



FACTORS INFLUENCING FIRE DISASTER MANAGEMENT PREPAREDNESS: A CASE OF PRIMARY SCHOOLS IN MAKUENI COUNTY, KENYA

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Abstract:

The study sought to establish the factors influencing fire disaster preparedness in primary schools in Makueni County in Kenya. Using multiple regression analysis, the findings showed that fire safety policy knowledge had a beta ($\beta = 0.172$), fire safety guidelines implementation practices ($\beta = 0.67$) and fire safety resources provision ($\beta = 0.210$). This infers that fire safety support resources provision affects fire disaster management preparedness in primary schools to a great extent followed by safety policy knowledge while fire safety guidelines implementation had the least effect. Analysis of variance (ANOVA) indicated a significance value of 0.009 which is less than 0.05 thus the model was significant in predicting how policy knowledge, guidelines implementation practices and support resources provision influence fire disaster management preparedness in primary schools. A paired t-test revealed that there was no significant difference ($\rho = 0.094$) in the means of fire disaster preparedness in the public and private primary schools. Therefore, the study recommends more emphasis should be put on training of school stakeholders on fire disaster preparedness and provision of fire safety support resources for combating fire disasters in primary schools.

Keywords: disaster preparedness, mitigation, hazard, disaster management, susceptibility, capacity building, resilience, risk reduction

1. Introduction

Fire incidents have been happening in schools in many parts of the world and it is likely no country has been spared from the problem. These fire incidences have brought devastating damages and loss of lives. A survey conducted in the United Kingdom by Arson Control Forum in 2006, revealed that nearly half of all schools surveyed had experienced incidences of fire serious enough to call fire rescue services in the past three years (Arson Control Forum, 2006).

A report from the United States Fire Administration, National Fire (2007) revealed that there were fire cases in schools, but the impact to the life of people was minimal. This is contributed by enforcement of policies and strict monitoring. Institutions such as schools have firefighting equipment installed on buildings, conduct regular fire drills and their occupants are trained on fire disasters so as to effectively manage the disasters when fire breaks out (United States Fire Administration, 2007).

Fire cases in schools are common and frequent in Africa. For example, in 2001, fire gutted a girls' school in Gindiri village, Northern Nigeria where twenty-three students lost their lives as the dormitory they were in was locked and fortified with iron bars and a chain. This made it very difficult for students to access escape routes such as doors and windows that should open outwards and without grills. In 2008, fire gutted Budo School near Kampala and at least 19 girls and two adults died. It was later established that the hostel doors were locked from outside (Mafaranga, 2009)

In Kenya, several fire incidences have been experienced where lives and property has been lost. In 2001, 67 boys perished in a night inferno at Kyanguli School in Machakos County. The dormitory doors had been locked causing a stampede at the door-step. In 2012, 8 girls died in a dormitory at Asumbi Girls Boarding Primary School in Homabay County. The fire could not be put out as the school did not have adequate firefighting equipment (Kaluoch, Ocheing & Yonga, 2012). The above fire incidences and many others that have occurred, depicts how schools are unprepared for fire disasters since many schools do not have firefighting equipment and their occupants are not trained in dealing with the disasters.

1.1 Research Hypothesis

The following research hypotheses were tested;

HO₁: There is no statistically significant effect of fire safety policy knowledge on fire disaster management preparedness in primary schools in Makueni County.

HO₂: There is no statistically significant effect of fire safety guidelines implementation practices on fire disaster management preparedness in primary schools in Makueni County.

HO₃: There is no statistically significant effect of support resources provision on fire disaster management preparedness in primary schools in Makueni County.

HO₄: There is no statistically significant difference between public primary schools and private schools in Makueni County in terms of fire disaster preparedness.

1.2 Theoretical Framework

1.2.1 Modern Disaster Theory

Modern Disaster Theory by Chen (2011) proposes the modern disaster law that consists of portfolio of legal rules in dealing with catastrophic risks. According to Chen (2014), preparedness is the performance of legal institutions and rules during disaster, adjusted for risks posed by environmental, hazard and social vulnerability. Defining disaster preparedness as institutional performance discounted by risks express the goals of disaster law in financial terms. Disaster law must increase social preparedness for calamitous events and must bring the optimal portfolio of rule to bear when such events occur. Preparedness is the reciprocal of disaster, that is, the effects of a disaster will always depend on how well the organization, family or individual was.

Breaking down vulnerability into its constituent components of susceptibility and resilience aligns all four variables along a single dimension:

Hazard \longleftrightarrow Susceptibility \longleftrightarrow Resilience \longleftrightarrow Capacity.

Individuals, communities and organizations are susceptible to hazards and therefore should be capacitated so that they are resilient. According to KESI (2011) the severity of the effects of a disaster may vary depending on the degree to which man has created an environment susceptible to damage that is an environment in which life and property are at risk. Therefore, all institutions, schools in particular, must put in place all legal frameworks for disaster preparedness, social networks as well as social support if proper disaster management is to be realized.

2.0 Literature Review

Fema (2009) defines disaster management preparedness as the leadership, training, readiness and exercise support and technical and financial assistance to strengthen citizens, communities, states, local and tribal governments and professional emergency workers as they prepare for disasters, mitigate the effects of disasters, respond to community needs after a disaster and launch effective recovery efforts. Disaster

management preparedness ensures necessary resources needed for disaster responses are in place and that all concerned parties in disaster management have knowledge of using them. Preparedness involves planning for resources, making emergency plans, acquisition and storage of disaster resources and ensuring all concerned acquire needed skills and competences so as to realize effective disaster risk reduction (NRC, 2006).

Makhanu (2009) observes that fire and safety departments in most learning institutions are non-existent and members are not trained or equipped to fight a fire in a school. This could be as a result of sheer negligence. The safety of students will be enhanced if staff and students know what to do before, during and after an outbreak of fire or other emergency. This can be achieved by ensuring that staff, students and other school stakeholders receive appropriate training in fire disaster risk reduction. School physical facilities should be appropriate and adequate and properly located devoid of any fire disaster sign. Failure to adopt all legal requirements for disaster risk reduction has caused the country loss of innocent boys and girls in school fire tragedies. For example, all the 67 boys who died in the Kyanguli fire tragedy were in a poorly maintained and overcrowded barracks style dormitory. One of the doors of the dormitory was locked from outside and all its ten windows were grilled. There were no fire extinguishers installed on the building. If the dormitory had big doors and windows without grills, many boys would have escaped the fire before the roof fell in (Rowan, 2001).

Studies by Mugiti (2012), Gichuru (2013) and Mwangi (2009) indicate that schools are not yet prepared for fire disaster risk reduction. The three studies show that firefighting equipment are inadequate, headteachers, teachers and students are not trained on fire disaster risk reduction and some building policies have not been adhered to. Akali, Khabamba and Muyinga (2009) observe that little has been done to prepare schools for fires. Only a few schools have fire extinguishers in offices, classrooms, dormitories and kitchen and most of them are not regularly serviced. School inspectors (QASOs) hardly perform safety assessment during routine checks in schools. Many schools experience water shortage more often and lack hydrant points that would be effective in putting out fires.

The present study sought to establish factors influencing fire disaster management in both public and private schools in Makueni County. The study considered the influence of adequate fire safety resources on fire disaster management preparedness as the most important in ensuring realization of fire disaster risk reduction in schools. With increased research in this area in Africa, practitioners and educationists can justify the need for improved adherence to safety regulations, disaster training programs and provision of adequate firefighting equipment especially in

Africa where common and/or frequent fire incidences have been reported and many lives and property lost.

3.0 Methods

The study employed a descriptive survey design. The design was appropriate for this study because information was solicited from respondents using questionnaires. The respondents gave their opinions based on their social construction and world view.

3.1 Sampling and Data Collection Tool

A sample of 385 respondents, calculated using the Cochran's formula developed by Cochran (1963) was used from a total population of 962 primary schools and 24500 standard eight pupils. Multi-stage proportionate sampling was used to arrive at the sample size of 13 headteachers and 353 pupils in public primary schools and 1 headteacher and 18 pupils in private primary schools. To address reliability of the instruments, test-retest method was administered. Cronbach's Alpha Reliability Formula was used to calculate the reliability coefficient. The results yielded a coefficient of 0.75 which was taken as high enough to consider the instruments as reliable.

3.2 Data Analysis

The filled questionnaires were coded and quantitatively analyzed using descriptive and inferential statistics. Testing of hypotheses was done using multiple regression with the coefficient of determination, r^2 being the square of the sample correlation coefficient between outcomes and predicted values. The main purpose of multiple regressions is to learn more about how several independent of predictor variables influence a dependent or criterion variable. Hypothesis on difference between public and private schools was tested using T-test. The response rate for the questionnaires was 92.8 percent. Qualitative information derived from interviews was analyzed in line with the objectives of the study. The responses from the interviews for pupils required "YES" or "NO" answers and were transformed into percentages and charts. The findings from interviews for the education officer were reported using descriptive statistics. Results of background information were presented using frequency distribution tables, bar graphs and charts.

The Analysis of Variance (ANOVA) was used to test if the overall study model was significant. A paired T-test was done to test the significance difference between public and private schools in Makeni County in terms of fire disaster preparedness. The Levene's Test for Equality of Variances indicated that there was no significance

difference ($p = 0.957$) in the means of disaster preparedness in the public and private schools.

3.3 Hypothesis Testing

Multiple regression was used to determine how knowledge of fire safety policy, implementation of fire safety guidelines and provision of fire safety resources influence fire disaster management preparedness in primary schools. Hypothesis on difference between public and private schools in terms of fire disaster preparedness was tested using a paired T-test. The model assumed that there is a linear relationship between variables, a normal distribution of the variables and little or no multicollinearity of variables. Coefficient of determination r^2 is the square of the sample correlation between outcomes and predicted values. This explains the contribution of the three independent variables (safety policy knowledge, implementation of guidelines practices and support resources provision) to the dependent variable. Of the three independent variables only 55.1 % of fire disaster management preparedness in primary schools was presented by R square (0.551). This means other factors not studied in this research contribute 44.9% of fire disaster preparedness in primary schools. Multiple regression coefficients also showed a strong prediction ratio of 0.742.

The ANOVA test showed a significance value of 0.009 which is less than 0.05 thus the model was statistically significant. The F critical at 5% level of significance was 2.39. Since F calculated was greater than F critical (value= 3.152), this shows that the overall model was significant. Beta coefficient showed that fire safety knowledge had (beta=0.172 and significance =0.276), implementation of fire guidelines (beta= 0.067 and significance=0.202) and provision of support resources (beta =0.210 and significance =0.0285). This infers that provision of support resources was significant and affects fire disaster preparedness in primary schools to a great extent followed by fire safety policy knowledge while guidelines implementation had the least effect.

Hypothesis HO₁

Fire safety knowledge policy contributes to fire disaster management preparedness in primary schools and therefore this study rejects the null hypothesis HO₁: *There is no statistically significant effect of fire safety policy knowledge on fire disaster management preparedness.*

Hypothesis HO₂

Fire safety guidelines implementation practices contribute to fire disaster management preparedness in primary schools and therefore this study rejects the null hypothesis

HO₂: *There is no statistically significant effect of fire safety guidelines implementation practices on fire disaster management preparedness.*

Hypothesis HO₃

Fire safety support resources provision contributes to fire disaster management preparedness in primary schools and therefore this study rejects the null hypothesis. HO₃: *There is no statistically significant effect of support resources provision on fire disaster management preparedness in primary schools in Makeni County.* Notwithstanding all the variables were significant as their P- values were less than 0.05.

A paired T-test was done to find out the difference between public and private primary schools in terms of fire disaster management preparedness. The Levene's Test for Equality of Variances indicated that there was no significance difference ($p=0.957$) in the means of disaster preparedness in public and private schools. Fire disaster management preparedness was therefore found to be equally important in both public and private primary schools. This study therefore accepts the hypothesis HO₄: *There is no statistically significant difference between public and private primary schools in Makeni County in terms of fire disaster management preparedness.*

4. Summary of Key Findings and Discussions

A beta coefficient was run to identify how the three independent variables (fire safety knowledge, implementation of guideline practices and provision of fire safety support resources) influence fire disaster management preparedness. The results revealed that fire safety policy knowledge had a beta co-efficient ($\beta=0.172$), fire safety guidelines implementation practices had a beta coefficient ($\beta=0.067$), and fire safety support resources provision beta coefficient ($\beta=0.210$). This means that provision of fire safety support resources contributes most to fire disaster management preparedness thus the need for schools to acquire and install them on the buildings. The Levene's T-test for Equality of Variances indicated that there was no significant difference ($p=0.957$) in the means of disaster preparedness in the public and private schools. Fire disaster management preparedness was therefore equally important in both public and private schools.

This study found out that fire safety policy knowledge has a direct bearing on fire disaster management preparedness. This therefore calls for training or creating awareness to school stakeholders on fire disaster preparedness. The results of this study were consistent with a study done by Murage (2012), to find out factors influencing fire disaster preparedness in the central business district of Nyeri town which showed that

the landlords/ladies and tenants had not been adequately trained in fire disaster preparedness with means of 36.7, 68.8, 72.5 and 67, 9 for never trained, once, twice and thrice respectively.

According to Murage (2012), the landlord/ ladies and tenants reported that their premises had not been often inspected for fire compliance where 38 out of 44 interviewed indicated "NO" and the rest otherwise. This study found out that few schools had adequate firefighting equipment such as fire extinguishers, fire blankets, hose reels, sand, water, and smoke detectors as indicated by a mean of 2.25 and standard deviation of 1.184. This conforms with a study done by Mwangi (2008) on factors influencing implementation of fire disaster risk reduction in public secondary schools in Nyandarua South District which showed that respondents majorly disagreed that schools had been fitted with sufficient fire extinguishers, first aid kits, reliable alarms systems, sufficient lighting arrestors and maintained school emergency kits. Lack of these fire devices led to poor or no fire disaster risk reduction in the schools hence serious fire in the effected schools were experienced leading to loss of lives and property.

The current study also found out that there was no significant difference between public and private primary schools in terms of fire disaster preparedness since a T-test for Equality of Means showed no significance difference ($p=0.094$). Therefore, both public and private primary schools should put in place proper mechanism for training their stakeholders and availing the necessary firefighting equipment.

More developed countries have defined structures and systems that must be followed by the schools for fire disaster risk reduction. In the United States of America, state governments require specific disaster preparedness activities in their school systems. In California schools are required to develop a disaster plan, have periodic "drop cover hold" practices, hold regular drills for staff and students and hold educational and training programs for students and staff (FEMA, 2009). With this kind of structures/ systems, it is easier to develop quality policies and programs for fire disaster risk reduction in schools.

5. Conclusions and Recommendations

The study sought to find out the factors influencing fire disaster management preparedness in primary schools in Makueni County. From the findings, it was confirmed that fire safety policy knowledge had a significant effect on fire disaster management preparedness as shown by a beta coefficient ($\beta = 0.172$). Staff and other

school stakeholders should therefore be trained on fire disaster for effective management of disasters.

The study found that fire safety guidelines implementation practices have a significant effect on fire disaster management preparedness as indicated by a beta coefficient ($\beta = 0.067$). Staff and other school stakeholders should therefore conduct fire drills regularly and inspection for compliance of fire safety guidelines should be conducted often.

Provision of fire safety support resources had a significant effect on fire disaster management preparedness since the results showed a beta coefficient ($\beta = 0.210$). Safety devices such as fire extinguishers, fire blankets, hose reels, water and detectors have to be acquired, installed in their right places and regularly serviced for realization of effective fire disaster management in schools.

The means of responses from public and private primary schools were compared and a T-test for Equality of Means ($p=0.094$) showed that there was no significant difference between them in terms of fire disaster preparedness. Therefore, fire disaster preparedness in both categories of schools was found to be equally important to focus on.

The ministry of education should introduce the disaster preparedness theory and practice into schools and training institutions' curriculum at all levels to equip stakeholders with adequate skills for prevention and management of disasters. More input on disaster management should be made in the provision of fire safety support resources as they have the greatest effect on fire disaster management preparedness in primary schools. Policies and guidelines on fire safety should be backed by law and an effective monitoring of safety guidelines conducted if proper fire disaster management is to be realized.

Finally, the current study can be replicated in other counties and other levels of learning institutions such as secondary schools and colleges so as to have a larger picture of the situation in the whole country. Further research should also be conducted to establish causes of the rising cases of fire incidences in schools in Kenya, especially secondary schools.

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