



# The prevention of occupational injuries in two industrial plants using an incident reporting scheme

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## Abstract

**Introduction:** The aim of this study was to examine whether the introduction of an incident reporting scheme with feedback in two industrial plants had an effect on the number of major incidents. **Method:** An intervention design with measurements before the implementation of the incident reporting scheme and two years later was used to examine the relationship between incident rates, safety climate, the willingness to report incidents and perceived management commitment to safety. **Results:** The results showed that a successful implementation of an incident reporting scheme was followed by a decline in the incidence of major incidents at a Danish metal plant. A key factor in implementing the scheme was top management commitment, which was lacking at another plant, where the implementation of a similar scheme failed. **Conclusion:** Although the study shows some encouraging results concerning the use of incident reporting schemes to prevent occupational accidents, the possibility to draw causal conclusions is limited in the present study, and further studies are needed before the effectiveness of such schemes can be evaluated with certainty.

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## 1. Introduction

Occupational injuries still pose a problem in most countries in the European Union. Among the Nordic countries, Denmark holds the unfavorable position of having the highest rate. While trans-national comparisons should be interpreted with caution, because of variations in national laws and definitions of reportable injuries, the overall injury rate has been 50–100% higher in Denmark compared to Sweden, Norway, and Finland since the mid 1990's. As a consequence of this considerable difference in injury rates between otherwise comparable countries, the prevention of occupational injuries has been one of the main areas of focus in Danish work environment research in the past 5–10 years.

Different strategies have been tried in the effort to prevent injuries both in Denmark and internationally. One of these is incident reporting schemes, which originate from high-risk

industries such as aviation, nuclear power plants, and off-shore oil and gas installations. These schemes are becoming increasingly widespread in conventional production plants and the use of an incident reporting scheme is one of the demands specified in the international occupational health and safety management system OHSAS18001 that many major companies use.

The use of incident reporting schemes as a way to prevent major incidents is based on two assumptions that date back to Heinrich's injury triangle model (Heinrich, 1931). First, the "safety iceberg"—assumption, which states that for every major incident that occurs a large number of related minor injuries and near-misses occur, and secondly the related "identical causation"—assumption, which assumes that these large numbers of near misses and minor incident have the same underlying causes as the major incidents. While the first assumption is widely accepted, and the only controversy is the specific ratio between the different incident types, the second assumption has received some criticisms. There has been a discussion of whether a

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differential causation-model of accident prevention should be accepted instead, as there is some empirical evidence showing that the causes for minor incidents and near misses are not the same as for major incidents (Kines, 2003; Salminen, Saari, Saarela, & Rasanen, 1992; Saloniemi & Oksanen, 1998). However, it has recently been argued that the identical causation assumption has not been properly understood and tested in earlier studies, and data that supports the assumption has been presented (Wright & van der Schaaf, 2004). So as of yet there is no agreement on the status of the identical causation assumption. None the less, if one accepts the two assumptions, the basic premise for incident reporting schemes states that it is possible to prevent major incidents by finding and analyzing the causes of the plethora of minor incidents and near misses and then set up preventive measures against these.

However, the empirical evidence for the effectiveness of this approach is hard to find. Most of the evidence for the effectiveness of incident reporting schemes in preventing major incidents is anecdotal and stems from companies around the world. A summary of evaluation data found only two studies of incident reporting schemes (Guastello, 1993), neither of which showed an effect on the number of major incidents, although one of them (Menckel & Carter, 1985) showed a drop in the severity of incidents.

The increasing use of reporting schemes increases the need for scientific evidence showing that this indeed is an effective way to prevent accidents. One way to obtain this evidence is to look at data from some of the many companies that have implemented incident reporting schemes. The data from these companies can be used to strengthen the link between near miss and minor incident reporting and the prevention of major incidents. For example Jones, Kirchsteiger, and Bjerke (1999) found an inverse proportionality between the number of reported near misses and the number of accidents at two different plants in Norsk Hydro. The present study seeks to add to this literature by reporting the results from the implementation of an incidence reporting scheme in two different industrial plants in Denmark.

When implementing an incident reporting scheme, some potential problems may occur, as the success of the scheme depends on multiple factors. Management commitment is recognized as probably the single most important factor (Flin, 2003) for success in any area of occupational safety, and presumably in any organizational change. This especially applies for top management commitment, but also line management's commitment is an important factor in changing the safety-oriented behavior of workers (Zohar, 2000, 2002; Zohar & Luria, 2003). Moreover, the effectiveness of the incident reporting scheme depends strongly on the workers' willingness to report any type of incident. At the outset this willingness might be low, especially concerning small and presumably insignificant incidents such as minor cuts and bruises or near misses, as these types of incidents are an accepted part of everyday work for many of the employees in the industrial sector. Likewise, there may

be a low willingness to report incidents in situations where workers feel they will be blamed for the incident, that is, if the necessary trust in the fairness of management is not present (Reason, 1997). Also, there are several reasons why there might not only be a general underreporting of incidents, but also a biased reporting of incidents, as the perceived importance of reporting specific types of incidents may differ (van der Schaaf & Kanse, 2004).

The present study examines whether the implementation of an incident reporting scheme in two industrial plants has an effect on the number of major incidents, and how general safety climate, perceived management commitment to safety and workers' willingness to report incidents, contributes to the success or failure of the scheme.

## 2. Methods and design

### 2.1. Design

The study was designed as an intervention study without a control group spanning 3 years, with pre- and post-intervention measurements. The study period was May 2001 – May 2004, with pre- and post-measurements two years apart in September 2001 (T0) and 2003 (T2), respectively.

### 2.2. Participants

The study involved two Danish production plants from the metal industry. The companies differed in size. Plant A had 200 workers involved in production at the start of the study and Plant B had 520 workers. At post measurement, two years later the plants had reduced their workforce to 188 and 445, respectively, due to cutbacks and layoffs. A total of 517 workers (146 and 371) were employed in the companies during the whole study period.

Questionnaires about perceived safety climate, the willingness to report incidents and perceived management commitment to safety, were administered to all workers involved in production at the two plants. At the first measurement there was a response rate of 81.5% at Plant A and 78.7% at Plant B. At the second measurement the response rate was 79.3 and 77.8%, respectively. Of the 517 workers who were employed at the companies during the whole study period, 359 (69.4%) completed the questionnaires at both measurements. The data reported here are from this group.

Although production characteristics at the two companies were to some extent comparable, major differences existed in other areas. Plant A was a relatively new and modern plant that was part of a large worldwide Danish corporation, whereas Plant B was an older and in many ways old-fashioned company that merged with a large worldwide American corporation just before the start of the study period. As Table 1 shows, these differences were also reflected at the shop floor, where Plant B's employees are older and more experienced than Plant A's. Plant B also has more skilled workers than Plant A.

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