Short Communication

Fatal Occupational Injuries in Yugoslavia: 1990 to 1999

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Rates of fatal accidents per 100,000 workers in industry are indicators of achievement in occupational safety and health1). The pattern of fatal occupational accidents varies in different regions of the world particularly in developing countries. In global estimates of fatal occupational accidents by Takala J (1999) from the International Labour Organization there are no data related to fatal occupational accidents in the Federal Republic of Yugoslavia2). There are no known published studies of occupational accidents in the Federal Republic of Yugoslavia3). There are no known published studies of occupational fatalities in Yugoslavia to date.

The Autonomous Province of Vojvodina is the most developed economic region in Yugoslavia. Vojvodina has an area of 21,506 km² with a population of roughly 2 million. The purpose of this study was to examine the characteristics of fatal occupational injuries in the Vojvodina, the most developed region in Yugoslavia, by industry and cause of death, and the influence of the economic situation on fatal occupational injury rates in the 1990s.

Materials and Methods

According to the Legislation of Yugoslavia occupational injuries are injuries that occur in the work place, during the journey to/from work and while the worker is carrying out work duties, and which cause absence from work for at least one day. All occupational injuries should be notified within 48 h of the occurrence to the regional Register of Occupational injuries. Self-employed workers and the military are not covered by this injury-reporting scheme.

Data about fatal occupational injuries including work-related motor vehicle fatalities for the period 1990–1999 were obtained from the Register of Occupational injuries of Vojvodina. Deaths due to war clashes were excluded.

Results

In the 10-yr period 1990 to 1999 there were 366 fatal occupational injuries in the Vojvodina. The average crude fatal occupational injury rate over the 1990s was 7.39 per 100,000 employees, ranging from 3.82 in 1996 to 12.15 in 1998. In the first six yr of the period studied the fatality rate decreased 58.79%, from 9.27 in 1990 to 3.82 in 1996 (Table 1).

Table 1 shows that construction had the highest fatality rate per 100,000 workers at 15.30; this was followed by machine-related deaths (0.42), falls (0.37), and related motor vehicle fatalities (0.34). All of these types of injury were characterized by a slightly decreasing trend over the 10 yr period. The lowest fatality rate was found in the health sector (0.01). The fatality rate decreased significantly over the 1990s and both GMP and NI, (r=0.60, p=0.06) and (r=0.63, p=0.05), respectively.

Table 2 shows the fatal occupational injury rate by cause of death and industry. Over the 1990s motor vehicle-related deaths had the highest fatality rate at 5.02; this was followed by machine-related deaths (0.42), falls
(0.30), electrocution (0.24) and homicide-related deaths (0.22). Motor vehicle-related deaths accounted for the highest fatality rate in all industry divisions, ranging from 3.39 in manufacturing and mining to 8.65 in construction. The second leading cause of work-related deaths was falls in construction (2.99), machines in agriculture/forestry/fishing (2.74), rail transport-related deaths in transportation/communication/public utilities (1.04), homicide in public and commercial services (1.03) and electrocution in manufacturing and mining (0.44).

**Discussion**

In the 1990s the fatal occupational injury rate varied widely. After the first six years of the period studied, both the fatality rate and values for all socio-economic variables (GMP, NI and CE) halved. In the studied period Yugoslavia has been subject continuously to numerous and varied sanctions by the international community. The United Nations imposed the first embargo in late 1991 because of the conflict in Croatia. After the war moved to Bosnia and Herzegovina sanctions were reinforced in May 1992, to be partially removed in November 1995, thanks to the signing of the Dayton Peace Agreement. The latter could explain the fatality rate increase after that.

The fatality rate decreased in 1999 to 5.62, probably due to sanctions imposed in May 1998, after the start of conflict in the Autonomous Province of Kosovo. They...
were reinforced in March 1999 after the start of the NATO bombing of Yugoslavia.5).

There was a positive correlation between the fatal occupational injury rate and socio-economic variables in the 1990s, which was significant only for CE, but the correlation was statistically significant for GMP and NI in the first eight years of the decade. The discrepancy between the relationship of the occupational fatality rate to both GMP and NI, which existed only in 1998 is not clear. Probably, besides the economic situation, other unknown factors influenced the high fatality rate in the period analyzed. Further studies to elucidate this are warranted.

Construction is the industry that has recorded the highest overall fatality rate for the ten years covered by the study (15.30). The rate in the construction industry was twice as high as the overall industry rate (7.39). The construction industry is the most hazardous industry in China, too.6) 7). Results showed that the industry with the second highest fatality rates was agriculture/forestry/fishing followed by public and commercial services and transportation/communication/public utilities. In the United States (U.S.), Australia and New Zealand, industries with the highest death rates were mining, agriculture/forestry/fishing, construction and transportation/communication/public utilities.8) 9).

In Great Britain, energy and water supply was the most dangerous industrial sector for fatality accidents. The

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>Manufacturing and Mining</th>
<th>Agriculture/Forestry/Fishing</th>
<th>Construction</th>
<th>Transportation/Communication/Public Utilities</th>
<th>Trade</th>
<th>Public and Commercial Services</th>
<th>All Others</th>
<th>Subtotal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor vehicle</td>
<td>68 (3.39)</td>
<td>39 (6.68)</td>
<td>26 (8.65)</td>
<td>25 (6.53)</td>
<td>27 (5.39)</td>
<td>32 (8.25)</td>
<td>34 (4.05)</td>
<td>251 (5.02)</td>
</tr>
<tr>
<td>Machine</td>
<td>4 (0.19)</td>
<td>16 (2.74)</td>
<td>–</td>
<td>1 (0.26)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>21 (0.42)</td>
</tr>
<tr>
<td>Fall</td>
<td>4 (0.19)</td>
<td>–</td>
<td>9 (2.99)</td>
<td>1 (0.26)</td>
<td>–</td>
<td>–</td>
<td>1 (0.11)</td>
<td>15 (0.30)</td>
</tr>
<tr>
<td>Electrocution</td>
<td>9 (0.44)</td>
<td>1 (0.17)</td>
<td>1 (0.33)</td>
<td>1 (0.26)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>12 (0.24)</td>
</tr>
<tr>
<td>Homicide</td>
<td>1 (0.04)</td>
<td>3 (0.51)</td>
<td>–</td>
<td>1 (0.26)</td>
<td>1 (0.19)</td>
<td>4 (1.03)</td>
<td>1 (0.11)</td>
<td>11 (0.22)</td>
</tr>
<tr>
<td>Suffocation</td>
<td>1 (0.04)</td>
<td>1 (0.17)</td>
<td>7 (2.32)</td>
<td>–</td>
<td>1 (0.19)</td>
<td>–</td>
<td>–</td>
<td>10 (0.20)</td>
</tr>
<tr>
<td>Struck by falling object</td>
<td>–</td>
<td>8 (1.37)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>8 (0.16)</td>
</tr>
<tr>
<td>Rail transport</td>
<td>2 (0.09)</td>
<td>–</td>
<td>2 (0.66)</td>
<td>4(1.04)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>8 (0.16)</td>
</tr>
<tr>
<td>Poisoning</td>
<td>2 (0.09)</td>
<td>1 (0.17)</td>
<td>–</td>
<td>–</td>
<td>2 (0.39)</td>
<td>–</td>
<td>–</td>
<td>5 (0.10)</td>
</tr>
<tr>
<td>Fire</td>
<td>3 (0.14)</td>
<td>–</td>
<td>–</td>
<td>1 (0.26)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>4 (0.08)</td>
</tr>
<tr>
<td>Bullet</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>1 (0.19)</td>
<td>1 (0.25)</td>
<td>2 (0.23)</td>
<td>–</td>
<td>4 (0.08)</td>
</tr>
<tr>
<td>Air transport</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>1 (0.19)</td>
<td>–</td>
<td>2 (0.23)</td>
<td>3 (0.06)</td>
</tr>
<tr>
<td>Nature</td>
<td>1 (0.04)</td>
<td>2 (0.34)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>3 (0.06)</td>
</tr>
<tr>
<td>Drowning</td>
<td>–</td>
<td>–</td>
<td>2 (0.66)</td>
<td>1 (0.26)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>3 (0.06)</td>
</tr>
<tr>
<td>Flying object/Caught in</td>
<td>1 (0.04)</td>
<td>1 (0.17)</td>
<td>–</td>
<td>1 (0.26)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>3 (0.06)</td>
</tr>
<tr>
<td>Nature</td>
<td>1 (0.04)</td>
<td>2 (0.34)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>1 (0.25)</td>
<td>6 (0.12)</td>
</tr>
<tr>
<td>Total</td>
<td>99 (4.94)</td>
<td>74 (12.69)</td>
<td>46 (15.30)</td>
<td>36 (9.41)</td>
<td>33 (6.59)</td>
<td>38 (9.80)</td>
<td>40 (4.77)</td>
<td>366 (7.39)</td>
</tr>
</tbody>
</table>
second and the third highest occupational fatality rates were in agriculture/forestry/fishing and in the construction industry, respectively.\cite{5,12,15}

The results of our study showed that in Vojvodina, comparing data from the other countries, those working in agriculture/forestry/fishing and in construction industry were consistently at very high risk. The consistency of high risk areas across comparable data provides clear targets for further attention.

In our study motor vehicle crashes were the leading cause of injury related deaths, both for all industry and the industry divisions (Table 2). Motor vehicle-related death was the leading cause of occupational fatalities for U.S. workers, too.\cite{5,12,15}

Results showed that machine-related death was the second leading cause of death, both in all industry and agriculture/forestry/fishing. The highest industry-specific rate of machinery-related occupational fatalities in the U.S. was noted in agriculture/forestry/fishing.\cite{11,13,14}

Besides motor vehicles, a wide variety of machinery is used in agriculture (tractors, corn pickers, hay balers etc.). The common type of injury associated with motor vehicles is being run over. Workers who operate machines risk injury due to rollover and being caught in machinery.\cite{5,13}

Falling was the third leading cause of death in all industries in Vojvodina and the second leading cause in construction. Construction workers risk fatal falls while working from heights (falls from buildings, roofs, ladders or scaffoldings). Falling was the most prevalent cause of death in construction in the U.S.\cite{5,12,15}, as well as in Australia\cite{7,10} and China\cite{6,16}. This was followed by motor vehicle-related deaths in the U.S. and Australia\cite{6,16}. In China's studies highway motor vehicle fatalities were excluded.\cite{7,16}

Homicide-related death was the second leading cause of death in the public and commercial services in our study. In the U.S. it is the second leading cause of death in public administration. Workers providing public security and having public contact involving the exchange of money are at highest risk of homicide-related death at work.\cite{5,10}. They risk being killed during robbery or by disgruntled clients.\cite{5,10}

The risk of specific causes of death varied by industry. Surveillance data provide the basis for strategies to prevent work-related injury deaths by taking into account high-risk industries and leading causes of death. The international harmonization of defining, reporting and recording occupational injuries is needed.

References


