

## A Study on the Importance of Uninsured (Indirect) Cost Item of Workplace Accidents

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**Abstract** – Estimation of accident cost is a sound and great safety indicator on determining accurate occupational safety and health prevention. Just like in Korea, Heinrich ratio analysis of (1:4) between direct and indirect costs has been become widely used in safety management because of its simplicity. In this study four major categories of uninsured (indirect) cost items and 18 sub-categories of uninsured (indirect) cost items were identified. To determine and validate the importance and necessity of the results of a literature review an expert or professional surveyed had been analyses using the SPSS 18.0, where in the participants whose expertize is in the field of compensation and safety. Based on the results of survey all participants all uninsured (indirect) cost items classified was important and necessary when accidents occurred. Despite recognition of expert on the classification of uninsured (indirect) cost items, it is quite difficult to make generalization for all kind of costs in occupational accident case due to different nature of business for each industry.

Key words: Uninsured cost, Indirect cost, Workplace accidents, Injury, Safety

### 1. Introduction

The Industrial Accident Compensation Insurance Act was introduced in 1964 in Korea to protect workers from the rapidly increasing number of industrial accidents. With this compulsory insurance program the state ensures the post-accidental livelihood of workers and their families. The government imposes a certain level of contribution on employers to take responsibility for accident compensation under the Labor Standards act, and compensates on behalf of employers for accident victims out of resources funded through collection of insurance contribution. Based on the Industrial Safety and Health Act, every employer should report occupational injury to the Ministry of Labor (MOL) within one month.

Occupational accidents or diseases in Korea are a major concern across industries both from a human suffering and a financial viewpoint. In 2014, there were 17,062,308 workers working in 2,187,391 workplaces covered by the Industrial Accident Compensation Insurance Act. Among them, 90,909 workers fell victim to occupational accidents requiring medical treatment for four days or more. Korea's rate of occupational injuries and illnesses in 2014 was 0.53% [1] and yearly average occupational accident compensation per victim is 1,557,000 Won. While incidence rates have continuously dropped from 2007 to the 2014 figure, the cost of industrial accident insurance provided in 2014 was as much as 3 trillion 926 million Won, wherein the estimated uninsured cost were 15 trillion 706 million Won, adopt-

ing the Heinrich ratio method of 1:4.[2]. Because of its simplicity, Heinrich ratio analysis of (1:4) between direct and indirect costs has become widely used in safety management just like in Korea.

Cost is not an easy concept to define. From a strictly financial viewpoint, a cost must be considered as the value that must be given up to acquire a good or service. It's clear that this definition cannot immediately be applied to costs of accidents at work and work-related ill-health. Krüger and Meis (1991) refer to this problem, indicating that "accident costs" is not a correct concept. In the context of a company, costs can be related to production factors (personnel costs, costs of goods, etc.), or to their accountability (fixed costs, variable costs), etc. Costs for accidents at work, work-related ill-health do not fit this profile. However, one has to take a broader perspective on the matter. Dorman (2000a) defines economic costs as costs that can be expressed in monetary units. They include the costs paid - or expected to be paid - by individuals and organizations acting within the economy, as well as the monetary values implicit in activities undertaken and foregone. It is clear that not all such costs involve financial payments. Some can be attributed through careful analysis, such as the impact of an accident on the depreciation of equipment or the loss of raw material. Ultimately, these come down to a set of payments, but it may take a careful study to determine what portion of the payment is attributable to accidents at work and work-related ill-

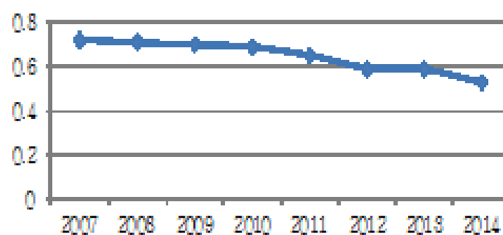


Fig. 1. Annual Occupational Accident Rate.

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<sup>‡</sup>This article is dedicated to Prof. Choon Han on the occasion of his retirement from Kwangwoon University.

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health. Other costs should be placed under the heading ‘opportunity costs’, referring to the value of the opportunities lost to the company due to worker absences or other forms of disruption due to ill-health. If a company loses market share, for instance, this is really the cost of not enjoying the benefits of the higher market share that would otherwise have been possible. According to Brody, occupational safety and health costs must be seen in the light of financial management of risks:

- Part of the risk is eliminated by prevention measures
- Another part of the risk is covered by insurance, and
- The residual part of the risk is considered as part of the hazards associated with managing a company [7].

Occupational safety and health costs are the sum of these compo-

nents, but only the last two are determined by the level of accidents at work and constitute accident costs. Prevention costs are by nature “ex ante” and Accident costs “ex post”[6,8].

Even though formulating a definition for costs of accidents at work and work-related ill-health brings about some difficulties, most authors consider these to be the costs that can be attributed to the effects of accidents at work and work-related ill-health [5,23].

In this regard it is obvious that the costs to a company due to accidents at work and work-related ill-health are by their very nature non-value added and should be avoided. They have a negative impact on the corporate value creation. The identification of the costs of occupational accidents illustrates the benefit of the corporate occupa-

**Table 1. Literature Review: Composition of the Cost of workplace Accidents**

Study	Data Source	Cost Components	Estimation Method
Everett and Frank [6]	Descriptive study US construction industry	· Administrative costs · Liability and property damage · Lost wages and benefits · Medical payments · Productivity loss · Replacement	Prevalence-based model
Head and Harcourt [10]	Descriptive study Sample of industries in New Zealand	· Investigation · Medical payments · Lost wages and benefits · Productivity loss · Replacement	Prevalence-based model
LaBelle [2]'	Literature Review	· inspection · Lost wages and benefits · Medical payments · Overhead · Productivity loss · Replacement · Return to work	Prevalence-based model
Laufer [13]		Productivity loss	Prevalence-based model
Leopold and Leonard [16]	[1987] Descriptive study Data in Great Britain	· Increased premiums · Investigation · Liability and property damage · Lost wages and benefits · Medical payments · Overhead · Productivity loss	Prevalence-based model
Miller [13]	Descriptive study US - National Expenditure Data	· Increased premiums · Investigation · Liability and property damage · Lost wages and benefits · Medical payments · Overhead · Productivity loss · Replacement · Tax payments	Prevalence-based model
Monnery [19]	Descriptive study Financial services organization	· Increased premiums · Overhead · Productivity loss · Replacement	Prevalence-based model
Rikhardsson and Impgaard [25]	Descriptive study Service, Construction, and Production Industry in Denmark	· Overhead · Productivity loss	Incidence Based model
Roche [23]	Descriptive study Data in New Jersey in 1992	· Lost wages and benefits · Medical payments · Overhead · Liability and property damage	Prevalence-based model

tional health and safety effort in terms of costs that could be avoided if accidents are prevented [24].

## 2. Research Methodology

### 2-1. Literature Review Strategy on the Inclusion of Study

The literature review focused on the nature of the uninsured components of work-related accidents. The purpose of the systematic review was to identify the most relevant uninsured cost components of workplace accidents. Publications were identified and selected through several databases-Pub Med, Science Direct and Web of Science-with the following keywords such as accident or injury, cost, estimation, occupational or workplace and inclusion of study using the following inclusion criteria:

1. The publication is available in English, and an abstract or a full-text version is available.
2. The publication specifically treats the insured (direct) and uninsured (indirect) cost evaluation,
3. The publication is about occupational / workplace accidents,
4. The publication divides the cost of accidents into meaningful categories or provides an approach to evaluate them.

The database search resulted in 254 entries available in all. Only 11 articles met the inclusion criteria.

### 2-2. Results of Literature Review

A spectrum of cost components is proposed by all relevant sources. An in-depth look into each different taxonomy shows that slight differences in terms of names and scope appear. Miller (1997) proposed the following categories: increased premiums, investigation, liability and property damage, lost wages and benefits, medical payments, overheads, productivity loss, replacement and tax payments [18]. Those categories were standardized for all sources to stress the differences across publications. Employees can insure medical payments, lost wages and benefits as part of workers' compensation. Property damage and third-party liability are commonly insured as well. Even though increased premiums are uninsured, the impact of increased premiums depends on the nature of the insurance policy and the frequency.

1. Legal and administrative cost: The employer has to assign human and financial resources to handle the administrative and legal issues of an accident. This component includes follow-up, record keeping, clean-up and claim processing and does not include fines imposed on the employer by the authorized agency which determines if there was any negligent behavior on the part of the employer.

2. Productivity cost: The productivity of the organization is affected by an accident, i.e., by reducing the pace of the workstation. Employees near the scene of an accident may stop their work to offer assistance in the case of an accident. Overtime might be required to complete previously scheduled work so as not to disrupt overall production planning. Nonetheless, productivity effects go beyond the moment of the accident. According to the Hawthorne Effect, employees are

likely to modify their regular pace after an accident because of the newly perceived risk of their work. Only over a period of time will the workers perform a safer routine with the same original pace.

3. Replacement Cost: An absent employee can be replaced by transferring or hiring a new employee. In either case, there is a cost associated with preparing the newcomer for the required job. This component includes the recruitment process for the new employee and the training required until this person is capable of the same productivity and quality as the injured worker.

4. Investigation Cost: All accidents should be investigated to meet administrative and legal requirements. A multi-disciplinary team may investigate the accident cause, prevent a future recurrence and complete the documentation of the incident. The investigation cost includes any safety measure required to prevent an accident from recurring.

### 2-3. Analysis Method

Results of the literature review of the uninsured (indirect) cost items of workplace accidents have been validated by asking the opinion of professional in the company in terms of compensation, company technical expert about the importance and necessity of the uninsured cost items using the Statistical Package for Social Sciences version 18.0. To analyze the validity of importance and necessity of the classified uninsured (insured) cost items, Statistical Package for Social Sciences (SPSS) 18.0 has been used, with the level score of 5 points as the highest score and 1 as the lower score; 3 points level is used as an average valid score determining the importance and necessity of the uninsured (indirect) cost items of workplace accidents.

### 2-4. Characteristics of Survey Participants

The pilot test was participated by the company's In-charge/expert on the part of compensations and safety practitioners through answering the questionnaire surveys using the Likert-type scale having 5 points as the highest scores to identify the uninsured (indirect) cost items determining its importance and necessity.

The questionnaire survey shows the results of the literature review of uninsured (indirect) cost items having 4 main categories and 18 sub-categories. The study had a total of 46 respondents primarily employed in the manufacturing industry. Male respondents were found to be more than female respondents, which had a portion of 91.3%. Respondents aged 40-49 years old had a large portion,

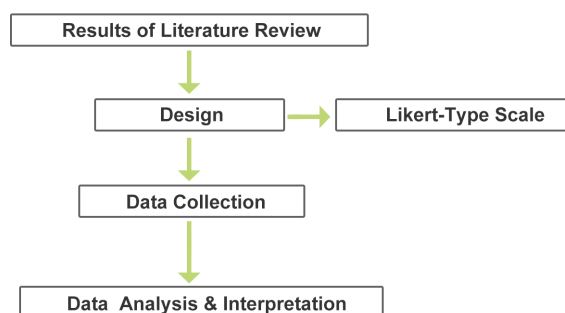


Fig. 2. Flowchart of Designing Questionnaire.

**Table 2. General characteristics of the respondents**

Types	Category	N	%
Gender	Male	42	91.3
Gender	Female	4	8.7
Age	29yrs old below	1	2.2
Age	30~39 years old	11	23.9
Age	40~49 years old	29	63.0
Age	50~59 years old	5	17.4
Education	Graduate	38	82.6
Education	Post Graduate	8	17.4
Profession	Compensation, Expert	29	58.7
Profession	Safety, Practitioners	19	41.3
Work Experience	below 5 years	6	13.0
Work Experience	above 5 years	40	87.0

63.0%, and those who had a Bachelor's degree in terms of education had a portion of 82.6%. Respondents whose in-charge in compensation had a percentage of 58.7%, while safety practitioners were 41.3%, respectively. Most of the respondents with five years work experience participated in the survey with 87.0%.

### 3. Statistical Analysis

#### 3-1. Validation of Survey on the Importance of Uninsured (indirect) cost items

To analyze the validity of importance and necessity of the classified uninsured (insured) cost items, Statistical Package for Social Sciences (SPSS) 18.0 was used, with the level score of 5 points as the highest score and 1 as the lower score. 3 points level was used as an average valid score for determining the importance and necessity of the uninsured (indirect) cost items of workplace accidents. As shown in the Table 3, 16 out of 18 uninsured (indirect) cost items scored above 3.0 points and the two sub-uninsured (indirect) cost items

failed to meet the average score, which are C3-Instructors training fee and D5-Special leave of absence not covered by compensation.

#### 3-2. Professional Expert Recognition

This study used SPSS 18.0 in recognizing the importance of expert pilot test by conducting an analysis of variance (ANOVA) using the Duncan post-hoc method with a significance level (p-level) of <0.05 (refer to Table 4). These results show 18 sub-cost items of uninsured (indirect) costs of workplace accidents stated between experts in the assessment area appearing normal in this study. Each classified uninsured (indirect) cost item seems to be applicable to evaluate. Both experts of compensation and safety recognize the high importance of Loss of profits & Sales and Workers productivity loss due to replacement as uninsured cost (indirect) items when workplace accidents occur and other cost items show moderate level of recognition.

### 4. Conclusion & Recommendation

The literature review on the importance of uninsured (indirect) costs items of workplace accidents does not present a uniformly accepted computation method. Differences in the various systems are substantial. More importantly, no published ratios are currently valid because the increase of direct costs (indemnity and medical costs resulting from an injury or illness) has exceeded the increase of indirect costs substantially in the past 20 years.

Although hidden costs are very real, they are very difficult to demonstrate. To say arbitrarily to management that they amount to four-times the insurable costs is asking for trouble. If management asks for proof, one can only say, "Heinrich said so." Management wants facts, not imagination. Without proof, hidden costs cannot be real. SH&E professionals need proof to support the indirect to direct

**Table 3. Results of the importance of the classified uninsured (indirect) cost items**

Item	Uninsured (Indirect) Cost Sub-Cost Item	M	SD
(A) Legal & Administrative Cost	A1. Administrative and insurance claim processing	3.80	1.00
	A2. Legal cost/litigation cost	3.33	1.41
	A3. Fines & penalties	4.24	0.82
	A4. Loss time accompanying injured person	3.80	0.95
	A5. Increase on Insurance Premiums	3.89	1.01
	A6. Overtime exposed on Management	3.76	4.64
(B) Investigation Cost	B1. Cost of investigation of accident by the supervisor	3.46	0.91
	B2. Time spent by the incident investigation team completing a thorough investigation	3.56	0.83
	B3. Consultants' fees to assist company in investigation	3.06	1.94
(C) Replacement Cost	C1. Recruitment and Selection of Replaced workers	3.28	0.78
	C2. Training cost for replacement of worker	3.17	0.80
	C3. Instructor Training Fee	2.82	0.85
	C4. Replacement or repair of equipment	3.78	0.85
(D) Productivity Cost	D1. Loss of production from the injured persons witnesses, other workers	4.13	4.37
	D2. Loss of profits or sales	3.87	1.09
	D3. Workers productivity loss due to replacement	3.80	0.93
	D4. Loss of efficiency of the injured worker after recovery	3.06	0.93
	D5. Special leave of absence not covered by compensation	2.43	0.65

**Table 4. Recognition of the Professional on the Importance uninsured (indirect) cost items of workplace accident**

		N	M	SD	F	Sig.
Administrative and insurance claim processing	Compensation Expert	27	4.03	.854	3.735	.060
	Safety Practitioners	19	3.47	1.124	3.735	.060
	Total	46	3.80	1.003	3.735	.060
Legal Cost/litigation	Compensation Expert	27	3.63	1.149	3.152	.083
	Safety Practitioners	19	2.89	1.663	3.152	.083
	Total	46	3.32	1.415	3.152	.083
Fines & Penalties	Compensation Expert	27	4.14	.864	.798	.376
	Safety Practitioners	19	4.36	.761	.798	.376
	Total	46	4.23	.822	.798	.376
Loss Time accompanying injured person	Compensation Expert	27	3.88	.934	.504	.481
	Safety Practitioners	19	3.68	1.003	.504	.481
	Total	46	3.80	.957	.504	.481
Increase on Insurance Premiums	Compensation Expert	27	4.11	.847	3.209	.080
	Safety Practitioners	19	3.57	1.170	3.209	.080
	Total	46	3.89	1.016	3.209	.080
Overtime exposed on management	Compensation Expert	27	3.37	.688	.458	.502
	Safety Practitioners	19	4.31	7.250	.458	.502
	Total	46	3.76	4.639	.458	.502
Cost of investigation of accident by supervisor	Compensation Expert	27	3.40	.888	.186	.668
	Safety Practitioners	19	3.52	.964	.186	.668
	Total	46	3.45	.912	.186	.668
Time spent by the incident investigation team completing a thorough investigation	Compensation Expert	27	3.70	.669	1.836	.182
	Safety Practitioners	19	3.36	1.012	1.836	.182
	Total	46	3.56	.834	1.836	.182
Consultants' fees to assist company in investigation	Compensation Expert	27	3.00	.920	.072	.790
	Safety Practitioners	19	3.15	2.873	.072	.790
	Total	46	3.06	1.948	.072	.790
Recruitment & selection of replaced workers	Compensation Expert	27	3.40	.747	1.703	.199
	Safety Practitioners	19	3.10	.809	1.703	.199
	Total	46	3.28	.779	1.703	.199
Training cost for replaced of worker	Compensation Expert	27	3.37	.839	4.256	.045
	Safety Practitioners	19	2.89	.658	4.256	.045
	Total	46	3.17	.797	4.256	.045
Instructor Training Fee	Compensation Expert	27	2.88	.641	.351	.557
	Safety Practitioners	19	2.73	1.098	.351	.557
	Total	46	2.82	.851	.351	.557
Replacement or repair of equipment	Compensation Expert	27	3.85	.864	.438	.512
	Safety Practitioners	19	3.68	.820	.438	.512
	Total	46	3.78	.841	.438	.512
Loss of production from the injured persons, witness, other workers	Compensation Expert	27	5.03	5.516	2.935	.094
	Safety Practitioners	19	2.84	.898	2.935	.094
	Total	46	4.13	4.370	2.935	.094
Loss of profits or sales	Compensation Expert	27	4.29	.823	12.678	.001
	Safety Practitioners	19	3.26	1.147	12.678	.001
	Total	46	3.87	1.087	12.678	.001
Workers productivity loss due to replacement	Compensation Expert	27	4.14	.718	10.788	.002
	Safety Practitioners	19	3.31	1.003	10.788	.002
	Total	46	3.80	.934	10.788	.002
Loss of efficiency of the injured worker after recovery	Compensation Expert	27	3.18	1.001	1.093	.301
	Safety Practitioners	19	2.89	.809	1.093	.301
	Total	46	3.06	.929	1.093	.301
Special leave of absence not covered by compensation	Compensation Expert	27	2.37	.565	.627	.433
	Safety Practitioners	19	2.52	.772	.627	.433
	Total	46	2.43	.655	.627	.433

cost ratios they use. For such a study to be successful, the methodology and scope should follow good research protocols, and a statistically based number of employers would need to be educated on and committed to the time and effort necessary. Most decisions about investments in healthier and safer work places are taken at company level. While presenting convincing arguments for investments in occupational safety and health, there is a need to make a link with business strategy and the company's bottom line. The link with business core activities is essential to obtain commitment and to integrate occupational safety and health into business processes. The available evidence on the links between occupational safety and health and company performance is promising and in some cases even convincing, but there is still work to be done to bring research results into companies. This emphasizes the need to set up economic assessments of occupational safety and health interventions on company level as part and in support of strategic business cases. Cost-benefit analysis is a useful assessment method since it compares benefits and costs of OSH interventions in monetary values.

While this study is limited to the importance of uninsured (indirect) cost items of workplace accident and results were recognized by the professional, it is recommended to bring the results of to the company itself in order to estimate the actual cost of workplace accidents. Also, since it is difficult to identify the uninsured cost items, continuous understanding and conducting detailed studies about loss cost is recommended.

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