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Is Construction Industry Workplace Injuries and Illness'sUnderreportinga Severe Problem: An Answer Based on Subjective Probability Analysis?

Keren Sun[1]& Peter Philips[1]

Abstract

This paper proposes a new research perspective, namely the subjective probability analysis method, to analyze the construction industry workplace injuries and illness's underreporting issue. We first argue that construction industry workplace injuries and illness's underreporting issue stems from the consequence of imperfect medical information and medical information asymmetry or the consequence of the intersection of imperfect medical information and medical information asymmetry between physicians and workers and contractors, then establish the connection between the subjective probability thoughts and the medical information asymmetry and imperfect information, i.e., facing the situation of medical information asymmetry and imperfect information, the workers and the employers' reasonable behavior is to make calculations about benefits via subjective probability method, so that the industry workplace injuries and illnesses statistics are relative to subjective probability theory and method. Also, we establish mathematical models of subjective probability of workers and employers in this paper. Therefore, the main conclusion of this paper is that, from the perspective of subjective probability theory, the construction industry workplace injuries and illness's underreporting issue is not severe.

Keywords: Construction OSHA Injuries Underreporting Subjective Probability

1.Introduction

Hazards exist in every workplace, which has become common sense already. These hazards can be divided into injury, illness, and death. Also, the degree of danger in different occupations is different.In December 1970, the USA Congress passed an Act titled Occupational Safety and Health Act of 1970[2]. The purpose of this Act is "to assure safe and healthful working conditions for working men and women"[3], the way to achieve this goal is "by authorizing enforcement of the standards developed under the Act; by assisting and encouraging the States in their efforts to assure safe and healthful working conditions; by providing for research, information, education, and training in the field of occupational safety and health."[4] To provide for information and monitor the job-related injuries and illness, the statistical work is needed, section 24 of this Act is statistics, in which there has such term: "the Secretary, in consultation with the Secretary of Health and Human Services, shall develop and maintain an effective program of collection, compilation, and analysis of occupational safety and health statistics."[5]

However, as time went by, people gradually discovered that data distortion existed in reporting occupational injuries and illness at construction industry workplaces (Weddle, 1996; Lowery et al., 1998; Leigh, Marcin, & Miller, 2004; Probst et al. 2008).

By studying, sorting out, and researching the relevant literature on this issue, we find that the researchers have argued the existence of underreporting of industry workplace injuries and illnesses rate via two types of evidence support.

[1]Department of Economics, University of Utah
[2]https://www.osha.gov/laws-regs/oshact/completeoshact
[3]https://www.osha.gov/laws-regs/oshact/section_1
[4]https://www.osha.gov/laws-regs/oshact/section_1
[5]https://www.osha.gov/laws-regs/oshact/completeoshact

The first type of evidence support is questionnaire analysis, for example, Weddle's research (Weddle, 1996), and the second type of evidence support is the comparison of BLS data to the workers' compensation claim data.

But using these above two types of evidence and analysis methods to justify the industry workplace injuries and illness's underreporting view is not sufficient:

(1) As employers are often central to the workers' compensation claim filing process, injuries which are not reported to the employer by the worker are unlikely to be reported to workers' compensation data.
(2) Viewing the questionnaire analytical method from the perspective of subjective probability, the shortcoming of this questionnaire analytical method can also be observed.
(3) Workers Compensation (WC) and Occupational Safety and Health Administration (OSHA) recordkeeping are two different systems, with different definitions, i.e., if WC insurance denies a claim, it doesn't mean this injury claim can be removed from the log[6], vice versa.

Due to the shortcomings of the above two analysis methods, this paper proposes a new research perspective, namely the subjective probability analysis method, we believe that the construction industry workplace injuries and illness's underreporting issue can be analyzed by subjective probability method, then some new cognitions and views may be drawn.

2. Literature review

The Occupational Safety and Health Act of 1970 requires that many employers with more than ten employees are required to keep a record of serious work-related injuries and illnesses. Minor injuries requiring first aid only do not need to be recorded[7].

According to BLS Handbook of Methods (Bureau of Labor Statistics, Bulletin 2490, 1997, p73):[8] "State agencies mail report forms to selected employers in February ……. Each employer completes a single report form ……." This form includes two parts, first part requests the summary information on the number of injuries and illnesses by type of cases, second part of the form requests detailed information on the worker and the injury or illness incident that resulted in the employee being away from work[9].

Since 1990s, many researchers began to find the underreporting issue of occupational injuries and illness at construction industry workplaces (Weddle, 1996; Lowery et al., 1998; Leigh, Marcin, & Miller, 2004; Probst et al. 2008). Later, the government also noticed this phenomenon. According to a U.S.A Congress hearing report addressing under-reporting of injuries, "However, a growing amount of evidence suggests that the workplace and injury statistics Secretary Foulke cites are grossly inaccurate. Today we will hear about the growing number of academic studies concluding that the Department of Labor is counting and reporting as few as one-third of all workplace illnesses, injuries, and deaths"[10].

Weddle argued that the accuracy of such injury surveillance systems could be compromised at either the employee or organizational levels or both (Weddle, 1996). The reasons are that ① employees must notify their employers when they are injured at work. If the employees injured at work do not report injuries to employers, employers are not able to record these injuries in the surveillance system. ② employers must accurately record injuries and illnesses experienced/reported by their workers in the Occupational Safety and Health Administration (OSHA) Log of Work-Related Injuries and Illnesses (Form-300) according to OSHA-provided criteria. These logs must be kept for a minimum of five years and be made available to OSHA and state regulators upon request. If the data in these logs are not accurate, this will result in BLS having flawed data in its surveillance system.

[6] https://kuhlinsurance.com/top-ten-mistakes-when-completing-an-osha-log
[7] https://www.osha.gov/recordkeeping/
[8] https://www.bls.gov/iif/oshwc/osar0003.pdf
[9] ibid
[10] Hearing before the Committee on Education and Labor, U.S. House of Representatives one hundred tenth Congress, 2008

Weddle (1996) also conducted a survey of hospital environmental service workers. He did a statistical analysis of the questionnaire and got such conclusions: ① 29.2% recalled having been injured in the previous year, and of these, 38.9% had not reported one or more injuries. ② among those injured, older workers and those having worked longer at the same job were more likely not to report an injury. ③ the injury seeming too minor is the most frequently cited reason for not reporting. ④ 64.4% of unreported injuries required medical care, and 44.1% resulted in lost work time.

Using comparisons of SOII data to workers' compensation data to discern occupational injury and illness' underreporting issue is regarded as another important research method. However, the results of this research method show that the underreporting problem is not severe. For example, Glazner et al. (1999) found that "DIA's LWT injury rates are more comparable to those reported by the BLS from its annual survey than are total injury rates, suggesting that the apparent excess in injury rates at DIA was largely in the category of injuries without LWT compensation."

Pransky et al. (1999) investigated the role of safety incentive programs as a barrier to reporting injuries among workers in the manufacturing industry.

Probst et al. (2008) surveyed 1390 employees of 38 companies, these employees contracted to work at large construction site in the northwestern United State, Probst et al. computed the OCIP-generated experienced injury rate, then calculated the unreported injury/illness rate, its formula is as below:

Unreported injury/illness rate= the OCIP-generated experienced injury rate – the OSHA recordable rate. The Probst et al.'s computation results show that "greater rates of injuries experienced by employees that met the definition of an OSHA recordable but were not included in the organization's official OSHA log", (Probst et al. 2008, p1151) and "for every injury that was appropriately reported to OSHA, there were an additional 3.5 injuries that resulted in medical care beyond first aid and a Workers' Compensation claim and should therefore have been included in the official OSHA injury log but were not." (Probst et al. 2008, p1151)

Probst et al. further analyze the relationship between organizational safety climate and unreported injury/illness rate, and argue that organizational safety climate is an essential factor that can affect under-reporting rate of a company. Their conclusion is "organization with a poor safety climate had significantly higher rates of underreporting (81% of eligible injuries unreported) compared with organizations with a positive safety climate (47% of eligible injuries unreported)." (Probst et al. 2008, p1147).

Rappin et al. (2016) use survey/interview methods to identify reasons that employers fail to report some injuries and illnesses in the Bureau of Labor Statistics Survey of Occupational Injuries and Illnesses. They identify the establishments that had failed to report one or more eligible workers' compensation claims in the 2012 Washington SOII at the beginning, then they interview these establishments about their reasons for not reporting specific claims. The reasons based on the survey results are as the following: non-compliance with OSHA recordkeeping rules; non-compliance with SOII reporting instructions; employer did not consider the injury to be work-related, despite workers' compensation eligibility; data entry errors; indeterminate SOII eligibility.

3.Medical information asymmetry and imperfect information and the role of the subjective probability

3.1 Medical information asymmetry and imperfect information between physicians and workers and contractors

From the perspective of information economics, construction industry workplace injuries and illness's underreporting issue is the consequence of imperfect medical information and medical information asymmetry or the consequence of the intersection of imperfect medical information and medical information asymmetry.

Imperfect information means that either the buyer, the seller or both, are less than 100% about the qualities of what is being bought and sold[11]. Imperfect medical information referring to workplace injuries and illness means that workers, contractors, insurers, even physicians all sometimes can't fully understand and grasp the severity of the injuries and illness. "an individual already suffering from an illness is uncertain about the effectiveness of medical treatment, and his uncertainty may be quite different from that of his physician". (Arrow, 1963, P964) The underlying meaning of Arrow's expression is actually the incomplete information.

Under the situation of third-party payment, such as medical insurance and traffic accidents, sometimes, the individual due to seeking personal benefits will overstate the severity of his injuries or illness. This is also a situation in which information is imperfect.

Asymmetric information means that, the both parties involved in an economic transaction have an unequal amount of information, i.e., one party knows much more than the other[12]. In medical care market, the asymmetric information is mainly manifested as information asymmetry between patients and physicians. Medical knowledge is very professional and technical; a person needs to take a long time of specialized study and clinical practice to become qualified medical personnel. After becoming qualified medical personnel, along with the prolongation of medical service time and the increase of clinical practice, his medical knowledge will become more abundant and professional. Patients generally have a one-time or short-term need for specific medical knowledge, even if the patients have the will to acquire medical information, it is impossible to gain much knowledge in a short time, in the meantime, the opportunity cost of collecting, acquiring and processing professional medical knowledge is too high so that the patients naturally become the party with a disadvantage of information compared with professional medical staff with an advantage of information. So, it is obvious that the asymmetry of professional information is an inherent feature of doctor-patient relationship.

Kenneth J. Arrow analyzes the existence of asymmetric information in the medical care by demonstrating uncertainty in the medical care. "That risk and uncertainty are, in fact, significant elements in the medical care hardly needs argument." (Arrow, 1963, p946).

Arrow argues the uncertainty in medical care from 4 respects: ① the nature of demand; ② expected behavior of the physician; ③ product uncertainty; ④ supply conditions. (Arrow, 1963, p948, p949, p951, p952).

Arrow means that the most obvious distinguishing characteristics of an individual's demand for medical services is not steady, but irregular and unpredictable. Arrow particularly emphasizes that "the demand for medical services is associated, with a considerable probability, with an assault on personal integrity." (Arrow, 1963, p949). The expected behavior of the physician should be ① advertising and overt price competition are virtually eliminated among physicians; ② advice given by physicians as to further treatment by himself or others is supposed to be completely divorced from self-interest; ③ the treatment is dictated by the objective needs of the case and not limited by financial considerations; ④ the physicians is relied on as an expert in certifying to the existence of illnesses and injuries for various legal and other purposes; ⑤ correct conveying of information will outweigh a physician's desire to please his customers.

Arrow (1963) argues that the uncertainty of medical service product lies in the following aspects: ① the possibility of learning the quality of medical service product from one's own experience or that of others is low; ② the amount of uncertainty measured in terms of utility variability is much great for medical care in severe cases; ③ medical knowledge is so complicated, the information possessed by the physician as to the consequences and possibilities of treatment is necessarily very much greater than that of the patient, both physicians and patients recognize and accept this fact, i.e., the informational inequality between physicians and patients.The supply of medical care is restricted by some conditions. Entry to medical care profession needs licensing, and the cost of medical education is high. However, the high cost is borne only to a minor extent by the student, as the medical students get a subsidy, the subsidy is rationing through the limited entry to medical schools and through the elimination of students during the medical-school career.

[11] https://opentextbc.ca/principlesofeconomics/chapter/16-1-the-problem-of-imperfect-information-and-asymmetric-information/

[12] ibid

Then "Both the licensing laws and the standards of medical-school training have limited the possibilities of alternative qualities of medical care. The declining ratio of physicians to total employees in the medical-care industry shows that substitution of less trained personnel, technicians, and the like, is not prevented completely, but the central role of the highly trained physician is not affected at all." (Arrow, 1963, p953)

3.2 The role of the subjective probability in agents' behavior facing the medical information asymmetry and imperfect information

Imperfect medical information and medical information asymmetry in medical care have resulted in the workplace injuries and illness's statistics issues in complications. It cannot be simply assumed that the industry workplace injuries and illnesses rate is underreported. The industry workplace injuries and illnesses statistics are relative to subjective probability.

Subjective probability is a type of probability derived from an individual's personal judgment about whether a specific outcome is likely to occur. It contains no formal calculations and only reflects the subject's opinions and past experience. Subjective probabilities differ from person to person and contains a high degree of personal bias[13].

"in order to apportion correctly our belief to the probability we must also be able to measure our belief." (Ramsey, 1926, p12) Ramsey (1926) first proposed to use subjective confidence as an explanation of probability, and believed that this interpretation could be used as a supplement or a substitute for frequency interpretation. "Theory of Probability is taken as a branch of logic, the logic of partial belief and inconclusive argument." (Ramsey, 1926, p7)

Subjective probability can be affected by a variety of personal beliefs held by an individual. Even if the individual's belief can be rationally explained, it does not make the prediction an actual fact. It is often based on how each individual interprets the information presented to him.

In order to understand subjective probability, a common example is horse racing: The viewers bet on a horse based on subjective probability, because most viewers do not have comprehensive knowledge of horses and jockeys, the viewers are facing the imperfect information and asymmetric information, a horse's probability of winning they recognize reflects their personal beliefs, this probability is thus subjective probability.

Bayesian probability is a kind of important subjective probability, is "interpreted as reasonable expectation representing a state of knowledge or as quantification of a personal belief."[14]

In fact, there are two views on Bayesian probability, one is the objective probability, which interprets probability as an extension of logic, probability quantifies the reasonable expectation everyone sharing the same knowledge should share in accordance with the rules of Bayesian statistics, another is the subjective probability, which corresponds to a personal belief. The objective and subjective variants of Bayesian probability differ mainly in their interpretation and construction of the prior probability[15].

The Bayes theorem provides a way to revise existing predictions or theories given new or additional evidence, i.e., posterior probability = adjustment factor determined by observation data × prior probability.

Its mathematical formula is[16]

$$P(A \mid B) = \frac{P(A \cap B)}{P(B)} = \frac{P(A) \cdot P(B \mid A)}{P(B)}$$

The meaning of the above formula refers to the obtaining the unknown probability: first gets a priori probability, and then combines with the observed data to correct the a priori and gets a more reasonable posterior probability. The "priori" and the "posterior" are relative.

[13] https://www.investopedia.com/terms/s/subjective_probability.asp
[14] https://en.wikipedia.org/wiki/Bayesian_probability
[15] ibid
[16] https://www.investopedia.com/terms/b/bayes-theorem.asp

The previously calculated posterior probability can be used as the next prior probability, combined with the new observation data, to obtain a new posterior probability. Therefore, using the Bayesian formula, it is possible to modify the probability model successively for some unknown uncertainty and get the final result.

In the workplace, the workers have the chance to suffer from the injuries and illnesses, when a worker suspects that he/she has suffered an injury/illness, the worker will firstly make a subjective judgment as to whether or not he/she is injured and the likelihood value of being injured. This likelihood value of being injured is a subjective probability, we use the symbol $p_{s,i}$ to indicate this subjective probability value, here symbol s presents subjective, and symbol i represents the i-th worker. There is a real objective probability of whether the i-th worker is injured and the likelihood value of an injury. We use the $p_{o,i}$ symbol to indicate.

The party representing the employer will also make a subjective judgment on whether the i-th worker is injured and the likelihood value of an injury. We use the $p_{e,s,i}$ symbol to indicate.

Using the above three probability values, we get calculation and get three mathematical expected values of the number of industry workplace injuries and illnesses, formulated as follows:

$$Ns = \sum_{i=1}^{N} p_{s,i}$$

$$No = \sum_{i=1}^{N} p_{o,i}$$

$$Ne = \sum_{i=1}^{N} p_{e,s,i}$$

N is the total number of workers. Ns is the expected value calculated based on the subjective probability of the worker, No is the expected value calculated based on the real objective probability of the worker, Ne is the expected value calculated based on the subjective probability of the employer.

Now we have three values Ns, No, Ne, and then we can compare the size of the three values. There are several possibilities, as follows:

①No < Ne < Ns
② Ne < No < Ns
③ Ne < Ns < No

It is obvious that it is always Ne ≤ Ns. In the first case, there is a fact that the industry workplace injuries rate is overreported; in the third case, there is a fact that the industry workplace injuries rate is underreported. In the second case, the result is not sure, as there is a possibility that the industry workplace injuries rate is overreported, and also, there is a possibility that the industry workplace injuries rate is underreported.

4.The factors affecting the subjective probability

The key question is what are the factors that affect the subjective probability of workers and the subjective probability of employers.

4.1 the factors that affect the subjective probability of workers

Weddle (1996) directly counts his statistical survey and shows the results like the following: 16 of 27 responding, i.e., 59.2% proportion, think that the reason for not reporting is the injury too minor, this is the most common reason; 6 of 27 responding, i.e., 22.2% proportion, think that the reason for not reporting is the not wanting a supervisor to think that the worker is careless; 2 of 27 responding, i.e., 7.4% proportion, think that the reason for not reporting is too busy to report an injury; 2 of 27 responding, i.e., 7.4% proportion, think that the reason for not reporting is fear of finding out about AIDS needle sticks, and of the unreported injuries, 29 of 45 responding, i.e., 64.4% proportion, require medical care, and 44.1% (15 of 34 responding, i.e., 44.1%, have been resulted in lost work time.

Via further statistical analysis, Weddle (1996) also finds that among the injured, older workers and those having worked longer at the same job are more likely to not report an injury.

Based on the survey and analysis of Weddle, we construct a worker' subjective probability function as following:

$$p_{s,i} = f(x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8)$$

Independent variable x_1 indicates the severity of the injury, which is the subjective judgment of the workers themselves;

Independent variable x_2 indicates the extent to which this injury occurs with the carelessness of the worker, and this extent is the subjective judgment of the workers themselves;
Independent variable x_3 indicates the busy extent of work, and this extent is the subjective judgment of the workers themselves;

Independent variable x_4 indicates the extent to which the worker fears of finding out about AIDS needle sticks, this extent is the subjective judgment of the workers themselves;
Independent variable x_5 indicates the age of worker;
Independent variable x_6 indicates the length of time in which the worker has worked at the same job.
Independent variable x_7 indicates the level of the workers' compensation premium.
Independent variable x_8 indicates the level of organizational safety climate.
So, we get a derivative relationship as follows:

$$\frac{\partial f}{\partial x_1} > 0,\ \frac{\partial f}{\partial x_2} < 0,\ \frac{\partial f}{\partial x_3} < 0,\ \frac{\partial f}{\partial x_4} < 0,\ \frac{\partial f}{\partial x_5} < 0,\ \frac{\partial f}{\partial x_6} < 0,\ \frac{\partial f}{\partial x_7} > 0,\ \frac{\partial f}{\partial x_8} < 0$$

"In fact, only 20% of all injury claims that received medical attention met these strict criteria for inclusion." (Probst et al., 2008, p1150);

4.2 The factors that affect the subjective probability of employers.

The size of the rate of workplace injuries and illness of an establishment will affect the interests of this establishment: ① as the rate of workplace injuries and illness is used as the basis of identifying and hiring security contractors. Thus, it is advantageous for contractors to have low recordable rates (Leigh et al., 2004); ② the rate of workplace injuries and illness is sometimes be used to recruit new employees and show a favorable "commitment to safety" image to the public (Probst et al., 2008); ③ the rate of workplace injuries and illness of an establishment will affect the health insurance premium paid by the employer; ④incentive systems may reward managers and safety personnel for coding injuries as something other than a recordable (Probst et al., 2008).

we construct an employer's subjective probability function as following:

$$p_{s,j} = g(y_1, y_2, y_3, y_4, y_5, y_6, x_7, x_8)$$

Independent variable y_1 indicates the employer's attention degree to which the rate of workplace injuries and illness of establishment is used as an indicator to identify and hire security contractors.

Independent variable y_2 indicates the employer's attention degree to which the rate of workplace injuries and illness of establishment is used as an indicator to recruit new employees and show a favorable "commitment to safety" image to the public.

Independent variable y_3 indicates the employer's attention degree to which the rate of workplace injuries and illness of establishment will affect the health insurance premium paid by the employer.

Independent variable y_4 indicates the awarding degree to which the rate of workplace injuries and illness of establishment is used as an indicator to reward managers and safety personnel for coding injuries as something other than a recordable.

Independent variable y_5 indicates the industry level of rate of workplace injuries and illness.

Independent variable y_6 indicates the level of rate of workplace injuries and illness of establishment previous year.

So, we get a derivative relationship as follows:

$\frac{\partial g}{\partial y_1} < 0$, $\frac{\partial g}{\partial y_2} < 0$, $\frac{\partial g}{\partial y_3} < 0$, $\frac{\partial g}{\partial y_4} < 0$, $\frac{\partial g}{\partial y_5} > 0$, $\frac{\partial g}{\partial y_6} > 0$, $\frac{\partial g}{\partial x_7} < 0$, $\frac{\partial g}{\partial x_8} < 0$

5.The adjusting way of deviation between the two subjective probability

We have owned worker' subjective probability function value of all workers already, then according to the employee's business affiliation, the workers belonging to the same enterprise are grouped into the same group, then calculate the arithmetic mean of the subjective probability values of all workers in the same group, Calculate the arithmetic mean for the subjective probability values of all workers in the same group, denoted by the symbol $\bar{p}_{s,i}$.

In general, these two values, $p_{s,i}$, $\bar{p}_{s,i}$ will not be equal. There will be some deviation between the two values. If the deviation is too large, the employer will adjust the deviation. Realistic surveys (Rappin et al. 2016) also show that the employers do adopt the following adjustment methods and excuses in reality to reduce this gap: non-compliance with OSHA recordkeeping rules; non-compliance with SOII reporting instructions; employer did not consider the injury to be work-related, despite workers' compensation eligibility; data entry errors; indeterminate SOII eligibility.

In the process of this adjustment, the underreporting problem may occur. Insufficient recordkeeping systems and limited knowledge of reporting requirements lead to the underreporting of workplace injury problems to occur. This is needed to be improved. Some other adjustment measures are taken by the employers also have reasonable ingredients.

The survey statistics of Rappin et al. (2016) also shows that the construction industry workplace injuries and illness's underreporting issue is not severe, because in total 171 claims, ① twelve claims belong to the category of "Employer Did Not Consider the Injury Work-Related". ② some of these claims, which are OSHA recordable injuries, are less severe than a Days Away From Work (DAFW) case, and many DAFW cases occurred after the employment arrangement relationship between the injured worker and the enterprise had been over. ③ a small number of claims met the requirements of the workers' compensation act but not met the requirements of OSHA regulations. Some cases which are recorded in the workers' compensation system show that they should not be included in OSHA because the injured workers are not the employees of the sampled establishments. ④ some cases are included in SOII, but the information of these cases in SOII differs from the information in workers' compensation system.

If the numbers in ①, ②, ③, ④ are deducted, the residual value is small. So, "most employers were not classified as under-reporters" (Rappin et al., 2016, p353).

6.Conclusion

The construction industry workplace injuries and illness's rate statistical value is a statistical value under subjective probability thinking, which is a reflection result of subjective thinking. Therefore, this statistical value is not a pure objective value, it will fluctuate around the objective value, may be higher than the objective value, or may be lower than objective values**.**

Under No < Ne < Ns, there is a fact that the industry workplace injuries rate is overreported; under Ne < No < Ns, the result is not sure, as there is a possibility that the industry workplace injuries rate is overreported, and also, there is a possibility that the industry workplace injuries rate is underreported; under Ne < Ns < No, there is a fact that the industry workplace injuries rate is underreported.

Mathematical models of subjective probability of workers and employers are built on the basis of actual surveys, from which we can see that many subjective factors and objective factors will affect the change of the subjective probability values.

Industry workplace injuries and illness's underreporting cannot be inferred through the form of the questionnaire. Because it is a subjective probability problem when the workers judge whether they are injured or not. The subjective probability value will be affected by many factors, some factors will increase the subjective probability value, and some factors will reduce the subjective probability value. However, when the workers fill out the questionnaire, the factors that reduce the subjective probability value do not work. So, using the questionnaire method to estimate industry workplace injuries and illness' rate naturally enlarges occupational injury and illness's rate.

Therefore, from the perspective of subjective probability theory, the construction industry workplace injuries and illness's underreporting issue is not severe. Even so, by urging the establishments to compliance with SOII reporting instructions, reducing entry errors, and improving the level of organizational safety climate, the accuracy degree of SOII will be improved.

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