A Systematic Literature Review of the Effectiveness of OHS Regulatory Enforcement: A Review of the Quantitative Literature

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IWH Plenary
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Overview and Rationale

- regulation takes different forms across jurisdictions & over time
- current context—competitive global markets, contingent employment contracts, limited public resources
- cost of regulatory enforcement is substantial, so gathering evidence on effectiveness is critical
- in Ontario, approx 43% of the $220M cost of the OHS system
Previous Review: Tompa et al. 2007

Objective

- to determine the strength of evidence on effectiveness of two policy levers focused on employer behavioural incentives
  - experience rating of insurance premiums
  - regulatory mechanisms

Need for an update

- review considered studies from 1970 to 2003
- literature base has grown since that review was published
  - experience rating review updated in 2012 publication
  - regulatory mechanisms review not updated (till now)
Findings from Earlier Review

Policy levers considered

• introduction of broad OHS regulation and enforcement activity
• particular enforcement activities—inspections, citations and penalties

Key findings from review

1. mixed evidence that introduction of regulation reduces injuries
2. limited to mixed evidence of general and specific deterrence of inspections and general deterrence of citations/penalties
3. strong evidence that actual citations/penalties reduces injuries
General and Specific Deterrence

General Deterrence
• the probability of an inspection, citation or penalty serves as an incentive for compliance with firms not experiencing these enforcement activities

Specific Deterrence
• the experience of an actual inspection, citation or penalty serves as an incentive for compliance with firms experiencing them
Multiple reasons regulation and enforcement may be ineffective:

- regulation may not address root causes of injuries
- regulator’s ability to detect non-compliance may not be sufficient
- regulator may be restricted in ability to enforce compliance or punish non-compliance
- threat of punishment may not be an effective deterrent
- firms may not always act rationally or focus on long-term issues
- punishment might create antagonism
- punishment may divert attention from important H&S concerns to compliance
What mix of enforcement activities are ideal?

Implementation of regulation can take many forms:

- education, assistance, persuasion, promotion, economic incentives, monitoring, enforcement and sanctions
- each activity contributes towards some aspect of mission accomplishment
- identifying the optimal mix of activities is a challenge
- tangled web of causes and effects make linking specific actions to specific outcomes difficult
On the research side...

How to parse out the marginal impact of a specific policy lever:
• conceptual understanding of behaviours of stakeholders
• need good data
• appropriate study design
  • statistical methodology to control for context
  • opportunity of natural experiment
  • randomized controlled trial
• sufficient measurement time frame to detect an effect
• deep understanding what results mean for real world phenomena
Deconstructing and then reconstructing the complexity is a challenge!
Overarching Question of this Review

“What is the strength of evidence on the effectiveness of OHS policy levers in creating incentives for organizations to focus on health and safety issues.”

• Expanded scope from previous review:
  • intermediate outcomes (compliance)
  • smoke-free workplace legislation
  • awareness campaigns
  • nature of enforcement
Methods

International Advisory Committee
• provided guidance at front end on framing and tail end on interpretation of findings

Search Strategy
• quantitative and qualitative reviews had a common search and initial selection process

Quality Assessment and Evidence Synthesis
• drew on methods and tools from previous review
• took a best evidence synthesis approach
  • quality, quantity and consistency
Search Strategy (1)

Four category modified PICO search

1) Regulatory Focus
2) Setting
3) Policy Levers
4) Context (Conditions + Outcomes)

First level screening

• studies had to consider directives related to OHS legislation and/or regulation made by a government authority
• studies had to evaluate OHS legislation and/or regulations using quantitative and/or qualitative methods
Search Strategy (2)

Screening for quantitative review

1. study had a temporal element (i.e., used data from multiple points in time, or asked respondents about past experiences);

2. study design was rigorous (i.e., used multiple regression modeling methods or had a quasi-experimental design); and

3. study considered final outcomes, such as injuries and illnesses, or intermediate outcomes, such as compliance
### Overall study quality

1. Does the study specify a theoretically correct relationship between the policy feature (explanatory variable) and the outcome variable (dependent variable)?

2. Are the characteristics of the study population properly well-defined, measured and described?

3. Was the statistical methodology appropriate for the research question and study design?

4. Does the study establish an empirically correct relationship between the outcome and independent variables?

5. Was there adjustment made for important covariates?

6. Are the results interpreted correctly?

### Quality of regulatory evidence

7. How strongly would you rate the measurement validity of this policy lever?

8. How strongly would you rate the statistical validity?

9. How strongly would you rate the internal validity?

10. How strongly would you rate the external validity?

*High = ≥70% quality assessment in both categories; Medium = 50-70% quality assessment in both categories*
## Best Evidence Synthesis Guidelines/Guidelines for Messages

<table>
<thead>
<tr>
<th>Level of Evidence</th>
<th>Minimum Quality*</th>
<th>Minimum Quantity</th>
<th>Consistency</th>
<th>Strength of Messages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong</td>
<td>High (H)</td>
<td>3</td>
<td>3H agree; If 3+ studies, 3/4 of the M &amp; H agree</td>
<td>Recommendations</td>
</tr>
<tr>
<td>Moderate</td>
<td>Medium (M)</td>
<td>2H or 2M &amp; 1H</td>
<td>2H agree or 2M &amp; 1H agree; If 3+, &gt;2/3 of the M &amp; H agree</td>
<td>Practice Considerations</td>
</tr>
<tr>
<td>Limited</td>
<td>Medium (M)</td>
<td>1H or 2M or 1M &amp; 1H</td>
<td>2 (M and/or H) agree; If 2+, &gt;1/2 of the M &amp; H agree</td>
<td>Not enough evidence to make recommendations or practice considerations</td>
</tr>
<tr>
<td>Mixed</td>
<td></td>
<td>2</td>
<td>Findings from M &amp; H are contradictory</td>
<td></td>
</tr>
<tr>
<td>Insufficient</td>
<td></td>
<td></td>
<td>Medium quality studies that do not meet the above criteria</td>
<td></td>
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<tr>
<td>SOURCE</td>
<td>N</td>
<td>SOURCE</td>
<td>N</td>
<td></td>
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<td>Medline</td>
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<td>Wilson Social Science Abstracts</td>
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<td>Hand-search: Policy and Practice in Health and Safety</td>
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<td>Content Experts</td>
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<td>EconLit</td>
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**Total of 11,947 Titles and Abstracts**
Search Results

Database Searches
N=11,947

Title & Abstract Screening
Included N=2,360
Excluded N=9,587
Not in English: 234
Not peer-reviewed: 358

Full Study Screening
Quantitative & Mixed Method Studies N=282
Qualitative & Review Studies N=268
Excluded Studies N=1,810

Quantitative Rigor Screening
Studies for QA N=61+3 (from references)
Excluded Studies N=221

Quality Assessment
Medium & High Quality N=43
Low Quality N=21
### Comparison with Previous Review

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Previous Review</th>
<th>This Review</th>
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<table>
<thead>
<tr>
<th>Types of outcomes</th>
<th>Final outcomes</th>
<th>Intermediate &amp; Final</th>
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<tbody>
<tr>
<td>Peer-reviewed and Grey Literature</td>
<td>Peer-reviewed Literature</td>
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<table>
<thead>
<tr>
<th>Cluster</th>
<th>No. of Studies</th>
<th>No. of Studies</th>
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<tbody>
<tr>
<td><strong>Introduction of OHS Legislation</strong></td>
<td>2 studies</td>
<td>9 studies</td>
</tr>
<tr>
<td>Introduction of Smoke-free Workplace Legislation</td>
<td>--</td>
<td>6 studies</td>
</tr>
<tr>
<td>Inspection Sequence</td>
<td>--</td>
<td>4 studies</td>
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<tr>
<td>General and Specific Deterrence of Inspections and Penalties</td>
<td>21 studies</td>
<td>16 studies</td>
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<tr>
<td>Nature of Enforcement</td>
<td>--</td>
<td>6 studies</td>
</tr>
<tr>
<td>Awareness Campaigns</td>
<td>--</td>
<td>4 studies</td>
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</table>
Evidence Synthesis: Introduction of OHS Legislation

Nine studies retained in this cluster (1H & 8M)

• mix of different legislations—hearing conservation, chemical exposure mitigation, universal precautions for blood borne pathogens, ergonomics regulation, lockout/tagout requirements…

• some considered final outcomes—injuries, illnesses and fatalities

• others considered intermediate outcomes—exposure and compliance

• *moderate evidence* that the introduction of legislation has *no effect* on injuries (1H & 5M)

• *limited evidence* that the introduction of legislation improved intermediate outcomes (3M)
Evidence Synthesis: Introduction of Smoke-free Workplace Legislation

Six studies retained in this cluster (5H & 1M)

- introduction of different forms of smoke-free workplace legislation in North America and Europe
- some studies considered final outcomes—respiratory and sensory symptoms
- others considered intermediate outcomes—reductions in smoke exposure and reductions in cigarette consumption

- **strong evidence** that the introduction of smoke-free legislation reduces exposure to smoke (3H & 1M)
- **moderate evidence** that the introduction of smoke-free legislation reduces respiratory and/or sensory symptoms (2H & 2M)
Evidence Synthesis: Inspection Sequence

Four studies retained in this cluster (2H & 2M)

- all studies undertaken in US jurisdictions
- considered how inspection sequence influences compliance rates based on changes in compliance violations cited

- *moderate evidence* that the first inspection has the largest impact on compliance (2H & 2M)
Evidence Synthesis: General Deterrence of Inspections and Penalties

Three studies retained in this cluster (3M)

- studies considered the impact of the probability of inspections through aggregate/industry levels inspection activity
- final outcomes included lost-time injury rate, lost workdays, and the fatality rate

- **limited evidence** that general deterrence has no effect on lost-time injuries at the aggregate level (3M)
- **limited evidence** that general deterrence reduces fatalities and lost workdays (1M for each outcome)
Evidence Synthesis: Specific Deterrence of Inspections and Penalties

13 studies retained in this cluster (8H & 5M)

- most considered specific deterrence in the form of inspections with/without penalties
- some considered other enforcement activities such as consultations or details of the inspection activity

- **strong evidence** inspections with penalties reduce injuries (6H & 3M)
- **moderate evidence** inspections without penalties have **no effect** on injuries (6H & 3M)
- **limited evidence** that a compliance review of motor safety performance reduced truck crashes (1H)
Evidence Synthesis: Nature of Enforcement

Six studies retained in this cluster (4H & 2M)

- divided into two groups: 1) consultative activity (4H studies), and 2) state- versus federal-level enforcement (2 M studies)

- **strong/limited evidence** consultations have **no effect** on injuries (3H)
- **limited evidence** that an autonomy-supportive style reduces the number of visits to achieve compliance (1H)
- **limited evidence** that state enforcement results in lower fatality rates compared to federal enforcement (2M)
Evidence Synthesis: Awareness Campaigns

Four studies retained in this cluster (4M)

• studies in different sectors and focused on different OHS risks—noise regulations, guidelines on childhood labour in agriculture, eye injury campaign, managerial training program

• two considered final outcomes and two considered intermediate outcomes

• *limited evidence* that campaigns reduce injuries (2M)

• *moderate evidence* that campaigns improve compliance (2M)
Discussion/Questions/Advice/Comments

• introduction of legislation—what can we learn from the introduction of smoke-free workplace legislation?
• specific deterrence—findings reinforce the importance of being in the field citing/fining non-compliance
• consultations appear to have no effect on injury outcomes—what are the implications for the move towards voluntary guidelines?
• compliance outcomes
  • first inspection has the largest impact on compliance
  • awareness campaigns improve compliance
  • what is the relationship between compliance and injury outcomes?
• need to create more opportunities to understand what works best, when and why!!
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