A systematic review of OHS interventions with economic evaluations

VOLUME 2 - Appendices

sharing best evidence

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List of Appendices

Appendix A

Attendees at the first stakeholder workshop

External Participants

Richard Allingham	Workplace Safety & Insurance Board (WSIB)
Gloria Taylor-Boyce	Workers Health & Safety Centre (WHSC)
Norma Akinbiyi	WSIB
John Vander Dolen	Ministry of Labour
John MacNamara	Dofasco [by phone]
Richard Wells	University of Waterloo
Elizabeth Mills	Ontario Service Safety Alliance

Institute for Work & Health Participants

Emile Tompa
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Roman Dolinschi
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Kathy Chapeskie

Appendix B

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Kristina Kemmlert, PhD	National Institute for Working Life, Solna, Sweden; Department of Rehabilitation and Physical Medicine, Karolinska Institute, Stockholm, Sweden; National Institute of Occupational Health, Division of Applied Physiology, Solna, Sweden	Kristina Kemmlert Psychology, Social Affairs and Ergonomics Division Medical and Social Department National Board of Occupational Safety and Health, S-171 84 Solna, Sweden (1998)
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Appendix C

MEDLINE search strategy

Ovid Technologies, Inc. Email Service

Search for: limit 180 to yr="1990 - 2006"
Results: 1

Database: Ovid MEDLINE(R) <1966 to July Week 4 2006>
Search Strategy:
---

1 intervention studies/ (3462)
2 evaluation studies/ (120479)
3 intervention$.mp. (252603)
4 evaluation$.mp. (730245)
5 or/1-4 (948930)
6 workplace/ (5931)
7 work?place?.mp. (16072)
8 work?site?.mp. (1553)
9 work?environment?.mp. (0)
10 work environment?.mp. (3444)
11 work-environment?.mp. (3444)
12 work/ (6662)
13 worker?.mp. (88659)
14 employ$.mp. (227253)
15 company.mp. (12077)
16 companies.mp. (9312)
17 employer?.mp. (8320)
18 organizations/ (5368)
19 organi#ation?.mp. (199323)
20 firm?.mp. (12318)
21 hospital?.mp. (611406)
22 hospitals/ (32072)
23 plant?.mp. (271454)
24 factory.mp. (4938)
25 factories.mp. (2115)
26 restaurant?.mp. (2231)
27 agricultur$.mp. (33587)
28 office?.mp. (40638)

29 industry/ (15510)
30 industr$.mp. (121169)
31 paid?work.mp. (0)
32 paid work.mp. (245)
33 paid-work.mp. (245)
34 or/6-33 (1464023)
35 HEALTH/ (14635)
36 Workers' Compensation/ (4707)
37 claim?.mp. (24813)
38 time#los?.mp. (0)
39 time los?.mp. (571)
40 time-los?.mp. (571)
41 lost?time.mp. (0)
42 lost-time.mp. (288)
43 lost time.mp. (288)
44 lost#time.mp. (0)
45 impairment?.mp. (113786)
46 SAFETY/ (23282)
47 OHS.mp. (440)
48 OSH.mp. (108)
49 disabilit$.mp. (70486)
50 disease/ (12454)
51 disease?.mp. (2900919)
52 return#to#work.mp. (0)
53 return?to?work.mp. (0)
54 return to work.mp. (3097)
55 return-to-work.mp. (3097)
56 "Sprains and Strains"/ (2461)
57 mental health/ (9755)
58 trauma?.mp. (110625)
59 fatal$.mp. (86359)
60 death/ (8881)
61 ACCIDENT PREVENTION/ or PRIMARY PREVENTION/ (15374)
62 "Wounds and Injuries"/ (38378)
63 low back pain/ (7238)
64 lower back.mp. (1261)
65 low back pain.mp. (11398)
66 lumbar vertebrae/ (24942)
67 lumbar vertebrae.mp. (25662)
68 exp cervical vertebrae/ (19962)
69 cervical vertebrae.mp. (18352)
70 thoracic vertebrae.mp. (10074)
71 thoracic vertebrae/ (9782)
72 intervertebral disk/ (6612)
73 intervertebral disk.mp. (15941)
74 shoulder/ (5905)
75 shoulder.mp. (27930)

76 exp arm/ (19621)
77 arm.mp. (70773)
78 upper arm.mp. (2779)
79 upper extremity.mp. (7676)
80 rotator cuff.mp. (3556)
81 rotator cuff/ (2261)
82 exp bursitis/ (2450)
83 bursitis.mp. (2096)
84 shoulder dislocation/ (3115)
85 shoulder dislocation.mp. (3161)
86 tennis elbow/ (805)
87 tendinitis.mp. (1301)
88 tennis elbow.mp. (925)
89 tendinitis/ (2523)
90 tenosynovitis/ (1781)
91 tenosynovitis.mp. (2189)
92 hip/ (5304)
93 hip.mp. (62677)
94 exp leg/ (43626)
95 lower limb.mp. (9967)
96 exp musculoskeletal diseases/ (570057)
97 cumulative trauma disorders/ (2339)
98 exp respiratory tract diseases/ (727565)
99 ACCIDENTS/ (10269)
100 illness$.mp. (189100)
101 disorder?.mp. (855475)
102 sick$.mp. (57850)
103 sick#leave/ (0)
104 sick leave/ (1529)
105 sick-leave.mp. (2658)
106 absenteeism/ (5522)
107 presenteeism.mp. (54)
108 productivity.mp. (13136)
109 REHABILITATION/ (9879)
110 therap$.mp. (1328564)
111 Accidents, Occupational/ (11476)
112 re?employment.mp. (66)
113 injur$.mp. (428011)
114 occupational diseases/ (61290)
115 functional limitation.mp. (552)
116 physical capacity.mp. (666)
117 work#capacity.mp. (0)
118 work capacity.mp. (6425)
119 work-capacity.mp. (6425)
120 work?capacity.mp. (0)

121 work limitation?.mp. (67)
122 work#related.mp. (0)
123 work?related.mp. (2)
124 work related.mp. (5155)
125 work-related.mp. (5155)
126 time#on#benefit?.mp. (0)
127 time?on?benefit?.mp. (0)
128 time-on-benefit.mp. (0)
129 time on benefit.mp. (0)
130 benefit?.mp. (223976)
131 lost#workday?.mp. (0)
132 lost?workday?.mp. (0)
133 lost workday?.mp. (115)
134 lost-workday?.mp. (115)
135 wage#replacement.mp. (0)
136 wage?replacement.mp. (0)
137 wage replacement.mp. (24)
138 wage-replacement.mp. (24)
139 risk/ (74992)
140 or/35-139 (5563473)
141 cost?.mp. (222371)
142 expense?.mp. (15111)
143 saving?.mp. (26764)
144 economic.mp. (65526)
145 financial.mp. (42408)
146 los#reduction.mp. (1)
147 payback.mp. (146)
148 internal#rate#of#return.mp. (0)
149 internal?rate?of?return?.mp. (0)
150 internal rate of return.mp. (34)
151 internal-rate-of-return.mp. (34)
152 return#on#investment.mp. (0)
153 return?on?investment.mp. (0)
154 return on investment.mp. (317)
155 return-on-investment.mp. (317)
156 pay?back?.mp. (162)
157 medical care.mp. (22365)
158 or/141-157 (334000)
159 osteoporosis/ (22047)
160 osteoarthritis/ (19956)
161 arthritis/ (18094)
162 child/ (994498)
163 exp Guillain-Barre Syndrome/ (1488)
164 exp hospitalization/ (100054)
165 sports/ (15139)
166 congenital.mp. (142577)
167 exp "Legal Cases [Publication Type]"/ (7698)

168 exp Guillain-Barre Syndrome/ (1488)
169 exp Fetus/ (84181)
170 exp Skin Diseases/ (558812)
171 exp Neoplasms/ (1784465)
172 exp Diabetes Mellitus, Experimental/ or exp Diabetes Insipidus, Nephrogenic/ or exp Diabetes Mellitus, Lipoatrophic/ or exp Diabetes Mellitus, Type 2/ or exp Diabetes Insipidus/ or exp Diabetes Mellitus, Type 1/ or exp Diabetes, Gestational/ or exp Diabetes Insipidus, Neurogenic/ or exp Diabetes Complications/ or exp Diabetes Mellitus/ (197578)
173 Pregnancy/ (531852)
174 exp Horses/ (44080)
175 exp Renal Dialysis/ (69884)
176 exp Arthroscopy/ (9165)
177 or/159-176 (3898536)
178 5 and 34 and 140 and 158 (14564)
179 178 not 177 (9807)
180 limit 179 to (humans and english language) (7447)
181 limit 180 to yr="1990 - 2006" (6568)
182 from 181 keep 1 (1)

Appendix D

Title and abstract selection guidelines

Question	Include	Exclude
#1 Does the title/abstract refer to an **intervention** study?	Intervention studies: • ergonomic interventions • return-to-work interventions • health promotion programs directed at reducing work-related illness/injury • other interventions focused on work-related injury/illness prevention	• observational data studies where no change has been implemented
#2 Does the title/abstract imply/refer to a **workplace setting**?	If setting is: • workplace • worksite • work environment • firm / company • employment / job • workstation • employer-based • farm If subjects are: • workers / employees • labourers • include regardless of categories of paid employment	If subjects are: • homemakers • volunteers • self-employed • unpaid family help (farm or other business) If setting is: • outside the workplace • an army or naval base
#3 Does the title/abstract refer to primary or secondary prevention **(i.e., reduce work-related injuries/illnesses** or **minimize the impact of injury/illness on work disability)**?	If objectives are to reduce the following: • the incidence or severity of any work-related injury/illness • for primary prevention, work-related	• If outcomes are: smoking, drinking, illegal drug use, level of physical activity or other health-related behaviours • for primary

Question	Include	Exclude
FLAG Note whether the study is on primary or secondary prevention	injury/illness • for primary prevention, mental health outcomes caused by work exposure • for secondary prevention, disability arising from any injuries/illnesses • for secondary prevention, mental health even if it is due to exposure outside of work	prevention, exclude mental health due to exposure outside of work
#4 Does the title/abstract refer to (or suggest) an **economic evaluation** or **costing** study? **FLAG** Literature reviews Methods papers Comments/Letters referring to other papers (not a candidate study, but may be used as source of references, etc.)	• Economic evaluations: cost-minimization, cost-benefit, cost-effectiveness, cost-utility, cost analysis studies • If both costs and consequences are considered • Include studies that look at outcomes measured in term of dollars (e.g., cost saving, cost reductions in health care, insurance, etc.) • Include studies that consider productivity (e.g., reduced cost absenteeism)	• If title/abstract makes no reference to costs, savings, or application of economic evaluation methodology

Appendix E

Quality assessment tool

Overarching questions that frame the purpose of the study and the nature of the intervention

1) Was the conceptual basis of, and/or the need for the intervention explained and sound?
- there should be some description of why the intervention is being considered and evaluated, both a motivation for undertaking the intervention and the choice of the intervention
- related to this, is a well-defined question posed in an answerable form?
- this may be based on theory, previous studies in the field, and/or previous experience
- this may also be based on evident problems (as opposed to theory) and factual evidence, such as analysis of injury statistics, risk factors assessment, etc.
- information about this should generally be found in the introduction or literature review section, though it may not be expressly stated as a hypothesis statement

☐ 1 (there is no indication of why the intervention was undertaken)
☐
☐
☐
☐ 5 (there was a clear articulation of the conceptual basis for undertaking the intervention)

2) Was the intervention clearly described?
- a detailed description of the intervention is required to be able to assess its merits
- also, to appropriately apply the intervention in another setting, the details of intervention need to be articulated such as program content, process issues, duration

☐ 1 (few details about the nature of the intervention are provided)
☐
☐
☐
☐ 5 (the intervention is clearly described)

3) Were the study population and context clearly described?
- external validity or generalizability can only be assessed if the key variables are described so that reader can assess transferability to other settings
- key sociodemographic characteristics include age, gender, experience, occupation, experience
- key factors that are important to present data on include industry, firm size, company performance characteristics (injury/illness experiences, profitability and growth), company commitment to OHS, and major trends and patterns (prior to the intervention) related to outcomes and contextual factors of interest

☐ 1 (the study population and context are poorly described)
☐
☐
☐
☐ 5 (the study population and context are clearly described)

Study design and issues related to evaluation the intervention's effectiveness

4) Rank the means by which selection and confounding are controlled for through study design?

- consider the strengths and weaknesses of different designs
- experimental design possibilities— the key characteristics are randomization and having a control group
- cohort-control assignment random (at individual, team, or workplace level)—there should be measurement of baseline differences and the analysis may control for these differences through regression modelling
- quasi-experimental design possibilities—the key characteristic is having a control group
- cohort-control with assignment not randomized (N.B. It is not possible to have case-control design, since an intervention requires a planned exposure change which is then evaluated in terms of outcomes compared to one or more alternatives. With a case-control design, one starts with differences in outcomes then looks back at exposures.)
- measurement and control for baseline differences in key characteristics, possibly by matching key characteristics at baseline or controlling for these characteristics through regression modelling

- non-experimental design possibilities—the key characteristic is not having a control group
i) interrupted time series – there are multiple measures of explanatory characteristics and outcomes of interest prior to and after exposure with differences in explanatory characteristics possibly controlled for through regression modelling— this design type was put into quasi-experimental design category by Shannon et al. (1999)
ii) before-after without control—measurement of differences in explanatory characteristics and outcomes before and after exposure
iii) post-only one-group design— measurement is only taken after the intervention
iv) non-equivalent dependent variable—a different outcome measure not thought to be affected by exposure is evaluated before and after the intervention along with the key outcome variable—this design type was put into quasi-experimental design category by Shannon et al. (1999)

☐ 1 (the study design does not adequately address confounding)
☐
☐
☐
☐ 5 (the study design adequately address confounding)

5) Were appropriate statistical analyses conducted?
- at a minimum, statistical methods should be clearly described
- statistics provide information on the significance of observed differences in outcomes
- it also allows one to control for differences between control and intervention groups
- statistical adjustment allows one to control confounding factors within each group, including individual and contextual characteristics
- statistics can also be used to address temporal sequencing issues

- the statistical approach should be congruous with the nature of the underlying phenomenon being studied (e.g., time in a certain state is usually modelled with duration modelling approaches), and the characteristics of the data (e.g., for an outcome that is an integer, it is customary to use a Poisson regression model)

☐ 1 (the statistical analyses were not appropriate)
☐
☐
☐
☐ 5 (the statistical analyses were appropriate)

6) Are exposure, involvement, and intensity of involvement in the intervention appropriate?
- is the exposure, involvement and intensity of involvement in the intervention appropriate?
- in a clinical setting, this would be interpreted as compliance with the treatment regime, whereas in the workplace setting, factors such as an active ergonomics change team, actual changes implemented, and use of new equipment/procedures would be indicative of involvement, intensity of involvement, and exposure
- one needs to keep in mind the purpose of the study
- a key factor may be the measurement time frame, which needs to be long enough to be able to have an impact on outcomes and be effective on a longer-term basis (i.e., sustainable)
- it requires information on the proportion of sample affected by intervention and the details of their involvement
- need to make a distinction between a poorly reported and executed intervention versus a well-executed one that is not effective—in this question we are focusing on what actually happens in the intervention (clear reporting is important, but not the focus of this question)

☐ 1 (exposure is not described and/or is not appropriate)
☐
☐
☐
☐ 5 (exposure is appropriate)

7) Are the outcomes included in the analysis appropriate?
- one needs to keep in mind the purpose of the study
- a key factor may be the measurement time frame, which needs to be long enough to be able to clearly assess effectiveness and sustainability (if applicable) of the intervention for the outcome being considered (e.g., an intervention to address cumulative trauma injury cannot be measured evaluated over a six-month period; it needs to be longer for changes to the outcome to surface)
- it may be appropriate to consider more than one outcome if it is difficult to accurately measure the outcome of interest, e.g., implementation outcomes, intermediate outcomes, final outcomes, unintended outcomes
- other factors also bear on the quality of outcome measures used—e.g., are they self-reported, questionnaires, objective measures, review of charts, administrative database, blinded or unblended outcome assessment?
- if intermediate outcomes are considered, the authors need to substantiate their choices and demonstrate that they are related to final outcomes of interest (i.e., injuries and illnesses)

☐ 1 (the outcomes included in the analysis are not appropriate)
☐
☐
☐
☐ 5 (the outcomes included in the analysis are appropriate)

Measurement and analytic issues related to the economic evaluation

8) Were all relevant comparators explicitly considered?
- did the study involve comparison of one or more alternatives?
- was the comparator(s) explicitly stated?
- were these alternatives reasonable, and were any important alternatives omitted?
- the status quo may be an implied comparator

☐ 1 (no comparator explicitly considered)
☐
☐
☐
☐ 5 (all relevant comparators were explicitly considered)

9) Was the study perspective explicitly stated and appropriate?
- the study perspective may be explicitly stated, implied or not clear
- the perspective taken can be that of the firm, worker, workers' compensation board, society or multiple perspectives
- in some studies the perspective may be implied (e.g., firm perspective may be implicit by the nature of the types of costs and consequences considered)
- consistent measurement of costs and consequences with the perspective is considered later in the quality assessment
- was the chosen perspective appropriate given the study objectives, distribution of resulting costs and consequences, etc?
- a related issue is the kind of economic evaluation undertaken- e.g., doing CBA from the perspective of an not-for-profit public insurer seems less appropriate than CEA or CUA

☐ 1 (perspective is not explicitly stated and not appropriate)
☐
☐
☐
☐ 5 (the perspective is explicitly stated and is appropriate)

10) Were all important costs and consequences considered in the analysis, given the perspective?
- perspective is important to consider, since it will determine the relevant costs and consequences

- it is also important that the analytic time frame is defined appropriately (i.e., it considers the lifetime of the intervention)
- were future costs and future consequences considered (this would be appropriate whenever applicable – e.g., for ongoing interventions/programs)?

☐ 1 (a number of important costs and consequences were overlooked)
☐
☐
☐
☐ 5 (all important costs and consequences were included in the analysis)

11) Are the measures of costs and consequences appropriate?
- accurate valuation of costs and consequences can present some critical challenges
- it is important to identify prices that correctly reflect the value of resources embodied in the costs and consequences under consideration
- it is also important to identify prices that are consistent with the perspective taken
- it is also important to measure incremental costs and consequences attributable to an intervention, rather than the total costs incurred and consequences realized
- in valuing costs, studies may simply take "sticker price" at face value, without questioning whether they reflect the true costs
- it is important to ensure there is no double counting in the measurement of different cost and consequence components of the intervention
- also, were future costs and possible future consequences appropriately identified/measured/valued (whenever applicable – e.g., for ongoing interventions/programs)?
- the evaluations of adjustments for inflation and time preference are treated separately below

☐ 1 (costs and consequences were not well measured)
☐
☐
☐
☐ 5 (all costs and consequences were well measured)

12) Was there appropriate adjustment for inflation and time preference?
- there should be clear indication that monies from different years were adjusted for the consumer price index and discounted for time preference

☐ 1 (time preference and inflation were not considered)
☐
☐
☐
☐ 5 (there was appropriate adjustment for inflation and time preference)

13) Was there appropriate use of assumptions and treatment of uncertainty?
- consider assumptions made in projecting costs and consequences into the future, assumptions made about the relationship between intermediate and final health outcomes, assumptions made about values of proxy measures and any other assumptions
- any assumptions made should be tested for their impact on the robustness of results

- the assumptions should be justified and tested through sensitivity analysis

☐ 1 (assumptions were not justified and sensitivity analysis was not undertaken)
☐
☐
☐
☐ 5 (there was appropriate use of assumptions and treatment of uncertainty)

Discussion and interpretation of results

14) *Did the presentation and discussion of study results include all issues of concern?*
- was there an appropriate interpretation of statistical results?
- were the conclusions of the analysis based on some overall index or ratio of cost to consequences?
- were the statistical results appropriately interpreted and were proper conclusions/inferences made (given the study design, data and measurement quality, statistical power, etc.)?
- were the results compared to those of others who have investigated the same question (if applicable)?
- did the authors discuss important factors that could not be measured or events that could not be integrated into the analysis?
- did the study consider limitations of the data, measurement or analysis, or alternate interpretations?
- did the study consider (or fail to discuss) ambiguous results or "unexpected" findings?
- do they discuss the generalizability of the results to other settings?
- were other important issues discussed, such as the distribution of costs and consequences and ethical issues?
- did the study discuss issues of implementation?

Overall Ranking

15) Rank the overall quality of the study.
- consider the 14 items above and any other aspect of the study that you feel is pertinent to the overall study quality

☐ 1 (low quality)
☐
☐
☐
☐ 5 (high quality)

Appendix F

Guide to the Data Extraction Form for the
Systematic Review of Workplace-based OHS Interventions with Economic Evaluations

Please read this guide before beginning the data extraction. It may be helpful to print this guide and have it available to refer to while doing the data extraction. Please extract the data from the articles you review by completing the form in the Excel spreadsheet and entering text in the provided areas.

Please read the questions carefully, especially the instructions in italics which provide details on how to enter the data. In the table below, the blue text provide some additional instructions that will help to ensure that the answers from different reviewers are consistent – please read this before beginning the data extraction. Also the text in red font provides some examples to illustrate specific responses.

All of the questions in the Excel spreadsheet should have an answer when you are complete. If an article does not have the information necessary to answer a particular question, then enter "**NA**" for not provided in the text box for that question. It is important that all questions have answers because we will not know if an article did not have the information or a reviewer forgot to enter it if we allow blank answers. Remember, try not to interpret or extrapolate just provide the data that is presented in the article.

General Information

1. **Reviewer:**
   Use first and last initials (CO, RD, ET)

2. **Refman ID #**
   insert number use to track article

3. **Short Reference**
   last name of first author, calendar year

4. **Refer to the quality assessment questions and related guidelines for the next set of items, which are on inclusion and quality assessment.**

Data Extraction Questions and Guidelines

1a. **State the motivation for the intervention.**

Please use the exact wording from the article or enter “not provided”

1b **Identify the motivation category.**

Use the number from the list provided.

1b. **State the research question/objective**

Please use the exact wording from the article or enter “not provided”

2. **List the jurisdiction where the study was completed**

(Provide information regarding the country, region, province, city, etc. where the study was carried out - type "Not Provided" where applicable)

Country

Province/State/Region

e.g., Mid-western USA

State

City

Enter “not provided” in all comment boxes where information is not available in article.

3. **What Industry/Sector was the study conducted in?**

(Check the one that applies)

http://www.statcan.ca/english/Subjects/Standard/naics/2002/naics02-menu.htm

0
Not provided

1
Agriculture, Forestry, Fishing and Hunting

2
Mining and Oil and Gas Extraction

3
Utilities

4
Construction

5
Manufacturing and Warehousing

6

Wholesale Trade

7
Retail Trade

8
Transportation

9
Information and Cultural Industries

10
Finance and Insurance

11
Real Estate and Rental and Leasing

12
Professional, Scientific and Technical Services

13
Management of Companies and Enterprises

14
Administrative and Support, Waste Management and Remediation Services

15
Education Services

16
Health Care and Social Assistance

17
Arts, Entertainment and Recreation

18
Accommodation Food Services

19
Other Services (Except Public Administration)

20
Public Administration

21
Multiple Sectors

Provide details in text form. Please refer to the NAICS 2002 classification system so that all reviewers are responding to this question in the same way. Use the two-digit category ***http://www.statscan.ca/english/Subjects/Standard/naics/2002/naics02-menu.htm.***

4. **Describe the job titles of the participants involved in the study.**

Use text/prose to describe. Provide the level of detail given in the study or enter "not provided."

5. **What type of prevention did the study investigate?**
(Choose only one)
0
not clear

1
Primary

2
Secondary

3
Both

4
Other

Indicate whether the study evaluated a primary, secondary or both types of prevention. If you choose other please provide details.

6. **What was the intervention evaluated?** *(Check all that apply)*
0
not provided

1
ergonomics

2
part ergonomics

3
return-to-work

4
train-the-trainer ergonomics program

5
not provided

7. **Describe the Intervention**

(Provide details in the text box about the intervention type)

Provide all details about the intervention that you feel are important (e.g., is it multi site, are there aspects that are not workplace based).

8. **What is the study design?**

(Choose only one)

0
not provided

1
randomized controlled

2
longitudinal (interrupted time series) controlled

3
before-after with control

4
longitudinal (interrupted time series) uncontrolled

5
before-after uncontrolled

6
post-only one group design

7
non-equivalent dependent variable

8
other

If other, please describe the unique characteristics verbatim about the study design in the comment boxes beside the choice you make.

9. **List the inclusion and exclusion criteria used to select individuals into the event and control samples.**

List inclusion and exclusion criteria, clearly indicating each by beginning with
Inclusion: …
Exclusion: …

10. **Indicate the calendar year in which the intervention began.**

11. **What is the duration of the intervention in months?**

Duration of intervention in months (from start of intervention to last month of measurement)-- assume 6 months for start year if not otherwise specified.

12. **What was the measurement time frame in months (for the component relevant to the economic evaluation)?**

Measurement time frame is from the start of the measurement period (which could be before the beginning of the intervention) to the time of the last follow-up measurement.

13. **What is the analytic time frame in months (for the component relevant to the economic evaluation)?**

Analytic time frame is from the start of the measurement period to the end of the in which measurement and/or projections are made. It may be the same or longer than the measurement time period.

14. **Describe the <u>Intervention</u> Group**.
(Provide answers for each category and identify what intervention each group received - use "Not Provided" where applicable)
Sample Size (in the statistical model)
Group 1 = , Group 2 = , …

Number of Individuals Targeted
Group 1 = , Group 2 = , …

Enter “not provided” in all comment boxes where information is not available in article.

15. **Describe the <u>Referent</u> Group**
(Provide answer for each category and identify which intervention group each referent group was matched to - use "Not Provided" where applicable)
Sample Size (in the statistical model)
Group 1 = , Group 2 = , …

Number of Individuals Targeted
Group 1 = , Group 2 = , …

Enter “not provided” in all comment boxes where information is not available in article.

16. **Describe overall (study) group - Answer only if paper did not provide information needed to answer questions 17 and 18.**
(Provide answer for each category - use "Not Provided" where applicable)
Sample Size
Group 1 = , Group 2 = , …

Number of Individuals Targeted
Group 1 = , Group 2 = , …

Place “not provided” in all comment boxes where information is not available in article. If this information is provided in questions 13 & 14 then enter “see Q13 & 14” in EACH comment box.

17. **Were measures of involvement or exposure to the intervention presented and or used in the modeling?**
0
No

1
Yes

Provide details in the comment box.

18. **Describe the final outcomes considered in the economic evaluation.**
0
not provided

1
absence

2
injuries

3
workers' compensation costs

4
productivity

8
other

Describe the final outcome measure in prose.

18a. **Data source.**
0
not provided

1
administrative

2
primary data collection (questionnaire, observation)

3
primary and administrative data

4
other

Describe the data source in prose.

18b. **Unit of analysis.**
0
not provided

1
individual

2
work group

3
department

4
plant/firm

5
other

If other, describe.

18c. **Periodicity.**
0
not provided

1
single point

2
before/after

3
weekly

4
monthly

5
yearly

6
other

If other, describe.
If there is more than one outcome of interest please number and identify them. Use a separate row on the spreadsheet for each outcome. Note, also fill out a unique number at the beginning of the row for that study and outcome.

19. **Describe the intermediate outcomes considered in the economic evaluation.**
0
not provided

1
absence

2
injuries

3
workers' compensation costs

4
productivity

8
other

Describe the intermediate outcome measure in prose.

19a. **Data source for the intermediate outcomes.**
0
not provided

1
administrative

2
primary data collection (questionnaire, observation)

3
primary and administrative data

4
other

Describe the data source in prose.

19b. **Unit of analysis for the intermediate outcomes.**
0
not provided

1
individual

2
work group

3
department

4
plant/firm

5
other

If other, describe.

19c. **Periodicity of the intermediate outcomes.**
0
not provided

1
single point

2
before/after

3
weekly

4
monthly

5
yearly

6
other

If other, describe.
If there is more than one intermediate outcome of interest please number and identify them. Use a separate row on the spreadsheet for each outcome. Note, also fill out a unique

number at the beginning of the row for that study and outcome.

20. **Please check the types of analysis done for testing the observed effect of the intervention from the list below and provide details about the analysis in the comment box.**
(You should select the one that represents the final test not the preliminary analyses.)
0
not provided

1
difference analysis

2
anova/ ancova/ manova

3
regression modeling

4
other

This question refers to the effectiveness analysis that feeds into the economic evaluation. Also describe in text form.

21. **Describe the observed effect including its magnitude if provide.**
(Be brief and concise, i.e., enter "effect size", "risk ratio", "rate differences ,"mean differences" etc, the actual number and associated outcome)

If there is more than one outcome of interest please number and identify them. Use a separate row on the spreadsheet for each outcome. Note, also fill out a unique number at the beginning of the row for that study and outcome.

22. **What type(s) of economic evaluation was undertaken?**
0
not clear

1
CBA

2
CEA

3
CUA

4
CMA

5
partial or other

If partial or other, describe.
If there is more than one economic evaluation of interest, please number and identify them. Use a separate row on the spreadsheet for each. Note, also fill out a unique number

at the beginning of the row for that study and evaluation type.

23. **List the key consequences measure used in the economic evaluation.**
0
not clear

1
human capital

2
willingness-to-pay

3
statistical value of human life

4
quality adjusted life years

5
natural units

Describe in prose.

24. **List the comparators considered in the economic evaluation.**
1st comparator
describe

2nd comparator
describe

3rd comparator
describe

4th comparator
describe

24a. **Are the alternatives explicitly stated?**
0
no

1
yes

25. **What is the perspective taken?**
Perspective

0
not clear

1
societal

2
system (e.g., workers' compensation, public sector agency)

3
industry

4
firm

5
work

6
multiple

7
other

If other, describe.

25a. **Is the perspective stated explicitly?**
0
no

1
yes

26a. **Type of non-monetary consequences.**

0
not clear

1
injuries

2
pain

3
days away from work due to injury

4
other

Describe in prose.

26b. **Monetary consequences.**
productivity
(yes=1/no=0), describe.

insurance
(yes=1/no=0), describe.

other
(yes=1/no=0), describe.

consequences mentioned but not measured
describe.

did the study consider all major consequence components of the intervention, given the perspective?
(yes=1/no=0)

list missing consequence components
describe.

N.B. Treat WC as an insurance expense unless study expressly refers to it as a proxy for productivity consequence based on it being a proxy for the value of human capital

26c. **Monetary costs.**
capital equipment
(yes=1/no=0), describe.

external services
(yes=1/no=0), describe.

internal staff time
(yes=1/no=0), describe.

other
(yes=1/no=0), describe.

costs mentioned but not measured
describe.

did the study consider all major cost components of the intervention, given the perspective?
(yes=1/no=0)

list missing cost components
describe.

27. **Were future costs and consequences taken into consideration?**
0
no

1
yes

28. **Was there discounting of funds from different time periods?**
0
no

1
yes

28a. **List the principal discount rate used in the analysis.**

28b. **Was inflation included in the discount rate?**
0
no

1
yes

29. **Was there adjustment for inflation?**
0
no

1
yes

30. **List the type of summary measure used.**
0
not applicable

1
cost-benefit ratio

2
net present value (incl. the one without discounting)

3
cost-effectiveness/utility ratio

4
other

If other, describe.

31. **Provide details about the results (numeric).**

32. **Was sensitivity analysis undertaken?**
0
no

1
yes

Describe the types of sensitivity analysis undertaken.

33. **Describe critical assumptions implicit or explicit in the analysis (not conclusions).**

34. **Describe critical details.**

Appendix G

Best Evidence Synthesis Guidelines

Quality Scores

High Quality: 3.5 - 5
Medium Quality: 2.5 - 3.4
Low Quality: 1 - 2.4

Best Evidence Synthesis Guidelines

Strong Evidence

Minimum Study Quality: High
Minimum Number of Studies: 3
1) If there are only three high quality studies, all studies must report consistent findings.
2) The majority (≥3/4) of high and medium quality studies must concur with the findings.
If the above criteria are not met, then the criteria for establishing moderate evidence are applied.

Moderate Evidence

Minimum Study Quality: Medium
Minimum Number of Studies: 2 high quality studies, or 3 of medium and high quality
1) The 2 high quality studies must agree, or the 3 studies constituting a mixture of medium and high quality must agree.
2) If there are four or more studies of medium and high quality, more than two thirds (>2/3) of all studies must report consistent findings.
If the above criteria are not met, then the criteria for establishing limited evidence are applied.

Limited Evidence

Minimum Study Quality: Medium
Minimum Number of Studies: 1 high quality study, 2 medium quality studies, or 2 studies one of which is medium quality and the other high quality
1) If there are 2 studies, the studies must agree.
2) The majority (>50%) of medium and high quality studies must report consistent findings.
If the above criteria are not met, then there is no evidence or mixed evidence.

Mixed Evidence

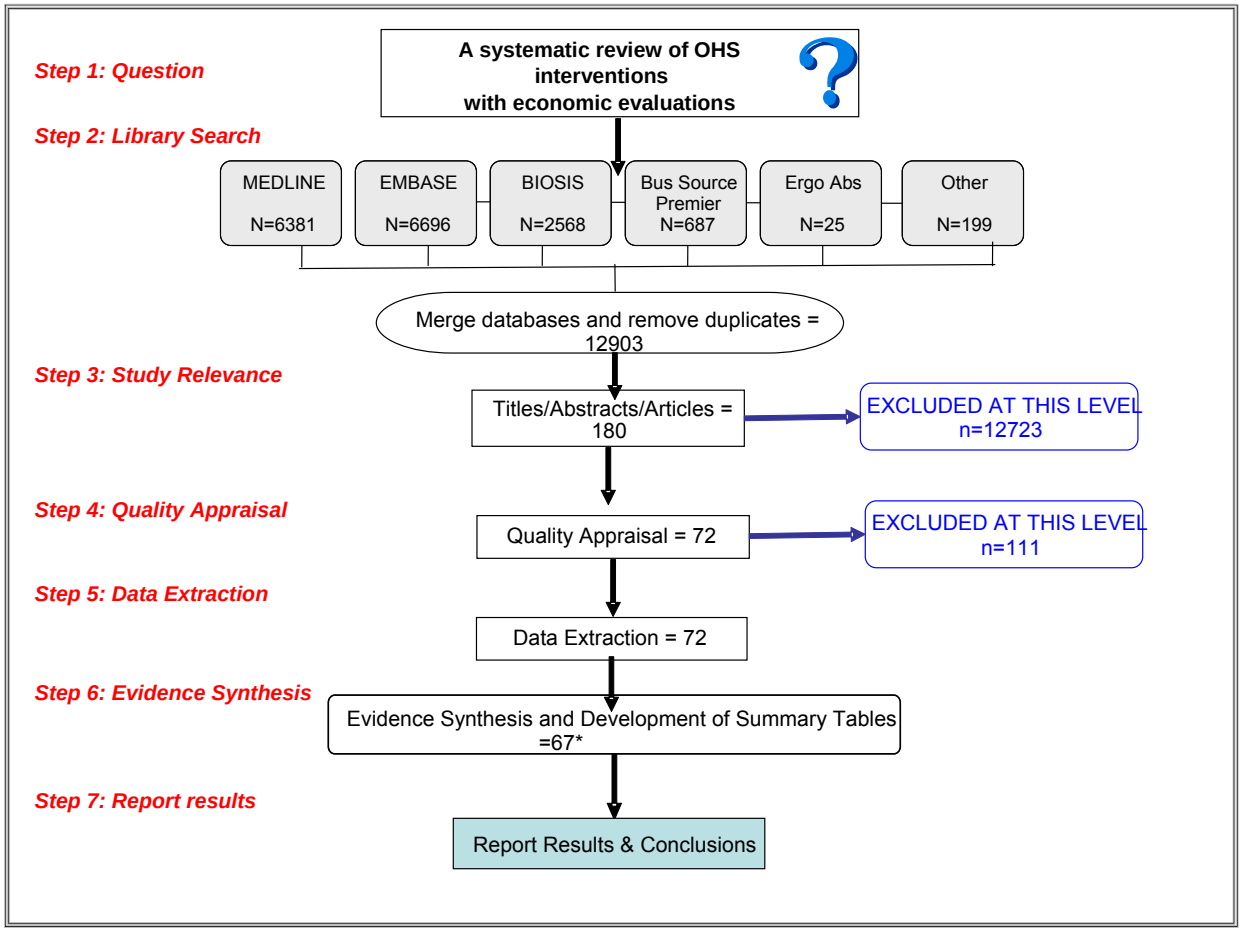
Findings from medium and high quality studies are contradictory.

Insufficient/No Evidence

No high quality studies
One or no medium quality studies
Any number of low quality studies

Appendix H

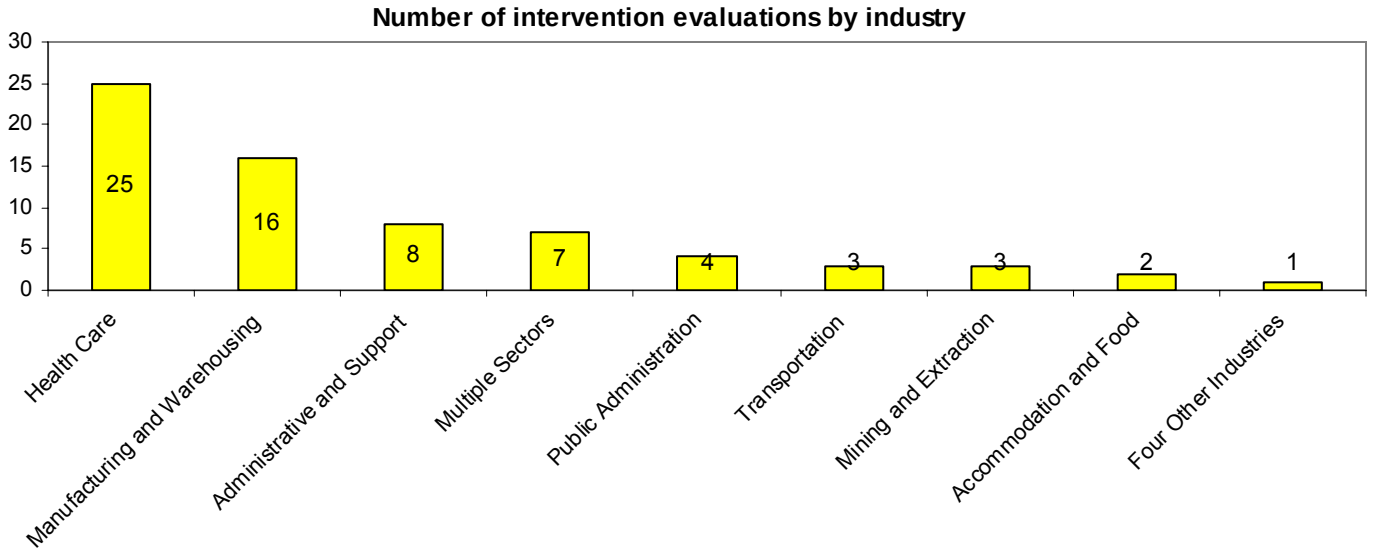
Title and abstract search results



***some of these 67 studies had multiple interventions, so that 72 interventions were examined in total**

Appendix I

Characteristics of included studies



Appendix J

Summary of evidence by intervention study stratum

1) Accommodation and Food Services

Multi-faceted Interventions

- 2 interventions
- 1 medium quality, 1 low quality
- insufficient/no evidence

2) Administrative and Support

Ergonomics and Other MSK Injury Prevention Interventions

- 8 interventions
- 2 high quality, 1 medium quality, 5 low quality
- moderate evidence

3) Educational Services

Ergonomic and Other MSK Injury Prevention Interventions

- 1 intervention
- 1 low quality
- insufficient/no evidence

4) Health Care

Occupational Disease Prevention Interventions

- 5 interventions
- 3 medium quality, 2 low quality
- moderate to limited evidence

Ergonomic and Other MSK Injury Prevention Interventions

- 11 interventions
- 4 medium quality, 7 low quality
- moderate evidence

Disability Management Interventions

- 5 interventions
- 1 medium quality, 4 low quality
- insufficient/no evidence

Multi-faceted Interventions

- 3 interventions
- 3 low quality
- insufficient/no evidence

Interventions to Reduce Violence in the Workplace

- 1 intervention
- 1 low quality
- insufficient/no evidence

5) Information and Culture

Ergonomic and Other MSK Injury Prevention Interventions

- 1 intervention
- 1 medium quality
- insufficient/no evidence

6) Manufacturing and Warehousing

Ergonomic and Other MSK Injury Prevention Interventions

- 9 interventions
- 3 high quality, 2 medium quality, 4 low quality
- strong evidence

Disability Management Interventions

- 3 interventions
- 1 medium quality, 2 low quality
- insufficient/no evidence

Multi-faceted Interventions

- 4 interventions
- 2 medium quality, 2 low quality
- limited evidence of negative findings to mixed evidence

7) Mining and Oil and Gas Extraction

Ergonomic and Other MSK Injury Prevention Interventions

- 1 intervention
- 1 medium quality
- insufficient/no evidence

Disability Management Interventions

- 2 interventions
- 1 medium quality, 1 low quality
- insufficient/no evidence

8) Multiple Sectors

Ergonomic and Other MSK Injury Prevention Interventions

- 1 intervention
- 1 low quality
- insufficient/no evidence
-

Disability Management Interventions

- 5 interventions
- 4 high quality, 1 low quality
- strong evidence

Health Promotion Interventions

- 1 intervention
- 1 medium quality
- insufficient/no evidence

9) Public Administration

Ergonomic and Other MSK Injury Prevention Interventions

- 2 interventions

- 2 low quality
- insufficient/no evidence

Disability Management Interventions
- 1 intervention
- 1 low quality
- insufficient/no evidence

Health Promotion Intervention
- 1 intervention
- 1 low quality
- insufficient/no evidence

10) Retail and Trade

Ergonomic and Other MSK Injury Prevention Interventions
- 1 intervention
- 1 medium quality
- insufficient/no evidence

11) Transportation

Ergonomic and Other MSK Injury Prevention Interventions
- 3 interventions
- 1 high quality, 2 medium quality
- moderate evidence

12) Utilities

Disability Management Interventions
- 1 intervention
- 1 medium quality
- insufficient/no evidence

Appendix K Tables for Accommodation and Food Services

Table 1: Accommodation and Food Services, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Multi-faceted Interventions					
Landstad (2002) study quality: 3.0 multiple: ergonomics, training and health promotion program cost-benefit analysis	high number of injuries	Sweden County of Jämtland	Health Care and Social Assistance hospital cleaning personnel	multiple (primary and secondary prevention)	An intervention consisting of group development, leadership development, massage, improved cleaning methods, training in floor care, lectures, fitness activities, development of the suggested activities, working out a work environment program, and development of cooperation with other authorities.
Landers (2004) study quality: 2.2 multiple: ergonomics, training and disability management program cost-benefit analysis	high cost of injuries	United States Nevada Las Vegas	Accommodation and Food Services hotel guest room attendants, housekeeping supervisors, house persons	multiple (primary and secondary prevention)	An intervention consisting of ergonomics (modification of work environment); training (didactic classroom and practical on-the-job education, practice and testing); and disability management (light duty program).

Table 2: Accommodation and Food Services, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude, if provided
Multi-faceted Interventions								
Landstad (2002) study quality: 3.0 multiple: ergonomics, training and health promotion program cost-benefit analysis	NA	8	**Treatment group:** 97 **Control group:** 30	before-after with control	use of regression analysis to model change in total time-loss expenses at the individual level (ordinary least squares is assumed but not explicitly stated)	--	change in total time-loss expenses at the individual level (difference between expenses in 1985 and expenses in 1987)	1) According to the human resources costing and accounting (HRCA) model, the intervention counteracted a rise in time-loss expenses at the company level, giving an average net effect of 266.5 Euros per person (full-time working) during an 8-month period. 2) Using an analogue statistical analysis (regression modelling), the contribution of the intervention counteracted a rise in time-loss expenses at the company level giving an average net effect of 283.2 Euros (not significant at conventional levels). In the younger group, the intervention resulted in net contributions of 605.6 Euros (significant at 10% level), while the net contributions in the older group were 45.4 Euros (not significant at conventional levels).
Landers (2004) study quality: 2.2 multiple: ergonomics, training and disability management program cost-benefit analysis	1996	24	**Treatment group:** 395 **Control group:** 473	before-after uncontrolled	before-after comparison of medical expenses (comparison of medical expenses pre-intervention with medical expenses in each year post-intervention)	information provided on attendance for the training sessions, but no information on ongoing exposures	total claims, direct medical expenses, lost work days, reduced work days	There was a reduction in total injury claims, total medical expenses, total lost work and total restricted duty time with the intervention. 1) Total injury claims decreased from 98 claims in 1995 to 68 and 37 claims in 1996 and 1997, respectively. 2) Direct medical expenses decreased from $136,336 in 1995 to $23,041 and $16,197 in 1996 and 1997, respectively. 3) Total lost work time decreased from 718 days in 1995 to 97 and 25 days in 1996 and 1997, respectively. 4) Total restricted duty decreased from 2,079 days in 1995 to 521 and 913 days in 1996 and 1997, respectively.

Table 3: Accommodation and Food Services, Economic Analysis (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other details		
Study reference	**Productivity changes**	**Insurance and health-care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Multi-faceted Interventions										
Landstad (2002) study quality: 3.0 multiple: ergonomics, training and health promotion program cost-benefit analysis	yes	--	--	--	--	--	yes	NA	NA	yes
Landers (2004) study quality: 2.2 multiple: ergonomics, training and disability management program cost-benefit analysis	--	--	yes	--	--	--	yes	--	--	--

Table 4: Accommodation and Food Services, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Multi-faceted Interventions					
Landstad (2002) study quality: 3.0 multiple: ergonomics, training and health promotion program cost-benefit analysis	status quo	employer	payback period	time-loss expenses	**Costs of the intervention:** The cost of the intervention (for the 8-month period) was 139,534 Euros (no details provided on what this value includes). **Consequences of the intervention:** Savings from the intervention over an 8-month period were 24,100 Euros (85.1 FTEs x 283.2 Euros per person). This includes savings obtained with time-loss expenses (difference between productive value time-loss due to absence before and after the intervention). **Result:** The payback period (excluding interest costs) was 46.4 months (5.8 x 8-month periods).
Landers (2004) study quality: 2.2 multiple: ergonomics, training and disability management program cost-benefit analysis	status quo	employer	cost-benefit analysis	direct medical expenses	**Costs of the intervention:** Costs of management and implementation of the program were $26,350 (USD). **Consequences of the intervention:** Saving of direct medical expenses over two years were $233,434 (USD). **Result:** The benefit-to-cost ratio obtained was 8.86.

Appendix L Tables for Administrative and Support, Waste Management and Remediation Services

Table 1: Administrative and Support, Waste Management and Remediation Services, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Ergonomic and other MSK Injury Prevention Interventions					
Amick (2003); DeRango (2003) study quality: 3.6 ergonomic program cost-benefit analysis	high number of injuries	United States	Administration state department of revenue services office workers	ergonomics (primary prevention)	Highly adjustable chair and a one-time office ergonomic training workshop with a series of educational follow-ups conducted concurrently with the chair distribution.
Lahiri (2005) study quality: 3.5 ergonomic program cost-benefit analysis	high number of injuries	United States	Manufacturing automotive supplier office workers: secretaries, engineers, engineering technicians, managers, salespersons	ergonomics (primary prevention)	Lumbar pads and backrests were made available to employees to reduce back discomfort. Back school workshops were also conducted.
Rempel (2006) study quality: 2.8 ergonomic program cost-benefit analysis	high number of injuries	United States	Health Care and Social Assistance call centre customer service workers at call centre (either registered nurses or health-care specialists)	ergonomics (primary prevention)	Four workplace interventions compared: Intervention A: ergonomic training Intervention B: trackball and ergonomic training Intervention C: forearm and support board (armboard) and ergonomic training Intervention D: forearm support board (armboard), trackball, and ergonomic training.
Bradley (1996) study quality: 2.2 ergonomic program cost-benefit analysis	high number of injuries and high costs of injuries	United States Florida	Administration electric transmission and distribution employees working with computers	ergonomics (primary and secondary prevention)	Ergonomic program consisting of training and workstation redesign.
Kemmlert (1996) study quality: 2.2 ergonomic program cost-benefit analysis	high costs of injuries	Sweden	Administration public administration department computer operators	ergonomics (primary prevention)	Ergonomic program consisting of workplace assessment and redesign: new chair, manuscript support, wrist support, change in workplace layout to reduce reaching and viewing distances; ergonomic training; more frequent breaks and pauses for variation.

Table 1 (continued): Administrative and Support, Waste Management and Remediation Services, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Ergonomics and Other MSK Injury Prevention Interventions (continued)					
Tadano (1990) study quality: 2.0 multiple: ergonomics and health promotion program cost-benefit analysis	high number of injuries	United States	Administration telecommunications employees working with computers	multiple (primary prevention)	Ergonomic program consisting of training, workstation redesign, and health promotion (exercises and mini-breaks).
Wahl (1998) study quality: 1.9 ergonomic program cost-benefit analysis	not provided or not clear	United States Colorado	Administration clerical class office workers/clerks	ergonomics (secondary prevention)	Workstation evaluation which consisted of an interview (to determine tasks performed and gauge workers' understanding of risk factors for cumulative trauma), observation of workers performing their regular duties; explanation of risk factors for cumulative trauma, and adjustment of workstation.
Lewis (2002) study quality: 1.9 ergonomic program partial economic analysis	high number of injuries	United States New Jersey	Administration petrochemical research and development employees working with computers (VDT users)	ergonomics (primary prevention)	Training program for proper computer use.

Table 2: Administrative and Support, Waste Management and Remediation Services, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude, if provided
Ergonomics and Other MSK Injury Prevention Interventions								
Amick (2003); DeRango (2003) study quality: 3.6 ergonomic program cost-benefit analysis	2001	12	**Intervention groups**: 1) 88 in chair with training group 2) 61 in training only group **Control group**: 59	before-after with control	1) total effects model, estimated with both fixed and random effects regression modeling, where the dependent variable was productivity per effective day 2) health-mediated model estimated with a two-step approach (fitted values of changes in pain used as explanatory variables to estimate productivity changes)	no	sick leave hours per month, productivity per effective day	1) Neither intervention had an impact on sick leave hours; 2) The health-mediated model found training alone did not have a statistically significant effect on pain levels, whereas the chair-with-training intervention significantly reduced pain (5.95 to 6.23 points for the fixed and random effects models respectively); 3) The second step of the approach found improved productivity effects which were significant (a one point improvement in pain was associated with a $13.25 and $19.14 increase in production per effective workday for the fixed and random effects models, respectively).
Lahiri (2005) automotive supplier case study study quality:3.5 ergonomic program cost-benefit analysis	NA	144	637	before-after uncontrolled	before-after comparison of back pain cases, sick days due to low-back pain, and productivity changes	annual average number of employees subject to intervention (out of total number of employees)	1) cases of low-back pain; 2) sick days due to low-back pain; 3) medical care costs (incl. for no-lost time cases); 4) productivity	1) total back pain cases: reduction from 41 to 12; acute back pain cases: reduction from 3 to 2; annual average number of sick days due to back pain: reduction from 20 to 0; 2) avoided lost time costs from work due to low back of $4,800 (annual); avoided medical care costs of $96 (annual); 3) total annual productivity gain: $66,384 ($3,984 in avoided productivity loss + $62,400 in productivity enhancement)

Table 2 (continued): Administrative and Support, Waste Management and Remediation Services, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude, if provided
Ergonomics and Other MSK Injury Prevention Interventions (continued)								
Rempel (2006) study quality: 2.8 ergonomics cost-benefit analysis	2002	12	**Group A:** ergonomic training only – 46 **Group B:** ergonomic training and trackball – 45 **Group C:** ergonomic training and armboard – 46 **Group D:** ergonomic training, trackball, and armboard – 45	randomized controlled trial	Cox regression modelling	no	incidence of neck/shoulder disorders	For the armboards, the hazard rate was 0.49 of incident neck/shoulder disorders (95% CI 0.24 to 0.97). The armboards reduced the risk of incident neck-shoulder disorder by approximately one half.
Bradley (1996) study quality: 2.2 ergonomic program cost-benefit analysis	1992	30	NA	before-after uncontrolled	before-after comparison of number and severity of repetitive strain injuries (RSIs)	no	number and severity of RSIs	There were 5 serious RSIs prior to the intervention and 35 early reported cases after the intervention with no time loss associated with them.
Kemmlert (1996) study quality: 2.2 ergonomic program cost-benefit analysis	NA	NA	60	before-after uncontrolled	before-after comparison of sick leave and associated expenses / savings	no	value of sick leave / absenteeism (associated losses and expenses averted)	There was a 5% reduction in sick leave (across 60 workers) which was reflected in savings of $40,603 US per year. There were also savings due to reduced training of new recruits of $3,980 US per year based on reduced turnover; savings due to reduced overtime of $22,839 US per year based on absenteeism requiring 1 hour of overtime per day off and 50% premium on overtime; savings due to reduced recruitment of employees of $5,846 US per year based on 1 less recruitment per year; and finally, savings due to reduced training of new recruits of $7,647 US per year based on reduced turnover.

Table 2 (continued): Administrative and Support, Waste Management and Remediation Services, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude if provided
Ergonomics and Other MSK Injury Prevention Interventions (continued)								
Tadano (1990) study quality: 2.0 multiple: ergonomics and health promotion program cost-benefit analysis	1988	6	500	before-after uncontrolled	before-after comparison of number of RSI cases	no	number of RSI claims	There was a reduction in the number of reported RSI cases from 49 to 28.
Wahl (1998) study quality: 1.9 ergonomic program cost-benefit analysis	1995	24	**Intervention group**: 72, consisting of 5 lost-time (LT) and 67 non lost-time (NLT) claims **Control group**: 129, consisting of 24 LT and 105 NLT claims	post-only with control	odds ratio of a claim becoming an LT claim based on whether or not the individual received the intervention	no	status of the claim (LT or NLT); workers' compensation expenses associated with the claim	The odds of a claim becoming a LT claim was 3.06:1 if the individual did not receive the intervention compared to if the individual received it.
Lewis (2002) study quality: 1.9 ergonomic program partial economic analysis	1995	48	292 (number of individuals taking training, which differs from the number of individuals represented in the effectiveness analysis)	before-after uncontrolled	before-after comparison of injury rates for computer-related MSK claims	no	injury rates and workers' compensation expenses associated with computer-related MSK claims	The average injury rate was reduced from 16.8 per 1,000 employees to 6.94 per 1,000 employees (number of claims was 12 before and 18 after the intervention).

Table 3: Administrative and Support, Waste Management and Remediation Services, Economic Analysis (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other details		
Study reference	**Productivity changes**	**Insurance and health-care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Ergonomics and Other MSK Injury Prevention Interventions										
Amick (2003); DeRango (2003) study quality: 3.6 ergonomic program cost-benefit analysis	yes	--	--	yes	yes	yes	--	--	--	yes
Lahiri (2005) study quality: 3.5 ergonomic program cost-benefit analysis	yes	yes	--	yes	yes	yes	--	yes	yes	yes
Rempel (2006) study quality: 2.8 ergonomics cost-benefit analysis	--	yes	--	yes	--	--	--	NA	NA	--
Bradley (1996) study quality: 2.2 ergonomics cost-benefit analysis	--	yes	--	yes	--	yes	--	--	--	--
Kemmlert (1996) study quality: 2.2 ergonomic program cost-benefit analysis	yes	yes	yes	yes	--	yes	--	NA	NA	--

Table 3 (continued): Administrative and Support, Waste Management and Remediation Services, Economic Analysis (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other details		
Study reference	**Productivity changes**	**Insurance and health-care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Ergonomics and Other MSK Injury Prevention Interventions (continued)										
Tadano (1990) study quality: 2.0 multiple: ergonomics and health promotion program cost-benefit analysis	--	--	yes	--	yes	--	--	NA	NA	--
Wahl (1998) study quality: 1.9 ergonomic program cost-benefit analysis	--	yes	--	--	--	yes	--	--	--	--
Lewis (2002) study quality: 1.9 ergonomic program partial economic analysis	--	yes	--	--	--	--	-	NA	yes	--

Table 4: Administrative and Support, Waste Management and Remediation Services, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Ergonomics and other MSK Injury Prevention Interventions					
Amick (2003); DeRango (2003) study quality: 3.6 ergonomic program cost-benefit analysis	Alternative A: chair with training Alternative B: training only Alternative C: status quo	employer	cost-benefit analysis	value of productivity per year	**Costs of the intervention:** Total costs per worker were $1,032. This includes cost of the chair ($800 per person), trainers' time and travel expenses ($200 per worker), and labour costs of the 90-minute training session ($32 per worker) (USD). **Consequences of the intervention**: The increase in taxes collected per worker per year (based on the health mediated model) was $25,398.12 (USD). There was no change in absenteeism. **Result**: The benefit-cost ratio was 24.61.
Lahiri (2005) automotive supplier case study study quality:3.5 ergonomic program cost-benefit analysis	status quo	employer	cost-benefit analysis	1) medical care costs associated with low-back pain cases; 2) value of lost work time due to sick leave (productivity); 3) productivity loss due to low-back pain at work; 4) productivity enhancements due to intervention	**Costs of the intervention**: Costs per year were $839 which include equipment, internal labour costs (likely including installation and maintenance; internal training and other time costs), and cost of back school workshops. **Consequences of the intervention**: Savings per year were $71,280 which include avoided medical care costs, avoided loss in work time due to sick leave, productivity losses (averted) due to low-back pain and discomfort while at work (before intervention), and productivity enhancements due to intervention. **Results**: Net savings per year were $70,441 with savings per worker of $111. The benefit-to-cost ratio was 84.9 and the payback period was 0.5 months (all 2002 dollars).
Rempel (2006) study quality: 2.8 ergonomics cost-benefit analysis	Alternative A: ergonomic training Alternative B: trackball and ergonomic training Alternative C: forearm support board (armboard) and ergonomic training Alternative D: forearm support board (armboard), trackball, and ergonomic training	employer	cost-benefit analysis	workers' compensation expenses	**Costs of the intervention:**: Estimated retail cost of the armboard intervention plus installation was $75 per operator. **Consequences of the intervention:** Savings in workers' compensation expenses associated with neck/shoulder injuries were estimated to be $11,540 per neck/shoulder injury. **Result**: The payback period was 10.6 months, based on the assumption that the incidence of accepted claims for neck/shoulder injuries among customer service operators at the company is 0.0144 and the neck/shoulder injury reduction from the intervention is 49% (taken from the estimated hazard rate).

Table 4 (continued): Administrative and Support, Waste Management and Remediation Services, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Ergonomics and Other MSK Injury Prevention Interventions (continued)					
Bradley (1996) study quality: 2.2 ergonomic program partial economic analysis	status quo	employer	partial economic analysis	workers' compensation expenses associated with RSIs	**Costs of the intervention**: No intervention costs considered. **Consequences of the intervention**: Savings in workers' compensation expenses associated with RSIs. **Result:** The total costs for the 5 cases were $63,628.98; and for the 35 cases were $2,886.25. Savings were estimated to be $442,515.61 based on the assumption that the 35 cases could have been as costly as the 5 prior to intervention (USD).
Kemmlert (1996) study quality: 2.2 ergonomic program cost-benefit analysis	status quo	employer	cost-benefit analysis		**Costs of the intervention**: Costs were $19,316 (USD); this includes the costs with education and the acquisition of chairs and wrist and manuscript supports. **Consequences of the intervention**: Benefits were $76,935 (USD) (benefits for a one-year period); this includes gains with reduced sick leave, reduced overtime, reduced recruitment and reduced introduction of new employees. **Result**: The payback period was estimated at 3 months.
Tadano (1990) study quality: 2.0 multiple: ergonomics and health promotion program cost-benefit analysis	status quo	employer	cost-benefit analysis	workers' compensation expenses associated with RSI claims	**Costs of the intervention:** Costs were **$**10,000 which includes the therapist hired (USD). **Consequences of the intervention**: The reduction in claims from 49 to 21 at an average cost of $3,002.54 per claim amounts to a total savings of $63,053.34 (USD). **Result:** The net savings were $53,053.34 over a 6-month period (USD).

Table 4 (continued): Administrative and Support, Waste Management and Remediation Services, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Ergonomics and Other MSK Injury Prevention Interventions (continued)					
Wahl (1998) study quality: 1.9 ergonomic program cost-benefit analysis	status quo	system	cost-benefit analysis	workers' compensation expenses per claim NB: all cases were either closed or had reserves assigned to them so that the expenses reflected full cost of claims	**Costs of the intervention:** Costs include $95 per visit for each workplace assessment visit by a prevention specialist. This includes wage, benefits, and overhead (USD). **Consequences of the intervention**: The average workers' compensation expense per claim decreased from $4,652 before the intervention to $2,959 after for a savings of $1,693 per claim (USD). **Result:** The benefit-cost ratio was 17.8**.**
Lewis (2002) study quality: 1.9 ergonomic program partial economic analysis	status quo	not clear	cost savings with reduction of VDT-related WC claim	workers' compensation expenses per claim	**Costs of the intervention:** No intervention costs considered. **Consequences of the intervention**: Savings from decreased average expenses per workers' compensation claim. **Result:** The average workers' compensation expense per claim decreased from $15,141 to $1,553. The average claim expense per capita decreased from $185 to $3 (USD 1998).

Appendix M Tables for Educational Services

Table 1: Educational Services, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Ergonomic and Other MSK Injury Prevention Interventions					
Feuerstein (2000) study quality: 2.3 training program partial economic analysis	high injuries	United States New York Rochester	Education Services school sign-language interpreters	training (primary and secondary prevention)	A multi-component intervention consisting of eleven 1.5 hr group meetings designed to reduce the impact of work on upper-extremity symptoms/disorders and lost time.

Table 2: Educational Services, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude, if provided
Ergonomic and Other MSK Injury Prevention Interventions								
Feuerstein (2000) study quality: 2.3 training program partial economic analysis	1991	48	53	before-after uncontrolled	before-after comparison of the number of upper extremity problems and work demands	--	number of upper-extremity problems, work demands (measured by total hours of interpreting services)	1) There was a 69% reduction in the number of upper-extremity cases reported in the three years following the intervention. 2) Following the intervention, the number of interpreting hours (work demands) increased while the number of workers remained fairly constant.

Table 3: Educational Services, Economic Analysis (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other details		
Study reference	**Productivity changes**	**Insurance and health-care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Ergonomic and Other MSK Injury Prevention Interventions										
Feuerstein (2000) study quality: 2.3 training program partial economic analysis	yes	--	yes	--	--	--	--	--	--	--

Table 4: Educational Services, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Ergonomic and Other MSK Injury Prevention Interventions					
Feuerstein (2000) study quality: 2.3 training program partial economic analysis	status quo	not clear	partial economic analysis	workers' compensation time-loss and health-care expenses	**Costs of the intervention:** No intervention costs considered. **Consequences of the intervention:** Savings from workers' compensation time-loss and health-care expenses. **Result:** In the three years following the intervention, the time-loss expenses were reduced by 64% and were maintained over the following 2 years. Health-care expenses followed a similar pattern, although with a smaller magnitude of change.

Appendix N Tables for Health Care

Table 1: Health Care, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Occupational Disease Prevention Interventions					
Laufer (1994) study quality: 3.4 occupational disease prevention program cost-effectiveness analysis	high number of injuries	United States New York	Health Care and Social Assistance hospital nurses are used as an example but other health-care workers are also affected	occupational disease prevention (primary prevention)	Needlestick injury prevention program consisting of safety syringes, recessed needles, and use of needleless intravenous access systems.
Yassi (1995) study quality: 2.7 occupational disease prevention program cost-benefit analysis	high number of injuries	Canada Manitoba Winnipeg	Health Care and Social Assistance Tertiary-care teaching hospital Health-care workers	occupational disease prevention (primary prevention)	Needlestick injury prevention program consisting of a needleless intravenous access system.
Orenstein (1995) study quality: 2.6 occupational disease prevention program cost-effectiveness analysis	multiple: high injuries and high cost of injuries	United States Virginia	Health Care and Social Assistance hospital nurses	occupational disease prevention (primary prevention)	Needlestick injury prevention program consisting of safety syringe and the components of a needleless IV system.
Korniewicz (2005) study quality: 2.3 occupational disease prevention program cost-consequence analysis	multiple: high number of injuries and high cost of injuries	United States	Health Care and Social Assistance university hospital operating room personnel: registered nurses, operating room or surgical technicians, surgeons, anaesthesiologists	occupational disease prevention (primary prevention)	Conversion from powdered latex gloves to powder-free latex gloves.

Table 1 (continued): Health Care, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Occupational Disease Prevention Interventions (continued)					
Cameron (1997) study quality: 1.6 occupational disease prevention program cost-minimizing analysis	high cost of injuries	Canada Ontario Hamilton	Health Care and Social Assistance hospital health-care workers	occupational disease prevention (primary prevention)	Conversion from powdered latex gloves to powder-free latex gloves.
Ergonomic and Other MSK Injury Prevention Interventions					
Collins (2004) study quality: 3.4 ergonomic program cost-benefit analysis	high number of injuries	United States	Health Care and Social Assistance nursing home nurses	multiple (primary prevention)	A musculoskeletal injury prevention program consisting of mechanical lifts and repositioning aids, a zero lift policy, and worker training on lift usage.
Chhokar (2005) study quality: 3.1 ergonomic program cost-benefit analysis	high number injuries	Canada British Columbia	Health Care and Social Assistance long-term care facility nurses and nurses' aides	ergonomics (primary prevention)	Introduction of mechanical ceiling lifts and training.
Gundewall (1993) study quality: 2.7 exercise program cost-benefit analysis	high number of injuries	Sweden Kungsbacka, suburb of Gothenburg	Health Care and Social Assistance geriatric hospital nurses and nurses' aides	health promotion (primary prevention)	An exercise program with training/supervision and advice on back problems.
Evanoff (1999) study quality: 2.5 participatory ergonomic program cost-consequence analysis	high number of injuries	United States	Health Care and Social Assistance medical centre hospital orderlies	participatory ergonomics (primary prevention)	Introduction of a participatory ergonomic team.

Table 1 (continued): Health Care, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Ergonomic and Other MSK Injury Prevention Interventions (continued)					
Engst (2005) study quality: 2.4 ergonomic program cost-benefit analysis	high number of injuries	Canada British Columbia	Health Care and Social Assistance long-term care facility nurses and nurses' aides	ergonomics (primary prevention)	Introduction of mechanical ceiling lifts and training.
Li (2004) study quality: 2.3 ergonomic program partial economic analysis	high number of injuries	Unites States Missouri St. Louis	Health Care and Social Assistance community hospital nursing personnel: nurses, nursing assistants, and patient-care technicians	ergonomics (primary prevention)	Introduction of mechanical patient lifts and training.
Ore (2003) study quality: 2.3 education program cost-benefit analysis	high number of injuries	Australia	Health Care and Social Assistance long-term care services for the disabled disability services workers	training (primary prevention)	35-hour manual handling training provided by an ergonomist, involving on-site assessment of manual handling tasks, training on specific techniques, and equipment design and correct use.
Brophy (2001) study quality: 2.2 ergonomic program cost-benefit analysis	multiple: high number of injuries and high cost of injuries	United States New York	Health Care and Social Assistance nursing home nursing aides	ergonomics (primary prevention)	Introduction of patient-lifting equipment and a five-step ergonomic program: (1) create a resident transfer evaluation team; (2) establish an accident review committee; (3) mandatory ergonomic training for new nursing aides; (4) regular maintenance checks for lifting equipment; (5) direct access to the management and budget process.
Kemmlert (1996) study quality: 2.2 ergonomic program cost-benefit analysis	high cost of injuries	Sweden	Health Care and Social Assistance nursing home nurses' assistants	ergonomics (primary prevention)	The ergonomic intervention consisted of workplace assessment and redesign and included: increase in workspace by means of reducing patient admissions by 15%, thus allowing proper use of electric hoists; old hoist repairs and wheel replacements, and purchase of new hoists; training courses on lifting techniques; electing a back health representative to monitor the ergonomic situation.
Charney (1991) study quality: 1.8 ergonomic program cost-benefit analysis	multiple: high injuries and high cost of injuries	United States West Coast	Health Care and Social Assistance hospital registered nurses, licensed vocational nurses	ergonomics (primary prevention)	A lifting team to reduce the number of lifts performed by nurses by 95%.

Table 1 (continued): Health Care, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Ergonomic and Other MSK Injury Prevention Interventions (continued)					
Guthrie (2004) study quality: 1.6 ergonomic program partial economic analysis	high number of injuries	United States Minnesota Robbinsdale	Health Care and Social Assistance community-based level one trauma centre nurses	ergonomics (primary prevention)	Introduction of patient-lifting equipment and other mechanical equipment, a back school, and a lift team.
Disability Management Interventions					
Linton (1992) study quality: 2.7 multiple: back injury program that included physical therapy, ergonomic education, and behavioural therapy cost-benefit analysis	not clear	Sweden	Health Care and Social Assistance hospital licensed practical nurses and nursing aids	multiple (secondary prevention)	Five-week physical and behavioural preventive intervention consisting of: 1) physical therapy, including ergonomic education in the form of a 'low-back school', practising high-risk manoeuvres on the job; 2) behaviour therapy - to help workers learn to better control their pain and maintain ”healthy,” low risk lifestyles, which included group meetings with a psychologist and training on pain control, lifestyle management, risk analysis, and application training (practising strategies learned during training sessions, at work and at home).
Yassi (1995) study quality: 2.0 disability management program partial economic analysis	multiple: high number of injuries and high cost of injuries	Canada Manitoba Winnipeg	Health Care and Social Assistance teaching hospital registered nurses	disability management (secondary prevention)	Disability management pilot program consisting of prompt assessment, treatment and rehabilitation through modified work.
Bernacki (2003) study quality: 1.9 disability management program partial economic analysis	high cost of injuries	United States Maryland Baltimore	Health Care and Social Assistance teaching hospital and university all workers	disability management (secondary prevention)	Integrated workers' compensation claims management system to allow safety professionals, adjusters, and selected medical and nursing providers to collaborate in a process of preventing accidents and expeditiously assessing, teaching, and returning individuals to productive work.

Table 1 (continued): Health Care, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Disability Management Interventions (continued)					
Koviack (2004) study quality: 1.5 disability management program partial economic analysis	multiple: high number of injuries and systems level initiative	United States	Health Care and Social Assistance clinical research facility nurses	disability management (secondary prevention)	An accommodation program to support workers during their period of work-related or personal injury or illness, to promote healing, and to facilitate their return to work.
Tracz (1992) study quality: 1.5 disability management program partial economic analysis	high number of injuries	Canada British Columbia Kamloops	Health Care and Social Assistance hospital nurses	disability management (secondary prevention)	Early intervention and occupational rehabilitation program to identify and assess factors that might delay recovery. Also assists the injured worker in recovery and return to work earlier than might otherwise be achieved. The occupational health nurse explains the program; determines how the worker is progressing and provides counselling during recovery; establishes an expected date for return to work; refers the worker to the occupational health physician; and arranges for the worker to attend a hospital back-care program.
Multi-faceted Interventions					
Davis (2004) study quality: 2.0 multiple: MSK injury prevention and disability management program partial economic analysis	high number of injuries	Canada British Columbia Vancouver	Health Care and Social Assistance acute- and tertiary-care teaching hospital all hospital staff	multiple (both primary and secondary prevention)	Program that combines three components: (1) primary prevention; (2) early intervention (prompt follow-up of injured workers, targeted workplace modifications, and clinical treatment, when required); (3) extensive evaluation.
Collins (1990) study quality: 1.8 multiple: risk assessment, education, and disability management program partial economic analysis	high number of injuries	Australia Queensland Brisbane	Health Care and Social Assistance hospital nurses	multiple (both primary and secondary prevention)	Major components of the intervention are risk identification, assessment and control strategies, education and training strategies and injury management strategies.

Table 1 (continued): Health Care, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Multi-faceted Interventions (continued)					
Caulfield (1996) study quality: 1.7 multiple: health promotion, disease prevention and disability management program partial economic analysis	high cost of injuries	Canada Ontario Tillsonburg	Health Care and Social Assistance hospital all hospital staff	multiple (both primary and secondary prevention)	Comprehensive program consisting of health promotion, disease prevention, and disability management.
Intentions to Reduce Violence in the Workplace					
Martin (1995) study quality: 2.3 education program partial economic analysis	multiple: high number of injuries and high cost of injuries	United States Pennsylvania	Health Care and Social Assistance department of psychiatric nursing at a teaching hospital nurses, nursing assistants, physicians, occupational therapists, social workers and unit secretaries	education and training (primary prevention)	Development of a team approach to aggression management and education of all staff in verbal and physical management of the potential and/or actual aggressive patient using the team approach.

Table 2: Health Care, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude, if provided
Occupational Disease Prevention Interventions								
Laufer (1994) study quality: 3.4 occupational disease prevention program cost-effectiveness analysis	1990	6	NA	before-after uncontrolled	before-after comparison of needlestick injuries decision tree analysis for outcome evaluation	--	number of needlestick injuries	1) For registered nurses, the reduction in time-loss per worker year was between 27% and 40%. 2) For health science professionals the reduction in time-loss per worker year was between 37% and 67%. 3) For facility support services, the reduction in time-loss per worker year was between 8% and 13%.
Yassi (1995) study quality: 2.7 occupational disease prevention program cost-benefit analysis	1992	12	approx. 6,000 workers	before-after uncontrolled	before-after yearly comparison of number of needlestick injuries	--	number of needlestick injuries	Overall reduction of 43.4% of needlestick injuries (from 281 to 159).
Orenstein (1995) study quality: 2.6 occupational disease prevention program cost-effectiveness analysis	1992	6	NA	before-after uncontrolled	before-after comparison of needlestick injuries	compliance with the use of needleless IV system components was 50%	number of needlestick injuries prevented (IV related; 3 ml syringe related; disposal related; other)	1) There were 33 needlestick injuries before and 14 after (difference of 19). 2) The overall rate of needlestick injuries was reduced by 61% in the intervention unit, from 0.785 to 0.303 needlestick injuries per 100 health-care worker days (significant at 5%). NB: No statistically significant reduction could be directly attributed to the protective devices since the needlestick injury rate decreased for the intervention group, but also for a control group that was not used directly in the statistical analysis.
Korniewicz (2005) study quality: 2.3 occupational disease prevention program cost-consequence analysis	2002	21	103 (82 completed the entire study)	before-after uncontrolled	before-after comparison of symptoms	--	number of reporting symptoms	Prior to glove conversion, nearly one-half of the operating room staff reported symptoms related to natural rubber latex exposure. At the end of the 14-month data collection period, only 27% reported symptoms related to natural rubber latex exposure.

Table 2 (continued): Health Care, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude, if provided
Occupational Disease Prevention Interventions (continued)								
Cameron (1997) study quality: 1.6 occupational disease prevention program cost-minimizing analysis	NA	NA	2000	before-after uncontrolled	before-after comparison	--	no outcome measures provided since cost-minimizing analysis	No consequences were considered since the study was a cost minimization analysis.
Ergonomic and Other MSK Injury Prevention Interventions								
Collins (2004) study quality: 3.4 ergonomic program cost-benefit analysis	1998	36	NA	longitudinal (interrupted time series) uncontrolled	Poisson regression model with generalized estimating equations	number of hours in training and training intensity	number of claims per 1,000 hours worked; rate of assaults	1) There was a significant reduction in resident handling injury incidence and lost workday injuries after the intervention. 2) The number of claims per 1,000 hours was 0.39 based on workers' compensation claims data, 0.54 based on OSHA 200 logs, and 0.65 based on first reports of worker injury data. 3) The rate of post-intervention assaults on caregivers during resident transfers was down 72%, 50%, and 30% based on workers' compensation, OSHA, and first reports of injury data, respectively.
Chhokar (2005) study quality: 3.1 ergonomic program cost-benefit analysis	1998	36	108	before-after uncontrolled	Poisson regression modelling	--	incidence and days lost from lifting/ transferring/ repositioning claims	1) Significant reductions were found with lifting/ transferring claims, and with days lost from lifting/ transferring claims. 2) No significant reductions were found for repositioning claims or days lost from repositioning claims.
Gundewall (1993) study quality: 2.7 exercise program cost-benefit analysis	NA	13	**Intervention group:** 28 **Control group:** 32	randomized controlled trial	before-after comparison of lost work days; post-only difference analysis between intervention and control group	average length of training program, average number of sessions per month, and number of months of intervention were recorded	incidence and duration of lost work days cases due to back problems	1) The intervention group had lower incidence and duration of work absences due to back problems after the intervention than the control group. 2) The intervention group also had less back complaints, lower pain intensity, and greater back muscle strength than the controls.

Table 2 (continued): Health Care, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude if provided
Ergonomic and Other MSK Injury Prevention Interventions (continued)								
Evanoff (1999) study quality: 2.5 participatory ergonomic program cost-consequence analysis	1996	24	100-110	before-after with control for effectiveness analysis before-after without control for economic analysis	before-after comparison of injury rate/lost workday injury rate per 100 FTE (injury rates/lost workday injury rates adjusted for time trends based on control)	--	relative risk of injury and lost workday injury	The relative risk (before/after) for injury was 0.64, while for lost workday injury it was 0.40 (both significant at 5%).
Engst (2005) study quality: 2.4 ergonomic program cost-benefit analysis	2001	21	34	before-after uncontrolled	before-after comparison of workers' compensation cost	self-report on the most preferred method of transferring and repositioning patients was recorded before and after the intervention	number of lifting/ transferring/ repositioning injuries	1) There were 5 lifting/transferring injuries before and 5 after. 2) There were 7 repositioning injuries before and 5 after.
Li (2004) study quality: 2.3 ergonomic program partial economic analysis	2001	26	138	before-after adjusted by trend in non-intervention groups for effectiveness analysis before-after without control for economic analysis	before-after comparison of injury rate/lost workday injury rate per 100 FTE (injury rates/lost workday injury rates adjusted for time trends based on control)	data from mechanical counter on lifts were compared to the expected usage; implementation of a lift compliance survey	relative risk for lost workday injury	The relative risk (before/after) was 0.5 for injury, while for lost workday injury it was 0.35 (both significant at 5%).

Table 2 (continued): Health Care, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude if provided
Ergonomic and Other MSK Injury Prevention Interventions (continued)								
Ore (2003) study quality: 2.3 education program cost-benefit analysis	1998	12	**Intervention group:** 351 **Control group:** 351	post-only with control group	difference between intervention group and control group in post intervention time period	--	number of manual handling injuries per 100 FTEs by age, sex, injury type, length of service in the agency, and job category	1) Training in manual handling methods significantly reduced the risk of injury by as much as 42%, with an average rate of 49.6 per 100 FTE (95% CI 44.4-55.0) among the intervention group compared with 84.8 per FTE (95% CI 76.0-94.1) among the control group. 2) The risk differentials between intervention and control group were consistent across gender, age group, length of service, and job classification (significant at 1%). However, in two injury categories (client lift/transfer and general manual handling), the intervention group had a marginally higher risk.
Brophy (2001) study quality: 2.2 ergonomic program cost-benefit analysis	1994	60	NA	before-after uncontrolled	before-after comparison of yearly average of injuries	all new nursing aides were required to taka a 7-hour ergonomic class	number of injuries per year, number of injuries per 100 FTE nursing assistants, yearly average number of lost workdays, number of lost workdays per FTE, lost workdays per injury	1) The number of injuries per year was 30 before and 21.5 after (significant at 5%). 2) The number of injuries per 100 full-time nursing assistants was 15.7 before and 11.0 after (significant at 5%). 3) The yearly average number of lost workdays was 1,476 before and 625.4 after (significant at 5%). 4) The number of lost workdays per full-time nursing assistant was 7.8 before and 3.0 after (significant at 5%). 5) The number of lost workdays per injury was 50 before and 29.4 after (not significant).
Kemmlert (1996) study quality: 2.2 ergonomic program cost-benefit analysis	NA	NA	20	before-after uncontrolled	before-after comparison of sick leave and associated expenses/ savings	--	value of sick leave/ absenteeism (associated losses and expenses averted)	There was a 20% reduction in sick leave (across 20 workers) which was reflected in savings of $51,744 US per year. Also, there were savings due to reduced recruitment of $3,487 US per year based on per-year savings of 3 employees working 5 days for 8 hours, and savings due to reduced training of new recruits of $3,980 US per year based on reduced turnover.
Charney (1991) study quality: 1.8 ergonomic program cost-benefit analysis	1989	12	NA	before-after uncontrolled	comparison of accident rate per thousand years based on two years prior with rate in year of intervention	--	rate of back injuries per 1,000 FTEs	1) The rate of back injury per 1,000 person years was 39 before and 2.4 after the intervention. 2) The firm expected 16 lost-time accidents in day shift, but only had 1.

Table 2 (continued): Health Care, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude, if provided
Ergonomic and Other MSK Injury Prevention Interventions (continued)								
Guthrie (2004) study quality: 1.6 ergonomic program partial economic analysis	2002	6	NA	before-after uncontrolled	before-after comparison of injuries	at the end of Dec 2002, 95% of the orthopedic and neurology nursing staff had attended back school	number of lifting-related injuries	A dramatic increase in injuries occurred in 2001 followed by a decline in 2002.
Disability Management Interventions								
Linton (1992) study quality: 2.7 multiple: back injury program that included physical therapy, ergonomic education, and behavioural therapy cost-benefit analysis	NA	24	36	longitudinal (interrupted time series) uncontrolled	1) difference analysis on actuall sick days before and after; 2) regression analysis of data from before and after to predict the number of sick days with and without the intervention	--	number of days sick-listed for musculoskeletal pain	The *actual* reduction in number of days sick-listed was 6.7 days (difference between the number of days absent in the 18-month period prior to intervention and the 18-month follow-up period) and was not statistically significant. The reduction in number of days sick-listed of 76.5 days is derived using the *predicted* number of absence days in the 18-month follow-up period if the intervention had not occurred.
Yassi (1995) study quality: 2.0 disability management program partial economic analysis	NA	24	131	before-after with control	before-after comparison of injuries between intervention wards and control wards	distinction made between those who consented, refused, were ineligible and confounded	number of reported back injures per 100,000 hours paid, total time-loss per 100,000 hours paid	1) The number of reported back injuries dropped from 17.2 to 13.3 per 100,000 hours paid in the study wards, compared to an increase from 4.5 to 6.4 per 100,000 hours paid in the control wards (significant at the 1% level). 2) Total time-loss per 100,000 paid hours dropped by 29% in the study wards, compared to 51% increase in the control wards.
Bernacki (2003) study quality: 1.9 disability management program partial economic analysis	1992	132	NA	post-only one group design	trends analysis of injuries	--	number of lost-time claims per 1,000 workers, medical-only claims per 1,000 workers, temporary total days paid per 100 insured workers	1) The lost-time claim rates decreased from 22 per 1,000 workers in 1992 to 6 per 1,000 in 2002. 2) The medical-only claim rates decreased from 155 to 61 per 1,000 workers. 3) Temporary total days paid decreased from 163 days per 100 insured to 37 days per 100 insured.

Table 2 (continued): Health Care, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude if provided
Disability Management Interventions (continued)								
Koviack (2004) study quality: 1.5 disability management program partial economic analysis	1999	36	147	not clear if it is before-after or after only	estimated value of time spent in temporary assignments	--	number of hours of temporary work assignments over a three-year period	There were 25,382 hours of temporary work assignments completed over the three-year time period.
Tracz (1992) study quality: 1.5 disability management program partial economic analysis	1988	30	NA	post only with comparison to industry average	comparison of days lost by injured individuals receiving benefits from the program with days lost by injured individuals in the industry	--	number of days lost to back pain	The average number of days lost per back injury decreased from 40 days per injury to 23 days. This compares to an average of 45 days lost per claim due to back injury in health-care industry, during the 1988-1990 time period.
Multi-faceted Interventions								
Davis (2004) study quality: 2.0 multiple: MSK injury prevention, and disability management program partial economic analysis	2002	12	332	longitudinal (interrupted time series) controlled	before-after comparison of injuries; Poisson regression modelling; Cox regression modelling	number of eligible workers accessing the program and distribution of the types of services provided were recorded	number of lost-time MSK injuries	1) Registered nurses experienced a reduction in time-loss per person year between 27% and 40%. 2) Health science professionals experienced a reduction in time-loss per person year between 37% and 67%. 3) Facility support service staff experienced a reduction in time-loss per person year between 8% and 13%.

Table 2 (continued): Health Care, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude if provided
Multi-faceted Interventions								
Collins (1990) study quality: 1.8 multiple: Risk assessment, education, and disability management program partial economic analysis	1987	24	NA	before-after uncontrolled	trends analysis of claims costs	--	frequency, duration and incidence of lost-time back injuries	1) For three years prior to the intervention, the frequency of lost-time back injuries was 13.7, 19.1 and 12.8. For the two years after the intervention, the frequency was 16.6 and 13.6. 2) For three years prior to the intervention, the average duration (in days) was 17.2, 14.4 and 18.5. For the two years after the intervention, the frequency was 15.3 and 11.5. 3) For three years prior to the intervention the incidence was 1:39, 1:29 and 1:41. For the two years after the intervention, the incidence was 1:33 and 1:40. Though duration decreased, it is not clear if frequency and incidence have decreased.
Caulfield (1996) study quality: 1.7 multiple: health promotion, disease prevention, and disability management program partial economic analysis	1992	27	NA	before-after uncontrolled	before-after comparison of costs of year prior with each of the two years post	--	sick days (number and rate); days lost to workers' compensation; healthcare only and lost-time workers' compensation claims	1) Number of sick days taken decreased from 17,777 in 1992 to 15,000 in 1994; 2) Sick day rate decreased from 8.47 in 1991 to 7.8 in 1994, compared to an increase from 9.51 to 9.81 in the Ontario hospital sector. 3) Days lost to workers' compensation claims decreased from 226 in 1991 to 35 in 1994; 4) Healthcare only workers' compensation claims decreased from 14 in 1991 to 6 in 1994; 5) Lost-time workers' compensation claims decreased from 9 in 1991 to 3 in 1994.
Intentions to Reduce Violence in the Workplace								
Martin (1995) study quality: 2.3 education program partial economic analysis	1992	24	NA	before-after uncontrolled	trends analysis of injuries	--	frequency and severity of injuries	1) Although the frequency of injury changed only slightly, the results indicate that there was a decrease in the severity of aggression-related staff injuries after the institution of the formal program, as well as a reduction in time missed from work. 2) The occurrence of staff injuries improved only in the second year after the program's development. 3) The number of injuries resulting in missed work time remained the same over all three years.

Table 3: Health Care, Economic Analysis (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other details		
Study reference	**Productivity changes**	**Insurance and health-care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Occupational Disease Prevention Interventions										
Laufer (1994) study quality: 3.4 occupational disease prevention program cost-effectiveness analysis	yes	--	yes	--	--	--	yes	yes	yes	yes
Yassi (1995) study quality: 2.7 occupational disease prevention program cost-benefit analysis	yes	--	yes	--	yes	--	yes	--	--	yes
Orenstein (1995) study quality: 2.6 occupational disease prevention program cost-effectiveness analysis	--	--	--	--	yes	yes	yes	NA	NA	--
Korniewicz (2005) study quality: 2.3 occupational disease prevention program cost-consequence analysis	--	yes	--	--	--	yes	--	--	--	--

Table 3 (continued): Health Care, Economic Analysis (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other details		
Study reference	**Productivity changes**	**Insurance and health-care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Occupational Disease Prevention Interventions (continued)										
Cameron (1997) study quality: 1.6 occupational disease prevention program cost-minimizing analysis	--	--	--	yes	--	yes	yes	NA	NA	--
Ergonomic and Other MSK Injury Prevention Interventions										
Collins (2004) study quality: 3.4 ergonomic program cost-benefit analysis	--	yes	--	yes	--	yes	--	--	--	--
Chhokar (2005) study quality: 3.1 ergonomic program cost-benefit analysis	--	yes	--	yes	--	--	--	--	--	yes
Gundewall (1993) study quality: 2.7 exercise program cost-benefit analysis	yes	--	--	--	--	yes	--	NA	NA	--

Table 3 (continued): Health Care, Economic Analysis (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other details		
Study reference	**Productivity changes**	**Insurance and health-care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Ergonomic and Other MSK Injury Prevention Interventions (continued)										
Evanoff (1999) study quality: 2.5 participatory ergonomic program cost-consequence analysis	--	yes	--	yes	--	yes	--	--	--	--
Engst (2005) study quality: 2.4 ergonomic program cost-benefit analysis	--	yes	yes	yes	--	yes	--	--	--	--
Li (2004) study quality: 2.3 ergonomic program partial economic analysis	--	yes	--	--	--	--	--	--	--	--
Ore (2003) study quality: 2.3 education program cost-benefit analysis	--	yes	--	--	--	yes	--	NA	NA	--
Brophy (2001) study quality: 2.2 ergonomic program cost-benefit analysis	yes	yes	--	yes	--	--	--	NA	--	--

Table 3 (continued): Health Care, Economic Analysis (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other details		
Study reference	**Productivity changes**	**Insurance and health-care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Ergonomic and Other MSK Injury Prevention Interventions (continued)										
Kemmlert (1996) study quality: 2.2 ergonomic program cost-benefit analysis	yes	yes	yes	yes	--	yes	yes	NA	NA	--
Charney (1991) study quality: 1.8 ergonomic program cost-benefit analysis	--	yes	--	--	--	yes	--	NA	NA	yes
Guthrie (2004) study quality: 1.6 ergonomic program partial economic analysis	yes	--	--	--	--	--	--	NA	--	--
Disability Management Interventions										
Linton (1992) study quality: 2.7 multiple: back injury program (physical therapy, ergonomic education, and behavioural therapy) cost-benefit analysis	yes	--	--	--	yes	--	yes	--	--	yes
Yassi (1995) study quality: 2.0 disability management program partial economic analysis	--	yes	--	--	--	--	--	--	--	--

Table 3 (continued): Health Care, Economic Analysis (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other details		
Study reference	**Productivity changes**	**Insurance and health-care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Disability Management Interventions (continued)										
Bernacki (2003) study quality: 1.9 disability management program partial economic analysis	--	yes	--	--	--	--	--	NA	--	--
Koviack (2004) study quality: 1.5 disability management program partial economic analysis	yes	--	--	--	--	--	--	--	--	--
Tracz (1992) study quality: 1.5 disability management program partial economic analysis	yes	--	--	--	--	--	--	--	--	--
Multi-faceted Interventions										
Davis (2004) study quality: 2.0 multiple: MSK injury prevention and disability management program partial economic analysis	--	yes	--	--	--	--	--	NA	--	yes

Table 3 (continued): Health Care, Economic Analysis (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other details		
Study reference	**Productivity changes**	**Insurance and health-care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Multi-faceted Interventions (continued)										
Collins (1990) study quality: 1.8 multiple: Risk assessment, training, and disability management program partial economic analysis	--	yes	--	--	--	--	--	NA	--	--
Caulfield (1996) study quality: 1.7 multiple: health promotion, disease prevention, and disability management program partial economic analysis	--	yes	--	--	--	--	--	--	--	--
Intentions to Reduce Violence in the Workplace										
Martin (1995) study quality: 2.3 education program partial economic analysis	--	yes	--	--	--	--	--	NA	--	--

Table 4: Health Care, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Occupational Disease Prevention Interventions					
Laufer (1994) study quality: 3.4 occupational disease prevention program cost-effectiveness analysis	**Alternative A**: status quo **Alternative B**: needlestick prevention device A: injection equipment **Alternative C**: needlestick prevention device B: recessed needles **Alternative D**: needlestick prevention device C: needleless IV systems	employer	cost-effectiveness analysis	number of needlestick injuries	**Costs of the intervention**: Costs include annual implementation costs of program at hospital. Specifically, annual injection equipment costs were $18,857, recessed needle equipment costs were $23,240, and needless IV costs $26,700. **Consequences of the intervention:** Non-monetary consequences consist of the number of needlestick injuries averted. Monetary consequences were $363 per needlestick injury averted, which includes $184 for the reporting of the incident and initial testing and any treatment and follow-up for HBV, and $179 for the initial evaluation, follow-up, and prophylactic treatment (if any) for HIV infection. **Results**: The cost-effectiveness ratio obtained for injection equipment compared to status quo was $984 per injury averted; for recessed needles compared to status quo was $1,574 per injury averted; for needleless IV systems compared to status quo was $1,877 per injury averted; and for recessed needles compared to needleless IV systems was $790 per injury averted (1992 US dollars).
Yassi (1995) study quality: 2.7 occupational disease prevention program cost-benefit analysis	status quo	employer	cost-benefit analysis	expenses associated with treatment of needlestick injuries	**Costs of the intervention**: The one-year net cost for the introduction of the new system was $47,756. This includes costs with needles, syringe-needle combinations, non-interlink injection caps, intravenous sets and interlink products. The net cost for sharps containers disposal was $13,234. **Consequences of the intervention:** The total savings obtained was estimated to range from $10,142 to $68,214 for the 122 needlestick injuries avoided during the intervention period. These values include savings in personnel time (wage value of worker time away from workplace to receive testing and initial care), reduced expenses of virus testing, vaccine for HBV, and counselling (includes personnel time, laboratory expenses, primary and secondary prophylaxis); workers' compensation expenses not included. **Results**: The estimated net present value (NPV) to the hospital for the needleless access system ranged from an additional expense of $24,380 to a saving of $33,692.

Table 4 (continued): Health Care, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Occupational Disease Prevention Interventions (continued)					
Orenstein (1995) study quality: 2.6 occupational disease prevention program cost-effectiveness analysis	status quo	employer	cost-effectiveness analysis	cases of needlestick injuries	**Costs of the intervention**: Costs include needlestick injury evaluations ($260 per evaluation); costs of protective devices and additional needles and syringes (for 6 months before the intervention these costs were $2,444 and for six months after were $22,558). **Consequences of the intervention:** The number of needlestick injuries decreased from 33 for a six-month period to 14 with the intervention. **Results**: The direct cost per needlestick injury prevented was $789.
Korniewicz (2005) study quality: 2.3 occupational disease prevention program cost-consequence analysis	status quo	employer	before-after comparison of costs and consequences	workers' compensation expenses	**Costs of the intervention**: Costs include personnel hours required for glove storage and handling. These costs were lower than before the intervention by $10,070. Incremental costs of the gloves were not considered. **Consequences of the intervention:** There were no changes in workers' compensation expenses. **Results**: The lack of changes in workers' compensation expenses can be compared to the reduced personnel hours required for storage and handling in the amount of $10,070.
Cameron (1997) study quality: 1.6 occupational disease prevention program cost-minimizing analysis	status quo	employer	cost-minimizing analysis	consequences not considered since cost minimization study	**Costs of the intervention**: Consists of seed money for project; set-up costs for allergy clinic; Latex Allergy Task Force time; occupational health costs; Infection Control Department costs; education costs; purchasing costs; and nursing time costs for allergy clinic. **Consequences of the intervention:** Consequences not considered. **Results**: Conversion to powder-free gloves decreased the cost of gloves from $197,000 to $167,500, a reduction of $32,500. This was due to the hospital's review of the entire glove stock, the elimination of wastage, and the streamlining of ordering to a smaller menu of more appropriate gloves.

Table 4 (continued): Health Care, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Ergonomic and Other MSK Injury Prevention Interventions					
Collins (2004) study quality: 3.4 ergonomic program cost-benefit analysis	status quo	employer	cost-benefit analysis	workers' compensation expenses (medical and indemnity payments) related to resident handling injuries	**Costs of the intervention**: Costs were $158,556, which include $143,556 for capital investment and $15,000 for worker training. **Consequences of the intervention**: Savings from reduced workers' compensation expenses were $164,609.40, estimated by comparing the direct workers' compensation expenses for 129 injuries related to resident handling for the pre-intervention period ($411,670.11) and the 56 injuries post-intervention ($277,060.71). **Results**: The payback period was slightly less than 3 years.
Chhokar (2005) study quality: 3.1 ergonomic program cost-benefit analysis	status quo consisting of use of portable lifts and manual lifting/ transferring/repositioning	employer	cost-benefit analysis	workers' compensation expenses	**Costs of the intervention**: Costs were $344,323, which include capital equipment. **Consequences of the intervention**: Savings from reduced workers' compensation expenses for the three years post intervention. These savings were estimated based on two assumptions: 1) expenses would remain at the previous level, and 2) expenses would continue to increase at the same rate as previous years in the absence of the intervention. The lower-bound estimate of savings is $412,754 and upper-bound estimate is $1,257,605. **Results**: These upper- and lower- bounds estimates translate into a payback period of 2.50 years and 0.83 years, for the lower and upper bounds respectively (1998 Canadian dollars).
Gundewall (1993) study quality: 2.7 exercise program cost-benefit analysis	status quo	not clear	cost-benefit analysis	value of absence days due to lower back pain	**Costs of the intervention**: Costs consist of physiotherapist time (specific amount not provided). **Consequences of the intervention**: Consequences consist of the value of averted lost days due to low-back pain (specific amount not provided). **Results**: 1.3 work days were gained by the training group for every hour of physiotherapist time. The benefit-cost ratio is almost 10 (no detail was provided on how this value was obtained).

Table 4 (continued): Health Care, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Ergonomic and Other MSK Injury Prevention Interventions (continued)					
Evanoff (1999) study quality: 2.5 participatory ergonomic program cost-consequence analysis	status quo	employer	cost-consequence analysis	workers' compensation expenses	**Costs of the intervention**: Costs over the 2-year period were $5,000 which include equipment and wages for time spent on team activities. **Consequences of the intervention:** Workers' compensation savings over the two years adjusted for overall trends at the hospital were $22,758. **Results**: Total workers' compensation expenses for orderlies was $24,443 pre-intervention ($237 per FTE) and $34,207 post-intervention ($139 per FTE), representing a 41% decrease in expenses per worker, or total savings of $22,758. These savings can be compared to the $5,000 costs incurred over 2 years.
Engst (2005) study quality: 2.4 ergonomic program cost-benefit analysis	status quo	employer	cost-benefit analysis	workers' compensation expenses	**Costs of the intervention**: Costs were $284,297 which includes purchasing and installing the intervention and hiring a program coordinator. **Consequences of the intervention:** Direct and indirect savings for "all resident handling" were $9,835 and $19,670, respectively. Direct and indirect savings for only 'lifting and transferring tasks' were $14,493 and $28,986, respectively. **Results**: The payback period was 9.6 years if all resident handling claims are considered in the estimation of consequences, and 6.5 years if only lifting and transferring claims are considered.
Li (2004) study quality: 2.3 ergonomics partial economic analysis	status quo	employer	before-after comparison of annual workers' compensation expenses per FTE	workers' compensation expenses	**Costs of the intervention**: No intervention costs considered. **Consequences of the intervention:** Savings in workers' compensation expenses considered. **Results**: Annual workers' compensation expenses for nursing personnel in the intervention units averaged $484 per FTE pre-intervention and $151 post-intervention.
Ore (2003) study quality: 2.3 education program cost-benefit analysis	status quo	employer	cost-benefit analysis	average (per claim) workers' compensation expenses	**Costs of the intervention**: Costs consist of an estimate of training cost per trainee (specific amount not provided). **Consequences of the intervention:** The control group had an average workers' compensation claims expense of $11,354, or 4.2 times that of the intervention group ($2,658). **Results**: The cost benefit ratio was $5.80 per dollar invested.

Table 4 (continued): Health Care, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Ergonomic and Other MSK Injury Prevention Interventions (continued)					
Brophy (2001) study quality: 2.2 ergonomic program cost-benefit analysis	status quo	employer	cost-benefit analysis	total expenses of low-back injury (consisting of medical, compensation, and replacement wages expenses)	**Costs of the intervention**: Costs were $163,910 which include the price of lifts and cost of replaceable parts, such as slings. **Consequences of the intervention:** The average yearly expenses for back injuries before the intervention were $201,100 and decreased to $91,800 during the 5-year period after the intervention (significant at 5%). **Results**: Total savings during the 5 years following the intervention were $546,500. This is more than three times the total cost of lifting equipment and associated items which were $163,910.
Kemmlert (1996) study quality: 2.2 ergonomic program cost-benefit analysis	status quo	employer	cost-benefit analysis	value of sick leave / absenteeism (and associated losses and expenses averted)	**Costs of the intervention**: Costs were $4,992 US (1988 dollars), which include equipment (new wheels, electric hoist) costs, internal time costs of ergonomic training, and costs of reconstruction of (patient) toilet rooms (to accommodate equipment usage). **Consequences of the intervention**: Savings (benefits) for a one-year period were $59,211 US (1988 dollars), which include savings due to reduced sick leave, reduction in insurance expenses due to reduced sick leave, and reduced turnover and lower related recruitment and training expenses. **Results**: The payback period was 1 month.
Charney (1991) study quality: 1.8 ergonomic program cost-benefit analysis	status quo	employer	cost-benefit analysis	workers' compensation expenses	**Costs of the intervention**: Costs were $70,000 per year, which consists of salary costs of the lifting team. **Consequences of the intervention:** Savings in workers' compensation expenses were $135,000 per year. **Results**: The net present value of the intervention for one year was $65,000.
Guthrie (2004) study quality: 1.6 ergonomic program partial economic analysis	status quo	employer	before-after trends analysis of work-related injury expenses	replacement and salary expenses for staff unable to work due to a work-related injury	**Costs of the intervention**: No intervention costs considered. **Consequences of the intervention:** Savings in the orthopedic and neurology units from replacement and salary expenses. **Results**: In the year before the intervention (2001), the orthopedic and neurology units' replacement and salary expenses for staff unable to work due to a work-related injury were $48,220, while in the year the intervention was introduced (2002) these expenses declined to $2,560.

Table 4 (continued): Health Care, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Disability Management Interventions					
Linton (1992) study quality: 2.7 multiple: back injury program that included physical therapy, ergonomic education, and behavioural therapy cost-benefit analysis	a) pre-intervention baseline; b) status quo - counterfactual based on continuing upward trend	unclear	cost-benefit analysis	wage value of sick days due to pain	**Costs of the intervention**: Costs were $4,000 USD (25,000 krona) per person plus $225 (1,375 krona) out-of-pocket worker costs. **Consequences of the intervention:** The number of *actual* days averted was based on data from 18 months before compared to 18 months after the intervention, and the *estimated* reduction in sick days were based on regression modelling (accounting for existing trend). The range of savings values for averted absences due to musculoskeletal pain less cost of program are as follows: • At value of $127/day, the savings for actual days averted is $851, and savings for estimated days averted is $9,715; • At value of $206/day, the savings for actual days averted is $1,380 and savings for estimated days averted is $15,759; • At value of $400/day, the savings for actual days averted is $2,680 and savings for estimated days averted is $30,600; • At value of $52/day, the savings for actual days averted is $348 and savings for estimated days averted is $3,978. The first three values are estimates of daily absenteeism savings for the employer based on published data from different sectors. The last one is for daily absenteeism savings in terms of GNP. **Results**: If it assumed that the trend for an increase in sick-listing would have continued, then employers would save at least twice the costs of the program ($9,715, or 61,198 krona).
Yassi (1995) study quality: 2.0 disability management program partial economic analysis	status quo	employer	comparison of workers' compensation expenses between intervention and control groups	workers' compensation expenses	**Costs of the intervention**: No intervention costs considered. **Consequences of the intervention:** Savings in workers' compensation expenses. **Results**: Expenses per injury were 32% lower and 34% lower per lost-time injury in the intervention group compared to the control group ($608 versus $893 per injury and $2,662 versus $4,052 per lost-time injury). The higher overall medical expenditures for injured workers in the program ($262 versus $171 per injury and $773 versus $696 per lost-time injury) were more than offset by the lower wage replacement compensation expenses ($346 versus $722 per injury and $1,890 versus $3,356 per lost-time injury). Total workers' compensation expenses for all back injuries decreased by 5% per 100,000 paid hours in the intervention group ($13,553 to $12,870) compared to an increase of 49% for the control group ($4,992 to $7,437).

Table 4 (continued): Health Care, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Disability Management Interventions (continued)					
Bernacki (2003) study quality: 1.9 disability management program partial economic analysis	status quo	employer	before-after trends analysis of workers' compensation expenses	workers' compensation expenses	**Costs of the intervention**: No intervention costs considered. **Consequences of the intervention:** Savings from workers' compensation expenses. **Results**: Total workers' compensation expenses decreased from $0.81 to $0.37 per $100 payroll. The medical expense component decreased from $0.27 to $0.15. The temporary total indemnity component decreased from $0.18 to $0.07. The permanent partial indemnity component decreased from $0.19 to $0.07. The administrative expense component decreased from $0.16 to $0.09 (all decreases per $100 of payroll).
Koviack (2004) study quality: 1.5 disability management program partial economic analysis	status quo	employer	post only analysis of savings	value of time spent in temporary assignments rather than on disability	**Costs of the intervention**: No intervention costs considered. **Consequences of the intervention:** Savings obtained with the employment of accommodated staff and with workers' compensation expenses. **Results**: There were 25,382 hours of temporary work assignments completed over the three-year time period which, if valued at $28.83 per hour, amounts to a total savings of $731,763. There were also savings in workers' compensation expenses of $112,537, $80,301, and $77,282 in calendar year 2000, 2001 and 2002 respectively.
Tracz (1992) study quality: 1.5 disability management program partial economic analysis	status quo	employer	post only analysis of savings obtained with wage costs associated with intervention	wage value of time off work due to back injury claim	**Costs of the intervention**: No intervention costs considered. **Consequences of the intervention:** Savings in time off work due to back injury. **Results**: Estimated saving of $3,135 (49% of the expense per back injury) based on a comparison of absences at the hospital with absences in the industry.

Table 4 (continued): Health Care, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Multi-faceted Interventions					
Davis (2004) study quality: 2.0 multiple: MSK injury prevention and disability management program partial economic analysis	status quo	employer	before-after comparison (of workers' compensation expenses) of each of three years before the intervention with one year of the intervention	workers' compensation expenses	**Costs of the intervention**: No intervention costs considered. **Consequences of the intervention:** Savings in workers' compensation expenses. **Results**: Savings in workers' compensation expenses for registered nurses between $309,474 and $143,796 (reduction in expenses per person-year of between 27% and 44%). Savings in workers' compensation expenses for health science professionals between $42,920 and $128,180 (reduction in expenses per person-year between 48% and 73%). Savings in workers' compensation expenses for facility support services was between $32,900 and $105,280, (ireduction in expenses per person-year between 8% and 21%).
Collins (1990) study quality: 1.8 multiple: risk assessment, education, and disability management program partial economic analysis	status quo	employer	before-after trends analysis of workers' compensation claims expenses for all strains and back injuries	workers' compensation expenses	**Costs of the intervention**: No intervention costs considered. **Consequences of the intervention:** Savings from rebates on workers' compensation premiums. **Results**: Claims expenses in the second year of the program (1988/89) were the lowest recorded over the five-year period for nurses' strains, and also for nurses' back injury claims expenses. As a result of these savings, the hospital earned rebates on their workers' compensation premiums of $105,000 at the end of the first year of the intervention and a further $177,000 at the end of the second year. Prior to that, the maximum rebate received had been $4,000.
Caulfield (1996) study quality: 1.7 multiple: health promotion, disease prevention, and disability management program partial economic analysis	status quo	employer	before-after comparison of workers' compensation and sick time replacement expenses	workers' compensation expenses and sick time replacement expenses	**Costs of the intervention**: No intervention costs considered. **Consequences of the intervention:** Savings from rebates on workers' compensation premiums and sick-time replacement expenses. **Results**: Before the intervention (1992) the hospital received an $18,000 surcharge from the workers' compensation insurer. Since then, they have received rebates of $39,000, $28,000, and $18,000. Workers' compensation insurance assessment rates were reduced from $225,000 to $190,000 for the hospital, and were fixed until mid-1995. Sick-time replacement expenses before the intervention were $214,918 and were $179,236 in 1994. Total savings from the program are estimated at $200,000 or 1.6% of total salary budget.

Table 4 (continued): Health Care, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Intentions to Reduce Violence in the Workplace					
Martin (1995) study quality: 2.3 education program partial economic analysis	status quo	employer	before-after comparison of injury expenses	injury expenses (medical and indemnity expenses, wage value of sick time)	**Costs of the intervention**: No intervention costs considered. **Consequences of the intervention:** Savings from reduced medical and indemnity expenses, and sick time. **Results**: Medical, indemnity, and sick time expenses were $173,960 the year before the intervention, and $2,478 and $2,414 for each of the two years after the intervention. This represents a savings of $171,482 and $171,546 in the first and second year, respectively.

Appendix O Tables for Information and Cultural Industries

Table 1: Information and Cultural Industries, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Ergonomic and Other MSK Prevention Interventions					
Hocking (1991) study quality: 3.4 ergonomic program cost-benefit analysis	high number of injuries and high cost of injuries	Australia	Information and Cultural Industries telecommunications provider external plant staff	ergonomics (primary)	An intervention consisting of workplace ergonomic assessments and the introduction of new equipment and training. Three teams of engineers were trained in ergonomics, and then progressively assessed and improved the equipment and associated work practices for a range of projects, which were subsequently released in the field with instructions, presentations, and publicity.

Table 2: Information and Cultural Industries, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude, if provided
Ergonomics and Other MSK Prevention Interventions								
Hocking (1991) study quality: 3.4 ergonomic program cost-benefit analysis	1985	48	21,294.5	before-after with control (set of injuries not associated with manual handling)	before-after comparison of number of manual handling accidents, rate of accidents, ratio of accident rates between the intervention and the control groups' injuries (statistical significance tested)	a questionnaire and field visits were used to establish a 75% or more take-up of improved agents (new safety equipment/products) in the field	manual handling accidents	1) Accident rates per 1,000 workers in 1981/82 and 1988/89 for the manual handling injuries were 93 and 87, while for the non-manual handling injuries they were 195 and 189. 2) Accident rate ratios for the intervention and control injuries between 1981/82 and 1988/89 were 0.89 and 1.04. The difference was not statistically significant (5% level), indicating that the intervention was not effective. 3) Focusing specifically on back injuries, there were 479 back injuries in 1981/82 and 497 in 1988/89 (22% and 29% of all injuries in the manual handling group). The author concludes that there was no evidence that manual handling projects reduced back injuries.

Table 3: Information and Cultural Industries, Economic Analysis (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other Details		
Study reference	**Productivity changes**	**Insurance and health-care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Ergonomics and Other MSK Prevention Interventions										
Hocking (1991) study quality: 3.4 ergonomic program cost-benefit analysis	yes	yes	--	yes	--	yes	--	yes	--	--

Table 4: Information and Cultural Industries, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Ergonomic and Other MSK Prevention Interventions					
Hocking (1991) study quality: 3.4 ergonomic program cost-benefit analysis	**Alternative 1**: status quo – level of manual handling injuries in the pre-period **Alternative 2**: non-manual handling injuries (reference group)	employer	net present value (NPV)	manual and non-manual handling accidents expenses	**Costs of the intervention:** Costs of the intervention were $11,247,000 (USD). This includes research and development, materials, general development, and general overhead. **Consequences of the intervention:** Savings from the intervention were $29,731,000, which consisted of a gross savings of $40,869,000 (all from increases in productivity attributable to the plastic pits), less a taxation effect of $11,138,000 (USD). **Result:** The net present value was $3,995,000 (USD). Although the Telecom project was apparently ineffective in reducing injury, paradoxically it was economical (note that the individual costs and consequences provided in the study do not add up correctly).

Appendix P Tables for Manufacturing and Warehousing

Table 1: Manufacturing and Warehousing, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Ergonomic and Other MSK Injury Prevention Interventions					
Lanoie (1996) study quality: 3.9 participatory ergonomic program cost-benefit analysis	high number of injuries	Canada Quebec Quebec City	Wholesale Trade warehousing and distribution of alcoholic beverages warehouse workers and truck drivers	participatory ergonomics (primary)	A participatory ergonomic intervention to reduce back disorders at an alcohol distributor. Six principal problems were addressed by the joint worksite safety committee.
Lahiri (2005) study quality: 3.5 ergonomic program cost-benefit analysis	high number of injuries	United States	Manufacturing wood-processing manufacturing plant labourers and assemblers: forklift, crane, and machine operators; technicians; and utility/general production workers	ergonomics (primary prevention)	Engineering controls and workstation modifications were instituted following ergonomic evaluations. New equipment introduced included adjustable chairs, conveyors, lift tables, anti-fatigue matting, grabbers, and catwalks to minimize the use of ladders.
Lahiri (2005) study quality: 3.5 ergonomic program cost-benefit analysis	high number of injuries	United States	Manufacturing manufacturer of truck and automotive bodies and engines assemblers in different assembly lines	ergonomics (primary prevention)	A number of engineering controls were implemented. Ergonomic dollies were redesigned (to reduce the amount of bending), lift and tilt tables were installed (to allow adjustment of workstation heights), and mechanical lift assists, and various platforms and risers were introduced (to reduce loads and awkward back postures).
Abrahamsson (2000) study quality: 3.3 participatory ergonomic program cost-benefit analysis	multiple: low productivity (and high absenteeism), high turnover, poor working conditions	Sweden Lulea	Manufacturing steel foundry ladle operators and foremen	participatory ergonomics (primary prevention)	Development of new ladle service department by a consultant company, which used different participatory and pedagogical methods in the process of designing the new department. The intervention addressed issues related to environment, climate factors, the role of the ladle service in the steelworks, transport routes and production flows. The new ladle service department had an advanced climate and ventilation system that kept the heat and smoke from the ladles out of the working area.

Table 1 (continued): Manufacturing and Warehousing, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Ergonomic and Other MSK Injury Prevention Interventions (continued)					
Halpern (1997) study quality: 2.5 participatory ergonomic program partial economic analysis	high number of injuries	United States Mountain West region	Manufacturing automobile products and accessories manufacturer sewing machine operators	participatory ergonomics (both primary and secondary prevention)	A participatory ergonomic program was introduced based on a suggestion from a risk management consulting firm. The intervention included a number of engineering changes and related training to use new tools/equipment, a stretching program, return-to-work activities (e.g. increased use of modified duty program), and an awareness education effort. Steering committee, design committee, and medical and claims management committee worked together with top management participation at the implementation stage.
Kemmlert (1996) study quality: 2.2 ergonomic program cost-benefit analysis	high cost of injury	Sweden	Manufacturing radiator industry mechanics	ergonomics (primary prevention)	The ergonomic intervention consisted of workplace assessment and redesign and included mechanization of manual tasks consisting of wiring and stretching spirals about once every minute.
Kemmlert (1996) study quality: 2.2 ergonomic program cost-benefit analysis	high cost of injury	Sweden	Manufacturing metal industry material handlers	ergonomics (primary prevention)	The ergonomic intervention consisted of workplace assessment and redesign and included purchase and introduction of more shallow and less heavy hampers with more comfortable working height, electrical adjustable hoist, as well as reorganization of work so that workers rotated between several jobs.
Moore (1998) study quality: 2.0 participatory ergonomic program partial economic analysis	high number of injuries	United States	Manufacturing red meat packing (slaughtering and processing) plant workers in slaughtering and processing plants	participatory ergonomics (primary prevention)	A corporate participatory ergonomic program was introduced that included the following elements: 1) workplace analysis, 2) hazard correction, prevention, and control, 3) medical management, and 4) training and education.

Table 1 (continued): Manufacturing and Warehousing, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Ergonomic and Other MSK Injury Prevention Interventions (continued)					
Ridyard (2000) study quality: 1.8 participatory ergonomic program partial economic analysis	multiple	United States Northeast	Manufacturing beverage packaging facility all workers, primarily those working in filling, packing and warehouse	participatory ergonomics (both primary and secondary prevention)	A multi-disciplinary participatory ergonomic team was given training by an external consultant.
Disability Management Interventions					
Hochanadel (1993) study quality: 2.9 disability management program cost-benefit analysis	high cost of injury	United States South Central US	Manufacturing research and manufacturing for the US Department of Energy all workers	disability management (secondary prevention)	On-site industrial physical therapy program for all injuries, both work-related and not. Services include evaluation, treatment, physical therapy referrals, and education in the form of a back school.
Goodman (1992) study quality: 2.4 disability management program partial economic analysis	high number of injuries	United States Arkansas	Manufacturing	disability management (secondary prevention)	Intervention consisted of surgical release of cases with carpal tunnel syndrome followed by an aggressive return-to-work program.
Perry (1996) study quality: 1.9 disability management program partial economic analysis	high cost of injuries	United States Midwest	Retail and Trade department store warehouse workers, furniture delivery workers	disability management (secondary prevention)	A return-to-work program, called the REACH program (acronym for recovery, employment and community help), consisting of temporary employment at the regular place of employment, if possible, or in "sheltered workshops," until the worker is able to resume regular duties.

Table 1 (continued): Manufacturing and Warehousing, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Multi-faceted and Other Interventions					
Kjellen (1997) study quality: 2.6 other: occupational health and safety management system program cost-consequence analysis	legislative requirement	Norway	Manufacturing aluminium plant aluminium plant workers (specific occupations unclear)	other: occupational health and safety management system (primary prevention)	Safety, health and environment (SHE) management systems based on internal control (IC) principles. This included clarification of SHE responsibilities, especially related to order and housekeeping, improved reporting of accidents and near accidents and for safety inspections, establishment of safety committees, defining and following-up on yearly goals, development of improved OHS policies and procedures. The intervention included education and training for various personnel, as well as hiring new SHE personnel and external consultants to assist in development of new SHE program, and investment in equipment for the emergency squad.
Lemstra (2003) study quality: 2.5 multiple: 1) work reorganization and ergonomic program, and disability management program; 2) disability management program partial economic analysis	systems level initiative	Canada Saskatchewan	Manufacturing meat industry all workers	multiple (both primary and secondary prevention)	1) Occupational management protocol for primary and secondary prevention. Primary prevention strategies included worker rotation schedules, reduced lifting loads and ergonomic redesign of tasks. Secondary prevention strategies consisted of independent on-site management of injuries with a physical therapist that included reassurance of good prognosis, encouragement to resume normal activities, simple exercises, and recommendation to resume work as soon as safely possible on either full duties or time-limited modified or light duties. 2) Early Intervention Program. Rapid and expanded rehabilitation services to injured workers to facilitate their return to the workplace. Injured workers are required to immediately participate in expanded physical therapy and work-hardening programs. If worker not at work at 6 weeks, broader secondary or tertiary treatment protocols are initiated (following a multidisciplinary assessment) that include psychosocial intervention.
Bunn (2001) study quality: 2.4 multiple: ergonomics, disability management, and health promotion program partial economic analysis	high cost of injury	United States, Canada and Mexico	Manufacturing manufacturing of medium- and heavy-duty trucks, buses, and diesel engines workers in truck assembly, engine assembly, foundry/metal-working operations, as well as engineering, information technology, and various corporate functions	multiple (both primary and secondary prevention)	Included ergonomics, disability management, and health promotion. A health, safety and productivity group was given the task of expanding the management of safety, workers' compensation, disability, absenteeism, medical services, preventive care and disease management, and indirect costs of the loss of health and productivity.

Table 1 (continued): Manufacturing and Warehousing, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Multi-faceted and Other Interventions (continued)					
Melhorn (1999) study quality: 2.3 other: program of risk assessment of new recruits cost-benefit analysis	high cost of injury	United States	Manufacturing aircraft manufacturer sheet metal mechanic	other: risk assessment of new recruits (primary prevention)	A musculoskeletal injury risk management program in which new hires are assessed for their risk of injury based on an individual risk-assessment instrument. New hires are assigned to a specific group of risk-reduction strategies based on their risk assessment category.

Table 2: Manufacturing and Warehousing, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude, if provided
Ergonomic and Other MSK Injury Prevention Interventions								
Lanoie (1996) study quality: 3.9 participatory ergonomic program cost-benefit analysis	1990	57	approximately 90 workers	longitudinal (interrupted time series) uncontrolled	Poisson regression model, where the dependent variable is the number of back injuries	in the regression, intensity of exposure measured with a count variable for each year the intervention was active; a department thought to be most affected was identified with an interaction term with the intervention variables	back injuries resulting in a workers' compensation claim	The coefficient on the variable that identifies the ergonomic intervention was significant at the 10% level. From the regression results, it is estimated that the intervention reduced the number of back injuries by 6 in 1991, by 11 in 1992, and by 15 in 1993.
Lahiri (2005) wood-processing plant case study study quality:3.5 ergonomic program cost-benefit analysis	NA	36	123	before-after uncontrolled	before-after comparison of back-pain cases, sick days due to low-back pain, and productivity changes	annual average number of employees subject to intervention (out of total number of employees)	1) cases of low-back pain; 2) sick days due to low-back pain; 3) medical care costs (incl. for no-lost time cases); 4) productivity	1) acute back pain cases: reduction from 6 to 0 - hence, medical costs of $1,010 avoided (annually); 2) sick days due to low-back pain remain at 0; 3) total annual productivity gain: $81,200 ($2,160 in avoided productivity loss + $79,040 in productivity enhancement)
Lahiri (2005) truck, auto body, engine manufacturer case study study quality:3.5 ergonomic program cost-benefit analysis	NA	48	1500	before-after uncontrolled	before-after comparison of back pain cases, sick days due to low-back pain, and productivity changes	annual average number of employees subject to intervention (out of total number of employees)	1) cases of low-back pain; 2) sick days due to low-back pain; 3) medical care costs (incl. for no-lost time cases); 4) productivity	1) annual average number of acute back pain cases: reduction from 11 to 3.3; annual average number of chronic cases: reduction from 4 to 0; annual average number of sick days due to back pain: reduction from 693 to 1; 2) avoided medical care costs: $16,280, avoided sick leave costs: $121,792; 3) total reported annual gain in productivity: $2,708,992

Table 2 (continued): Manufacturing and Warehousing, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude, if provided
Ergonomic and Other MSK Injury Prevention Interventions (continued)								
Abrahamsson (2000) study quality: 3.3 participatory ergonomic program cost-benefit analysis	1990	36	30	before-after uncontrolled	before-after comparison of absenteeism, working environment measures as well as production quality and efficiency	--	1) absenteeism due to illness and occupational injuries; 2) measures of quality and efficiency of production	1) Absenteeism due to illness fell substantially and, after the first year of operation, was 2.5% lower than the average for the whole steelworks. 2) Work environment has improved considerably. The most harmful work movements and positions have been reduced from 20% of the work time at the old workplace to 1% at the new workplace. Other strenuous movements and positions have been reduced from 34% to 13%. 3) Improvements in production quality and efficiency: fewer breakdowns (annual reduction by 10 major breakdowns), less production disturbances, improved production planning reliability, reduced need for maintenance, reduction of returned steel by 35%, and reduced need for mechanical repair and the use of incidental materials.
Halpern (1997) study quality: 2.5 participatory ergonomic program partial economic analysis	1993	36	approximately 250 employees	before-after uncontrolled	before-after comparison of workers' compensation claims	--	number of workers' compensation claims (total and musculoskeletal injury related claims)	Total number of workers' compensation claims (all operations) rose by 21% from 106 in 1992-93 (one year prior to intervention) to 128 in 1995-96 (third year of intervention). The number of MSK claims (sewing operations) fell from 13 to 2 in the same time period. The number of employees over this time period rose from 514 to 700
Kemmlert (1996) radiator industry case study study quality: 2.2 ergonomic program cost-benefit analysis	NA	NA	4	before-after uncontrolled	before-after comparison of sick leave and associated expenses / savings	--	value of sick leave / absenteeism (associated losses and expenses averted)	There was a 5% reduction in sick leave (across 4 employees) which was reflected in savings of $3,010 US per year. Also, there were savings due to reduced overemployment of $9,025 US per year based on 5% reduction in absenteeism (sick leave); reduced recruitment of $207 US per year based on 70% reduced turnover and ensuing savings in personnel manager time; reduced training costs of new employees of $570 US due to reduced turnover; and reduced staff cost of $45,126 US due to one less FTE required to perform the task.

Table 2 (continued): Manufacturing and Warehousing, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude, if provided
Ergonomic and Other MSK Injury Prevention Interventions (continued)								
Kemmlert (1996) metal industry case study study quality: 2.2 ergonomic program cost-benefit analysis	NA	NA	4	before-after uncontrolled	before-after comparison of sick leave and associated expenses / savings	--	value of sick leave / absenteeism (associated losses and expenses averted)	There was a 10% reduction in sick leave (across 4 employees) which was reflected in savings of $5,055 US per year. Also, there were savings due to reduced overemployment of $15,044 US per year based on 10% reduction in absenteeism (sick leave); reduced recruitment of $53 US per year based on 10% reduced turnover and ensuing savings in personnel manager time; reduced training costs of new employees of $56 US due to reduced turnover.
Moore (1998) study quality: 2.0 participatory ergonomic program partial economic analysis	1986	90	NA	post-only one group design	percentage change in workers' compensation claims and expenses	--	workers' compensation total claim incidence rate (per 100 workers), lost-time incidence rate (per 100 workers), workers' compensation expenses (total and per capita)	1) Increase in total incidence rate (by 7% relative to baseline: 1987 level); decrease in lost-time incidence rate (by 89% relative to baseline: 1984); decrease in the percentage of recordable disorders related to musculoskeletal risk factors (from 66% in 1987 to 46% in 1993); 2) overall 84% decrease in total annual WC costs between 1987 and 1993; overall 73% decrease in per-capita WC costs between 1987 and 1993.
Ridyard (2000) study quality: 1.8 participatory ergonomic program partial economic analysis	1996	24	140	before-after uncontrolled	before-after trends analysis of MSK injuries and associated lost days from work	--	number of MSK injuries and associated lost days from work	1) MSK injuries decreased from 82 pre-intervention (1995) to 78 during intervention (1996) to 73 post-intervention (1997) and associated days lost declined from 2,407, to 1,317 and to 272 respectively. 2) Number of severe injuries (with long-term absences) also fell from 8 (1995) to 5 (1996) to 2 (1997) as did the average number of lost workdays associated with severe injuries (fell from 134 in 1995, 166 in 1996, and 76 in 1997).

Table 2 (continued): Manufacturing and Warehousing, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude, if provided
Disability Management Interventions								
Hochanadel (1993) study quality: 2.9 disability management program cost-benefit analysis	1982	120	2900	before-after uncontrolled	before-after comparison of the mean absence rate	number of evaluations, referrals and treatment courses; number of clinical visits (average by body part treated) and treatment procedures	absences / time away from work (disability and time spent seeking treatment)	1) the absence rates were significantly lower after the intervention (declined from almost 19% in 1978 pre-intervention to consistently below 3% following the intervention, 1982-1986); 2) previously treated employees who attended the Back School (compared to treated employees who did not attend the Back School) reported in a questionnaire: having less pain, better ability to control pain without medication, having lost less work time.
Goodman (1992) study quality: 2.4 disability management program partial economic analysis	1982	84	**treatment group**: 44 **control group**: 23	post-only controlled	difference in time off work and cost per case between intervention and control groups	--	days off work per case, proportion of cases resulting in disability, number of recurrences, number failing to return to work, workers' compensation costs per claim	1) The average time off work for treatment and control group was 6.25 days and 29.285 days per carpal tunnel release, respectively. 2) 22% and 33% of releases respectively resulted in permanent partial impairment; 3) One patient in each group had a recurrence of carpal tunnel syndrome. 4) One patient in the treatment group and three in the control group failed to return to work. 5) (Workers' compensation) cost per release was $4,020.59 and $7,715.33 for treatments and controls, respectively.
Perry (1996) study quality: 1.9 disability management program partial economic analysis	1993	24	NA	before-after uncontrolled	before-after comparison of trends in temporary total disability payments and percentage changes in workers' compensation expenses	30 employees from the four distribution centres had participated in REACH since its introduction and have averaged 3 weeks in the REACH program	temporary total disability (TTD) expenses, workers' compensation expenses	There was a dramatic reduction (66%) in temporary total disability (TTD) payments to injured workers from 1991 to 1994, after REACH had been implemented at all four distribution centres (wages for REACH participants were included in the TTD payment totals for the first year). With respect to workers' compensation expenses, the department store as a whole showed a reduction of 28%, compared to 59% at the distribution centres where REACH was in place.

Table 2 (continued): Manufacturing and Warehousing, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude if provided
Multi-faceted and Other Interventions								
Kjellen (1997) study quality: 2.6 other: occupational health and safety management system cost-consequence analysis	1989	66	405	before-after uncontrolled	trends analysis	--	lost-time injuries, sick leave hours, count of accidents, count of reclaims	1) Lost-time injuries per one million hours of work have decreased overall from 33 in 1985-86 to 4 in 1994. 2) Severity rate (# of lost work days due to accidents per million hours of work) fell from 285 in 1988 to 30 in 1994. 3) Number of lost work days per accident dropped from 8 in 1985 to 2 in 1994 (not including three fatalities from 1988). 4) Sickness leave (absences) as a percentage of total working hours fell from 6.4% in 1985-86 to 4.5% in 1994. 5) Number of reclaims was reduced by a factor three from 1985-86 to 1994.
Lemstra (2003) study quality: 2.5 multiple: 1) work reorganization and ergonomic program, and disability management program; 2) disability management program partial economic analysis	2000	12	**treatment group**: 285 for Company A (Occupational Management), 232 for Company B (Early Intervention Program) **control group**: 185 Company A (Standard Care)	before-after comparison with control *and* before-after uncontrolled	1) Standard care in company A compared to early intervention program in company B; 2) before-after comparison of occupational management protocol with standard care in company A; 3) occupational management protocol in company A compared to early intervention program in company B	--	upper extremity, back, and all/total claims and their duration	Occupational management resulted in lower injury claim incidence (for upper extremity, back, and all claims), duration, and costs than standard care, which, in turn, was superior to the early intervention program (on the same indicators). All time-loss claims incidence: 3.2, 7.9 and 21.8/22.4 respectively, work-related upper-extremities MSK time-loss claims incidence: 0.6, 2.3, 8.9/7.3 respectively; back time-loss claims incidence: 0.6, 2.6, 5.4/4.0 respectively; total days lost: 66.1, 220.4 and 1129.2/1224.8 respectively, work-related upper-extremities MSK days lost: 12.3, 138.5, 662.6/731.6 respectively; back days lost: 1.1, 60.9, 280.1/141.0 respectively (all per 100,000 hours worked).

Table 2 (continued): Manufacturing and Warehousing, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude if provided
Multi-faceted and Other Interventions (continued)								
Bunn (2001) study quality: 2.4 multiple: ergonomics, disability management, and health promotion program partial economic analysis	1997	48	18,000	before-after uncontrolled	trends analysis	audit scores used to measure compliance and safety systems management (a safety performance measure); for the Health Promotion program authors looked at activity level of site committees, awareness rates, and participation rates (not used in econ. eval.)	incidence frequency rate per 100 employees for all cases and lost-time cases, number of long-term disability cases, controllable absenteeism as a percentage of all time off, workers' compensation expenses, disability (STD & LTD) expenses, medical expenses / health-care costs saved	1) Reduction in incidence frequency rate from 21.5 (3-year average in 1996) to 16.3 per 100 employees in 1999. 2) Reduction in lost-time case rate from 6.5 (3-year average in 1996) to 4.3 per 100 employees in 1999. 3) Workers' compensation expense per worker was reduced from $687.60 (3-year average in 1996) to $596.30 in 1999. 4) Long-term disability total cases decreased from 350 in 1996 to 241 in 2000 (active cases decreased from 207 in 1996 to 142 in 2000, while retiree cases dropped from 143 in 1996 to 99 in 2000); LTD cost per worker fell from $172.57 in 1996 to $135.46 in 1999; STD cost per worker fell from $514.86 to $460.57 in 1999. 4) An overall decrease in controllable absenteeism as a percentage of all time off from 4.7 in 1997 to 4.3 in 2002.
Melhorn (1999) study quality: 2.3 other: program of risk assessment of new recruits cost-benefit analysis	1995	48	3152	before-after uncontrolled	before-after comparison of workers' compensation claims and expenses	distribution of risk score across sample group, and transitional work guides for different risk levels	lost-time claims incident rate per 200,000 hours, lost-time claims severity rate per 200,000 hours; workers' compensation expenses (per worker)	1) Significant reduction in lost-time claims incident rate per 200,000 hours (71% decrease during program implementation period of 1995 to 1998). 2) Significant reduction in lost-time claims severity rate per 200,000 hours (88% reduction from 1995 to 1998). 3) Workers' compensation expenses per worker dropped to $356, $346, $258, and $252 from 1995 to 1998 (previous five years had high of $472 and low of $415).

Table 3: Manufacturing and Warehousing, Economic Analysis (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other details		
Study reference	**Productivity changes**	**Insurance and health-care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Ergonomic and Other MSK Injury Prevention Interventions										
Lanoie (1996) study quality: 3.9 participatory ergonomic program cost-benefit analysis	yes	yes	--	yes	--	yes	yes	yes	yes	yes
Lahiri (2005) study quality: 3.5 ergonomic program cost-benefit analysis	yes	yes	--	yes	yes	yes	--	yes	yes	yes
Abrahamsson (2000) study quality: 3.3 participatory ergonomic program cost-benefit analysis	yes	--	--	yes	yes	--	--	yes	--	--
Halpern (1997) study quality: 2.5 participatory ergonomic program partial economic analysis	--	yes	--	--	--	--	--	--	--	--
Kemmlert (1996) study quality: 2.2 ergonomic program cost-benefit analysis	yes	yes	yes	yes	--	yes	--	NA	NA	--

Table 3: Manufacturing and Warehousing, Economic Analysis (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other details		
Study reference	**Productivity changes**	**Insurance and health-care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Ergonomic and Other MSK Injury Prevention Interventions (continued)										
Moore (1998) study quality: 2.0 participatory ergonomic program partial economic analysis	--	yes	--	--	--	--	--	--	--	--
Ridyard (2000) study quality: 1.8 participatory ergonomic program partial economic analysis	--	yes	yes	--	--	--	--	--	--	--
Disability Management Interventions										
Hochanadel (1993) study quality: 2.9 disability management program cost-benefit analysis	yes	yes	--	--	--	yes	yes	--	--	--
Goodman (1992) study quality: 2.4 disability management program partial economic analysis	yes	yes	--	--	--	--	--	NA	NA	--

Table 3: Manufacturing and Warehousing, Economic Analysis (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other details		
Study reference	**Productivity changes**	**Insurance and health-care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Disability Management Interventions (continued)										
Perry (1996) study quality: 1.9 disability management program partial economic analysis	--	yes	--	--	--	--	--	NA	--	--
Multi-faceted and Other Interventions										
Kjellen (1997) study quality: 2.6 other: occupational health and safety management system cost-consequence analysis	yes	yes	yes	yes	yes	yes	yes	--	yes	--
Lemstra (2003) study quality: 2.5 multiple: 1) work reorganization and ergonomic program, and disability management program; 2) disability management program partial economic analysis	--	yes	--	--	--	--	--	--	--	--

Table 3 (continued): Manufacturing and Warehousing, Economic Analysis (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other details		
Study reference	**Productivity changes**	**Insurance and health-care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Multi-faceted and Other Interventions (continued)										
Bunn (2001) study quality: 2.4 multiple: ergonomics, disability management, and health promotion program partial economic analysis	--	yes	--	--	--	--	--	--	--	--
Melhorn (1999) study quality: 2.3 other: program of risk assessment of new recruits cost-benefit analysis	--	yes	--	--	--	yes	--	--	--	--

Table 4: Manufacturing and Warehousing, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Ergonomic and Other MSK Injury Prevention Interventions					
Lanoie (1996) study quality: 3.9 participatory ergonomic program cost-benefit analysis	status quo	employer	net present value	direct and indirect expenses associated with back-related injuries	**Costs of the intervention**: Costs were $164,529.44 for the duration of the intervention, and were estimated to be $227,318.31 for the period which included a projection of costs for 5 years into the future (CAD). These values include costs with training, time devoted to activities related to the intervention, automatic pallet distributor, pallet truck, stuck boxes, trucks, wrapper and trucks. **Consequences of the intervention**: Consequences were $156,546.79 for the duration of the intervention (consisting of direct and indirect expenses), and were estimated to be $415,019.12 for the period that included a projection of benefits for 5 years into the future (CAD). **Result**: The net present value for the duration of the intervention was (-$7,982.64) and over the time period that included future projections was $187,700.79. The net present value becomes positive in the year following the measured intervention time period (all values are in 1989 Canadian dollars).
Lahiri (2005) wood-processing plant case study study quality: 3.5 ergonomic program cost-benefit analysis	status quo	employer	cost-benefit analysis	1) medical care costs associated with low-back pain cases; 2) value of lost work time due to sick leave (productivity); 3) productivity loss due to low-back pain at work; 4) productivity enhancements due to intervention	**Costs of the intervention**: Costs per year were $5,338, which include equipment, physical therapists' time, internal labour costs (likely including installation and maintenance; internal training and other time costs). **Consequences of the intervention**: Savings per year were $82,210, which include medical care costs avoided, avoided loss in work time due to sick leave, productivity losses (averted) due to low-back pain and discomfort while at work (before intervention), and productivity enhancements due to intervention. **Results**: Net savings per year were $76,872, with savings per worker of $625. The benefit-to-cost ratio was 15.40 and the payback period was 5.3 months (all 2002 dollars).

Table 4: Manufacturing and Warehousing, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Ergonomic and Other MSK Injury Prevention Interventions (continued)					
Lahiri (2005) truck, auto body, engine manufacturer case study study quality:3.5 ergonomic program cost-benefit analysis	status quo	employer	cost-benefit analysis	1) medical care costs associated with low-back pain cases; 2) value of lost work time due to sick leave (productivity); 3) productivity loss due to low-back pain at work; 4) productivity enhancements due to intervention	**Costs of the intervention**: Costs per year were $512,657, which include equipment, ergonomic redesign, installation, internal labour costs (likely including maintenance and internal training costs). **Consequences of the intervention**: Savings per year were $2,847,066, which include medical care costs avoided, avoided loss in work time due to sick leave, productivity losses (averted) due to low-back pain and discomfort while at work (before intervention), and productivity enhancements due to intervention. **Results**: Net savings per year were $2,334,409, with savings per worker of $1,556. The benefit-to-cost ratio was 5.5 and the payback period was 3.3 months (all 2002 dollars).
Abrahamsson (2000) study quality: 3.3 participatory ergonomic program cost-benefit analysis	status quo	employer	cost-benefit analysis	value of absenteeism, production quality, and production efficiency	**Costs of the intervention:** The present value of costs was SEK 13,580,000 (Swedish Krona), which include investment (equipment) costs and consultant services. **Consequences of the intervention:** The present value of total savings over 10 years was SEK 25,633,000, which include improved production quality and efficiency, namely: fewer breakdowns, less slag handling, less returned steel, reduced maintenance and materials consumption, reduced need for manpower, as well as reduced absenteeism due to illness and occupational injury. **Results:** The Net Present Value was SEK 12,053,000. The internal interest rate (internal rate of return) was 36%, the pay-off time (payback period) was 2.2 years, while the profit (using the annuity method) was SEK 2,732,000.

Table 4 (continued): Manufacturing and Warehousing, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Ergonomic and Other MSK Injury Prevention Interventions (continued)					
Halpern (1997) study quality: 2.5 participatory ergonomic program partial economic analysis	status quo	employer	before-after comparison of workers' compensation expenses	workers' compensation expenses	**Costs of the intervention**: No intervention costs considered. **Consequences of the intervention**: Savings in workers' compensation expenses. **Results**: The number of employees at the plant over the study period rose from 514 to 700. 1) For sewing operations: workers' compensation expenses related to MSK disorders fell from $414,000 to $100,000, $54,000, and $11,000 respectively each year following the introduction of the intervention (overall decrease of 97%), while the per MSK claim expenses fell from $31,846 to $5,500 during the same period. 2) For all operations: total workers' compensation expenses decreased from $723,000 before the intervention to $420,000 in the third year of the intervention (overall decrease in total expenses of 42%), while workers' compensation expenses per claim fell from $6,821 to $3,281 (a 52% decrease).
Kemmlert (1996) radiator industry case study study quality: 2.2 ergonomic program cost-benefit analysis	status quo	employer	cost-benefit analysis	value of sick leave / absenteeism (and associated losses and expenses averted)	**Costs of the intervention**: Costs were $21,368 US (1988 dollars), which include equipment (machinery) costs and costs of internal consultations (internal staff time costs). **Consequences of the intervention**: Savings (benefits) for a one-year period were $57,938 US (1988 dollars), which include savings due to reduced sick leave and related reduced need for over-employment, productivity increases due to mechanization, reduction in insurance expenses due to reduced sick leave, and reduced turnover and lower related recruitment and training expenses. **Results**: The payback period was 4 months.
Kemmlert (1996) metal industry case study study quality: 2.2 ergonomic program cost-benefit analysis	status quo	employer	cost-benefit analysis	value of sick leave / absenteeism (and associated losses and expenses averted)	**Costs of the intervention:** Costs were $5,043 US (1988 dollars), which include equipment costs (trays, truck) and internal time costs of training for job rotation. **Consequences of the intervention: S**avings (benefits) for a one-year period were $20,208 US (1988 dollars), which include savings due to reduced sick leave and related reduced need for over-employment, reduction in insurance expenses due to reduced sick leave, and reduced turnover and lower related recruitment and training expenses. **Results:** The payback period was 3 months.

Table 4 (continued): Manufacturing and Warehousing, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Ergonomic and Other MSK Injury Prevention Interventions (continued)					
Moore (1998) study quality: 2.0 participatory ergonomic program partial economic analysis	status quo	employer	percentage change in workers' compensation expenses from baseline year	workers' compensation expenses	**Costs of the intervention**: No intervention costs considered. **Consequences of the intervention**: Savings in workers' compensation expenses. **Results**: 1) Following the introduction of intervention (1986), there was an 84% decrease in workers' compensation expenses between 1987 and 1993 (values adjusted for inflation). 2) Per capita workers' compensation expenses declined by 73% between 1987 and 1993 (per capita expenses not adjusted for inflation).
Ridyard (2000) study quality: 1.8 participatory ergonomic program partial economic analysis	status quo	employer	trends analysis of workers' compensation indemnity and medical expenses	workers' compensation expenses	**Costs of the intervention**: No intervention costs considered. **Consequences of the intervention**: Savings in workers' compensation expenses. **Results**: 1) Direct savings in workers' compensation indemnity and medical expenses for 1996: $76,330 in indemnity expenses and $30,000-$38,000 in medical expenses (total of $106,330-$114,330). 2) Direct savings in workers' compensation indemnity and medical expenses for 1997: $83,600 in indemnity expenses and $40,000-$45,000 in medical expenses (total of $123,600 to $182,600) 3) Indirect savings at 3 times direct gives a maximum total savings of $425,320 for 1996 and $515,320 for 1997.
Disability Management Interventions					
Hochanadel (1993) study quality: 2.9 disability management program cost-benefit analysis	status quo	employer	cost-benefit analysis	wage value of reduced disability time	**Costs of the intervention**: Costs over the 10-year period were $940,000, which include labour and fringe costs of staff in physical therapy clinics, as well as maintenance, operating costs, materials, and supplies. **Consequences of the intervention**: Total savings were $9.3M, which include treatment cost savings of $3.2M, evaluation cost savings of $0.5M, savings from reduced treatment time of $2.4M, and savings from reduced disability time of $3.2M. **Results**: Net savings were $8.3M. The benefit-to-cost ratio was 9:1.

Table 4 (continued): Manufacturing and Warehousing, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Disability Management Interventions (continued)					
Goodman (1992) study quality: 2.4 disability management program partial economic analysis	status quo	employer and worker	partial economic analysis	workers' compensation expenses per claim	**Costs of the intervention**: Unclear what is regarded cost and what is consequence. **Consequences of the intervention**: Unclear what is regarded cost and what is consequence. **Results**: 1) The cost per carpal tunnel release was $4,020.59 for individuals in the treatment group and $7,715.33 for individuals in the control group. The average time off work was shorter for the treatment group by 23.035 days, suggesting the incremental wage replacement cost of $1842.80 per average case in the control group before return to work. Therefore, the average cost of treatment/recovery before return to work in the control group is $9558.13, while in the treatment group it is $4020.59 (58% less than with traditional treatment). 2) The worker/patient is financially better off following the aggressive RTW program by getting higher income ($408.89 for the average 23.035-day earlier return to work), compared to patients in the control group who receive capped workers' compensation.
Perry (1996) study quality: 1.9 disability management program partial economic analysis	status quo	employer	before-after comparison of trends in temporary total disability payments and percentage change in workers' compensation expenses	temporary total disability payments (workers' compensation expenses)	**Costs of the intervention**: No intervention costs considered. **Consequences of the intervention**: Savings in temporary total disability and medical payments. **Results**: The temporary total disability (TTD) payment trend for fiscal years 1991 to 1994 showed a dramatic reduction in payments to injured workers. There was a 4% increase in TTD payment averages at the distribution centres from fiscal years 1991 to 1992. In 1993, the average TTD payment per claim decreased 19% compared to the 1991 value. In 1994, after REACH had been implemented at all four distribution centres, there was a 66% decrease from the fiscal year 1991 (wages for REACH participants were included in the TTD payment totals for the first year). With respect to workers' compensation expenses, the department store as a whole showed a reduction of 28%, compared to 59% at the distribution centres where REACH was in place.

Table 4 (continued): Manufacturing and Warehousing, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Multi-faceted and Other Interventions					
Kjellen (1997) study quality: 2.6 other: occupational health and safety management system cost-consequence analysis	status quo	employer	cost-consequence analysis / trends analysis	value of lost work hours (absenteeism), accidents, and reclaims	**Costs of the intervention**: Changes in safety, health and environment (SHE) costs per ton of aluminium produced in Norwegian Krone (NOK) (adjusted for inflation) relative to the 1985/86 average for 1989-1994 respectively were 66, 70, 50, 25, 11, and 24 (intervention introduced in 1989). These costs include hiring consultants to support the development of the SHE program, providing SHE courses for all personnel, courses for process operators, training emergency squad, personnel time for the SHE department and time of maintenance personnel, as well as equipment for the emergency squad. **Consequences of the intervention**: Changes in SHE-related losses/expenses (in inflation-adjusted NOK per ton of aluminium produced) relative to the 1985/86 average for 1989-1994 respectively were -50, -46, -57, -54, -64, and -58. Negative values represent savings and reflect decreases in lost-time injuries and their severity, sickness absenteeism, and number of reclaims. **Results**: 1) Over the 1985-1994 time period, there were substantial decreases in safety, health and environment (SHE) related losses/expenses, while expenditures on SHE activities (costs) have significantly increased. 2) The authors conclude that "Management's priorities of Internal Control (IC) have not paid back from a SHE perspective due to the low costs to the company of SHE-related losses" (small magnitude of SHE-related expenses). 3) Maintenance, personnel, and total operation costs (per ton of aluminium produced) in relation to the baseline level in 1985 have decreased over the ten-year period and some of this may be attributable to SHE.

Table 4 (continued): Manufacturing and Warehousing, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Multi-faceted and Other Interventions (continued)					
Lemstra (2003) study quality: 2.5 multiple: 1) work reorganization and ergonomic program, and disability management program; 2) disability management program partial economic analysis	occupational management protocol early intervention program status quo (standard care)	perspective unclear	comparison of workers' compensation expenses per 100,000 hours worked (for all time-loss claims, upper extremity and back time-loss claims before/after and between two companies with different interventions)	workers' compensation claim expenses (per 100,000 hours worked)	**Costs of the intervention**: No intervention costs considered. **Consequences of the intervention**: Savings in worker's compensation expenses: wage replacement and medical/rehabilitation compensation related to upper-extremity MSK disorders, back disorders, and all injury claims. **Results**: *Occupational management resulted in lower injury claim incidence, duration, and costs (all per 100,000 hours worked) than standard care, which, in turn, was superior to the early intervention program (on the same indicators).* 1) Occupational Management [OC] (company A in 2000) vs. Early Intervention Program [EIP] (company B in 2000): total workers' compensation expenses under OC were $6,028 vs. $120,459 under EIP; workers' compensation expenses for upper-extremity MSK injury claims under OC were $597 vs. $73,136 under EIP; workers' compensation expenses for back disorders under OC were $287 vs. $29,737 (all per 100,000 hours worked). 2) Occupational Management [OC] (company A in 2000) vs. Standard Care [SC] (company A in 1999): from 1999 to 2000, total time-loss workers' compensation expenses reduced from $25,878 to $6,028, upper-extremity time-loss expenses reduced from $15,777 to $597, and back time-loss expenses reduced from $8,713 to $287 per 100,000 hours worked. 3) Standard Care [SC] (company A in 1999) vs. Early Intervention Program [EIP] (company B in 1999): under SC total time-loss workers' compensation expenses were $25,878 vs. $133,902 under EIP, upper-extremity time-loss expenses were $15,777 vs. $80,816; back time-loss expenses were $8,713 vs. $12,296 (all per 100,000 hours worked).
Bunn (2001) study quality: 2.4 multiple: ergonomics, disability management, and health promotion program partial economic analysis	status quo (baseline level in 1996)	employer	trends analysis of per-employee workers' compensation, short-and long-term disability expenses	workers' compensation expenses per worker, long- and short-term disability expenses per worker	**Costs of the intervention**: No intervention costs considered. **Consequences of the intervention**: Savings in workers' compensation and disability expenses. **Results**: Workers' compensation expenses per worker were reduced from $687.60 (3-year average in 1996) to $596.30 in 1999. Long-term disability expenses per worker fell from $172.57 in 1996 to $135.46 in 1999. Short-term disability expenses per worker fell from $514.86 to $460.57 in 1999. Overall, an integrated Health, Safety, and Productivity strategy was reported to show at least a two-fold return on investment.

Table 4 (continued): Manufacturing and Warehousing, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Multi-faceted and Other Interventions (continued)					
Melhorn (1999) study quality: 2.3 other: program of risk assessment of new recruits cost-benefit analysis	status quo	employer	cost-benefit analysis	workers' compensation expenses	**Costs of the intervention**: Costs of the intervention per year were $76,118 ($304,470 over the 4 years). These costs include: costs of individual risk assessment ($122,928), costs of repeated assessments after transitional work ($29,679), costs of transitional work related to intervention protocols ($142,350), costs of educational classes and instructor ($2,028), and administrative costs related to managing the program, including physician and staff time ($7,485). **Consequences of the intervention**: Workers' compensation expenses per worker dropped to $356, $346, $258, and $252 between 1995 and 1998 (post-implementation years), respectively. Employer-estimated savings in direct workers' compensation expenses per year between 1995 and 1998 were $469,990, $678,337, $1,936,105, and $1,995,759, respectively. **Results**: Savings in workers' compensation expenses translate into a benefit-to-cost ratio of 6 in the first year (6:1), 9 in the second year (9:1), 25 in the third year (25:1), and 26 in the fourth year (26:1).

Appendix Q Tables for Mining and Oil and Gas Extraction

Table 1: Mining and Oil and Gas Extraction, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Ergonomic and Other MSK Injury Prevention Interventions					
Maniscalco (1999) study quality: 3.0 health promotion program cost-benefit analysis	high number of injuries	United States Louisiana	Mining and Oil and Gas Extraction offshore oil exploration job types: production operator and platform repairmen - mechanical, electrical, and automation	health promotion (primary prevention)	A wellness program was established with the goal of reducing the number of work-related injuries, especially back injuries. It focused on risk factors that might be modifiable through planned interventions: namely, nutrition and exercise. It included a health assessment, fitness programs, education programs, and incentives.
Disability Management Interventions					
Greenwood (1990) study quality: 3.0 disability management program cost-consequence analysis	high cost of injuries	United States West Virginia	Mining and Oil and Gas Extraction underground coal mining coal mine workers	disability management (secondary prevention)	Very Early Intervention (VEI), a form of a disability management program, consisting of health and psychosocial evaluation post-injury (8 days after injury) and recovery management / case management.
Ryan (1995) study quality: 1.9 disability management program partial economic analysis	high cost of injuries	Australia Queensland	Mining and Oil and Gas Extraction coal mines coal mine workers	disability management (secondary prevention)	The intervention had multiple components and consisted of education of the entire workforce, acute back care by first aid officers, early referral to a general practitioner and facilitation of early return to work as well as attention to psychosocial perceptions of the work environment.

Table 2: Mining and Oil and Gas Extraction, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude, if provided
Ergonomic and Other MSK Injury Prevention Interventions								
Maniscalco (1999) study quality: 3.0 health promotion program cost-benefit analysis	1992	63	147	before-after uncontrolled	before-after trends analysis, multiple regression used to test the statistical significance of observed differences in outcomes	1) frequency of times the wellness program was offered (every 12 vs. 18 months); 2) percentage of employees eligible for the program (100% prior to 1995, 50% from 1995 onwards); 3) introduction of mandatory participation in the Back Power program and nutrition counselling (1995)	no-lost workday injuries (back injuries and all injuries), lost workday injuries (back injuries and all injuries), first aid cases, and levels of cholesterol, nutrition and fitness	1) The number of back injuries decreased from an average of 5 to 6 per year pre-intervention to an average of 1 to 2 post-intervention (threefold decrease). 2) The total number of all injuries declined from 22 in 1990 (2 years before intervention) to 9 in 1997 (6 years post-intervention). 3) Lost workday injuries declined from an average of 7.2 per year over the 1986-1991 period to an average of 2.7 per year over the 1992-1997 period. No-lost workday injuries decreased 12-fold from a total of 36 cases in the 1986-1991 period to a total of 3 cases in the 1992-1997 period. 4) First aid cases fell from a total of 44 in the 6-year pre-intervention period to a total of 19 in the 6-year post-intervention period (2.3-fold reduction). 5) There were improvements in levels of cholesterol, nutrition and fitness post-intervention. 6) The annual rate of decrease in injury rates for the Offshore Business Unit was greater than that for the entire Amoco Corporation (though not statistically significant).
Disability Management Interventions								
Greenwood (1990) study quality: 3.0 disability management program cost-consequence analysis	1985	27	**Intervention group**: 117 **Control group**: 161	randomized controlled trial	before-after analysis testing between-group differences in outcomes: two-tailed Student t test used for disability days, disability benefits paid, medical benefits paid; permanent total disability awards and litigated cases reported as percentages; Chi-squared tests used on return-to-work and hospitalization rates	--	number of days off work, disability and medical benefits paid, number of permanent disability awards and litigated cases, number of claimants still off work at 18 months follow-up, and number of hospitalizations and operations	1) No statistically significant difference was found between the intervention and control groups in the number of days off work and disability benefits paid. Medical benefits paid were actually higher in the intervention group (significant at 10%), but this was driven by the incremental costs of the very early intervention program (VEI) (the significance of this difference disappears when the VEI costs are excluded). 2) The intervention group had fewer extreme (lengthy and expensive) cases than the control group (low statistical significance). The authors suggest this may be some indication that intervention is beneficial. 3) The number of permanent partial disability awards, the number of claimants still off work at 18 months follow-up, and the number of hospitalizations and operations were all similar (not statistically significantly different) between the two groups.

Table 2 (continued): Mining and Oil and Gas Extraction, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude if provided
Disability Management Interventions (continued)								
Ryan (1995) study quality: 1.9 disability management program partial economic analysis	1980	72	NA	post-only with control group	difference analysis, where nonparametric analysis was used to compare the differences in average expenses per claim and the number of claims between the two mines, and where life table analysis was used to evaluate time to return to work	--	claims per 100 workers, average workers' compensation claims expenses per year, number of days to return to work	1) The number of claims per 100 workers was significantly less (P<0.01) in the intervention site compared to control site (on a year-to-year basis over a 6-year period). 2) The median time to return to work after injury was 10 days, and no worker was off more than 60 days during the 6-year period (authors conclude "avoidance of chronicity"). 3) The authors report that in the intervention mine, one worker returned to work to lighter duties and that only six workers needed referral to an orthopedic surgeon.

Table 3: Mining and Oil and Gas Extraction, Economic Analysis (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other details		
Study reference	**Productivity changes**	**Insurance and health-care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Ergonomic and Other MSK Injury Prevention Interventions										
Maniscalco (1999) study quality: 3.0 health promotion program cost-benefit analysis	yes	yes	--	--	--	--	yes	--	--	--
Disability Management Interventions										
Greenwood (1990) study quality: 3.0 disability management program cost-consequence analysis	--	yes	--	--	yes	--	yes	--	--	--
Ryan (1995) study quality: 1.9 disability management program partial economic analysis	--	yes	--	--	--	--	--	--	--	--

Table 4: Mining and Oil and Gas Extraction, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Ergonomic and Other MSK Injury Prevention Interventions					
Maniscalco (1999) study quality: 3.0 health promotion program cost-benefit analysis	status quo (pre-intervention)	employer	cost-benefit analysis	expenses associated with lost days and back injuries (medical expenses and productivity losses)	**Costs of the intervention**: Direct program costs were $355,250 and "indirect costs" were $174,000 over 5 years (unclear what is included in these costs). **Consequences of the intervention**: The savings associated with the intervention include savings due to reduction in lost days and back injuries. The observed decrease in lost workday injuries associated with the wellness program was 9.5 lost workday injuries per year (1993 to 1997), which translates into savings of $1,330,000 for the 5-year period. Also, there was a 4.5 back injury decrease per year associated with the intervention, which translates into savings of $309,375 for the 5-year period. **Results**: Net savings due to reduction in lost workday injuries for the 5-year period (NPV without discounting) were $800,750 (or a return of $2.51 per dollar after program cost is recovered). Net savings due to reduction in back injuries for the 5-year period (NPV without discounting) were $167,085 (a return of $1.85 per dollar after program cost is recovered).
Disability Management Interventions					
Greenwood (1990) study quality: 3.0 disability management program cost-consequence analysis	status quo	system (state workers' compensation agency)	cost-consequence analysis: between-group comparison of disability benefits and medical care payments; cost of intervention considered separately	disability benefits and medical care payments	**Costs of the intervention**: The total costs were $49,505.03, which include costs of initial health and psychosocial assessment (by rehabilitation nurse), costs of travel for initial assessment, and costs of recovery management services. Specifically, the cost of initial evaluation per case including travel was $110 and the mean cost per case for recovery management services was $651.38. **Consequences of the intervention**: 1) No statistically significant difference found between the intervention and control groups in disability benefits paid. Medical benefits paid were actually higher in the intervention group (significant at 10%), but this is driven by the incremental costs of the Very Early Intervention program (the significance of the difference disappears when the VEI costs are excluded). 2) The intervention group had fewer extreme (lengthy and expensive) cases than the control group (low statistical significance). **Results**: Intervention was as costly as standard practice and was not more effective. The fact that the intervention group had fewer lengthy and expensive cases than the control group may indicate that the intervention was beneficial.
Ryan (1995) study quality: 1.9 disability management program partial economic analysis	status quo	employer	comparison (on annual basis) of average workers' compensation expenses per claim between the intervention and control mines	average workers' compensation expenses per claim (per year)	**Costs of the intervention**: No intervention costs considered. **Consequences of the intervention**: Savings obtained due to lower average expenses per claim in the intervention mine compared to the control mine. **Results**: The log mean expenses per claim were significantly lower in the intervention mine compared to control mine (P<0.01). For the control mine versus the intervention mine, the claim expenses were: $1412 vs. $295 (1981-82); $1546 vs. $450 (1982-83); $2941 vs. $492 (1983-84); $2009 vs. $572 (1984-85); and $2239 vs. $846 (1985-86).

Appendix R Tables for Multiple Sectors

Table 1: Multiple Sectors, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Ergonomic and Other MSK Injury Prevention Interventions					
Shi (1993) study quality: 2.4 multiple: back injury prevention program cost-benefit analysis	high injuries and high cost of injuries	United States California	Public Administration workers from four county government divisions (parks and recreation, public works, and two county hospitals)	multiple (primary prevention)	An integrated back injury program, which consisted of a combination of education, training, physical fitness activities and ergonomic improvements.
Disability Management Interventions					
Loisel (2002) study quality: 4.0 disability management program cost-benefit analysis cost-effectiveness analysis	high cost of injuries	Canada Quebec Sherbrooke	Multiple Sectors manufacturing, health care, service sector	disability management (secondary prevention)	four arms: 1) standard care 2) clinical intervention: clinical examination by a back medical specialist, participation in a back school after 8 weeks of absence from regular work, and, if necessary, a multidisciplinary work rehabilitation intervention after 12 weeks of absence from work 3) occupational intervention: visits to the study occupational medicine physician, and a participatory ergonomic intervention with the study ergonomist, the injured worker, his supervisor, and management and union representatives 4) Sherbrooke model intervention: clinical intervention combined with occupational intervention **(main intervention under consideration)**
Jensen (2005, 2001) study quality: 3.8 disability management program cost-benefit analysis	high number of injuries	Sweden	Multiple Sectors blue-collar and service/care workers	disability management (secondary prevention)	four arms: 1) behaviour-oriented physiotherapy (PT) aimed at enhancing physical functioning and facilitating a lasting behaviour change 2) cognitive behavioural therapy (CBT), aimed at improving the subjects' ability to manage pain and resume a normal level of activity 3) behavioural medicine (BM) rehabilitation consisting of behaviour-oriented physiotherapy and cognitive behavioural therapy 4) treatment-as-usual control group (CG)

Table 1 (continued): Multiple Sectors, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Disability Management Interventions (continued)					
Arnetz (2003) study quality: 3.7 disability management program cost-benefit analysis	multiple: high injuries and high cost of injuries	Sweden Skogas, Handen	Multiple Sectors various industries various occupations	disability management (secondary prevention)	A disability management program that includes early medical, rehabilitation and vocational interventions, as well as ergonomic improvements and adaptation of workplace conditions.
Karjalainen (2003, 2004) study quality: 3.5 disability management program cost-consequence analysis	multiple: high injuries and high cost of injuries	Finland Helsinki	Multiple Sectors blue and white collar industries blue-collar and service/care workers	disability management (secondary prevention)	Mini-intervention group (A) consisting of an interview with a physician specializing in physiatry -- aim of consultation was to reduce patients' concerns about their back pain by providing accurate information and to encourage physical activity. Mini-intervention and worksite visit group (B), latter consisting of a 75-minute visit to the worksite by the physiotherapist – the aim of the visit was to ensure that the patient had adapted to the information and practical instructions of appropriate ways of using the back at work, to involve the supervisor and company health-care professionals, and to encourage their cooperation. Usual care group (C), i.e., patients receiving treatment from general practitioners (GPs) in primary health care. Groups A and B underwent one assessment by a physician plus a physiotherapist. Group B received a worksite visit in addition. Group C served as controls and was treated in municipal primary health care. All patients received a leaflet on back pain.
Matheson (1997, 1995) study quality: 2.1 disability management program partial economic analysis	high cost of injuries	United States California	Multiple Sectors injured workers from various industries various occupations, with two largest groups being sheriff deputies and hotel housekeepers	disability management (secondary prevention)	The program uses a multidisciplinary team approach that focuses on immediate identification and treatment of soft-tissue injuries. At-home rest is avoided by the assignment of the patient to transitional light duty work, provided there is no medical contraindication. The patient participates in treatment during work hours. This model is based on the premise that workers' compensation medical care must be focused on return to work from the initial contact. Everything that can be done to maintain the injured worker within the work role and to avoid the patient role should be done.

Table 1 (continued): Multiple Sectors, Description of Intervention (clustered by type of intervention and sorted by quality score)

Health Promotion					
Wickizer (2004) study quality: 2.7 health promotion program cost-consequence analysis	systems level initiative	United States Washington State	Multiple Sectors (1) Agriculture, Forestry, and Fishing (2) Mining (3) Construction (4) Manufacturing (5) Transportation and Public Utilities (6) Wholesale and Retail Trade (7) Finance, Insurance, and Real Estate (8) Services	health promotion (primary prevention)	Introduction of the Washington Drug-Free Workplace Program, which consisted of: written workplace policy on substance use; employee assistance program for an approved provider list; paid drug testing pre-employment, post-accident and post-treatment; annual education program on substance abuse; minimum two hours of training for all supervisors and managers on substance abuse, treatment referral and drug testing.

Table 2: Multiple Sectors, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude, if provided
Ergonomic and Other MSK Injury Prevention Interventions								
Shi (1993) study quality: 2.4 multiple: back injury prevention program cost-benefit analysis	1989	12	205-267	randomized controlled	before-after comparison of back pain prevalence using chi-square analysis	--	back pain prevalence, health risk assessment	1) Overall modest decline in back pain prevalence. Daily pain and monthly pain numbers were not significant, but there was a significant decrease in annual back pain numbers, and an increase in no back pain numbers (1% level). 2) Numbers in high-risk category decreased, medium risk increased, and low risk decreases (1% level). Increase in medium-risk numbers was due to declines in high-risk numbers.
Disability Management Interventions								
Loisel (2002) study quality: 4.0 disability management program cost-benefit analysis cost-effectiveness analysis	1991	77	Sherbrooke model arm: 25; Occupational arm: 22; Clinical arm: 25 Standard care: 26	randomized controlled trial	difference in workers' compensation expenses and in days on full benefits because of back pain across the four arms	--	workers' compensation expenses and days on full benefits because of back pain	At 1 year follow-up, workers' compensation expenses (consequences of disease costs) were as follows: standard care arm: $7,133; clinical arm: $6,458; occupational arm: $6,529; and Sherbrooke arm: $6515. At mean follow-up of 6.4 years, workers' compensation expenses were as follows: standard care arm: $23,517; clinical arm: $10,045; occupational arm: $12,820; and Sherbrooke arm: $7,060. The differences between arms were not statistically significant. There were a few costly cases, and differences between arms in proportion of costly cases were statistically significant. At 1 year follow-up, the mean number of days on full benefits (DFB) because of back pain was as follows: standard care: 126.9; clinical arm: 114.9; occupational arm: 116.1; Sherbrooke arm: 115.9. At mean 6.4 years follow-up, the mean DFB was as follows: standard care: 418.3; clinical arm: 178.7; occupational arm: 228.0; Sherbrooke model: 125.6.

Table 2 (continued): Multiple Sectors, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude, if provided
Disability Management Interventions (continued)								
Jensen (2005, 2001) study quality: 3.8 disability management program cost-benefit analysis	NA	36	Per protocol sample sizes (does not include dropouts): behaviour-oriented physiotherapy (PT): 48; cognitive behavioural therapy (CBT): 41; fulltime behavioural medicine rehabilitation (BM): 49 Per protocol sample size: 'treatment-as-usual' control group (CG): 48	randomized controlled trial	Analysis of co-variance (ANCOVA) using a mixed model approach, Cox regression, and logistic regression was employed to evaluate effects of treatment on absence from work, full-time early retirement, and the SF-36 global score at the 3-year follow-up.	therapist compliance was monitored by checklists and telephone interviews with participants (95% of scheduled activities were completed and the booster sessions were BM (65%), PT (64%), CBT (65%); follow-up questionnaires were mailed to participants	absence from work, health-related quality of life, health-care utilization	1) Per protocol results for three-year follow-up for total absences from work (days on sick leave or disability pension) comparing each intervention with controls: Females: BM (-201.3, significant at 5%), PT (-57.1, not significant at 5% [ns]), CBT (-1.5, ns). Males: BM (-136.7, ns), PT (25.5, ns), CBT (55.6, ns). 2) Per protocol results for three-year follow-up for SF-36 global score (health-related quality of life) comparing each intervention with controls: Females: BM (8.8, significant at 5%), PT (2.4, ns), CBT (5.5, ns). Males not presented due to small sample size. 3) Women in the BM group returned to work faster compared to the CG group; a significantly faster rate of return to work was found in the per protocol analyses; no significant results were found for men (Cox regression results). 4) The risk of being granted full-time early retirement did not significantly differ between the groups (logistic regression results). 5) In health-care utilization, the BM group consulted physiotherapists less than the others (significant at 5%) and the control group consulted the social services less often than subjects in the intervention programs (significant at 5%), with no other significant differences between the groups.
Arnetz (2003) study quality: 3.7 disability management program cost-benefit analysis	NA	12	**Intervention group**: 65 **Control group**: 72	randomized controlled trial	difference between intervention and control group in mean sick days and number of reimbursed rehabilitation days (Student's t tests, Chi-squared tests); logistic regression analysis used to assess the likelihood of being off sick leave	proportion and speed of employers submitting rehabilitation investigations; proportion with appropriate work accommodation	sick days, likelihood of being off sick leave, number of reimbursed rehabilitation days	For the 0-6 month and 6-12 month period, the mean sick days were 110 and 95.8 for the intervention group and 131.1 and 150.3 for the reference group (difference is significant at 5% for 0-6month, and 1% for 6-12). For the entire 12-month period (12 months after initiation of the project), the total mean number of sick days for the intervention group was 144.9 days/person as compared to 197.9 days in the reference group (P<0.01). The odds ratio of being off sick leave after the initial 6 months (as compared to the reference group) was 1.9 (significant at 10%) and for the 12-month point was 2.5 (significant at 1%). There was no significant difference in the number of reimbursed rehabilitation days during 0-6 and 6-12 months and for the entire 12 months.

Table 2 (continued): Multiple Sectors, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude, if provided
Disability Management Interventions (continued)								
Karjalainen (2003, 2004) study quality: 3.5 disability management program cost-consequence analysis	NA	12	**Intervention group A** (mini intervention): 58 **Intervention group B** (work site visit group): 51 **Control group C**: 57	randomized controlled trial	modelling and difference analysis was used to test differences between groups in pain, disability, specific and generic health-related quality of life, satisfaction with care, days on sick leave, and use of health-care consumption	follow-up questionnaires	Pain, disability, specific and generic health-related quality of life, satisfaction with care, days on sick leave, and use of health care	During follow-up, fewer subjects had daily pain in Groups A and B than in Group C (Group A vs. Group C, P = 0.002; Group B vs. Group C, P = 0.030). In Group A, pain was less bothersome (Group A vs. Group C, P = 0.032; B vs. C, P=0.315) and interfered less with daily life (Group A vs. Group C, P = 0.039; B vs. C, P=0.088) than among controls. No statistically significant difference between the three treatment arms regarding intensity of pain, Oswestry disability index, or generic health-related quality of life. Average days on sick leave were 19 in Group A, 28 in Group B, and 41 in Group C (Group A vs. Group C, P = 0.019, B vs. C, P=0.128). The median sick leave was 0 days for the mini intervention group, 1 day for the work site visit group and 7 days for the usual care group (A vs. C, P=0.43; B vs. C, P=0.189). Treatment satisfaction was better in the intervention groups than among the controls (A vs. C, P=0.001; B vs. C, P<0.001).

Table 2 (continued): Multiple Sectors, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude, if provided
Disability Management Interventions (continued)								
Matheson (1997, 1995) study quality: 2.1 disability management program partial economic analysis	1992	43	281 (back injury study) 295 (all injuries study)	post-only one group design	description of outcomes across the group	no	days lost from work, health-care costs, return to work	Back Injury Group Study (followed for 43 months): 1) 281 cases studied-- of the 279 subjects who returned to work (2 of 281 retired), 94 missed no days from work and 86 returned to work in 3 days or less - i.e. 65% of subjects returned to work before wage-loss payments were scheduled to begin. The mean (SD) number of days lost for all injured workers was 8.8 (23.6) days. For those subjects who returned to work, 10% of the subjects accounted for 70% of the days lost. 2) Return-to-work indicator based on days from injury: two subjects retired from the workforce, of the remaining, 266 (95.3%) eventually returned to their prior jobs, eight (3.6%) returned to new jobs and five (1.8%) returned to modified work at the prior employer. Within 30 days, 94% of all subjects had returned to work. 3) Health-care costs (based on 121 cases): medical costs were much higher for the injured workers who lost 1 or more days from work. Mean (SD) medical case costs were $4,408 ($4,064) for this group compared with a mean (SD) of $2,459 ($2,712) for the 68 subjects on whom complete costs data were obtained who returned to work before losing a day. All Injury Group Study (followed for 1 year): 1) 295 cases studied. 2) Number of days lost: 225 missed no days from work, 32 returned to work in 2 days or less, mean (SD) days lost for all workers was 1.9 (6.6), for the 70 injured workers who lost at least 1 day the mean (SD) days lost was 8.0 (11.7). 2) Health-care costs (based on 294 cases): average cost was $2,330, 30 most costly cases accounted for 53%, 60 most costly cases for 73%.

Table 2 (continued): Multiple Sectors, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude, if provided
Health Promotion								
Wickizer (2004) study quality: 2.7 health promotion program cost-consequence analysis	1996	36	unknown (**Intervention group**: 261 *employers;* **Control group**: 20215 *employers*)	before-after with control	Difference-in-differences analysis and regression modelling on injury rates and lost-time injury rates per 100 FTEs.	mailed questionnaire and site visits revealed the great majority of employers fully implemented the program and complied with its requirements; qualitative information gathered through site visits suggests program may have helped change the culture in ways that promoted safety	injury rate per 100 FTEs (person-years), lost-time (four or more days) injury rate per 100 FTEs (person-years)	The drug-free workplace intervention was associated ($p < 0.05$) with a statistically significant decrease in injury rates for three industry groups: construction, manufacturing, and services. Also, the overall change was significant at 5%. The rate difference-in-differences was 4.78 for construction, 3.41 for manufacturing, and 7.11 for services; the overall change was 3.33. The intervention was associated ($p<0.05$) with a reduction in the incidence rate of more serious injuries involving four or more days of lost work time for two industry groups: construction and services, as well as for all industries (taken together). The rate difference-in-differences was 0.95 for construction and 2.51 for services, while the overall change was 0.92. Sensitivity analyses (modelling) supported these findings. The drug-free workplace program was associated with a selective, industry-specific preventive effect. The strongest evidence of an intervention effect was for the construction industry.

Table 3: Multiple Sectors, Economic Analysis (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other details		
Study reference	**Productivity changes**	**Insurance and health care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Ergonomic and Other MSK Injury Prevention Interventions										
Shi (1993) study quality: 2.4 multiple: back injury prevention program cost-benefit analysis	yes	yes	--	yes	yes	yes	yes	--	--	--
Disability Management Interventions										
Loisel (2002) study quality: 4.0 disability management program cost-benefit analysis cost-effectiveness analysis	--	yes	--	--	yes	yes	--	--	yes	yes
Jensen (2005) study quality: 3.8 disability management program cost-benefit analysis	yes	--	--	--	--	--	yes	--	--	--
Arnetz (2003) study quality: 3.7 disability management program cost-benefit analysis	--	yes	--	yes	yes	--	yes	NA	NA	--

Table 3 (continued): Multiple Sectors, Economic Analysis (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other details		
Study reference	**Productivity changes**	**Insurance and health-care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Disability Management Interventions (continued)										
Karjalainen (2003, 2004) study quality: 3.5 disability management program cost-consequence analysis	yes	yes	--	--	yes	--	--	NA	NA	--
Matheson (1997, 1995) study quality: 2.1 disability management program partial economic analysis	--	yes	--	--	--	--	--	--	yes (partly)	--
Health Promotion										
Wickizer (2004) study quality: 2.7 health promotion program cost-consequence analysis	--	yes	--	--	yes	--	--	--	--	yes

Table 4: Multiple Sectors, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Ergonomic and Other MSK Injury Prevention Interventions					
Shi (1993) study quality: 2.4 multiple: back injury prevention program cost-benefit analysis	status quo	employer	cost-benefit analysis	lost-time and medical expenses	**Costs of the intervention:** Costs were $90,000, which includes costs of outside consultants and providers who designed and implemented the program, and ergonomic spending related to ergonomic improvements ($60,000); wages of company staff involved in the program ($20,000); materials related to health promotion ($10,000) (USD). **Consequences of the intervention:** Savings were $251,108, which includes savings from fewer sick days ($137,760), and from the reduced medical expenses ($113,348) (USD). **Result:** The net present value was $161,108, and the return on investment was 179% ($161,108 divided by $90,000) (USD).

Table 4 (continued): Multiple Sectors, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Disability Management Interventions					
Loisel (2002) study quality: 4.0 disability management program cost-benefit analysis cost-effectiveness analysis	**Alternative A**: standard care **Alternative B**: clinical intervention **Alternative C**: occupational intervention	system (public workers' compensation insurer)	cost-benefit analysis cost-effectiveness analysis	workers' compensation expenses (per claim) and days on full benefits (natural units)	**Costs of the intervention**: Mean intervention costs at 1 year were $2,656 in the standard care arm, $5,580 in the clinical arm, $3,040 in the occupational arm, and $5,622 in the Sherbrooke arm, while total mean intervention costs at mean 6.4 years follow-up were $9,562 in the standard care arm, $6,857 in the clinical arm, $3,432 in the occupational arm, and $7,434 in the Sherbrooke arm (all in 1991 Canadian dollars). The costs include costs of health-care services, occupational medicine physician services, back pain specialist services, back school, rehabilitation, and ergonomist services, as well as time costs of employees spent in participatory ergonomic interventions. **Consequences of the intervention**: Workers' compensation income replacement expenses (cost-benefit analysis): At 1 year follow-up, mean income replacement expenses were $7,133 in the standard care arm, $6,458 in the clinical arm, $6,529 in the occupational arm, and $6,515 in the Sherbrooke arm. At mean 6.4 years follow-up, mean income replacement expenses were $23,517 in the standard care arm, $10,045 in the clinical arm, $12,820 in the occupational arm, and $7,060 in the Sherbrooke arm (all in 1991 Canadian dollars). Differences between arms were not statistically significant. Days on full benefits (cost-effectiveness analysis): At 1 year follow-up, the mean number of days on full benefits (DFB) was 126.9 in the standard care arm, 114.9 in the clinical arm (12.0 DFB saved compared to standard care), 116.1 in the occupational arm (10.8 DFB saved),115.9 in the Sherbrooke arm (11.0 DFB saved). At mean 6.4 years follow-up, the mean number of DFB was 418.3 in the standard care arm, 178.7 in the clinical arm (239.6 DFB saved compared to standard care), 228.0 in the occupational arm (190.3 DFB saved), and 125.6 in the Sherbrooke model (292.7 DFB saved). **Results**: Cost-benefit analysis: At 1 year follow-up the incremental net present value (NPV) per claim (compared to standard care arm) was (-$2,250) for the clinical arm, $220 for the occupational arm, and (-$2,348) for the Sherbrooke arm. At mean 6.4 years follow-up, the incremental NPV per claim (compared to standard care arm) was $16,176 for the clinical arm, $16,827 for the occupational arm, and $18,585 for the Sherbrooke arm (all amounts are per worker and in 1991 Canadian dollars). The differences between arms were not statistically significant. Cost-effectiveness analysis: At 1 year follow-up, the relative cost per DFB (compared to the standard care arm) was $187.40 per DFB saved for the clinical arm, (-$20.4) per DFB saved for occupational arm, and $213.50 per DFB saved for the Sherbrooke arm. At mean 6.4 years follow-up, the relative cost per DFB (compared to the standard care arm) was (-$67.50) per DFB saved for the clinical arm, (-$88.40) per DFB saved for the occupational arm, and (-$63.50) per DFB saved for the Sherbrooke arm (all in 1991 Canadian dollars).

Table 4 (continued): Multiple Sectors, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Disability Management Interventions (continued)					
Jensen (2005) study quality: 3.8 disability management program cost-benefit analysis	**Alternative A**: status quo - 'treatment-as-usual' (control group, CG) **Alternative B**: behaviour-oriented physiotherapy (PT) aimed at enhancing the physical functioning and facilitating a lasting behaviour change of the individual **Alternative C**: cognitive behavioural therapy (CBT) aimed at improving the subjects' ability to manage their pain and resume a normal level of activity **Alternative D**: full-time behavioural medicine (BM) rehabilitation, consisting of behaviour-oriented physiotherapy and cognitive behavioural therapy	societal	cost-benefit analysis	wage value of sick leave and disability pension	**Costs of the intervention**: Total intervention costs per patient were 1,862 Euros for BM, 1,000 for PT, and 1,179 for CBT. These include costs of each standardized rehabilitation program, including costs of physician, psychologist, fitness trainer, and secretary time. **Consequences of the intervention**: Total sick leave and disability pension expenses net of intervention costs per person for a 3-year period stratified by gender: BM expenses of 107,703 Euros for females and 130,015 for males; PT expenses of 189,760 for females and 220,268 for males; CBT expenses 157,800 for females and 199,824 for males; CG expenses of 245,212 for females and 193,239 for females. **Results**: The results reveal that compared to the control group, the full-time program (BM) is the most cost-effective program, since it decreased the sick leave and disability pension expenses by about 137,509 Euros per subject in the female group during the first 3 years after rehabilitation. Overall for women the expenses were reduced with treatment, the least reduction being in behaviour-oriented physiotherapy (PT) 54,452 Euros.
Arnetz (2003) study quality: 3.7 disability management program cost-benefit analysis	status quo	system (national insurance agency)	cost-benefit analysis	indemnity and medical care payments (total reimbursement payments)	**Costs of the intervention**: Direct costs of the intervention were 550,000 Skr [Swedish krona] ($91,700 USD) or 8,500 Skr ($1,410 USD) per person. These include purchase of tools, ergonomic improvements, cost of occupational therapist / ergonomist time, and costs of vocational and occupational training. **Consequences of the intervention**: Benefits in reduced reimbursement were 1,015,625 Skr ($169,325 USD) or 15,625 Skr ($2,605 USD) per person. **Results**: Direct savings (NPV) were 972,900 Skr ($162,150 USD) or 7,164 Skr ($1,195 USD) per case/person, with the (direct) benefit-to-cost ratio being 6.8.

Table 4 (continued): Multiple Sectors, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Disability Management Interventions (continued)					
Karjalainen (2003, 2004) study quality: 3.5 disability management program cost-consequence analysis	**Alternative A**: mini-intervention consisting of an interview with a physician specializing in physiatry **Alternative B**: mini-intervention and worksite visit group **Alternative C**: status quo - usual care group treatment by patients' GPs in primary health care	not clear	cost-consequence analysis	wage value of sick leave, direct health care expenses	**Costs of the intervention**: Cost of mini-intervention was $181 (1999 USD) and mini-intervention plus worksite visit was $250. These include: for mini-intervention – time cost of physician specializing in physiatry, cost of radiographs, and time cost of physiotherapist; for mini-intervention and worksite visit group – time cost of physician specializing in physiatry, cost of radiographs, time cost of physiotherapist, and time cost of worksite visit session for patient's work supervisor, company nurse, physiotherapist, and physician. The costs of diagnostic tests and radiologic examinations were significantly smaller in the worksite visit group than in the usual care group. **Consequences of the intervention**: The direct health-care expenses were $359 (1999 USD) less in the mini-intervention group and $163 (U.S.) less in the worksite visit group compared with controls, but these differences were not statistically significant. When adding expenses related to sick leave to the direct health-care expenses, total expenses were $3,552 (U.S.) less in the mini-intervention group and $2,927 (U.S.) less in the worksite visit group compared with the usual care group. **Result**: There were no statistically or clinically significant differences between the mini-intervention and the worksite visit groups with respect to clinical or economic outcomes.
Matheson (1997, 1995) study quality: 2.1 disability management program partial economic analysis	NA, post only one group design with comparison to external benchmarks, but no alternatives	not clear	comparison of average medical expenses per case in the return-to-work program under investigation to estimates of such expenses from external benchmarks (Liberty Mutual Insurance and the National Council on Compensation Insurance)	medical expenses	**Costs of the intervention**: No intervention costs considered. **Consequences of the intervention**: Back Injury Group Study (followed for 43 months): 1) Average per case medical expenses for back injuries under the Comprehensive Management Care (CMC) program were $3,346, which compares favourably to average medical expense estimates from Liberty Mutual Insurance of $3,757 (in 1992 dollars, adjusted for inflation). 2) Average per case expenses for lost-time back injuries under the CMC program was $4,408 compared to average for National Council on Compensation Insurance (NCCI) of $12,518 (in 1992 dollars adjusted for inflation). All Injury Group Study (followed for 1 year): 1) Average per case medical expenses for all injuries under the Comprehensive Management Care (CMC) program were $2,330, which compares favourably to average medical expense estimates from Liberty Mutual Insurance of $2,480 (in 1992 dollars, adjusted for inflation) [authors indicate a "savings of $151 per case"]. 2) Average expenses per case for all lost-time injuries under the CMC program were $4,701 compared to average for National Council on Compensation Insurance (NCCI) of $8,990 (in 1992 dollars adjusted for inflation). **Result**: Average per case medical expenses for back and for all injuries under the CMC compare favourably to those from Liberty Mutual Insurance. Average per case expenses for lost-time back injuries under the CMC compare favourably to the average estimate from the National Council on Compensation Insurance (authors indicate a "savings of ... $7,597 per back pain case" and "savings of $4,289 per lost day case overall").

Table 4 (continued): Multiple Sectors, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Health Promotion					
Wickizer (2004) study quality: 2.7 health promotion program cost-consequence analysis	status quo	employer	cost-consequence analysis	workers' compensation medical and disability (wage replacement) expenses	**Costs of the intervention**: Costs of drug testing (per drug-test cost of $50) and costs of employee assistance programs' (EAP) services (annual EAP cost of $20 per employee). **Consequences of the intervention**: For construction, manufacturing, and service industries the average (medical and disability) expenses per injury were $4,851, $2,228, and $3,222, respectively (1996 dollars). Given these expenses, the injury risk reduction associated with the drug-free workplace program for a company with 50 employees would generate estimated annual savings of approximately $11,600 for construction companies, $3,800 for manufacturing companies, and $11,450 for service companies. **Result**: The above figures (estimated annual savings) do not represent net savings because they do not account for the costs of drug testing or employee assistance programs' (EAP) services that the employer would pay. Depending upon the frequency of testing and the cost of EAP services, these gross savings figures could be reduced by $1,500 to $2,000 assuming a per drug-test cost of $50 and an annual EAP cost of $20 per employee.

Appendix S Tables for Public Administration

Table 1: Public Administration, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Ergonomic and Other MSK Injury Prevention Interventions					
Hilyer (1990) study quality: 2.4 multiple: health promotion program partial economic analysis	high number of injuries	United States Southeast	Public Administration firefighting municipal firefighters	multiple (primary prevention)	Introduction of a designated 30-minute exercise period and a formal 2-hour training session on flexibility exercises and flexibility testing for exercise leaders and alternates.
Brown (1992) study quality: 2.3 education program partial economic analysis	high number of injuries and high cost of injuries	United States	Public Administration municipal services street and sanitation (majority), police, parks and recreation, equipment management, buildings and inspection, and engineering	training (primary prevention)	Back school program consisting of 6 weeks of education and training.
Disability Management Interventions					
Karrholm (2006) study quality: 2.3 disability management program partial economic analysis	need for more effective return-to-work programs	Sweden Stockholm	Public Administration city municipality occupations not specified	disability management (secondary prevention)	Vocational rehabilitation program that included a one day course for the disabled worker's immediate superiors; a meeting with the rehabilitation team, the worker, the worker's immediate superior, a social insurance office representative, a representative from the employer's personnel department, a company physician, and a support person for the worker.
Dollard (1998) study quality: 1.5 multiple: health promotion program partial economic analysis	high number of injuries	Australia	Public Administration department for correctional services correctional officers	multiple (primary prevention)	Multifaceted intervention to reduce work stress that included: (1) job redesign; (2) enrichment of psychological health services; (3) training and education; (4) surveillance of psychological distress and risk factors; (5) implementation research and evaluation; (6) appointment of a safety consultant; (7) a health, safety and welfare incentive award; and (8) development of a stress management policy.

Table 2: Public Administration, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude if provided
Ergonomic and Other MSK Injury Prevention Interventions								
Hilyer (1990) study quality: 2.4 multiple: health promotion program partial economic analysis	Not stated	6	**Intervention group**: 218 **Control group**: 251	randomized controlled	use of ANCOVA to test the impact of the intervention on post-intervention flexibility	exercise physiologists visited experimental stations during exercise period in first 20 days of the intervention; exercise leaders were observed for delivery skills and rapport with their groups; when necessary, exercise leaders were given skill updates; monthly contact was made with the exercise leaders to identify problems and maintain the intervention	flexibility	1) The exercise intervention program significantly increased the overall flexibility of firefighters (1% level). 2) Pre-test flexibility scores for “sit and reach,” “shoulder flexion,” “shoulder extension” and “knee flexion” significantly contributed to overall flexibility (1% level), but not "twist and touch" or “knee extension.”
Brown (1992) study quality: 2.3 education program partial economic analysis	1987	6	**Intervention group**: 70 **Control group**: 70	before-after with control	before-after comparison of number of back injuries lost work time, lost-time costs, total costs, medical costs one-tailed analysis of covariance for the comparison of post-intervention differences between intervention and control paired t-tests for the comparison of the pre-post within-group change	--	number of back injuries, lost-work time, lost-time costs, total costs, medical costs	1) Post intervention differences in number of back injuries were significant (and lower) for the intervention group compared to the control group after control for pre-intervention numbers (5% level). 2) Post-intervention lost-work time, lost-time costs, and total costs were not significantly different for the intervention group compared to the control group after controlling for pre-intervention numbers (5% level). Medical costs were significantly lower for the intervention group but only at the 10% level. 3) Pre-post intervention differences were significant for the intervention group for number of injuries, lost-work time, lost-time costs, medical costs (1% level). Pre-post intervention differences were not significant the control group for the four outcome variables.

Table 2 (continued): Public Administration, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude, if provided
Disability Management Interventions								
Karrholm (2006) study quality: 2.3 disability management program partial economic analysis	2000	12	**Intervention group**: 64 **Control group**: 64	before-after with control	experimental matched-pairs design with before-after comparison of days per month on sick leave between intervention and control groups	--	days per month on sick leave	1) No significant difference found in days per month absent between intervention and control group for the first six months post-intervention. Pre-intervention days on sick leave for the two groups were similar. 2) Days per month absent were significantly lower for the subset with above median days of absence for workers in the intervention compared to the control group for the first six months post-intervention. Pre-intervention days on sick leave for the two groups were similar. 3) Comparison of days per month absent for the second 6 month period post-intervention of the entire group and group with above median days of absence were significantly lower than their matched control counterparts.
Multi-faceted Interventions								
Dollard (1998) study quality: 1.5 multiple: health promotion program partial economic analysis	1991	60	NA	before-after uncontrolled	before-after comparison of yearly trends of number and rate of workers' compensation claims	over 500 staff contacts in 12 months with staff councillor	number of workers' compensation claims for work stress; number of workers' compensation claims per 1,000 workers	Substantial reduction in stress claims over a seven-year period. Decrease from 80 claims (78 per 1,000 workers) in 1989/90 (year prior to the intervention) to 52 claims (42 per 1,000 workers) in 1995/96.

Table 3: Public Administration, Economic Analysis (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other details		
Study reference	**Productivity changes**	**Insurance and health-care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Ergonomic and Other MSK Injury Prevention Interventions										
Hilyer (1990) study quality: 2.4 multiple: health promotion program partial economic analysis	yes	yes	--	--	--	--	--	--	--	--
Brown (1992) study quality: 2.3 education program partial economic analysis	yes	yes	--	--	--	--	--	NA	NA	--
Disability Management Interventions										
Karrholm (2006) study quality: 2.3 disability management program partial economic analysis	yes	--	--	--	--	--	--	--	--	--
Multi-faceted Interventions										
Dollard (1998) study quality: 1.5 multiple: health promotion program partial economic analysis	--	yes	--	--	--	--	--	NA	--	--

Table 4: Public Administration, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Ergonomic and Other MSK Injury Prevention Interventions					
Hilyer (1990) study quality: 2.4 multiple: health promotion program partial economic analysis	status quo	employer	partial economic analysis, comparison of post-intervention workers' compensation expenses for the intervention and control groups	workers' compensation lost-time, medical, and total expenses	**Costs of the intervention:** No intervention costs considered. **Consequences of the intervention:** Savings in workers' compensation lost-time and medical expenses over the two years post-intervention. **Result:** Total workers' compensation expenses (medical and lost-time expenses) for the intervention group were $85,372, and for the control group were $235,131. Lost-time expenses were $45,597 and medical expenses $39,775 for the intervention group and $147,581 and $87,550 respectively for the control group. The difference in average total expenses per injury between the two groups was only significant at the 10% level. Average lost-time expenses per injury on their own were significantly different between the two groups (5% level); this was not the case for average medical expenses (USD).
Brown (1992) study quality: 2.3 education program partial economic analysis	status quo	system	partial economic analysis	lost-time, medical, and total expenses	**Costs of the intervention:** No intervention costs considered. **Consequences of the intervention:** Savings in lost time, medical, and total expenses. **Result:** In the six month post-intervention period, lost time, medical, and total expenses for the intervention group were $23,182.78, $24,086.93, and $47,269.71, respectively. For the control group they were $19,532.48, $33,829.96, and $53,362.44, respectively. The difference between the two groups was not significant for these expenses (5% level), though medical expenses were lower for the intervention group at the 10% level (AUD).

Table 4 (continued): Public Administration, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Disability Management Interventions					
Karrholm (2006) study quality: 2.3 disability management program partial economic analysis	status quo	societal	partial economic analysis	indirect expenses associated with lost-time	**Costs of the intervention:** No intervention costs considered. The authors assumed there was no intervention costs at the societal level since no extra funding was raised for the project. **Consequences of the intervention:** Savings in indirect expenses associated with lost-time/sick leave. **Result:** For the entire sample, the value of reduced days on sick leave was EURO 1,278.35 per month per person. For the sub-sample with sick days above the median this value was EURO 2,405.38 per month per person.
Multi-faceted Interventions					
Dollard (1998) study quality: 1.5 multiple: health promotion program partial economic analysis	status quo	employer	partial economic analysis	workers' compensation expenses	**Costs of the intervention:** No intervention costs considered. **Consequences of the intervention:** Savings in workers' compensation expenses. **Result:** Over a period of two years, savings in workers' compensation expenses were $ 2M (USD).

Appendix T Tables for Retail and Trade

Table 1: Retail and Trade, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Ergonomic and Other MSK Injury Prevention Interventions					
Banco (1997) study quality: 2.5 ergonomic program cost-benefit analysis	high number of injuries	United States Connecticut	Retail and Trade supermarket chain supermarket workers (grocery department, deli, general merchandise department)	ergonomics (primary prevention)	Three ergonomic interventions were implemented in 3 groups of stores: • Group A stores: new safety case cutters with education; • Group B stores: old cutters with education; • Group C stores: status quo, i.e., old cutters (control group)

Table 2: Retail and Trade, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude if provided
Ergonomic and Other MSK Injury Prevention Interventions								
Banco (1997) study quality: 2.5 ergonomic program cost-benefit analysis	1992	12	NA	randomized controlled trial	before-after comparison of annual cutting injury rates for the 3 groups	--	annual case cutter injury rate per 100,000 man-hours	The case cutter injury rate decreased by 3.5/100,000 man-hours in Group A stores (from 4.7 to 1.2), compared to a reduction of 1.5/100,000 in Group B stores (from 3.3 to 1.8), and a reduction of 1.6/100,000 man-hours in Group C control stores (from 3.6 to 2.0). There was a marked reduction in compensation-related injuries in Group A stores.

Table 3: Retail and Trade, Economic Analysis (part 1) (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other details		
Study reference	**Productivity changes**	**Insurance and health-care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Ergonomic and Other MSK Injury Prevention Interventions										
Banco (1997) study quality: 2.5 ergonomic program cost-benefit analysis	yes	yes	--	--	--	yes	yes	--	--	--

Table 4: Retail and Trade, Economic Analysis (part 2) (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Ergonomic and Other MSK Injury Prevention Interventions					
Banco (1997) study quality: 2.5 ergonomic program cost-benefit analysis	**Alternative A**: new safety cutters with education **Alternative B**: old cutters with education **Alternative C**: status quo (old cutters)	employer	cost-benefit analysis	wage value of time-loss from work due to injury, workers' compensation (indemnity and medical care) expenses	**Costs of the intervention**: Costs include education costs (health educator's time spent in training employees) at $20.00/hr and new case cutters at a cost of $2.35/unit. **Consequences of the intervention**: Savings obtained due to reduction in time lost due to injury (using assumption 3 hrs lost if less than 1 day off from work, and 8 hours lost for a day lost from work) valued at a wage of $6.00/hr. Workers' compensation expenses (indemnity and medical care) were $317.00 for group A stores and $188.00 for group B stores. **Results**: Estimated savings for Group A stores were $245 per year per store and $29,413 per year for the chain when compared to the status quo (Group C stores). Benefits for Group B stores were less dramatic and totalled $106 per 100,000 man-hours per store, with total net savings of $12,773 for the chain.

Appendix U Tables for Transportation

Table 1: Transportation, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Ergonomic and Other MSK Injury Prevention Interventions					
Daltroy (1997) study quality: 3.6 education program partial economic evaluation	high number of injuries and high costs of injuries	United States Massachusetts Boston	Transportation and Warehousing mail processing facilities (postal service) mail handlers (incl. maintenance workers) and clerks	education (primary)	Back school program consisting of two training sessions. The program included principles of back safety; correct lifting and handling; posture exercises and pain management. The therapists (instructors) also examined each workstation and suggested physical and procedural modifications. The therapists provided additional reinforcement training six months after the first sessions and yearly thereafter.
Versloot (1992) study quality: 3.4 education program cost-benefit analysis	high number of injuries	The Netherlands	Transportation and Warehousing bus company bus drivers	education (primary)	Back school program consisting of three training sessions. The first session covered topics such as motivation; responsibility for one's own health; mind-body interactions in relation to illness; stress, coping strategies and relaxation training; and body mechanics including sports, working posture, and seat adjustment. The second and third sessions reviewed participants' experiences since the first session and included a summary of the first session.
Tuchin (1998) study quality: 2.8 education program cost-consequence analysis	high number of injuries and high costs of injuries	Australia New South Wales Sydney (suburbs)	Transportation and Warehousing large mailing house (postal service)	education (primary)	A comprehensive lecture of approximately 120 minutes covered topics such as spinal anatomy; pain-sensitive structures; causes of back pain and injury; types of back injuries; spinal biomechanics; correct lifting techniques; methods of care for back problems; effective exercises; analysis and explanation of ergonomics; relationship of back pain to occupation and tasks involved; and effects of static posture. Prior to giving lecture, a tour of the workplace was undertaken so that potential problem areas could be identified and brought to the workers' attention during the lecture.

Table 2: Transportation, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude if provided
Ergonomic and Other MSK Injury Prevention Interventions								
Daltroy (1997) study quality: 3.6 education program partial economic evaluation	1985	65	**Intervention group:** 1,703 **Control group:** 1,849	randomized controlled (not blinded)	1) extended log-linear models used to compare rates of low-back injury and rates of other MSK injuries (related to lifting and handling); 2) survival analyses to model time off work per injury and time until further injury.	attendance at training sessions was mandatory for workers and supervisors in the intervention group; number/percentage of people who actually received training, number of training sessions and reinforcement contacts by physical therapists was noted; there was an undocumented amount of reinforcement by line supervisors	rate of low back and other MSK injury; time off work; likelihood of repeated injury	1) Rate of injury was not significantly different between intervention and control groups, or between trained workers and untrained workers. 2) Rate of major lifting and handling injuries was not significantly different between intervention and control groups, or between trained and untrained workers. 3) Rate of other MSK injury was not significantly different between the intervention and control groups. 4) There was little difference in the proportions of total injuries that resulted in lost workdays in the intervention group (61%) and the control group (56%); 5) Survival analyses of time until return to work showed no significant difference between the intervention and control groups or with training before injury. 6) The intervention group assignment to training or no training after injury (or whether the subject was actually trained) had no significant effect on the likelihood of repeated injury.

Table 2 (continued): Transportation, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude if provided
Ergonomic and Other MSK Injury Prevention Interventions (continued)								
Versloot (1992) study quality: 3.4 education program cost-benefit analysis	1986	48	**Intervention group:** 166 **Control group:** 300	randomized controlled (not blinded)	use of MANOVA to analyze differences between and within groups; use of ANCOVA to correct for initial differences between the groups; Chi-square analysis used to compare pre-program status of the two groups	From the initial 200 individuals who attended the 1st session, 166 attended the second session (34 lost to follow-up), and only 108 attended all three sessions; a post-training survey was given to the intervention group at the end of session 3 to assess the quality and perceived effects of the back school program	number and length of absenteeism events	1) The cumulative 50% level of absenteeism decreased for the intervention group (from <26 to <16 days) and remained steady for the control group (from <16 to <17 days). The statistical significance for this outcome was not estimated. 2) The intervention group experienced a decrease in average length of absenteeism from 58.8 days in the before period to 49.3 days in the after period, whereas the control group experienced an increased over the same time frame (from 56.9 to 59.9). The between group difference was significant only at the 10% level. 3) There was no change in short absenteeism (1-8 days) in the intervention group, whereas the control group experienced a significant decrease, but the between-group difference was not significant. 4) There was a significant decrease in intermediate absenteeism (8-43 days) in the intervention group from 26.7 days before to 20.4 days after the training, and no change in the control group; the between-group difference was not significant. 5) There was no significant within-group change in long absenteeism (more than 42 days) for the intervention or control groups. Between-group differences were significant only at the 10% level, indicating a trend to decrease long absenteeism in the control group compared to intervention group, after intervention.

Table 2 (continued): Transportation, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude, if provided
Ergonomic and Other MSK Injury Prevention Interventions (continued)								
Tuchin (1998) study quality: 2.8 education program cost-consequence analysis	NA	6	**Intervention group:** 34 **Control group:** 27 in the control group and 60 in the non-intervention group	randomized controlled (not blinded)	use of ANOVA and paired t-tests to compare the number of injuries and days lost due to injury for each group	--	days lost due to injury; Oswestry score for pain and disability; average expense of days lost per worker	1) Days lost per worker due to injury decreased from 4.5 days 6-month pre-intervention, to 1.9 days 3-month post-intervention, to 2.69 days 6-month post-intervention for the intervention group. There was no (substantial) decrease observed in the control or non-intervention groups. 2) Days lost due to injury in the intervention group decreased to 43% of pre-intervention level at 3 months post-intervention and then to 60% at 6 months post-intervention (5% level). There was no significant change in the control and non-intervention groups. 3) Oswestry scores decreased (i.e. improved) in the intervention group relative to the control and non-intervention groups. These changes were statistically significant (5% level). 4) Average expense of days lost per worker decreased from $451 to $194 at the 3-month period, and increased to $269 at the 6-month period in the intervention group. For the control group it changed from $396 to $409, and then to $382 in the respective time periods. For the non-intervention group it changed from $420 to $472, and then to $422.50 in the respective time periods. The intervention changes were not significant. Intervention group values post intervention were not significantly different from the control group values but were significantly different from the non-intervention group values at 3 months post-intervention (5% level).

Table 3: Transportation, Economic Analysis (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other details		
Study reference	**Productivity changes**	**Insurance and health care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Ergonomic and Other MSK Injury Prevention Interventions										
Daltroy (1997) study quality: 3.6 education program partial economic evaluation	yes	yes	--	--	--	--	--	--	--	**--**
Versloot (1992) study quality: 3.4 education program cost-benefit analysis	yes	--	--	--	--	yes	yes	--	--	yes
Tuchin (1998) study quality: 2.8 education program cost-consequence analysis	yes	--	--	--	yes	yes	--	NA	NA	--

Table 4: Transportation, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Ergonomic and Other MSK Injury Prevention Interventions					
Daltroy (1997) study quality: 3.6 education program partial economic evaluation	status quo	employer	total expenses per back injury claim compared using the Wilcoxon rank-sum statistic	back injury expenses	**Costs of the intervention:** No intervention costs considered. **Consequences of the intervention**: Savings in back injury expenses considered. **Result**: The effectiveness of the intervention was not established, though descriptive statistics of expenses were presented. The median total expenses per back injury were $309 for the intervention group, and $103 for the control group (USD). Group assignment (intervention or control) and training status were not significantly associated with cost. Workers with a history of low-back injury had higher median total expenses, medical expenses and personnel-replacement expenses than did workers without such a history.
Versloot (1992) study quality: 3.4 education program cost-benefit analysis	status quo	employer	net present value	absenteeism expenses	**Costs of the intervention:** Costs were $46,000 ($230 per worker x 200 workers); this includes costs with training (per employee) and costs of wages due to lost working hours (per employee) (USD). **Consequences of the intervention**: 1) Average length of absenteeism per worker decreased by 6.5 days per year based on changes between the intervention and control groups. Savings were $900 per worker ($140 per day), for a total savings of $149,400 across 166 workers. 2) Average length of absenteeism per worker decreased by 5 days per year based on changes within the intervention group. Savings were $700 per worker ($140 per day), for a total savings of $116,200 across 166 workers (USD). **Result**: If the change in absenteeism for the intervention group is assessed in relation to the change in the control group, then the net present value is $103,400. If the change in absenteeism is assessed only within the intervention group, then the net present value is $70,200 (USD).

Table 4 (continued): Transportation, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Ergonomic and Other MSK Injury Prevention Interventions (continued)					
Tuchin (1998) study quality: 2.8 education program cost-consequence analysis	**Alternative A:** status quo (non-intervention group) **Alternative B:** intervention of lower intensity (instructed to perform a series of daily exercises, but did not receive any educational classes) (control group)	employer	costs and consequences considered separately	absenteeism expenses	**Costs of the intervention**: Costs were $71 per worker, which includes training costs and worker time cost for training. Total costs for the 281 workers were $19,880. **Consequences of the intervention**: Savings were $257 per worker, based on a decrease in absence expenses of $451 pre-intervention to $194 post-intervention. Total savings for the 281 workers were $71,960. **Result**: Though costs and consequences were only considered separately, the implied net present value was $52,080. The authors mentioned that the saving could be in excess of $50,000 for a three-month period.

Appendix V Tables for Utilities

Table 1: Utilities, Description of Intervention (clustered by type of intervention and sorted by quality score)

Study reference	Motivation	Location	Industry details	Type of intervention	Description of intervention
Disability Management Interventions					
Wiesel (1994) study quality: 2.5 disability management program partial economic analysis	high number of injuries and high cost of injuries	United States	Utilities public utility company 65% of blue collar workers and 35% white collar workers	disability management (secondary prevention)	An intervention consisting of an injury surveillance system with the use of quality-based standardized diagnostic and treatment protocols. All occupational injuries were to be reported within 24 months; workers were examined at a central medical facility as soon as it was practical, and data on the injury was added to the computerized database. Based on clinical data, a diagnosis was obtained and a course of management was recommended according to the standardized diagnostic and treatment algorithm specific to the injury's anatomic region. Time-loss injuries were reviewed on a weekly basis during the acute phase.

Table 2: Utilities, Effectiveness Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Start year	Exposure duration in months	Number of workers	Study design	Details of analysis	Information on uptake/ involvement	Effectiveness outcome measure	Observed effect including magnitude if provided
Disability Management Interventions								
Wiesel (1994) study quality: 2.5 disability management program partial economic analysis	1982	108	NA	before-after uncontrolled	before-after comparison of MSK injuries (comparison between the year prior to intervention with the nine-year average after the intervention)	--	MSK injuries (low-back and knee), time-loss and light duty days	Low-back injuries: 1) The number of new back injuries reported fell by 51% (decrease from 59 new injuries per year in index year to an average of 29 in the 1982-1990 period). 2) The number of days lost due to low-back injury fell by 55% (decrease from 3,701 lost days per year to an average of 1,684 in the 1982-1990 period). 2) The average time lost per back injury dropped by 40% (decrease from 28 days to 17 days lost per back injury). 3) The number of surgeries performed decreased by 67% and the operative success rate increased dramatically (decrease from 9 to 3 surgeries per year). 4) Return to work after surgery increased from 56% to 90% (a 34% increase). Knee injuries: 1) The number of new injuries decreased from 21 to 8 (a 62% decrease). 2) The number of days lost due to knee injury decreased from 1,614 to 680 (a 42% decrease). 3) The number of days lost per injury decreased from 40 to 29 (a 28% decrease).

Table 3: Utilities, Economic Analysis (clustered by type of intervention and sorted by quality score)

	Monetary consequences			Monetary costs				Other Details		
Study reference	**Productivity changes**	**Insurance and health care savings**	**Other**	**Capital equipment expenditures**	**External services**	**Internal staff time**	**Other**	**Discounting**	**CPI adjustment**	**Sensitivity analysis**
Disability Management Interventions										
Wiesel (1994) study quality: 2.5 disability management program partial economic analysis	yes	--	--	--	--	--	--	--	yes	--

Table 4: Utilities, Economic Analysis (clustered by type of intervention and sorted by quality score)

Study reference	Alternatives considered	Perspective of analysis	Details of analysis	Outcome(s) used in economic analysis	Description of economic analysis results
Disability Management Interventions					
Wiesel (1994) study quality: 2.5 disability management program partial economic analysis	status quo	employer	relative cost savings for each year were obtained by calculating the difference in cost from the control (pre-intervention) year and aggregated (post-intervention) years	time-loss expenditures (cost with lost time and light duty)	**Costs of the intervention:** No intervention costs were considered. **Consequences of the intervention:** Savings with time-loss expenditures. **Result:** For low-back injuries, savings from lost time and light duty for the ten-year period were $2,655,728 (average savings were 59% compared to index year). For knee injuries savings were $1,369,803 (average savings of 65%). Total savings for low-back and knee injuries were more than $4M dollars. All other MSK injuries were shown to have decreased, resulting in a cumulative 10-year savings of more than $4.1M (1990 USD).