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Costs

Adnan Hyder, MD, PhD
Maria Segui-Gomez, MD, ScD
Bloomberg School of Public Health

Lecture Topics

- Identifying which injury costs should be characterized
- Identifying which intervention costs should be characterized
- Describing and quantifying costs associated with injuries as reported in the literature
- Case study

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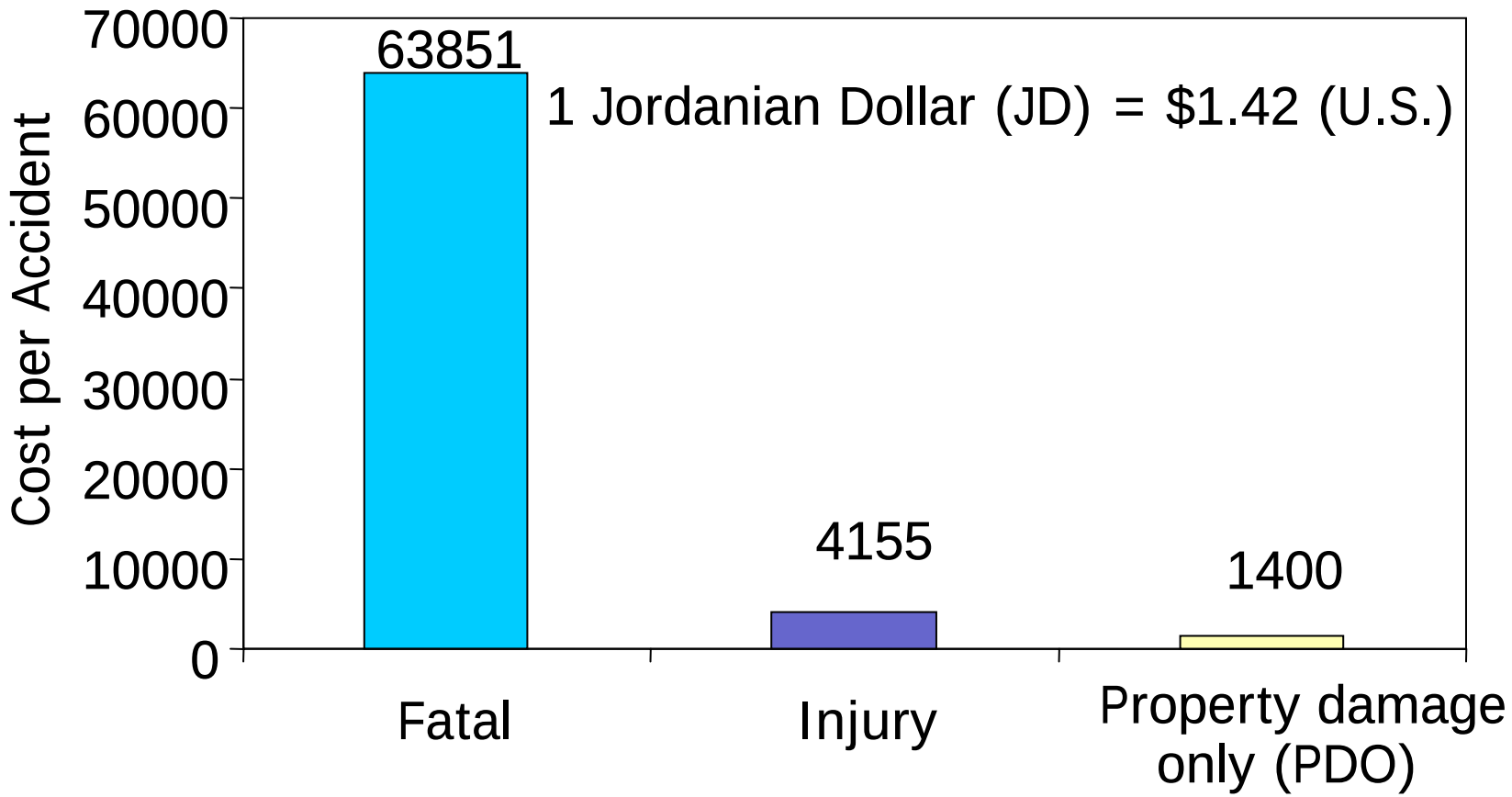
Section A

Identifying which Injury Costs Should Be Characterized

Maria Segui-Gomez, MD, ScD

Average Unit Cost (JD) per "Accident" by Severity Level in Jordan, 1996



Source: Al Masaeid, et al. Accid Anal Prev *1999; 31: 347–357*

What Do We Mean by Costs?

- Not cash, but resource utilization!!!
  - Opportunity costs

What Do You Consider a Resource?

- Time
- Life
- Any good or service consumed
  - Money

Peculiarities of Costs

- One more outcome measure (like mortality or morbidity or long-term disability)
- Helps summarize the burden of injuries with mortality, morbidity, and disability implications in one metric
- Eases comparison to cost of intervention
- Attention gatherer (useful for advocacy)

Dimensions of Costs

- Resources: Used (direct) or not produced (indirect)

Peculiarities of Costs and XXX

- Perspective—Costs for whom?
  - E.g., government, household, employer, society (for an example see table 6.1 in Gold)
- Lifetime / duration
- Time preference
  - Timing (present vs. future)
  - Inflation (constant dollars)

Which Costs?

- Health-related costs (there is an inherent value of health indicated, for example, by the willingness to pay for a certain healthy state)
- Changes in use of health care resources and other resources

. . . Or

- Direct costs—value of all goods, services, and other resources consumed in the dealing with an injury (changes in resource use can be attributed to condition):
  - Direct health care costs
  - Professional, family, volunteer, or patient time
  - Direct non-health related costs

Continued

. . . Or

- Indirect costs—productivity gains or losses
  - Not to be mistaken with overhead or fixed costs in accounting terms
  - Unmeasurable or difficult to measure costs

Which Cost Should Not Be Included?

- When the analysis perspective is the societal one, do not include transfer payments (i.e., cash transfer from tax payers to welfare recipients)
  - Resources redistributed, not consumed
- Unrelated future health or non-health resource utilization

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Section B

Identifying which Injury Costs Should Be Characterized

Maria Segui-Gomez, MD, ScD

Costing Methods

- Costs = units of resources consumed (x) cost per unit
- Quantifying cost
- Quantifying units
- Direct measure of change in resource consumption
  - Micro-costing: “Bottom-up” or “top down”
  - Gross-costing

Continued

Costing Methods

- Indirect measure of change in resource consumption
- Quantifying cost
- Market prices for goods or services
- Time costs (productivity)
- Willingness to pay (or to accept)
  - In general, do not include fixed costs

How Accurate Does Costing Have to Be?

- It depends on intent and data availability
  - Accuracy of units ~ accuracy of costs

Source: Drummond, et al, 1997

Data Sources

- Billing vs. payment (charges vs. costs)
  - Billing records*, payment logs, medical charts, etc . . .
  - Self-reports
- Wages
- Willingness to pay
- Willingness to accept survey and analysis

** In many countries, health services are not billable*

Data Coding

- Monetary (and in constant year)

Data Comparability of Costs

- Data source variability (perspective, inclusion criteria, duration, time preference, representability)
- Coding system variability (year)

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Section C

Identifying which Intervention Costs Should Be Characterized

Maria Segui-Gomez, MD, ScD

What Do We Mean by Intervention Costs?

- Resources used in adopting the intervention
  - Implementation (capital)* and operational costs

** Depreciation of initial costs*

Relevance of Intervention Costs Data

- Necessary to evaluate resources needed to adopt intervention
- Helps identify whether intervention is a reasonable investment or cost saving when compared to the costs of the injuries

Issues to Consider

- As with injury costs:
  - Resources used (depreciation)
  - Perspective
  - Timing
  - Inflation

Which Costs and Data Sources?

Which costs?

- Initial and operational costs

Data Sources

- Same as for injury costs

Continued

Which Costs and Data Sources?

- In general, do not include fixed costs or research and development costs if analysis is on the implementation of the program rather than the development of the program

Data Coding

- Monetary (and in constant year)

Intervention Costs Data Comparability

- Data source variability
- Case identification variability
- Coding system variability (year)

Two Important Concepts:

- **Marginal cost:** The cost of producing one more unit of output
  - E.g., one more helmet order
- **Incremental cost:** The cost associated with doing more of something—relates mostly to changes in the input
  - E.g., one more state with a helmet law

Note: For a review of other cost-related terms, see box 4.3 in the cost analysis chapter in Drummond, et. al., 1997

Why Do We Care about the Intervention Cost?

- Comparing the cost of injury vs. the cost of intervention
- Very simply:
  - Cost benefit: The intervention has net savings (cost of intervention – cost saving of injury-related costs < 0)
  - Cost effective: The intervention yields benefit of some costs lower than other maximum costs that we are eager to pay

Continued

Why Do We Care about the Intervention Cost?

- Comparing the cost of injury vs. the cost of intervention
- Very simply:
  - Cost minimization: Several equally effective interventions are evaluated to find out which one is cheaper to implement

Cost Benefit Analysis of Legislation for Bicycle Safety Helmets in Israel

Cost

- Crash helmets for Israelis 833,000 cyclists: $19.5 million
- Health education over five years: $607,000
- Total costs over five year period: $20.1 million

Source: Ginsberg, G.M., et al., Am J Public Health *1994; 84: 653–56*

Continued

Cost *Benefit* Analysis of Legislation for Bicycle Safety Helmets in Israel

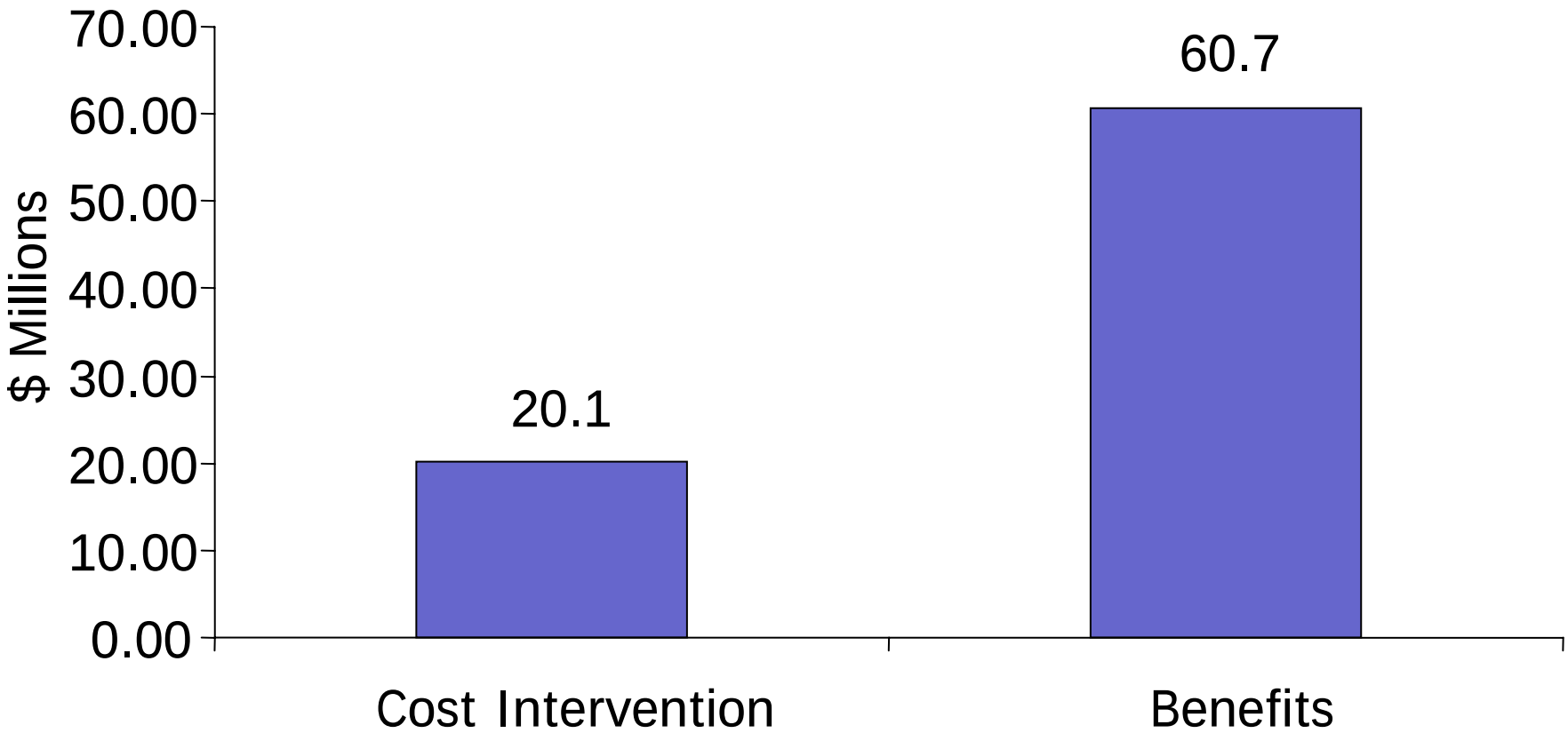
Benefits

- Reduction in health service use: $60.7 million
- Reduction in work absences: $7.5 million
- Reduction in mortality: $8.9 million
- Total benefits over five year period: $60.7 million

Source: Ginsberg, G.M., et al., Am J Public Health *1994; 84: 653–56*

Benefit-Cost Ratio of 3:1

Of Legislation for Bicycle Safety Helmets in Israel



Source: Ginsberg, G.M., et al., Am J Public Health *1994; 84: 653–56*

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- David Bishai, MD, PhD, is an assistant professor in the Department of Population and Family Health Sciences at the Bloomberg School of Public Health at Johns Hopkins University (www.jhsph.edu)

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Section D

The Cost of Injuries: Examples

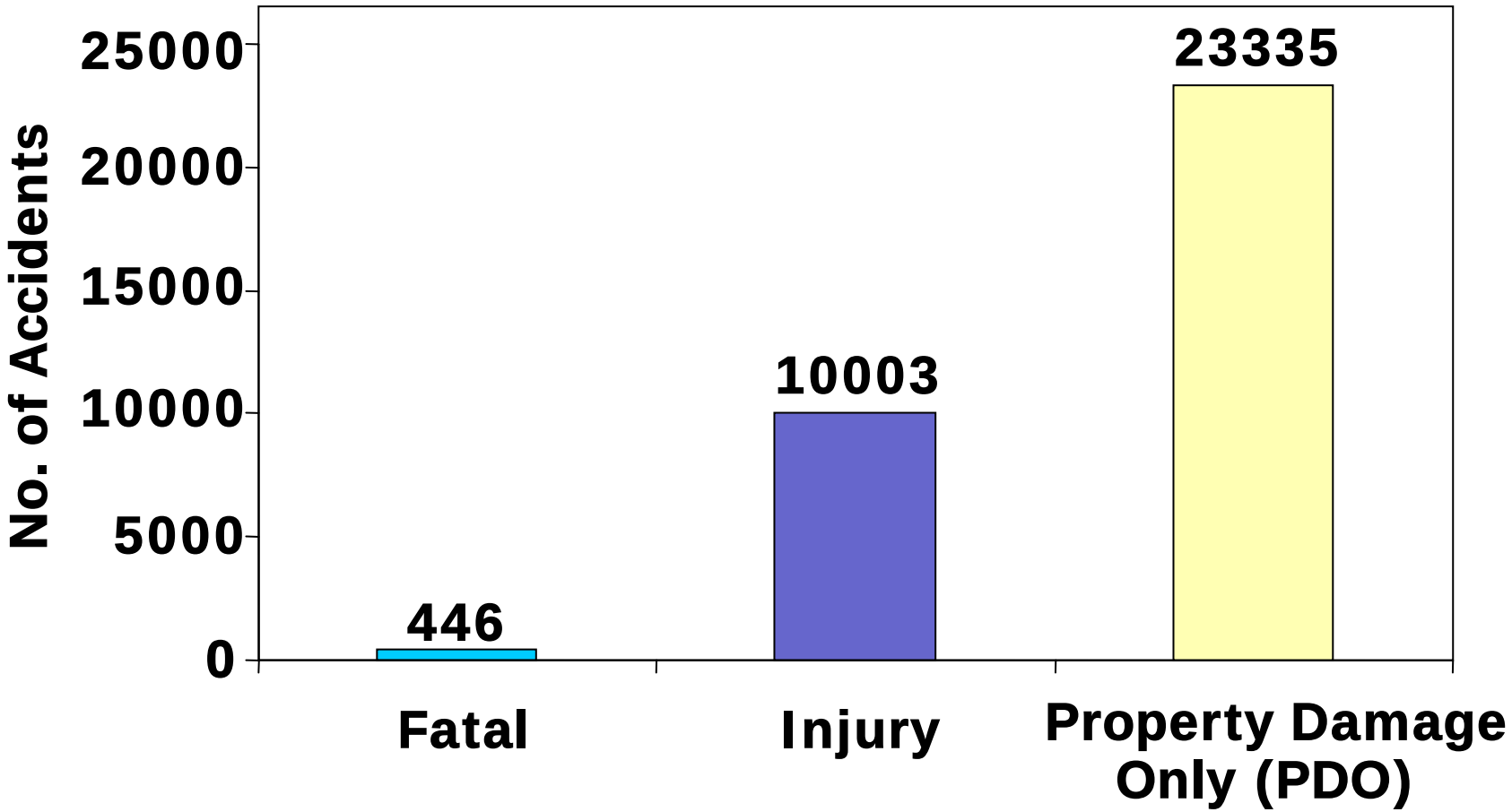
Adnan Hyder, MD, PhD

Examples of...

- Unit and total costs
- Cost comparison with GNP
- Cost of occupational injuries
- Cost of trauma and inpatient care

Traffic Accidents (Units)

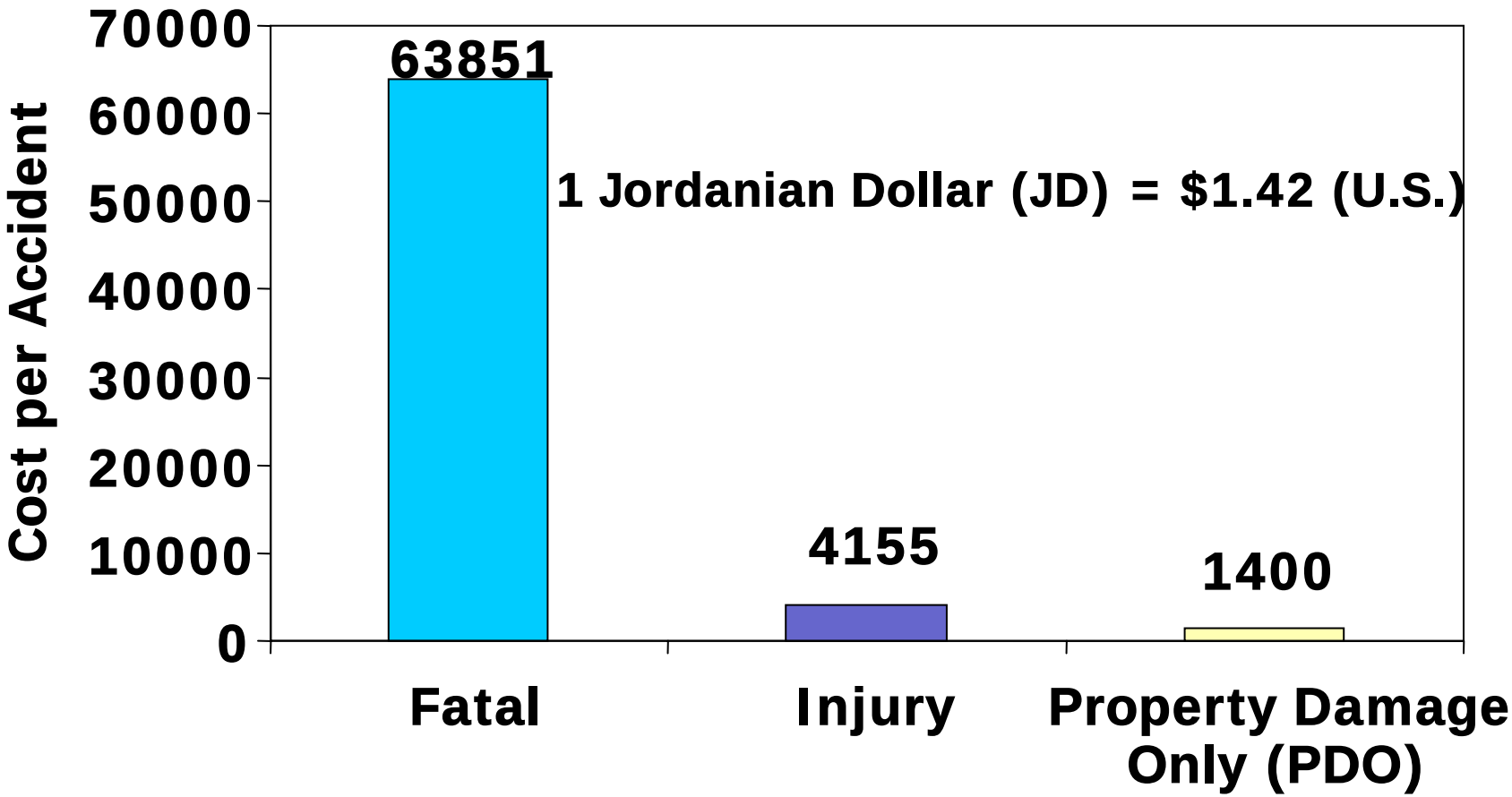
By Severity Level, Jordan, 1996



Source: Al Masaeid, et al., Accid Anal Prev *1999; 31: 347–357*

Average Unit Cost (JD) per "Accident"

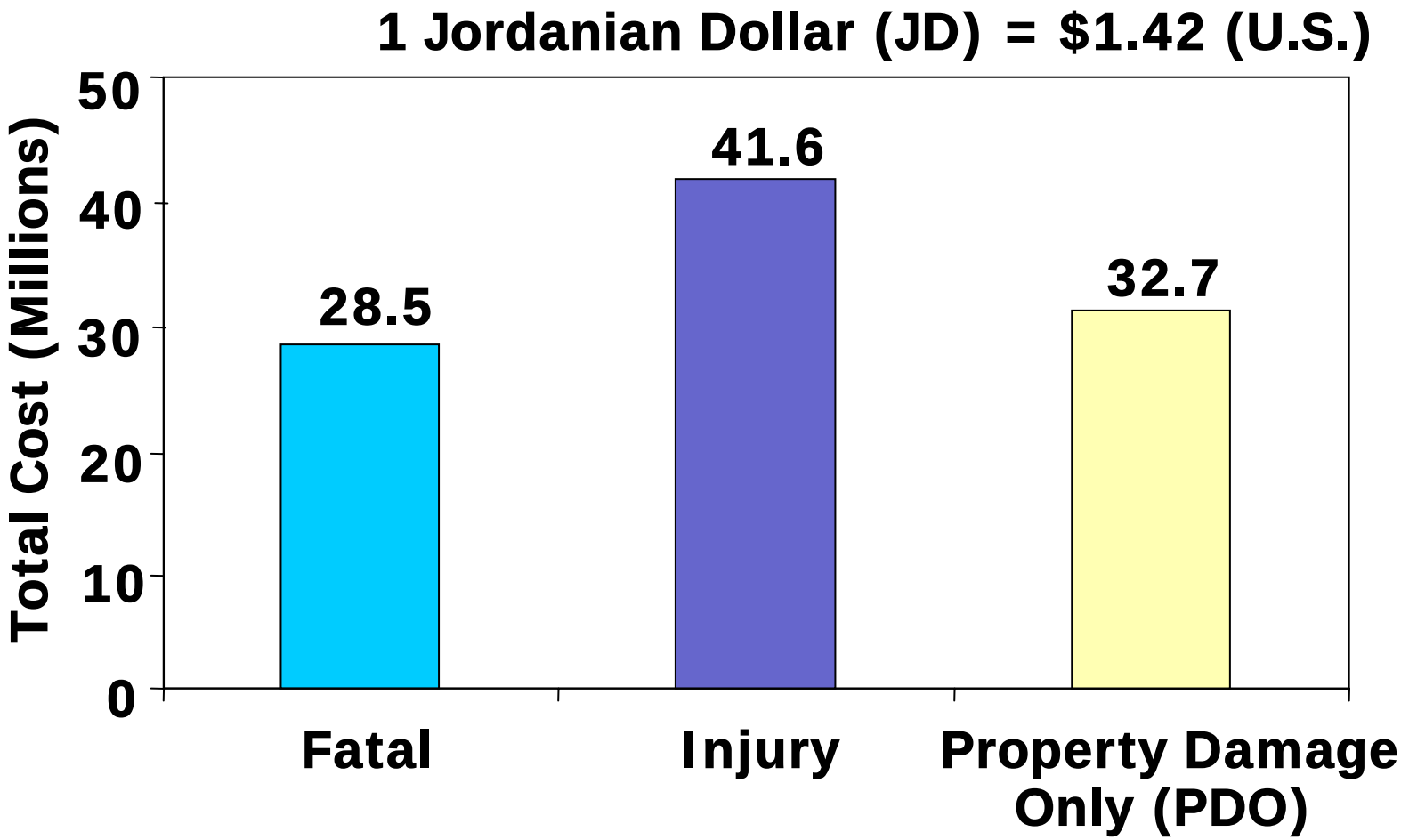
By Severity Level, Jordan, 1996



Source: Al Masaeid, et al., Accid Anal Prev *1999; 31: 347-357*

Total Cost (JD)

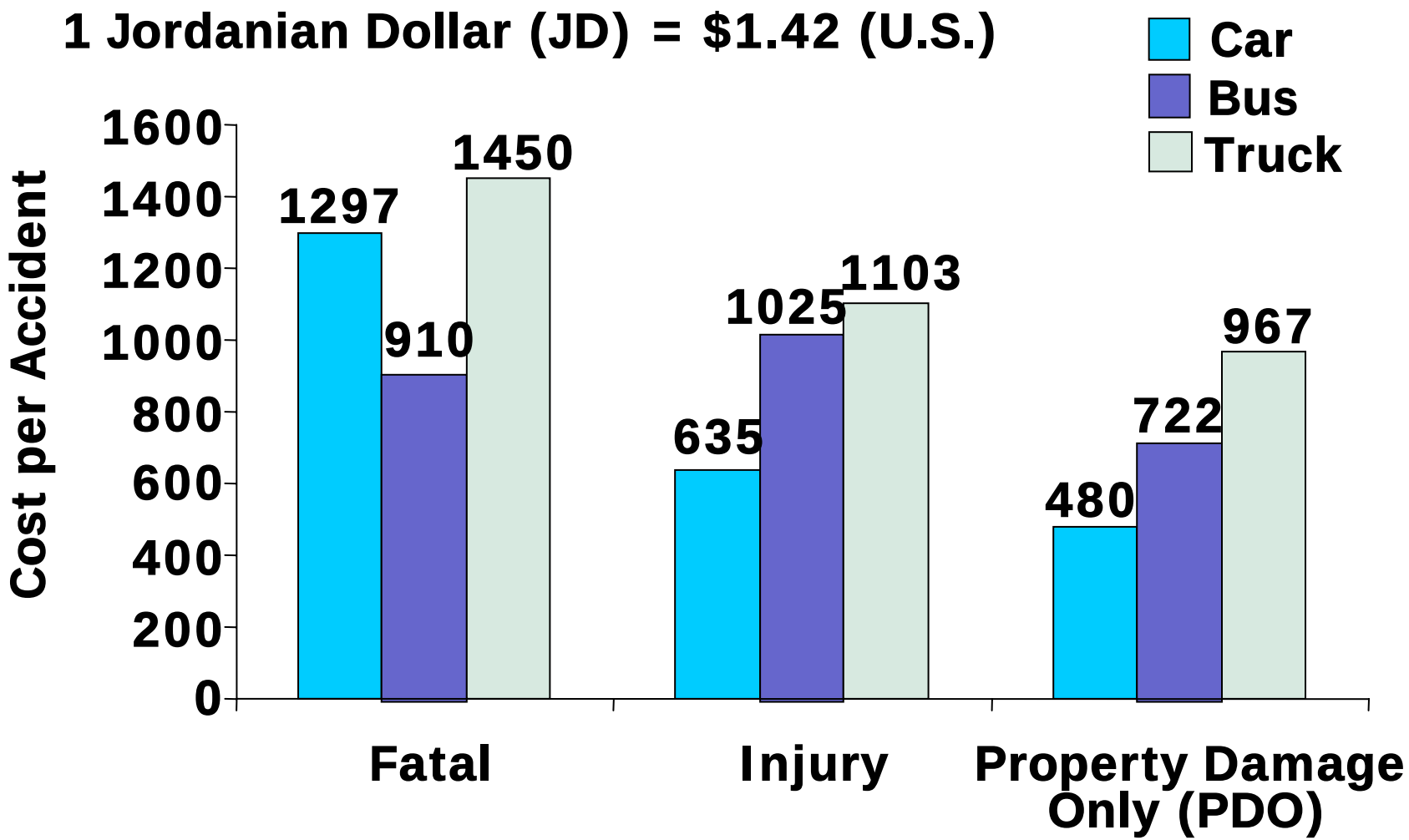
By Severity Level, Jordan, 1996 (TC = units x cost per unit)



Source: Al Masaeid, et al., Accid Anal Prev *1999; 31: 347–357*

Vehicle Repair Cost (JD) per Accident

By Severity Level, Jordan, 1996



Source: Al Masaeid, et al., Accid Anal Prev *1999; 31: 347–357*

Overall Costs of RTA to Jordan

- 1996 traffic accidents in Jordan cost the country 103 million Jordanian dollars (146.3 million U.S. dollars)
- Fatal accidents accounted for 1.3% of all accidents but 28% of overall costs
- Accidents with property damage made up 69% of all accidents but contributed only 32% to overall costs

Source: Al Masaeid, et al., Accid Anal Prev *1999; 31: 347–357*

Overall Cost of Traffic Injuries in Kuwait

- Cost per fatality: $500,000 (U.S. dollars)
- Per capita GNP of Kuwait: $13,890 (U.S. dollars)
- Cost per fatality / per capita GNP: 36:1

Source: Jadaan, 1990

Cost of Injuries in Malaysia

- Annual economic loss due to all injuries in Malaysia (U.S. $1 = MR 2.76 approximately):
  - Two billion Malaysia Ringgit
- Costs for road injuries in 1988:
  - Unit cost per person **killed** = MR 184,000 or 66,666 U.S. dollars

Source: Arokiasamy, Asia Pac J Public Health *1994; 7: 16–20*

Continued

Cost of Injuries in Malaysia

- Costs for road injuries in 1988 (U.S. $1 = MR 2.76 approximately):
  - Unit cost per **slightly injured** person = MR 1,840 or 666 U.S. dollars
  - Unit cost per **seriously injured** person = MR 184,000 or 66,666 U.S. dollars

Source: Arokiasamy, Asia Pac J Public Health *1994; 7: 16–20*

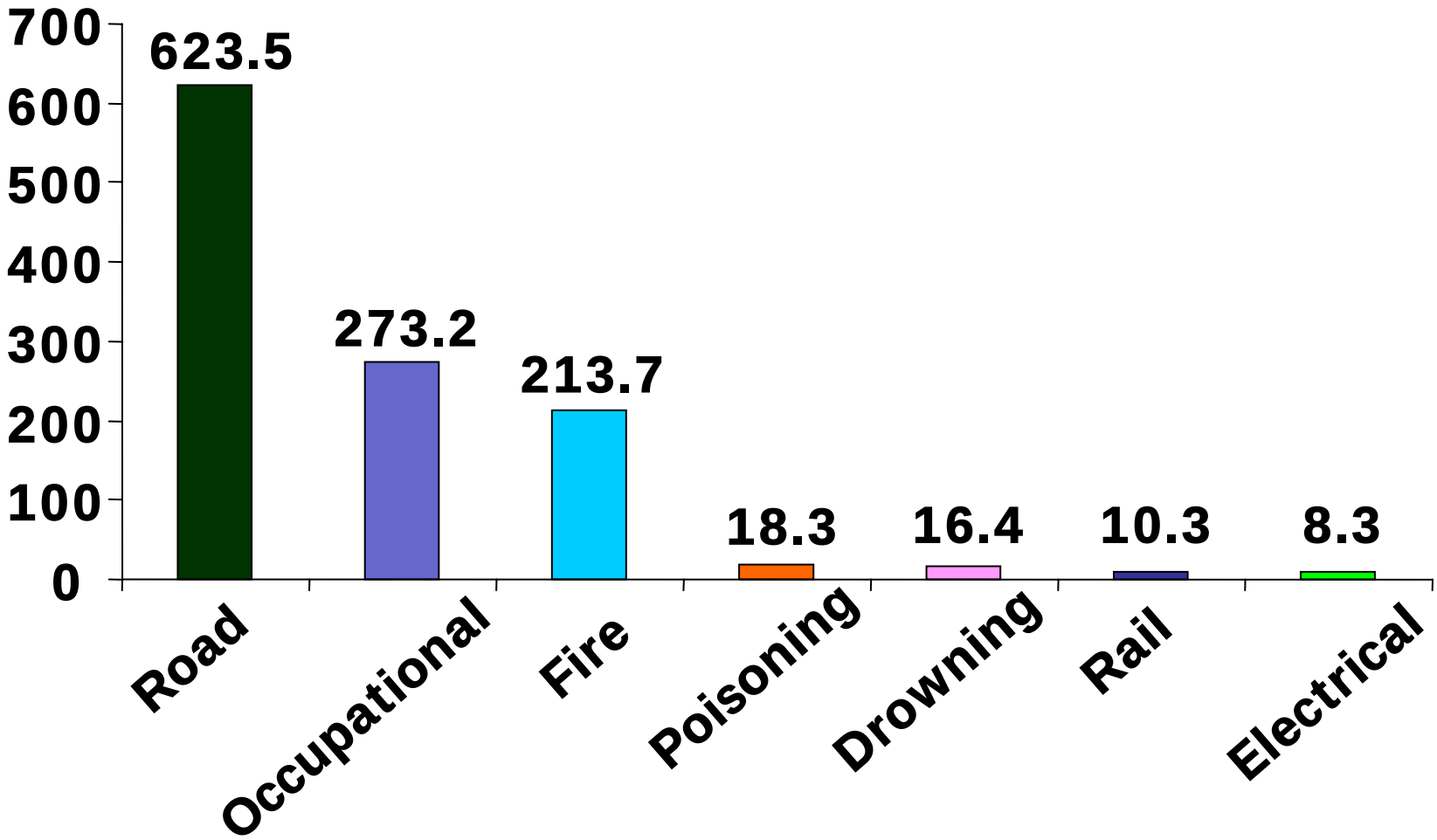
Ratio of Cost per Fatality / per Capita GNP in Developing Countries*

Country	GNP per Capita	Cost per Fatality	Ratio of Cost per Fatality / per Capita GNP
Jordan	$1,623	$74,210	92:1
Kuwait	$13,890	$500,000	36:1
Malaysia	$1,835	$66,666	36:1

**All currency in U.S. dollars*

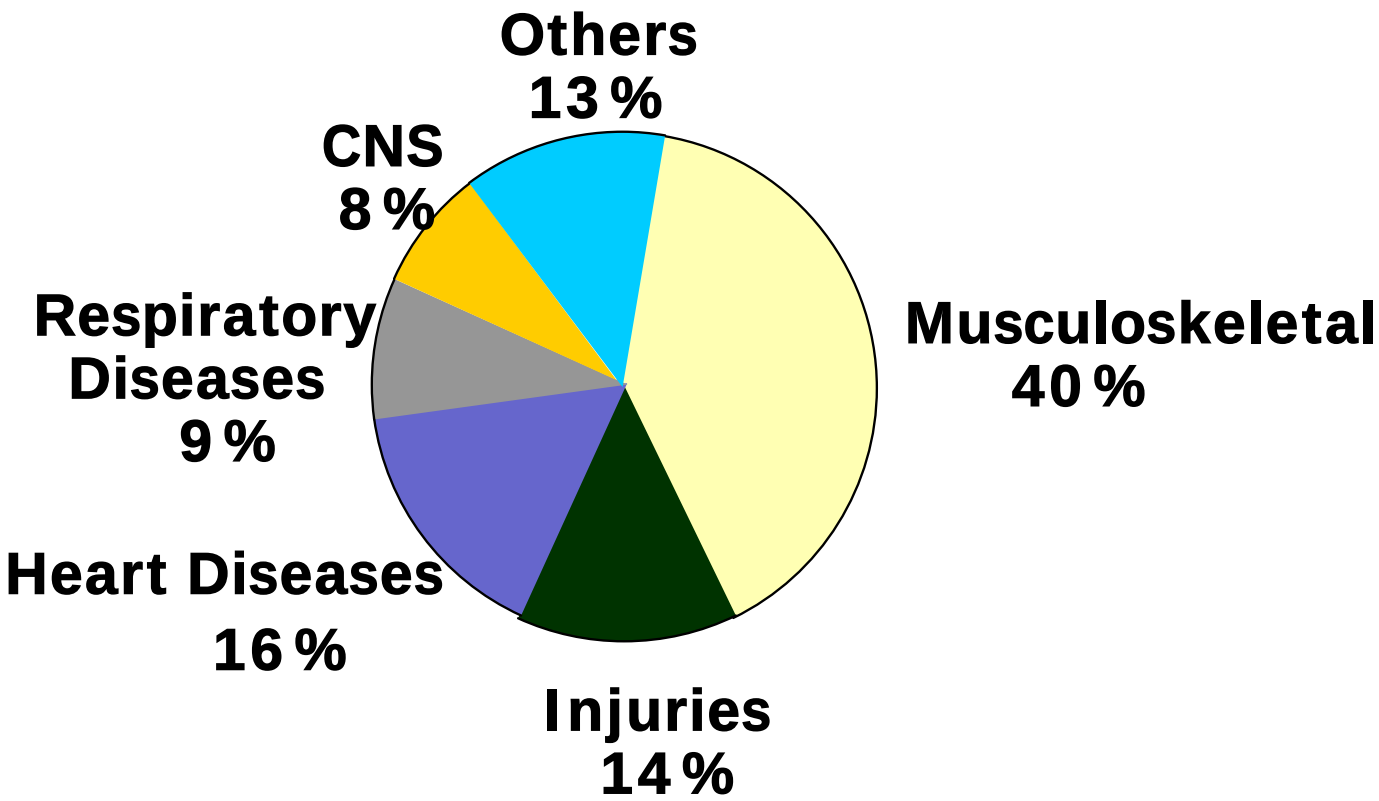
Injuries and Economic Costs in Malaysia

1998 Million M. Ringgits



Source: Arokiasamy, Asia Pac J Public Health *1994; 7: 16–20*

Distribution of Costs for Work Related Injuries and Diseases (Globally)



Source: ILO *1999*

Costs of Non-fatal Occupational Injuries, Saudi Arabia

- Cohort study conducted on 65,915 insured industry workers admitted to two randomly selected private hospitals in Al-Khobar City, Saudi Arabia
- The injury incidence rate was 7.1 per 1,000 full-time workers a year
- Direct medical cost per admission was less than 533 U.S. dollars (SR 2,000) in 63.9% of the cases

Source: Kasim Al-Dawood, CMJ *2000; 41: 228*

Continued

Monetary Quantification of Occupational Injuries, Taiwan

- Occupational injuries among workers of steel companies in Taiwan, 1984–1996
- Disability frequency rate (**DFR**) = (total number of disabling injuries x 1,000,000) / total number of employee hours worked
- DFR = 4.85 in 1994

Source: Jan-Juan Sheu, et al., Accid Anal Prev *2000; 32: 435–443*

Continued

Monetary Quantification of Occupational Injuries, Taiwan

- Disabling severity rate (**DSR**) = (total disabling days x 1,000,000) / total number of employee hours worked
- DRS = 231 in 1994
- Average potential salary lost of the whole company was more than two million U.S. dollars

Source: Jan-Juan Sheu, et al., Accid Anal Prev *2000; 32: 435–443*

Occupational Injury and Illness in the United States

- Approximately 6,500 job-related deaths from injuries and 13.2 million nonfatal injuries
- Injuries cost $145 billion in 1992
- These estimates are low because they ignore costs associated with pain and suffering, within-home care, and undercounting of events

Source: Leigh, J.P., Arch Intern Med *1997 Jul 8; 157 (14): 1557–68*

Trauma Cost in the Accident and Emergency Unit

- Trauma accounted for 37% of 22,311 patients seen in the Accident and Emergency Unit (A and E) at the University Hospital of the West Indies during 1996

Source: McDonald A., West Indian Med J*, 1999; Sep; 48(3): 141–42*

Continued

Trauma Cost in the Accident and Emergency Unit

- The average cost of caring for each injury patient in the A and E unit was 70 U.S. dollars resulting in an annual cost of 578,000 U.S. dollars

Source: McDonald A., West Indian Med J*, 1999; Sep; 48(3): 141–42*

Inpatient Cost of Injuries Due to Motor Vehicle Traffic Crashes in New Zealand

- The hospital inpatient costs for the treatment of injuries were obtained for Dunedin Hospital for a two-year period using the resource utilization system
- Results show that injuries were on average more expensive to treat than non-injuries ($3,115 vs. $2,749 per case)

Source: Langley, J.D., Accid Anal Prev *1993; Oct; 25(5): 585–94*

Continued

Inpatient Cost of Injuries Due to Motor Vehicle Traffic Crashes in New Zealand

- At a mean cost of $5,253 per case, injuries due to MVCs were the most expensive class of injury events to treat
- Pedestrians were, on average, twice as costly to treat as motor vehicle occupants

Source: Langley, J.D., Accid Anal Prev *1993; Oct; 25(5): 585–94*

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Section E

Case Study on Costs

Maria Segui-Gomez, MD, ScD

Occupational Hand Injuries in Jaipur, India

Background

- Occupational injuries as an important source of temporal and permanent disability
- Cost as a measure of importance

The Question(s)

- Frequency and magnitude of hand injuries in developing cities
  - Are costs useful?

What Would You Like to Know for All Outcomes?

- What do they call a hand injury?
- Which data source do they use?
- Which years?
- Were there any changes in definitions, codes?
- Which unit(s) do they evaluate?
- If rates, were they adjusted?

The Data

- Records from Department of Orthopaedics
- And
  - Census data
  - Disability payment (claims settlement)
  - Employer information
- Case inclusion criteria
  - Consecutive cases visited 1983–1986

Outcomes

- Hand injuries:
  - Digit/palm/whole
  - Minor/major
- Time of work
- Economic loss

The Numbers

- Hand injuries:
- 625 cases
  - 71% of the cases had single injuries
  - 812 digits and 49 palms
  - 44% of the injuries were major
- Time off work:
  - 471 of 625 cases
  - 16,806 days of work lost

Source: Mathur, et al., 1988

What Costs Are They Trying to Compute?

- Resource utilization or monetary transaction?
- Perspective
  - Employee's state insurance corporation?
- First year? Lifetime? (timing)
- 1983? 1984? 1988? (inflation)

The Numbers II

- Economic loss—295 of 625 cases
  - Rs 1,830,000 paid as temporary disability
  - Rs 15,420,000 paid as permanent disability
  - Rs 62,000 in wages lost during time off
  - Rs 2,570,000 in loss of production
  - Rs 43,000,000? (extrapolation to other cases without information)

Discussion: Let's Question It

- "Many working days lost [. . .] large economic loss [. . .] in Jaipur"
- "Loss of Rs one million*"
- ". . . the loss of Rs 6,900 per injured worker whose wages are in the Rs 5,400–19,000 [. . .] is disproportionately high"

** Inflated to whole country*

Continued

Discussion: Let's Question It

- "Laxity in provision of adherence to safety measures"
- "Surprisingly high incidence . . ."
- ". . . it reflects the casual and indifferent manner in which workers are required to handle heavy objects"
- "Existing facilities at the regional ESI hospital are inadequate"

Continued

Discussion: Let's Question It

- How would YOU do the study?