

# Ergonomics Intervention Cost-Benefit Calculator

*Cost justifying an ergonomics project pre-intervention*  
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[www.Lni.wa.gov/Safety](http://www.Lni.wa.gov/Safety)



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# Outline

- The business case for ergonomics
- Using case studies to create a cost-benefit model
- A quick guide to the Washington State cost-benefit calculator
- Other (very similar) cost-benefit models

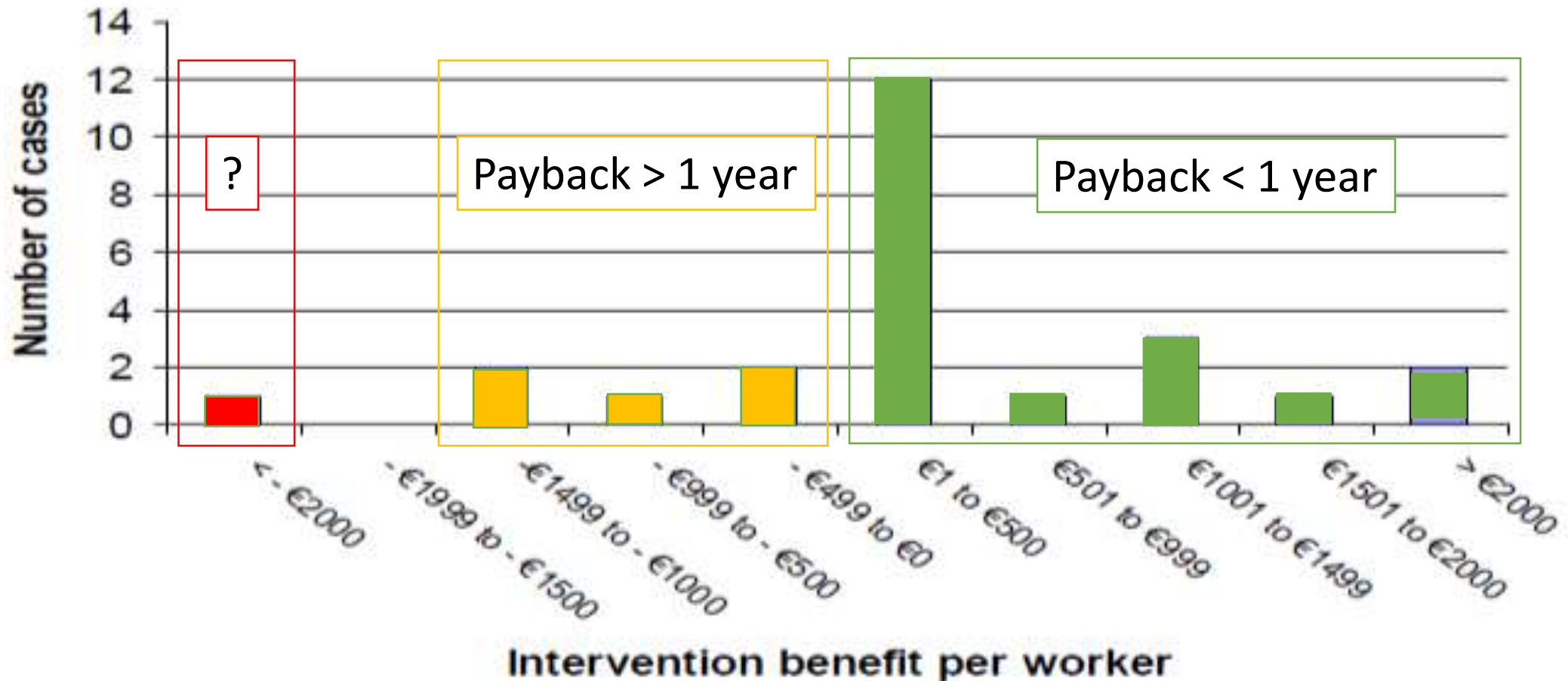
# Tompa, et al. (2007): Systematic review of OHS interventions with economic evaluations

## Evidence of cost-effectiveness

Strong evidence	Moderate evidence	Insufficient evidence
Manufacturing and Warehousing (9 studies)	Offices (8 studies) Healthcare (11 studies) Transportation (3 studies)	All other industry sectors

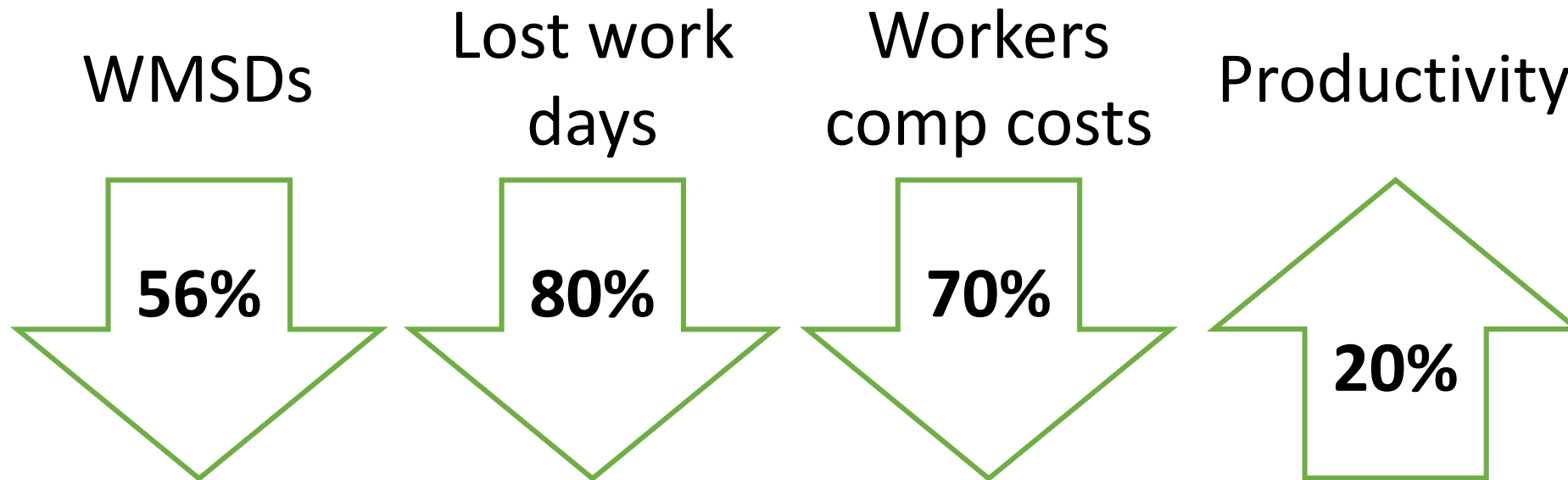
# Verbeek, et al. (2009): Systematic review of occupational safety and health business cases

Median net value of benefits in first year = €214 (\$238) per worker



# Goggins, R., et al.(2008). Estimating the effectiveness of ergonomics interventions through case studies: implications for predictive cost-benefit analysis

Median benefits of ergonomics:



Most payback periods less than one year

**Injury Costs**

**Indirect Costs**

**Inefficient  
work process**



**Ergonomic Intervention: X% effective**



**Reduced Injuries & Costs**

**Increased  
Productivity**

# How effective were different types of interventions?



Removal

Changing the job to remove all or most of the danger is **60-100% Effective**.

*Examples*

- Automate hazardous part of job
- Mechanize lifting (hoist, vacuum lift, patient lift)



Time

Decreasing the amount of time spent doing the task is **20-40% Effective**.

*Examples*

- Rotation to tasks without the hazard
- Process redesign to reduce duration of hazardous task



Exposure Level

Reducing the exposure somewhat is **40-60% Effective**.

*Examples*

- Reduce weight of items handled
- Lower vibration tools



Behavior

Relying on people's actions alone is only **10-20% Effective**.

*Examples*

- Lifting techniques training
- Team lifting (get help if it seems too heavy)

# Benefit values chosen for calculator

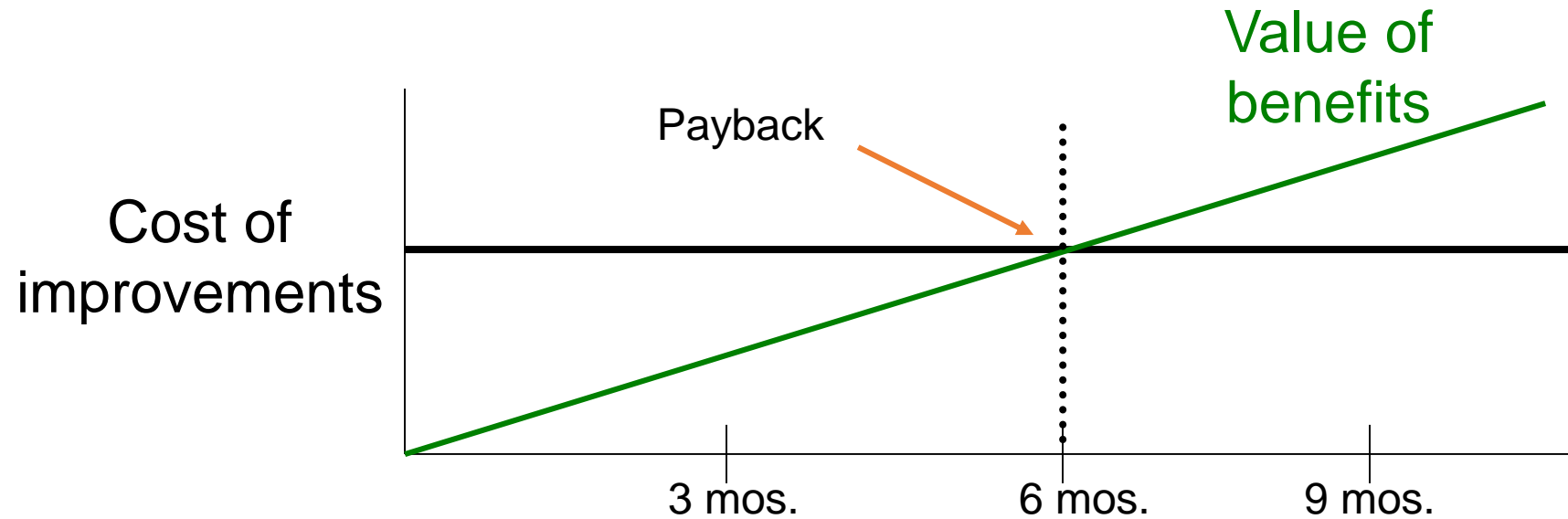
Solution Effectiveness Estimates	
Type of Solution	Reduction in Claims
Eliminates exposure	70%
Reduces level of exposure	40%
Reduces time of exposure	15%
Relies on behavior	10%

Productivity Improvement Estimates	
Level of Increase	Percent Increase
High – speeds up process	10%
Medium – reduces wasted motion	5%
Low – improves comfort/fatigue	2.5%



# Calculator Output: Payback Period

Time required for accrued benefits to equal cost of initial investment



# How to Use the Calculator



<https://www.pshfes.org/cost-calculator>

# Case Study: Pallet Wrapping



Thanks to Jeff Tiedeman, CSP, CIE, ARM, State  
Compensation Insurance Fund of California

# Current state

- 2 workers wrap pallets
- Pay rate: \$30/hr.
- ~13,000 pallets/yr. @ 3.5 minutes per pallet
- Injuries over the past 3 years:
  - Last year: 1 back strain
  - The year before: None
  - The year before that: 1 shoulder strain



# Proposed solution

- Semi-automatic pallet wrapper
- Costs:
  - Purchase - \$11,000
  - Pre-stretch module - \$2,000
  - Shipping and installation - \$3,000
  - Training - \$120
  - Energy use and maintenance - \$2,000 annually
- Benefits:
  - Eliminates most of the risk
  - Time to wrap each pallet drops from 3.5 minutes to 1 minute
  - Pre-stretch module saves \$6,000 per year in stretch wrap costs



## Alternate solution

- Stretch wrap dispenser
- Cost: \$600 each, delivered
- No installation, minimal training costs



Number of employees in this job/dept./org.:   
Average hourly salary for these employees:  per hour

Enter # of workers that will benefit and their hourly salary

Number of WMSD claims for this job/ dept./ org. per year:

This past year:

Type	Back strain	▼	Number	<input type="text" value="1"/>
Type	Back strain	▼	Number	<input type="text"/>
Type	Back strain	▼	Number	<input type="text"/>
Type	Back strain	▼	Number	<input type="text"/>
Type	Back strain	▼	Number	<input type="text"/>

Typical costs: \$ 16,384

\$ -

\$ -

\$ -

\$ -

Total costs for year: \$ 16,384

The year before:

Type	Back strain	▼	Number	<input type="text"/>
Type	Back strain	▼	Number	<input type="text"/>
Type	Back strain	▼	Number	<input type="text"/>
Type	Back strain	▼	Number	<input type="text"/>
Type	Back strain	▼	Number	<input type="text"/>

Typical costs: \$ -

\$ -

\$ -

\$ -

\$ -

Total costs for year: \$ -

2 years before:

Type	Shoulder strain	▼	Number	<input type="text" value="1"/>
Type	Back strain	▼	Number	<input type="text"/>
Type	Back strain	▼	Number	<input type="text"/>
Type	Back strain	▼	Number	<input type="text"/>
Type	Back strain	▼	Number	<input type="text"/>

Typical costs: \$ 26,001

\$ -

Total costs for year: \$ 26,001

Average annual WMSD claim costs: \$ 14,128

Estimated annual indirect costs: \$ 15,541

Select injury type and enter the number of that type in each year

Direct and indirect costs will automatically populate



Add costs for  
up to 3 options

**Option 1:**

Purchase cost:

Engineering cost:

Training cost:

Recurring costs:

Other costs of change:

Total cost of intervention: \$ 18,120

**Option 2:**

Purchase cost:

Engineering cost:

Training cost:

Recurring costs:

Other costs of change:

Total cost of intervention: \$ 625

**Option 3:**

Purchase cost:

Engineering cost:

Training cost:

Recurring costs:

Other costs of change:

Total cost of intervention: \$ -

**Effectiveness of solution:**

- ☒ Eliminates exposure to hazard
- ☐ Reduces level of exposure
- ☐ Reduces time of exposure
- ☐ Relies on employee behavior
- ☐ No reduction in injuries expected

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- ☐ Reduces time of exposure
- ☐ Relies on employee behavior
- ☒ No reduction in injuries expected

Select the appropriate  
effectiveness category

**Productivity Improvements:**

- ☐ High - speeds up entire process
- ☒ Medium - reduces wasted motion
- ☐ Low - improves comfort/reduces fatigue
- ☐ No productivity gains expected

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Estimate the impact  
on productivity



Benefits from reduced claims costs and increased productivity are automatically calculated

### Estimated benefits for solution options

Option 1 Semi automatic		
Reduction in claims:		70%
Reduction in workers' comp costs:	\$	9,890
Reduction in indirect costs:	\$	10,879
Increase in productivity:		5.0%
Productivity value:	\$	5,100
Other estimated savings:	\$	6,000
Total estimated annual savings:	\$	31,869
Total estimated savings over 3 years:	\$	95,606
Total estimated savings over 5 years:	\$	159,344

Option 2 Dispenser		
Reduction in claims:		40%
Reduction in workers' comp costs:	\$	5,651
Reduction in indirect costs:	\$	6,216
Increase in productivity:		2.5%
Productivity value:	\$	2,550
Other estimated savings:		
Total estimated annual savings:	\$	14,418
Total estimated savings over 3 years:	\$	43,253
Total estimated savings over 5 years:	\$	72,089

Option 3 Do nothing		
Reduction in claims:		0%
Reduction in workers' comp costs:	\$	-
Reduction in indirect costs:	\$	-
Increase in productivity:		0.0%
Productivity value:	\$	-
Other estimated savings:		
Total estimated annual savings:	\$	-
Total estimated savings over 3 years:	\$	-
Total estimated savings over 5 years:	\$	-

Savings in stretch wrap costs added here

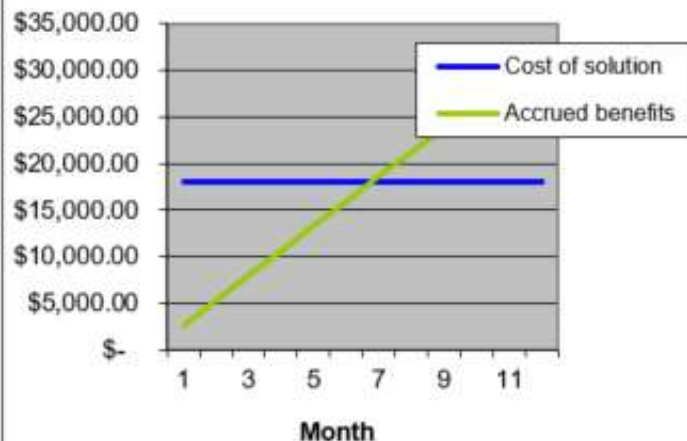
Estimated savings are added up for 5 years, assuming the solution lasts that long

## Payback Period

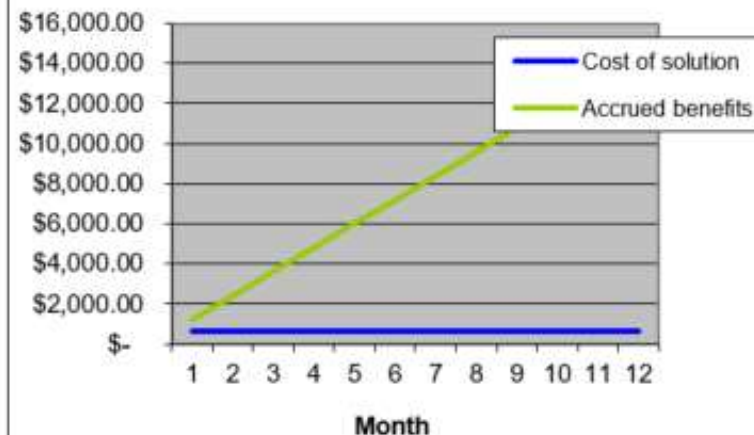
	Option 1	Semi automatic	Option 2	Dispenser	Option 3	Do nothing
Total first-year cost of control:	\$	18,120	\$	625	\$	-
Annually recurring costs:	\$	2,000	\$	-	\$	-
Estimated annual benefits:	\$	31,869	\$	14,418	\$	-
Estimated payback period:		0.57 years		0.04 years		
Estimated net benefits after one year:	\$	13,749	\$	13,793	\$	-
Estimated net benefits after 3 years:	\$	73,486	\$	42,628	\$	-
Estimated net benefits after 5 years:	\$	133,224	\$	71,464	\$	-

Payback periods are automatically calculated

Option 1 payback period



Option 2 payback period



Option 3 payback period



Feel free to change to prettier graphs

# **Other Ergonomics CBA Models**

# Ohio Calculator

[illegible]

<https://www.ohio.edu/engineering/safety-training>

# Ontario Cost Benefit Calculator

Select Your Time Period for Injury Cost:		During Pandemic (2020-2022)	
Select Your Industry Sectors:		E4 Metal transportation equipment and furniture manufacturing	
Number of employees in this job/dept./org.:		10	
Average hourly salary for these employees:		\$20.00	
Number of MSD claims for this job/ dept./ org. per year:			

per hour

Year	Type of Injury:	Number of Injuries:	Typical costs:	Total costs for year:
This past year:	Back (including spine, spinal cord, neck)	5	\$ 22,636	\$ 200,463
	Lower extremities	5	\$ 35,961	
	Trunk (excluding back)	5	\$ 49,278	
	Upper extremities	5	\$ 46,355	
	Other	5	\$ 46,234	
The year before:	Back (including spine, spinal cord, neck)	5	\$ 22,636	\$ 200,463
	Lower extremities	5	\$ 35,961	
	Trunk (excluding back)	5	\$ 49,278	
	Upper extremities	5	\$ 46,355	
	Other	5	\$ 46,234	
2 years before:	Back (including spine, spinal cord, neck)	5	\$ 22,636	\$ 200,463
	Lower extremities	5	\$ 35,961	
	Trunk (excluding back)	5	\$ 49,278	
	Upper extremities	5	\$ 46,355	
	Other	5	\$ 46,234	

Ontario WSIB Input Solutions Benefits Payback Drop Downs Table 2020-2022 Table 2018 & 2019



<https://www.msdpreservation.com/resource-library/ontario-ergonomics-intervention-cost-benefit-calculator>

# Questions?

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