Ng E: Employment relations, social class and health: A review and analysis of conceptual and measurement alternatives. Soc Sci Med 2010, 71:2130–2140. doi: 10.1016/j.socscimed. 2010.09.038.

[20] Osler M, Christensen U, Lund R, Gamborg M, Godtfredsen N, Prescott E: High local unemployment and increased mortality in Danish adults: Results from a prospective multilevel study. Occup Environ Med 2003, 60:e16.

[21] Gordis L (Editor): Epidemiology. Philadelphia: Elsevier Saunders, 2014.

[22] Berg-Beckhoff G, Hellmeier W: Introduction in epidemiology. ELEARNING introduction published online with limited access, 2013.

[23] Galea S, Link BG: Six paths for the future of social epidemiology. Am J Epidemiol 2013, 178:843–849. doi: 10.1093/aje/kwt148.

[24] Nishi A: Evolution and social epidemiology. Soc Sci Med 2015, 145:132–137. doi: 10.1016/j.socscimed.2015.08.015.

[25] Oakes MJ: Invited commentary: Paths and pathologies of social epidemiology. Am J Epidemiol 2013, 178:851–851. doi: 10.1093/aje/kwt144.

[26] Dunn JR: Chapter 2—Explanation, philosophy and theory in health inequalities research: towards a critical realist approach. In: (eds) Campo PO, Dun RJ: Rethinking Social Epidemiology: Towards a Science of Change. Hamilton Canada: Springer Science and Business Media, 2012.

[27] Geyer S, Peter R: Hospital admission after transition into unemployment. Soz Praeventivmed 2003, 48:105–114.

[28] Keefe V, Reid P, Ormsby C, Robson B, Purdie G, Baxter J Iwi: Serious health events following involuntary job loss in New Zealand meat processing workers. Int J Epidemiol 2002, 31:1155–1161.

[29] Peteet JR: Cancer and the meaning of work. Gen Hosp Psychiatry 2000, 22:200–205.

[30] Spelten ER, Sprangers MAG, Verbeek JHAM: Factors reported to influence the return to work of cancer survivors: A literature review. Psychooncology 2002, 11:124–131.

[31] Tamminga SJ, de Boer AG, Verbeek JH, Taskila T, Frings-Dresen MHW: Enhancing return-to-work in cancer patients, development of an intervention and design of a randomized controlled trial. BMC Cancer 2010, 10:345. doi: 10.1186/1471-2407-10-345.

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