

CHAPTER 4

RESULTS OF THE RESEARCH

Results

The research on the protective behavior from dust among workers in the lime factories and stone crushing mills in Nakhon Si Thammarat Province is the survey study using the descriptive research with the objective to study the protective behavior from dust among workers in the lime factories and stone crushing mills and also studying for factors which are related to the protective behavior from dust among workers in the lime factories and stone crushing mills in Nakhon Si Thammarat Province; the factors on socio-demographic data consisting of gender, age, family income, marital status, educational levels, period of time to work, job characteristic, smoking behavior and workers' illness; the factors on the health belief model consisting of perceived susceptibility, perceived severity, perceived benefits and barriers of performing; and the factors on the supportive environment to health and the health policy. The total number of 211 samples consisted of the group of 64 workers in the lime factories, 9 owners and operators of the lime factories and the group of 134 workers, 4 owners and operators of the stone crushing mills.

The data analysis is made in the SPSS program for Windows. The main statistic used in the analysis is the analysis of the relationship between the factors on socio-demographic data and the factors on the health belief and protective behavior from dust among workers, using the relationship statistic on the Chi-square (χ^2 – test) and secondary statistic on the percentage, mean and standard deviation. Such overall statistical analysis is made in each section for individual aspect and item to obtain the most distinctive data analytical result.

The presentation of data analytical result is made in the form of tables with explanations. The presentation is divided into 4 sections as follows:

Part 1: Data analytical result in part of workers in the lime factories and stone crushing mills. The presentation is divided into 3 parts as follows:

Section 1: The socio-demographic characteristics of workers in the lime factories and stone crushing mills

Section 2: The protective behavior from dust among workers in the lime factories and stone crushing mills

Section 3: The health beliefs of workers in the lime factories and stone crushing mills

Section 4: The relationship between the factors on the socio-demographic data , the health beliefs and protective behavior from dust among workers

Part 2: The result of the data analysis in part of the owners and operators of the lime factories and stone crushing mills which is divided into 2 sections as follows:

Section 1: The socio-demographic characteristics of the owners and operators

Section 2: The supportive environments conducive to health provided by the factories and the health promotion policy

Part 3: The result of the observation of the dust protective device application of workers and the supportive environment to health of the factories.

Part 4: The data analytical result of the workers in the lime factories and stone crushing mills.

Section 1: The socio-demographic characteristics data of the workers in the lime factories and stone crushing mills.

The socio-demographic characteristics of the workers in the lime factories and stone crushing mills can be classified as follows:

1. Gender : majority of workers (72.2%) were males, with 27.8% females.
2. Age: the highest percentage of the respondents (33.8%) were in between 35-44 years old, next were in between 25-34 years old (30.3%) and 45-54 years old (19.2%) respectively.

3. Marital status: majority of workers (83.4%) were married, next 13.1% were single and 3.5% were widowed and separated.
4. Educational levels: the highest percentage of the respondents (51.5%) were having the educational level in the elementary level, next were having the educational level in the primary education school (25.3%) and secondary education school and Technical Educational Certificate or Vocational Educational Certificate (9.1%) respectively.
5. Family income: the highest percentage of the respondents (44.4%) were having income in between 2,000 – 4,000 baht, next were in between 4,001 – 6,000 baht (41.5%) and 6,001 – 8,000 baht (9.6%) respectively.
6. Period of time to work in the lime factories/stone crushing mills: the highest percentage of the respondents (31.3%) were employed in the limes factories/stone crushing mills for the period of 4-6 years, next were less than 3 years (30.8%) and 7-9 years (23.3%) respectively.
7. Employment in other lime factories/stone crushing mills: majority of worker (78.8%) had never been working in other lime factories/stone crushing mills before while 21.2% had been employed in other lime factories/stone crushing mills.
8. Length of employment in other lime factories/stone crushing mills: the highest percentage of the respondents (35.7%) had been employed in other factories for the period of time less than 3 years, 33.3% had before been employed in other factories longer than 7 years and 31.0%

had ever been employed in other factories before for the period of 4-6, years respectively.

9. Job characteristic : the highest percentage of the respondents (33.3%) were working in the position of stone transporter, next were in other positions such as security guards, mechanics and clerks (25.3%) and 15.7% were in the stone grinder position respectively.
10. Length of working per week: the highest percentage of the respondents (40.4%) were working at 6 days/week, next were working everyday at 30.3% and 3 days/week at 13.1%, respectively.
11. Length of working per day: the highest percentage of the respondents (68.2%) were working at 5-8 hours/day, next were 2-4 hours (23.7%) and 9-12 hours (8.1%) respectively.
12. Smoking behavior: the highest percentage of the respondents (59.6%) were smoking while 40.4% had never been smoking.
13. Number of cigarettes smoked by workers/day: the highest percentage of the respondents (40.4%) were found to smoke 5-10 cigarettes per day, 9.1% were found to smoke less than 5 cigarettes per day and 8.6% were found to smoke 11-20 cigarettes per day respectively.
14. Workers' illness: the highest percentage of the respondents (64.6%) were found to have been sick or getting cold, 20.2% had been sick or getting allergy diseases, and 13.1% contracting the respiratory diseases respectively (please refer to the details in table 1).

Table 1: Socio-demographic characteristic of the respondents

Socio-demographic characteristic	Number N = 198	Percentage (%)
1. Sex		
- Male	143	72.2
- Female	55	27.8
2. Age		
- 18-24 years	18	9.1
- 25-34 years	60	30.3
- 35-44 years	67	33.8
- 45-54 years	38	19.2
- 55-68 years	15	7.6
\bar{x} = 37.69 S.D. = 10.50, youngest age: 18 years old, oldest age: 68 years old		
3. Marital status		
- Single	26	13.1
- Married	165	83.4
- Divorced	3	1.5
- Separated	4	2.0
4. Educational levels		
- No education	4	2.0
- Elementary school	102	51.5
- Primary education school	50	25.3
- Secondary education school	18	9.1
- Technical Education Certificate or Higher Vocational Education Certificate	18	9.1
- Higher Vocational Education Certificate or Diploma	6	3.0
5 Family income/month		
- 2,000 – 4,000 baht	88	44.4
- 4,001 – 6,000 baht	82	41.5
- 6,001 – 8,000 baht	19	9.6
- 8,001 – 10,000 baht	9	4.5

\bar{x} = 4741.16 S.D. = 1719.07, the lowest income = 2,000 baht, the highest income = 10,000 baht.

Table 1: (Cont.) Socio-demographic characteristic of the respondents

Socio-demographic characteristic	Number N = 198	Percentage (%)
6. Length of employment in the lime factories/stone crushing mills		
- Less than 3 years	61	30.8
- 4-6 years	62	31.3
- 7-9 years	46	23.3
- 10-12 years	25	12.6
- Longer than 13 years	4	2
$\bar{x} = 64.21$ S.D. = 39.29, the lowest employment duration = 1 month, the highest employment duration = 15 years.		
7. Employment in other lime factories/stone crushing mills		
- had ever been employed	42	21.2
- had never been employed	156	78.8
8. Length of employment in other lime factories/stone crushing mills N = 42		
- Less than 3 years	15	35.7
- 4-6 years	13	31
- longer than 7 years	14	33.3
$\bar{x} = 3.57$ S.D. = 0.91, minimum was 1 year, maximum was 10 years.		
9. Working in the positions of:		
- Stone transport	66	33.3
- Lime burning	11	5.6
- Lime sun drying	3	1.5
- Lime filling	30	15.2
- Rock grinding	31	15.7
- Rock explosion, rock drilling	7	3.5
- Others	50	25.3
10. Length of working/week		
- 2 days	1	0.5
- 3 days	26	13.1
- 4 days	18	9.1
- 5 days	13	6.6
- 6 days	80	40.4
- 7 days	60	30.3
$\bar{x} = 5.64$ S.D. = 1.37, minimum length = 1 day, maximum length = 7 days.		

Table 1: (Cont.) Socio-demographic characteristic of the respondents

Socio-demographic characteristic	Number N = 198	Percentage (%)
11. Length of working/day		
- 2-4 hours	47	23.7
- 5-8 hours	135	68.2
- 9-12 hours	16	8.1
$\bar{x} = 6.83$ S.D. = 2.02, minimum length = 2 hours, maximum length = 12 hours.		
12. Smoking behavior		
• Have never smoked	80	40.4
• Smoke	118	59.6
- once in a while	50	42.4
- everyday	57	48.3
- have ever smoked	11	9.3
13. Number of cigarettes smoked/day (N = 118)		
- Less than 5 cigarettes	18	9.1
- 5-10 cigarettes	80	40.4
- 11-20 cigarettes	17	8.6
- More than 20 cigarettes	3	1.5
$\bar{x} = 4.85$ S.D. = 3.46, minimum = 2, maximum=30		
14. Illness of disease		
- Common cold	128	64.6
- Asthma	4	2.1
- Sore throat	26	13.1
- Allergy	40	20.2

Section 2 Protective behavior from dust among workers in the lime factories and stone crushing mills.

The instrument used in evaluating the protective behavior from dust among workers is the two choices questionnaires for evaluating the application of dust protective devices, of workers consisted of 13 items.

The protective behavior from dust among workers in the lime factories and stone crushing mills can be classified as follows:

1. Dust protective devices application: Majority of workers (62.6%) were found to use the dust protective devices while 37.4% did not.
2. Type of dust protective devices: Majority of workers (93.6%) used pieces of cloth to close their noses and mouths, 4% used the masks made of filtered paper and 2.4% used the masks with molecular filter, respectively.
3. Use of dust protective devices at all time during working: Majority of workers (75.8%) used the dust protective devices at all time during on duty and not at all time at 24.2%.
4. Adjustment of dust protective devices to snug fit to the face at all time was found to be done by majority of workers (93.5%) while another 6.5% did not do it all the time.
5. Use of dust protective devices together with others was found that majority of workers (56.5%) did not use the dust protective devices together with others while 43.5% did.
6. Cleaning the dust protective devices at all time after use was found to be done by majority workers (86.3%) and 13.7% did not.
7. Storage of dust protective devices away from dust when not in use was found to be done by majority workers (83.1%) and only 16.9% did not.
8. In case of feeling uncomfortable when using the dust protective devices the supervisor would be informed immediately, 61.3% of the high percentage of the respondents would while 38.7% would not.

9. Prompt acquisition of the new dust protective devices to replace the unworkable ones was found to be done by majority of workers (87.9%) and only 12.1% did not.
10. Selection of using the dust protective devices that could be assured for the dust protection was found to be done by majority of workers (90.3%) while 9.7% ignored to do so.
11. Avoidance of inhaling the dust into the lung directly was found to be followed by majority of workers (74.2%) while 25.8% failed to do so.
12. Distribution of the dust protective devices to workers was found to be done by the factories at 49.5% while the close percentage of workers at 50.5% were not given the dust protective devices by the factories.
13. Application of the dust protective devices distributed by the factories: the dust protective devices distributed by the factories were found to be used by the majority of workers at 68.7% while another 31.3% did not (please refers to the details in table 2).

Table 2: Application behavior of dust protective devices of the respondents

Application behavior of dust protective devices	Number N = 198	Percentage (%)
1. Application of the dust protective devices		
- Yes	124	62.6
- No	74	37.4
2. Type of the dust protective devices, N = 124		
- Pieces of cloth to close noses and mouths	116	93.6
- Paper filtered mask	5	4.0
- Mask with molecular filter	3	2.4
3. Use of the dust protective devices at all time when on duty		
- Yes	94	75.8
- No	30	24.2
4. Adjustment of the dust protective devices to snug fit to the face at all time		
- Yes	116	93.5
- No	8	6.5
5. Use of the dust protective devices together with others		
- Yes	70	56.5
- No	54	43.5
6. Cleaning of the dust protective devices at all time after use		
- Yes	107	86.3
- No	17	13.7
7. Storage of the protective devices away from dust when not in use		
- Yes	103	83.1
- No	21	16.9
8. In case of feeling uncomfortable while using the dust protective device, the supervisor would be informed immediately.		
- Yes	76	61.3
- No	48	38.7

Table 2: (Cont.) Application behavior of dust protective devices of the respondents

Application behavior of dust protective devices	Number N = 198	Percentage (%)
9. Prompt acquisition of the new dust protective devices to replace the unworkable ones.		
- Yes	109	87.9
- No	15	12.1
10. Selection of using the dust protective devices to be assured that the dust could be protected		
- Yes	112	90.3
- No	12	9.7
11. Avoidance of inhaling the dust into the lung directly		
- Yes	92	74.2
- No	32	25.8
12. Distribution of the factories dust protective devices		
- Yes	98	49.5
- No	100	50.5
13. Use of the dust protective devices distributed by factories		
- Yes	136	68.7
- No	62	31.3

The data analysis at the level of the protective behavior from dust among workers in the lime factories and stone crushing mills consisted of the total of 9 questions, please refers to the details of questions in the Appendix A. (items 3-11) having the continuous value in between 1-9 points.

The analysis of point value can be done by using the educational principle which can be divided into 3 levels as follows:

The protective behavior from dust at the high level can earn between 80-100% points.

The protective behavior from dust at the medium level can earn between 60-79% points.

The protective behavior from dust at the low level can earn between 0-59% points.

According to the data analytical result, it was found that the higher percentage of the samples (50.5%) were having the protective behavior from dust at the low level, 29.8% were having the protective behavior from dust at the high level, and 19.7% were having the protective behavior from dust at the medium level, please refers to the details in the table 3.

Table 3: Levels of the protective behavior from dust of the respondents

Levels of Behavior	Number N = 198	Percentage (%)
Behavior at the high level (point value between 80-100%)	59	29.8
Behavior at the medium level (point value between 60-79%)	39	19.7
Behavior at the low level (point value between 0-59%)	100	50.5
$\bar{x} = 49.29$ S.D. = 40.95		

The data analytical result of the levels of the protective behavior from dust among workers in lime factories it was found that the higher percentage of respondents (53.1%) were having the protective behavior from dust at the low level , 31.3% were

having the protective behavior from dust at the medium level and 15.6% were having the protective behavior from dust at the high level , please refers to the details in the table 4.

Table 4: Levels of the protective behavior from dust of the respondents in lime factories

Levels of Behavior	Number	Percentage
	N = 64	(%)
Behavior at the high level (point value between 80-100%)	10	15.6
Behavior at the medium level (point value between 60-79%)	20	31.3
Behavior at the low level (point value between 0-59%)	34	53.1
$\bar{x} = 45.61$ S.D. = 37.89		

The data analytical result of the levels of the protective behavior from dust among workers in stone crushing mills it was found that the higher percentage of respondents (49.3%) were having the protective behavior from dust at the low level , 36.6% were having the protective behavior from dust at the high level and 14.2% were having the protective behavior from dust at the medium level , please refers to the details in the table 5.

Table 5: Levels of the protective behavior from dust of the respondents in stone crushing mills

Levels of Behavior	Number N = 134	Percentage (%)
Behavior at the high level (point value between 80-100%)	49	36.6
Behavior at the medium level (point value between 60-79%)	19	14.2
Behavior at the low level (point value between 0-59%)	66	49.3
$\bar{x} = 51.02$ S.D. = 42.33		

Section 3: On the health belief among workers in the lime factories and stone crushing mills

The health belief data consists of 3 parts as follows

- 3.1 Perceived susceptibility
- 3.2 Perceived severity
- 3.3 Perceived benefits and barriers of performing

The statistics used in analyzing the data are frequency, percentage, average mean, standard deviation.

3.1 Perceived susceptibility

The instrument used was the evaluating form of the perceived susceptibility having the diseases. The form consisted of 10 statements, each statement contained 5 units of scale, were extremely agreed, agreed, uncertain, disagreed and extremely disagreed. The points given to the positive statements would be 5, 4, 3, 2, 1 and 1, 2, 3, 4, 5 to the negative statements respectively which the continuous points were in between 10-50 points. The result of the analytical data found that:

- 1.) The overall average mean (\bar{x}) of the perceived susceptibility on having the diseases was equal to 3.51, the standard deviation (S.D.) was equal to .85.
- 2.) The statement with the highest average mean was the statement which said “If you have a choice you would choose to work for other works as you’d have taken less risk to have dust in your lung” that had the average mean equal to 3.99. Next was the statement that said “Working in the lime factories/stone crushing mills is the work harmful to health” that had the average mean equal to 3.97 and the statement “The work you’re now doing is risky to having the dust in your lung” had the average mean equal to 3.78 respectively.
- 3.) The statement with the lowest average mean was the statement to say “You have the good and strong health, so the lung disease wouldn’t have come to visit you” that had the average mean equal to 3.14. Next was the statement that said “To keep yourself to be healthy and strong at all times would made it difficult for you to get the lung diseases caused by dust” had the average mean equal to 3.19 and the statement of “You have been working in the factory for long time until you’re familiar with the dust, so you would not have gotten the lung disease by dust” had the average mean equal to 3.27 respectively. (Appendix B).

Levels of the perceived susceptibility

The data analysis required the application of the descriptive statistic in percentage, using the standard according to the standard of scale to find the average mean which was divided into 3 levels as follows:

The high level of the perceived susceptibility on having the disease from dust got the average points in between 3.6-5 points.

The medium level of the perceived susceptibility on having the respiratory disease got the average points in between 2.6-3.5 points.

The low level of the Perceived susceptibility on having the respiratory disease got the average points between 1-2.5 points.

The data analytical result found that the highest percentage of the samples (51.5%) were Perceived susceptibility of having the diseases from dust at the high level, 47% were Perceived susceptibility of having the diseases from dust at the medium level and 1.5% of the samples were Perceived susceptibility of having the diseases from dust at the low level. Please see the details in the table 6.

Table 6: Perceived susceptibility of the respondents

Perceived susceptibility	Number N = 198	Percentage (%)
High level of perceived (Average point between 3.6-5)	102	51.5
Medium level of perceived (Average point between 2.6-3.5)	93	47.0
Low level of perceived (Average point between 1-2.5)	3	1.5
$\bar{x} = 3.51$ S.D. = .85		

3.2 Perceived severity

The instrument used was the evaluating form on the perceived severity of having diseases. The evaluating form consisted of 10 statements, each statement contained 5 units of scale. They were the extremely agreed, agreed, uncertain, disagreed and extremely disagreed. The points given to the positive statements would be 5, 4, 3, 2, 1 and 1, 2, 3, 4, 5 to the negative statements respectively which the continuous points were in between 10-50. The result of the analytical data found that:

- 1.) The overall average mean (\bar{x}) of the perceived severity of diseases was equal to 3.42, the standard deviation (S.D.) was equal to .84.
- 2.) The statement with the highest average mean was the statement of “The chest pain symptom is considered as normal for workers employed in the lime factories/stone crushing mills” had the average mean equal to 3.75. The statement of “Those who have the lung disease from dust shall be easy to have the complication diseases” had the average mean equal to 3.73 and the statement of “The lung disease from dust has the same condition as the common cold, so it would not be frightening” had the average mean equal to 3.66 respectively.

- 3.) The statement with the lowest average mean was that of “The dust in the factory is equally harmful to health as those in general” had the average mean equal to 2.81. The statement of “Getting the lung disease from dust would have caused the patient to die within the short time” had the average mean equal to 3.19 and the statement of “Treatment of the lung disease from dust would require the great amount of money” had the average mean equal to 3.24 respectively. (Appendix B).

Levels of the perceived severity

The data analysis required the application of the descriptive statistic in percentage, using the standard according to the standard of scale to find the average mean which was divided into 3 levels as follows:

The high level of the perceived severity of the disease from earned the average point between 3.6 – 5 points.

The medium level of the perceived severity of the disease from earned the average point between 2.6-3.5 points.

The low level of the perceived severity of the disease from earned the average point between 1-2.5 points.

The data analytical result found that the highest percentage of the samples (60.6%) were perceived severity of diseases from dust at the medium level, 38.4% of

the samples were perceived severity of diseases from dust at the high level and 1% of the samples were perceived severity of disease from dust at the low level. Please see the details in the table 7.

Table 7: Perceived severity of the respondents

Perceived severity	Number N = 198	Percentage (%)
High level of perceived (Average point between 3.6-5)	76	38.4
Medium level of perceived (Average point between 2.6-3.5)	120	60.6
Low level of perceived (Average point between 1-2.5)	2	1.0
$\bar{x} = 3.42$ S.D. = .84		

3.3 Perceived benefits and barriers of performing

The instrument used was the evaluating form of perceived benefits and barriers of performing. The evaluating form consisted of 10 statements, each statement contained 5 units of scale. They were the extremely agreed, agreed, uncertain, disagreed and extremely disagreed. The points given to the positive statements would be 5, 4, 3, 2, 1 and to the negative statements would be 1, 2, 3, 4, 5 respectively. The continuous points were in between 10-50. The result of the analytical data found that:

- 1.) The overall average mean (\bar{x}) of the perceived benefits and barriers of performing was equal to 3.60, and the standard deviation (S.D) was equal to .98.
- 2.) The statement with the highest average mean was “The use of dust protective devices at work is quite necessary” had the average mean equal to 4.17. The statement of “Though feeling annoyed to use the dust protective device, you can be tolerated with it for your own safety”

had the average mean equal to 3.89 and the statement of “You’d better take the risk of having the lung disease from dust than being tolerated in using the dust protective device” had the average mean equal to 3.87 respectively.

- 3.) The statement with the lowest average mean was that of “Use of the dust protective device causes you hardly to communicate with others” had the average mean equal to 2.94. The statement of “Use of the dust protective device while on duty would cause you feeling annoyed” had the average mean equal to 3.05, and the statement of “Maintenance of the dust protective device after use is too complicated and waste the time” had the average mean equal to 3.15 respectively. (Appendix B).

Levels of the perceived benefits and barriers of performing

The data analysis required the use of the descriptive statistic in percentage, using the standard according to the standard of scale to find the average mean which was divided into 3 levels as follows:

The high level of the perceived benefits and barriers of performing came the average points between 3.6-5 points.

The medium level of the perceived benefits and barriers of performing came the average points between 2.6-3.5 points.

The low level of the perceived benefits and barriers of performing came the average points between 1-2.5 points.

The data analytical result found that the highest percentage of the samples (58.1%) were perceived benefits and barriers of performing at the high level. 37.9% were perceived benefits and barriers of performing at the medium level and 4% were perceived benefits and barriers of performing at the low level. Please see the details in the table 8.

Table 8: Perceived benefits and barriers of performing of the respondents

Perceived benefits and barriers of performing	Number N = 198	Percentage (%)
High level of perceived (Average point between 3.6-5)	115	58.1
Medium level of perceived (Average point between 2.6-3.5)	75	37.9
Low level of perceived (Average point between 1-2.5)	8	4.0
$\bar{x} = 3.60$ S.D. = .98		

Section 4: The relationship between the socio-demographic factor, factor on the health belief and protective behavior from dust among workers.

The relationship between the socio-demographic factor and the protective behavior from dust among workers were gender, age, marital status, educational levels, family income, period of time to work, job characteristic, sickness and the protective behavior from dust among workers. The statistic used for the analysis was the Chi-square (X^2 - test). The analytical result could be classified as follows:

- 1. The relationship between gender and protective behavior from dust among workers** was found that the majority of male workers (50.3%) were having the protective behavior from dust in the low level, second

and third were in the high level (30.8%) and medium level (18.9%) respectively.

The female workers, the higher percentage of the respondents (50.9%) were having the protective behavior from dust in the low level. Next were in the high level (27.3%) and in the medium level (21.8%) respectively.

Considering the overall picture, it was found that the highest percentage of the respondents (50.5%) were having the protective behavior from dust in the low level, the second and third were having the protective behavior from dust in the high level (29.8%) and in the medium level (19.7%) respectively.

When the Chi-square (X^2 -test) was analyzed to demonstrate the relationship between gender and protective behavior from dust among workers, it was found that no statistical significance relationship was found that no statistical significance relationship was made which showed that the gender had no relationship with the protective behavior from dust among workers in the lime factories and stone crushing mills. Please see the details in the table 9.

Table 9: Relationship between gender and the protective behavior from dust among the respondents

Socio-demographic data	Levels of behavior			Total	p-value
	High	Medium	Low	N = 198	
Gender					
Male	44 (30.8)	27 (18.9)	72 (50.3)	143 (100.0)	.844
Female	15 (27.3)	12 (21.8)	28 (50.9)	55 (100.0)	
Total	59 (29.8)	39 (19.7)	100 (50.5)	198 (100.0)	

2. The relationship between age and the protective behavior from dust

among worker was found that majority of workers (52.6%) with 35-50 years of age were having the protective behavior from dust in the low level, workers with 35-50 years of age were having the protective behavior from dust in the high level (24.7%) and medium level (22.7%) respectively.

Considering the overall picture, it was found that the high percentage of the respondents (50.5%) of every age group were having the protective behavior from dust in the low level, 29.8% were in the high level and 19.7% were on the medium level respectively.

When the Chi-Square (X^2 -text) was analyzed to demonstrate the relationship between age and the protective behavior from dust among workers, it was found that no statistical significance. Please see the details in the table 10.

Table 10: The relationship between age and the protective behavior from dust among the respondents

Socio-demographic data	Levels of behavior			Total	p-value
	High	Medium	Low	N = 198	
Age					
18-34 years old	23 (29.5)	14 (17.9)	41 (52.6)	78 (100.0)	.133
35-50 years old	24 (24.7)	22 (22.7)	51 (52.6)	97 (100.0)	
51 years old and up	12 (52.2)	3 (7.7)	8 (34.8)	16 (100.0)	
Total	59 (29.8)	39 (19.7)	100 (50.5)	198 (100.0)	

3. The relationship between the marital status and the protective behavior from dust among workers was found that the higher percentage of the married couple workers (50.9%) were having the protective behavior from dust in the low level, 27.9% were having the protective behavior from dust in the high level and 21.2% were in the medium level respectively.

The single status workers with the higher percentage (48.5%) of the respondents were having the protective behavior in the low level, next was 39.4% were having the protective behavior from dust in the high level and 12.1% were in the medium level.

Considering the overall picture it was found that the high percentage of the respondents (50.5%) of every marital status were having the protective behavior from

dust in the low level, 29.8% were also in the high level and 19.7% were in the medium level.

When the Chi-Square (X^2 -test) was analyzed to demonstrate the relationship between the marital status and the protective behavior from dust among workers in the lime factories and stone crushing mills, it was found that no statistical significance relationship was established which showed that the marital status had no relationship with protective behavior from dust among workers. Please see the details in the table 11.

Table 11: The relationship between marital status and the protective behavior from dust among the respondents

Socio-demographic data	Levels of behavior			Total	p-value
	High	Medium	Low	N = 198	
Marital status					
- Single/widow, widower/ divorced/separated	13 (39.4)	4 (12.1)	16 (48.5)	33 (100.0)	.300
- Couples	46 (27.9)	35 (21.2)	84 (50.9)	165 (100.0)	
Total	59 (29.8)	39 (19.7)	100 (50.5)	198 (100.0)	

4. The relationship between the educational level and the protective behavior from dust among workers was found that higher percentage of samples (48.1%) with the elementary educational level were having the protective behavior from dust in the low level, 28.3% were in the high level and 23.6% were in the medium level.

Workers with higher than elementary educational level were found to have, at the higher percentage of the respondents (46.5%), the protective behavior from dust in the low level, 31.5% were in the high level and 15.2% were in the medium level.

Considering in the overall picture it was found that the highest percentage of the respondents (50.5%) of all levels of education were having the protective behavior from dust in the low level, 29.8% were in the high level and 19.7% were in the medium level.

When the Chi-Square (X^2 -test) was analyzed to demonstrate the relationship between the educational levels and the protective behavior from dust among workers, it was found that no statistical significance relationship was established which showed that the educational levels had no statistical significance with the protective behavior from dust among workers. Please see the details in the table 12.

Table 12: The relationship between the educational levels and the protective behavior from dust of the respondents

Socio-demographic data	Levels of behavior			Total	p-value
	High	Medium	Low	N = 198	
Levels of education					
- No education/elementary School	30 (28.3)	25 (23.6)	51 (48.1)	106 (100.0)	.336
- Higher than elementary School	29 (31.5)	14 (15.2)	49 (53.3)	92 (100.0)	
Total	59 (29.8)	39 (19.7)	100 (50.5)	198 (100.0)	

5. The relationship between the family income and the protective behavior from dust among workers was found that the higher percentage of the respondents (64.3%) with income earning more than 6,001 baht were having the protective behavior from dust in the low level, the income earning between 4,001-6,000 baht were in the low level (53.4%) and 2,000 – 4,000 baht/month were in the low level (42.7%) respectively.

Considering the overall picture it was found that the higher percentage of the respondents (50.5%) of all spans of income earning were having the protective behavior from dust in the low level, 29.8 were in the high level and 19.7% were in the medium level.

When the Chi-Square (X^2 -test) was analyzed to demonstrate the relationship between the family income earning and the protective behavior from dust among workers if the relationship was found to have the statistical significance at $p < 0.05$. Please see the details in the table 13.

Table 13: The relationship between family income earning and the protective behavior from dust among respondents

Socio-demographic factor	Levels of behavior			Total N = 198	p-value
	High	Medium	Low		
Family income					
- 2,0000-4,000 baht	18 (20.5)	23 (26.1)	47 (53.4)	88 (100.0)	.016
- 4,001-6,000 baht	33 (40.2)	14 (17.1)	35 (42.7)	82 (100.0)	
- More than 6,001 baht	8 (28.6)	2 (7.1)	18 (64.3)	28 (100.0)	
Total	59 (29.8)	39 (19.7)	100 (50.5)	198 (100.0)	

6. The relationship between the period of time to work in the factories and the protective behavior from dust among workers were found that The higher percentage of samples (70%) with the duration of employment period less than 7 years were having the protective behavior from dust in the high level, 20% were in the medium level and 10% were in the low level.

The higher percentage of workers (52.7%) with duration of employment period in the factories from 7 years and up were having the protective behavior from dust in the low level, 27.7% were in the high level and 19.7% were in the medium level.

Considering the overall picture it was found that the higher percentage of the respondents (50.5%) working in the factories were having the protective behavior from

dust in the low level, 29.8% were in the high level and 19.7% were in the medium level.

When the Chi-Square (X^2 -test) was analyzed to demonstrate the relationship between the period of time to work in the factories and the protective behavior from dust among workers, it was found to have the statistical significance at $p < 0.05$. Please see the details in the table 14.

Table 14: The relationship between the period of time to work in the factories and the protective behavior from dust among respondents

Socio-demographic data	Levels of behavior			Total	p-value
	High	Medium	Low	N = 198	
period of time to work					
- Less than 7 years	7 (70.0)	2 (20.0)	1 (10.0)	10 (100.0)	.010
- More than 7 years	52 (27.7)	37 (19.7)	99 (52.7)	188 (100.0)	
Total	59 (29.8)	39 (19.7)	100 (50.5)	198 (100.0)	

7. The relationship between the job characteristic and the protective behavior from dust among workers was found that the higher percentage of the respondents (53.2%) working in the lime transport/lime burning positions were having the protective behavior from dust in the low level, 28.6% were in the high level and 18.2% were in the medium level.

The higher percentage of the respondents (33.8%) working in the lime sun drying/lime filling/stone grinding and stone drilling positions were having the protective behavior from dust in the high level and low level, 32.4% were in the medium level

The higher percentage of the respondents (70%) working in other positions such as mechanic, security guard, clerk, were having the protective behavior from dust in the low level, 26% were in the high level and 4% were in the medium level

Considering the overall picture, it was found that the highest percentage of the respondents (50.5%) working in the other positions were having the protective behavior from dust in the low level, 29.8% were in the high level and 19.7% were in the medium level respectively.

When the Chi-Square (X^2 -test) was analyzed to demonstrate the relationship between the positions in working and the protective behavior from dust among workers, the relationship was found to have the statistical significance at $p < 0.001$. Please see the details in the table 15.

Table 15: The relationship between the job characteristic and the protective behavior from dust among workers

Socio-demographic factor	Levels of behavior			Total	p-value
	High	Medium	Low	N = 198	
job characteristic					
- Lime transport/burning	22 (28.6)	14 (18.2)	41 (53.2)	77 (100.0)	
- Lime sun drying/filling/ rock grinding/drilling	24 (33.8)	23 (32.4)	24 (33.8)	71 (100.0)	.000
- Others	13 (26.0)	2 (4.0)	35 (70.0)	50 (100.0)	
Total	59 (29.8)	39 (19.7)	100 (50.5)	198 (100.0)	

8. The relationship between illness and the protective behavior from dust among workers was found that the higher percentage of workers (56.8%) who were sick or had been sick of common cold/asthma, were having the protective behavior from dust in the low level, 23.5% were in the medium level and 19.7% were in the high level.

The higher percentage of the respondents (50%) who were sick or had been sick of sore throat/allergy were having the protective behavior from dust in the high level, 37.9% were in the low level and 12.1% were in the medium level.

Considering the overall picture, the highest percentage of the respondents (50.5%) who were sick or had been sick were found to have the protective behavior from dust in the low level, 29.8% were in the high level and 19.7% were in the medium level.

When the Chi-Square (X^2 -test) was analyzed to demonstrate the relationship between the sickness and the protective behavior from dust among workers in the lime factories/stone crushing mills, the relationship was found to have the statistical significance at $p < 0.001$. Please see the details in the table 16.

Table 16: The relationship between the sickness and the protective behavior from dust of the respondents

Socio-demographic factor	Levels of behavior			Total	p-value
	High	Medium	Low	N = 198	
Illness					
- Common cold/Asthma	26 (19.7)	31 (23.5)	75 (56.8)	132 (100.0)	.000
- Sore throat/allergy	33 (50.0)	8 (12.1)	25 (37.9)	66 (100.0)	
Total	59 (29.8)	39 (19.7)	100 (50.5)	198 (100.0)	

The relationship between the health belief factor and the protective behavior from dust among workers such as the perceive susceptibility on having the diseases from dust, the perceive severity, the perceive benefits and barriers of performing with the protective behavior from dust among workers. The statistic to be analyzed was the Chi-Square (X^2 -test) and the analytical result could be classified as follows:

- 1. The relationship between the perceived susceptibility on having the diseases from dust and the protective behavior from dust among workers** was found that the higher percentage of the respondents (46.1%) with perceived susceptibility on having diseases from dust in

the high level having the protective behavior from dust in the low level, 36.3% were in the high level and 17.6% were in the medium level.

The higher percentage of the respondents (54.8%) with the perceived susceptibility on having the diseases from dust were in the medium level and having the protective behavior from dust in the low level, 23.7% were in the high level and 21.5% were in the medium level.

The samples with the perceived susceptibility on having the diseases from dust were having the protective behavior from dust in the low level (66.7%) and 33.3% were in the medium level.

Considering the overall picture, it was found that the higher percentage of the respondents (50.5%) with the perceived susceptibility on having the diseases from dust at all level having the protective behavior from dust in the low level, 29.8% were in the high level and 19.7% were in the medium level.

When the Chi-Square (X^2 -test) was analyzed to demonstrate the relationship between the perceived susceptibility on having the diseases from dust among workers, it was found that no statistical significance relationship was established which showed that the perceived susceptibility on having the diseases from dust among workers had no relationship with the protective behavior from dust among workers, please see the details in the table 17.

Table 17: The relationship between perceived susceptibility and the protective behavior from dust among the respondents

Perceived susceptibility	Levels of behavior			Total	p-value
	High	Medium	Low	N = 198	
- The high of perceived susceptibility	37 (36.3)	18 (17.6)	47 (46.1)	102 (100.0)	.281
- The medium of perceived susceptibility	22 (23.7)	20 (21.5)	51 (54.8)	93 (100.0)	
- The low of perceived Susceptibility	- (0)	1 (33.3)	2 (66.7)	3 (100.0)	
Total	59 (29.8)	39 (19.7)	100 (50.5)	198 (100.0)	

2. The relationship between the perceived severity of diseases from dust and the protective behavior from dust among workers was found that

The higher percentage of the respondents (44.7%) with the perceived severity of diseases from dust in the high level were having the protective behavior in the low level, 40.8% were in the high level and 14.5% were in the medium level.

The higher percentage of the respondents (55%) with the perceived severity of diseases from dust in the medium level were having the protective behavior from dust in the low level, 23.3% were in the high level and 21.7% were in the medium level.

The respondents with the perceived severity of diseases from dust in the low level were having the protective behavior from dust in the medium level (100%).

Considering the overall picture, it was found that the high percentage of the respondents (50.5%) with the perceived severity of diseases from dust in all levels were having the protective behavior from dust in the low level, 29.8% were in the high level and 19.7% were in the medium level.

When the Chi-Square (X^2 -test) was analyzed to demonstrate the relationship between the perceived severity of diseases from dust and the protective behavior from dust, the relationship was found to have the statistical significance at $p < 0.01$. Please see the details in the table 18.

Table 18: The relationship between perceived severity and the protective behavior from dust of the respondents

Perceived severity	Levels of behavior			Total	p-value
	High	Medium	Low	N = 198	
-High of perceived severity	31 (40.8)	11 (14.5)	34 (44.7)	76 (100.0)	.004
-Medium of perceived severity	28 (23.3)	26 (21.7)	66 (55.0)	120 (100.0)	
- Low of perceived severity	- (0)	2 (100.0)	- (0)	2 (100.0)	
Total	59 (29.8)	39 (19.7)	100 (50.5)	198 (100.0)	

3. The relationship between the perceived benefits and barriers of performing and the protective behavior from dust among workers was found that

The higher percentage of the respondents (41.7%) with the perceived benefits and barriers of performing in the high level were having the protective behavior from dust in the high level, 40% were in the low level and 18.3% were in the medium level.

The higher percentage of the respondents (61.3%) with the perceived benefits and barriers of performing in the medium level were having the protective behavior from dust in the low level, 24% were in the medium level and 14.7% were in the high level.

The respondents with the awareness of benefits and obstacles on the prophylaxis practice in the low level were having the protective behavior from dust in the low level (100%).

Considering the overall picture, it was found that the highest percentage of the respondents (50.5%) with the awareness of benefits and obstacles on prophylaxis practice in all levels were having the protective behavior from dust in the low level, 29.8% were in the high level and 19.7% were in the medium level.

When the Chi-Square (X^2 -test) was analyzed to demonstrate the relationship between the perceived benefits and barriers of performing and the protective behavior from dust, the relationship was found to have the statistical significance at $p < 0.001$. Please see the details in the table 19.

Table 19: The relationship between perceived benefits and barriers of performing and the protective behavior from dust of the respondents

Perceived benefits and barriers of performing	Level of behavior			Total N = 198	p-value
	High	Medium	Low		
- High of perceived benefits and barriers of performing	48 (41.7)	21 (18.3)	46 (40.0)	115 (100.0)	
- Medium of perceived benefits and barriers of performing	11 (14.7)	18 (24.0)	46 (61.3)	38 (30.6)	.000
- Low perceived benefits and barriers of performing	- (0)	- (0)	8 (100.0)	8 (100.0)	
Total	59 (29.8)	39 (19.7)	100 (50.5)	198 (100.0)	

Part 2: Data analytical result in part of the owners and operators of the lime factories and stone crushing mills.

Section 1: Characteristic on the socio-demographic aspect of the owners and operators of the lime factories and stone crushing mills.

The characteristic on the socio-demographic aspect of 13 owners and the operators of the lime factories and stone crushing mills can be classified into the followings:

1. Gender: Majority of the owners and operators of the lime factories and stone crushing mills (76.9%) were found to be male while 23.1% were female.

2. Age: The higher percentage of the respondents (46.2) were in between 34-40 years old, 30.8% were in between 51-60 years old and 23.1% were in between 41-50 years old respectively.
3. Positions: The higher percentage of the respondents (61.5%) were the factory owners, 23.1% were both the ownership and executives, 15.4% were the factory executives respectively.
4. Educational levels: The higher percentage of the respondents (53.8%) were having the educational level at the elementary school, (23.1%) earned bachelor degree, (15.4%) earned Higher Vocational Education Certificate or diploma and (7.7%) earned the certificate of higher secondary school respectively.
5. Marital status: The most of owners and operators of the lime factory and stone crushing mills were married (100%).
6. Length of factory business engagement: The higher percentage of the respondents (69.2%) have been engaged in the factory business for the period of 5-10 years, 15.4% more than 10 years and 7.7% less than 5 years respectively. Please see the details in the table 20.

Table 20: Characteristic on the socio-demographic data of the respondents

Characteristic on the socio-demography	Number N = 13	Percentage (%)
1. Sex		
- Male	10	76.9
- Female	3	23.1
2. Age:		
- 34-40 years old	6	46.2
- 41-50 years old	3	23.1
- 51-60 years old	4	30.8
$\bar{x} = 45.0$ S.D. = 8.13, the youngest age: 34 years old, the oldest age: 58 years old		
3. Position		
- Owner	8	61.5
- Executive	2	15.4
- Owner & executive	3	23.1
4. Educational level		
- No education	-	-
- Elementary school	7	53.8
- Lower secondary education	-	-
- Higher secondary education	1	7.7
- Technical Education Certificate or Vocational Education Certificate	-	-
- Higher Vocational Education Certificate or Diploma	2	15.4
- Bachelor degree	3	23.1
- Higher than bachelor degree	-	-
5. Marital status		
- Single	-	-
- Married	13	100.0
- Widow-widower/separated/divorced	-	-
6. Period of factory engagement		
- Less than 5 years	1	7.7
- 5-10 yeas	10	76.9
- More than 10 years	2	15.4
$\bar{x} = 8.54$ S.D. = 2.44 , the minimum period 4 years, the maximum period 12 years		

Section 2: The supportive environment provided by factories and health promotion policy.

This section was interview of 13 owners and operators of the lime factories and stone crushing mills

According to the interview of the owners and operators of the lime factories and stone crushing mills with respect to the supportive environment provided by the factories, it was found that:

1. For the policy concerning the health maintenance for workers in writing, none of the lime factories and stone crushing mills were having the health maintenance policy in writing.
2. For the issuance of regulations to enforce workers to use the dust protective mask while on duty, it was found that majority of factories (92.3%) issued the regulations to enforce workers to wear the dust protective mask while on duty and 7.7% failed to have the regulations to enforce workers to wear dust protective mask while on duty.
3. For the notification of policy or regulations for acknowledgement to all workers or posting the announcement at the place where it could be clearly seen, majority factories (92.3%) were found to notify all workers of the policy or regulation while 7.7% failed to notify.
4. For the responsible persons for enforcing workers to wear the dust protective mask at all time while on duty, it was found that majority factories (76.9%) failed to provide the responsible persons for enforcing workers to wear the dust protective mask at all time while on duty, only 23.1% were enforcing their workers to do so.

5. For the availability of the annual health examination for workers, majority number of factories (84.6%) failed to provide the annual health examination for workers while 15.4% provided them with the annual health examination.
6. For the preparation of the dust protective devices for workers, it was found that most factories (76.9%) failed to provide the dust protective devices for workers and 23.1% provided such devices to the workers.
7. For the recommendation relating to the danger as the result of the operation and the prevention method to the workers before entering into the factories, it was found that majority of the factories (76.9%) failed to provide the recommendation relating to the danger as the result of the operation and the prevention method before starting to work and 23.1% provided the said recommendation to the workers.
8. For the importance of workers' health when working in the factories, it was found that most factories (84.6%) saw that the workers' health was important to their working performances while 15.4% deemed that their workers' health was very important to their working performances. Please see the details in the table 21.
9. On the responsible persons who gave advices with respect to the danger as the result of the operation and the protective method to workers, it was found that the factories provided the supervisors for each department to be responsible for it. Each supervisor would give the advices to workers who were newly working in the factories about the

job descriptions as well as the application of the dust protective devices.

10. On the dust protective devices, it was found that the dust protective devices in the forms of the masks to close noses and mouths were given to workers while on duty.
11. On the annual health examination, it was found that the annual health examination for workers was provided by the factories under the public health officials' responsibility. In case of illness, that worker would be ordered to stop working and took a rest or was sent to the hospital for further treatment. The workers' health examination records were not be available at the factories, however, the factories agreed that the workers' health was very important to the working performance in the factories.
12. On the support from the public health division; it was found that the factories needed the support on the workers' health examination services from the public health division at least once or twice a year.
(Appendix A).

Table 21: The supportive environment and the health policy of the lime factories and stone crushing mills

Supportive environment and the health policy	Number N = 13	Percentage (%)
1. The factory has the policy about the workers' health maintenance in writing		
- Yes	-	-
- No	13	100.01
2. The factory to issue the regulations to enforce workers to wear dust protective mask		
- Yes	1	7.7
- No	12	92.3
3. The factory to inform or post the policy or regulations to all workers in the office		
- Yes	1	7.7
- No	12	92.3
4. Factory to provide supervisor to supervise workers to wear dust protective mask at all time while on duty.		
- Yes	3	23.1
- No	10	76.9
5. The factory to arrange for the health examination for workers annually		
- Yes	2	15.4
- No	11	84.6
6. The factory to provide the workers the dust protective devices		
- Yes	3	23.1
- No	10	76.9
7. The factory to provide the recommendation about the danger from working and protective method to workers before starting to work		
- Yes	3	23.1
- No	10	76.9
8. The importance of workers' health and operation in the factory		
- Very important	2	15.4
- Important	11	84.6

Part 3: Observation of workers' behavior in using the dust protective devices and the supporting environment to health of the factories

This part was observation 13 the lime factories and stone crushing mills which the workers' behavior in using the dust protective devices and the supporting environment to health of the factories

According to the observation, the workers' behavior in using the dust protective devices and the environmental conditions within the lime factories and stone crushing mills could be classified as follows:

1. On the dust protective devices for workers while on duty, it was found that the higher percentage of factory (53.8%) owned the dust protective devices while on duty while 46.2% did not and the dust protective devices used by workers were the mask made of filtered paper and piece of cloth to close nose and mouth.
2. The factory to post the policy or regulations in the place where it can be seen clearly. It was found that most factories (92.3%) failed to post the policy or regulations in the places where they could be clearly seen while only 7.7% did so.
3. The factory to have fence of its own surrounding the factory. It was found that the highest percentage of samples (76.9%) did not have fences while 23.1 did.
4. The factory to have the nursing room. It was found that most factory failed to provide workers the nursing room (100%).

5. The factory to take care of workers. Most factories (100%) had no nurses to take care of workers.
6. Workers to use dust protective devices. Workers in most factories (76.9%) were found to use dust protective devices and 23.1% of the factories found no workers to use dust protective devices.
7. Workers to use dust protective devices properly. The higher percentage of factory (69.3%) found the workers to use dust protective devices improperly and 30.8% found their workers to use dust protective devices properly. Please see the details in the Table 22.

Table 22: Observation of workers behavior in using dust protective devices and the environmental conditions within the lime factories and stone crushing mills

Observation of behavior and environment	Number N = 13	Percentage (%)
1. Workers' dust protective devices while on duty		
- Yes	7	53.8
- No	6	46.2
2. The factory to post the policy or regulations in the place where it can be clearly seen		
- Yes	1	7.7
- No	12	92.3
3. Factory's condition with surrounded fence		
- Yes	3	23.1
- No	10	76.9
4. The factory to have nursing room		
- Yes	-	0
- No	13	100.0
5. The factory to have nurses to take care of workers		
- Yes	-	0
- No	13	100.00
6. Workers to use dust protective devices in factory		
- Yes	10	76.9
- No	3	23.1
7. Workers to use dust protective devices properly		
- Yes	4	30.8
- No	9	69.2