Theoretical and practical knowledge on fire safety standards in shopping malls in Huancayo - Junín 2016.

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Abstract. The research aims to determine the level of knowledge of fire safety standards by those attending shopping malls in the city of Huancayo. Currently, in the city of Huancayo there are shopping malls that concentrate businesses and therefore the population who go to these places for two purposes: to acquire all kind of goods and for recreation. In this sense, the population needs to be aware of the dangers to which they are exposed, as well as being aware of the high probability of the presence of a fire, especially the owners of these shopping malls, who could be affected with substantial losses in monetary value, as well as the loss of human lives. This research analyzes the level of practical theoretical knowledge that people who go to these malls have and what to do so that these people adopt this knowledge, for which the type of research to be applied is developed being applied - observational - comparative, where a sample population is taken in order to perform an analysis regarding this research. It has been found that a large percentage of the surveyed population does not know the fire safety standards in shopping centers. This is attributed to various causes including the socio-cultural level of the population under study, although the results regarding the theoretical and practical knowledge of fire safety in shopping malls in Huancayo are not encouraging, it asks to develop more work and join efforts in order to raise awareness among our population. This research work will be of great importance since it will help to change the thinking of people who go to these shopping centers in the city of Huancayo.

Keywords: Safety Standards, Shopping Malls, Knowledge.

1. Introduction

In the last twenty-five years the world economy has reflected a great commercial economic growth, placing Peru within the 4 countries that reflect this great growth mainly related to the modern retail industry, which contributes to the development of the cities where a shopping center is installed.

"It is not only about satisfying public demand with novel offers; we are an industry that generates employment extensively, increases the value of the properties that are located in the areas of influence, contributes with public ornamentation, encourages formality, is a great contributor and contributes with new spaces for people's interaction." (Contreras, n.d.)

However, it is important to be aware that there must be a direct relationship between Development and Disaster Risk Management, which is why it is necessary to incorporate safety criteria, especially in the occupation of the territory, which implies considering the natural environment as a space of two-way interrelations (offers and restrictions) and not only as a dispensary of resources.

In 2011, the National Disaster Risk Management System was created as an "inter-institutional, synergic, decentralized, transversal and participatory system, with the purpose of identifying and reducing risks associated with hazards or minimizing their effects" Law 29664 (2011). Defining Disaster Risk Management as a "social process whose ultimate goal is the prevention, reduction and permanent control of disaster risk factors in society, as well as adequate preparedness and response to disaster situations" Law 29664 (2011), for which it establishes Prospective, Corrective and Reactive components, within which processes such as risk estimation, prevention, risk reduction, preparedness, response, rehabilitation and reconstruction are indicated.

In this framework "the National Institute of Civil Defense is responsible for the Reactive Management of the National System of Disaster Risk Management (SINAGERD) (Indeci, 2012) analyzes the occurrence of natural hazards and those induced by human action such as urban fires, indicating them as the most recurrent mainly in large cities, therefore it is important that the population knows this danger and how to prevent, reduce and prepare to act in case it occurs".

For this reason, the present study is focused on the degree of knowledge of the population to act in the event of a fire in the retail shopping centers grouped in the Real Plaza Shopping Center located in the outskirts of the city of Huancayo, department of Junín.

The following are the objectives and hypotheses of the research:

1.1 General objective

To determine the level of knowledge about fire safety standards of the attendees and their behavior in the shopping malls of Huancayo - Junín. 2016.

1.2 General hypothesis

If the level of knowledge of fire safety standards is determined by those attending the shopping centers in the city of Huancayo, then the attending population will be protected by their appropriate behavior.

1.3 Specific hypothesis

a. The degree of knowledge of those attending the shopping centers in the city of Huancayo in the event of a fire, influences the appropriate behavior of the population by locating themselves in the safety zones.

b. The knowledge of safety standards by the attendees of shopping malls in Huancayo, influences their behavior in a fire drill.

c. If the Provincial Municipality of Huancayo fulfills its role of providing the attendees in shopping centers with rules and measures in the event of a fire, then the population will act correctly in the event of an adverse event.

2. Methodology

This research is carried out under a basic methodology, applied - observational - comparative, since it is desired to know the perception of a group of people in relation to the problem posed. For this purpose, the use of data collection tools such as surveys is used, contributing to the development of a quantitative analysis of the opinion of the respondents. Likewise, the application of interviews allows for a qualitative approach, as shown in Figure 1, which shows the phases through which the development of the research work is distributed.

The methodological sequence included the following steps:

Step 1. Collection of general information.

Step 2. Description and analysis of the current legal and institutional framework.

Step 3. Documentary and bibliographic research on best practices and experiences on urban and forest fires.

Step 4. The evaluation and selection of the theoretical framework in the national and international context.

2.1 Methodological design

	TECHNICS	**OBJECTIVES**
Phase I Quantitative	EBA face-to-face survey	To assess the perception of Andalusians with respect to the F.I.
Phase II Consultive	Holding of an expert seminar	Sharing of research results
Phase III Qualitative	6 focus groups + control area	Identification of discourses and attitudes about fires.
Phase IV Qualitative	15 interviews	Identification of fire causes in Huelva.

Figure 1. *Methodological Design*
Source: IESA-CSIC

It responds to a demonstrative experimental design. Its scheme is correlational and is expressed as follows:

X: Level of knowledge in fire safety regulations.

n   r

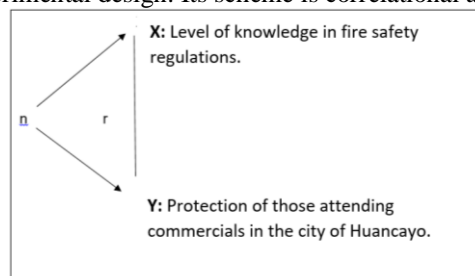Y: Protection of those attending commercials in the city of Huancayo.

Figure 2. Methodological design variables

Source: Own elaboration

Where:

n = Samples taken for Observations
Y = Dependent variable
X = Independent variable
r = Correlation

2.2 Hypothesis testing strategy

The contrasting strategy to be followed is as follows:

The Hypothesis Contrasting procedure will be carried out with the "statistical software that is very often used in the social sciences"; Statistical Package for Social Sciences, known by its acronym SPSS, IBM® SPSS® Statistics 22 edition, Spanish version (Pearson's correlation model), having the following:

To contrast the hypotheses, the *Chi-Square test* was used, whose procedure will be performed with the SPSS version 22 statistical software, taking into account the following steps or procedures:

    a. Formulating the null hypothesis (H_0):
    b. Formulating the alternating hypothesis (H_a)
    c. Setting the significance level (α), its range of variation is $5\% \leq \alpha \leq 10\%$, and it is associated with the value of the Chi-Square table that determines the critical point (X^2_t), specifically the value of the distribution is $X^2_{t\ (k-1),\ (r-1)\ gl.}$ and is located in the statistical table, "the Chi-Square distribution for forming confidence intervals and testing hypotheses about the variance of a population" (Levin - Rubin, 2010, p. 448), this value divides the distribution into two zones, acceptance and rejection as indicated in the graph; if X^2_c **is** $\geq X^2_t$, then the null hypothesis will be rejected.
    d. Calculate the statistical test with the following formula:

$$X^2_c = \ \Sigma \frac{(o_i\ -e_i)2}{e_i} \tag{1}$$

Where:

    $o_i =$ Value observed in surveys
    $e_i =$ Expected value calculated on the basis of observed values
    $X^2_c =$ Value of the statistic calculated with survey data and should be compared with the parametric values located in the Chi-Square table according to the alternating hypothesis statement and indicated in step c. or according to the values of the Chi-square test results obtained in SPSS software in the α-sig column. Which must be less than 5%.
    $X^2_{t\ (kn)} =$ Value of the statistic obtained in the Chi-Square statistical table.
    $K =$ Rows, r = columns, gl = degrees of freedom.

"Procedures that make it easier to decide whether a hypothesis is accepted or rejected or to determine whether observed samples differ significantly from expected results are called hypothesis tests, significance tests or decision rules" (Murray R. - Spiegel, 1980)

2.3 Results obtained

Forest fires are considered by a large majority of Andalusians as the main environmental problem of the Autonomous Community of Andalusia in the six years analyzed (2001-2006). Based on these results, it is possible to affirm the social relevance of forest fires among the environmental concerns of Andalusians and the high level of acceptance of the policy developed by the Regional Ministry of the Environment in this field.

The relationship between concern about forest fires and the forest fire accident rate in the provinces of residence of those surveyed over the last six years was also analyzed. The experience of the analysis carried out in this phase of the research has taught that the mere cross-checking of the concern of Andalusians about forest fires with statistics on the extent and number of fires in each province yields interesting results, but insufficient to understand the variations that occur in the opinions of respondents and the influence on them of the incidence and impact of the forest accident rate.

Nevertheless, the study allows to establish interesting associations between different variables and to contribute to a better understanding of the sociological keys underlying the concern of Andalusians about forest fires. Among these associations, the one that stands out is that which shows how those surveyed who are most concerned about forest

fires are those who are most concerned about this issue and are less interested in other environmental problems (such as soil erosion, air, sea and river pollution or the disappearance of plant and animal species). It has also been found that the Andalusians who are most concerned about forest fires are those who best value the general environmental policy of the Junta de Andalucía and its actions in this specific area of environmental policy.

It has been possible to define a sociological profile of the group where this concern is more intense, mainly older people, with low educational level and low level of environmental information, residents in small municipalities, with little general sensitivity to the environment and low level of adherence to pro-environmental values, as well as low involvement in environmental defense activities. On the other hand, in the profile traditionally identified with environmentalism, the first problem is still fires, but other problems stand out, such as soil erosion and desertification. In other words, mature, urban young people, with a medium-high level of education, left-wing ideology and positive values of environmental awareness, have a broader vision of environmental problems, not so closely linked to forest fires as an event.

Research on the causality of forest fires has revealed that there is a significant mismatch between the perception of Andalusians and the objective reality reflected in the statistics on the causality of this environmental problem.

According to the factors identified as the main causes of forest fires, the respondents consider that the most appropriate measures in the fight against fires are to toughen the penalties for the culprits and to prohibit lighting fires in all types of open spaces.

3. Discussion of results.

After applying the survey defined in the methodological design, which consists of 22 questions asked directly to a total of 750,000 people who attend monthly shopping centers in the city of Huancayo (See Table 1), valuable information was obtained that allows to reach different conclusions.

DAYS	Average monthly attendance
Total	750,000
Monday to Friday	250,000
Saturday and Sunday	500,000

Table 1. Population attending visiting malls in Huancayo
Source: Huancayo Shopping Center

The following are four examples of the questions applied with their respective analysis of the results obtained.

Question 1. Do you know the causes of a fire?

		Frequency	Percentage	Valid percentage	Cumulative percentage
VALID	Si	4	4.9	4.9	4.9
	No	58	70.7	70.7	75.6
	Algo	20	24.4	24.4	100.0
	Total	82	100.0	100.0	

Table 2. Result of the question "Do you know the causes of a fire?
Source: Own elaboration

When asked if they know the causes of a fire, Table 2 shows that 4.88% of the respondents stated that they do know, 24.39% stated that they know something, and 70.73% of the respondents stated that they do not know, concluding that more than 50% do not know the causes of a fire.

Question 2: How likely do you think it is that a fire will occur in this Shopping Center?

		Frequency	Percentage	Valid percentage	Cumulative percentage
VALID	Very low probability	1	1,2	1,2	4,9
	Low probability	4	4,9	4,9	6,1
	Moderately likely	21	25,6	25,6	31,7
	High probability	34	41,5	41,5	73,2

Very high probability	22	26,8	26,8	100,0
total	82	100,0	100,0	

Table 3. *Result of the question "How likely do you think it is that a fire will occur in this shopping center?*
Source: Own elaboration

To the question: How likely do you think it is that a fire will occur in this shopping center? Table 3 shows that 1.22% of the respondents stated that they believe it is very unlikely that a fire will occur, 4.88% stated that they believe it is unlikely that a fire will occur, 25.61% of the respondents stated that they believe there is a medium probability that a fire will occur, 26.83% of the respondents stated that they believe there is a very high probability that a fire will occur, and 41.46% of the respondents stated that they believe there is a high probability that a fire will occur. 83% of the respondents stated a very high probability that a fire could occur, and 41.46% of the respondents stated a high probability that a fire could occur, concluding that more than 50% believe that they have a high and very high probability that a fire could occur.

Question 3: Has the Municipality of Huancayo conducted training on how to act in case of fire?

		Frequency	Percentage	Valid percentage	Cumulative percentage
VALID	Yes	9	11.0	11.0	11.0
	No	66	80.5	80.5	91.5
	Some times	7	8.5	8.5	100.0
	Total	82	100.0	100.0	

Table 4. Result of the question Has the Municipality of Huancayo carried out training on how to act in case of fire?
Source: Own elaboration

To the question: Has the Municipality of Huancayo provided training on how to act in case of fire? Table 4 shows that 8.54% of the people surveyed stated that sometimes the Municipality of Huancayo has conducted training to act in case of fire, 10.98% of the people surveyed stated that it has conducted training, and 80.49% of the people surveyed stated that it has not conducted training, concluding that more than 80% of the people surveyed stated that the Municipality of Huancayo has not conducted training to act in case of fire.

Question 4: Do you believe that drills help the population to prepare for emergencies or disasters?

When asked if they believe that drills help the population to prepare for emergencies or disasters, the results in Figure 3 show that 56.10% of respondents said that they help a lot, 30.48% said that they help a little, and 13.41% of respondents said that they do not help at all, concluding that the population should be more aware of the need to participate in drills.
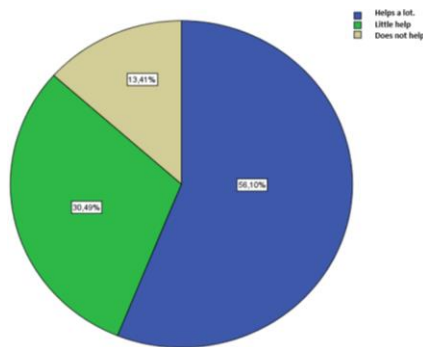

Figure 3. Do you believe that drills help the population to prepare for emergencies or disasters?
Source: Own elaboration

4. Contrasting the hypotheses

The Hypothesis Contrasting procedure was performed using the Chi-Square Test used for survey techniques and has been processed with the most widely used statistical software in the social sciences; Statistical Package for the Social Sciences, known by its acronym SPSS, edition 23, Spanish version (Pearson Correlation Model), having the following:

4.1 Specific hypothesis 1.

The degree of knowledge of those attending the shopping centers in the city of Huancayo in the event of a fire influences the appropriate behavior of the population by locating themselves in the safety zones.

Steps for contrast:

a. Formulating the null hypothesis (H₀)

The degree of knowledge of those visiting shopping malls in the city of Huancayo in the event of a fire does NOT influence the appropriate behavior of the population and is not located in the safety zones.

b. Formulating the alternating hypothesis (Ha)

The degree of knowledge of those visiting shopping centers in the city of Huancayo about the occurrence of a fire DOES influence the appropriate behavior of the population by locating themselves in the safety zones.

c. Setting the level of significance (α)

It is the probability of rejecting the hypothesis, being true, its range of variation is $5\% \leq \alpha \leq 10\%$, and it is associated with the value of the Chi-Square table that determines the critical point x_t^2 specifically the value of the distribution is $x_{t(f-1)(c-1)}^2$ and is located in the Chi-Square statistical table; this value divides the distribution into two zones, acceptance and rejection as shown in the distribution figure;

$$x_{t(8)gl}^2 = 15.50 \qquad (2)$$

$$x_t^2$$

d. Calculating the statistical test with the following formula:

$$X_c^2 = \Sigma\Sigma \frac{(o_i - e_i)2}{e_i} \qquad (3)$$

Where:

o_i = Observed value resulting from surveys

e_i = Expected value calculated on the basis of the expected value

X_c^2 = Value of the statistic calculated with data from the sample being worked on and must be compared with the parametric values located in the Chi-Square table, the value obtained is as follows:

$$x_c^2 = 18.54 \qquad (4)$$

e. Decision making

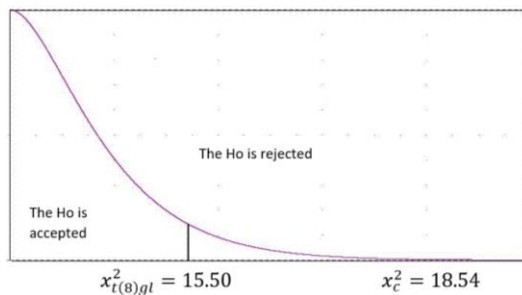The values should be compared with the values of the table:

Figure 4. Distribution and critical Chi-square values.
Source: own elaboration, with the use of SPSS software

Conclusion:

With a level of significance of 5% (α = 5%), the null hypothesis is rejected and the alternative hypothesis is accepted, i.e. "The degree of knowledge of those visiting the shopping centers of the city of Huancayo in the event of a fire, influences the appropriate behavior of the population, locating themselves in the safety zones", which has been tested by the Chi-Square test, using the statistical software SPSS version 23, for which the evidence is attached consisting of the contingency table No. 01 and the result of the statistical test.

Contingency table 01

Have you ever received informative brochures (leaflets, brochures) to know what to do in case of fire *Versus* question 7. If a fire occurred in this Shopping Center, what would be your reaction?

Table 5. Contingency table.

Variables		7. If a fire were to occur in this mall, what would your reaction be?					
		I run out, following the rest of the people.	I call the fire department	I help other people	I stay in a safe area	I use the fire extinguisher to help put out the fire.	Total
17. Have you ever received informational brochures (leaflets, brochures) on what to do in case of fire?	YES	1	2	2	1	1	7
	NO	2	11	22	20	7	62
	Some times	2	3	3	3	2	13
	Total	5	16	27	24	10	82

Source: Own elaboration

Table 6. Chi-Square Statistical Test.

Statistics	Value of the statistical test	Degrees of Freedom (gl)	Asyntonic significance (bilateral)
Pearson's Chi-square	18.544	8	.030
Likelihood ratio	15.085	8	.047
Linear by linear association	.004	1	.039
N of valid cases	82		

Source: Own elaboration

4.2 Specific hypothesis 2
The knowledge of safety standards by the attendees of shopping malls in Huancayo, influences their behavior in a fire drill.
Steps for contrasting
a. Formulating the null hypothesis (H₀)
The knowledge of safety standards by the visitors to shopping malls in Huancayo, influences their behavior in a fire drill.
b. Formulating the alternating hypothesis (Ha)
The knowledge of safety norms on the part of those who visit shopping malls in Huancayo, DOES influence their behavior in a fire drill.
c. Setting the level of significance (α)
It is the probability of rejecting the hypothesis, being true, its range of variation is $5\% \leq \alpha \leq 10\%$, and is associated with the value of the Chi-Square table that determines the critical point x_t^2 specifically the value of the distribution is $x_{t(f-1)(c-1)}^2$. "If the null hypothesis is true, then the sampling distribution of the chi-squared statistic X^2 can be approximated quite well by a continuous curve known as the chi-squared distribution" (Levin - Rubin, 2010, p. 452). This value divides the distribution into two zones, acceptance and rejection, as indicated in the figure of the distribution;

$$x_t^2 = 9.48 \tag{5}$$

d. Calculating the statistical test with the following formula:

$$X_c^2 = \Sigma\Sigma\frac{(o_i - e_i)^2}{e_i} \qquad (6)$$

Where:

o_i	=	Value observed in the surveys
e_i	=	Expected value calculated on the basis of the expected values.
X^2_c	=	Value of the statistic calculated with data from the sample being worked on and should be

compared with the parametric values located in the Chi-Square table according to the alternative hypothesis statement and indicated in step c.

$$x_c^2 = 10.697 \qquad (7)$$

e. Decision making

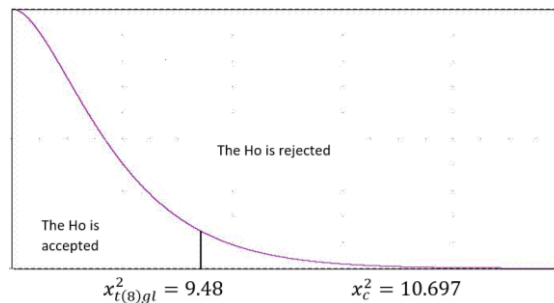The values of the test should be compared with the values in the table.

Figure 5. Distribution and critical Chi-square values.
Source: Own elaboration using SPSS software.

Conclusion:

With a significance level of 5% ($\alpha = 5\%$), the null hypothesis is rejected and the alternative hypothesis is accepted, i.e. "The knowledge of safety rules by the attendees of shopping centers in Huancayo, DOES influence their behavior in a fire drill", which has been tested by the Chi Square test, using the statistical software SPSS version 23, for which the evidence consisting of the contingency Table 2 and the result of the statistical test is attached.

Contingency Table 2

You have participated in a fire drill at the *Versus*22 Shopping Center. Do you think that the drills help the population to prepare in case of a disaster?

Table 7. Contingency table.

Variables		22. Do you believe that drills help the population to prepare in case of disaster?			
		Help a lot	Help little	Do not help	Total
14. Have you participated in a fire drill at the mall?	YES	11	3	2	16
	NO	19	17	6	42
	Some times	16	5	3	24
	Total	46	25	11	82

Source: Own elaboration

Table 8. Chi-Square Statistical Test

Statistics	Value of the statistical test	Degrees of Freedom (gl)	Asyntonic significance (bilateral)
Pearson's Chi-square	10.697	4	.022

Likelihood ratio	4,782	4	.031
Linear by linear association	.017	1	.029
N of valid cases	82		

Source: Own elaboration

4.3 Specific hypothesis 3
If the Provincial Municipality of Huancayo fulfills its role of providing the visitors of shopping malls with rules and measures in the event of a fire, then the population will act correctly in the event of an adverse event.

Steps for contrasting.
Formulating the null hypothesis (H₀)
If the Provincial Municipality of Huancayo does not fulfill its role of providing the assistants in commercial centers with norms and measures before the occurrence of a fire, then the population will act correctly before the adverse event.

b. Formulating the alternating hypothesis (Ha)
If the Provincial Municipality of Huancayo fulfills its role of providing the attendees in shopping centers with rules and measures in the event of a fire, then the population will act correctly in the event of an adverse event.

c. Setting the level of significance (α),
It is the probability of rejecting the hypothesis, being true, its range of variation is $5\% \leq \alpha \leq 10\%$, and is associated with the value of the Chi-Square table that determines the critical point x_t^2 specifically the value of the distribution is $x_{t(f-1)(c-1)}^2$. "If the null hypothesis is true, then the sampling distribution of the chi-square statistic, X2, can be approximated quite well by a continuous curve known as the chi-square distribution" (Levin - Rubin, 2010, p. 452) And it is located in the Ji-Square statistical Table, this value divides the distribution into two zones, acceptance and rejection as indicated in the figure of the distribution;

$$x_{t(4)gl}^2 = 9.48 \tag{8}$$

d. Calculate the statistical test with the following formula:

$$X_c^2 = \Sigma\Sigma \frac{(o_i - e_i)2}{e_i} \tag{9}$$

Where:
o_i = Value observed from surveys
e_i = Expected value based on the observed values.
X^2_c = Value of the statistic calculated with data from the sample being worked on and must be compared with the parametric values located in the Chi-Square table according to the approach of the alternating hypothesis and indicated in step c.

$$x_c^2 = 12.802 \tag{10}$$

e. Decision making
The values of the test should be compared with the values in the table.

The Ho is rejected

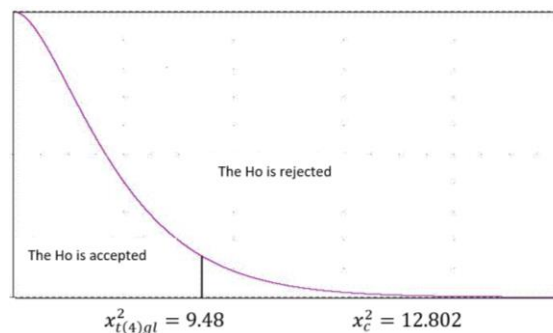The Ho is accepted

$x_{t(4)gl}^2 = 9.48$ $x_c^2 = 12.802$

Figure 6. Distribution and critical Chi-square values.
Source: Own elaboration, using SPSS software.

Conclusion:

With a significance level of 5% (α = 5%), the null hypothesis is rejected and the alternative hypothesis is accepted, i.e. "If the Provincial Municipality of Huancayo fulfills its role of providing the attendees in shopping centers with rules and measures in the event of a fire, then the population will act correctly in the event of an adverse event", which has been tested by the Chi Square test, using the statistical software SPSS version 23, for which the evidence consisting of the contingency table No. 03 and the result of the statistical test is attached.

Contingency table 03

The Municipalit   The Ho is accepted   iducted training to act in case of fire *Versus*13. Are you are interested in being prepared t   ent of a fire in this shopping center?

Table 9. *Contingency table.*

Variables		13. are you interested in being prepared for the occurrence of a fire in this mall?			
		YES	SOMEWHAT	A LOT	Total
18. Has the municipality of Huancayo provided training on how to act in case of fire?	YES	3	3	3	9
	NO	22	35	9	66
	Some times	3	1	3	7
	Total	28	39	15	82

Source: Own elaboration

Table 10. *Chi-Square Statistical Test*

Statistics	Statistical test value	Degrees of freedom (gl)	Asymptotic significance (bilateral)
Pearson's Chi-square	12.802	4	.014
Likelihood ratio	6.661	4	.015
Linear by linear association	.012	1	.021
N of valid cases	82		

Source: Own elaboration

7. Discussion

Reviewing the theoretical framework of some authors regarding fires, the results of the surveys and the contrast of the hypotheses that have been contracted, it can be inferred that there are few studies related to Disaster Risk Management that deal with this type of studies where the behavior of the population located in Shopping Malls is analyzed. This is analyzed in detail with questions asked to men and women, all of them over 18 years of age, with the highest percentage of the people surveyed being between 18 and 49 years of age, a figure that exceeds 70%. Among the most important aspects when asked if they know how to use the fire extinguishers, the answer is very surprising, only 10% know how to use them, and another question considered important is if they know the location of the fire extinguishers. Likewise, when asked if they feel prepared to act in case of fire, more than 70% of the people surveyed said that they do not feel prepared to act in case of a fire, which allows to affirm with greater

certainty that the population that attends the Shopping Centers does not have the necessary preparation to act in case of disasters.

6. Conclusions

✓ That those attending shopping malls in the city of Huancayo in general terms do not know about safety standards in the event of a fire.

✓ That those attending the shopping centers in the city of Huancayo have little active participation when fire drills are carried out.

✓ hat the Provincial Municipality of Huancayo, does not show the fulfillment of its role assigned by the SINAGERD law in preparing the population in general and in particular those who attend shopping centers in the city of Huancayo.

7. Recommendations

✓ It is necessary that those visiting the shopping centers of the city of Huancayo have a comprehensive knowledge of fire safety standards that favorably influence the behavior of the population before the occurrence of the adverse event.

✓ Those visiting the shopping malls in the city of Huancayo must have knowledge of safety standards to act in case of fire, which will allow them to actively participate in the fire drill exercises, thus successfully face a fire of great magnitude.

✓ The Provincial Municipality of Huancayo must assume its role assigned by law 29664 SINAGERD law in preparing the population that attends massively to shopping centers in order to be protected in the occurrence of an emergency, disaster.

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