

Factors Influencing Unsafe Behavior in Somber Small Industry Centers (SIKS) Using Logistic Regression Analysis

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Abstract

Tofu is a characteristic of Indonesian food, so it is not uncommon if this tofu food is found in Balikpapan City. Tofu is commonly produced in small and medium scale industries that are commonly found in the city of Balikpapan. The technology used in the tofu production process is still very simple, still uses human labor, and the process is less than optimal. The tofu production process begins with the washing, grinding, and pressing processes carried out by humans. This study aims to analyze the influence of the work environment and worker identity on Behavior Based Safety in the SIS tofu making industry. The population in this study is workers in SIKS somber totaling 32 workers from 14 home tofu production sites as for how to collect samples by direct observation and interviews with workers (response variables), namely unsafe behavior in the form of not wearing proper clothes while working (Y), and independent variables (predictors), namely a safe workplace environment (x1), Air Ventilation Conditions (X2), Layout Conditions (X3), Working Duration (X4) Denoted 1 if > have worked for 3 months and 0 if < 3 months, worker status (X5), use of PPE in the form of boots (x6), educational status (x7) This study uses binary logistic regression analysis $\pi(x)$, where the workplace environment and workplace layout have the opportunity to have a significant influence on the unsafe behavior of workers (not wearing proper clothing) production workers know SIKS Somber.

Keywords: Tofu Production, Behavior Based Safety, occupational safety and health, logistic regression analysis

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INTRODUCTION

Occupational Safety and Health (K3) has a major influence on worker productivity in the workplace. Various risks of accidents and occupational diseases are the result of poor implementation of K3 in the company. Limited information about workplace hazards and lack of training and awareness of the importance of Personal Protective Equipment (PPE) will further increase the potential for workplace accidents. Generally, there are three factors that affect the occurrence of work accidents, namely human factors, environmental factors and

equipment factors. Human factors (Unsafe action) are actions caused by human negligence either intentionally or unintentionally such as lack of training, lack of attention, fatigue, or disobeying SOPs set by the company. Environmental factors (Unsafe Condition) can come from conditions in the workplace such as temperature, lighting, noise. Equipment factors mean that they are caused by improper equipment conditions or layouts. (Mas'ari, 2019).

Behavior Based Safety, it is very clear that the basis of this program is behavior-based. Behavior here must be very clearly related to human behavior in terms of working in work areas that are very much intersecting with work tools, workpieces, work vehicles, work steps, and others. behaviour. According to Notoatmodjo (2007), said that from a biological point of view, behavior is an activity or activity of the organism (living thing) concerned. Thus, human behavior is essentially the action or activity of humans themselves who have a very wide expanse, including walking, talking, crying, laughing, working, lecturing, writing, reading, and so on. (Sartono et al, 2013).

Based on data shown by the Social Security Organizing Agency (BPJS), work accidents and occupational diseases that have occurred during 2023 are 370,747, this number is the highest compared to work accident cases that have been recorded for the last three years, namely in 2022 it was stated that there were 234,370 workers who experienced work accidents, Meanwhile, in 2021 there were 221,740 cases. 5.1% higher than the previous year, namely 2019 with 210,789 cases (Yuli et al, 2022). From the increasing data on work accidents in Indonesia every year, it proves that there is still low awareness of workers or companies about the importance of K3 culture in the workplace. Awareness of the importance of occupational safety and health culture, especially unsafe acts, is very important according to (W.H. Heinrich, 1931) that 88% of all accidents are caused by unsafe actions committed by people. These actions include ignoring safety procedures, taking unnecessary risks, or not using protective equipment in the workplace. The scope of industrial work has a risk of danger to work safety that should not be underestimated, one of which comes from traditional tofu production.

Tofu is one of the foods that are quite popular with some Indonesian people, one of the foods. The high content of protein, fat, and other nutrients makes soybeans an important food crop. Based on research that has been conducted (Ratnaningsih, 2017) soybeans have protein levels ranging from 36.44 – 40.55%, fat levels ranging from 17.52 – 21.80%, carbohydrate levels ranging from 27.15 – 29.91%. The process of making tofu involves the reaction of soy protein with vinegar acid, producing clumps of protein that then become tofu. Although the production process is still traditional, the popularity of tofu continues to increase due to its abundant availability and ease of processing, making it a top choice for people who prioritize health and nutritional value in their diet. (Ide Widaningrum, 2015).

The tofu industry in Indonesia, especially in Balikpapan City, is still in great demand and continues to grow. Tofu, as a popular traditional food, not only has good taste, but is also reasonably priced and rich in nutrients. With high nutritional value and low saturated fat, tofu is a healthy food choice for people from all walks of life. The tofu production process still uses traditional methods, such as those carried out at the Sombor Small Industry Center (SIKS) in the Sombor Muara Rapak area, Balikpapan. However, it should be noted that although the process is quite time-consuming, tofu remains excellent because of its ease of processing and high nutritional benefits, which come from soybeans, Indonesia's strategic agricultural commodity. From the large number of enthusiasts and dense activities in the tofu factory, the background is for us to conduct a behavior based safety analysis through the unsafe behavior of workers at the Sombor Small Industry Center (SIKS) using a regression analysis test.

Regression Analysis

Regression analysis is one analysis that aims to determine the influence of one variable on other variables. The simplest regression model is a simple linear regression model with the form of the Suyono equation (2015). Regression Analysis for Research. Deepublish, Yogyakarta. :

$$Y = \beta_0 + \beta_1 X + \varepsilon \quad (1)$$

Where:

Y = bound variable (predicted value)

X = independent variable

β_0 = constant

β_1 = regression coefficient (increase or decrease value)

ε = random error.

Binary Logistic Regression Analysis

Logistic regression is a method of statistical analysis to describe the relationship between bound variables that have two or more categories and one or more free variables on a category or continuous scale. The logistic regression can be divided into binary logistic regression, multinomial logistic regression and ordinal logistic regression. Binary logistic regression models are used to analyze the relationship between one response variable and several predictor variables, with the response variable being dichotomous qualitative data that is valued at 1 to express the existence of a characteristic and valued at 0 to express the absence of a characteristic. The binary logistic regression model is used if the response variable produces two categories valued at 0 and 1, thus following Bernoulli's distribution as follows: (Langi et al, 2017)

$$f(y_i) = \pi_i^{y_i} (1 - \pi_i)^{1-y_i} \quad (2)$$

where:

π_i = probability of i-th occurrence

y_i = i-th random variable consisting of 0 and 1

The form of a logistic regression model with one predictor variable is:

$$\pi(x) = \frac{\exp(\beta_0 + \beta_1 x)}{1 + \exp(\beta_0 + \beta_1 x)} \quad (3)$$

To make it easier to estimate the max regression parameter, the $\pi(x)$ in the equation above is transformed to produce the form of logistic regression logit, as follows:

$$g(x) = \ln \left[\frac{\pi(x)}{1 - \pi(x)} \right] = \beta_0 + \beta_1 x \quad (4)$$

METHOD

This research will be conducted on May 7, 2024. This research is located at the Somber Small Industry Center (SIKS). This study was conducted with data obtained by running observations and interviews with workers in the industry, the object of the study was tofu-making workers, in their understanding of Behavior-based safety, which amounted to 32 workers. the variables used in this study consisted of non-free variables (response variables), namely unsafe behavior in the form of not wearing decent clothes while working (Y), As well as independent variables (predictors), namely a safe workplace environment (X1) denoted 0 unsafe and 1 safe, the parameters on this variable can be said to be safe when the state of the workplace environment does not carry out the combustion process in the same room as workers, the condition of the air ventilation (X2) is denoted 1 if the air vent is said to be good and 0 if it is bad, the layout condition (X3) is denoted 1 if the equipment and room layout are neat and 0 if it is messy, length of work (x4) is denoted 1 if > has worked for 3 months and 0 if < 3 months, worker status (x5) is denoted as 1 if the worker is an owner of the business and 0 if the worker is an employee / ordinary worker, the use of PPE in the form of boots (x6) is denoted as 1 if the worker wears boots and 0 if the worker does not use boots, Education status (x7) is denoted as 1 if the worker has graduated from high school or equivalent and 0 if he did not graduate from high school or equivalent

In carrying out the collection of data and information needed in this study, the author uses two ways, including:

- A. The interview method is a technique of collecting data by asking questions directly to parties related to research.
- B. The observation method is the implementation of direct observation of phenomena related to the focus of research.

RESULTS AND DISCUSSION

3.1 Logistic Regression Model

Using the help of SPSS software, a logistic regression model of unsafe behavior in the workplace at SIKS somber was obtained as follows.

$$\pi(x) = \frac{\exp(-2.0295 + 22.811x_1 - 21.408x_4)}{1 + \exp(-2.0295 + 22.811x_1 - 21.408x_4)} \quad (5)$$

Simultaneous tests were carried out to see the influence of predictor variables as a whole on response variables using the help of software, the results were obtained as in table 1.

Table 1: Overall Significance Test

with rejection criteria $> 0.05H_0$

Table 1. Significance Test Results

-2 log likelihood	Cox & Snell R square	Nagelkerke R square
30.010	0.262	0.369

Based on the results of the analysis provided, the Log likelihood of 30,010 shows a significant value at a significance level of 0.05, so the null hypothesis is rejected. This indicates that there is at least one independent variable that has a significant effect on the model. In addition, a value of -2 Log likelihood of 30,010 indicates a good match of the model with the data. Good model fit with data. Results from Cox & Snell R Square (0.262) and Nagelkerke R Square (0.369) show that about 26.2% to 36.9% in the dependent variable can be explained by the independent variable in the model. Thus, the conclusion can be drawn that the model has an adequate degree of match with the data and the independent variable has a significant influence on the dependent variable.

3.2 Model Variable Partial Test

A partial test was conducted to see the effect of each predictor variable on the response variable using the help of software, the results were obtained as in table 2.

Table 2. Partial Test Results

	P- Value	β	$\beta\beta\beta(\beta)$
X1	1.000	22.811	806859
X2	0.496	0.845	2.329
X3	1.000	-21.408	0.000
X4	1.000	-20.577	0.00
X5	0.14	0.146	0.864
X6	0.166	-1.530	0.216
X7	0.999	22.095	394187

Model Variable Partial Test Interpretation

Physical workplace environment (X1) The chance of a worker who has a safe workplace area having a tendency to wear decent clothing while working is 8.06859 times that of a worker who works in an unsafe workplace environment. A positive coefficient indicates that the work environment can be said to be safe is associated with an increased likelihood of workers wearing decent clothing while working. Our parameter in determining a safe workplace environment in the production process knows is the placement of the combustion system if the combustion system is in the same room where workers carry out the work process then the work environment is declared unsafe, Some of the reasons why someone chooses to behave and behave unsafely at work according to Reamer's theory cited by Winarsunu include (bella et al, 2015): If safe ways require more work than unsafe ways, one will choose unsafe ways, to save effort or effort. In addition to one of the causes of an unsafe behavior previous research conducted by (Bella Sovira, Nurjanah 2015) the cause of work fatigue is caused by an inadequate physical environment in the tofu factory, but not much research has been done at that location. When viewed from the flow of tofu making, from soybean milling to tofu printing, has risks derived from the physical environment, which comes from hot temperatures, lighting, and also noise. Previous research (Hermawan et al., 2017) said that the variables that cause work fatigue in these workers are working period and workload.

Air ventilation conditions (X2). The odds of someone working in a well-ventilated area being more likely to wear proper clothing while working are 2,329 times that of a worker

working in an area with poor air ventilation, A positive coefficient of 0.349 indicates that adequate air ventilation is associated with an increased likelihood of workers wearing appropriate clothing while working. The use of fire in the tofu production process has an important role as one of the media for cooking. A large enough production capacity can affect the scale of fire use. If this is followed by poor ventilation conditions, it will indirectly cause the climate of the work environment to become hot which can cause workers to decide to behave unsafely (not using proper clothing), according to Sunaryo (2004) One of the factors that influence humans in behaving, one of which is exogenous factors or factors from outside the individual referred to here are environmental factors, Meanwhile, the environment in question is everything that exists around the individual, both physical, biological and social. In addition to encouraging workers to behave unsafely, poor ventilation conditions also have other impacts on workers such as dehydration, fatigue, and feelings of discomfort, and it is feared that it can also cause symptoms of heat strain to heat related illness if not treated as soon as possible. As revealed in the Irawati research (2019) It is known that the average temperature in the production area of the X tofu factory is 35.6 degrees Celsius and in the Y tofu factory is 35.5 degrees Celsius. As many as 61.7% of respondents experienced heat strain complaints.

Layout conditions (X3) good layout conditions do not have a significant effect a worker will use decent clothes $p\text{-value } 1.00 > 0.05$, Tofu making production room is a room where all stages of activities carried out take place. Based on the results of observations made by Muawanah et al (2021), tofu making activities consist of several stages, including: soaking, grinding, boiling, filtering, salting (clumping), printing, and re-boiling tofu that has been printed. Each stage to the next stage by workers often experiences obstacles. This happens because the layout is not well organized. research results from Purnomo (2014) a well-designed facility layout can contribute well and optimal results, this is not in line with the research we do, a good layout does affect the process of making tofu, but it is inversely proportional when talking about behavior, based on our research, a good layout does not affect or guarantee workers will behave safely (using decent clothes while working).

Length of work (X4) workers who have worked for more than 3 months tend not to use proper clothing when working negative coefficient even though the chance of possibility is close to 0 than workers who work under 3 months, From the results of the study, it can be seen that the longer the work the compliance rate has decreased slightly. This is likely due to the confidence gained due to longer work experience so that there is a sense of security even though they do not use proper clothes According to Suherreni (2014) a relatively longer working period does not guarantee someone to always behave obediently to SPO, seniority in work is still seen as a form of fear to behave obediently to more junior workers. according to Harlan (2017) The working period of a workforce is related to work experience, knowledge and work skills he has. The longer a person works, the more work experience, knowledge and work skills he gets so that it can affect compliance with the use of PPE. These results are in accordance with the results of Harlan's research (2017) that respondents who work <5 years but are compliant in using PPE as much as 60% and those who do not comply use PPE as much as 40%. This does not align with our research because workers who have longer experience tend to be insecure (dress inappropriately).

Worker status (X5) workers who have the status of owners tend to wear decent clothing while working with a probability of 0.864 than an ordinary worker The negative coefficient indicates that workers who have the status of business owners have the likelihood that they are able to wear decent clothing while working compared to workers who are not business owners. Human resources in organizations have a variety of individual characteristics that differ between one with everything else. This difference in individual characteristics will affect the

attitude and work behavior of organizational members which will also affect the performance of each member of the organization (Robbins, 2009 in Sari, S.D, 2009: 1) According to George R. Terry (2006: 76). The existence of leadership in management is a natural thing in an effort to achieve organizational goals. Some of the group members will lead and most others will follow. This condition is based on the fact that most subordinates / staff want someone else to determine, direct, motivate, guide and supervise the various activities they do. Therefore, the success and failure of an organization in achieving its goals is largely determined by the quality of leadership in that organization. A leader certainly has responsibility for something that is an obligation, from our research the tendency of business owners to behave safely compared to their workers is based on a sense of responsibility for ownership owned by home-based business owners know.

Use of PPE in the workplace (X6) The chance of a worker who works using PPE in the form of boots has a tendency not to use proper clothing while working is about 0.216 times that of workers who work with boot PPE. This is shown by a negative coefficient, this is not in line with research conducted by Friska Ayu and Mustika (2018) that the use of PPE affects unsafe behavior (unsafe act) This difference may be influenced by various factors, one of which is discomfort when using PPE due to the influence of a hot work environment According to (Sunaryo 2004) there are several factors that influence humans in behaving, one of which is exogenous factors or factors from The outside of the individual referred to here is environmental factors, while the environment in question is everything that is around the individual, both physical, biological and social.

Education history (X7) Workers who have a history of education equivalent to high school or equivalent have a very high probability of wearing decent clothing while working 394187 times than workers who do not have a history of high school education or equivalent, Education is something very important that everyone must have as a basic right. Education can give a person a mindset that can make the person able to choose and make a decision wisely and behave well (Mudyahardjo, 2014).this is in line with research conducted by (friska ayu and mustika 2018) that education affects a person in unsafe behavior at work (unsafe act), this is also in line with Notoatmodjo's theory that someone with low education will be difficult to absorb Information and innovation make it difficult for them to make changes.

CONCLUSION

Based on the results of the research we have done, the following conclusions can be drawn: in the results of the study using the logistic regression analysis method where the workplace environment and workplace layout have the opportunity to have a significant influence on the unsafe behavior of workers (not using proper clothing) production workers know SIKS Somber In the results and discussion above, there is a partial test in table 2 conducted in this study, The purpose of analyzing the understanding of Behavior Based Safety (BBS) in the tofu making industry is to understand the relative contribution of certain variables to the understanding and implementation of BBS, while controlling the effects of other variables that may affect the relationship, and the interpretation of odd ratio that can be used to understand the relationship between work environment factors and work habits with the risk of worker accidents or injuries.

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