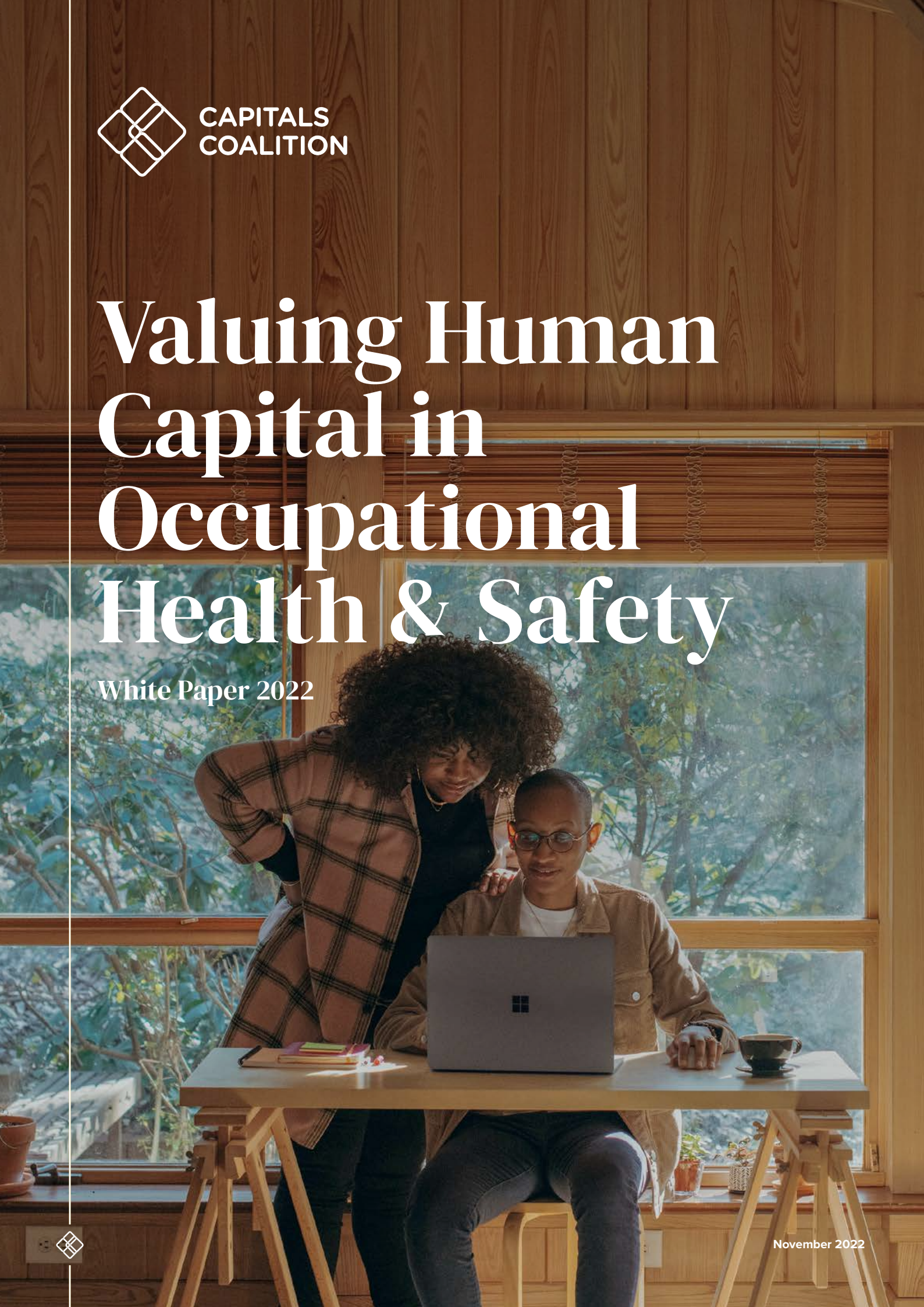
CAPITALS COALITION

Valuing Human Capital in Occupational Health & Safety

White Paper 2022



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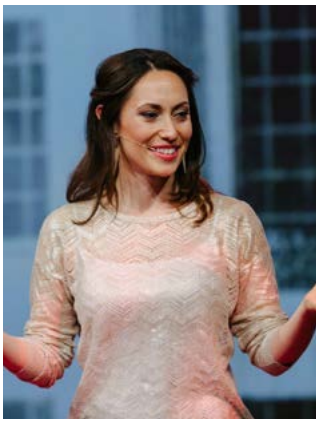
Foreward

The urgency to move towards equitable, nature-positive and carbon-neutral economies is gaining ground with CEOs, investors and policymakers around the world. Driven by a wave of corporate disclosure initiatives on sustainability and Environment, Social and Governance (ESG) factors, this urgency also comes from a shift in stakeholders' expectations that companies must better understand and manage how value is created, and for whom.

At the heart of business and the drive for companies to be more sustainable, are people. This White Paper, commissioned by L'Oréal and the Capitals Coalition, is an important contribution to human capital management. It presents how the value provided by people can, and must, be core to decision-making.



Based on the internationally-recognized framework, the Social and Human Capital Protocol (Capitals Coalition 2019)[1], and its Primer for Business[2], this paper demonstrates how companies can understand where they create value for people, communities, society and for their business through Occupational Health and Safety (OHS) programs.

Valuation of OHS risk management programs that affect our workforces is emerging as an important component of human capital management for companies. This paper aims to plug a gap in existing practice and ESG metrics on the value of OHS interventions. At the same time, it will provide companies with resources and data to conduct OHS human capital assessments that inform decision-making towards sustainable outcomes for people and business.

So, practically, what should you do once you have read this paper? A good first step is to use the Impact Pathways assessment approach to understand where OHS interventions create or erode value for the company and its people, and bring this information into your operational and strategic decision-making.

As a final note, this work comes from the Valuing Human Capital in Occupational Health and Safety[3] community, hosted by the Capitals Coalition. We are a community of current and future occupational health and safety professionals who believe in the importance of valuing the health, safety and the well-being of workers through a capitals approach as set out in the Social and Human Capital Protocol. This ultimately delivers commercial, and operational, health and safety excellence.

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[1] Social and Human Capital Protocol (Capitals Coalition 2019)

[2] Social and Human Capital: A Primer for Business

[3] Valuing Human Capital in Occupational Health and Safety community of practice

What are the capitals and why is important to understand their value?

Capital has traditionally been thought of only as money, or financial capital. However, capital describes any resource or asset that stores or provides value to people. Natural, human and social capital work in the same way as traditional capital – if we invest in them, they create value, and if we degrade them, we limit value.

Natural, human, and social capital are the foundations of produced capital – including financial assets – and our economy. Therefore, businesses must understand and account for the value of these types of capital to make better informed decisions.

01

Introduction

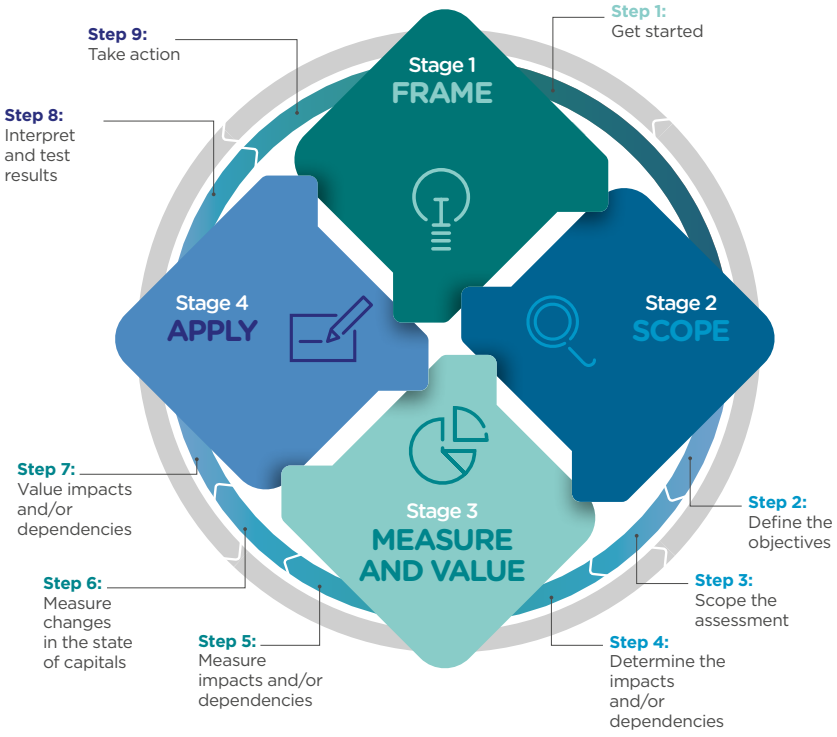
Valuation of occupational health and safety (OHS) programs is emerging as an important component of human capital management for companies. Human capital is defined as the knowledge, skills, competencies, and attributes embodied in individuals that contribute to improved performance and well-being (Capitals Coalition, 2019).

Valuation weighs up two elements that are at the heart of decision-making by companies and reflects a need to understand their value to the company. First, what is the business case for investing in these programs and their value to workers and society? Second, how do health and safety programs affect well-being? This suggests that impacts go beyond the avoided medical costs and lost income for workers.

Efforts to apply human capital valuation principles to OHS data are hampered by the lack of centralized information and methods describing how to conduct these valuations. The purpose of this white paper is to provide companies with some key resources and data for conducting OHS human capital assessments. This paper focuses on assessing the value of impacts from OHS, rather than assessing the value of dependencies on human capital.

The paper is organized around Measure and Value Stage of the Social and Human Capital Protocol (2019)[4], see Figure 1. It presents several impact pathways for interventions or programs that companies might consider investing in, referring to Protocol Step 4. Impact pathways are important for laying out a systematic approach to understand the methods and data, in order to conduct the valuations. The paper then establishes the components necessary for conducting a typical OHS human capital assessment, referring to Protocol Step 5 and Step 6. Finally, it uses an existing case study that summarizes the findings from an ergonomics assessment to illustrate how to conduct a valuation.

Figure 1: Steps and stages of the social and human protocol



Appendix A provides a literature review of twenty-six worker safety valuation studies from around the world. The literature review presents abstracts for each study with an overview of topics covered and methods used in the valuation, as well as a simple score that summarizes the suitability of the study for use by companies in their own analyses. The studies use a variety of metrics and indicators and were conducted at different times, which can make it challenging to use the studies directly. Therefore, Appendix A also contains standardized values measured in 2021 US dollars and euros, which can be used to measure the benefits and costs of different interventions.

Appendix B provides a template describing the type of data that is needed for a human capital OHS assessment.

[4] https://capitalscoalition.org/capitals-approach/social-human-capital-protocol/

Importance of valuation

Valuation is essential to transition towards sustainable businesses and markets. Understanding value highlights the significance of our impacts and dependencies and enables us to include their value in traditional decision-making processes. Being able to communicate the value that we create or erode by taking a certain decision provides us with the tools to make the most informed decisions that generate value across the capitals.

As the Social and Human Capital Protocol describes, valuation is context specific and organizations need to carefully consider the appropriate choice(s). For example, the monetary valuation of a worker safety program could evaluate the value of the program to the company in terms of reducing lost work days, employee turnover, or healthcare costs and/or the value as perceived by the workers, depending on the goals of the assessment.

Alternatively, incorporating basic human rights issues, such as a living wage or child labour, can be an integral part of human and social capital assessments; however, attempting to place a monetary value on human rights is unnecessary as their value has been collectively agreed upon at a global level.

Valuing the impact organizations have on human and social capital leads to the realization that issues previously considered to be immaterial, in fact, directly underpin business success, which in turn leads to finding new opportunities to be successful and sustainable.

02

Impact pathways

(Protocol Step 4)

An impact is a positive or negative contribution to one or more dimensions of well-being. This paper focuses on business impacts on human capital, but businesses also depend on human and social capital. A dependency is a reliance on human and social capital. Businesses depend, for example, on healthy and skilled workers, customer relationships and trust, as well as the rule of law. Some businesses rely heavily on resources that communities also use, and are therefore dependent on having a good relationship with these communities.

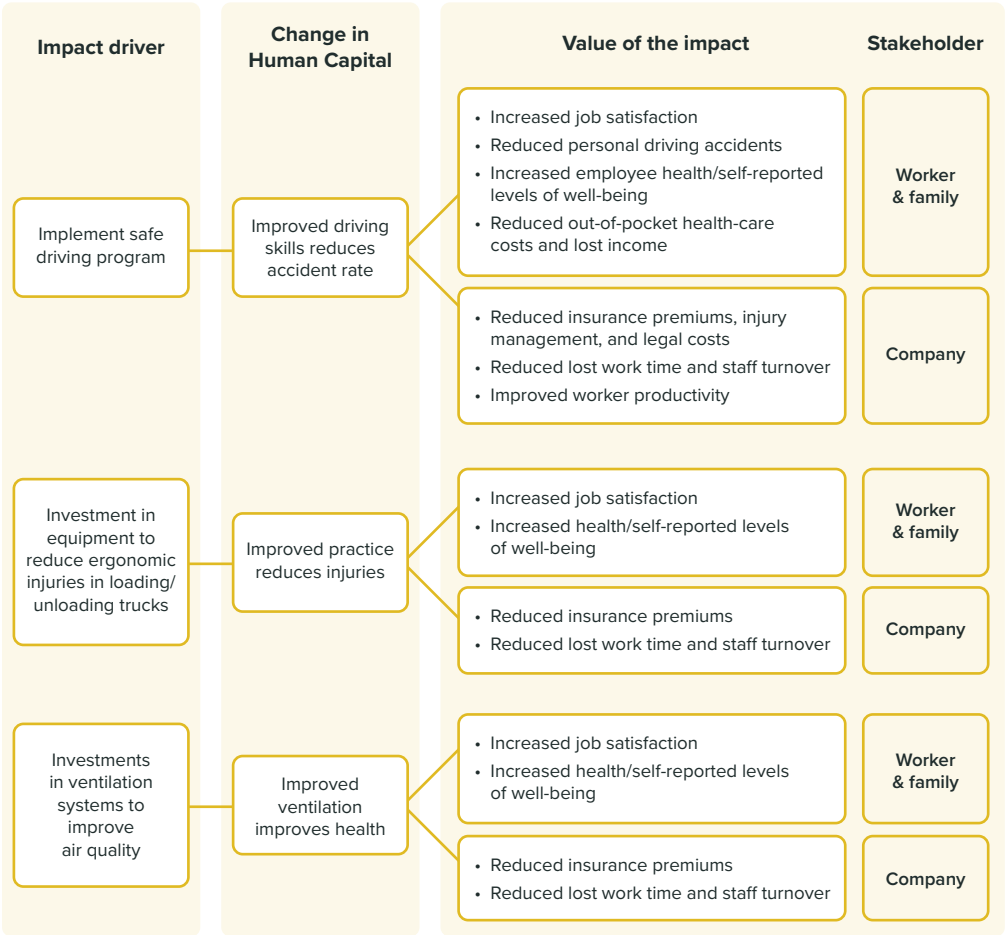
An impact pathway describes how, as a result of a specific business activity, a particular impact driver results in changes in social and human capital and how these changes impact different stakeholders. Impact pathways provide a valuable approach for organizing the activities of Stage 3, Measure and Value, in the Social and Human Capital Protocol.

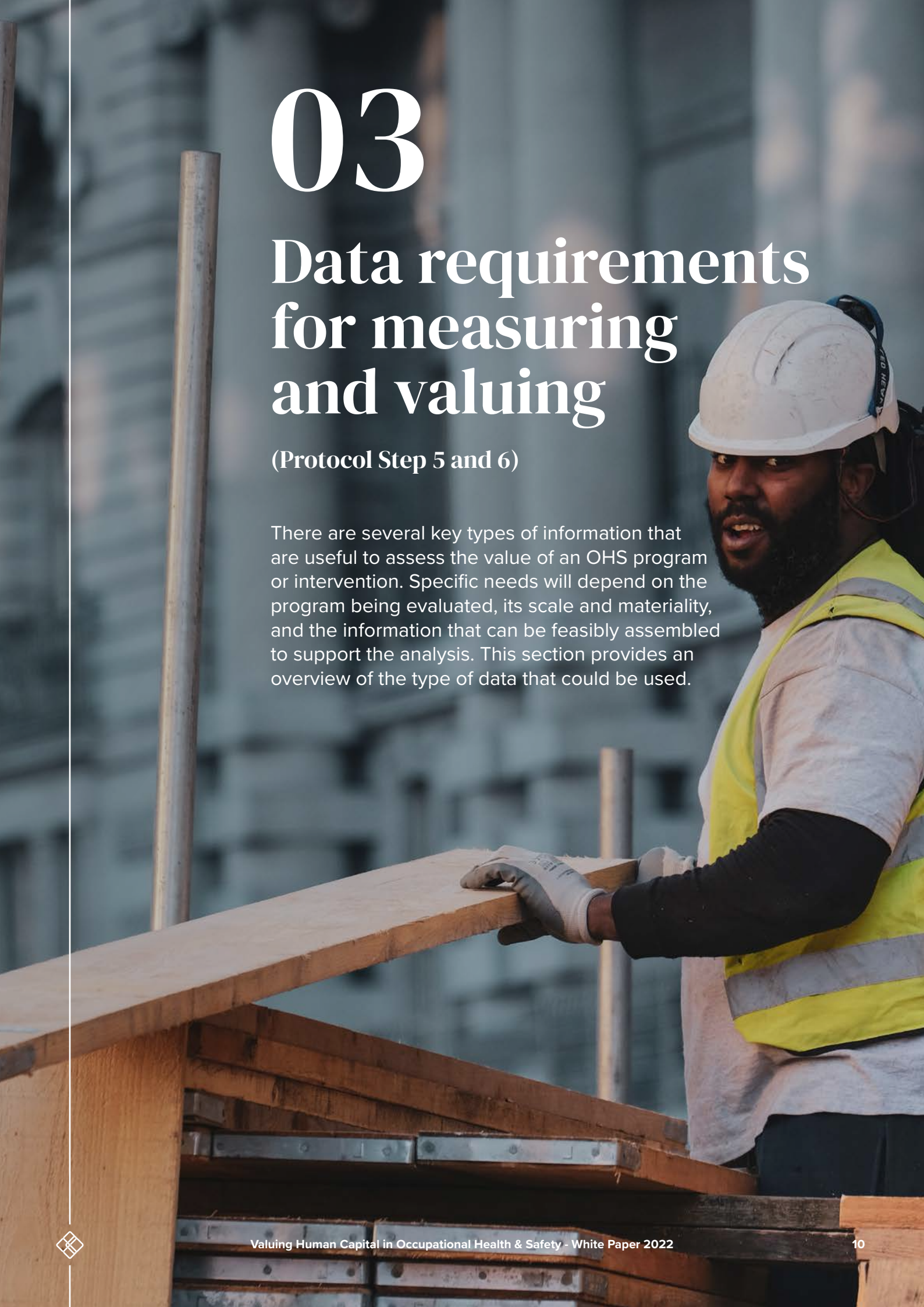
Impact pathways have three generic steps:

- **Measure impact drivers that affect human capital:** An impact driver is a measurable quantity that a business uses as an *input* for a business activity (e.g. cost of a training program) or a measurable *output* of a business activity (e.g. number of employees trained).
- **Measure changes in the state of human capital, resulting from the impact driver:** A human capital stock is a productive source of benefits to people and communities, now and in the future. Personal safety is an example of an asset within the stock of human capital, which can be impacted by a wide variety of business activities and practices.
- **Value impacts:** Assessments can focus on the value of the impact to your business (i.e., business value) or to society (i.e., societal value), or both (shared value). Valuation of impacts can be done in qualitative, quantitative or monetary terms.

Figure 2 provides three examples of impact pathways for OHS. These pathways exemplify three major types of impact drivers associated with OHS interventions: training programs through a safe driving program, investments in equipment to reduce ergonomics injuries and investments to reduce ill health through improvements in ventilation systems. In all cases, the impact drivers affect the human capital stock, which in turn affects the well-being of various stakeholders. As can be seen in Figure 2, the broad categories of changes in capital and valuation are similar.

Figure 2: Example impact pathway for health and safety interventions





03

Data requirements for measuring and valuing

(Protocol Step 5 and 6)

There are several key types of information that are useful to assess the value of an OHS program or intervention. Specific needs will depend on the program being evaluated, its scale and materiality, and the information that can be feasibly assembled to support the analysis. This section provides an overview of the type of data that could be used.

Each type of information needs to reflect the conditions both with and without the program from the perspective of the worker and from the perspective of the company. For example, this can be pre/post data, comparing the condition before the program is implemented to after the implementation. Alternatively, the data can be with/without, where some groups (e.g., specific locations or business units) are currently active in the program and are compared to other groups that are not.

The basic approach for calculating the value of an OHS program is to compare the value of the impact with and without the program (using the same valuation metrics as reference). The net value of the program will be the value of the improvements minus the cost of implementing it. It is important to remember that the valuation should consider the value to the company as well as the value to the worker. The types of valuation metrics that are typically required include:

- **Impact on the company**
  - Changes in company revenue due to missed or restricted workdays. This metric estimates the impacts associated with injuries. To estimate these, the key information is:
    - Number of lost workdays per time period (i.e., year, quarter, month, etc).
    - Number of restricted workdays per time period.
    - Level of productivity for the restricted workdays (e.g., restricted employees can perform 50% of their usual duties).
    - Company revenue per employee per day.
  - Workers' compensation or disability payments: This metric includes income replacement payments that are made to injured workers.
  - Wages: Workers require higher wages to perform riskier work. Reductions in risk may reduce the wage risk premium.
  - Medical costs: These costs include medical expenses for the company, or changes in health care insurance (including liability insurance), or workers' compensation costs. Medical costs can be estimated using data on the medical costs per injury (which is then multiplied by the number of injuries), or the total medical costs for the group.
  - Job satisfaction: The value to the company can extend beyond the direct costs of the injuries avoided. If the program increases job satisfaction, it can improve well-being outcomes to the workers and their families and reduce employee turnover costs and increase productivity.
  - Program implementation costs.
- **Impact on the workers**
  - Any changes in medical costs borne by the worker resulting from the injury.
  - Any changes in income attributable to the injury.
  - Job satisfaction and/or health changes: This metric measures improvements in worker health due to changes in the working environment and fewer injuries. This is also a benefit to the worker themselves as they will live with less injuries. It is typically measured by willingness-to-pay and is one of the most difficult metrics to measure, because it requires a metric for quantifying the change in well-being and a method for converting that metric into a monetary values.

Although the ideal analysis would include all this data, some of it simply may not be available. In such cases, it is best to note the limitations or assumptions of the assessment and what the likely impact on the valuation would be if all the data were available. For example, an assessment may only have information on lost workdays and could note that no measures of restricted workdays are available. The assessment could then report the results from a study that did have information on restricted workdays compared to lost workdays to indicate the potential impact.

04

A worked example: Ergonomics

A study by Nelson et al. (2006) provides a good example of the data and calculations for valuing a patient care ergonomics program for nurses.

The program involved six intervention elements: Ergonomic assessment protocols, patient-handling assessment criteria and decision algorithms, peer safety leaders, patient-handling equipment, an after-action review process, and a no-lift policy. The study uses pre/post data for twenty-three high-risk care units, comparing injury impacts for the nine-month period prior to program implementation (May 2001 to January 2002) to those experienced in the nine-month period after the program was implemented (February 2002 to October 2002).

The program included 825 nursing staff and was estimated to cost $123,037 per year[5]. Nelson et al. (2006) report several metrics for the study including injury rates, lost work time, medical costs, workers' compensation, and lost productivity.

As shown in Table 1, the study reports a significant decrease in the injury rate, from 24 out of 100 caregivers in the pre-intervention period to 17 out of 100 caregivers post-intervention. The program benefits are calculated based from the corporate perspective[6] and include savings from reduced medical treatment costs, workers' compensation payments, and lost productivity costs ($245,727) during the nine months the program was implemented. Therefore, on an annual basis, the benefits to the company are $327,636.

Once the program cost of $123,037 has been incorportated, this means the net annual benefit is $204,599 and the program has a benefit-cost ratio of 2.7.

Ultimately, the program is expected to provide benefits for ten years, for a total net value of over $2 million, on an undiscounted basis.

[5] Involving: an equipment cost of $1.16 million and training cost of $74,000, annualized over 10 years, without discounting

[6] Although the study measured an increase in job satisfaction through a survey, the change was not monetized and thus not included in the valuation.

The important takeaway from this analysis is that the ergonomics program provides significant value but yet represents an underestimate of the total value created by the project.

First, it does not include the impact on worker well-being, which could be a significant addition to total value. However, one of the most challenging aspects of measuring and valuing OHS is estimating the improvement in worker well-being that results from a program. The value goes beyond cost and out-of-pocket expenses, and includes the value of risk reduction and lower levels of stress and anxiety. This value should be assessed and included in organizational decision-making because it is an important source of value creation in human capital management.

Second, it is also important to point out that the value to the company is underestimated, because the assessment assumes that no revenue is lost and that ergonomic injuries do not affect staff turnover and recruitment.

As mentioned previously in this paper, there is no single standardized approach for measuring and valuing OHS impacts, nor can one generate a single all-encompassing list of data requirements. That said, despite the lack of standardization, it is possible to generate credible estimates of the value of an OHS program. The discussion above provides a concise overview of types of data and methods that can be used to conduct an assessment. Appendix B provides more detail about the types of information that would be beneficial for conducting the assessment and presents a template showing many of the types of data that a company might need.

Table 1: Example of OHS program valuation: ergonomics program for nurses

	Before	After	Savings or improvement
Impact quantification			
Injury rate	24 out of 100	17 out of 100	7 out of 100
Lost workdays	256	210	46
Restricted workdays	1,777	539	1,238
Impact valuation, by category			
Medical treatment cost			
Facility care	$62,702	$16,260	$46,442
Diagnostic tests	$8,610	$7,810	$800
Physician services	$23,778	$25,173	-$1,395
1. Total medical	$95,091	$49,244	$45,847
2. Total workers' compensation	$134,763	$35,200	$99,563
Lost productivity costs*			
Lost workdays	$55,743	$49,352	$6,391
Restricted workdays	$136,426	$42,500	$93,926
3. Total lost productivity	$192,169	$91,852	$100,317
Total benefits (9-month study period) (1+2+3)	$422,023	$176,296	$245,727
Valuation summary			
Annual benefits (12 months)			**$327,636**
Annual program cost			**$123,037**
Annual program net value			**$204,599**

*Nelson et al. (2006) value lost productivity using the wage rate for personal leave days and lost workdays, and half the wage rate for restricted workdays. This may underestimate the actual impact to the medical facility, as the amount of revenue for a day of nursing work is likely higher than the wage rate paid to nursing staff.

05

Conclusion

Valuation of OHS risk management programs that affect our workforces is emerging as an important component of human capital management for companies.

This paper has provided insights about integrating worker health and safety dimensions of human capital into assessing the value of OHS programs, thus plugging a gap in existing practice and ESG metrics. It has used the Measure and Value stage of the Social and Human Capital Protocol to develop impact pathways that link worker health and safety programs to changes in human capital and the value of those changes to workers and to companies.

This paper also points to important next steps for expanding the breadth and depth of the valuations:

1. This study has focused on U.S. and European valuations that are publicly available in English. There are undoubtedly additional valuations and data sources in other languages that could be added, which would expand the global coverage of the valuations.

2. It is likely that there is a significant number of studies that individual companies have already conducted that include either valuations or information that could be used to derive values with some additional data or assumptions.

3. Many companies are in the process of designing or implementing OHS programs. If these do not yet include valuations, it would be straightforward to add a module to the design/implementation strategy to collect the data for valuation. Therefore, from a technical and analytical perspective, building a robust inventory of OHS valuations is achievable.

During the research for this paper, collecting company data was hampered by confidentiality and disclosure concerns within companies. Therefore, developing a data-collection framework that meets corporate confidentiality needs would be an important first step for implementation.

People are at the heart of driving sustainable companies. Understanding where value lies, and to whom is fast becoming the barometer of corporate performance. Readers are encouraged to use the resources and data in this white paper to get started on conducting OHS human capital assessments to inform their decision-making and deliver sustainable outcomes for both people and companies.

Acknowledgements

Our thanks go to Doug McNair and the ERM team for researching and writing this White paper to Dr Marta Santamaria, Tom McKenna and Natalie Nicholles from the Capitals Coalition for their inputs and to the members of the Valuing Human Capital in OHS community of practice for their sustained collaboration.

The Capitals Coalition would also like to acknowledge Kathy Seabrook and Malcolm Staves, Co-Chairs of the Valuing Human Capital in Occupational Health and Safety community of practice, for your leadership and continued connection of the dots.

With thanks to L'Oreal for supporting this White Paper.

06

Appendix A - Valuation studies: Summaries and transfer values

A.1 Valuation data (Protocol Step 7)

ERM conducted a literature review to find studies that companies can use to better understand the potential benefits and costs of OHS programs and their outcomes. The review is not intended to be an exhaustive assessment, but rather indicative of the types of information that are available. In all, we reviewed twenty-six valuation studies. They range from the assessment of specific OHS programs to national level statistics and include data from ten countries, as well as some worldwide studies. Out of the twenty-six studies, there are seven studies that specifically evaluate the costs and benefits of ergonomics programs.

This section provides brief summary information about each study, organized alphabetically by first author's last name. The summary is generally based on the abstract or executive summary and describes the study goals, methods, and results. To help users better evaluate whether the study might be useful for valuation, the summary provides a score for each of three criteria:

- Relevance of the study for valuation of OHS;
- Quality of the valuation methods used; and,
- Quality of the data.

The scores could be either an A, B, or C and are described in more detail in Figure 3. It is important to note that low scores do not mean the study was poorly done. It could mean the study is relatively old, or that valuation was not the primary focus of the study and therefore the description of the valuation methods was incomplete.

Figure 3: Scoring criteria

Scoring criteria		
Metric	**Score**	**Criteria**
Relevance of the study	A	Explicitly measures multi-faceted costs of OHS injuries and reports monetary values
	B	Measures aspects of values associated with OHS, but only one component, or not occupational-specific explicitly, or compilation of results of other studies
	C	A methods paper that could be applicable to OHS injuries or observational paper that could provide quantities but not values
Quality of the methods	A	Approach appears to be consistent with best practices and is clearly explained
	B	Methods are partially explained or potentially outdated or simplistic
	C	The methods are not explained, or methods may be incorrect
Quality of the data	A	Most of the data is post 2005 and contains an adequate sample size
	B	A significant portion of the data is 1995-2004 or the sample size is small
	C	Most of the data is pre-1995 or the sample size is small

1. **"The economic impact of integrating ergonomics within an automotive production facility" W. Gary Allread et al. (2010)**

Relevance	Methods	Data
A	A	A

Location: United States

Programs/activities valued: Cost-benefit analysis of manufacturing ergonomic intervention plan.

Summary: Honda facilities have teams of ergonomists and engineers who study human–machine interaction issues and develop solutions aimed at improving associate safety, vehicle quality, and process efficiency. These individuals are guided by corporate-level ergonomists as well as by health and safety professionals, who are charged with understanding production issues across all of Honda's North American facilities and with developing a systematic approach to address and solve ergonomics-related concerns. For more in-depth ergonomics analyses and those geared toward specific issues, Honda worked with faculty and researchers at the Institute for Ergonomics, a center on The Ohio State University's main campus in Columbus. In 2007, the Center for Occupational Health in Automotive Manufacturing (COHAM) opened at Ohio State. Researchers at COHAM work with automobile manufacturers and their parts suppliers to test these types of manufacturing technology and determine how it can best be used to improve employee health. COHAM is an interdisciplinary partnership funded by several OSU departments, automobile manufacturers (including Honda), and automobile suppliers. Engineers and ergonomists at Honda have used COHAM to study possible equipment and production improvements with their decisions based on scientific evidence regarding employee health and safety. Because of its research capabilities and geographical proximity to several Honda manufacturing facilities, Ohio State and Honda formed a University–Industry partnership. This unique collaboration allows for the study of design processes aimed to optimize new vehicle production while minimizing occupational health risk. This partnership provides educational and research opportunities for Ohio State students and faculty. It also benefits Honda, by advancing their ability to solve complex production issues and produce higher-quality products.

Methods: The changes that were decided upon focused on improving the efficiency of the Door Line process. This involved relocating the area's existing materials-handling equipment that assisted with lifting the completed doors as well as modifying guards that surrounded the door drop-lifts, so they could be loaded more easily. The project costs involved in making improvements to the Door Line process, as well as the documented and projected savings across a five-year period, are listed in Table 13.1. The upper portion of this table shows that there was a cost to conduct the ergonomics evaluation itself. Its findings guided the decision to streamline the production process and create a more efficient workplace layout. The total project costs were $89,000.

Results: The improvements made to the Door Line process resulted in both manpower and injury reductions. The greater efficiency of the workplace arrangement required three fewer associates to perform the same work, at the same production capacity (Note: these individuals were moved to other production processes.) The lower portion of Table 13.1 shows that the increase in work efficiency accounted for a large portion of the first year's project savings. However, additional savings also were realized through a reduced number of injuries that occurred within this redesigned process. Company records showed that approximately 2.45 work-related MSDs are estimated to be reduced each year since the modifications were made for savings of more than $100,000. In total, the first-year's estimated savings was more than $362,000. In relation to this project's costs, the payback period for these changes was slightly less than three months.

2. "Workplace wellness programs can generate savings" Katherine Baicker et al. (2010)

Relevance	Methods	Data
A	B	B

Location: United States

Programs/activities valued: Occupational health care costs, absenteeism.

Summary: Amid soaring health spending, there is a growing interest in workplace disease prevention and wellness programs to improve health and lower costs.

Methods: Used a critical meta-analysis of the literature on costs and savings associated with workplace disease prevention and wellness programs.

Results: We found that medical costs fall by about $3.27 for every dollar spent on wellness programs and that absenteeism costs fall by about $2.73 for every dollar spent. Although further exploration of the mechanisms at work and broader applicability of the findings is needed, this return on investment suggests that the wider adoption of such programs could prove beneficial for budgets and productivity as well as health outcomes.

3. "A conceptual framework of cost/benefit justification for ergonomic projects to reduce musculoskeletal disorders in the workplace" Nitipong Boon-Long (2001)

Relevance	Methods	Data
C	B	C

Location: United States

Programs/activities valued: Absenteeism due to occupational injury.

Summary: A framework for justifying ergonomic projects by the overall cost savings is developed which estimates the extent of musculoskeletal disorders (MSD) exposures in a specific industry. A cost structure is developed to estimate the investment needed for an ergonomics program and the costs related to MSD problems including workers' compensation costs, work-related costs, and labor turnover costs. The study makes it possible to identify the proportion of exposure types that contribute to the overall costs of MSD problems, so that managers can prioritize ergonomic analysis and control activities appropriately. Furthermore, based on the literature review, this is the first study to investigate the feasibility of using the Real Options method to quantify ergonomic investment as well as an attempt to identify different types of real options in an ergonomics program. Results showed that the value of an ergonomics program could increase by up to 2.43 times of the original value when Real Options are included.

Methods: Data was adopted from sources including Bureau of Labor Statistics (BLS), the Healthcare Cost and Utilization Project (HCUP-3), and estimates suggested in OSHA's former Ergonomics Standard. Top fifteen manufacturing industries with the highest MSD rates were selected to apply the framework.

Results: The results showed that the overall cost savings among the fifteen selected industries come from ergonomics activities addressing the problem of overexertion (58%), bodily reaction (15%), and repetitive motion (27%).

4. **"Tracking the market performance of companies that integrate a culture of health and safety" Raymond Fabius et al. (2016)**

Relevance	Methods	Data
C	B	B

Location: United States

Programs/activities valued: Stock market performance of CHAA-awarded companies.

Summary: The aim of this study was to assess the hypothesis that stock market performance of companies achieving high scores on either health or safety in the Corporate Health Achievement Award (CHAA) process will be superior to average index performance.

Methods: The stock market performance of portfolios of CHAA winners was examined under six different scenarios using simulation and past market performance in tests of association framed to inform the investor community.

Results: CHAA portfolios out-performed the S&P average on all tests. This study adds to the growing evidence that a healthy and safe workforce correlates with a company's performance and its ability to provide positive returns to shareholders. It advances the idea that a proven set of health and safety metrics based on the SHAA evaluation process merits inclusion with existing measures for market valuation.

5. **"An assessment of ergonomics climate and its association with self-reported pain, organizational performance and employee well-being" Elham Faez et al. (2021)**

Relevance	Methods	Data
C	C	C

Location: Iran

Programs/activities valued: Ergonomics climate scores.

Summary: Previous studies have demonstrated that a positive ergonomics climate with an equal focus on improving operational performance and employee well-being is beneficial to both employee health and organizational performance. This study aimed to assess the ergonomics climate at two power plants and examine its association with self-reported pain, performance, and well-being.

Methods: At two power plants in Iran, survey responses from 109 and 110 employees were obtained. The questionnaires contained data on ergonomics climate, organizational performance, employee health, and self-reported pain.

Results: The mean ergonomics climate scores between the Besat and Rey power plants were significantly different ($p < 0.001$). The overall ergonomics climate score and all subscales scores were positively associated with organizational performance ($p < 0.001$). The overall ergonomics climate score and some of its subscales were significantly associated with employees' general health ($p < 0.001$). The ergonomics climate score was significantly higher in the group of employees who reported musculoskeletal pain than those who did not report musculoskeletal pain ($p < 0.05$). Investigation of ergonomics climate can provide organizations with a baseline for prioritizing their values and finding areas for improving organizational performance and employee health.

6. "Global estimates of occupational accidents and work-related illnesses 2017" Paivi Hamalainen et al. (2017)

Relevance	Methods	Data
C	B	B

Location: Global

Programs/activities valued: Fatal/non-fatal occupational accidents and illnesses.

Summary: This report provides an update to the global estimates of occupational accidents and work-related diseases that were presented during the XX World Congress on Safety and Health at Work 2014 at Frankfurt. These updated figures were released during the XXI World Congress held in Singapore on 3-6 Sep 2017, as agreed under the Memorandum of Understanding between the International Labour Organization (ILO) and the Workplace Safety and Health (WSH) Institute, Singapore.

Methods: These estimates were worked out by a team comprising experts from the Ministry of Health and Social Affairs in Finland and Workplace Safety and Health Institute of the Ministry of Manpower in Singapore. The methodology used in this update was the same as for the 2014 study so as to keep the estimated numbers comparable. In the 2014 study, estimates were made based on the World Health Organization (WHO) regions. In addition to the WHO classification, estimates were also made based on the United Nations (UN) geographical regions. As there was under-estimation on the number of respiratory disease cases in 2014, new attributable fractions (AF) were used to estimate the number of respiratory cases caused by Chronic Obstructive Pulmonary Disease (COPD) and Asthma.

Results: We estimated that 2.78 million deaths occur annually across the countries which can be attributed to work, higher than the 2.33 million deaths estimated in 2014. Work-related mortality accounted for 5% of the global total deaths (based on the Global Burden of Disease Study 2015). The biggest share of work-related mortality came from work-related diseases which accounted for 2.4 million (86.3%) of the total estimated deaths. Fatal accidents accounted for the remaining 13.7%. With the inclusion of COPD in our estimation, respiratory diseases (17%) had increased and was among the top three illnesses after circulatory diseases (31%) and malignant neoplasms (26%). Together, they contributed more than three-quarter of the total work-related mortality, followed by occupational injuries at 14% and communicable diseases (9%). Asia was the highest contributor, with about two-thirds of the global work-related mortality, followed by Africa at 11.8% and Europe at 11.7%. Similar to previous estimates, the number of estimated work-related illnesses far exceeds that of work accident and fatalities. The increase in the quantity of ill-health was due to previous underestimates of COPD, leading to the respiratory estimates climbing to the third spot among the work-related mortality.

7. "Costs to Britain of workplace fatalities and self-reported injuries and ill health, 2018/19" Health and Safety Executive (2020)

Relevance	Methods	Data
A	A	A

Location: Great Britain

Programs/activities valued: Fatal/non-fatal occupational injuries, fatal/non-fatal occupational diseases.

Summary: HSE statistics show that each year, over a million workers are injured or made ill by their work in Great Britain. This can have serious effects on these individuals and their families, as well as employers, government and wider society. The impacts can be measured in terms of 'human' costs (the impact on the individual's quality of life and, for fatal injuries, loss of life), and 'financial' costs, such as loss of production and healthcare costs. HSE's estimate of the total costs of workplace injuries and ill health includes both financial costs and a valuation of human costs.

Results: The latest estimates show that annually between 2017/18 and 2019/20 an average of 610,000 workers were injured in workplace accidents and a further 559,000 workers suffered a new case of ill health which they believe to be caused or made worse by their work. The cost estimates (for 2018/19) include only new cases of work-related ill health and self-reported injuries, and exclude pre-existing cases, to represent the costs arising from current working conditions.

8. "What do employers spend to protect the Health and Safety of workers?" Institute for work & health. (2018)

Relevance	Methods	Data
A	A	A

Location: Canada

Programs/activities valued: OHS expenditure per worker.

Summary: While the financial costs of work-related injury and illness are well known, limited information is available on what employers spend to control or eliminate the causes of work-related injury and illness. This Issue Briefing describes the results of a 2017 study to estimate occupational health and safety expenditures among employers from seventeen economic sectors in Ontario, Canada.

Methods: We recruited Ontario employers with twenty or more employees from seventeen economic sectors, with the number of employers recruited from each sector representing the percentage of the Ontario labour force working in that sector.

Results: In both the goods-producing sectors and the service sectors, the share of total expenditures attributed to OHS professional services and to the health and safety component of new capital investments was modest in both cases. Employers reported an average expenditure of approximately $25 per worker per year on external OHS professional services, representing two per cent of total OHS expenditures. The average dollar value of the estimated health and safety share of new capital investments was $52 per worker per year, representing four per cent of total OHS expenditures.

9. "An economic analysis of a safe resident-handling program in nursing homes" Supriya Lahiri et al. (2013)

Relevance	Methods	Data
A	B	B

Location: United States

Programs/activities valued: Cost/benefit of safe resident-handling program intervention.

Summary: Occupational injuries, especially back problems related to resident handling, are common in nursing home employees and their prevention may require substantial up-front investment. This study evaluated the economics of a safe resident-handling program (SRHP), in a large chain of skilled nursing facilities, from the corporation's perspective. Decreased costs of worker injury compensation claims and turnover appear at least partially attributable to the SRHP. Future research should examine center-specific factors that enhance program success, and improve measures of turnover costs and healthcare productivity.

Methods: The company provided data on program costs, compensation claims, and turnover rates (2003-2009). Workers' compensation and turnover costs before and after the intervention were compared against investment costs using the "net-cost model".

Results: Among 110 centers, the overall benefit-to-cost ratio was 1.7–3.09 and the payback period was 1.98–1.06 year (using alternative turnover cost estimates). The average annualized net savings per bed for the 110 centers (using company based turnover cost estimates) was $143, with a 95% confidence interval of $22–$264. This was very similar to the average annualized net savings per full time equivalent (FTE) staff member, which was $165 (95% confidence interval $22–$308). However, at 49 centers costs exceeded benefits.

10. "Estimation of net costs for prevention of occupational low back pain: Three case studies from the US" Supriya Lahiri et al. (2005)

Relevance	Methods	Data
A	A	B

Location: United States

Programs/activities valued: Cost-benefit analysis of ergonomic interventions aimed at reducing occupational-induced low back pain.

Summary: We are focusing on efforts to develop a model approach at a micro or company level for the economic evaluation of interventions to reduce work-related low back pain (LBP). Our study provides a simple transparent framework to estimate the net economic costs of investments in ergonomic interventions at the company level to reduce occupational morbidity. Although we do not like to generalize on the basis of three case studies, our analyses show that it might be in the economic interest of management to play a more active role to prevent back pain. In our attempts to gather useful cost information from a number of companies, we have found that the retrospective gathering of cost data, even on interventions deemed effective by corporate innovators, proved to be extremely difficult. Hence, we have concluded that it is essential to incorporate a protocol for collecting cost and effectiveness data in the standard operating procedures of ergonomists and companies introducing such innovations. In the near future, we aim to validate the net-cost model for the monitoring and reporting of such data through prospective studies in a variety of industrial settings and in countries at various stages of economic development.

Methods: We have developed an instrument for data collection and data analysis at the facility level known as the net-cost model. All costs are annualized costs and are calculated at the level of an individual organization. Costs of low back pain interventions are defined comprehensively by incorporating not only the costs of investment of equipment and labor for the interventions but also by taking into account the avoided costs of lost work time, medical care costs and productivity improvements. Three case studies have been performed based on data from three companies in the manufacturing sector of the United States using the above approach.

Results: Our net-cost estimates for the three case studies consistently show that ergonomic interventions applied appropriately can result in substantial cost savings for the companies.

11. "Numbers and costs of occupational injury and illness in low-wage occupations" J. Paul Leigh et al. (2012)

Relevance	Methods	Data
A	A	A

Location: United States

Programs/activities valued: Cost of fatal & non-fatal occupational injuries in low-wage occupations.

Summary: Economists have estimated the medical and productivity costs of workplace injuries and illnesses for U.S. workers in all occupations. The slow economic recovery, however, has shifted job creation toward low-wage jobs and industries. This paper provides the first estimates of the numbers and costs of occupational injury and illness in low-wage occupations during the Great Recession, specifically in 2010.

Methods: To generate these estimates, I use critical definitions and assumptions to identify low-wage occupations, to define medical and productivity costs, and to note which occupations are omitted from the data and results. The paper reports on costs in sixty-five low-wage occupations for four classes of injury and illness: non-fatal injuries, non-fatal illnesses, fatal injuries, and fatal illnesses.

Results: I estimate 596 fatal injuries and 1,625,152 non-fatal ones, costing $441 million and $28.3 billion in 2010. For illnesses, the estimates are 12,415 fatal and 87,857 non-fatal cases, with costs of $8.77 billion and $1.53 billion. Seven low-wage occupations account for a substantial share of the injuries and illnesses, and the greatest total costs: retail salespersons ($4.5 billion); janitors and cleaners ($4.1 billion); maids and housekeeping cleaners ($3.1 billion); stock clerks and order fillers ($2.7 billion); food preparation and serving workers ($2.1 billion); restaurant cooks ($1.8 billion); and cashiers ($1.8 billion). These estimates suggest that workers in low-wage occupations contribute significantly more medical and productivity costs than is generally assumed.

12. "Economic burden of occupational injury and illness in the United States" J. Paul Leigh (2011)

Relevance	Methods	Data
A	A	A

Location: United States

Programs/activities valued: Fatal/non-fatal occupational injuries, fatal/non-fatal occupational diseases.

Summary: The allocation of scarce healthcare resources requires a knowledge of disease costs. Whereas many studies of a variety of diseases are available, few focus on job-related injuries and illnesses. This article provides estimates of the national costs of occupational injury and illness among civilians in the United States for 2007. The medical and indirect costs of occupational injuries and illnesses are sizable, at least as large as the cost of cancer. Workers' compensation covers less than 25% of these costs, so all members of society share the burden. The contributions of job-related injuries and illnesses to the overall cost of medical care and ill health are greater than generally assumed.

Methods: This study provides estimates of both the incidence of fatal and non-fatal injuries and non-fatal illnesses and the prevalence of fatal diseases as well as both medical and indirect (productivity) costs. To generate the estimates, I combined primary and secondary data sources with parameters from the literature and model assumptions. My primary sources were injury, disease, employment, and inflation data from the U.S. Bureau of Labor Statistics (BLS) and the Centers for Disease Control and Prevention (CDC) as well as costs data from the National Council on Compensation Insurance and the Healthcare Cost and Utilization Project. My secondary sources were the National Academy of Social Insurance, literature estimates of Attributable Fractions (AF) of diseases with occupational components, and national estimates for all health care costs. Critical model assumptions were applied to the underreporting of injuries, wage-replacement rates, and AFs. Total costs were calculated by multiplying the number of cases by the average cost per case. A sensitivity analysis tested for the effects of the most consequential assumptions. Numerous improvements over earlier studies included reliance on BLS data for government workers and ten specific cancer sites rather than only one broad cancer category.

Results: The number of fatal and non-fatal injuries in 2007 was estimated to be more than 5,600 and almost 8,559,000, respectively, at a cost of $6 billion and $186 billion. The number of fatal and non-fatal illnesses was estimated at more than 53,000 and nearly 427,000, respectively, with cost estimates of $46 billion and $12 billion. For injuries and diseases combined, medical cost estimates were $67 billion (27% of the total), and indirect costs were almost $183 billion (73%). Injuries comprised 77% of the total, and diseases accounted for 23%. The total estimated costs were approximately $250 billion, compared with the inflation-adjusted cost of $217 billion for 1992.

13. "Health and productivity as a business strategy: A multi-employer study"
Ronald Loeppke et al. 2009

Relevance	Methods	Data
C	B	B

Location: United States

Programs/activities valued: HPQ health conditions.

Summary: The objective of this study is to explore methodological refinements in measuring health-related lost productivity and to assess the business implications of a full-cost approach to managing health. The study finds that a strong link exists between health and productivity. Integrating productivity data with health data can help employers develop effective workplace health human capital investment strategies. More research is needed to understand the impacts of comorbidity and to evaluate the cost effectiveness of health and productivity interventions from an employer perspective. (J Occup Environ Med. 2009; 51:411-428)

Methods: Health-related lost productivity was measured using the Health and Work Performance Questionnaire combined with 1,134,281 medical and pharmacy claims. Regression analyses were used to estimate the associations of health conditions with absenteeism and presenteeism using a range of models.

Results: Health-related productivity costs are significantly greater than medical and pharmacy costs alone (on average 2.3 to 1). Chronic conditions such as depression/anxiety, obesity, arthritis, and back/neck pain are especially important causes of productivity loss. Comorbidities have significant non-additive effects on both absenteeism and presenteeism. Executive/Managers experience as much or more monetized productivity loss from depression and back pain as Labors/Operators. Testimonials are reported from participating companies on how the study helped shape their corporate health strategies.

14. "Development and evaluation of a multifaceted ergonomics program to prevent injuries associated with patient-handling tasks" Audrey Nelson et al. (2006)

Relevance	Methods	Data
A	B	B

Location: United States

Programs/activities valued: Cost-benefit analysis of multidimensional ergonomics program.

Summary: Nurses have one of the highest rates of work-related musculoskeletal injury of any profession. Over the past thirty years, efforts to reduce work-related musculoskeletal disorders in nurses have been largely unsuccessful. The primary goal of this program was to create safer working environments for nursing staff who provide direct patient care. Our first objective was to design and implement a multi-faceted program that successfully integrated evidence-based practice, technology, and safety improvement. The second objective was to evaluate the impact of the program on injury rate, lost and modified work days, job satisfaction, self-reported unsafe patient-handling acts, level of support for program, staff and patient acceptance, program effectiveness, costs, and return on investment. This multi-faceted program resulted in an overall lower injury rate, fewer modified duty days taken per injury, and significant cost savings. The program was well accepted by patients, nursing staff, and administrators. Given the significant increases in two job satisfaction subscales (professional status and task requirements), it is possible that nurse recruitment and retention could be positively impacted.

Methods: A pre-/post design without a control group was used to evaluate the effectiveness of a patient care ergonomics program on twenty-three high risk units (nineteen nursing home care units and four spinal cord injury units) in seven facilities. Injury rates, lost work days, modified work days, job satisfaction, staff, and patient acceptance, program effectiveness, and program costs/savings were compared over two nine month periods: pre-intervention (May 2001–January 2002) and post-intervention (March 2002–November 2002). Data were collected prospectively through surveys, weekly process logs, injury logs, and cost logs.

Results: The program elements resulted in a statistically significant decrease in the rate of musculoskeletal injuries as well as the number of modified duty days taken per injury. While the total number of lost workdays decreased by 18% post-intervention, this difference was not statistically significant. There were statistically significant increases in two subscales of job satisfaction: professional status and tasks requirements. Self-reports by nursing staff revealed a statistically significant decrease in the number of 'unsafe' patient-handling practices performed daily. Nurses ranked program elements they deemed to be ''extremely effective'': equipment was rated as most effective (96%), followed by No Lift Policy (68%), peer leader education program (66%), ergonomic assessment protocol (59%), patient-handling assessment criteria and decision algorithms (55%), and lastly after action reviews (41%). Perceived support and interest for the program started at a high level for managers and nursing staff and remained very high throughout the program implementation. Patient acceptance was moderate when the program started but increased to very high by the end of the program. Although the ease and success of program implementation initially varied between and within the facilities, after six months there was strong evidence of support at all levels. The initial capital investment for patient-handling equipment was recovered in approximately 3.75 years based on annual post-intervention savings of over $200,000/year in workers' compensation expenses and cost savings associated with reduced lost and modified work days and worker compensation.

15. "Average lost work productivity due to non-fatal injuries by type in the USA" Cora Peterson et al. (2021)

Relevance	Methods	Data
B	B	B

Location: United States

Programs/activities valued: Direct medical costs of fatal and non-fatal injuries.

Summary: Injuries are costly and preventable. Accurate estimates of attributable lost work productivity are important to monitor the economic burden of injuries and help to prioritise cost-effective public health prevention activities. This study aims to estimate the average lost work productivity due to non-fatal injuries in the USA comprehensively by injury type.

Methods: The attributable average number and value of lost work days in the year following non-fatal emergency department (ED)–treated injuries were estimated by injury mechanism (eg, fall) and body region (eg, head and neck) among individuals age 18–64 with employer health insurance injured 1 October 2014 through 30 September 2015 as reported in MarketScan medical claims and Health and Productivity Management databases. Workplace, short-term disability and workers' compensation absences were assessed. Multivariable regression models compared lost work days among injury patients and matched controls during the year following injured patients' ED visit, controlling for demographic, clinical and health insurance factors. Lost work days were valued using an average US daily market production estimate. Costs are 2015 USD.

Results: The one-year per-person average number and value of lost work days due to all types of non-fatal injuries combined were approximately 11 days and US$1590. The range by injury mechanism was 1.5 days (US$210) for bites and stings to 44.1 days (US$6196) for motorcycle injuries. The range by body region was 4.0 days (US$567) for other head, face and neck injuries to 19.8 days (US$2787) for traumatic brain injuries.

16. "Economic cost of injury – United States 2019" Cora Peterson et al. (2019)

Relevance	Methods	Data
B	A	A

Location: United States

Programs/activities valued: Cost of fatal injuries.

Summary: Unintentional and violence-related injuries, including suicide, homicide, overdoses, motor vehicle crashes, and falls were among the top ten causes of death for all age groups in the United States and caused nearly twenty-seven million non-fatal emergency department (ED) visits in 2019.

Methods: CDC estimated the economic cost of injuries that occurred in 2019 by assigning costs for medical care, work loss, value of statistical life, and quality of life losses to injury records from the CDC's Web-based Injury Statistics Query and Reporting System (WISQARS).

Results: In 2019, the economic cost of injury was $4.2 trillion, including $327 billion in medical care, $69 billion in work loss, and $3.8 trillion in value of statistical life and quality of life losses. More than one half of this cost ($2.4 trillion) was among working-aged adults (aged 25–64 years). The economic cost estimate for injuries that occurred in 2019 uses the societal perspective, including tangible and intangible costs to multiple payers, and a one-year time horizon (period over which costs are assessed) for non-fatal injuries. Costs are presented in 2019 U.S. dollars (USD). WISQARS non-fatal injury counts are hospital ED injury visits from the nationally representative National Electronic Injury Surveillance System – All Injury Program. WISQARS fatal injury counts are from CDC's National Vital Statistics System mortality data.

17. "Business case of implementing two ergonomic interventions at an electric power utility" Patricia Seeley (2003)

Relevance	Methods	Data
A	B	B

Location: United States

Programs/activities valued: Ergonomics study of implementing battery-operated cutters.

Summary: Ergonomics analysis of line workers in the electric power industry who work overhead on utility poles revealed some tasks for which less than 1% of the general population had sufficient strength to perform.

Methods: During a two-year study, a large Midwestern US electric utility provided a university with a team of represented workers and management. They evaluated, recommended, and monitored interventions for thirty-two common line worker tasks that were rated at medium to high magnitude of risk factors for musculoskeletal disorders (MSDs). Two of the recommended ergonomic interventions—the battery-operated press and cutter—were selected by the team as having the greatest potential for reducing risk factors of MSDs. Only overhead distribution line worker tasks were evaluated. A business case was formulated that took into account medical injury and illness statistics, workers' compensation, replacement worker and retraining costs. An outline of a business case formulation and a sample intervention payback calculation is shown.

Results: Based on the business case, the utility committed over $300,000 to purchase battery-operated presses and cutters for their overhead distribution line crews.

18. "Case examples; business benefits arising from health & safety interventions" Peter Shearn (2003)

Relevance	Methods	Data
A	B	B

Location: Global

Programs/activities valued: Occupational health/wellness programs; safety training.

Summary: Our review of the literature has revealed a number of interesting case examples where OHS interventions have been evaluated. The cases identify a range of business benefits that can arise from OHS interventions. However, the search for suitable cases identified significantly fewer than we anticipated might be available. This can be explained by a number of factors, not least the cost of conducting evaluations and the absence of any business motivation for publishing results. Although cost-benefit analysis is based on a simple principle of calculation, the case examples demonstrate that methods have to be adapted to the contingent requirements of evaluation, and, depending on the preference of the evaluators, can become highly technical accounts.

Of the cases reviewed there was no explanation provided of the prior business motivations for implementing OHS interventions – although it could be assumed that the businesses involved have a pro-active attitude toward OHS. Neither was any indication provided of the manner in which business managers incorporate cost-benefit information into business decision making. Throughout the research literature there is very little discussion of manager's propensity or ability to interrelate profitability and OHS issues. On the whole, the business benefit argument for health and safety investment is unlikely to provide a principal motivation for better health and safety management. Furthermore, the business benefit argument will only provide partial support for the decisions made by company managers. Nevertheless, the results from one business survey (Wright et al 2000) indicate that 10% of UK businesses would be prompted to do more for OHS management if they were provided with evidence that business benefits would arise.

Methods: Literature review of case studies.

Results: The case examples demonstrate a range of benefits that can arise from OHS interventions, including:

Direct benefits

- reduced insurance premiums;
- reduced litigation costs;
- reduced sick pay costs;
- improved production/productivity rates;
- lower accident costs/production delays;
- reduced product and material damage.

Indirect benefits

- reduced absenteeism;
- reduced staff turnover;
- improved corporate image;
- improved chances of winning contracts;
- improved job satisfaction/morale.

19. "A life satisfaction approach to valuing the impact of health behaviours on subjective well-being" Yipu Shi et al. (2019)

Relevance	Methods	Data
C	A	A

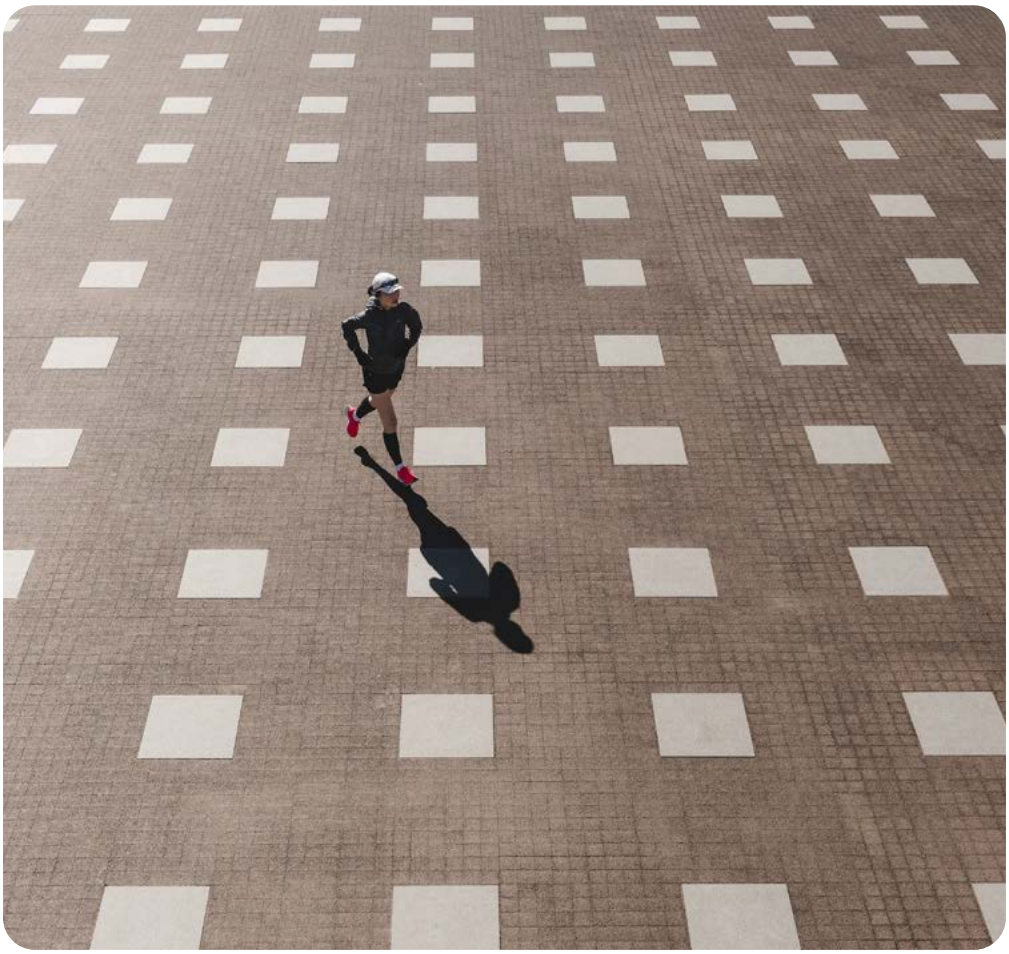
Location: Canada

Programs/activities valued: Increased physical activity, not smoking.

Summary: Increasingly, decision-makers are interested in understanding the returns on investments in programs and policies that promote health and prevent chronic diseases. While the costs of these programs are more easily quantified, many of the outcomes they aspire to achieve are intangible and lack obvious market values. The subjective well-being (SWB) method was developed to value a wide range of non-market goods, including health outcomes directly in monetary terms. This paper presents an application of the SWB approach to estimate the monetary value of health-promoting behaviours as the intermediate outcomes of health promotion and chronic disease prevention programs and policies.

Methods: Life satisfaction (LS) was used as a proxy of individuals' SWB. Based on the combined Canadian Community Health Survey 2009–10 data, we modelled LS as a function of income and healthy behaviours, controlling for the socio-demographic factors associated with LS at the individual level using ordinary least squares regression. Equivalent effects of income and healthy behaviours on LS derived from the models allowed us to estimate the trade-off between income and healthy behaviours.

Results: We found that income and healthy behaviours were positively associated with LS. The values of increased physical activity, an additional daily serving of fruits/vegetables, and not smoking are respectively $631, $115 and $563 per week.



20. "Implementing a resident-lifting system in an extended care hospital"
Jerry Spiegel et al. (2002)

Relevance	Methods	Data
B	B	B

Location: Canada

Programs/activities valued: Musculoskeletal disorder claims.

Summary: Authors of work-related musculoskeletal disorder reviews have consistently found healthcare workers at high risk for these conditions, and patient handling poses a particularly high risk (Daynard, 200 I; Hoogendoorn, 2000; Lagerstrom, 1998; Yassi, 1995a). Koehoorn (1999) and Lagerstrom (1998) each conducted comprehensive reviews of healthcare sector studies of musculoskeletal disorders. They noted that ten prospective studies and a number of high quality case control studies demonstrated consistent, clinically significant associations between these conditions and providing direct patient care. The most common approach to preventing occupational low back injuries in health care workers traditionally has been education and training in biomechanics and lifting techniques. However, consensus is currently emerging that mechanical hoists and assistive patient handling devices can play an important role in reducing the risk of back injuries in nursing staff (Smedley, 1997). Nonetheless, there have been few evaluations of the effectiveness of such systems, and even fewer attempts to assess the economic benefits and costs associated with such investments.

Methods: Between April and August 1998, sixty-five ceiling-mounted lifts were installed in the extended care unit of a hospital in British Columbia (BC), with funding from the BC Workers' Compensation Board. The direct benefit of the intervention was considered to be the cost reduction associated with a decrease in all permanent and casual employees' MSI-related time loss and subsequent compensation claims. The total costs of claims initiated in each period were documented from compensation records and then compared. To ensure that absolute claims amounts were comparable despite a slight variation in the total hours worked during the two periods, the claims paid in the pre-intervention period were adjusted by applying the actual cost per 100,000 hours to the number of hours worked during the post-intervention period.

Results: Prior to the installation of the ceiling lifts, MSI-related compensation costs per 100,000 hours worked at the Extended Care Unit had been rising steadily (see Figure 2 of the study). However, following the intervention, the costs of lift or transfer and all MSI-related compensation claims declined sharply, as also shown in Figure 2. Table I in the study shows a comparison of pre- and post-intervention costs in more detail. While the incidence of lift and transfer claims decreased by 58% (from 24 to 10), the costs per 100,000 hours worked were also reduced by 69% (from $65,997 to $20,731)

21. “Occupational health: The global evidence and value” Jonas Steel et al. (2018)

Relevance	Methods	Data
A	A	A

Location: European Union

Programs/activities valued: Comprehensive occupational health studies.

Summary: Effective occupational health measures result in the absence of health impairment (although this consequently remains invisible unless properly monitored). However, in general, existing economic evaluations sketch a mostly bright picture of the benefits of investing in occupational health. Most work-related diseases are multifactorial in origin and appear after a relatively long latency period between exposure and health effects. Despite the difficulties and the challenges in the economic evaluation of occupational health interventions, both literature and case studies provide evidence of the global rationale for investing in occupational health for enterprises. The study illustrates the following key messages:

- Benefits of occupational health can accrue to all involved stakeholders.
- There is a strong moral rationale for investing in OH.
- The value of OH interventions is strongly influenced by a country’s workers’ compensation and social security system.
- The overall health-related impact and return on investment of well-designed OH programs is positive for a wide variety of interventions and countries.
- The workplace health agenda can include workplace wellness, sustainability, and corporate social responsibility.

Methods: We first discuss the value of Occupational Health (OH) from a global perspective. We apply a broad meaning to the word “value”, including financial aspects, legal, moral, and other less tangible effects (such as effects on the corporate image). Next, we synthesise the global evidence on OH, combining indications from the scientific literature with case studies.

Results: In general, existing economic evaluations sketch a mostly bright picture of the benefits of investing in occupational health. However, many of the available studies and reviews also highlight a need for more high quality research, both on the effectiveness of interventions on health outcomes, as well as on the financial and economic impact of these programmes. Contradictory indications of reviews can often be explained because of low quality studies, or a general lack of evidence upon economic outcomes. To strengthen results, more research with a thorough economic component is needed, preferably accounting for the local legal and health-economic context. While the evidence review focused on financial reasons to invest, there are many intangible reasons to invest in occupational health, such as an improved reputation and compliance with the law (325), as a moral obligation, or to bring corporate social responsibility into practice (27, 326). Finally, the conclusions of the reviews should be seen in their context. Much of the research has been conducted in high-income countries, where the prevalence of some hazards and diseases is lower than in low- and middle-income countries.

22. "Economic evaluations of ergonomic interventions preventing work-related musculoskeletal disorders: A systematic review of organizational-level interventions" Helene Sultan-Taieb et al. (2017)

Relevance	Methods	Data
C	B	C

Location: Canada

Programs/activities valued: Occupational ergonomic interventions.

Summary: Work-related musculoskeletal disorders (WMSD) represent a major public health problem and economic burden to employers, workers and health insurance systems. This systematic review had two objectives: (1) to analyse the cost-benefit results of organizational-level ergonomic workplace-based interventions aimed at preventing WMSD, (2) to explore factors related to the implementation process of these interventions (obstacles and facilitating factors) in order to identify whether economic results may be due to a successful or unsuccessful implementation.

Methods: Systematic review. Studies were searched in eight electronic databases and in reference lists of included studies. Companion papers were identified through backward and forward citation tracking. A quality assessment tool was developed following guidelines available in the literature. An integration of quantitative economic results and qualitative implementation data was conducted following an explanatory sequential design.

Results: Out of 189 records, nine studies met selection criteria and were included in our review. Out of nine included studies, grouped into four types of interventions, seven yielded positive economic results, one produced a negative result and one mixed results (negative cost-effectiveness and positive net benefit). However, the level of evidence was limited for the four types of interventions given the quality and the limited number of studies identified. Our review shows that among the nine included studies, negative and mixed economic results were observed when the dose delivered and received by participants was low, when the support from top and/or middle management was limited either due to limited participation of supervisors in training sessions or a lack of financial resources and when adequacy of intervention to workers' needs was low. In studies where economic results were positive, implementation data showed strong support from supervisors and a high rate of employee participation.

23. "Global estimates of the burden of injury and illness at work in 2012" Jukka Takala (2014)

Relevance	Methods	Data
B	B	B

Location: Global

Programs/activities valued: Cost of occupational injuries and diseases as percentage of GDP.

Summary: This article reviews the present indicators, trends, and recent solutions and strategies to tackle major global and country problems in health and safety at work. The article is based on the Yant Award Lecture of the American Industrial Hygiene Association (AIHA) at its 2013 Congress. Leadership and management at all levels, and engagement of workers are key issues in changing the workplace culture. Vision Zero is a useful concept and philosophy in gradually eliminating any harm at work. Legal and enforcement measures that themselves support companies and organizations need to be supplemented with economic justification and convincing arguments to reduce corner-cutting in risk management, and to avoid short- and long-term disabilities, premature retirement, and corporate closures due to mismanagement and poor and unsustainable work life. We consider that a new paradigm is needed where good work is not just considered a daily activity. We need to foster stable conditions and circumstances and sustainable work life where the objective is to maintain your health and work ability beyond the legal retirement age. We need safe and healthy work, for life.

Methods: We reviewed employment figures, mortality rates, occupational burden of disease and injuries, reported accidents, surveys on self-reported occupational illnesses and injuries, attributable fractions, national economic cost estimates of work-related injuries and ill health, and the most recent information on the problems from published papers, documents, and electronic data sources of international and regional organizations, in particular the International Labor Organization (ILO), World Health Organization (WHO), and European Union (EU), institutions, agencies, and public websites. We identified and analysed successful solutions, programs, and strategies to reduce the work-related negative outcomes at various levels.

Results: Work-related illnesses that have a long latency period and are linked to ageing are clearly on the increase, while the number of occupational injuries has gone down in industrialized countries thanks to both better prevention and structural changes. We have estimated that globally there are 2.3 million deaths annually for reasons attributed to work. The biggest component is linked to work-related diseases, 2.0 million, and 0.3 million linked to occupational injuries. However, the division of these two factors varies depending on the level of development. In industrialized countries the share of deaths caused by occupational injuries and work-related communicable diseases is very low while non-communicable diseases are the overwhelming causes in those countries. Economic costs of work-related injury and illness vary between 1.8 and 6.0% of GDP in country estimates, the average being 4% according to the ILO. Singapore's economic costs were estimated to be equivalent to 3.2% of GDP based on a preliminary study. If economic losses would take into account involuntary early retirement then costs may be considerably higher, for example, in Finland up to 15% of GDP, while this estimate covers various disorders where work and working conditions may be just one factor of many or where work may aggravate the disease, injury, or disorders, such as traffic injuries, mental disorders, alcoholism, and genetically induced problems. Workplace health promotion, services, and health and safety management, however, may have a major preventive impact on those as well.

24. "Quantifying the costs and benefits of occupational health and safety interventions at a Bangladesh shipbuilding company" Irene Thiede et al. (2015)

Relevance	Methods	Data
A	A	A

Location: Bangladesh

Programs/activities valued: Costs/benefits of workplace safety overhaul, cost/risk of injuries pre and post-intervention.

Summary: This study is the first cost–benefit analysis (CBA) of occupational health and safety (OHS) in a low-income country. It focuses on one of the largest shipbuilding companies in Bangladesh, where globally recognized Occupational Health and Safety Advisory Services (OHSAS) 18001 certification was achieved in 2012. The study examines the relative costs of implementing OHS measures against qualitative and quantifiable benefits of implementation in order to determine whether OHSAS measures are economically advantageous. OHS measures decrease injuries, increase efficiency, and bring income security to workers' families. Certification has proven a competitive edge for the shipyard, resulting in access to greater markets. Intangible benefits such as trust, motivation and security are deemed crucial in the CBA, and this study finds the high investments made are difficult to offset with quantifiable benefits alone.

Methods: Quantifying past costs and benefits and discounting future ones, this study looks at the returns of OHS measures at Western Marine Shipbuilding Company Ltd.

Results: Costs included investments in workplace and environmental safety, a new clinic that also serves the community, and personal protective equipment (PPE) and training. The results are impressive: previously high injury statistics dropped to close to zero, for a nearly 100% decrease in medical treatment costs per worker.

25. "The value of occupational health and safety and the societal costs of work-related injuries and diseases" Emile Tompa et al. (2019)

Relevance	Methods	Data
A	A	A

Location: European Union

Programs/activities valued: Economic burden of occupational injuries/diseases.

Summary: The need to improve working life in the European Union (EU) is still urgent today. In 2016, approximately 2.4 million non-fatal accidents requiring at least four days of absence from work and 3,182 fatal accidents were reported in EU Member States. In addition to these accident rates, figures from 2013 show that 7.9% of the workforce suffered from occupational health problems, of which 36% resulted in absence from work for at least four days (Eurostat, 2018a, 2018c). These occupational injuries, diseases and deaths result in high economic costs to individuals, employers, governments and society. Negative effects may include costly early retirement, the loss of skilled staff, absenteeism as well as presenteeism (when employees go to work despite illness, increasing the likelihood of mistakes) and high medical costs and insurance premiums.

Methods: Earlier attempts have been made to estimate the financial burden of occupational injuries and diseases. Often, they are limited to one or more diseases, or to the consequences of a specific type of exposure. Only a few studies address the full burden of occupational diseases. EU-OSHA decided to address this large research gap in the field of OHS and initiated a project to estimate the costs of occupational injuries, diseases and deaths at a European level. The project involved a two-stage approach. The first stage started in 2015 and resulted in an overview of the availability and quality of the national and international data sources required for the development of cost estimation at a European level. It was concluded that in many countries the available data sources were insufficient for a reliable estimation of the economic burden of occupational injury and disease. However, in some countries the availability appears to be reasonably sound and may be sufficient to carry out a cautious estimation (EU-OSHA, 2017b).

Results: In the bottom-up model, the total estimated economic burden of work-related injuries and diseases — including fatal and non-fatal cases — ranges from 2.9% of GDP in Finland to 10.2% in Poland. In the top-down model, the economic burden is highly dependent on the monetisation approach used. In the human capital approach, the work-related economic burden varies from 0.6% to 4.5%, dependent on the monetisation method, with less variance among countries. In the WTP approach, percentages are higher and vary from 0.5% to 8.3%. The VSLY approach yields the highest values, with estimates of the economic burden of occupational injury and disease at 1.4% of GDP at the minimum and 27.7% at the maximum. In this approach, variance among countries is also higher.

26. "Estimating the costs of work-related accidents and ill-health: An analysis of European data sources" Swenneke Van Der Heuvel et al. (2017)

Relevance	Methods	Data
B	B	A

Location: European Union

Programs/activities valued: Direct and indirect costs of occupational injuries and illnesses.

Summary: The European Agency for Safety and Health at work (EU-OSHA) aims to estimate the costs of accidents at work, work-related health problems and work-related deaths in Europe. The first step towards achieving this objective entails the production of an overview of the availability and quality of the national and international data sources required for the development of such a European-level cost calculation. The current report presents these results.

Methods: The availability of relevant data was checked at the international as well as the national level in the twenty-eight Member States of the European Union (EU-28), Iceland and Norway. Data were collected with the assistance of country experts who were asked to complete forms relating to sources of cases and costs of accidents at work and work-related health problems. The resulting data were assessed against predefined quality criteria. The cost assessment was limited to an overview of availability of data.

Results: Having assessed the coverage and quality of the available data sources, it became apparent that there were insufficient data to determine cases of the work-related burden of disease at the European level. There is a paucity of robust, reliable data relating to accidents at work and work-related health problems. With regard to costs, we found that direct healthcare costs can be deduced from international data sources. Calculating indirect costs, however, would be challenging, as data relating to several additional costs and the friction period are missing. Based on the available data sources on gross salary, we recommend adopting the human capital approach. An essential prerequisite for the use of such an approach, however, is that the number of missed work days can be estimated. Despite the lack of data, some of the gaps may be filled through estimation. Suggestions for an approach to doing so can be based on the following observations:

a. In some countries the availability of data sources appears to be reasonably sound and may be sufficient to carry out a cautious estimation. Subsequently, these results may be used to estimate the costs in other countries with comparable structures.

b. Through a combination of figures on the work-related fraction of diseases, incidence and prevalence of these diseases, and costs associated with such diseases, a cost estimation may be feasible for some specific work-related diseases.

c. Since much research has been done on the impact of certain risk factors on specific health problems, and figures on the occurrence of certain risk factors are also available, a cost estimation by risk factor seems feasible.

An approach like this may allow a partial cost estimation. However, an estimate of the total burden of work-related disease would require a considerable number of assumptions to be made.

A.2 Transfer values for use in OHS assessments (Protocol Step 7)

The literature review provides data as reported in each of the studies. The reviews and the original studies provide important information about the context surrounding the valuation, which will help the user decide whether the study could be applicable to their situation. However, the "as-is" study results may not be useful for value transfer because:

- They need to be adjusted to current year currency to reflect the impact of inflation.
- The studies do not report standardized values, such as cost-per-injury or benefits-per-injury avoided.
- The components of the costs and benefits vary across the studies.

Table 2 presents normalized values that overcome the challenges described above. Specifically:

- All values have been updated to year-end 2021 values based on the country where the study took place and they are reported in U.S. dollars and Euros.[7]
- To the extent possible, the benefits and costs are reported on a per-injury basis. If such calculation cannot be made, Table 2 describes the basis for the calculation.
- Where possible, we also describe the components of the per-injury costs and benefits. For example, costs to workers might be broken down by medical costs and impact on well-being.

Table 2 includes a total of forty-nine potential values. Of the seven studies that specifically evaluate the costs and benefits of ergonomics programs, seventeen values pertaining to ergonomics were included in Table 2. The estimates include both impacts to companies and impacts to workers. Even with the normalization, users should be cautious when choosing the values to use. Providing guidance on appropriate value transfer approaches is beyond the scope of this paper, but some useful guidance can be found about individual studies in the Notes column of Table 2. Three important best practice considerations are: always describe the basis for your selection and note any material limitations; conduct sensitivity analysis to assess the robustness of your choice; consult with valuation experts about your selection and approach.

Finally, please note that not all of the studies contained values that could be normalized and reported here. However, these studies often contain information could inform a valuation. For example, the Allread study has no value per injury information, but does include data on the benefit-cost ratio and ROI of some very specific programs.

[7] The majority of the standardized studies were estimated in the United States, but others were conducted in Canada, Finland, Germany, Great Britain, Italy, Poland, and the Netherlands. For US-based studies, we used the Consumer Price Index (CPI) from the National Bureau of Labor Statistics for December 2021 to adjust costs that were calculated in the past, and multiplied by the 2021 exchange rate to be calculated in Euros. For studies conducted around the globe, cost results were multiplied by the country's local CPI first, with data from inflation.eu, the Bank of England, and the Bank of Canada, then multiplied by 12/31/2021 exchange rates to be valued in US Dollars and Euros.

Table 2: Standardized benefit and cost values

First author last name	Publication year	Topic valued	Unit	Cost description	Location	Dec 2021 USD value ($)	Dec 2021 EUR value (€)	Notes
Allread	2010	Average savings from MSD ergonomics program	Per year	Direct + Indirect costs	United States	187,649	165,131	
Baicker	2010	Medical costs - Savings per dollar spent on wellness programs	Per case	Direct cost	United States	4	4	
Baicker	2010	Absenteeism costs savings for every dollar spend	Per case	Indirect cost	United States	4	3	
Boon-long	2001	Ergonomics program - motor vehicle and car bodies	Per worker	Present value of project benefits	United States	3,165,710	2,785,825	15 industries reported - selected high and low.
Boon-long	2001	Ergonomics program - men and boys clothing, except trousers and slacks	Per worker	Present value of project benefits	United States	122,294	107,618	Injuries not reported
HSE	2020	Workplace fatalities	Per case	Productivity and health cost to society	Great Britain	2,436,893	2,180,378	
HSE	2020	Cost of illness	Per case	Productivity and health cost to society	Great Britain	26,534	23,741	
HSE	2020	Illness, 7 days or more	Per case	Productivity and health cost to society	Great Britain	55,441	49,605	
HSE	2020	Illness, 6 days or less	Per case	Productivity and health cost to society	Great Britain	1,313	1,175	
HSE	2020	Cost of non-fatal injury	Per case	Productivity and health cost to society	Great Britain	12,289	10,996	
HSE	2020	Non-fatal injuries, 7 days or more	Per case	Productivity and health cost to society	Great Britain	48,040	42,983	
HSE	2020	Non-fatal injuries, 6 days or less	Per case	Productivity and health cost to society	Great Britain	1,257	1,125	
Lahiri	2005	Annualized cost savings from lower back pain	Per worker	Direct cost	United States	963	847	
Lahiri	2005	Gain in productivity after intervention	Per worker	Direct cost	United States	2,396	2,109	
Leigh	2011	Indirect cost per fatal injury	Per case	Indirect costs	United States	1,335,406	1,175,158	

First author last name	Publication year	Topic valued	Unit	Cost description	Location	Dec 2021 USD value ($)	Dec 2021 EUR value (€)	Notes
Leigh	2011	Medical cost per fatal injury	Per case	Direct medical costs	United States	72,884	64,138	
Leigh	2011	Medical cost per nonfatal injury	Per case	Direct medical costs	United States	73,941	65,068	
Leigh	2011	Indirect cost per nonfatal injury	Per case	Indirect costs	United States	21,738	19,129	
Leigh	2011	Occupational fatal diseases	Per case	Medical and indirect costs	United States	1,133,530	997,506	
Nelson	2006	Cost of intervention	Per worker	Direct cost	United States	2,158	1,899	
Nelson	2006	Annualized cost of intervention	Per worker	Direct cost	United States	230	202	
Nelson	2006	Average medical cost pre-intervention	Per case	Direct cost	United States	178	156	
Nelson	2006	Average medical cost post-intervention	Per case	Direct cost	United States	92	81	
Nelson	2006	Average cost of personal days pre-intervention	Per case	Indirect cost	United States	104	92	
Nelson	2006	Average cost of personal days post-intervention	Per case	Indirect cost	United States	92	81	
Nelson	2006	Average cost of modified dates pre-intervention	Per case	Indirect cost	United States	255	224	
Nelson	2006	Average cost of modified dates post-intervention	Per case	Indirect cost	United States	79	70	
Nelson	2006	Average annualized cost savings	Per worker	Direct + Indirect cost	United States	382	336	
Peterson	2019	Average medical cost of fatal injuries	Per case	Direct costs	United States	16,619	14,624	
Peterson	2019	Average value of statistical life (fatal)	Total	Indirect costs	United States	9,579,070	8,429,582	
Peterson	2019	Average medical cost of non-fatal injuries	Total	Direct costs	United States	13,451	11,837	Medical care for an injury that starts in an emergency department
Peterson	2019	Average work loss cost (non-fatal)	Total	Indirect costs	United States	2,862	2,519	
Peterson	2019	Average QOL injuries (non-fatal)	Total	Indirect costs	United States	67,914	59,765	Injuries that decrease life expectancy and baseline quality of life

First author last name	Publication year	Topic valued	Unit	Cost description	Location	Dec 2021 USD value ($)	Dec 2021 EUR value (€)	Notes
Peterson	2019	Average medical costs unintentional non-fatal injuries	Per case	Direct costs	United States	12,870	11,325	Unintentional injuries exclude homicide and assault intentions
Peterson	2019	Average work lost unintentional non-fatal injuries	Per case	Indirect costs	United States	2,833	2,493	Unintentional injuries exclude homicide and assault intentions
Peterson	2019	Average QOL unintentional non-fatal injuries	Total	Indirect costs	United States	67,199	59,135	Unintentional injuries exclude homicide and assault intentions
Seeley	2003	Annualized medical costs (indemnity, reimbursements (drugs, parking, transportation)	Per employee	Direct + Indirect costs	United States	817	719	
Seeley	2003	Projected annual savings	Per employee	Direct costs	United States	787	692	
Seeley	2003	Replacement worker cost annualized	Total	Indirect Cost	United States	528	464	
Shi	2019	Physical activity	Per week	Individual value	Canada	625	553	
Shi	2019	Not smoking	Per week	Individual value	Canada	558	493	
Spiegel	2002	Pre-intervention average cost per claim for musculoskeletal injuries	Per case	Direct cost	Canada	3,985	3,525	
Spiegel	2002	Post-intervention average cost per claim for musculoskeletal injuries	Per case	Direct cost	Canada	3,244	2,870	
Thiede	2015	Change in treatment costs of injuries with OHS program implementation	Per worker	Medical cost savings	Bangladesh	10	9	Value obscures result; nearly 100% decrease in medical treatment costs per worker.
Tompa	2019	Economic Burden	Per case	Total cost	The Netherlands	91,249	80,751	Economic burden is determined by the value of DALYs lost to occupational injury and disease

First author last name	Publication year	Topic valued	Unit	Cost description	Location	Dec 2021 USD value ($)	Dec 2021 EUR value (€)	Notes
Tompa	2019	Economic Burden	Per case	Total cost	Italy	65,215	57,712	Economic burden is determined by the value of DALYs lost to occupational injury and disease
Tompa	2019	Economic Burden	Per case	Total cost	Germany	58,333	51,622	Economic burden is determined by the value of DALYs lost to occupational injury and disease
Tompa	2019	Economic Burden	Per case	Total cost	Finland	54,361	48,107	Economic burden is determined by the value of DALYs lost to occupational injury and disease
Tompa	2019	Economic Burden	Per case	Total cost	Poland	48,343	42,782	Economic burden is determined by the value of DALYs lost to occupational injury and disease

07

Appendix B - OHS study information template

ERM developed a form to collect information on additional studies from interested parties. The form is reproduced below and can be accessed at this web address: **https://forms.gle/S16Ay5sjSDPusUxA8.**

Occupational Health and Safety valuation studies

The Capitals Coalition is collecting information on the value and impacts of occupational health and safety (OHS) programs. This information will be compiled into a resource that companies can use to evaluate the different types and magnitude of benefits provided by OHS programs. This information, in turn, can help identify the most effective interventions, as well as provide justification for investing time, money, and resources into OHS programs.

The purpose of this form is to collect information about any studies your company may have conducted about the costs, benefits, effectiveness, and/or value of the company health and safety programs or interventions.

Relevant studies do NOT need to have monetary values; they can provide impacts measured as qualitative or non-monetary quantitative terms, such as improvements in outcomes, fewer injuries, improved worker satisfaction, etc. Information about perceived value is also helpful, such as results from an employee satisfaction survey.

Further, studies do NOT need to be formal evaluations; data that has been collected and/or reviewed to evaluate or support interventions and programs is also relevant, even if the analysis has not been performed.

If you have multiple studies, please complete the form once for each study. Please send a copy of each study via e-mail to miranda.freeman@erm.com. If you are able to share study data files, please indicate that in the e-mail as well and we will contact you to arrange for the data transfer.

Please note that no data that can be traced back to individual companies will be released; identifying details will be kept private, as will the study files.

1. What is the topic of the study? (i.e., what is the study evaluating or measuring?) For example, what types of occupational health and safety injuries are being studied, what are the main components of the program (e.g., ergonomic training, defensive driving)?

2. How would you classify what this study did? (Check all that apply)

- ☐ Estimated cost of health and safety issues (i.e., injuries, deaths, etc) to the company and/or employees
- ☐ Measured value, impacts, or benefits of an intervention or a program to the company
- ☐ Measured value, impacts, or benefits of an intervention or program to the well-being of employees
- ☐ Measured the perceived value, impacts, or benefits of an intervention or program from the perspective of the employee
- ☐ Other

3. What types of costs or benefits does the study measure? (Check all that apply)

- ☐ Medical costs
- ☐ Worker income and benefits
- ☐ Productivity impacts
- ☐ Legal costs
- ☐ Insurance costs or benefits
- ☐ Individual costs or benefits (not income)
- ☐ Number or severity of injuries
- ☐ Worker well-being
- ☐ Other

4. Please list the impacts or values reported in the study, with a short (1-10 word) description of each.

5. Is the impact or value(s) reported a total or a per case value? (Check all that apply)

   - ☐ Total
   - ☐ Per case
   - ☐ Other

6. What currency or units are the impacts or values measured in? For example, US dollars or number of injuries per year.

7. What year(s) are included in the study data?

8. What country(ies) was the study conducted in? List all countries if there is more than one.

9. Are the results of the study public, or confidential?

   - ☐ Public
   - ☐ Confidential

10. Please provide any further comments you would like to share about this study. For example, key conclusions, strengths and limitations, etc.

11. Who conducted the study? (Company or consultant name, or lead authors' names)

12. What is the name of your company?

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The Capitals Coalition is a global collaboration transforming the way decisions are made by including the value provided by nature, people and society. Our ambition is that by 2030 the majority of business, finance and government will include all capitals in their decision-making, and that this will deliver a fairer, more just and more sustainable world.

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