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Cost of Compensated Injuries and Occupational Diseases in Agriculture in Finland

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ABSTRACT. Although agriculture is one of the most hazardous industries, the costs of agricultural injuries and illnesses are not well known. This study aimed to determine the cost burden from compensated injuries and occupational diseases in Finnish agriculture using workers compensation records.

The incidence rates in 1996 were 7.4/100 for injuries and 0.61/100 for occupational diseases. Men had a higher risk of injury (RR = 1.89; 95% CI: 1.81-1.97), but a lower risk of an occupational disease (RR = 0.68; 95% CI: 0.60-0.78), compared to women. The total cost burden was €75 (Euros) per person in 1983, increasing to €215 in 1999. The total insurance cost in 1996 was €23.5 million consisting of medical care (16%), per diem (lost time compensation within one year from the incident) (37%), pension (lost time compensation after one year from the incident) (23%), survivors pension (3%), impairment allowance (7%), rehabilitation (6%), and other costs (9%). The total cost was 0.7% of the national gross farm income and 2.2% of the net farm income. The mean cost of 1996 cases was €1340 for injuries and €6636 for occupational diseases. Injuries represented 92% of the claims and 71% of the total costs. Occupational diseases represented 8% of the claims and 29% of the costs. Twenty percent of the most severe claims represented 79.5% of the total insurance costs.

Injuries and occupational diseases result in significant costs in agriculture. Lost time was the largest cost item. Overall, injuries were more costly than occupational diseases. This study indi-

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cates that the 20%-80% rule applies to agricultural injury and illness costs, and from the cost standpoint, it is important to focus prevention efforts on the most severe incidents. [Article copies available for a fee from The Haworth Document Delivery Service: 1-800-HAWORTH. E-mail address: <docdelivery@haworthpress.com> Website: <<http://www.HaworthPress.com>> © 2005 by The Haworth Press, Inc. All rights reserved.]

KEYWORDS. Agriculture, injury, occupational disease, insurance, workers compensation, injury cost, occupational disease cost

INTRODUCTION

Although agriculture is one of the most hazardous industries, the costs of agricultural injuries and illnesses are not well known. Self-employed farmers are typically not covered by workers compensation, and therefore claims data for them are not available. Health insurance may cover the treatment of farm injuries and illnesses, but lost time and indirect costs may not be covered, and the work-relatedness of the incidents may not be determined. Furthermore, private insurers may not publish cost data as they consider them proprietary information.

Injuries place a significant burden on the economy. In the United States, work-injury costs have been estimated at 1.3%¹ or 1.8%² of the gross domestic product (GDP).³ The economic losses from occupational injuries and illnesses rival those from cancer and heart diseases. In U.S. agriculture, the injury costs have been estimated at \$4.573 billion, which was 2.8% of the value of agricultural products sold, and 15.0% of the net cash returns in 1992.^{4,5} This estimate is very high, and further research is needed to examine agricultural injury costs.

It is in the interest of farmers, family members, insurers, and society as a whole to reduce injuries and illnesses. Current lack of cost information limits risk assessment efforts, and policy decisions are often made with little knowledge of the magnitude of the problem. Accurate cost information would be valuable for sizing and targeting research and prevention efforts.

This study aimed to quantify compensated agricultural injury and illness costs. The Finnish farmers workers compensation system provided a unique opportunity for this research. Since 1982, Finnish farmers have had a mandatory workers compensation program. It covers

all farmers and provides a broad range of benefits. The system is well established and well utilized. Large databases, detailed coding systems, and effective quality control procedures enable accurate cost analysis over a long period of time.

METHODS

Injury and occupational disease rates were calculated using 1996 incidents ($n = 10,922$) and the mid-year population ($n = 137,002$). An injury is described in MATA as a sudden unexpected forceful event with an external cause, which results in bodily damage or an ailment, and which occurs in the course of agricultural work. Occupational diseases are specific illnesses defined by legislation, which are probably predominantly due to specific physical, chemical, or biological factors associated with work. They include respiratory diseases (farmers lung, occupational asthma, rhinitis), cumulative trauma/repetitive motion injuries (epicondylitis, tenosynovitis), skin diseases (allergic and irritant contact dermatitis), zoonoses, and hearing loss. Low back pain is compensated as an injury.

Two primary methods were used to examine injury and illness costs. Method 1 provided the actual claim cost from 1983 to 1999, adjusted for inflation. This method showed the evolution in the insurance cost and benefit structure. It also established the historical cost burden to the insured persons over time. Method 2 provided an estimate of the costs for injuries that occurred in 1996. This estimate included benefits paid up to the data extraction point, as well as estimated future payments for long-term disability cases.

Setting

Finland is the world's most northern agricultural nation with self-sufficient production of major grain and livestock commodities. Small family farms are common and Finnish farmers have a broad range of social insurance programs, including national health care, health insurance, old-age pension, earnings-related pension, and a workers compensation insurance.⁶ Farmers Social Insurance Institution (Mela) administers the workers compensation program, which is mandatory for 18-64 year-old self-employed farmers, fishermen, and reindeer herders, as well as family members earning more than €2532 (Euros in 2001)⁷ from the family enterprise. The premiums are based on insured farm income, which is determined by Mela, reflecting the value of the work conducted on the farm. Arable land, forestland, animal production, taxable income, and personal adjustments are considered in the assessment, and the farm income is divided in most cases equally between the spouses or owners. The income is adjusted annually by a specific cost-of-living and wage index.⁸

Data

This study was conducted based on a research agreement between The University of Iowa and Mela. The descriptive study of the annual cost burden (Method 1) was conducted using Mela's administrative data from 1992 to 1999. The estimation of 1996 injury and occupational disease costs (Method 2) was conducted using 1996 claims records (N = 10,922). The data were extracted from the claims database on August 1, 2000, and compensated costs up to that point were included. This time lag enabled including at least three years of accumulated costs from long disabilities after the incident year. The present value of permanent pensions was included, as determined by Mela. All costs were converted from the Finnish currency, Markka (FIM) into Euros. Starting January 1, 2002, the Euro has been the official currency of Finland.

Statistical Methods

Injury and occupational disease rates were constructed using 1996 incidents and the in-

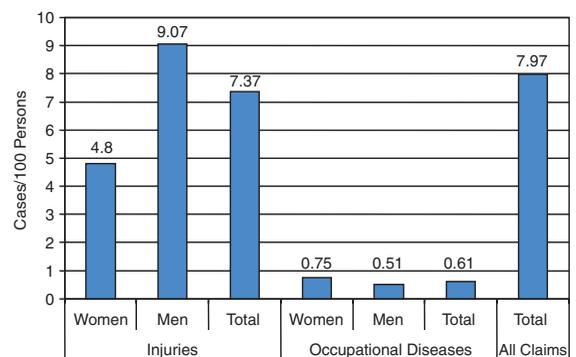
sured mid-year population. The rates among men and women were compared using the chi-square test. The annual insurance cost burden (Method 1) from 1982 to 1999 was compiled from administrative data, and actual costs were adjusted for inflation using the Finnish official cost-of-living and wage index for social insurance programs (known in Finland as the TEL index). Annual costs per insured person were calculated using the actual paid benefits and the mid-year populations. This method provided the annual cost burden per insured persons over time. The estimation of the cost for 1996 cases (Method 2) included actual paid benefits up to the data extraction point, as well as the present value of future costs.

RESULTS

Injury and Occupational Disease Rates

The 1996 injury rate was 9.1/100 for men, 4.8/100 for women, and 7.4/100 for both. The occupational disease rate was 0.51/100 for men, 0.75/100 for women, and 0.61/100 for both. Men had a higher risk of injury (RR: 1.89, 95% CI: 1.81-1.97) but lower risk of occupational disease (RR: 0.68, 95% CI: 0.60-0.78), compared to women. Especially farmers lung, asthma, dermatitis, and epicondylitis rates were higher in women. Figure 1 shows the injury and occupational disease rates by gender. Figure 2 shows the injury and occupational disease rate development from 1983 to 1999, as well as the development in total claim costs.

FIGURE 1. Injury and Occupational Disease Rates.



Method 1: Annual Insurance Cost Burden

Figure 3 shows the annual insurance costs by benefit category. The total cost burden per insured person increased from €75 in 1983 to €215 in 1999. The costs increased rapidly in the 1980s, but appeared to stabilize in the 1990s. The annual insurance cost consist of paid benefits for new cases, as well as old cases from previous years, which continue to require medical care, rehabilitation, or pensions. The

FIGURE 2. Injury and Occupational Disease Claim Rate and Compensated Claim Costs per Person, 1983-1999.

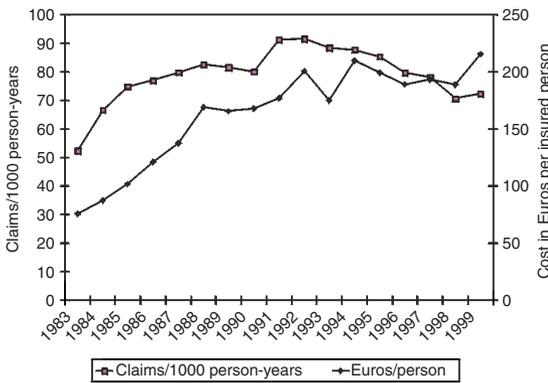
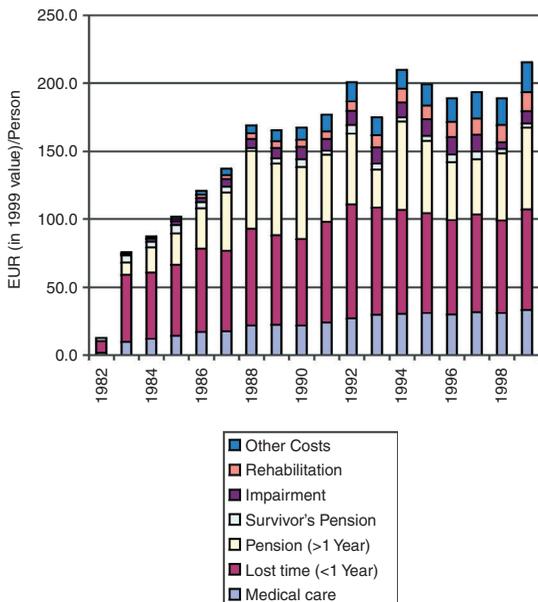


FIGURE 3. Workers' Compensation Cost Burden per Insured Person in 1982-1999.



reasons for cost increases were outside the scope of this study, but could include changes in population, incidence rate, claim severity, accumulation of long-term disability cases, health care costs, and other factors. The claim rate and the claim cost burden per insured person (shown in Figure 2) had a significant correlation ($r = 0.655, p < 0.05$).

During 1996, the compensated insurance costs were €23.5 million, consisting of medical care (16%), lost-time (per diem) during one year from the incident (37%), lost time (accident pension) after one year from the incident (23%), survivors pension (3%), impairment allowance (7%), rehabilitation excluding lost time during rehabilitation (6%), and other costs, including insurance administration (9%). These costs included payments for 1996 cases as well as long-term disability cases from previous years.

Method 2: Estimated Cost of 1996 Incidents

The total and mean costs were calculated for 1996 injuries and occupational diseases, and the results are shown in Table 1. The total cost was €19 million. The mean cost was €1340 for injuries, €6636 for occupational diseases, and €1743 for all claims. Occupational diseases

TABLE 1. Claims and Claim Costs

	Method 1		Method 2	
	Total	Occup. Disease	Injury	Total
Number of Claims	N/A ¹	830	10092	10922
Mean Cost per Claim, EUR	N/A ¹	6636	1340	1743
Total Cost, Million EUR	23.5	5.5	13.5	19
Percentage of Total Cost				
Medical Care %	16	5	15	12
Lost time Per Diem %	37	12	57	44
Rehabilitation %	6	14	0	4
Impairment Allowance %	7	0	0	0
Paid Pension %	23	34	10	17
Survivors' Pension %	3	0	0	0
Permanent Pension (present value) %	N/A ¹	34	18	23
All Pensions Combined %	26	68	28	40
All Pensions and Per Diems Combined %	63	80	85	83
Other Costs %	9			
Total %	100	100	100	100

¹ In this method, costs include payments for 1996 cases (n = 10922) as well as long-term disability cases (n not determined) from previous years. Part of the cost for 1996 long-term disability cases will occur in subsequent years. Therefore, mean costs per claim cannot be accurately calculated in this method.

were about five times as costly as injuries. Injuries represented 92% of the claims and 71% of the total costs, and occupational diseases represented 8% of the claims and 29% of the costs. Lost-time per diem was the largest cost sub-category (44%), followed by present value of permanent pensions (23%) and paid pensions up to August 1, 2000 (17%). All pensions combined were 40% of the total costs. Lost time compensation including per diems and all pensions was 83% of the total costs, and medical care was only 12% of the total costs. Insurance administration and impairment allowance costs were not included in this analysis.

Table 1 presents the costs using both Method 1 and 2. Method 2 does not include administrative costs and impairment allowances, which explains part of the difference in total costs. Pensions were much greater in Method 2 (40% versus 26%). The permanent pension cases (66 out of 10,922 cases) represented 23% of the total costs in Method 2. These cases consisted of 42 injuries and 24 occupational diseases.

Figure 4 shows the number of cases and total costs by category. The greatest numbers of cases were in the three categories between 200 and 1600 Euros. A small number of claims ($n = 55$, 0.5% of claims) in the most severe category (over 51,200 Euros) represented nearly one-third of the total costs (5.9 million Euros, 31% of the total costs). Furthermore, 20% of the most severe cases represented 79.5% of the total costs. A relatively large number of small claims, less than 200 Euros ($n = 2055$, 18.8% of

claims), represented only a small fraction of the total costs (0.2 million Euros, 1.2% of total costs).

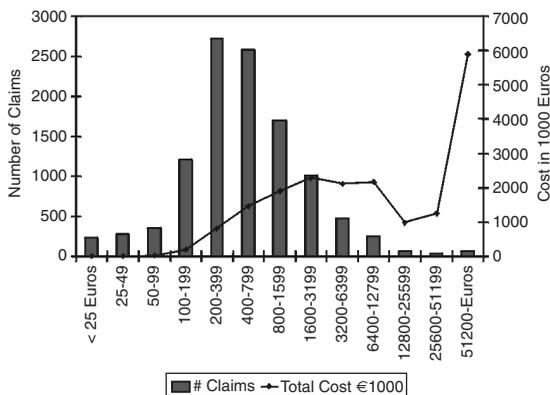
DISCUSSION

Agriculture is a hazardous industry worldwide. In Finland, the annual fatal injury rate in agriculture was 6.5/100,000;⁹ less than the rate in United States agriculture (22.5/100,000)² and Canadian agriculture (11.6/100,000).¹⁰ Several factors may contribute to the low fatality rate in Finnish agriculture. The rollover protective structures (ROPS) became mandatory on new tractors in 1969. Many safety standards have been applied. About 40% of farmers utilize occupational health services.¹¹ Extensive safety education has been provided.¹² Insurance premium reductions are offered based on claims experience and occupational health service participation.¹³

Comparable workers compensation-based non-fatal injury rates are not available for self-employed farmers in the U.S. A survey-based estimate indicates 6.8 injuries per 200,000 hours (equivalent of 100 person years),¹⁴ which is similar to the injury rate in our study (7.4/100 person years). In our study, men had a greater risk for injury but a lower risk for an occupational disease compared to women. This may be due to work exposure hours. Men spend more time in fieldwork (men 602, women 72 hours/year), construction (men 107, women 7 hours/year), forest work (men 88, women 3 hours/year), and animal care (men 1,092, women 776 hours/year) compared to women. Men contribute less to household work (men 80, women 1,022 hours/year). The annual working hours on farms in 1996 were: men 2,446 hours, women 2,169 hours, male family members 524 hours, and female family members 308 hours.¹⁵ Overall, the greater injury risk for men appears to be explained by the higher share of hazardous work tasks, but the higher risk of occupational diseases for women does not seem to be clearly explained by division of work duties.

In this study, the injury costs were 0.7% of the national gross farm income, 2.2% of the net farm income, and 2.5% of Melas insured farm income.^{16,17} This is somewhat comparable to estimates in all industries in the U.S.; 1.3%¹ or

FIGURE 4. Number of Claims and Total Costs by Cost Category.



1.8%² of the GDP.³ Leigh et al.⁴ estimated the total injury costs in U.S. agriculture in 1992 at \$4.573 billion, which is 2.8% of the value of agricultural sales, and 15.0% of the net cash returns.⁵ This estimate appears considerably higher than our estimates, which may indicate that agricultural injury costs are higher in the United States compared to Finland. This finding is consistent with workers compensation premium rates. The U.S. workers compensation premiums were generally in the range of 1.3-4.1% of the payroll for most industries. Rates for agriculture varied by State and were 2.8-16.9% for field crop farming, 4.2-16.2% for cattle farming, 3.1-18.0% for orchards, and 2.4-17.8% for nurseries.¹⁸ The total workers compensation costs in Finnish agriculture were about 2.5% of the insured income (equivalent to payroll). The actual premiums have been about 1%, and the majority of the insurance costs have been covered from state and general health insurance funds.

It is well recognized that workers compensation represents only part of injury and illness costs. Broader consequences of injuries and illnesses have been described in the literature. Dembe¹⁹ presented the social consequences of occupational injuries and illnesses in the following categories: affected individuals and groups; societal role; institutions and structures; and vocational function. The broader impacts are complex and difficult to trace and measure. The investigation of social consequences is complicated by the intricate reciprocal relationships among the determinants, effects, and modifiers of work-related disorders. Several methods have been utilized for valuation of the broader economic consequences of injuries and illnesses. Weil summarized three methods: present value of future earnings, contingent valuation, and compensating wage differentials.²⁰

In agriculture, there are significant timeliness costs if the planting, harvesting, pesticide application, or animal care is not done at the optimal time. The timeliness cost is an important factor in selecting production capacity.²¹ A serious injury could cause timeliness losses much beyond compensated income replacement (one lost day equals 1/360th of the annual calculated income in the Finnish insurance system). However, one study found that only two out of ten

farmers with harvest time injuries experienced actual harvest delays of one day or more as others helped the injured farmer with his/her harvest work.²² Injury events (accidents) may also lead to material damage, besides personal injury. One study of 48 Finnish farmers with an injury in 1988 indicated that 41% of the cases involved material damage, mostly minor repairs. Lost off-farm earnings and payments to substitute workers were major cost items, besides compensated costs.²³

The total insurance cost burden per insured person increased almost three-fold in the past two decades. This is partly explained by the decreasing number of farmers and the accumulating number of permanent pensions in the insurance system as it matures. The claim rate had a high correlation ($r = 0.655$) with costs. During the most recent years, it appears that the injury rate has continued to decrease while the cost have stabilized or increased. Other factors may include increased incomes and health care costs. Medical costs were 12% (method 2) or 16% (method 1) of all costs, which is comparable to reported estimates by the U.S. National Safety Council (16%).¹ The lost-time compensation including per diems and pensions was 63% (method 1) or 84% (method 2), compared to 52% productivity losses in the U.S. These data consistently suggest that medical costs are only a small fraction and losses of time, earnings, and productivity are much greater cost factors.

The U.S. workers compensation data indicate that medical costs are much higher compared to our estimate and the National Safety Councils estimate. Workers compensation data from California indicate that from 1997 to 2002, the average medical costs per claim jumped from \$13,845 to \$31,120. The average indemnity benefits rose from \$15,874 to \$21,022 per claim. By 2002, medical costs increased to 60% of total claim costs.²⁴ This may be due to rising health care costs and limitations in indemnity payments (weekly maximums, maximum disability durations). The Finnish workers compensation is based on full compensation of lost time with no duration limits, which increases the indemnity proportion in comparison to the US. The national health insurance and universal health care may provide more economical care, and may absorb some of the costs,

reducing the medical cost in Finnish workers compensation.

The mean injury cost was €1099 without permanent pensions and €1340 with permanent pensions. The respective costs were €4380 and €6636 for occupational diseases. These data indicate that permanent disabilities, although few in number (0.6%), greatly contribute to the total costs. The cost distributions showed that a small number of claims represented a large proportion of total costs. Interestingly, our data support almost exactly the commonly used 20%-80% rule. In our case, 20% of the most severe cases represented 79.5% of the total insurance costs. These data suggest that from cost-saving standpoint, it is important to concentrate on the prevention of the most severe long-term disability cases.

National injury cost estimates are helpful in making decisions about the appropriate level of investment into prevention. Several jurisdictions allocate a certain percentage of workers compensation budgets into prevention (2% in Finland,⁶ 3% in Ontario). Two percent of Leigh's estimate, \$4.6 billion, is equal to \$92 million, which is considerably higher than the current agricultural health and safety funding level in the US.

Strengths and Weaknesses

The Finnish farmers accident insurance data help provide baseline information on agricultural injury and illness costs. The data are comprehensive as nearly all farmers are insured. Claims are made in most cases that have compensable costs involved. A mail survey in 1986 found that about three out of four self-reported injuries requiring professional medical care were found in the claims data and out of unclaimed injuries, 80.7% caused no disability.²⁵ Significant efforts are made in the adjudication process to code each case completely, and various quality control methods are used to ensure accurate coding. No missing or obvious mis-coded data were found in the entire dataset.

This study is limited to compensated costs only. No attempt was made to estimate various indirect and social costs. A small part of eligible costs is likely excluded due to unclaimed cases

and excluded (right censored) costs beyond August 1, 2000.

This paper discusses the Finnish data and makes some comparisons to the U.S. These two countries have major differences in their social insurance and health services infrastructures. Some European countries, like Finland, have mandatory workers compensation coverage for self-employed farmers while most countries do not. Comparisons between countries in their injury and injury cost rates require careful consideration, and we made no attempt to provide a comprehensive comparison. The International Social Security Association (ISSA)²⁶ and the Organization for Economic Cooperation and Development (OECD)²⁷ may provide useful information on for international comparisons.

Generalizability

The Finnish agriculture is most comparable to Northern Europe and Northeastern parts of North America. Finnish farms are relatively small. Dairy production is common. The main crops are hay, forage, barley, oats, wheat, rye, rapeseed, potatoes, and sugar beets. Production is highly mechanized, but the machinery is generally smaller compared to North American agriculture. About 6% of arable land is in organic production. Most farms have some forestry production. Off-farm employment is important, but about half of the farms still receive over 75% of their income from farming.²⁸ Agriculture is regulated by European Union and National regulations and subsidies are an important part of farm income.²⁹ Farmers have various social insurance programs including national health insurance, old-age pension, work-related pension, and occupational health services. These characteristics may be helpful in assessing the generalizability of our results to other countries.

CONCLUSIONS

This study characterized injury and occupational disease costs in Finnish agriculture. The total insurance costs in 1996 were €23.5 million, which is 2.5% of the insured farm income. The costs consisted of medical (16%), lost time

per diem (37%), accident pension (23%), survivors pension (3%), impairment allowance (7%), rehabilitation (6%), and other costs (9%). The mean costs of 1996 claims were €1340 for injuries, €6636 for occupational diseases, and €1743 for all claims. The cost distribution was skewed and 20% of cases represented 79.5% of total costs. Overall the costs were low: about 0.7% from the gross farm income compared the 2.8% estimate in the U.S.

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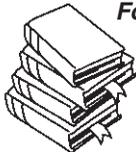
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