Economic Dimensions of OSH

Emile Tompa
Health & Labour Economist
Senior Scientist, Institute for Work & Health
Associate Professor, McMaster University
Co-director, Centre for Research on Work Disability Policy

Ten-year anniversary of the PEROSH network
12 May 2014, Paris
Presentation Overview

• Health as a key part of human capital
• Impact on labour-market activity of injury and illness
• Review of studies on the economic effects of H&S interventions
• Quality issues with H&S interventions that consider economic effects
• Guidance and tools for researchers and workplaces
• Summary and recommendations

OSH Economics in 35 minutes
Popular View of Economics
What Economics is Really About

Valuation
• Material resources
• People time
• Health

Consideration
• Individual
• Organization
• Society

Ultimate objective
• Maximize societal welfare
Workers with Impairments from a Work Injury Experience Earnings Losses for Many Years

- Loss of livelihood for worker
- Loss of productivity for employer
- Loss of tax base for public sector
- Dependency on social safety net transfers

Reville et al. (2001)
Low Earnings Recovery by Age Group Following a Permanent Impairment from a Work Injury

Study undertaken in Ontario, Canada (Tompa et al., 2012)
Macroeconomic Costs of Work Injury in the US

<table>
<thead>
<tr>
<th>Category</th>
<th>Direct medical costs</th>
<th>Indirect (work &amp; home production) costs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>fatal and non-fatal injuries</strong></td>
<td>$46.26</td>
<td>$145.56</td>
<td>$249.63</td>
</tr>
<tr>
<td><strong>fatal and non-fatal illnesses</strong></td>
<td>$20.83</td>
<td>$36.98</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$67.09</td>
</tr>
</tbody>
</table>

*Leigh (2011)

Burden underestimated for a number of reasons, key factors:
- Under reporting of occupational diseases
- Employer costs for labor turnover, retraining and hiring not included
- Impact on productivity of “presenteeism” not included
- Pain, suffering and loss of enjoyment of life not included

This amount exceeds the individual cost of cancer, coronary heart disease, stroke, and diabetes
## Macroeconomic Costs of Work Injury in Australia

Total cost ($ billion) occupation injuries and illnesses in Australia in 2008–09*

<table>
<thead>
<tr>
<th></th>
<th>Injuries</th>
<th>Illnesses</th>
<th>Total</th>
<th>Percentage of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Employers</strong></td>
<td>$ 1.7</td>
<td>$ 1.4</td>
<td>$ 3.1</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Workers</strong></td>
<td>$ 20.3</td>
<td>$ 24.5</td>
<td>$ 44.8</td>
<td>74%</td>
</tr>
<tr>
<td><strong>Community</strong></td>
<td>$ 8.7</td>
<td>$ 4.0</td>
<td>$ 12.7</td>
<td>21%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$ 30.7</td>
<td>$ 29.9</td>
<td>$ 60.6</td>
<td>100%</td>
</tr>
</tbody>
</table>

*SafeWork Australia (2012)

This is approximately 5% of GDP
Summary of Systematic Reviews

• Several reviews synthesize evidence on economic effects of programs to mitigate adverse health consequences
• Economic effects considered include earnings, productivity/presenteeism, labour-market engagement, organizational performance
• Key types of programs evaluated include:
  1) Health promotion, disease management and wellness
  2) Disability management
  3) Ergonomics
• Synthesis studies find economic returns for enterprises are positive within a few years after implementation for most programs

There are few full-fledged economic evaluations
Evidence on Economic Effects of H&S Programs (2)

Economic Impact of Health Promotion and Wellness (Lerner et al., 2013)

• Studies of health behaviours programs published 2000-2010
• 44 studies identified, with 32 reporting favourable economic effects
• Economic effects considered—health care expenses, work absences, and presenteeism
• 10 studies of sufficient quality to be included in a synthesis, 8 of which reported a positive economic effects
• 7 of 10 studies reported findings in monetary terms, 4 of which accounted for both program costs and consequences, and 2 that considered direct and indirect costs
• Evidence regarding economic effects is limited and inconsistent
Evidence on Economic Effects of H&S Programs (3)

Impact of Health Promotion on Presenteeism (Cancelliere et al., 2011)

- Studies of health promotion programs published 1990-2010
- 47 studies reviewed and 14 were included
- 4 studies considered of strong quality and 10 moderate
- Factors contributing to presenteeism: being overweight, poor diet, lack of exercise, high stress, and poor relations with co-workers and management
- Program components improving presenteeism: involving supervisors and managers, targeting organizational and environmental factors, screening, physical exercise during work hours, and individual tailoring.
- **10 of 14 studies showed evidence of positive effects on presenteeism**
- Conclusive evidence is *preliminary* for positive effects
Evidence on Economic Effects of H&S Programs (4)

Health Promotion and Disease Management (Pelletier, 2011)

- Studies of comprehensive health promotion and disease management programs published 2008-2010
- 8th in a series of critical reviews
- 27 new studies identified, with cumulative number amounting to 200
- New studies give further evidence of positive outcomes
- Guarded, cautious optimism about the clinical and/or cost-effectiveness
- Most studies are partial economic evaluations with a focus on returns to employers
Health and Safety Programs with Economic Analyses

- Objective was to assess the credible evidence that incremental investment in health and safety is worth undertaking
- Focussed on ergonomics and disability management programs
- Stratified studies by sector and intervention type
- Undertook a best evidence synthesis approach


Literature Search Results

Merged Database
12,903 article

67 H&S studies met inclusion criteria
contained 72 program evaluations

35 ergonomic program evaluations
17 disability management program evaluations
**Best Evidence Synthesis Criteria**

<table>
<thead>
<tr>
<th>Type</th>
<th>Minimum study quality:</th>
<th>Minimum number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong evidence</td>
<td>high</td>
<td>3</td>
</tr>
<tr>
<td>Moderate evidence</td>
<td>medium</td>
<td>2 high; or 3 of medium &amp; 1 high</td>
</tr>
<tr>
<td>Limited evidence</td>
<td>medium</td>
<td>1 high; 2 medium; or 1 medium &amp; 1 high</td>
</tr>
<tr>
<td>Mixed evidence</td>
<td>Findings from medium and high quality studies are contradictory</td>
<td></td>
</tr>
<tr>
<td>Insufficient / no evidence</td>
<td>No high quality studies; one or no medium quality studies; any number of low quality studies; no studies</td>
<td></td>
</tr>
</tbody>
</table>

*Based on Slavin’s best evidence synthesis approach (Slavin 1986, 1995)
Summary of Findings

Ergonomics

- **Strong evidence** in support of the financial merits of ergonomic programs in the manufacturing and warehousing sector, based on 6 studies
- **Moderate evidence** in administrative support services, health care and transportation sectors, based on 3 studies in each sector

Disability Management

- **Strong evidence** on the financial merits of disability management intervention in a multi-sector environment, based on 4 studies
Quality Issue

- Few effectiveness studies included an economic analysis component
- Few randomized controlled trials (RCTs)
- Non-experimental studies generally did not control for confounders
- Many studies had short follow-ups
- Studies with economic analyses used different computational methods
- Narrow focus on workers’ compensation, absenteeism, and health care expenses
- No consideration of future resource implications
- In general, need for more comprehensive consideration of economic impacts
- No direct valuation of health outcomes
## Costs and Consequences by Key Stakeholder

<table>
<thead>
<tr>
<th>Individual</th>
<th>Family and community</th>
<th>Employer</th>
<th>System, public sector and society</th>
</tr>
</thead>
<tbody>
<tr>
<td>• labour-market earnings</td>
<td>• time use of family and community members</td>
<td>• productivity and output</td>
<td>• productivity and output</td>
</tr>
<tr>
<td>• payroll benefits associated with labour-market earnings</td>
<td>• quality of life of family and community members</td>
<td>• insurance expenses (health, wage replacement and rehabilitation)</td>
<td>• health care and rehabilitation costs</td>
</tr>
<tr>
<td>• wage replacement benefits</td>
<td>• family income and savings</td>
<td>• recruitment, training and replacement costs</td>
<td>• population health and quality of life</td>
</tr>
<tr>
<td>• work role engagement</td>
<td>• adult outcomes of children</td>
<td>• penalties and fines</td>
<td>• capital accumulation, investment, and related productivity implications</td>
</tr>
<tr>
<td>• engagement in other social roles</td>
<td>• community outcomes</td>
<td>• capital costs</td>
<td>• program administration and other costs not covered by employer</td>
</tr>
<tr>
<td>• intrinsic value of health</td>
<td></td>
<td>• labour relations</td>
<td></td>
</tr>
</tbody>
</table>
**Monetary Value of Health-Related Quality of Life**

**Health policy arena and willingness-to-pay values**

- CAD$50,000 for QALY used by the Canadian Agency for Drugs and Technologies in Health (CADTH, 2007)
- €80,000 for QALY upper limit suggested by Dutch National Council for Public Health (Mackenbach, 2007)
- £20,000 - £30,000 for QALY suggested by the UK National Institute for Health and Excellence (NICE) (Appleby, 2007)
- 3 x GDP/capita upper limit for DALY suggested by World Health Organization (WHO) (Commission, 2001)
- US$20,000 - US$100,000 range for QALY common in health technology assessment (HTA) literature (Khor, 2010)
- US$161,305 willingness to pay for QALY (Hirth, 2000)
Work Productivity and Output is About the Group not the Individual

- Human capital approach is a standard method used in most OSH intervention evaluation studies
- Some studies use friction cost approach, which assumes only short term losses
- These two approaches have simplistic assumptions
- Multiple factors determine productivity/output loss due to absence and presenteeism:
  - a) Ability to replace the worker
  - b) Level of team production
  - c) Time sensitivity of output
- Nicholson et al. (2006) developed absenteeism multipliers for different occupations
- Pauly et al. (2008) developed presenteeism multipliers for different occupations

www.iwh.on.ca
## Absenteeism Multiplier Estimates by Job Type: Some Examples

Nicholson et al., 2006

<table>
<thead>
<tr>
<th>Type of Job</th>
<th>3-day cost of absence*</th>
<th>2-week cost of absence *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction engineer</td>
<td>447%</td>
<td>1,140%</td>
</tr>
<tr>
<td>Paralegal</td>
<td>213%</td>
<td>193%</td>
</tr>
<tr>
<td>Flight attendant</td>
<td>143%</td>
<td>143%</td>
</tr>
<tr>
<td>Mechanical engineer</td>
<td>154%</td>
<td>157%</td>
</tr>
<tr>
<td>Restaurant cook</td>
<td>132%</td>
<td>148%</td>
</tr>
<tr>
<td>Bartender</td>
<td>124%</td>
<td>114%</td>
</tr>
</tbody>
</table>

*Productivity losses of co-workers due to worker absence—assumption that employer pays sick leave benefits— a value of 100% means that the loss is simply the absent worker’s wages
We need more full-fledged economic evaluations of H&S interventions!

- Considering resource implications of program alternatives is imperative!
- It is critically important to policy decision making!
late invitations are better than none at all
Participatory Ergonomics Program Evaluations in the Textile Sector

Textile plant of 300 workers in southwestern Ontario

- Measurement time period was 144 weeks
- Regression modeling used with firm-level time series data to estimate impact of intervention on health and productivity outcomes
- Study undertook a CBA from the company perspective
- Intervention costs were $65,787 (primarily people time)
- Intervention consequences were $360,614
- **Net-present value of $294,827** and **benefit-to-cost ratio of 5.5**


www.iwh.on.ca
Need for Standardization of Methods

- Several groups in North America and Europe working towards standardization of OSH economic evaluation method
  - IWH: OSH economic evaluation methods text for researchers
  - ECOSH: Consensus building symposium on packaging evidence
  - NIOSH: White paper on methods for burden measurement
- Suggestion of having a reference case – set of standardized criteria for analysis and reporting that have professional scientific consensus
- Improve comprehension by readers, aid comparability, and facilitate uptake by policymakers, employers and other stakeholders
Economics Evidence Packaged with Best Practice Guidelines for Actionable Messages

- Actionable Messages
- Systematic Reviews of Research
- Single Studies, Articles and Reports
- Basic Science, Theoretical and Methodological Innovations
Six Summary Points on Best Practices from a Synthesis of Systematic Reviews on Ergonomics

Key message: ergonomics best practices are not about specific tools and procedures, but about an integrated approach to hazard control

1. Key characteristics of a successful ergonomics program
   • supported by an organizational policy
   • implemented with broad-based training
   • makes available the appropriate technologies

2. No one single component stands alone as a magic bullet
   • e.g., rest breaks, ergonomics training, adjustment to work stations as single components will not be successful

3. Ergonomic modifications are important for workers with injuries & illnesses
Six Summary Points on Best Practices from a Synthesis of Systematic Reviews on Ergonomics (cont’d)

4. For computer-based work, there is evidence that alternative pointing devices are useful for reducing musculoskeletal (MSK) injuries.

5. Participatory ergonomics programs are effective in reducing MSK injuries.

6. There is strong evidence to support the financial case for ergonomics:
   - particularly for manufacturing
   - moderate evidence for administrative support, health care and transportation sectors
   - strong evidence of multi-facetted disability management with ergonomics as a core facet

Developing Tools for Workplace Decision Making

- Started with a systematic literature review of workplace OHS interventions with economic evaluations
- Developed a methods text for OHS researchers
Developing Tools for Workplace Decision Making

- Started with a systematic literature review of workplace OHS interventions with economic evaluations
- Developed a methods text for OHS researchers
- Continued with software for workplace parties
  - Ontario manufacturing and service sectors
Developing Tools for Workplace Decision Making

- Started with a systematic literature review of workplace OHS interventions with economic evaluations
- Developed a methods text for OHS researchers
- Continued with software for workplace parties
  - Ontario manufacturing and service sectors
  - BC health care

Health & Safety Smart Planner:

- **DO YOUR OWN ANALYSIS**: Measure the costs and benefits of your health & safety interventions.
- **INCIDENT COST CALCULATOR**: Calculate the costs of your health & safety incidents. Retrieve past incidents from your database.
- **ABOUT H&S SMART PLANNING**: Learn how to use this tool, search the glossary of terms, review examples and get contact information.

Developing Tools for Workplace Decision Making

- Started with a systematic literature review of workplace OHS interventions with economic evaluations
- Developed a methods text for OHS researchers
- Continued with software for workplace parties
  - Ontario manufacturing and service sectors
  - BC health care
  - Manitoba multi-sector

[Image: Health & Safety Smart Planner]

- DO YOUR OWN ANALYSIS: Measure the costs and benefits of your health & safety interventions.
- INCIDENT COST CALCULATOR: Calculate the costs of your health & safety incidents. Retrieve past incidents from your database.
- ABOUT H&S SMART PLANNING: Learn how to use this tool, search the glossary of terms, review examples and get contact information.

Developing Tools for Workplace Decision Making

- Started with a systematic literature review of workplace OHS interventions with economic evaluations
- Developed a methods text for OHS researchers
- Continued with software for workplace parties
  - Ontario manufacturing and service sectors
  - BC health care
  - Manitoba multi-sector
  - Licensed to France
Developing Tools for Workplace Decision Making

- Started with a systematic literature review of workplace OHS interventions with economic evaluations
- Developed a methods text for OHS researchers
- Continued with software for workplace parties
  - Ontario manufacturing and service sectors
  - BC health care
  - Manitoba multi-sector
  - Licensed to France
- Developed full-day training workshops for OHS managers
Developing Tools for Workplace Decision Making

- Started with a systematic literature review of workplace OHS interventions with economic evaluations
- Developed a methods text for OHS researchers
- Continued with software for workplace parties
  - Ontario manufacturing and service sectors
  - BC health care
  - Manitoba multi-sector
  - Licensed to France
- Developed full-day training workshops for OHS managers
- Planning a portfolio of case studies with business case guidance and supporting app
Bridging the OHS-Operations Divide: Findings from In-depth Interviews with OHS Managers

- OHS often disconnected from operations in many organizations
- OHS managers lack data or access to data on output and productivity
- OHS not integrated into the management information systems
- As a result, OHS managers have poor understanding of organizational impacts of OHS investments

Economic Evaluation Training Workshop Recommendation to OHS Managers

Ensure OHS impacts are incorporated into organizational performance indicators by joining or starting a measurement task force!
International Efforts by Global Reporting Initiative (GRI)

- GRI promotes a sustainable global economy by providing organizational reporting guidance
- Health and safety performance is part of “corporate sustainability reports”
- Objective is to move health and safety performance measurement from traditional lagging indicators to an integral part of an organization's external overall corporate reporting

www.globalreporting.org

How many organizations currently mention health & safety in their annual report?
Summary

- Workplace injuries and illnesses result in substantial financial burdens
- Growing body of literature considers the economic effects of programs for improving worker health and well-being
- Key types of programs evaluated include: health promotion, disease management and wellness; disability management; and ergonomics
- Between 65-80% of studies included in reviews found positive returns at the organizational level
- Due to study quality concerns, most review authors recommend “guarded cautious optimism about the clinical and cost-effectiveness of these worksite programs”
Recommendations for the Next Generation of Studies

- Evaluation studies should endeavor to include an economic evaluation component whenever possible.
- Advanced statistical approaches needed as alternatives to randomization.
- Also need to track impacts for more than a year or two following program introduction, and where possible, consider future gains.
- A fuller set of costs and consequences needs to be considered, and particularly the direct value of health outcomes.
- Standardization of methods and comprehensiveness of reporting is essential for comparability and transferability of evidence.

Message to OHS Intervention Researchers
Invite an economist to your next program evaluation planning meeting!