Risk Factors for Injuries and Occupational Diseases in Agriculture in Finland

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INTRODUCTION

Agriculture ranks among most hazardous industries in many countries. Numerous reports have documented high injury and occupational disease rates among farmers [e.g. Rautiainen and Reynolds, 2002; Virtanen et al., 2003; McCurdy and Carroll, 2000]. In Finland, active farmers with at least five hectares of farmland are required to carry insurance against injuries and occupational diseases. The Finnish Farmers' Social Insurance Institution administers this insurance scheme, known in Finland as Mata insurance.

The Mata insurance system records statistical information on each claim and this information has been used in recent studies to identify risk factors for injury. This work has resulted in several important findings, including: 1) the majority of farmers file no claims in a given year. Out of those who do, most file one claim, but some file several claims. [Rautiainen et al., 2009]. Those with frequent compensated claims may be described injury prone individuals, and they could be considered a specific target group for prevention [Visser et al., 2006]. 2) 20% of the most serious injury claims represented 80% of all accident insurance costs [Rautiainen et al. 2005]. Identifying the characteristics of the most serious claims could help target preventive efforts. 3) Comparison of risk factors for serious injuries and all injuries showed that the risk factor profiles are similar but some risk factors are more prominent for serious injuries [Rautiainen et al. 2009] – this risk factor information can be used for targeting specific producer groups at greatest risk of injury.

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A broad range of preventive efforts have been implemented to reduce the high rates and costs of agricultural injuries and occupational diseases, but to date, there is little evidence that these efforts have been effective [Lehtola et al., 2008]. We suggest that better understanding of the characteristics and risk factors for injury and occupational disease is an important step in targeting prevention and improving the efficiency of preventive programs in agriculture.

OBJECTIVES

Our study aimed to identify risk factors that are associated with the compensated injury and occupational disease claims based on three year claim records. Using the national insurance and agricultural statistic data for Finnish farmers, we identified segments of farmers with increased risk of compensated claims. The resulting information allows for improved targeting of preventive efforts and their cost-effectiveness.

MATERIAL AND METHODS

The study population consisted of 85,980 active Finnish farmers (64% male, 36% female) who were insured during the entire three-year period, 2001–2003. The study variables included Mata insurance claims, demographic data from the Finnish Farmers Social Insurance Institution and farm production variables from the Finnish national agricultural statistics service (year 2002).

Claims records for a total of 19,643 compensated injuries and 1,127 occupational diseases were extracted and merged into the dataset with demographic and farm variables for the entire farm population. The data included no personal identifiers. A randomly generated identifier was added to data elements for merging and generating research datasets.

Multiple logistic regression was used as the primary method for identifying risk factors for both injuries and occupational diseases. We employed the stepwise (forward) procedure for model selection, including and keeping variables at the $P<0.05$ level. Statistical analyses were performed using SAS Version 9.2 software [SAS Institute Inc, 2007].

RESULTS

The great majority (71,794; 83.5%) of the insured farmers filed no claims during 2001–2003. Out of those 14,186 farmers who did file, most (10,681; 12.4%) filed only one injury or occupational disease claim. A total of 3505 (4.1%) farmers filed two or more claims, up to 11 claims.

Logistic regression with a stepwise (forward) model selection procedure identified the following factors that were associated with injuries: age, sex, language, income, residence, farm ownership status, field size in hectares, province (location of the farm), OHS (occupational health

service) membership, main type of production, and the presence of bovines, poultry, sheep, and horses. The same statistical procedure identified the following factors that were associated with occupational diseases: field size in hectares, OHS membership and main type of production.

The odds ratios (OR) for injuries and occupational diseases are presented together with 95% confidence limits for the levels of the explanatory variables. The results indicated that older farmers had a higher risk of injury. Compared to farmers in their sixties, the odds of injury were 0.76 (0.67–0.87) for farmers in their twenties, 0.78 (0.70–0.85) in their thirties, and 0.80 (0.73–0.88) in their forties.

Men had clearly higher risk of injury compared to women, OR 1.62 (1.56–1.70) – but there was no significant difference between the genders in occupational disease. Farmers in the lower income groups (annual farm income 0–4,999; 5,000–9,999; and 10,000–14,999 Euros) had lower risk of injury than their peers in the highest income group (≥15,000 Euros), OR 0.35 (0.31–0.38), OR 0.60 (0.56–0.63), and OR 0.80 (0.77–0.84), respectively.

Finnish speaking farmers had higher risk of injury than their Swedish speaking peers, OR 1.16 (1.03–1.30). OHS membership clearly increased the odds of both compensated injury and occupational disease; OR 1.41 (1.36–1.47) and 1.46 (1.27–1.67), respectively.

Farmers in the lower field size groups (0–9; 10–19; 20–29; and 30–39 hectares of cultivated land) had lower risk of injury than the farmers in the highest field size group (≥40 ha), OR 0.77 (0.70–0.85), OR 0.77 (0.72–0.82), OR 0.86 (0.81–0.90), and OR 0.92 (0.87–0.98), respectively. However, farmers in the second largest field size group (30–39 ha) had higher risk of occupational disease than their peers in the largest field size group, OR 1.23 (1.02–1.49).

The owner operators of the farm compared to salaried family members had lower risk of injury, OR 0.73 (0.62–0.86). Farmers living on the farm had higher risk of injury than farmers living outside the farm; OR 1.23 (1.09–1.40).

Six out of nineteen provinces had significantly higher risk of injury than the reference province (South Karelia). Main farm production type was associated with the risk of injury and occupational disease. Animal production, in general, and particularly the presence of bovines, poultry, sheep, or horses clearly increased the injury risk compared to growing cereal crops.

Growing dairy cattle, suckler cows, feeder pigs, and finishing pigs, as well as egg production had significantly higher risk of occupational disease than growing cereal crops; OR 2.35 (1.91–2.90), OR 2.92 (1.60–5.34), OR 2.00 (1.33–3.02), OR 1.79 (1.08–2.95) and OR 1.95 (1.01–3.75), respectively.

DISCUSSION

The current study reports risk factors for compensated injuries and occupational diseases from a large national insurance system (which started in 1982) that covers practically all active farmers in Finland. Farmers have a financial incentive to claim their injuries and diseases, and a well established legal framework is in place to guide insurance practices.

Farmers were predominantly male; only 36% were female. The average age of the farmers was 46 years in 2002 – middle year of our observation period. The average field area was 30 hectares and average forest area 53 hectares. Finnish farms were smaller than farms in many industrialized countries, but half of Finnish farms were still full-time operations.

Between 2001–2003 the average rates were 7.62 injuries per 100 person-years and 0.44 occupational diseases per 100 person-years. Large number of farmers (3505) had frequent compensated claims, especially injuries. Those farmers may have specific risk factors in addition to those identified in this study. This issue is addressed in ongoing studies using career-long compensated claim datasets, and visiting farms with no claims and multiple claims.

Interestingly, OHS aims to prevent injuries and occupational diseases but OHS membership increased the odds of compensated claims for both outcomes. This result could be due to detection and reporting biases where OHS members are more effectively diagnosed, and more aware of the insurance system and their state of health.

The material in this study consisted of the entire self-employed farmer population in Finland, which is a strength in this study. The identified risk factors for injuries are fairly similar to the results of Rautiainen et al. [2009], but in this study we had a three-year observation period (compared to one year in previous study), which increases statistical power. We also included additional variables in the analyses. The limitations include use of administrative data. The available potential risk factor variables were fairly few and general in nature: mostly basic personal characteristics (age, sex, etc.) and farm production characteristics (field size, main production, etc.).

CONCLUSIONS AND RECOMMENDATIONS

A total of 19,643 compensated agricultural injuries and 1,127 occupational diseases occurred in Finland in 2001–2003. To increase the cost-effectiveness of preventive efforts, specific segments of farmers based on their age, gender, income level, province, operation size, residence, language, and type of production, can be targeted, similar to what is done in traditional marketing of products and services. The risk level estimates for injury and occupational disease for all these factors provide insight into selecting target populations. Various combinations of engineering, education,

enforcement, incentives, and other measures may be needed to prevent specific types of injuries and occupational diseases in specific populations and their subgroups.

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