Accidents are the fourth leading cause of death in this country after heart disease, cancer, and strokes. There is a long history of debate on the effect of accidents on industry (workers and companies).

Historically, the prevailing view was that accident prevention programs were too costly.

The contemporary view is that accidents are too costly and accident prevention makes sense economically.

Accident prevention, which had been advocated on a moral basis, is now justified in economic terms.
COSTS OF ACCIDENTS

A proper perspective on economics of workplace accidents can be gained by viewing them in the overall context of all accidents.

Overall cost of accidents in the US is about $150 billion.

<table>
<thead>
<tr>
<th>Accident Type</th>
<th>Cost (in billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor vehicle accidents</td>
<td>$72</td>
</tr>
<tr>
<td>Workplace accidents</td>
<td>$48</td>
</tr>
<tr>
<td>Home accidents</td>
<td>$18</td>
</tr>
<tr>
<td>Public accidents</td>
<td>$12</td>
</tr>
</tbody>
</table>

Figure 2-1 Accident costs by accident type (in billions, in a typical year).

<table>
<thead>
<tr>
<th>Category</th>
<th>Cost (in billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wages lost</td>
<td>$37</td>
</tr>
<tr>
<td>Medical expenses</td>
<td>$24</td>
</tr>
<tr>
<td>Insurance administration</td>
<td>$29</td>
</tr>
<tr>
<td>Property damage (motor vehicle)</td>
<td>$27</td>
</tr>
<tr>
<td>Fire losses</td>
<td>$10</td>
</tr>
<tr>
<td>Indirect losses for work accidents</td>
<td>$23</td>
</tr>
</tbody>
</table>

Figure 2-2 Accident costs by categories (in billions, in a typical year).

Accidents on and off the job cost US industry dearly.

ACCIDENTAL DEATHS IN THE UNITED STATES

US accidental deaths result from many causes:

Motor vehicle accidents.
Falls, poisoning, drowning, fire-related injuries.
Suffocation (ingested object), firearms (non-combat).
Medical complications.
Air transport accidents, interaction with machinery.
Mechanical suffocation, impact of falling objects.

• The NSC periodically computes death totals and death rates in each of these categories.
  – In a typical year, there are over 14,000 deaths in these subcategories.
ACCIDENTAL VS OTHER CAUSES OF DEATH

There are more yearly deaths of heart disease, cancer & strokes than from accidents.

But concentrated among people at or near retirement age.

Note that for persons from 25 to 44 years of age, the leading cause is accidents.

Accidents are a serious detriment to productivity, quality & competitiveness in today’s workplace.

Accidents are one cause of death & injury that companies can most easily control.

<table>
<thead>
<tr>
<th>Accidents</th>
<th>27,500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer</td>
<td>20,300</td>
</tr>
<tr>
<td>Motor vehicle</td>
<td>16,500</td>
</tr>
<tr>
<td>Heart disease</td>
<td>16,000</td>
</tr>
<tr>
<td>Poison (solid, liquid)</td>
<td>2,700</td>
</tr>
<tr>
<td>Drowning</td>
<td>1,500</td>
</tr>
<tr>
<td>Falls</td>
<td>1,100</td>
</tr>
<tr>
<td>Fire related</td>
<td>900</td>
</tr>
</tbody>
</table>

Figure 2-3 Causes of accidents (ages 25 to 44 years, typical year).

WORK ACCIDENT COSTS AND RATES

Workplace accidents cost employers millions yearly.

Arco Chemical Co. was fined $3.48 million for failing to protect workers from an explosion at a Channelview, Texas plant.

USX paid a $3.25 million fine to settle numerous health and safety violation citations.

BASF Corporation agreed to pay a fine of $1.06 million associated with an explosion at a Cincinnati chemical plant that caused two deaths and 17 injuries.

• In addition to fines, employers incurred costs for safety corrections, medical treatment, survivor benefits, death & burial costs, & other indirect costs.
  – Clearly, work accidents are expensive.
WORK ACCIDENT COSTS AND RATES

The trend in the rate of accidents is downward, evidence of success of the US safety movement.

According to the NSC, Between 1912 and 1998, accidental work deaths per 100,000 population were reduced 81%, from 21 to 4.

In 1998, a workforce more than triple that of 1912 produced 11 times the goods & services, with approximately 10,000 work deaths.

Cost of the work deaths and injuries was $48.5 billion.

<table>
<thead>
<tr>
<th>Accident Type</th>
<th>Cost (billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor vehicle accidents</td>
<td>$72</td>
</tr>
<tr>
<td>Workplace accidents</td>
<td>48</td>
</tr>
<tr>
<td>Home accidents</td>
<td>18</td>
</tr>
<tr>
<td>Public accidents</td>
<td>12</td>
</tr>
</tbody>
</table>

Figure 2-1 Accident costs by accident type (in billions, in a typical year).

A cost of $420 per worker in the US, computed as the value-added required per worker to offset cost of work injuries. This translates further into $610,000 per death and $18,000 per disabling injury.
WORK ACCIDENT COSTS AND RATES

Many safety & health professionals believe the major cost of accidents & injuries on the job results from damage to morale.

It is widely accepted that few factors affect productivity more than employee morale.

Employees with low morale do not produce up to their maximum potential.

Accidents can have a devastating effect on morale.

Few things are as detrimental to employee morale as seeing a fellow worker injured.

TIME LOST BECAUSE OF WORK INJURIES

An important effect of accidents on industry is the amount of lost time due to work injuries.

About 35 million hours are lost in a typical year.

Additional time is lost for medical checkups after the injured employee returns to work.

Accidents in previous years often continue to cause lost time in the current year.
WORK INJURIES BY TYPE OF ACCIDENT

Work injuries can be classified by the type of accident from which they resulted.

- Overexertion; Impact accidents; Falls; Compression.
- Exposure to radiation/caustics; Bodily reaction (to chemicals).
- Rubbing or abrasions; Exposure to extreme temperatures.
- Motor vehicle accidents.

WORK INJURIES BY TYPE OF ACCIDENT

- Overexertion, the result of working beyond physical limits, is the leading cause, at 31% of work injuries.
  - The next most prominent cause of work injuries is falls.
DEATHS IN WORK ACCIDENTS

Deaths on the job have decreased markedly. But still occur, with causes that vary.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor vehicle related</td>
<td>37.2%</td>
</tr>
<tr>
<td>Falls</td>
<td>12.5</td>
</tr>
<tr>
<td>Electric current</td>
<td>3.7</td>
</tr>
<tr>
<td>Drowning</td>
<td>3.2</td>
</tr>
<tr>
<td>Fire related</td>
<td>3.1</td>
</tr>
<tr>
<td>Air transport related</td>
<td>3.0</td>
</tr>
<tr>
<td>Poison (solid, liquid)</td>
<td>2.7</td>
</tr>
<tr>
<td>Water transport related</td>
<td>1.6</td>
</tr>
<tr>
<td>Poison (gas, vapor)</td>
<td>1.4</td>
</tr>
<tr>
<td>Other</td>
<td>31.6</td>
</tr>
</tbody>
</table>

Figure 2-4 Work deaths by cause for a typical year.

DEATH RATES BY INDUSTRY

Variety of agencies & organizations collect & rank data on death rates within industrial categories.

- Highest to lowest:
  - Mining/quarrying - including oil & gas drilling/extraction.
  - Agriculture - including farming, forestry, and fishing.
  - Construction; Transportation/public utilities.
  - Federal, state, and local government
  - Manufacturing.
  - Services - including finance, insurance & real estate.
  - Trade - both wholesale and retail.

- Death rates are computed based of the number of deaths per 100,000 workers in a given year.
- Rankings sometimes change slightly from year to year.
PARTS OF THE BODY INJURED ON THE JOB

To develop/maintain an effective safety & health program, it is also necessary to know the parts of the body most frequently injured.

1998 disabling work injuries totaled about 1.75 million.

- 10,400 fatal & 60,000 resulted in some permanent impairment.

Injuries to the back occurred most frequently.

Followed by thumb & finger injuries and leg injuries.

Frequent injury rankings show that a fundamental component of a safety & health program should be instruction on how to lift without hurting the back.

CHEMICAL BURN INJURIES

The greatest incidence of chemical burns, about one-third, occurs in manufacturing, with the rest in services, trade, and construction.

- Acids & alkalis; soaps, detergents, cleaning compounds.
- Solvents and degreasers.
- Calcium hydroxide (used in cement & plaster).
- Potassium hydroxide (drain cleaners, etc.).
- Sulfuric acid (battery acid).

Many occur, in spite of personal protective equipment, safety instruction, and available treatment facilities.
CHEMICAL BURN INJURIES

Strategies recommended for safety & health professionals, for preventing chemical burn injuries:

- Familiarize yourself, workers & supervisors with the chemicals to be used and their inherent dangers.
- Secure the proper personal protection equipment.
- Provide instruction on proper use of equipment.
  - Supervisors confirm equipment is used properly every time.
- Replace personal protection equipment when it begins to show wear.

HEAT BURN INJURIES

Almost 40% of heat burn injuries occur in manufacturing every year.

- Most frequent causes are flame (also smoke inhalation), molten metal, petroleum asphalts, steam & water.
- Employees should be familiar with hazards, know the appropriate safety precautions, and have & use the proper personal protection equipment.
- Safety professionals should monitor to ensure that safety rules are being followed, personal protection equipment is being used correctly, and that it is in good condition.
HEAT BURN INJURIES

Factors contributing to workplace heat burn injuries:
- Employer has no health & safety policy regarding heat hazards.
- Employer fails to enforce safety procedures & practices.
- Employees are not familiar with the employer’s safety policy and procedures concerning heat hazards.
- Employees fail to use, or improperly use personal protection equipment.
- Employees have inadequate or worn personal protection equipment and/or poorly maintained tools and equipment.
- Employees work in a limited space, attempt to work too fast, or carelessly.

REPETITIVE STRAIN/SOFT TISSUE INJURIES

Repetitive strain injury (RSI) are typically associated with soft tissues of hands, arms, neck & shoulders.
Carpal tunnel syndrome (CTS) is the most widely known, but there are several other RSIs also.
- CTS is typically caused by repeated and cumulative stress on the median nerve.
- Symptoms of CTS include numbness, a tingling sensation, and pain in the fingers, hand, and/ or wrist.
- Evidence suggests a higher incidence of CTS among women than men.
- Overall incidence rate for CTS is increasing at a rate of more than 15% per year.
ESTIMATING THE COST OF ACCIDENTS

Successful, safety & health professionals must show that accidents are more expensive than prevention. They must be able to estimate the cost of accidents.

The procedure for estimating costs set forth in this section was developed by Professor Rollin H. Simonds of Michigan State College working in conjunction with the Statistics Division of the NSC.

Cost-Estimation Method

To have value, a cost estimate must relate directly to the specific company in question. Applying broad industry cost factors will not suffice.

To arrive at company-specific figures, divide costs associated with an accident into insured & uninsured costs. Determining insured costs of accidents is a matter of examining accounting records.
Cost-Estimation Method

To calculate uninsured costs, divide accidents into the following four classes:

**Class 1 accidents** - lost workdays, permanent partial disabilities, and temporary total disabilities.

**Class 2 accidents** - treatment by a physician outside the company’s facility.

**Class 3 accidents** - locally provided first aid, property damage less than $100, or loss of less than eight hours of work time.

**Class 4 accidents** - injuries so minor they require no physician attention, property damage of $100 or less, or eight or fewer work hours lost.

Average uninsured costs for each class of accident can be determined from records of accidents in a specified period.

For each accident in each class, record every cost not covered by insurance.

Compute total of these costs by class of accident & divide by the total number of accidents in that class to determine an average uninsured cost for each class, specific to the particular company.
Cost-Estimation Method

Shown is an example of how to determine average cost of a selected sample of Class 1 accidents.

There were four Class 1 accidents in the pilot test. The accidents cost the company $554.23 in uninsured costs, or an average of $138.56 per accident.

With this information, accurate cost estimates of an accident can be figured, and accurate predictions made.

<table>
<thead>
<tr>
<th>Class of Accident</th>
<th>Accident Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1</td>
<td>Class 1</td>
</tr>
<tr>
<td>Cost A</td>
<td>$16.00$ 6.95 $15.17 $ 3.26</td>
</tr>
<tr>
<td>Cost B</td>
<td>72.00 103.15 97.06 51.52</td>
</tr>
<tr>
<td>Cost C</td>
<td>28.73 12.62 — 36.94</td>
</tr>
<tr>
<td>Cost D</td>
<td>— 51.36 — 38.76</td>
</tr>
<tr>
<td>Cost E</td>
<td>— 11.17 — 24.95</td>
</tr>
<tr>
<td>Cost F</td>
<td>— — — —13.41</td>
</tr>
<tr>
<td>Cost G</td>
<td>— — — —</td>
</tr>
<tr>
<td>Total</td>
<td>114.73 185.25 112.23 142.02</td>
</tr>
<tr>
<td>Grand Total $554.23</td>
<td>Average Cost per Accident $138.56</td>
</tr>
</tbody>
</table>

Other Cost-Estimation Methods

Costs associated with workplace accidents, injuries, & incidents fall into broad categories such as:

- Lost work hours; Medical costs.
- Property damage; Fire losses.
- Insurance premiums and administration; Indirect costs.
Other Cost-Estimation Methods

- Compile total number lost hours for the period and multiply times the applicable loaded labor rate.
  - The employee’s hourly rate plus benefits.

Employee Hours Lost (period) × Average Loaded Labor Rate = Cost

Other Cost-Estimation Methods

Subtotal cost is medical costs, insurance premiums, property damage & fire losses for the period.

Increased by a standard percentage for indirect costs, to determine total cost of accidents for a specific period.
Estimating Hidden Costs

Accident costs are like an iceberg, in that the larger part of the actual cost is hidden beneath the surface. There is usually a great deal of activity when a serious accident occurs. There may be a slowdown in production near the site. There also will be a need to replace the injured worker.

- Costs associated with the learning curve of the replacement.

The supervisor & accident investigation team probably will need to spend time conducting an investigation.

---

<table>
<thead>
<tr>
<th>Checklist for Estimating the Hidden Costs of Accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>√ Paid time to the injured employee on the day of the accident.</td>
</tr>
<tr>
<td>√ Paid time of any emergency-response personnel involved (including ambulance driver).</td>
</tr>
<tr>
<td>√ Paid time of all employees who were interviewed as part of the accident investigation.</td>
</tr>
<tr>
<td>√ Paid time of the safety personnel who conducted the accident investigation.</td>
</tr>
<tr>
<td>√ Paid time of the human resources personnel who handled the workers’ compensation and medical aspects of the accident.</td>
</tr>
<tr>
<td>√ Paid time of the supervisor involved in the accident investigation and accident response.</td>
</tr>
<tr>
<td>√ Paid time to employees near the accident working (or slowed down) temporarily as a result of the accident.</td>
</tr>
<tr>
<td>√ Paid time to employees who spent time talking about the accident as news of it spread through the company’s grapevine.</td>
</tr>
</tbody>
</table>
GLOBAL IMPACT OF ACCIDENTS AND INJURIES

Rapid development & pressure of global competition are resulting in increased workplace fatalities in China and the Pacific Rim countries. Many developing countries becoming industrialized lack a safety and health infrastructure. Occupational safety & health must be seen as a strategy for sustaining economic growth & social development in emerging countries. The ILO reports record-keeping & reporting systems in developing countries are deteriorating instead of improving. Only a fraction of the real toll is being reported.

GLOBAL IMPACT OF ACCIDENTS AND INJURIES

Occupational injuries in developing countries are more prevalent in such high-risk industries as mining, construction, and agriculture. Men tend to die as the result of accidents, lung diseases, & work-related cancers such as caused by asbestos. Women suffer more from musculoskeletal disorders, communicable diseases, and psychosocial problems. Younger workers are more likely to suffer nonfatal injuries.

• Older workers are more likely to suffer fatal injuries. More than half of retirements are taken early to collect pensions based on work-related disabilities rather than normal retirement.
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