

KNOWLEDGE-RELATED FIRE HAZARDS REDUCTION CAPABILITIES AMONGST HOUSEHOLDS IN KIBERA SETTLEMENTS, NAIROBI COUNTY, KENYA

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Abstract

The purpose of the study was to determine knowledge-related fire hazards reduction capabilities amongst households in Kibera Settlements, Nairobi County, Kenya. The study was conducted in Kibera Slums. Descriptive cross-sectional study design was used. A total of 423 respondents were used in the study. Data was collected using Questionnaires, observation checklists and Focus Group Discussions. Data analysis was done using SPSS v.20. The study found out that the community's knowledge and awareness was fairly good, with no respondent (0%) willing to indicate total lack of school-based education. The respondents defined fire hazards as the causes, events and effects of fires without arriving at a clear definition of fire hazards. Males had better reduction capability than females. The study therefore recommends programs by the local authorities to train the community on preventive measures as well as gender-focused fire hazard reduction empowerment.

Introduction

Over 4 million people die prematurely from illness attributable to the household air pollution from cooking with solid fuels and more than 50% of premature deaths among children under 5 because of pneumonia caused by soot inhaled from household air pollution WHO (2014). According to WFSC (2015), all across the globe, people have neglected the need to forecast the possible occurrences of fire when constructing buildings. For Europe as a whole, the annual toll of fire deaths is measured in many thousands, with those suffering fire injuries numbered at many times more. Burns caused by fire hazards are among the most devastating of all injuries, resulting to physical impairments and disfigurement, to emotional and

mental consequences. SCDF (2015) agrees with this burden projected. It states that in 2014, 588 more cases were reported than in 2013 in the whole of Singapore. This was approximately a 14% increase. Despite the fact that injury due to burns is largely preventable, Africa carries an extraordinary burden of fire related injuries.

Background

Capability refers to the power to handle or just the inherent ability to cope with. In the case of fire hazards, reduction capabilities could cover from factors as small as carelessness to more complex factors such as the makeup of the house such as inclination, access or ventilation. The capability to reduce fire hazards can be measured in terms of preparation, reaction or the risk factors. This study will focus on how all these contribute to an overall rate of fire hazard occurrences (Ono & Da Silva, 2000). Fire is crucial for the development of human society, and it has become an important part of human civilization. Among different types of disasters, fire constitutes a significant threat to life and property in urban and rural areas (Dube, 2015). Fire hazards refer to all types of live flames, causes of sparks, hot objects, and chemicals that are potential for ignition, or that can aggravate a fire to become large; In addition fire hazards could also mean the potential threats to fire prevention practices, firefighting, built-in fire safety systems and situations that restrict the escape of people from an affected building or area in the event of a fire. Some common fire hazards are kitchen fires from unattended cooking, such as frying, boiling, and simmering, electrical systems that are overloaded, resulting in hot wiring or connections, or failed components, combustible storage areas with insufficient protection (Claret *et al.*, 2012).

Research Questions

The study addressed the following questions:

1. What is the level of fire hazards knowledge and awareness amongst the households in Kibera settlements?
2. What are the demographic characteristics contributing to fire hazards reduction capabilities in Kibera settlements?
3. What are the socio-economic characteristics contributing to fire hazards reduction capabilities in Kibera settlements?

Methods

Study Subjects

The study area was conducted in Kibera Slums within Nairobi County, purposely selected since it was the largest slum in Kenya, as at the time of study. Kibera is located 5km southwest of Nairobi City Central Business District. Kibera has a population of approximately 177,000 (2009) The target population consisted of Kibera residents who were above 18 years and who had been residents for the preceding one year in the study area (Fihlani, 2015). The study population was the household heads at Kibera settlements. Any adult above 18 years present in the absence of a household head also took part. The total number of households used was 1977 (KNBS, 2009).

Study Designs

Cross-sectional study design was used to determine the fire hazards amongst the households in Kibera settlements. Quantitative data was solicited through questionnaires conducted on house hold heads and Focus Group discussions were also used to compliment the quantitative data. Observation checklists were used to ascertain the findings from the questionnaire as well as provide qualitative data (Moskal&Leydens,

2000). Every household head or adult or mature minors found in the household and consented to take part in the study was included. Pretesting was conducted at Kawangware slums in Nairobi so as to ensure the reliability and suitability of the questionnaires and in-depth interviews. The pretest was used as a means of training enumerators who were involved in the main survey. Instruments to be used for the collection of data included in-depth interviews, observation checklist and Focus group discussions. As for the Collection procedure, First, the local administrators were consulted so as facilitate field entry. A sampling frame was then developed from which the sample populations for the household survey were drawn. A sample of 423 respondents was used for the study. Data was collected on fire hazards reduction capabilities amongst households

Analytical Techniques

Once questionnaires had been completed the data collected was systematically arranged according to the codes of the questions to facilitate analysis. Verification of all filled questionnaire for completeness and made a follow-up to make sure all questions were as appropriately answered as possible. The questionnaires were then presented to the Statistician for Cleaning and Analysis. Incomplete, irrelevant, inconsistent or inaccurate records were removed from the database. Panel data were sorted as so for ease of analysis with creation of new variables for appropriateness of the analysis process as per objectives. Data was analyzed using SPSS package version 22. Tables and graphs were used to present the results. Cross tabulations were generated to determine the relationships between variables. Chi-square and correlation analysis were used to test for associations among variables.

Results

Characteristics of the Respondents

Demographic Characteristics of the Respondents

Table 4.3.1 and Table 4.3.2 show the demographic characteristics of the respondents. Those aged 35 years and above were more. Male respondents were also fewer than females. Those who had been widowed or divorced were the majority. The mean number of household members was 5.99 with the median and mode being 5. The standard deviation from the mean for household members was 1.402. This means that the values were close to each other and not widely variant. However, the minimum number was 1 since there were a good number of single people involved in the study. The differences between capabilities across the ages were statistically significant [$p > 0.05$], with those aged 35 and above found to be more. Gender, however, varied significantly with the outcome variable [$p = 0.04$] with more female than male respondents. Most households had many members, above the mean household number.

Table 4.3.1: Demographic Characteristics

Variable	Values	Number, N	Percentage (%)
Age	≤ 35	221	52.24
	> 35	202	47.75
Gender	Male	201	47.52
	Female	222	52.48
Marital Status	Single	137	32.39
	Married	138	32.62
	Divorce/Widowed	148	34.99
Total		423	100.00

Table 4.3.2: Demographic Characteristics Bivariate analysis

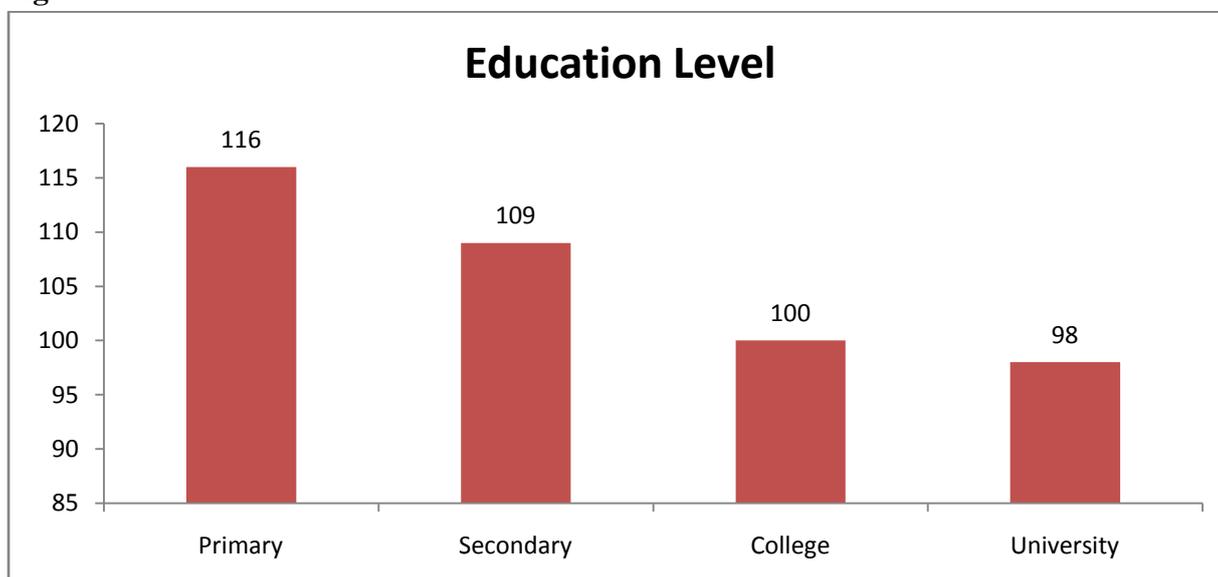
Variables	Values	FHRC			
		Poor	Good	Total (%)	
Age	<35 years	74(33.50)	147(66.50)	221 (100)	$\chi^2=1.446,$ $p=0.079, df=1$
	>35 years	79(39.10)	123 (60.90)	202 (100)	
Gender	Male	70(34.8)	131(65.2)	201 (100)	$\chi^2=0.300,$ $p=0.04, df=1$
	Female	83(37.4)	139(62.6)	222 (100)	
Marital Status	Single	48(35.04)	89(64.96)	137 (100)	$\chi^2=0.184,$ $p=0.584, df=2$
	Married	56(40.58)	82(59.42)	138 (100)	
Number of Household Members	Widowed/Divorced	49(33.11)	99(66.89)	148 (100)	$\chi^2=0.673;$ $p=0.412;$ $df = 1$
	Below Mean	64(38.55)	102(61.45)	166(100)	
	Above Mean	89(34.63)	168(65.37)	257 (100)	

Socio-economic Characteristics

Table 4.3.3 and Figure 4.3.1 show the frequency of education level and employment status. Majority of the respondents had acquired primary education. Fire Hazard Reduction Capability among those with secondary school level of education and below, compared to those who had attained post-secondary education were not significantly different.

Table 4.3.3: Socioeconomic Status

Variable	Values	Number, N	Percentage (%)
Education Level	Primary	116	23.17
	Secondary	109	23.64
	College	100	25.05
	University	98	27.42
Employment Status	Self/Casual /Unemployed	273	64.53
	Employed	150	35.47
Total		423	100.00

Figure 4.3.1: Level of Education

Knowledge and Awareness

The focus groups discussions revealed that when definitions for fire hazard were grouped into three, Two (25%) of the discussions adopted Fire Hazard as a Cause of fires, 3 (37.5%) adopted Fire hazards as the actual Fire event, with another 3 (37.5%) defining fire hazards as the aftermath of fire hazards (Appendix 4). Table 4.5.1 shows the frequencies of knowledge characteristics. Property loss was the most popular fire danger caused by fires, followed by disfigurement. The reason behind this observation was that anyone affected by fires almost always loses some resource, which quantified amounts to property. Table 4.5.2 shows the fire-fighting utilities used by the residents. Water was the most common agent of extinguishing fire, followed by sand and then blankets were also used. Table 4.5.3 shows the information access preference by the respondents. Most of them indicated that they obtained information on fire hazards mainly on internet, Television and Radio. This is indicative of the era that we are in as well as the socioeconomic status of the residents. Safety campaigns also had a fair share of usage. Members of all the discussions indicated they had experienced a fire hazard themselves, with all of them incurring Minor injuries. Minor injuries was indicative of any injury that did not leave an impairment or physical disability, even if the scars from the incident were permanent. Table 4.5.4 shows the cross-tabulation of various knowledge and awareness factors against the outcome variable. Fire Hazard Reduction Capability differed significantly by previous personal fire experience ($p=0.039$).

Table 4.5.1: Dangers Caused By Fire

Variable	Values	Number	Percentage
Dangers by Fire	Property loss	197	46.57
	Disfigurement	122	28.84
	Impairment	65	15.37
	Death	39	9.22
Total		423	100.00

Table 4.5.2: Fire Extinguishing Utilities

Variable	Value	Number	Percentage
Extinguishing Utility	Water	162	38.30
	Sand	108	25.53
	Blankets	30	7.09
	Missing/Others	123	29.08
Total		423	100.00

Table 4.5.3: Preferred Information Source

Variable	Value	Number	Percentage
Information Source	Internet	110	26.00
	Safety Campaigns	94	22.22
	Television	110	26.00
	Radio	109	25.77
Total		423	100.00

Table 4.5.4: Composite variable against various knowledge and awareness factors

Knowledge and Awareness Factors	FHRC Composite Variable				
Training on fire hazard	Yes	73(36.1)	129 (63.9)	222(100.0)	$\chi^2_{20.000}$ [0.99], df=1
	No	80(36.2)	141 (63.8)	201(100.0)	
Importance of raining	Yes	153 (36.3)	269 (63.7)	42(100.0)	0.568 [0.451], df=1
	No	0 (0.00)	0 (0.00)	1(100.0)	
Previous Personal fire experience	Yes	93 (40.4)	137	230 (100.0)	5.04 [0.039] df=1
	No	60 (31.1)	133 (68.9)	193 (100.0)	
Previous Neighbor fire experience	Yes	61 (14.4)	362 (85.6)	423(100.0)	3.687 [0.055] df=1
	No	0 (0.0)	0 (0.0)	0(0.0)	
Previous Distant fire experience	Yes	20(8.62)	401 (91.38)	423(100.0)	1.112 [0.292] df=1
	No	0(0.0)	13(6.81)	0(0.0)	
Fire hazards can be avoided	Yes	77(34.5)	146(65.5)	223(100.0)	0.550 [0.458] df=1
	No	76(38.0)	124(62.0)	200(100.0)	

Discussions

Demographic Characteristics

Socio-demographic characteristics captured both the economic as well as residential factors of the study population. They were considered vital as they aid in explaining certain attributes of the population as well as for purposes of grouping the responses. Those aged 35 and above were the majority which was considered as the most conversant group with information regarding fire hazards. The association between age and Fire hazard reduction capabilities did not yield statistically significant results – inconsistent with what Lam *et al.* (2012) reported that age is a huge contributor to level of awareness.

There were more females than males who took part in the study. This was expected since the population distribution reported from KDHS (2014) also revealed the same. However, the males had a higher reduction capability presumably due to their exposure based on social roles.

On marital status it was observed that most respondents were either divorced/widowed. This observation implied that most times the households were left unattended and in the event of fire, there was no enough manpower with techniques to contain the same. Claret *et al.* (2012) argued that children of lone mothers had the highest death rates of all social groups and further that sole parenthood was associated with poverty.

Socio-economic characteristics

Level of education and fire-related knowledge and awareness levels were directly proportional. As observed, most residents had a Primary School level of education for the whole of the study area, which was an indication that most residents had not acquired the appropriate knowledge to equip them with information of handling fire. According to IFRC (2011), it is important to conduct the drills in schools, the primary goal is to ensure the safety of the students and staffs and it requires family participation and on-going process of identification of hazards, mitigation and developing response capacity. Also it was clear that relationship between education and unemployment yielded statically significant results when it comes to fire hazard reduction capabilities.

The number of those employed was generally low all across the villages. The highest level of education achieved. This was not too different from what Kamengere (2014) reported that the average level of education was Secondary School. The median number of household members was 5 across all the villages, which is relatively high considering the high number of those reported as not married. Television

and radio was reported as the most significant. This means most locals had embraced the modern use of electronics, and therefore the information about fire hazards should be disseminated through the same channel. This is in concurrence with Pausas&Keeley (2009) who stated that in United States, selected local radio stations and newspapers are used to reach ethnic populations which are the prime target audience for these media. It was also observed that all the locals used matches as a means to ignite fire which can be connected to common cause of fires in Kibera as evidenced by Lam *et al.*(2012) who stated that prevention of young childhood deaths involved several approaches, including keeping matches and lighters out of reach.

Socio economic characteristics in relation to Fire hazard reduction capability was as good, which means there was still more room for improvements which could be done through other means of sensitization like fire hazard campaigns. IRCCS (2015) stated that it was important to give people the information relevant to their level of participation in the community, in addition training should be appropriate to the level at which it is conducted of which the objective is to develop an everyday awareness of the possibility of hazard occurrence in which people take conscious precautions.

Knowledge and Awareness Levels

The discussions revealed that when definitions for fire hazard were classified into three groups, 2 of the discussions adopted Fire Hazard as a Cause of fires, 3 adopted Fire hazards as the actual Fire event, with another 3 defining fire hazards as the aftermath of fire hazards

The study indicated that among the dangers caused by the fire among others, property loss was the most. This can be concluded that most respondents had previous information on fire hazards which can be attributed to property loss, thus they had acquired information through experience with fire

The observation that most respondents appreciated training as being important is in concurrence with Goldammer& De Ronde (2004) who stated training was important in addition Lam *et al.*(2012) indicated that educating parents regarding the dangers of leaving children unattended was important. The study noted that the most used extinguishing utility was water. Possible reasons for this could be due to unavailability of firefighting equipment in the area coupled with readily available water supplied through pipes by the local authorities. The locals did not have information on other means to contain fire like blankets.

The study revealed that besides the internet being a common entity in the area, radios and television were also found to hold great preferences as source of information. This means implies that the residents complemented the information they obtained from the internet by using radios and television so that they can get informed and current information as regards to fire hazards. The greater usage of internet than radios could be explained through reference on reporting by Pausas&Keeley (2009) that radios were used to communicate to people of certain ethnic inclination. Newspaper reading was rarely used as a source of fire-related information which could imply that the members of the area either could not afford the papers or simply found it easy to use the other modes of information access. Newspapers, therefore, are not a good way of communicating with the residents. It was also an indicator of the low economic status of the people.

The study also revealed that all the respondents interviewed had witnessed neighbors' experience with fire and elsewhere which was an indicator of fires as a routine occurrence in Kibera. Such an observation was also an indication that they did not have knowledge on risk factors on how to completely stop these fires. Property loss was the most popular fire effect followed by disfigurement. This finding is consistent with the reporting by WFSC (2015) that fires are most devastating when they cause disability, property loss and disfigurement.

On the knowledge on flammable materials extent of risk, the study found that these materials ranged between high to very high risk. This finding is in line with what Mwau (2015) observed that Kibera had

building concentrations, flammable building materials, narrow roads, improper installation of electrical system. These are only some of the visible issues connected with the high rate of urban fire incidences. Extent of risk by unattended children also scored just as high, and was confirmed through the discussions that revealed failure to watch over children as one of the leading factors to fire hazards. Lam *et al.* (2012) stated that young children were in the event at higher risk for house fire death. The main reason was that they react slower with fire and then are developmentally unable to react appropriately and plan escape they may be left unattended.

Conclusions

An above average level of educational training or knowledge enhances the area's reduction capabilities since with greater education comes better understanding of situations and circumstances, and this is even implicated in disaster situations. Greater knowledge also improves people's approach and attitudes which can then be said to be a vital component of disaster preparedness for the hospital. The community members' knowledge of one another coupled with willingness to be involved in fighting the fires when they erupt is a good indication of good reduction capability.

Fire hazards ranged from those coming from electric wires (both indoor and from poles) to those caused by human activities such as cooking. Leaving children unsupervised also was seen as a predisposing factor. Personal habits were also identified as factors contributing to fire hazards such as alcoholism or carelessness by leaving appliances on the sockets without turning them off. All respondents indicated having been burnt in the past by fires and incurred injuries. Since electricity is the only other fire hazard cause common to all respondents, it could be concluded that electricity is the most threatening fire hazard.

Recommendations

1. Community members ought to be trained on ways of preventing fires as well as fire extinguisher training.
2. The local authority needs to hasten the process of introduction of the prepaid electricity tokens as they would then help eliminate naked wires usage.
3. Gender-based empowerment to improve fire hazard reduction among females

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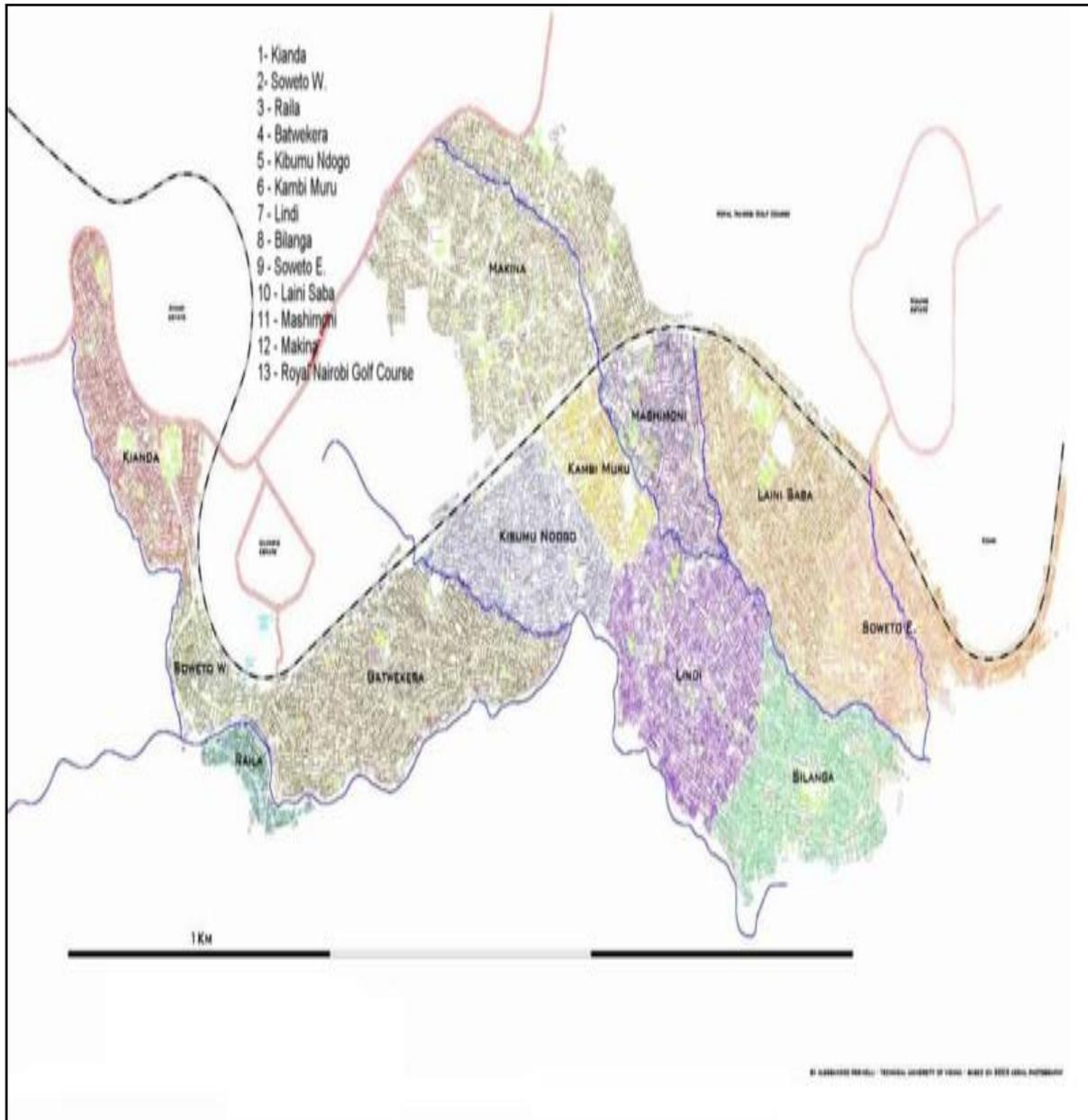
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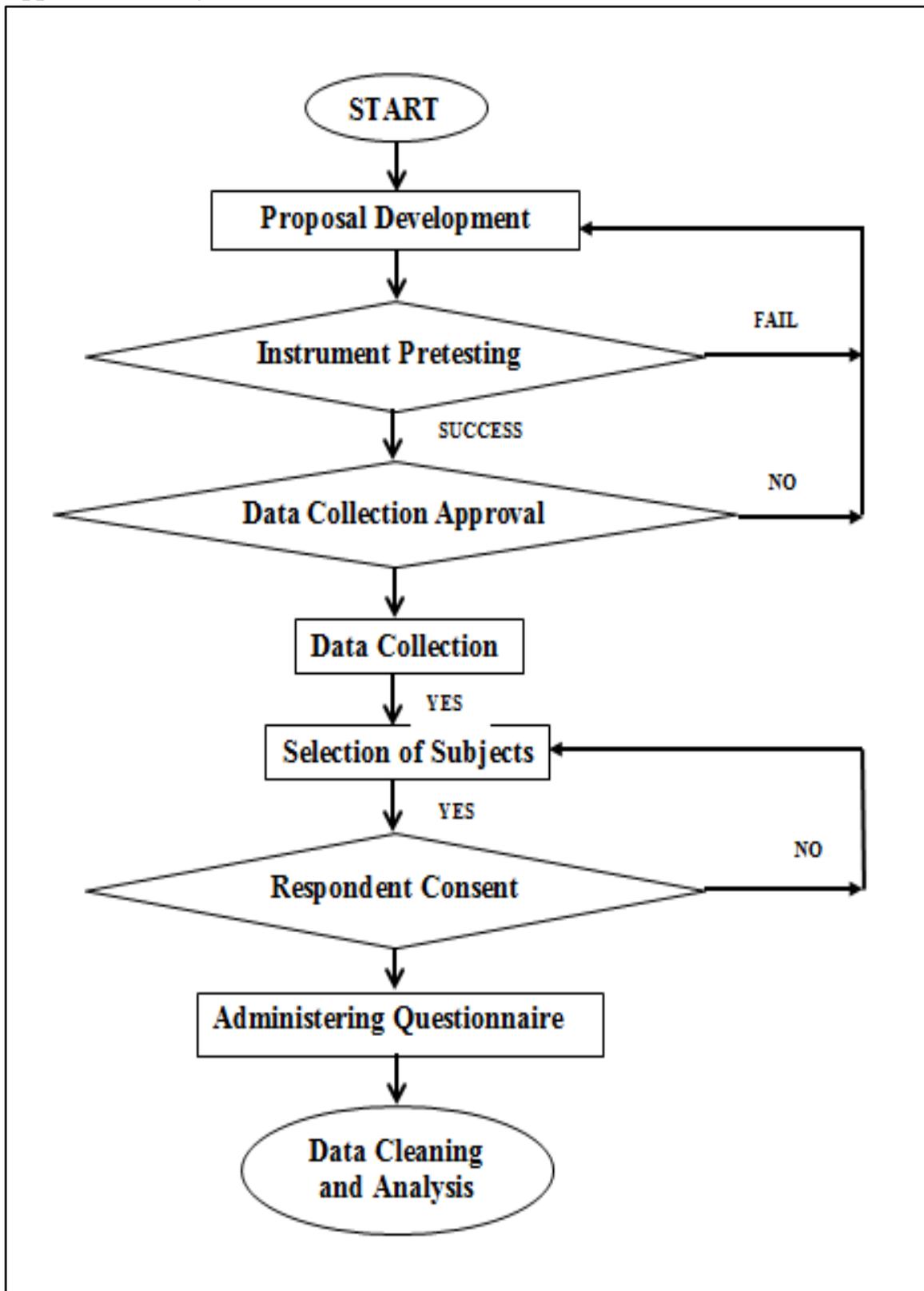
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APPENDICES

Appendix 1: Study Area Map



Appendix 1: Study Flow of Activities



Appendix 3: Observation Checklist

Parameter	Frequency (%)	
	Yes	No
Fire Promoting Fire Hazard Occurrence		
Candles near Walls	247 (58.4)	176 (41.6)
Kerosene	377 (89.1)	46(10.9)
Direct transformer connections	401 (94.8)	22 (5.2)
Smoking and Drinking in-house	143 (33.8)	280 (66.2)
Poor Roads	N/A	N/A
Congested Roads	311 (73.5)	112 (26.5)
Congested Houses	345 (81.6)	78 (18.4)
Presence of electronic equipment	373 (88.2)	50 (11.8)
Presence of stoves	394 (93.1)	29 (6.9)
Safety Measures		
Sprinkler Use	0 (0.0)	423(100.0)
Fire Extinguishers inside	0 (0.0)	423(100.0)
Fire extinguishers in plot	0 (0.0)	423(100.0)
Fire Hydrants Presence	0 (0.0)	423(100.0)
Presence of rules for fire hazard control	0 (0.0)	423(100.0)
Switched off appliances and bulbs	381 (90.0%)	42 (10.0)
High risk Housing conditions	238 (56.3)	185 (43.7%)
Littering and Dumping	412 (97.4)	11 (2.6)
Periodic Cleaning of Litters	5 (100.0)	0 (0.0)
Overloaded sockets	362 (85.6)	61(14.4)
Open (Uncoated) cables	207 (48.9)	216 (51.1)
Fire Alarms Presence	0 (0.0)	423(100.0)
Fire alarms functionality	0 (0.0)	423(100.0)
Presence of Billboards	0 (0.0)	423(100.0)
Presence of Public safety campaigns	0 (0.0)	423(100.0)

Appendix 4: Focus Group Discussions

Variable	Values	Makina 1	Makina 2	Ayany 1	Ayany 2	Olympic 1	Olympic 2	Soweto	Gatwek era
What are Fire Hazards	Cause	-	9	6	14	2	6	1	9
	Effect	4	11	4	4	10	13	4	3
	Event	12	5	8	12	5	4	6	5
Personal Experience	Yes	8	17	20	8	17	20	8	17
	No	0	0	0	0	0	0	0	0
Worst Fire	Gatwekera	2	10	2	2	10	3	4	10
	Olympic	7	3	17	8	3	12	5	3
	Soweto/Sarang'o mbe	3	2	1	3	2	1	3	2
	Makina	3	-	-	3	-	-	3	-
Explanation	Oil/Gas Blasts	11	10	9	11	7	4	5	10
	Neighbour mishaps or Residential negligence	15	13	5	12	15	6	15	11
	Cooking Utilities	-	-	0	-	-	0	-	-
	Electrical Appliances/Fault	9	-	6	9	-	7	9	-
	Ignorance (Leaving switches on)	9	-	0	9	-	0	9	-
	Lack of Unity	-	5	-	-	5	-	-	5
Type of effect	Visible Burns	Minor	5	11	13	10	9	6	10
			Lost face shape	-	-	-	-	7	-
	Property Loss		14	8	14	8	-	14	8
	Walking/ Mobility affected	Major	-	-	-	-	2	-	-
			Deep Skin Burn	12	-	8	-	-	9
	Death		3	4	6	4	-	7	4
Ever witnessed fires here or elsewhere in Kibera	Yes	17	18	20	18	16	17	14	15
	No	2	0	2	2	0	2	2	0

Explanation of what took place	Neighbour carelessness	-	5	7	-	5	7	-	5
	Child ignorance	12	-	9	12	-	9	12	-
	Unfortunate Electricity/Power supply	12	13	-	12	13	-	12	13
	Illegal power connections	-	15	-	-	15	-	-	15
Most Common Fire Hazard	Children	12	-	-	11	-	-	14	-
	Electricity	11	-	-	6	-	-	14	-
	Petroleum/Gases	2	5	16	2	6	16	2	6
	Flammable materials	-	-	2	-	-	2	-	-
	Ignorance	-	2		-	2		-	2
	Appliance Mishandling	-	11		-	11		-	11

	Sentiments
On Worst Fire	<p><i>"1. You think of Fires in Kibera, what comes first to mind is either Laini Saba, or Olympic. Businesses were affected and there was much loss."</i></p> <p><i>"2. "There was this fire here in Makina. People burnt to death. It's unbelievable. I lost two of my brothers"</i></p>
	<i>"Property loss is not an injury but it injures us from inside identified as not an injury but the effects are drastic"</i>
	<i>"The connections from the running wires around the house led to the fire in Soweto"</i>
On Fire Prevention	<p><i>1. "Fires are impossible to prevent. You try your best to keep yourself safe, but kids mess you up just when you don't want them to"</i></p> <p><i>2. "The devil is also to blame. Sometimes, I feel Kibera is cursed. We need to pray for Kibera"</i></p> <p><i>3. "However much I try to ensure my own safety, my neighbours could easily start a fire and I will be affected." Those were the sentiments of one of the group participants. "It is easier to say that we can avoid fires when we can handle the vulnerabilities around us such as what we use to make our houses. Until we safeguard the construction raw materials we are never guaranteed of safety from fires"</i></p>
Causes	<i>"The electricity is our worst enemy here on the streets. And the government has ignored us" – by one street urchin</i>