INJURIES

Costs of health care for unintentional injury in Stavanger, Norway

BRANKO KOPJAR

The objective was to analyse the utilization of health services and the costs of treatment of unintentional injuries by type of injuries according to the common Nordic classification of injuries. From prospective registration of all injuries seen at the only hospital and emergency clinic in Stavanger, Norway, we selected at random a stratified sample of 2,819 cases from 7,019 unintentional injuries that occurred in 1992 among the residents of Stavanger. From medical records, we obtained information about the utilization of health services and estimated medical costs during the first year after injury. Of the patients 70% required only a single out-patient visit, while an additional 20% completed their treatment within the first 30 days after injury. Fifty per cent of the total costs were due to injuries among persons aged 65 years and older. Home and leisure-time injuries accounted for 75% of the total costs. The per-injury cost among people aged 65 years and older was NOK 15,428, compared with NOK 2,158 among people aged 0–64 years, the difference primarily due to the increase in the average severity of injury. The per-injury costs were ranked (in descending order): nursing home, undefined, street, home, other home and leisure, traffic, occupational, free nature, sports, school and day care centre/playground injuries. If health care costs are to be reduced by injury prevention, priority should be given to injuries occurring at home and during leisure time and to injuries among elderly people.

Key words: accidents, utilization, incidence, prevention, costs

Injuries represent one of the major public health problems in European countries and increased attention and resources have been invested in the promotion of measures to reduce the risk of injury. The cost of injuries to society provides a rationale for investing public resources in injury prevention. Medical costs are responsible for the majority of the direct costs of injuries.

Studies have described the medical costs of specific types of injuries, for example motor vehicle injuries, burns, hip fractures, injuries among children and injuries among elderly people. Population-based studies of medical costs are much more limited. One study from the USA described population-based medical costs for injuries sustained in 1980, while another study reported costs for injuries sustained in 1985. Population-based medical costs of injuries have also been reported from Dunedin, New Zealand (1990). In Europe the population-based medical costs of injury have been reported from Norway and Sweden. The Norwegian study from 1983 found an average medical cost per injury of Norwegian kroner (NOK) 1,335 (1994 values). In contrast, a Swedish study from 1983 found an average per-injury medical cost of NOK 4,900 (1994 values). Another Swedish study reported average costs of NOK 4,000 for treatment of injuries sustained during the 1-year period ending March 1986 in 1 Swedish district (it was unclear to which year the cost data were adjusted). We were unable to locate scientific publications of population-based medical cost data for injuries from other European countries.

New population-based injury cost studies are needed for 2 reasons. First, cost data from earlier studies are 10–15 years old (except for the New Zealand study), and their accuracy is unknown. Second, cost information in earlier studies was disaggregated by medical diagnosis and/or external cause of injury (E-codes). While useful for some purposes (e.g. planning of health services) such cost information is of limited value for setting priorities in injury prevention. Only a few E-code categories represent potential prevention targets (e.g. traffic injuries, firearm injuries and drowning) and most injuries are classified into categories that have little informative value (e.g. cutting and piercing, falls, and overexertion). Thus, in-depth studies or specially designed injury registration systems are required to collect information useful for planning prevention programmes. One such system is the European Home and Leisure Accident Surveillance System (EHLASS) that is used by member countries of the
European Union. Similar to EHLASS, though more extensive, is the NOMESCO\(^{14}\) classification of injuries that is in use in Scandinavian countries. Information in these register systems enables identification of, for example, injuries occurring in schools and day care centres, in the countryside and during bicycle riding. However, breakdowns of population-based estimates of medical costs by these categories are not available.

The aim of this study is to analyse the utilization of health services and to evaluate the medical costs of unintentional injuries by type of injury according to the classification used by the Norwegian National Injury Registration System.

**METHODS**

**Population, registration of injuries and sampling procedure**

We identified cases for this study through a prospective ongoing registration system operated by the Central Hospital and the Emergency Clinic in Stavanger which both participate in the Norwegian National Injury Registration System. These 2 institutions provide in-patient and out-patient medical care to the total population in Stavanger. No other medical facilities that routinely treat acute injuries exist in the town. Data recently collected as part of the ongoing quality assurance activities performed for the registration system indicate that approximately 10% of all injuries are treated by general practitioners and go unreported. These cases consist of minor injuries. The registration, described in detail elsewhere,\(^{15,16}\) includes all in-patients and out-patients treated for injuries and operates according to the common classification and protocol for the registration of injuries in the Nordic countries. It includes extensive structured information about the circumstances of the injury.\(^{14}\) All patients presenting for diagnoses with ICD-9 codes 800–995, but not codes 905–909 (late consequences of in-patients presenting for diagnoses with ICD-9 classification and protocol for the registration of injuries) includes all in-patients and out-patients where,\(^{15}\) approximately 10% of all injuries are treated by general practitioners and go unreported. These cases consist of minor injuries. The registration, described in detail elsewhere,\(^{15,16}\) includes all in-patients and out-patients treated for injuries and operates according to the common classification and protocol for the registration of injuries in the Nordic countries. It includes extensive structured information about the circumstances of the injury.\(^{14}\) All patients presenting for diagnoses with ICD-9 codes 800–995, but not codes 905–909 (late consequences of in-patients presenting for diagnoses with ICD-9 classification and protocol for the registration of injuries) includes all in-patients and out-patients.

All patients resident in Stavanger who were unintentionally injured in 1992 were selected for study. This excludes injuries stemming from violence and purposely self-inflicted injuries (e.g. suicide attempts). These cases represented 7,019 injury events. The unit of observation for the study is the injury event. If the same person had sustained several separate injuries requiring medical care in 1992 he or she would have been counted as multiple injury events. The following information was obtained for all patients: age, sex, injury severity score (AIS)\(^{17}\) and type of injury. The types of injuries studied were traffic, occupational, school, sports, street, home, day care centre and playground, nursing home, free nature and other home and leisure-time injury. Traffic injuries were injuries occurring in traffic areas in which some means of land transport vehicle was involved, including bicycles. Injuries occurring during paid working time were classified as occupational injuries. Injuries sustained in schools and school yards were classified as school injuries. Sports injuries were those sustained during the sport activities. Injuries occurring in transport areas but not representing traffic or occupational injury were classified as street injuries. Injuries occurring in private residences or premises were classified as home injuries. Day care centre and playground injuries were all cases occurring in day care centres or in public playgrounds. Nursing home injuries were those that occurred in nursing homes and free nature injuries were those sustained in free nature areas (e.g. woods and sea). Other home and leisure-time injuries included all injuries that were not traffic, occupational or school injuries and that were not included in any of the other categories. Cases with incomplete information were classified as undefined injuries. The incidence of injuries per 10,000 population in Stavanger according to type of injury, age and sex is shown in **Table 1**.

The estimation of medical costs involved a stratified random sample of cases, selected from 7,019 patients injured in 1992. For traffic, occupational, school, sports,
Medical cost of injury

Utilization of health services and cost calculation

Information regarding utilization of health services due to injury was obtained by a retrospective manual review of medical records, performed by medical doctors. The medical records contained information on all in-patient and out-patient treatment. Only information about treatment provided for the injury event was abstracted. The review was performed 15 months or more after the first visit for an injury to ensure that all treatment provided during the 12 months after injury was included. The following information was recorded for each visit: date of visit, type of visit (first and follow-up out-patient visit to hospital and emergency clinic, along with in-patient treatment), discharge date (for in-patients), diagnosis(es) and medical and surgical procedure codes (for in-patients). Health services in Norway are non-profit and are financed through a single payer system – national health insurance that covers the whole population. Because hospitals in Norway operate on fixed budgets and out-patient services are reimbursed according to fixed rates, charge data for in-patient and out-patient treatment were unavailable. We estimated the costs of treatment as follows. For in-patient treatment we classified patients into diagnosis-related groups (DRGs) and calculated the costs of in-patient treatment according to the 1994 DRG price list maintained by the Ministry of Social Affairs and Health. The costs of out-patient treatment and treatment provided by the emergency clinic were calculated according to the following rates: first out-patient visit NOK 900 and follow-up visits NOK 280. The in-patient and out-patient costs analysed represent only the operating costs of health services provided during the first 12 months following the injury.

We also calculated the length of treatment, defined as the time that elapsed between the first and the last visit to the hospital or the emergency clinic for treatment resulting from the injury. The first visit was defined as the date of the first out-patient treatment or admission to the hospital. The last visit was the date of the last out-patient visit or discharge from the hospital.

The validity of DRG cost calculation

The cost of in-patient medical treatment for injuries can be estimated in several ways. Studies often use patient charge data or data on the length of stay, which is multiplied by an average per diem cost. The major limitation of charge data is that they often overestimate real costs (at least in the USA). However, the length of stay data also tend to overestimate costs for patients requiring simple treatment (e.g. in hospital observation of patients with brain concussions), as well as for those requiring prolonged hospital stays (e.g. injured elderly people who require long nursing periods).

Another possible way of estimating cost of the in-patient medical treatment for injuries, used by this study, is to classify patients into resource use categories, such as DRGs. The DRG classification is designed to group patients into homogeneous categories based upon expected resource use, thereby overcoming some of the above limitations. The DRG classification is the most widely used patient cost reimbursement system. It is derived from an empirical analysis of USA hospital cost data that was

Table 2 Number of injuries occurring in 1992 in Stavanger and number and proportion of injuries in the studied sample

<table>
<thead>
<tr>
<th>Age</th>
<th>Traffic</th>
<th>0-14 years</th>
<th>15-24 years</th>
<th>25-64 years</th>
<th>65 years</th>
<th>All ages</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>Samp %</td>
<td>All Samp %</td>
<td>All Samp %</td>
<td>All Samp %</td>
<td>All Samp %</td>
<td>All Samp %</td>
</tr>
<tr>
<td>Traffic</td>
<td>169</td>
<td>70</td>
<td>41</td>
<td>189</td>
<td>90</td>
<td>48</td>
</tr>
<tr>
<td>Occupational</td>
<td>1</td>
<td>0</td>
<td>214</td>
<td>83</td>
<td>39</td>
<td>556</td>
</tr>
<tr>
<td>School</td>
<td>274</td>
<td>166</td>
<td>61</td>
<td>154</td>
<td>101</td>
<td>66</td>
</tr>
<tr>
<td>Sports</td>
<td>227</td>
<td>51</td>
<td>22</td>
<td>390</td>
<td>111</td>
<td>28</td>
</tr>
<tr>
<td>Street</td>
<td>84</td>
<td>47</td>
<td>57</td>
<td>84</td>
<td>49</td>
<td>58</td>
</tr>
<tr>
<td>Home</td>
<td>675</td>
<td>90</td>
<td>13</td>
<td>207</td>
<td>36</td>
<td>17</td>
</tr>
<tr>
<td>Day care centre/ playground</td>
<td>178</td>
<td>167</td>
<td>94</td>
<td>2</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>Nursing home</td>
<td>56</td>
<td>53</td>
<td>95</td>
<td>32</td>
<td>32</td>
<td>100</td>
</tr>
<tr>
<td>Free nature</td>
<td>86</td>
<td>82</td>
<td>95</td>
<td>81</td>
<td>79</td>
<td>98</td>
</tr>
<tr>
<td>Other home and leisure</td>
<td>130</td>
<td>58</td>
<td>45</td>
<td>99</td>
<td>52</td>
<td>53</td>
</tr>
<tr>
<td>Total</td>
<td>1,879</td>
<td>784</td>
<td>42</td>
<td>1,453</td>
<td>636</td>
<td>44</td>
</tr>
</tbody>
</table>

Samp: sample
undertaken to develop a new system of prospective payment for Medicare (over 65 years) patients. While useful for analysing the resource consumption of groups, DRGs are less useful for analysing individual patient costs because of known intra-group heterogeneity (which reduces predictive validity at the individual patient level). The most important criticism of DRGs as a tool for analysing hospital resource consumption is their acknowledged lack of sensitivity to hospital case-mix differences. For example, a hospital treating patients within the same DRG but having more severe injuries than the average general hospital would receive inadequately low reimbursement. This has occurred with highly specialized trauma centres in the USA. However, for our analysis this does not pose a serious problem, because the hospital studied treats a representative spectrum of injured patients and it would therefore be reflective of the average case mix.

The DRG 'prices' for Norwegian hospitals are determined retrospectively by dividing the total resources used in a year (i.e. the aggregate budget for all hospitals combined) by the summed amount of DRG weights representing all cases treated. These synthetic DRG prices reflect actual resource use. The Norwegian DRG weights are based upon empirical data on resource use at Norwegian hospitals and are continuously updated and adjusted.

Estimation of the costs among the population

Weighted average cost estimates were calculated for each type of injury, with the weights being the sampling fraction. One patient aged 23 years sustained a very severe and complicated occupational injury and incurred extraordinarily high treatment costs. No similar injury occurred among the other occupational injury cases in the sample. Therefore, to avoid overestimating the costs of occupational injuries, we excluded this case when calculating the weighted average of costs of occupational injuries. Once the costs were estimated, we added the cost for this patient.

Statistical methods

Differences in costs and the length of treatment were analysed by Kruskal-Wallis ANOVA. Regression analysis was used to correlate patients' ages and costs of treatment, based on stepwise regression procedures that entered costs as the dependent variable and age, sex and severity score as independent variables. Differences in per-injury costs between different types of injuries were evaluated by analysis of variance, with age included as a covariate and then followed by the Tukey honestly significant difference (HSD) test.

RESULTS

Length of treatment

The distribution of cases by time that elapsed between the first and last visit to the hospital or emergency clinic is shown in Table 3. The majority (70%) of patients required only one out-patient visit (0 days), 81% of the patients completed their treatment within 1 week and 90% within the first 30 days following the initiation of treatment. Only 9% of the patients required treatment lasting between 30 and 365 days and less than 1% required longer than a year to complete treatment. The difference in the length of treatment among the different types of injuries shown in Table 3 was statistically significant (p<0.01). Nursing home injuries required the longest treatment, followed by free nature injuries, street injuries, undefined injuries, other injuries and sports injuries. Traffic injuries, home injuries, day care centre/playground injuries, occupational injuries and school injuries required the shortest treatment.

Per-injury costs

The average per-injury cost was NOK 3,807 (US$ 614). The average cost per hospitalized patient was NOK 24,831 ($4,005), while the cost per non-hospitalized patient was NOK 1,011 (US$ 163). Table 4 shows the average per-injury cost by type of injury and age of the patient. Statistically significant (p<0.01) differences were found in per-injury costs among the different types of injuries. The most expensive cases were nursing home, undefined, street, home and other home and leisure injuries. These were followed by traffic, occupational and free nature injuries. The least expensive cases were sports, school and day care centre/playground injuries.

Per-injury costs increased with age, in particular after the age of 65 years. Injury severity proved to be an important predictor of injury costs, explaining 44% of the variance (β = 0.61, p<0.001) in the logarithm of costs.

### Table 3 Time elapsed between the first and the last visit for treatment of injury (% of patients)

<table>
<thead>
<tr>
<th>Length of Treatment</th>
<th>0 days</th>
<th>1-7 days</th>
<th>8-30 days</th>
<th>31-180 days</th>
<th>181-365 days</th>
<th>&gt;365 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic</td>
<td>69</td>
<td>15</td>
<td>9</td>
<td>6</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Occupational</td>
<td>77</td>
<td>9</td>
<td>7</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>School</td>
<td>78</td>
<td>11</td>
<td>9</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sports</td>
<td>67</td>
<td>14</td>
<td>10</td>
<td>6</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Street</td>
<td>65</td>
<td>10</td>
<td>9</td>
<td>13</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Home</td>
<td>73</td>
<td>8</td>
<td>10</td>
<td>7</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Day care centre/playground</td>
<td>73</td>
<td>11</td>
<td>7</td>
<td>9</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Nursing home</td>
<td>38</td>
<td>30</td>
<td>14</td>
<td>14</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Free nature</td>
<td>61</td>
<td>13</td>
<td>13</td>
<td>12</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Other home and leisure</td>
<td>66</td>
<td>11</td>
<td>10</td>
<td>10</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Undefined</td>
<td>63</td>
<td>16</td>
<td>11</td>
<td>8</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>All types*</td>
<td>70</td>
<td>11</td>
<td>10</td>
<td>7</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

*Weighted average corrected for sampling fraction

Kruskal-Wallis ANOVA: p<0.01 for the differences among the types of injuries.
based on regression analysis. Patient age explained an additional 3% ($\beta = 0.18, p<0.001$) of the variance. Overall, the regression model explained 47% of the variance in costs [$R^2 = 0.475 (p<0.001)$]. The estimated regression coefficient for sex was not statistically significantly different from zero. In sum, the medical costs of injury depend strongly on the severity score. In addition, there is a small but significant independent impact of age upon cost that cannot be explained by an increase in the average severity of injury. There was a significant ($p<0.01$) difference in average per-injury cost among the different types of injuries, even after adjusting for age. A Tukey HSD post hoc test revealed that the difference was due to nursing home injuries ($p<0.01$) which were more expensive than other types of injuries.

**Population costs**

Table 5 shows population costs according to type of injury and patient age. The overall costs for medical treatment in the first year following injury were approximately NOK 27 million (US$ 4.4 million). Hospitalized patients accounted for 77% of the costs overall, but for 96% of the costs among people aged 65 years or older (who accounted for 50% of costs overall).

Forty per cent of the total costs were due to home injuries. Street injuries accounted for 10%, occupational injuries for 9%, nursing home injuries for 8% and traffic and sports injuries for 7% of the total costs. Free nature, school, day care centre/­playground and other injuries in combination accounted for 12% of the total costs.

**DISCUSSION**

This study is the first to evaluate medical costs of injury on the population level, with costs broken down by type of injury according to the detailed injury classification system used in Nordic countries. The average medical cost for treating unintentional injuries was NOK 3,807. Estimates of medical costs for treating injuries differ among studies. An earlier (1983) Norwegian study estimated these costs at NOK 1,335 (1994 values). The difference in cost estimates between the previous study and the current study is probably due to the rate of hospitalized cases, which was lower in the earlier study (609 versus 824 per 100,000 population respectively). An earlier (1983) Swedish study estimated medical costs for treating injuries at NOK 4,900 (1994 values) and a later (1985) Swedish study found costs to be approximately NOK 4,100 (it is unclear which year these prices reflect). Our estimates are similar to those generated by

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**Medical cost of injury**

**Table 4 Average per-injury medical costs**

<table>
<thead>
<tr>
<th>Type</th>
<th>0-14 years</th>
<th>15-24 years</th>
<th>25-64 years</th>
<th>65+ years</th>
<th>All ages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic</td>
<td>1,390</td>
<td>1,804</td>
<td>1,654</td>
<td>14,732</td>
<td>2,520</td>
</tr>
<tr>
<td>Occupational</td>
<td>-</td>
<td>1,085</td>
<td>2,709</td>
<td>1,203</td>
<td>2,745</td>
</tr>
<tr>
<td>School</td>
<td>1,561</td>
<td>1,539</td>
<td>1,031</td>
<td>-</td>
<td>1,527</td>
</tr>
<tr>
<td>Sports</td>
<td>1,366</td>
<td>1,518</td>
<td>2,980</td>
<td>1,027</td>
<td>2,143</td>
</tr>
<tr>
<td>Street</td>
<td>1,368</td>
<td>1,282</td>
<td>3,632</td>
<td>11,137</td>
<td>4,926</td>
</tr>
<tr>
<td>Home</td>
<td>1,333</td>
<td>2,646</td>
<td>2,212</td>
<td>15,610</td>
<td>4,759</td>
</tr>
<tr>
<td>Day care centre/­playground</td>
<td>1,818</td>
<td>1,449</td>
<td>5,273</td>
<td>-</td>
<td>1,907</td>
</tr>
<tr>
<td>Nursing home</td>
<td>-</td>
<td>907</td>
<td>7,443</td>
<td>21,977</td>
<td>21,277</td>
</tr>
<tr>
<td>Free nature</td>
<td>2,467</td>
<td>1,468</td>
<td>3,231</td>
<td>3,423</td>
<td>2,861</td>
</tr>
<tr>
<td>Other home and leisure</td>
<td>1,452</td>
<td>1,747</td>
<td>3,995</td>
<td>21,234</td>
<td>4,498</td>
</tr>
<tr>
<td>Undefined</td>
<td>1,596</td>
<td>1,442</td>
<td>3,943</td>
<td>19,360</td>
<td>5,158</td>
</tr>
</tbody>
</table>

**Table 5 Total medical costs**

<table>
<thead>
<tr>
<th>Type</th>
<th>0-14 years</th>
<th>15-24 years</th>
<th>25-64 years</th>
<th>65+ years</th>
<th>All ages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic</td>
<td>235</td>
<td>341</td>
<td>475</td>
<td>693</td>
<td>1,344</td>
</tr>
<tr>
<td>Occupational</td>
<td>-</td>
<td>632</td>
<td>1,533</td>
<td>17</td>
<td>2,182</td>
</tr>
<tr>
<td>School</td>
<td>428</td>
<td>237</td>
<td>24</td>
<td>-</td>
<td>688</td>
</tr>
<tr>
<td>Sports</td>
<td>310</td>
<td>392</td>
<td>1,529</td>
<td>8</td>
<td>2,439</td>
</tr>
<tr>
<td>Street</td>
<td>112</td>
<td>108</td>
<td>654</td>
<td>1,481</td>
<td>2,355</td>
</tr>
<tr>
<td>Home</td>
<td>900</td>
<td>548</td>
<td>1,730</td>
<td>6,822</td>
<td>9,999</td>
</tr>
<tr>
<td>Day care centre/­playground</td>
<td>324</td>
<td>3</td>
<td>26</td>
<td>-</td>
<td>353</td>
</tr>
<tr>
<td>Nursing home</td>
<td>-</td>
<td>1</td>
<td>15</td>
<td>2,176</td>
<td>2,192</td>
</tr>
<tr>
<td>Free nature</td>
<td>138</td>
<td>47</td>
<td>459</td>
<td>86</td>
<td>729</td>
</tr>
<tr>
<td>Other home and leisure</td>
<td>125</td>
<td>142</td>
<td>403</td>
<td>679</td>
<td>1,349</td>
</tr>
<tr>
<td>Undefined</td>
<td>207</td>
<td>143</td>
<td>852</td>
<td>1,491</td>
<td>2,693</td>
</tr>
</tbody>
</table>

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a. All figures represent Norwegian kroner adjusted to 1994 price levels.
b. Weighted average corrected for sampling fraction.
c. p<0.001 for the difference in per-injury cost among the types of injuries.

d. All costs are in 1,000 Norwegian kroner adjusted to 1994 price levels.
the earlier Swedish studies, suggesting that our findings may be reasonably representative of other Scandinavian countries. The per-injury costs reported in the current study are significantly lower than those reported from the USA. The average cost of initial hospitalization and rehospitalization in the USA in 1985 was estimated to be approximately $14,123 (1994 values), compared with approximately $4,000 found in our study. The medical costs of treating non-hospitalized injury patients in the USA are estimated to be approximately $300 (1994 values), compared with $163 in our study. The reason for the substantial difference in cost estimates between the current study and previous USA investigations is unclear. Explaining these differences would require a review of primary data used for the USA studies, which is beyond the scope of this study.

The per-injury costs in our study differed significantly among the types of injuries. The most expensive injuries were nursing home, street and home injuries while the least expensive were sports, school and day care centre/playground injuries. The source of these cost differences was not the type of injury per se, but rather the difference in the age of patients with different types of injuries. When age is controlled for through regression analysis, differences in costs among different types of injuries disappear (except for nursing home injuries).

Two earlier studies described an association between the medical costs of injury and age. The first study was conducted on a sample of injuries occurring in the general population, while the second study included only a sample of hospitalized patients. Our regression analysis showed that the increase in costs with age is due mainly to the increase in the average severity of the injury associated with age. Although it represents an independent factor related to costs, age is of secondary importance. Elderly people sustain more severe injuries than younger people, which are more costly to treat. Further, for injuries of the same severity, elderly people require more intensive treatment requiring more resources, probably due to the longer period that is needed for recovery. On a population level, the majority of costs are due to home and leisure-time injuries and to injuries among people aged 65 years and older. Home and leisure-time injuries account for the majority of cases occurring among the population (65%) and for approximately three-quarters of the total costs. Injuries among people aged 65 years or older account for 12% of the cases, but for approximately half of the total costs. The per-injury costs among people aged 65 years or older are approximately seven times the costs among people aged 64 years or less (NOK 15,428 versus NOK 2,158 respectively). Injury control programmes that appear to be the most cost-effective associated with particular risk reduction programmes; programmes that appear to be the most cost-effective should be prioritized.

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