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Comparing fatal occupational accidents in Denmark and Sweden 1993–2012

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Abstract

Background: Denmark and Sweden are in many respects two very similar countries with similar welfare state systems and work environment authorities. Nevertheless, marked differences in the incidence of fatal occupational accidents have been found in earlier comparisons of the two countries.

Aims: To investigate differences in the incidence of fatal occupational accidents in the period from 1993-2012 to establish to what extent characteristics of the deceased can explain some of the difference between the two countries.

Methods: Analyses of the accident registers of the two countries' national work environment authorities with supplemental linkages to official registers on employment status are used to determine the incidence of fatal occupational accidents for different groups. The analysis is based on 2,375 accidents (1,068 in Denmark and 1,307 in Sweden) over the period of 20 years. Poisson regression is used to derive incidence rates over time for specific groups.

Results: In the study period, the incidence of fatal occupational accidents decreased in both countries (IRR: 0.95) although the incidence was on average higher in Denmark (IRR: 1.20) and grew larger over time. This difference did not disappear after adjusting for age, sex, and industry among the deceased (IRR: 1.12).

Conclusions: The incidence of fatal occupational accidents was slightly higher in Denmark in the entire period. The difference could not be explained completely by sociodemographic differences or differences related to the labour market structure in the two countries, i.e. other factors (e.g. cultural) may play a role in producing the difference.

Keywords: Fatal occupational accidents; comparative study; register-study

Introduction

Occupational accidents are important public health problems across the globe even in countries with a large tertiary sector [1]. In this study, fatal occupational accidents in Denmark and Sweden are compared. The two countries are very similar: BNP per capita has equal level, welfare systems are generous, and the organization of the work environment authorities has a lot in common. However, quite marked differences in the incidence of occupational accidents across the two countries have been found especially in construction [2]. A study conducted while building the Øresund Bridge showed a marked difference in rate of lost time injuries when comparing workers from the two countries doing similar type of work [3].

The aim of this paper is to compare the rates of fatal occupational accidents in Denmark and Sweden to examine whether earlier results can be replicated using linked register data from both countries. This type of detailed country comparisons has been carried out before [4-6]. By comparing countries that are so similar, we examine to what extent sociodemographic differences in the characteristics of the people who are killed and the industry in which they worked can explain the difference in incidence of fatal occupational accidents.

Methods

Data on 2,375 fatal occupational accidents for the period 1993-2012 were retrieved from administrative databases of the national work environment authorities and included information on sex, age, industry and occupation. To estimate the incidence of fatal accidents, information on the number of employed persons by sex, age and industry was derived from official statistics. Due to discretionary rules, we were unable to use more fine-grained information on those experiencing fatal accidents (e.g. occupation). The study was approved by the Regional Ethics Committee, Gothenburg (547-14).

Because of incomplete information in the Danish accident database, register linkages between the accident database and IDA (Integrated Database for Labour Market Research) [7] was established to supply information on the occupation (ISCO-code) the deceased had worked as in the year prior to the fatal accident. Fatal accidents without information on age, sex or industry was excluded from the analyses (n = 10) as well as fatalities in 1994 (because of the loss of the ship Estonia).

To make data comparable across countries and over time and to comply with the discretionary rules, industry codes were recoded into 7 overall industries inspired by the division of NACE used by Statistics Denmark (DB07 10-grp) and only the first digit of ISCO-codes was used to derive 10 major groups in the classification scheme.

Poisson regression was used to estimate the difference in incidence rates between Denmark and Sweden while adjusting for age, sex and industry. All analyses were carried out using STATA 14.

Results

The yearly decline in incidence of fatal accidents was estimated to 6% for Sweden and 3% for Denmark (IRRs: 0.94 vs. 0.97). On average, Sweden had a consistent lower incidence of fatalities per 100.000 employed. However, the difference grew significantly larger over time (results not shown). The IRR was 1.20 for the unadjusted analyses and 1.12 with full adjustments suggesting that a part (40%) of the relatively small country difference could be explained by age, sex and industry.

Table 1 reports on familiar sociodemographic differences in the incidence rate of fatal accidents. The risk of experiencing a fatal occupational accident is much higher for men (IRR: 9.06) and clearly associated with age. 'Agriculture/forestry/fishing' is the most dangerous industry with a more than four-fold IRR compared to manufacturing. Examining interactions between industry and country, show significantly lower IRRs for 'Agriculture' and 'Public administration' in Denmark ($p < 0.01$) (results not shown).

Table 2 shows fatal accidents distributed by occupation for the entire 20-year period. In both countries most fatalities (> 40 %) occur among craft and trades workers as well as plant and machine operators. We see some divergences between the two countries as well: in Denmark, more fatal accidents are registered among Elementary workers whereas a higher share of the accidents occur among agricultural workers and fishermen in Sweden.

Discussion

This paper confirms earlier research indicating Sweden has on average lower incidence of fatal occupational accidents. This difference grows larger over time and persists even when considering the distribution of sex, age and industry among employees in the two countries.

The strength of this study is the use of 20 years of total registration of fatal occupational accidents in the two countries and the linking of information from national registers. This makes the comparison more comprehensive than earlier comparative studies where only bivariate analyses were conducted. In most cross-country comparisons [4-6], there are no problems in identifying very precisely the numerator in the analyses (i.e. the number of fatal accidents). Detailed specification of the denominator, however, is difficult because of a lack of precise information on the number of employed in specific industries split by sex and age. The analysis is also more comprehensive than earlier comparisons of official statistics in the Nordic countries [3]: the difference between Denmark and Sweden is slightly overestimated in official statistics because of lack of control for the composition of the workforce.

Several weaknesses of the study must be addressed. First, due to discretionary policies, it was not possible to include occupation in the analyses. Second, we cannot rule out differences in the practices of reporting accidents in Danish and Swedish companies [8]. However, for accidents with a fatal outcome, the level of underreporting will probably be small [9] and only of importance if the rate is different across the two countries. Third, information on industry and occupation in the registers was available only at the end of each year and might not be the same as at the time of the accident.

The implication of this study is that the difference in incidence of fatal occupational accidents between Denmark and Sweden cannot be explained by differences in the labour market structure alone which means that other factors (e.g. cultural) must be at work as well. Further studies delving into these mechanisms are needed.

What is already known about this subject:

- Official statistics show that Denmark has a higher incidence of fatal occupational accidents than Sweden despite the two countries being very similar.
- Existing comparisons, however, do not take into account differences in the workforce or the composition of the labour market.

What this study adds:

- The rate of fatal occupational accidents has been declining from ~3 to 1.5 fatal accidents per 100.000 worker-years. On average, the incidence higher in Denmark even when considering differences in the composition of the work force.
- The difference in incidence of fatal occupational accidents grew larger over the study period.

What impact this may have on practice or policy:

- Further research into cross-country differences between Denmark and Sweden should focus on factors other than sociodemographic and industry-related differences, i.e. cultural explanations.

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Table 1. Incidence rate ratios (IRRs) for fatal occupational accidents and age, sex, industry, year and country. Poisson regression. (N = 131,352,045 person years).

	IRR	95% Confidence Interval
Year (1-year increase)	0.95	0.95 to 0.96
Country		
Sweden (reference)	1	
Denmark	1.12	1.03 to 1.22
Sex		
Women (reference)	1	
Men	9.06	7.67 to 10.71
Age		
16-19 years	0.79	0.61 to 1.02
20-24 years	0.93	0.79 to 1.10
25-34 years	0.68	0.60 to 0.78
35-44 years	0.71	0.62 to 0.80
45-54 years (reference)	1	
55-59 years	1.33	1.16 to 1.53
60-64 years	1.63	1.41 to 1.90
65+ years	2.06	1.74 to 2.43
Industry		
Agriculture, forestry and fishing	4.25	3.69 to 4.90
Manufacturing, energy supply and mining (reference)	1	
Construction	2.15	1.88 to 2.46
Wholesale, retail, accommodation and food service	0.59	0.50 to 0.70
Transporting, storage and information	2.17	1.89 to 2.49
Financial and insurance	0.74	0.63 to 0.88
Public administration and private service	0.82	0.71 to 0.94

Table 2: Distribution of fatal accidents by occupation in Denmark and Sweden. 1993-2012.

ISCO group (number)	ISCO group (name)	Sweden	Denmark
0	Armed forces	98 (7%)	36 (3%)
1	Legislators, officials and managers	34 (3%)	93 (8%)
2	Professionals	60 (5%)	27 (2%)
3	Technicians and associate professionals	101 (8%)	70 (6%)
4	Clerks	21 (2%)	28 (2%)
5	Service workers and shop sale workers	60 (5%)	50 (4%)
6	Skilled agricultural and fishery workers	260 (20%)	86 (8%)
7	Craft and related trades workers	311 (24%)	266 (23%)
8	Plant and machine operators and assemblers	321 (24%)	258 (23%)
9	Elementary occupations	51 (4%)	220 (19%)