# Determining the Health Risk Factors Impacting Occupants of a Dilapidated Building in Durban, South Africa

*By*

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*Submitted in fulfilment of the requirements of the Degree of Masters of Sciences: Environmental Health in the Faculty of Health Sciences at the Durban University of Technology*

I, Mzimasi Mdoda, do declare that this dissertation is representative of my own work.

Approved for final submission

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**STUDENT DECLARATION**

***I, Mzimasi Mdoda, declare that;***

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## DEDICATION

***I dedicate this work to;***

- My precious Mother Thozama Grace Mdoda: I am very fortunate and grateful to experience such love and tremendous support from you.

- My two beautiful, lovely sisters Zomzi Mdoda, and Esihle Mdoda: you both stood by me and are very special to me. Thank so much for being there for me throughout this journey. Thanks for being my best cheerleaders.

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**ABSTRACT**

In most developing countries such as South Africa, the phenomenon of buildings dilapidation has persisted in cities. Despite endeavors by the government, municipalities and others to eliminate this point of contention, the problem has remained. In different metropolitan areas such as Durban, Port Elizabeth and Johannesburg in South Africa, the existence and effects of disrepair continue to increase. The primary purpose of the study was to determine the health risk factors impacting occupants of a dilapidated building in Durban, South Africa. A dilapidated building is any building exhibiting signs of being a health hazard. This can be determined by factors such as unsanitary conditions, unsightliness, over-crowding, poor ventilation, mismanagement of refuse or waste, and poor maintenance of the building. A dilapidated building was purposely selected in South Beach, Durban. This is a residential building that satisfied the definition of 'dilapidated building'. The dwelling houses 600 people occupying 140 units.

The minimum sample size was 103 Units. The head of the household or his/her proxy was targeted to participate in each unit. The research instrument used to collect primary data was a questionnaire and an inspection survey. Data analysis included descriptive, inferential statistical analysis carried out using the Social Sciences Statistical Package (SPSS Version 26.0 IBM). A Chi squared statistical test of independence and Phi Coefficient and Cramer's V Correlation test has shown a statistical significant association between the painful ankles experienced and the non-use of the elevator to reach the upper floors ($p$=0.002, phi and V=0.351), crime and depression/ anxiety ($p$=0.003, phi and V=0.018), lack of air circulation through open windows and TB ($p$=0.035, phi and V=0.197), as well as enervated waste removal versus medical attention seeking ($p$=0.003, phi and V=0.197). This research highlights that conditions in a dilapidated building linked strongly with adverse health outcomes of the occupants. A wide range of risk groups has affected occupants' health, mainly from poor solid waste management, crowded units, and crime. Dilapidated building conditions were linked to a wide range of health problems and symptoms including respiratory infections, headaches, sleepless asthma, crime, ankle pain and mental health. Interventions to ensure healthy buildings and to prevent building dilapidation require a tripartite approach including government, building owners and occupants, with every stakeholder having a role to play in ensuring building health.

## TABLE OF CONTENTS



### CHAPTER 1



### CHAPTER 2

**CHAPTER 3**



**CHAPTER 4**

## CHAPTER 5



## CHAPTER 6

**LIST OF FIGURES**

## LIST OF TABLES

## LIST OF APPENDICES

## LIST OF ABBREVIATIONS/ ACRONYMS

| | |
|---|---|
| HoH: | Head of the Household |
| ITRUMP: | Inner City Thekwini Regeneration and Urban Management Programme |
| TB: | Tuberculosis |
| UK: | United Kingdom |
| SSSP: | Social Sciences Statistical Package (SSSP |
| HOA: | Housing Ownership Assistance |

# CHAPTER 1

# INTRODUCTION

## 1.1. BACKGROUND OF THE STUDY

A global increase in the number of people migrating into cities has resulted in massive pressure on the housing sector and has led to the emergence of dilapidated buildings (Wolch, Byrne and Newell 2014: 234). According to Krieger and Higgins (2002: 759), dilapidated buildings were linked with a number of health ailments such as chronic/communicable diseases and injuries, as well as crime and violence. Additionally, these buildings often manifested unsatisfactory conditions such as poor sanitation, overcrowding, inadequate ventilation and other negative social determinants of health. Feige *et al.* (2013) concurred that the building itself impacted on the health of its inhabitants. Conditions in dilapidated buildings could trigger asthma attacks and respiratory symptoms by exposing residents to irritating risk factors such as smoke, damp, dust mites, mould, rats and mice (Krieger and Higgins 2002: 758). However, a review of the literature has shown that during the past five to ten years, not many articles have been published in relation to health risk factors impacting residents in dilapidated buildings.

## 1.2. RESEARCH PROBLEM

Urbanization has increased worldwide as a result of the uncontrolled migration of rural/ peri-urban dwellers, the unemployed, tertiary students, expatriates and foreigners (Fernandez 2012: 214). Concomitantly, although cities are perceived to be the main sources of economic activities and allow great development opportunities to inhabitants as the cities have grown in size and complexity, they have, however, generated a wide range of problems that may become difficult to address (Monzon 2015: 3). Those problems include dilapidation of buildings and health problems. eThekwini news flash (27

January 2016) indicated that city of Durban was struggling to cope with this influx of people, and resulted in overcrowding and destabilisation in the housing sector. Further to that, unsound building structures strongly impacted upon the health status of the residents. Those experienced health impacts have added pressure on a health system which is already under immense strain.

Given the economic, health and social impacts, it is vital therefore, to further determine the health risk factors impacting occupants of dilapidated buildings. Anecdotal evidence showed that dilapidated buildings in Durban's inner city acted as hide-outs for criminals. Also, inadequate ventilation, poor sanitation and illegal dumping gave further credence to the term "*problem buildings*". South African cities are challenged by access to decent and healthy housing. Balaban and De Oliveira (2017: 72) emphasised that although housing provides accommodation, the conditions of that accommodation impacts strongly on the health and wellbeing of the occupants.

## 1.3. OVERVIEW OF THE STUDY

This study determined the health risk factors that impacted occupants of a dilapidated building in Durban, South Africa. The health status of the residents was evaluated by an administered questionnaire. An inspection checklist was used to record all the identified health risk factors in each residential unit.

## 1.4. STUDY SETTING

Durban, a city on the east coast of Africa within the eThekwini Metropolitan Municipality, has a population of approximately 3.7 million people (Roberts 2010: 398). Factors that contributed to this population density included abundantly available personal and professional opportunities, and enriched access to workplaces and tertiary institutions. Balaban and De Oliveira (2017: 68) stated that cities have continued to experience the influx of people because of the concentration of economic and social activities and infrastructures in the cities, as well as the pressure and expectation of gainful employment by people from rural areas. The South Beach precinct (also known as the Point) as

depicted by Figure 1.1, was chosen as the study area as it has a high number of buildings fitting the definition of dilapidated buildings as used in this study.


*Figure 1.1. Map showing the Study Area; South Beach (AfriGIS 2018).*

## 1.5. RATIONALE OF THE STUDY

A search of the literature showed that there was minimal research conducted on health risk factors in dilapidated buildings. Steenkamp (2017: 328) Lopez *et al*. (2006: 1756) suggested that further research was needed to improve data on risk factor exposure. The aforementioned investigators further outlined that such research would enhance understanding of the main causes of disease burden in buildings and the comparative importance of control of exposure to individual or multiple environmental, socio-economic and life-style risk factors among building occupants. This study will encourage policy makers to connect public health to the housing sector when undertaking urban planning.

## 1.6. BENEFITS OF THE STUDY

- The study will provide an unconventional tactic in addressing and assessing areas of dilapidation in buildings.
- As there may be no financial means available to local authorities for household surveys and to seek for individual responses in a residential setting, the results of this study, therefore, could assist in developing intervention strategies to alter behaviour that predisposes building occupants to health risks.
- Pioneering policies can be implemented to give greater access to health care and prevention services.
- This study has also anticipated that the methodology could be utilised and or adapted in other cities in South Africa where similar concerns need to be addressed.

## 1.7. AIM OF THE STUDY

The main aim of the study was to determine the health risk factors impacting occupants of a dilapidated building in Durban, South Africa.

## 1.8. OBJECTIVES OF THE STUDY

The objectives of this study were:

- To identify health risk factors in a dilapidated building that may affect the health and well-being of the building occupants.

- To evaluate how the identified health risk factors impact upon the health status of the building occupants.

## 1.9. CONCLUSION

This chapter established and set the scope, context, and significance of this research study by summarising current understanding and background information regarding dilapidated buildings and their effects upon human health. The main purpose of this research study and the research problem is stated in this chapter. The methodology used to examine the research problem and the possible benefits of the study, are emphasised. The ensuing chapter will provide a comprehensive review and analysis of the relevant literature and an explanation of the research already undertaken in relation to dilapidated buildings and health risk factors which impact on occupants living in dilapidated buildings.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1. INTRODUCTION

This chapter provide a framework and context in which the study was set, drawing on historical and existing health outcomes and experiences in dilapidated buildings. The history of global and national approaches to achieving urban regeneration was explored.

## 2.2. THE HISTORY OF DILAPIDATED BUILDINGS PHENOMENON

Archaic literature was deliberately reviewed and referenced in this section for the purpose of gaining an insight to the historical events regarding dilapidated buildings. Research has shown that problems in buildings for residential accommodation was a global phenomenon as a result of tenancy and rentals. For example, more than half the population of many cities in Africa and Asia resided in city buildings, and at least one-third of the urban population, rent accommodation in Latin America (Gilbert and Varley 1991). In South Africa, however, over a million people were living in shacks, hostels or outbuildings in urban areas, occupying 23.8% of all urban households (Angel and Amtapunth (1989).

After 1994, Gilbert *et al.* (1997: 133) noted that a major housing accommodation problem emerged in the cities of South Africa. This was driven by the fact that a significant proportion of the urban household's population began to occupy rental accommodation. Gilbert *et al.* (1997: 449) gave insight that the challenge of urban shelter increased as more people migrated into the cities, unhindered by apartheid restrictions, particularly in the cities of Durban and Johannesburg where the demand for housing grew exponentially. This influx of migrants has excessively stressed the housing sector and resulted in buildings dilapidation.

## 2.3. DEFINITION OF DILAPIDATED BUILDINGS

Literature searches have shown that the term 'dilapidated buildings' was interchangeable with problem buildings, derelict buildings and bad buildings. There is no operational definition for dilapidated buildings. However, eThekwini Municipality Problem Buildings By-Law, (2015: 6) defined problem buildings: as a building or portion of a building which is:

- Is "*Showing signs of becoming unhealthy, unsanitary, unsightly, or objectionable".*
- *Has been abandoned by the owner, or appears to have been abandoned by the owner.*
- *Is overcrowded.*
- *Has been hijacked, has been the subject of one or more written complaints, charges or convictions regarding criminal activities being conducted in the building, as confirmed in writing by a member of the Durban Metropolitan Police or the South African Police Service.*
- *Is illegally occupied.*
- *Has refuse or waste material unlawfully accumulated, dumped, stored or deposited.*
- *Has been unlawfully erected or has a part which has been unlawfully erected, change or usage is unauthorised.*
- *Is partially completed, or is structurally unsound and is or may be a threat or danger to life and property. "*

Sharfstein and Sandel (1998: 6) stated a similar definition by considering a building to be a problem if it lacked complete plumbing or a complete kitchen, had inadequate ventilation, lacked structural design, is poorly maintained as seen in Figure 2.1 (Robinson 2010), and in figure 2.2 (Direct observation in the city of Port Elizabeth, 27 April 2021; 16:30 pm).

*Figure 2.1. Dilapidated building in Cambodia (Robinson, 2010)*

*Figure 2.2. Building dilapidation in the city of Port Elizabeth (Direct observation, 27 April 2021; 16:30 pm).*

In contrast, Ziersch *et al.* (2017: 2) explained the importance buildings in influencing health by defining the term “housing” as a protection from cold, damp, heat, rain, wind structural hazards, disease vector and other health threats. Colton *et al.* (2015: 2482) agreed that universally, housing was the second most important need of man after food, noting that housing transcends shelter and includes the entire environment and infrastructure that nurtures human comfort, improves human health and wellbeing.

## 2.4. DILAPIDATED BUILDINGS AS A GLOBAL PHENOMENON

Dilapidated buildings in cities is a global phenomenon and has been the subject of growing interest by the media, from urban researchers and increasingly, from policy makers (Fernandez *et al.* 2012). Bethlehem (2013: 69) also acknowledged that many cities, even in developed countries, faced a steady decline in their inner cities which was further exacerbated by dilapidated buildings. Audirac (2018: 12) indicated that In America, dilapidated buildings were one the causes of shrinking cities, thereby causing distress to these cities. Alexandrova, Hamilton and Kuznetsova (2004: 115) acknowledged that in the city of Tomsk in Russia, citizens who lived in undesirable and poor quality housing conditions which were most likely to become slums, had limited access to jobs. In Malaysia (Kayan 2006: 41), many old buildings experienced problems including unsightly building appearance and aesthetics; and sub-standard building materials and building character, which greatly affected their overall condition. Furthermore, there was a fear that cultural significance and heritage values would be lost if these problems were continuously ignored.

Hong Kong, a highly developed and densely populated town, had many old buildings that lacked support, according to Chan and Choi (2015: 97). However, to maintain these buildings and promote building health, the *"Mandatory Building Inspection Scheme"* (MBIS) was adopted as an approach to addressing building dilapidation. The main purpose of the MBIS ensured that owners took responsibility for regularly inspecting and repairing their own buildings and resolving any maintenance problems.

## 2.5. LEGISLATIVE IMPLICATIONS REGARDING CAUSATION OF DILAPIDATED BUILDINGS

In the South African context (South Africa 2008), the National Building Regulations and Building Standards Act (No. 103 of 1977) stipulate the basis of how buildings in South Africa should be built and developed for human occupancy. Initially, this law was not enforced. Although the aforementioned law went into effect in September 1985, the phenomenon of building dilapidation persisted due to the law's shortcomings. The regulation only specifies how buildings should be constructed and does not specify how they should be maintained or used (Drukis, Gailea and Pakrastinsa 2017: 247). For example, figure 2.3 show some of the buildings that lacked maintenance in the city of Durban (Direct observation, 03 February 2021, 15:00 pm)

*Figure 2.3. Some of the buildings lacking maintenance in the city of Durban (Direct observation, 03 February 2021, 15:00 pm).*

## 2.6. THE MAIN CAUSES OF DILAPIDATED BUILDINGS IN SOUTH AFRICA

*Table 2.1. Main causes of dilapidated buildings in South Africa.*

| Cause | Explanation |
|---|---|
| **Apartheid Legacy** | In South Africa, apartheid resulted in separate development which led to fragmented development and building maintenance programmes within the municipal demarcation and left many South African cities dysfunctional (Maharaj 2020: 39). Most of the areas were characterised by a deliberate differentiation according to poverty level, race, class, social and perpetuating segregation and inequity (Pillay 2011: 3). |
| **Democracy** | By the mid-1980s, the Group Areas Act, which restricted black people to outlying areas, became unworkable and the Influx Control Act, which sought to prevent black urbanization, became impractical (Bethlehem 2013: 1). As a result, a large and dynamic population arrived in towns looking for accommodation, opportunities and well-located housing. Several building managers were unable to deal with this, and several management systems broke down (Bethlehem 2013: 1). Pillay (2011: 5234) offers an insight into Bertrams in the city of Johannesburg. This suburb was a residential area of the White working class during the apartheid era. It has since developed into an indigent neighbourhood, evidenced by dilapidated buildings, drug abuse and violence. |

| | |
|---|---|
| **Unlawful Ownership of the buildings** | Strydom and Viljoen (2014: 1210) noted that dilapidated buildings resulted when many private owners left their inner-city buildings vacant. At the same time, thousands of desperately poor households struggled to find affordable accommodation in the centres of towns near their workplaces. This led to building invasions, illegal occupation and unlawful ownership. The authors further indicated that these new owners had no future plans for the buildings such as redevelopment of the premises and investment backup plans for building maintenance. |
| **Globalisation** | Globalisation is pulling culture, power and resources away from local bodies and authorities to international bodies (Smith 2013: 3). In this way, the different building systems could be regulated and monitored by international bodies that have less interest in the country's security and health. Popke and Ballard (2004: 99) claimed that increasing globalisation also contributed to the influx of people into the cities. The eThekwini Inner City Local Area Plan (2016: 38) suggests that the essence of urban economies has changed in the past, and further describes that the inner-city precincts have historically been characterised by large corporate centres that had many high-rise offices. Globalisation and technological changes have forced them out of towns. Consequently, this has had a great impact on the way business is done and the management of buildings in the city because several of these large companies have been downsized or relocated. |
| **Black Economic Empowerment** | "Black Economic Empowerment" (BEE) is one of the major policies of the South Africa democratic government in promoting and creating business ownership opportunities to those were previously disadvantaged and excluded (Ponte, Roberts and Van Sittert 2007: 933). Many initiatives were undertaken in promoting BEE. Some included Sectional Title building ownership that allowed black people to own buildings. This meant that buildings formerly owned by wealthy, large firms, or government bodies were now available for ownership by small enterprises and previously disadvantaged black people. Alexandrova, Hamilton and Kuznetsova (2004: 122) observed that housing owned by wealthy and big corporates body is likely to remain in relatively good condition |
| **Human behaviour and scanty service delivery** | Poor housing conditions can be worsened by population explosion, insufficient waste management, and inadequate layout of buildings that created unconducive environments (Kenneth, Faith and Nkechi 2019: 109). |

## 2.7. STRATEGIES ATTEMPTED TO ADDRESS THE ISSUE OF DILAPIDATED BUILDINGS

### 2.7.1. GLOBAL

#### a. Enforcement of Laws and Regulations

The Latvian Parliament has laid down the obligation of the owner of the building to ensure that the building and its components are properly maintained during operation (Republic of Vietnam. Construction Law 2014). Outlined responsibilities and requirements are identical to the basic requirements laid down at the European Union. These include stability, fire safety, hygiene, health and the environment, safety and accessibility, acoustic properties, mechanical resistance, energy saving and thermal retention (European Union 2011: 5).

**Projects / Programmes**

In Malaysia, building maintenance has been adopted as a key approach within the built environment. Government further defines building maintenance as the key factor for building conservation. Obia (2016: 39) outlined that effective building conservation approaches are also essential for ensuring continuous building protection.

#### b. Sustainable Construction of Buildings

In the United Kingdom (UK), Sustainable Construction was the adopted strategy by the government as a policy to improve construction industry performance of the UK (Stewart 2017). Kauskale *et al.* (2017: 211) referred to Sustainable Construction as a construction intended to consider the health, comfort and safety aspect in the building for the residents of this building during its life cycle. Latvia and Europe have passed the Construction Law of Latvia (2014) in ensuring building health. The aim was to create a quality living environment by establishing an effective regulation of the building construction processes.

### 2.7.2. NATIONAL

#### a. Enforcement of Laws and Regulations

In the context of South Africa, National Building Regulations and Building Standard Act, 1977 (Law No. 103 of 1977) stresses the importance of ensuring that every building is maintained in the safe and sound functional conditions or facility provided in or connected with such building. It also requires the owner or any person designated by that owner to control that building and to ensure that any provision or installation in the building shall be kept in operation in such a way as to meet any performance standard specified in the regulations.

#### b. Projects / Programmes

Apartheid restrictions and delineations caused many people to live in peripheral areas of the city, contending with inadequate or poor housing conditions. In the spatial post-apartheid regime, people fled into cities with the hope of better living conditions. Many cities like Johannesburg were not coping with overcrowding in the city buildings and needed intervention strategies that would meet both the essential basic needs of the people especially the disadvantaged, while simultaneously addressing urban degeneration. Charlton (2014: 177) described Housing Ownership Assistance (HOA) as one of the key approaches introduced through low-income housing projects to reduce the need for the people to have a desire to migrate into the city.

Charlton (2014: 177) further detailed that the HOA project was a state-funded project financed through a national government capital grant and which subsidised infrastructure at a local government level. This project aimed to serve the neediest persons as defined in terms of income, as well as people with insufficient shelter and who had never possessed property previously. The HOA focused on the more indigent population on the outskirts of the city and provided individual housing for ownership, but also provided low numbers of rented housing, known as social or institutional housing.

### 2.7.3. LOCAL

#### a. Enforcement of Laws and Regulations

EThekwini Municipality published the eThekwini Municipality Problem Buildings By-law in 2015, which provides for the monitoring and restoration of dilapidated buildings. The by-law law incurs offences and penalties for building owners who do not comply with the legal requirements of managing their buildings.

#### b. Projects / Programmes

The official website of the eThekwini Municipality explained the Inner City Thekwini Regeneration and Urban Management Programme (iTrump) as a “programme that was established as a response to the urgent need to prioritise the regeneration of the inner city”. It places the strategic value of the inner city at the core of its business and seeks to maximize its multiple opportunities. The team manages a range of planning, operational and maintenance issues related to the inner city. These also include addressing problem buildings challenges experienced in the city through identification, inspection, profiling and enforcement actions. The programme has strengthened synergies amongst the range of stakeholders which include government, civil society and business.

## 2.8. LIVING CONDITIONS IN DILAPIDATED BUILDINGS AND BUILDINGS AS A HEALTH DETERMINANT

In Johannesburg, many dilapidated buildings resulted in hijacked buildings, and slum-lords who still exercise their trade, especially in Hillbrow, Berea and Bertrams (Bethlehem 2013:1). The unsatisfactory living conditions in these buildings negatively impacted on the health of the occupants. Health is defined by the World Health Organization (1948 cited by Callahan 1973: 77) as a “state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity”. Krieger and Higgins (2002: 758) added that housing was an important determinant of health, and poor housing was a major public health issue for residents. Kenneth, Faith and Nkechi (2019: 109) described unpleasant conditions existing in dilapidated

buildings that included poor waste disposal and management, lack of good water supply, poor installations, and overcrowding. For instance, figure 2.4 show conditions inside dilapidated building in city of Port Elizabeth (Direct observation, 27 April 2021; 15:40 pm).

*Figure 2.4. Conditions inside dilapidated building in the city of Port Elizabeth (Direct observation, 27 April 2021; 15:40 pm).*

According to Olalekan (2014: 14), the majority of dilapidated buildings in cities lacked supervision resulting in building collapses in most cities, as well as rapid dilapidation of buildings. Building collapses could be attributed to a lack of sufficient quality building materials as noted by Kenneth, Faith and Nkechi (2019: 109). Insufficiency in terms of building materials can lead to compromising alternatives, for example, in some buildings people used mainly boards instead of bricks and other non-standardised materials, especially for illegal partitioning (Major 2013 cited in Kenneth, Faith and Nkechi (2019: 109). This contributed significantly in generating building defects which included cracks, dampness and overall building dilapidation. Shittu *et al.* (2013: 33) studied common defects in buildings in Nigeria and found that 39% defects were of cracking, 29% accounted for dilapidation, 17% for dampness and 15% were roof defects. On the other hand, health and safety in buildings has also been a neglected function for some time. However, it is now becoming an important issue for authorities, especially after many such buildings have caught fire, and collapsed worldwide,

resulting in fatalities (Drukis, Gailea and Pakrastinsa 2017: 247). For instance, several people reported dead from fire in a dilapidated building in city of Johannesburg (Sunday times, 05 July 2017), as per figure 2.5.

*Figure 2.5. Dilapidated building caught fire in the city of Johannesburg (Sunday times, 05 July 2017).*

## 2.9. HEALTH RISK FACTORS IN DILAPIDATED BUILDINGS AND ITS IMPACT UPON THE HEALTH STATUS OF THE RESIDENTS

Buildings are essential determinants of health and reflect the social status and the psychological welfare of the residents (Yusuf 2012: 33). Kenneth, Faith and Nkechi (2019: 105) perceives buildings as a unit of the environment with a profound association with the health, social behaviour, comfort and general well-being of the occupants. The majority of people spend about 80–90% of their lives inside buildings (Drukis, Gailea and Pakrastinsa 2017: 251). Zhang, Mo, and Weschler (2013: 751) outlines some of the health risk factors affecting occupants residing in dilapidated buildings. Poor housing conditions create a conduit for diseases to multiply and be transferred (Kenneth, Faith and Nkechi 2019: 115). These substandard conditions included poor indoor air quality, violence and crime, poor sanitation, poor waste

management, hazardous electrical installations and overcrowding. These conditions are further explained individually as:

### 2.9.1. Poor Indoor Air Quality

Zhang, Mo and Weschler (2013:751) considered poor indoor air quality as a main health risk factor in dilapidated buildings with emissions from indoor sources like building materials, furnishings, unvented combustion, paint, floor and wall coverings. Indoor air pollution can be further aggravated by emissions from outdoor sources like motor vehicles, fugitive emissions, unvented combustion, metallurgy and biomass burning. Poor indoor air quality caused 4.3 million deaths globally in 2012 (WHO 2012: 30). The statistics further showed that women and children were at high risk of disease caused by exposure to indoor air pollution in buildings and accounted for 60% of all of such deaths. Vandentorren *et al.* (2006: 584) examined the housing conditions of elderly people living at home in France to determine the risk factors for death. One of the main risk factors was the date of construction, as buildings built before 1975 had a greater risk of causing death.

### 2.9.2. Violence and Crime

Poor economics and an unstable political environment has been a major factor that has led to the increase in the inflow of migrants into South Africa (Naidoo and Tewari 2017: 56). This has often placed intense pressure on public resources like buildings for accommodation and has led to tensions and violence in those spaces. As often seen in daily broadcasts and anecdotal news, criminal activities have become more frightening in the world and are a major source of social concern today. A study on Spatial Pattern of Crime in Nigerian City, presented the rate of occurrence of criminal activities in the city from the perception of the residents (Badiora and Afon, 2013: 23).

Criminal activities perceived to have a higher rate of occurrence included store breaking, house breaking, stealing and pilfering, breach of public peace, child abuse, sexual harassment, child abandonment, attempted rape, pick pocketing, impersonation, vehicle hijacking, robbery, prostitution robbery and receiving stolen properties. The study concluded that prevalent crime differs significantly in its rate of occurrence in different residential zones as reflected by the socio-economic

characteristics of the residents. Badiora and Afon (2013: 16) have reported that high rates of crime persist in urban slum areas, and that there was a direct relationship between urban slum and criminal activities.

Figure 2.6. below identifies a dilapidated abandoned building in city of Durban which is alleged to be used as a drug den, and which promotes violence and crime (KwaZulu-Natal Daily news 2019). The literature informs that delinquency and criminal activities will continue to increase as a geographical area continues to decay and degenerate.

*Figure 2.6. Dilapidated abandoned building in the city of Durban used as drug dens, supporting violence and crime (KwaZulu-Natal Daily News 2019).*

Internationally, vacant and abandoned buildings have adversely impacted the health and wellbeing of the residents in the cities (United States Government Accountability Office report (2012: 12). The report further outlines that abandoned properties have increased by 51 percent in the United States of America (USA), from nearly 7 million in 2000 to 10 million in April 2010. Research conducted in Philadelphia has found a link between the presence of vacant neighborhood properties and a greater risk of neighborhood attacks and crime (Garvin, Cannuscio and Branas, 2012: 198).

It was also found that vacant lots were often unkempt and overrun by unwelcome vegetation and waste, making them attractive places for hiding illegal weapons, for

conducting illegal activity like drug sales and for prostitution, and for engaging in violent crimes. Kondo *et al.* (2015: 2) also noted the associations between abandoned buildings with drug dependence, mortality, increased rates of sexually transmitted diseases, and premature mortality. Furthermore, numerous abandoned and dilapidated buildings have many negative effects on the well-being, physical and mental health of the community (Garvin *et al.* 2013, 412). The dilapidated and abandoned properties reduce the cohesion of the community, encourage a build-up of refuse, rodents and crime, and increase fear, stress and anxiety according to these residents.

### 2.9.3. Poor Sanitation and Poor Water Suppliers

Owoeye and Adedeji (2013: 101) proclaimed that liquid waste was poorly managed in Akure, Nigeria. Wastewater from bathrooms, laundries and kitchens was not properly disposed of, and constituted foul smelling water which encouraged the breeding of mosquitoes. The study also showed that 14.3% of households obtained water through irregular pipe borne water supply. Furthermore, that type of water connection does not guarantee potability of water as contaminated pipes/tools may be used. As a result, people may be more susceptible to contracting serious water borne diseases, which constitutes danger of outbreak of communicable diseases like diarrheal illnesses.

In terms of a statement made by WHO (2017:30), diarrheal infection was spread through contaminated food or drinking-water or from person to person as a result of poor hygiene and poor living conditions. Diarrheal disease is the second leading cause of death for children under the age of five and kills approximately 525,000 children annually.

Christopher and Murray (2013:592) noted that it was necessary to identify risk factors like sanitation and water supplies as presenting the greatest danger to health in order to achieve good public health outcomes.

### 2.9.4. Poor Waste Management

In general, good quality housing is achievable if there are adequate waste management facilities. A study conducted by Kenneth, Faith and Nkechi (2019: 113) on housing conditions in Abuja, Nigeria, revealed that poor and improper waste management was observed to be among the major effects of poor housing conditions. An analysis of the study found that 42% of the main causative factors attributed to poor housing was poor and inadequate waste management. The management and disposal of waste in dilapidated buildings is generally unacceptable, according to Owoeye and Adedeji (2013:101). This stems from the public's approach to indiscriminate dumping of waste and the delay of disposal by the waste management authorities. Moreover, the study shows that over 30% of the participants in the study dispose of their waste in a hazardous fashion, while 11.7% of the participants burns waste in the residential environment, thereby causing pollution. These practices further involved 21.3% of the participants disposing of their waste in open dumping and 17% irresponsibly disposing of waste in drainage systems. These measures were a breeding ground for rodents, flies, mosquitoes, snakes, as well as an obstacle to the free flow of water run-off.

### 2.9.5. Hazardous Electrical Installations

In many instances, illegal electrical connections existed in dilapidated buildings, and often there was no electricity at all. Kenneth, Faith and Nkechi (2019: 113) revealed that 21.7% of the respondents were of the view that there is barely a power supply the duration of which is very short before a disconnection is carried out. Of the respondents, 26.8% pronounced that there is no power supply in their buildings.

### 2.9.6. Overcrowding

Aliyu and Amadu (2017: 149) identified overcrowding as a contributing cause to poor housing condition, further explaining that overcrowding in buildings is a result of the influx of people into a place or region, due to either the push factors which propel them from their places of origin (such as war, unfavorable climate, famine and unfavorable government policies) or the pull factors which attract people to the destination region (such as social and basic amenities). Kenneth, Faith and Nkechi (2019: 114)

determined that 98.8% of the respondents in the study were of the view that pressure arising from an increase in population resulted in poor housing conditions in the study area. Kenneth, Faith and Nkechi (2019: 113) revealed that this could be caused by over occupancy of rooms. An analysis conducted on the average number of persons per room is shown in the Table 2.3:

*Table 2.3. Average Number of Persons per Room (Kenneth, Faith and Nkechi 2019: 113).*

| Average number of persons per room | Frequency | Percentage (%) |
|---|---|---|
| 1 - 3 | 68 | 17.8 |
| 4 - 5 | 127 | 33.2 |
| 6 - 10 | 182 | 47.6 |
| 11 - above | 5 | 1.4 |
| **Total** | **382** | **100** |

The analysis shows that the average number of persons living in a room was between six and ten. Similar findings were also revealed in a study conducted by Owoeye and Adedeji (2013: 100) that the average family size of the study area fell in the region of five to six per unit. Major (2013 cited in Kenneth, Faith and Nkechi (2019: 113) disclosed that the increase in occupancy of the units was mainly caused by the act in which tenants lease out spaces in their units in exchange for money in the form of rent. Owoeye and Adedeji (2013: 100) discovered some of the elements exacerbating room occupancy increase, for example, 57.2% of persons lived with family, 17.8% preferred to live in low rental rates areas compared with other parts of the city, and 25.2% lived in the area in order to reduce transport costs because of proximity to work places.

The increase in occupancy may lead to exploitation and degradation of buildings, which impacts on human health. Lucas (2011) also emphasised the detrimental health consequences of poor building overcrowding, including the outbreak of diseases, and the lack of comfort. For example, the overcrowding in slum buildings may increase the development and spread of Tuberculosis (TB). According to the World Health Organization (2018: 30), TB is one of the ten leading causes of death in the world. Further outlined that, 10.4 million cases of TB in 2016 and 1.7 million people worldwide

died from the disease. TB is becoming a growing public health concern in low and middle income countries. For example, Padayatchi *et al.* (2019: 1) affirmed that India and South Africa rank among the top ten high TB burdened countries with the highest rate of TB incidence.

Padayatchi *et al.* (2019: 5) agreed that South Africa has indeed made significant strides with TB control programmes. However, the country is failing to appropriately prevent and manage TB development. Padayatchi *et al.* (2019: 5) further endorsed that monitoring must go beyond the traditional measures of success such as effective treatment, and assures that much can be done to accelerate the decline of TB. In this perspective, conditions in dilapidated buildings could be vital risk factors in development of TB.

## 2.10. CONCLUSION

According to Greenburg and Polzer (2008: 2), dilapidated buildings caused many problems that were associated with economic depression, social conflicts, poor living conditions and inefficient use of property. The authors also pointed to the fact that providing access to healthy and dignified housing is a major critical policy challenge for all urban residents in South Africa.

It is clear that buildings impacted strongly on health and livelihood and therefore, this information cannot be an overlooked. There is growing evidence that housing quality is associated with infectious/ communications disease morbidity, chronic disease, injury and crime (Krieger and Higgins 2002:758). Conditions like overcrowding and poor sanitation have exacerbated the prevalence of communicable diseases such as Tuberculosis (TB) and diarrheal illnesses. The next chapter discusses the methodology for this study. Study design, demographic study, sample size selection, inclusion and exclusion criteria, data collection techniques, data validity and data reliability, data analysis and ethical considerations will be the focus of the following chapter.

# CHAPTER 3

# METHODOLOGY

## 3.1. INTRODUCTION

This chapter outlines the methodology used in determining the health risk factors impacting occupants of a dilapidated building in Durban, South Africa. The chapter focuses on the study design, study population, a sample size selection, inclusion and exclusion criterion, data collection methods, validity and reliability of the data, data analysis and ethical considerations.

## 3.2. STUDY DESIGN

A quantitative cross sectional study design was used for this study as it allowed for a large population (occupants of a dilapidated building in Durban, South Africa) to be studied at a specific point in time (dilapidated building).

## 3.3. STUDY POPULATION

In order to conduct this research study among occupants of a dilapidated building, a dilapidated building was selected purposely in South Beach, Durban. This is a residential building that satisfies the description of the term 'dilapidated building'. The "Inner City Thekwini Program for Regeneration and Urban Management (iTrump)" also described it as a "problem building."

The total resident population and layout of the building is outlined in Table 3.1 below;

*Table 3.1. Study Population.*

| **Total No. of floors** | **Total No. of Units in the building** | **Total No. of units per floor** |
|---|---|---|
| 10 | 140 | 14 |
| **No. of building occupants** | **No. of occupants on each floor** | **No. of occupants in each unit** |
| 600 | 60 | Varies |

### 3.4. SAMPLE SIZE

A representative sample size of 103 units of a total population of 140 units was obtained. Targeted for participation in the analysis, was the head of each household or his / her representative from all 103 units.

### 3.5. SELECTION OF UNITS

Random sampling approach was used in the selection of units, as it was fair and provided equal opportunities for study participants. The maximum sample size was 140 heads of each household. If the head of the households or his/her proxy of the unit was unwilling to take part in the research, the researcher moved to the next unit until the required sample size was reached.

### 3.6. INCLUSION CRITERIA

The occupants who served as the representative sample of the entire building were restricted to the occupants who were:

- Head of each household or his/her proxy.
- Head of the household or his/her proxy who was resident for a period of >6 months.

### 3.7. EXCLUSION CRITERIA

- The sample size of the study excluded all the Head of household or his/her proxy who were resident for a period of <6 months because of the probability of limited experiences regarding building conditions, and may have had only a short period of exposure to health risk factors in the building.
- People who were visitors in the building were excluded as they are normally present in the building for a short period of time and may therefore lack experiences of living in this particular building.

## 3.8. DATA COLLECTION

The main purpose of the study was to determine the health risk factors impacting occupants of a dilapidated building in Durban. The research instrument used to collect primary data was a questionnaire and an inspection check sheet. Given that there were numerous South African nationals and immigrants residing in the study building, it would be impractical to translate the study instruments into every language. Therefore, the study instruments were only administered in English.

Data was collected during the day and in the evening in order to accommodate participant working hours. The head of each household or his/her proxy in the unit meeting inclusion criteria, was requested to participate in the study. The questionnaire was administered to the participants and inspection of units was undertaken after the researcher ensured that all ethical considerations were adhered to. If it was not a convenient time for a respondent to participate, an appointment was re-scheduled. Prior to the commencement of the study, all study instruments were piloted. This is further explained in 3.9 below.

### 3.8.1. Questionnaire

The health status and living conditions of the occupants of a dilapidated building were assessed by means of a questionnaire (Appendix 8) which was administered to the head of each household or his/her proxy in the unit and who met inclusion criteria and consented to participate in the study. The questionnaire focussed on health symptoms experienced, the frequency of health outcomes and the overall assessment of their experiences in the building. The questionnaire was designed to capture individual health symptoms and overall experiences in the unit. The questionnaire was adapted from similar research study undertaken by Vandentorren *et al*. (2006) in France. The permission to adapt and otherwise modify the questionnaire according to the South African context and the study context was requested by the researcher and permission was granted to do so by Professor Stephanie Vandentorren.

The main purpose of the questionnaire was explained to the respondents, as well as what was expected of them. The questionnaire was administered by the researcher who read out the questions and response options available, and completed the

questionnaire as per respondents' response. The questionnaire comprised of 58 questions, categorised into sections (Section A – G) as briefly described in the Table 3.2. below. The questions were designed to assess health status and living experiences of occupants in the building.

*Table 3.2. Sections of the questionnaire survey.*

| Section | Description |
|---|---|
| A: Demographics | Acquire demographic information such as gender, age, area, level of education. number of individuals living in one unit. |
| B: Description of the Unit | Looking for an understanding of the layout and physical conditions of the unit. |
| C: Sanitation Services | Assessing the adequacy of provision of sanitation services in the unit. |
| D: Electrical Installation | Assessing the safety of the residents from electrical installations. |
| E: Waste Management | Assessing the waste management practices in the building. |
| F: Activities in the Building | Identifying nuisance / illegal activities taking place in the building. |
| G: General State and Health | Evaluating the health status and experienced health symptoms of residents. |
| H: General | Any concerns from residents with regard to the study. |

### 3.8.2. Inspection Survey

An inspection walkthrough survey was undertaken in each of the units of the study participants. The main purpose of the unit inspection survey was to observe and identify health risk factors in the building that may affect the health and well-being of the residents. An inspection check sheet (Appendix 9) was used as a tool for collecting data about health risk factors impacting residents in the building. A check sheet has been selected as a tool because it organises facts in such a way that useful data on a potential problem is effectively collected. In order to avoid the collection of wrong data, insufficient data, or irrelevant data, the investigator also needed to establish the limits of the collection effort.

The inspection check sheet was adapted from the check sheet for accommodation inspection establishments as used by the eThekwini Municipality, City Health Department in the Environmental Health Services. All the units chosen for the

inspection were only inspected at a convenient time for the participant. If the scheduled time was not convenient for a participant to allow the researcher to undertake an inspection, then an appointment was re-scheduled.

## 3.9. PILOTING OF THE STUDY INSTRUMENTS

All the study instruments were piloted at one of the dilapidated buildings within the study area. The building comprised of 120 units with 450 residents. The main purpose of conducting the pilot study was to test all the study instruments for language usage and comprehension before the implementation of the actual study.

Five units were randomly selected in the building for piloting the study instruments. The head or proxy in the unit of each household was invited to take part in the pilot study. The study instruments were piloted upon receipt of the signed informed consent form. After administering all study tools, a one-on-one discussion was held with the participant to discuss any challenges faced during the process. Any suggested changes were implemented to ensure that study tools were meaningful, user friendly and suitable to the target group in the actual study.

## 3.10. VALIDITY AND RELIABILITY

The study instruments were piloted prior to study commencement. Any changes resulting from the pilot study were implemented for use in the actual study. The researcher administered the questionnaire and undertook inspection of the units. Face validity, Content validity and Criterion validity were maintained in data collection tools as follows:

### 3.10.1. Face Validity

The questionnaire was meant to measure health status and living experiences of residents living in a dilapidated building. For the piloting stage, participants were selected from a dilapidated building to respond to a questionnaire. After completion of the questionnaire, participants were asked the following questions: (1) what they thought the purpose of the questionnaire was, (2), what they believed was being measured and (3) whether or not they felt that the questionnaire was an adequate measure of their health status and living experiences. The information gained from the

piloting stage was then used to re-assess and correct the questionnaire used in the actual study.

### 3.10.2. Content Validity and Criterion Validity

Content validity and Criterion validity were tested in the measurement tools (questionnaire and inspection check sheet). The tools were presented and circulated among a panel of experts and officials from the Inner Thekwini Regeneration and Urban Management Programme: Better Buildings Committee, which consists of the city Manager, Health Department, Safer Cities, Durban Metro Electricity, Fire Department, Human Settlements, Development and Planning, Metro Water, Metro Police Services, Housing and Legal Services. These entities looked at and rated elements and variables within these study tools for relevance and representativeness. Input was made about the usefulness of the questions, the checklist and its relevance to measuring the construct under study. Based on their input, the two data collection tools were revised accordingly in order to improve Content and Criterion validity.

## 3.11. DATA ANALYSIS

Data collected was coded and entered in an Excel table according to numerical responses from the questionnaire. The data was cleaned in order to correct any errors prior to analysis. The Social Sciences Statistical Package (SPSS Version 26.0 IBM) was utilised to analyse data and perform descriptive statistics and inferential statistics. The aim was to describe the data and to analyse the distribution of scores across each variable to ascertain and whether the scores for various variables are mutually-related.

## 3.12. ETHICAL CONSIDERATIONS

***Permissions:*** A Gatekeepers' letter sought from the Inner-City eThekwini Regeneration and Urban Management Programme (iTrump) for approval to conduct this research within the eThekwini Municipality (Appendix 1). Permission to conduct the study in the study area was sought from the Ward Councillor (Appendix 2). Additionally, permission for conducting pilot study and actual study was also requested from the building owners or alternatively, the Body Corporate, or building management (Appendix 3 and 4). Ethical Clearance was sought from the respective faculty and

institutional research committees at the Durban University of Technology (Appendix 5).

***Consent:*** A letter of information (Appendix 6) was handed and explained to each participant. After reading the letter and being given an opportunity to ask any questions, respondents were issued with a consent form (Appendix 7) without any form of coercion. This means they were well informed about what participation entailed and were re-assured that declining to participate would not affect any service(s) they received. At the onset of this study, the investigator ensured that all the participants were aware of their right to withdraw from the research at any time, without giving reasons for their withdrawal. The participant may withdraw any consent and is entitled to request his or her own data, including requesting the questionnaire or recordings to be destroyed. Completion of questionnaires and allowing unit inspection was conducted on a completely voluntary basis.

***Confidentiality of results and follow up:*** This research involved two types of data collection methods (as described earlier, namely, questionnaire administration and the inspection checklist). In all cases, confidentiality was maintained. The questionnaires and checklists were stored in confidential files until the completion of the study and will then be destroyed after a period of five years.

## 3.13. CONCLUSION

This chapter discussed the research approach and defined the research design, population, sample size, data analysis, data collection instrument and ethical considerations. The following chapter (Chapter 4) will present the findings of the research and analyse the results

# CHAPTER 4

# RESULTS

## 4.1. INTRODUCTION

The results of the study are presented in this chapter. The primary tool used to collect data involved direct observations and a questionnaire. The questionnaire was distributed to 103 heads of the selected households (HOHs) for a total population of 140 units. A total of 103 questionnaires were administered and all had a response rate of 100%. The response rate was satisfactory as the researcher managed the administration of the questionnaire, affording the participants the opportunity to schedule participation at their convenience.

The data was analysed and a descriptive, inferential statistical analysis was carried out using the Social Sciences Statistical Package (SSSP Version 26.0 IBM). A chi-squared test of goodness of fit determined whether the score patterns for the statement were significantly different per option for a single variable analysis. The null hypothesis claimed that similar numbers of respondents scored across each option for each statement (one statement at a time), while the alternate hypothesis stated there was a significant difference between the options. The significant values; *p*-values less than 0.05 level of significance, implied that the distributions were not similar; indicating that the differences between the way respondents scored were significant.

Inferential statistics have been carried out to the determination of the association between variables. The level of significance in relation to the null hypothesis was determined by performing Pearson's independence chi-squared test. The null hypothesis claimed that the two observed variables (health risk and health symptoms) were not related, while alternative assumptions were believed to be true if the null hypothesis was found to be false. After a square test was conducted, the association strength was established with respect to the null hypothesis by the Phi coefficient and Cramer's V correlation test.

## 4.2. PRESENTATION OF RESULTS

The results presented in three main separate sections as Section A: Questionnaire Survey, Section B: Inspection Survey and Section C: Inferential analysis. The questionnaire survey will present findings on the questionnaire responses from the Head of households, while the inspection survey will present findings of direct observation during an inspection survey in the units. Inferential analysis determines strength and associations between variables. In both descriptive and inferential statistical analysis, results are presented in the form of graphs, cross tabulations and tables. The research instrument consisted of 143 items, which were divided into seven sections that measured various themes, namely, Biographical data, Description of the Unit, Sanitation Services, Electrical Installation, Waste Management, Activities in the Building and General State and Health.

### SECTION A: QUESTIONNAIRE SURVEY

### DEMOGRAPHIC AND BIOGRAPHICAL DATA

A survey questionnaire was administered to the heads of each household (n=103) or his / her representative in a unit who met the inclusion criteria (resided for a period of > 6 months) and who agreed to participate in the study. The main objective of the survey was to assess the health status and living conditions of the occupants of a dilapidated building. The questionnaire focused on the health symptoms experienced by the occupants of a dilapidated building, the frequency of health outcomes and the overall assessment of their experience in the building. The demographic characteristics of the respondents are summarised in this section

## 1.1. Gender and Age

*Table 4.1. Gender and Age.*

| Age (Years) | Gender | | | | % of Total |
|---|---|---|---|---|---|
| | Male | | Female | | |
| | Frequency | % | Frequency | % | |
| 18 -25 | 10 | 17 | 19 | 38.8 | 27.5 |
| 26 -35 | 11 | 20.8 | 11 | 22.4 | 21.6 |
| 36 - 45 | 11 | 20.8 | 14 | 28.6 | 25.5 |
| 46 - 55 | 8 | 15.1 | 2 | 4.1 | 9.8 |
| 56 - 65 | 7 | 13.2 | 0 | 0 | 6.9 |
| >65 | 7 | 13.2 | 3 | 6.1 | 9.8 |
| **Total** | 54 | 100 | 49 | 100 | 100 |
| **n=103** | | | | | |

Overall, the ratio of males to females was approximately 1:1 (52%: 48%) ($p$=0.622). Thus, it implies that similar numbers of respondents have scored across each option: males and females. There was a statistically significant difference in age distributions ($p$<0.001). The majority of respondents were between the ages of 18 and 45, both male and female. This accounted for 73% of the total sample group. There were significantly more females than males in this category, whereas in age categories 46 and above, there were more males (81%) than females.

## 1.2. Ethnicity

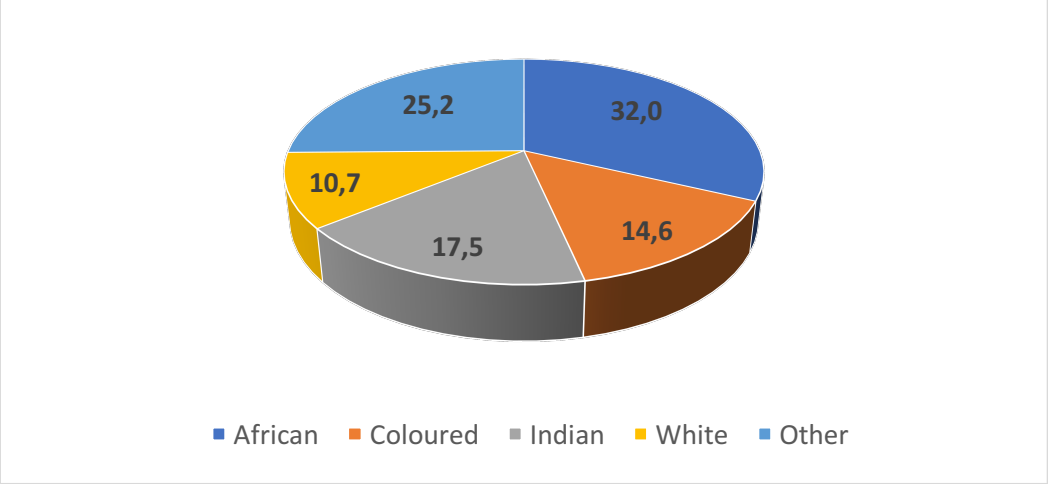

*Figure 4.1. Ethnic grouping of respondents.*

The sample was not similar in composition ($p$=0.004). About one third (32%) of respondents were Africans. Each of the other three South African race groups was distributed equally at about a quarter: Coloured (15 %), Indian (18%), White (11%). A quarter of respondents were not in one of the four categories of South African race (25%).

### 1.3. Occupation

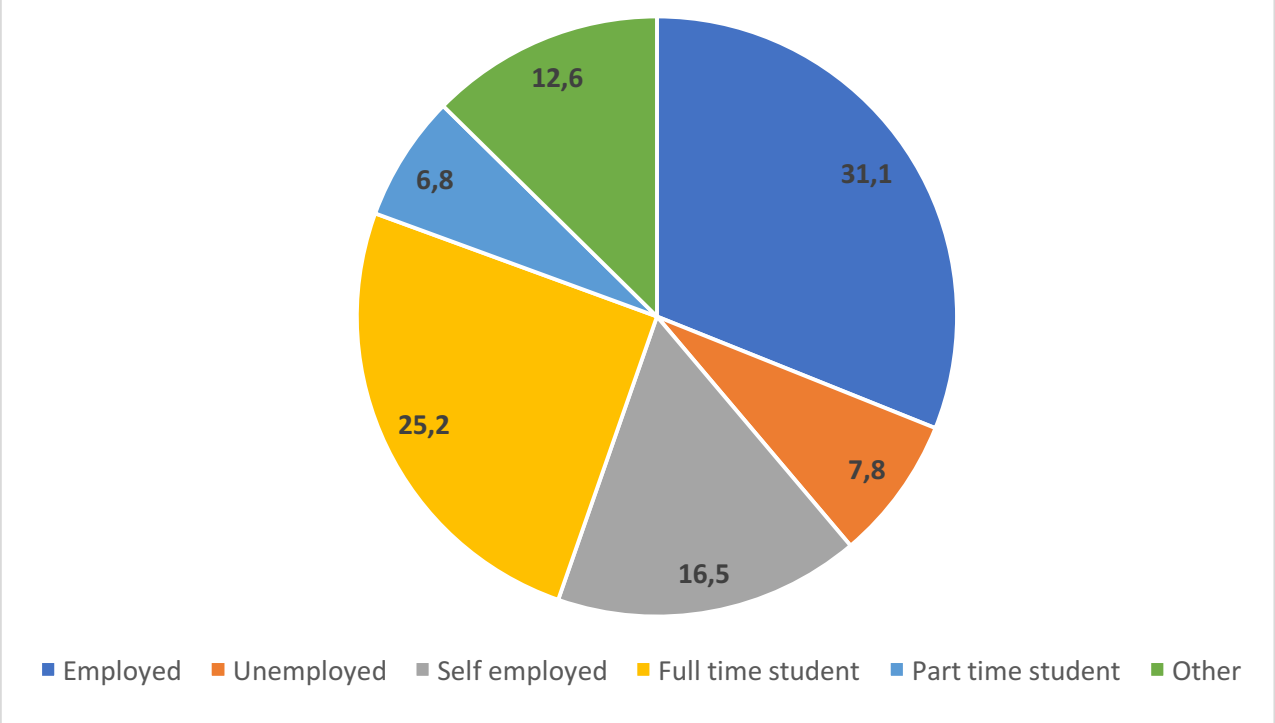


*Figure 4.2. Occupation status of the respondents.*

The occupation of the respondents determines the income level of the respondent. In light of this, interviewees were asked to state their employment status. The Heads of households had different occupations ($p$<0.001). Some were employed (31.1 %), fewer were autonomous (16.5%), students accounted for (32%), while those unemployed comprised 7.8%.

## 1.4. Education

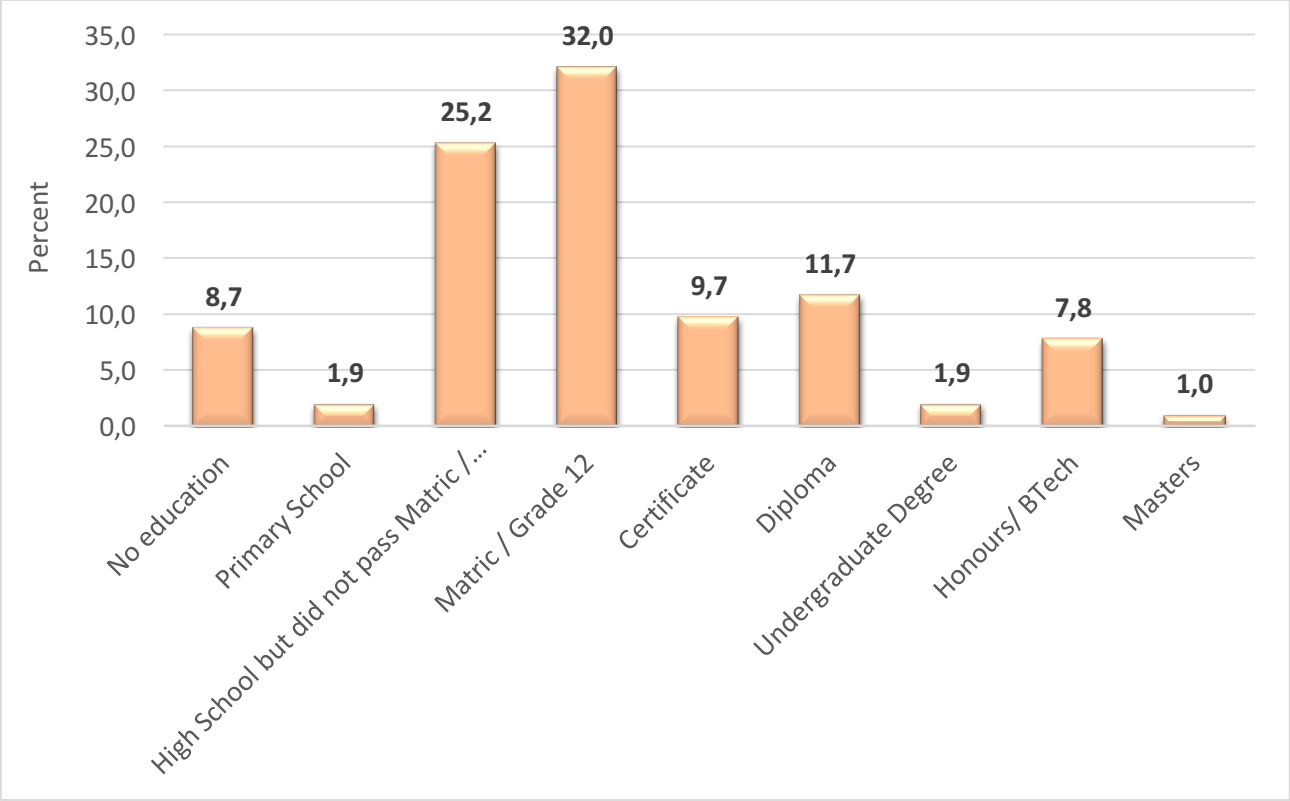


*Figure 4.3. Level of education of respondents.*

The results were statistically significantly different with regard to education levels ($p$<0.001). More than one-quarter of HoH was not in possession of a matric certificate (35.8%), while 32% had matriculated, and 32.1% had post Matric qualifications.

## 1.5. Level of Income

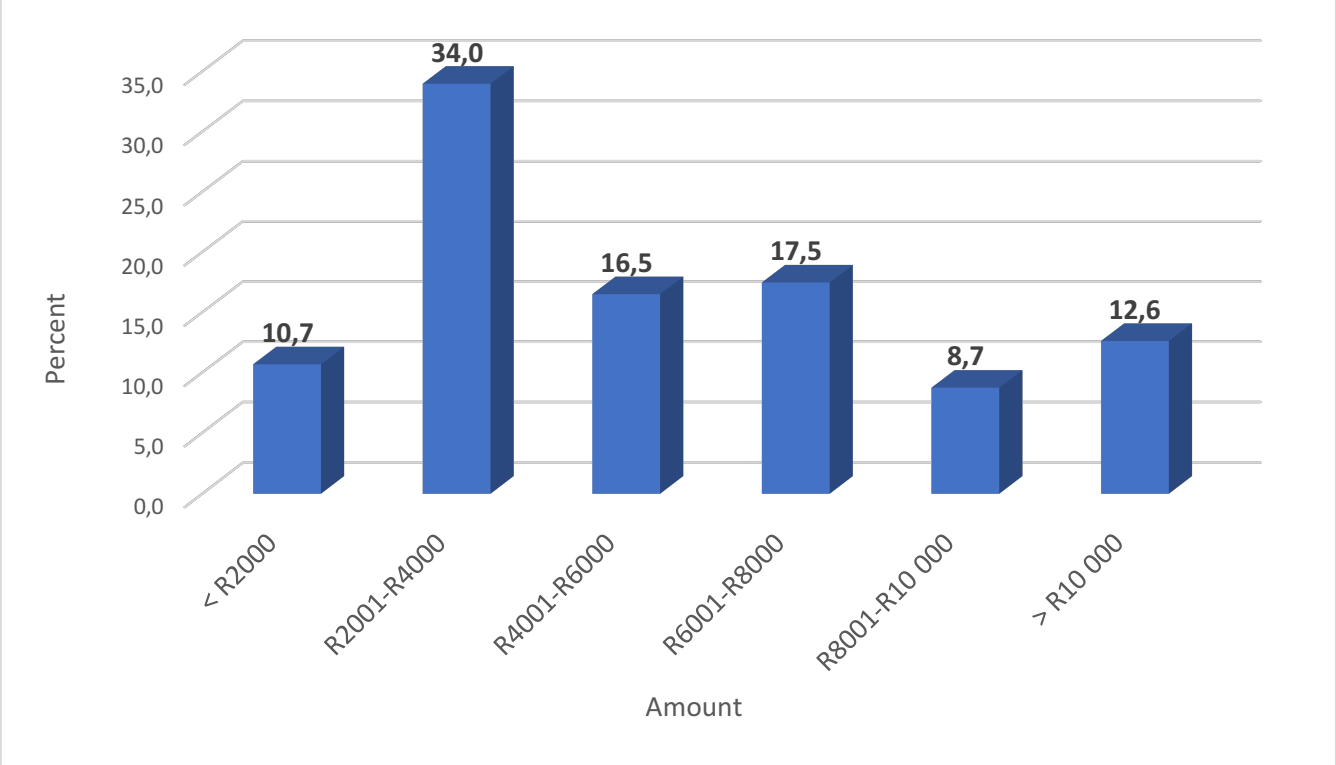


*Figure 4.4. Level of income of respondents.*

The income level influences a person's living standard and ability to maintain a good environment, in particular as a head of the household. Little More than half of the HoH (55.3%) had a monthly income of R4001 and more. While little less than half (44.7%) had a monthly income of R4000 and below.

## 2. DESCRIPTION OF THE UNITS

This section deals with the layout and physical conditions of the unit.

### 2.1. Period lived in the unit

*Table 4.2. Period lived in the building.*

| Period (Years) | Frequency | % |
|---|---|---|
| > 6 months <1 year | 8 | 8 |
| 1-2 years | 44 | 43 |
| 3-4 years | 18 | 18 |
| 5 years or > | 33 | 32 |
| **Total n=103** | **103** | **100** |

More than a quarter of the respondents (32%) have lived in the building for five years and more, while 69% have stayed in the building for <5 years. Of the 68%, 7.8% have stayed for less than one year ($p$<0.001).

### 2.2. Monthly Rental in the unit

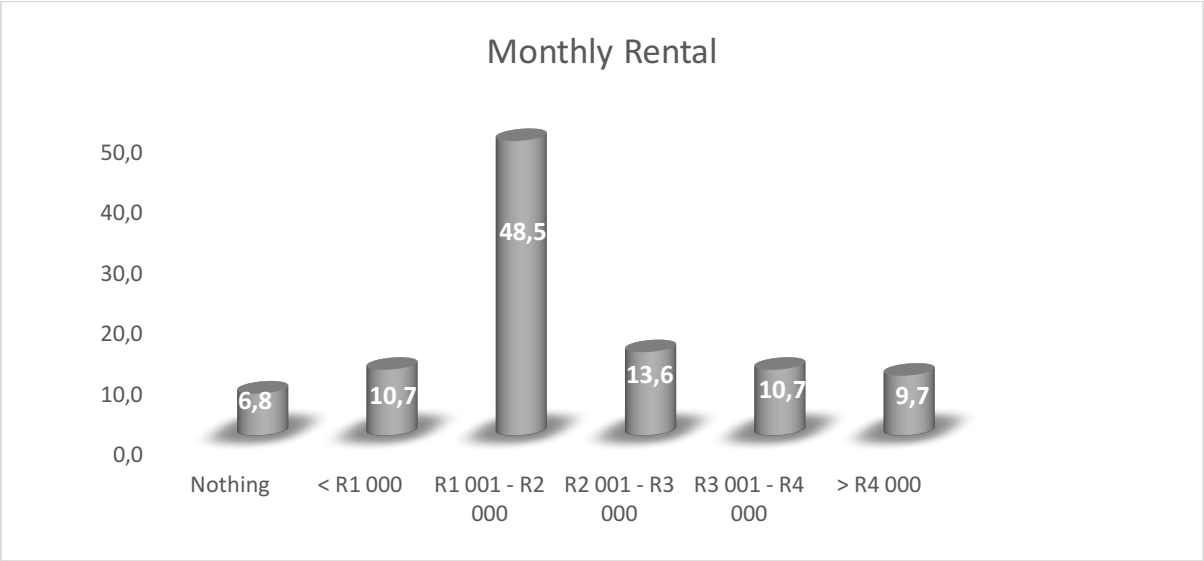


*Figure 4.5. Summary of the rent paid by period.*

Monthly rentals varied between units ($p$<0.001). Ten percent (10%) of HoH paid R4000 or more, while 83% paid less than R4000. Noting that there were significantly more respondents (48%) paid between R1001 and R2000. A proportion of 6.8% not paid monthly rental. The rent paid also appeared to vary in terms of the number of rooms used and the space available in the units. Figure 4.6 shows the number of rooms that respondents can access and use in their units. More than half of the respondents (55%) lived in and accessed one room in the unit ($p$<0.001), excluding common areas such as kitchens and passageways.

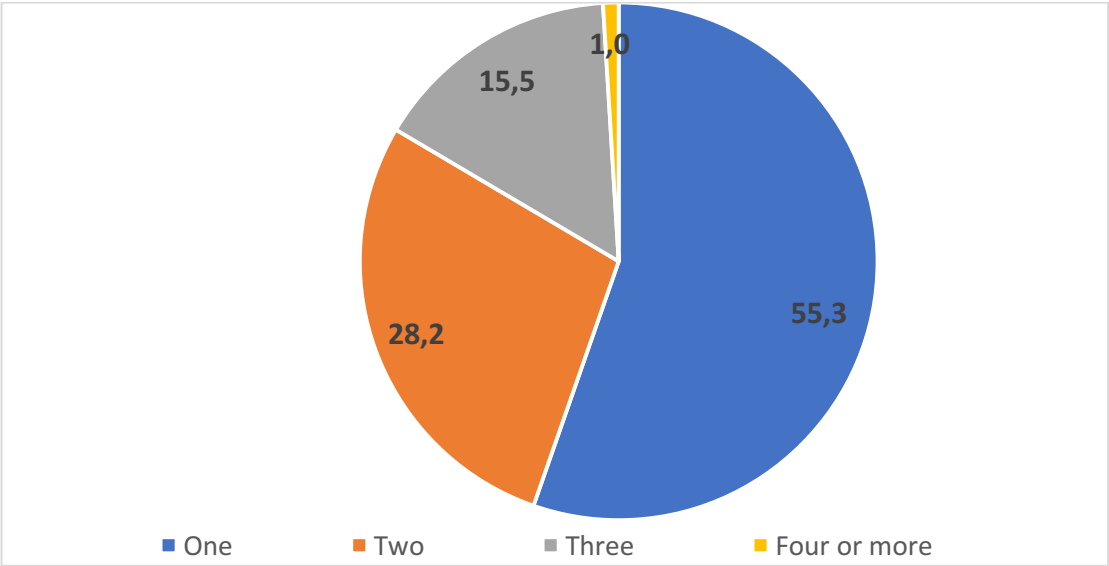


*Figure 4.6. Number of rooms respondents can access and use in the unit.*

## 2.3. Usage of Different Areas in the Unit

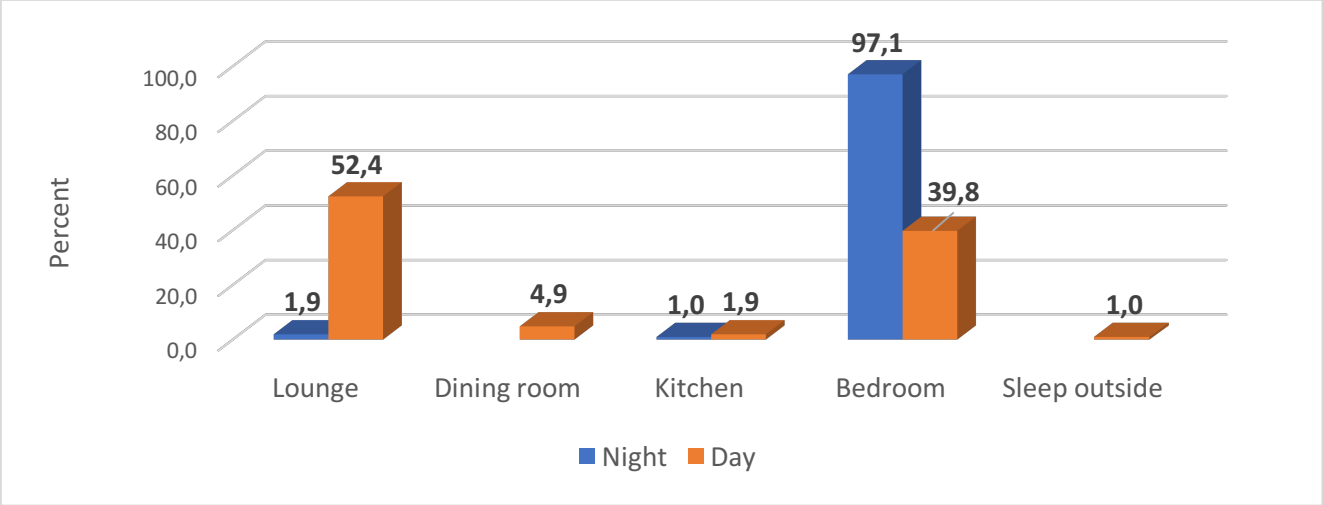


*Figure 4.7. Usage of different areas in the unit by night and day.*

Figure 4.7 shows the use of different areas in a unit by night and day. Significantly, more respondents attested to the use of the lounge by day, with more using the bedroom at night. A further 7.8% occupied common areas such as dining areas and kitchens both during the day and at night. There was a statistical significance difference between the options ($p$<0.001). It was noted that 26.2% of those areas most commonly used within the units during the day, had no open windows to allow air circulation (Figure 4.8) and 36.9% had one window, respectively.

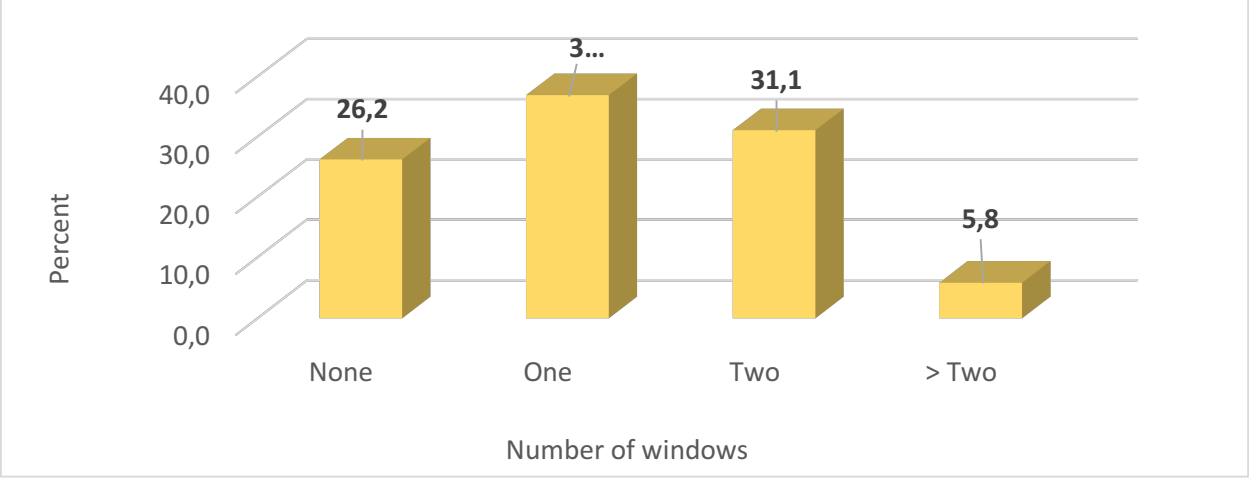


*Figure 4.8. Number of windows that can be opened directly in the open space, allowing air circulation in the most used room during the day.*

## 2.4. Use of Elevators in the Building

*Table 4.3. Relationship between the use of the elevator versus the floor on which unit is located.*

| Floor | Use of elevator to reach units | | |
|---|---|---|---|
| | Yes (%) | No (%) | Sometimes (%) |
| 1 | 0 | 13.5 | 0 |
| 2 | 6.5 | 10.8 | 0 |
| 3 | 6.5 | 13.5 | 15 |
| 4 | 10.9 | 18.9 | 5 |
| 5 | 8.7 | 10.8 | 10 |
| 6 | 13 | 8.1 | 5 |
| 7 | 15.2 | 13.5 | 10 |
| 8 | 15.2 | 2.7 | 15 |
| 9 | 17.4 | 5.4 | 20 |
| 10 | 6.5 | 2.7 | 20 |
| **Total Count** | **46** | **37** | **20** |
| **% n=103** | **44.7** | **35.9** | **19.4** |

With regard to the utilisation of the elevator to reach the upper floors, the use and non-use of the elevator in the building was partially proportional ($p$=0.006). As a result, 45% of respondents said they were using an elevator to reach their units, while 37% of respondents did not use the elevator to reach their units, and 20% said they use the elevator intermittently. Among the reasons for not using the elevator, 75% of those who did not use the elevator were of the view that the elevator was delayed and always overloaded (17.9%) (Figure 4.9).

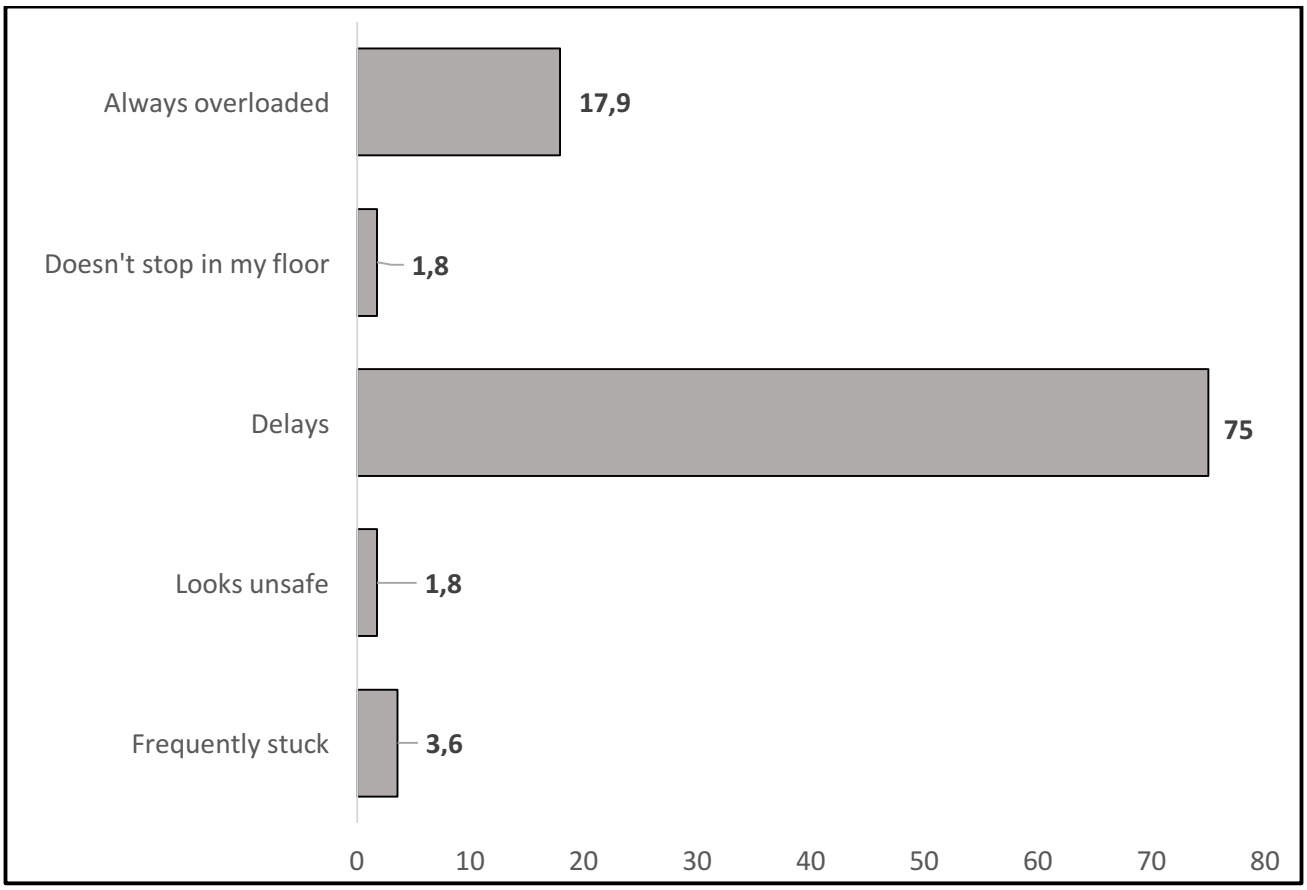

*Figure 4.9. Reasons not using elevator.*

## 3. WATER SUPPLY

The entire HoH sampled confirms that municipal water provision is the main source of water supplied to the region by the Metropolitan municipality EThekwini. Most of the respondents (77%) felt that the water supply was enough for their needs but 23.3% believed the opposite. Table 4.10 indicates that over half of those interviewed felt that water quality was also of acceptable standard in the building. However, less than half of the respondents were of the opinion that the color of the water was unusual (38.8%), the taste was unusual (38.8%) and that dust residue (28.2%) was present in the water.

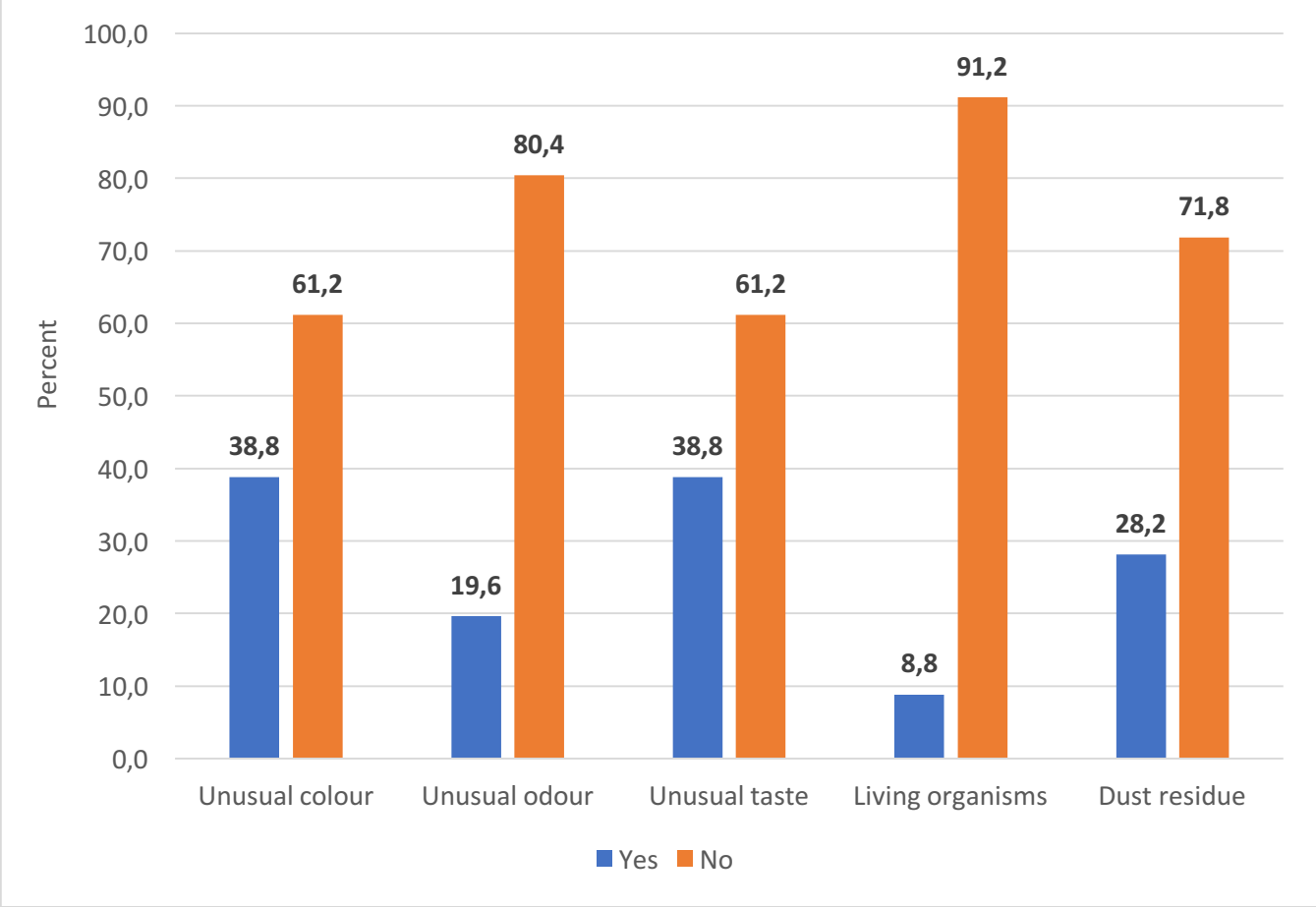


*Figure 4.10. Determinants of Water quality.*

# 4. SANITATION SERVICES

## 4.1. Sharing of Toilet Facility

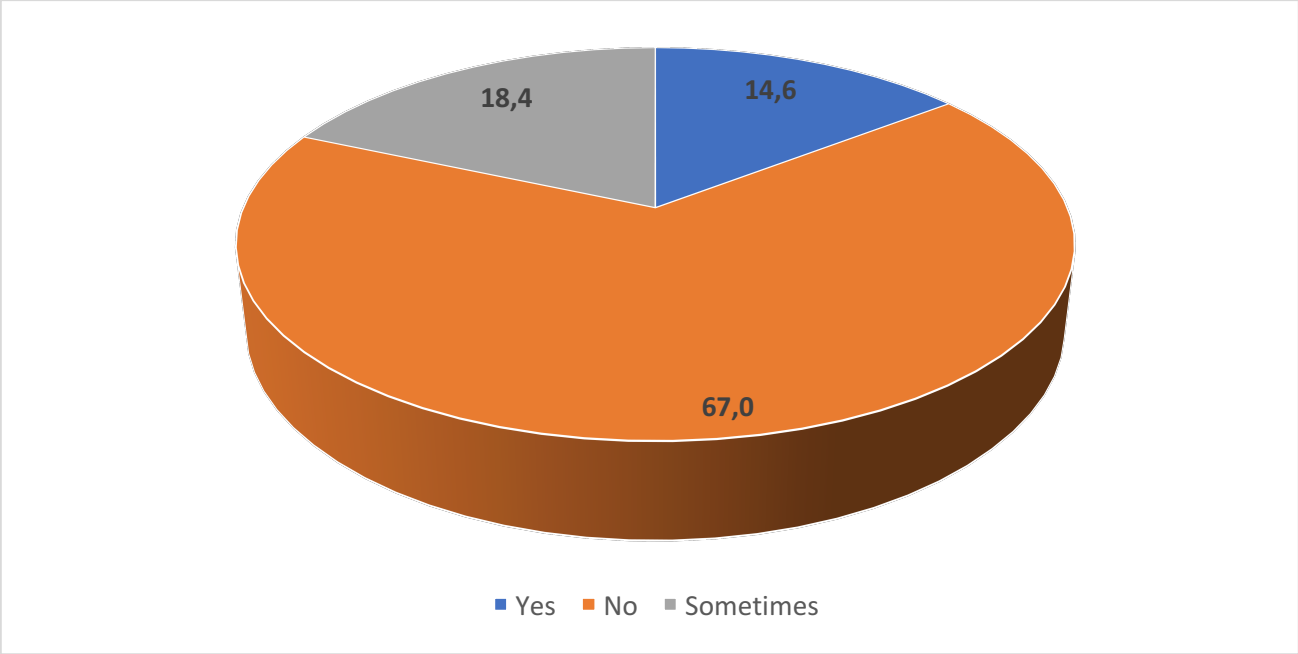


*Figure 4.11. Sharing of toilet facility with other residents living in other units.*

Each unit in the building had a single toilet which was shared by all the unit occupants. However, 14.6% claimed to share toilets with residents of other units. Within the units, 83.5% of the respondents stated that the toilet would be shared by three people and more. Five percent of the toilet facility in units (Figure 4.12) was shared by > 10 people ($p$<0.001).

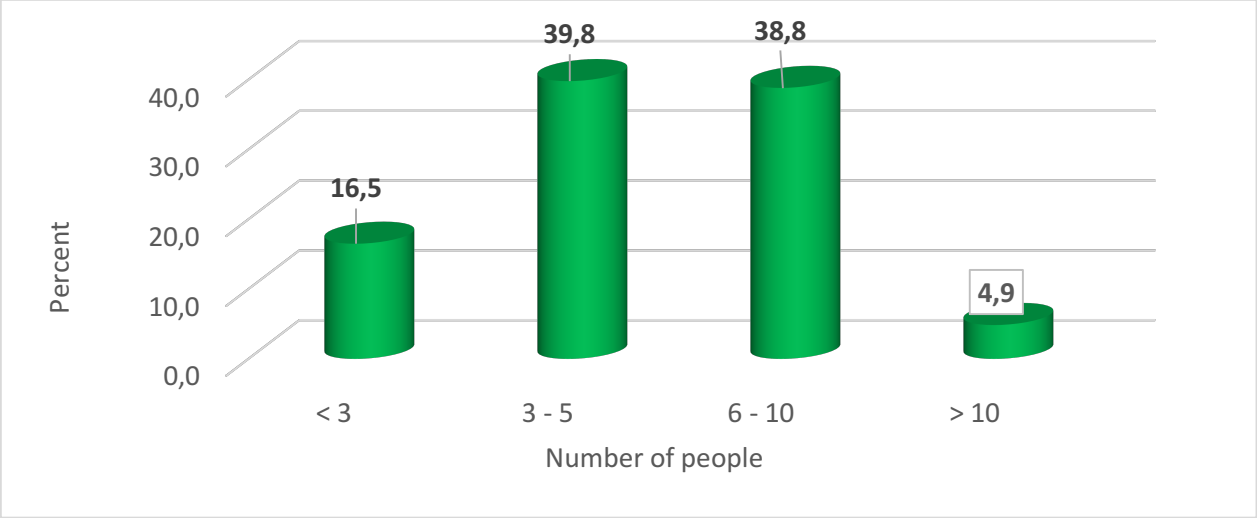


*Figure 4.12. Number of people sharing toilet facility in the units.*

## 4.2. Cleanliness of Toilet Facility in Units

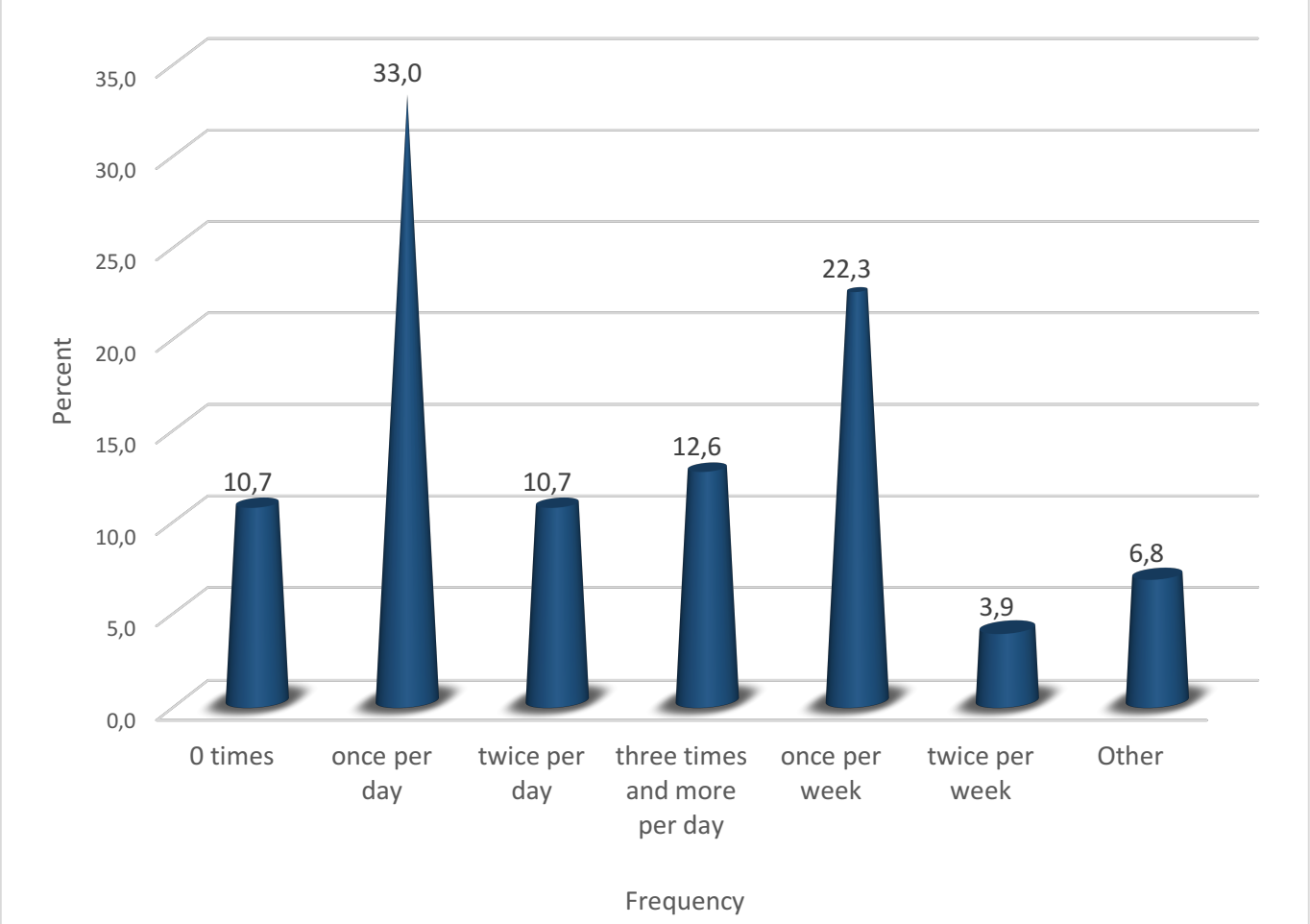


*Figure 4.13. Frequency of cleaning of toilet facility.*

In terms of the rate of cleaning toilet facilities in each unit, there was a significant statistical difference ($p$<0.001). The majority of the Units (33%) had toilet facilities cleaned once a day, while another proportions of respondents has different clean-up frequency rates as; twice a day (10.7%), three times and more per day (12.6%) and weekly (22.2%) respectively. Noting that 10% of the respondents do not clean their toilets.

## 5. ELECTRICAL SUPPLY

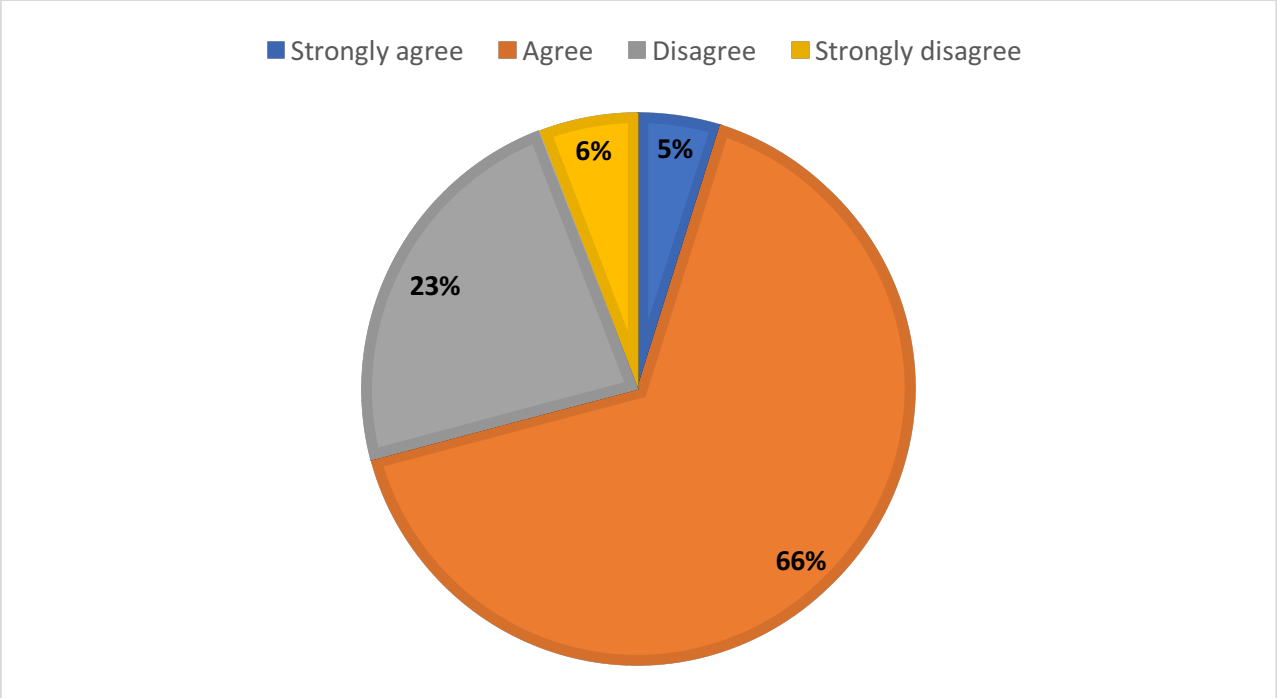


*Figure 4.14. Safeness of electrical installation in the units.*

Electrical supply in units was either prepaid (63%) or metered (37%) electricity. More than half (66%) of respondents agreed that electricity was safe to use in the building, while a quarter (23%) of respondents believed that it was unsafe to use their electrical systems. Figure 4.15 shows that 19.4% of respondents claimed that incidents of electric shock were caused by the malfunction of electrical appliances in their units. Of the respondents, 99% believed that electricity was never responsible for fires experienced in the buildings. Nevertheless, 99% stated that units were not provided with fire extinguishers in their units in the event of a fire (Figure 4.15).

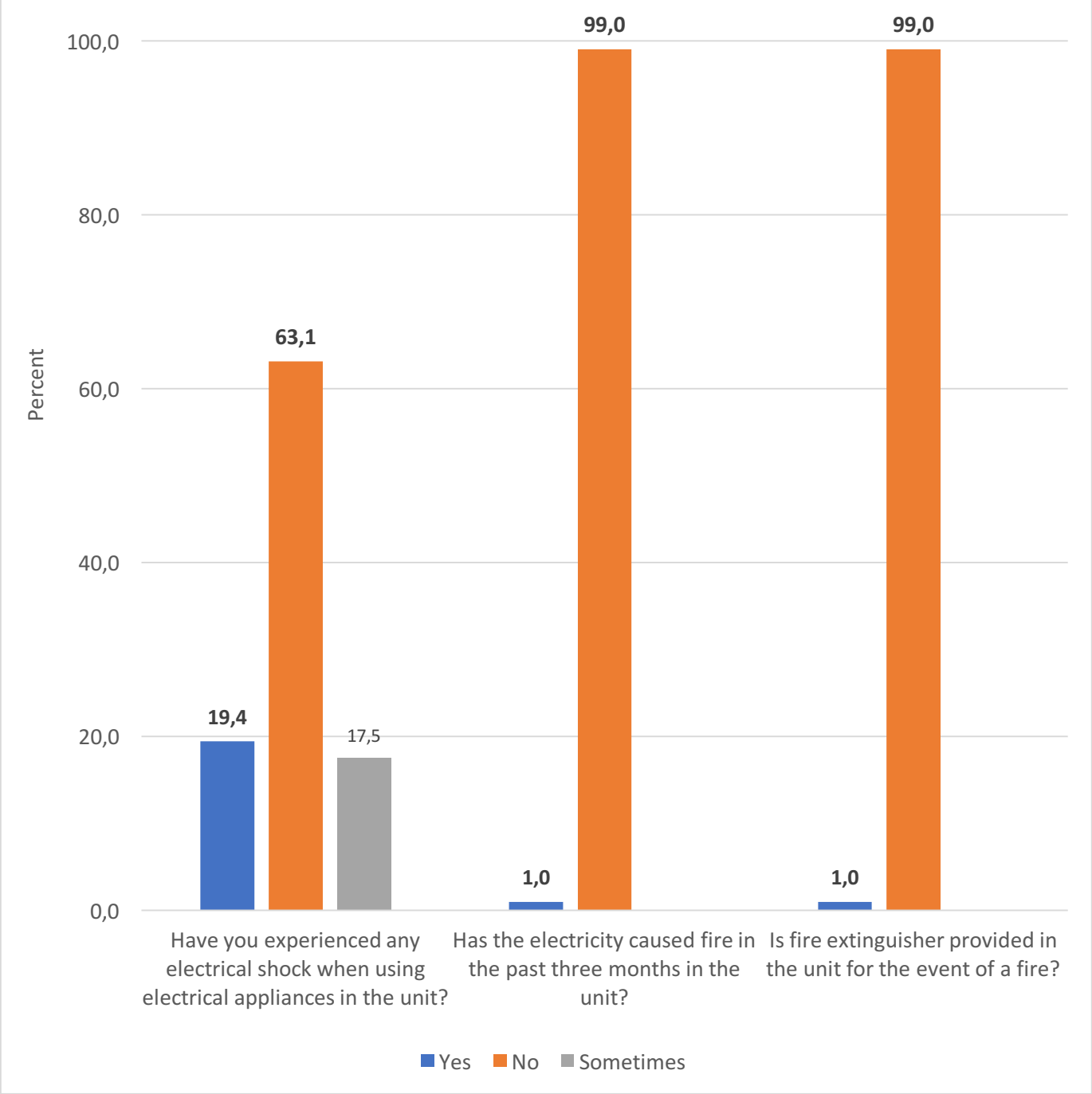


*Figure 4.15. Unsafe experiences in electrical installation.*

## 6. WASTE MANAGEMENT PRACTICES

*Table 4.4. Keeping of general waste in the unit.*

| Area used for keeping generated waste in the unit | % | Method of storing generated waste | | |
|---|---|---|---|---|
| | | Bin (%) | Plastic (%) | No means (%) |
| Kitchen | 76.7 | 61.2 | 10.7 | 4.9 |
| Bedroom | 7.8 | 4.9 | 1.9 | 1.0 |
| Other | 15.5 | 5.8 | 2.9 | 6.8 |
| **Total Count n=103** | **103** | **74** | **16** | **13** |

As a waste management practice, more than a third (77%) of the respondents stored waste generated by the unit in the kitchen. Most people used containers (61%) for the disposal of waste materials, while 15 percent had no particular area for waste management storage within their units, it was worth noting that 13% had no storage method for their units-generated waste.

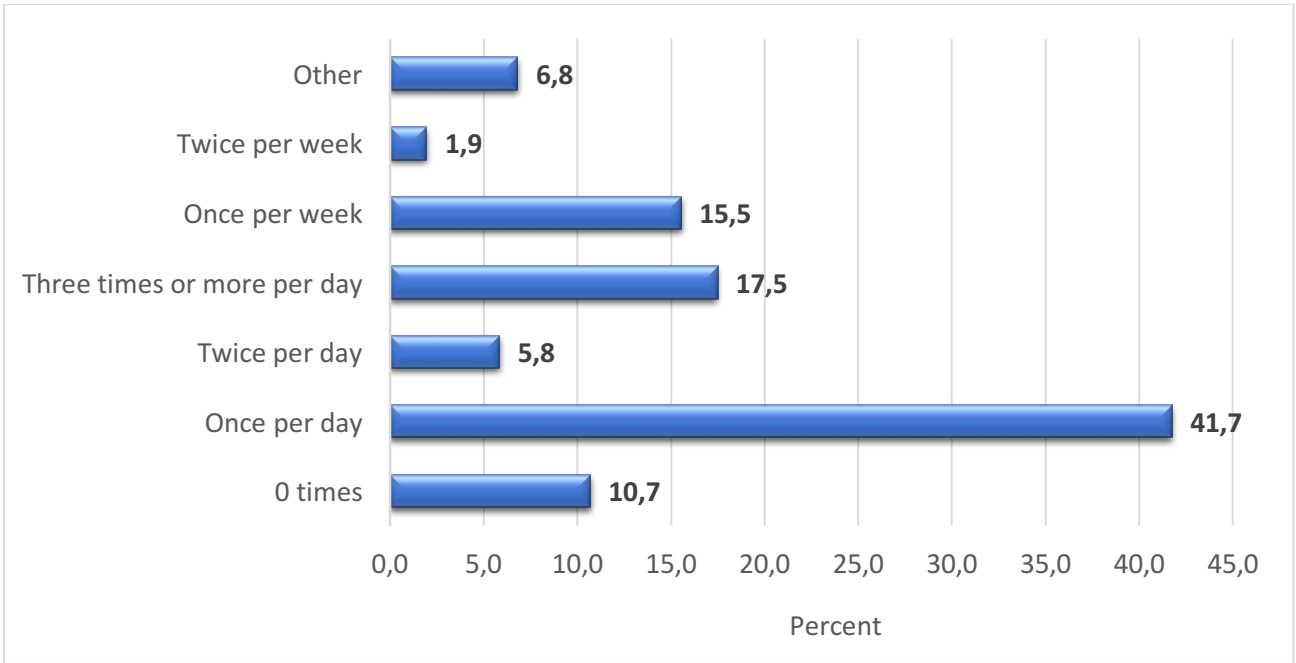


*Figure 4.16. Frequency of removing waste from the unit.*

The results show that 65% of participants remove waste from the unit daily. Just over one quarter (35%) of the HoH have, however, shown enervated waste removal. This includes removing waste once or twice weekly or zero times from their units.

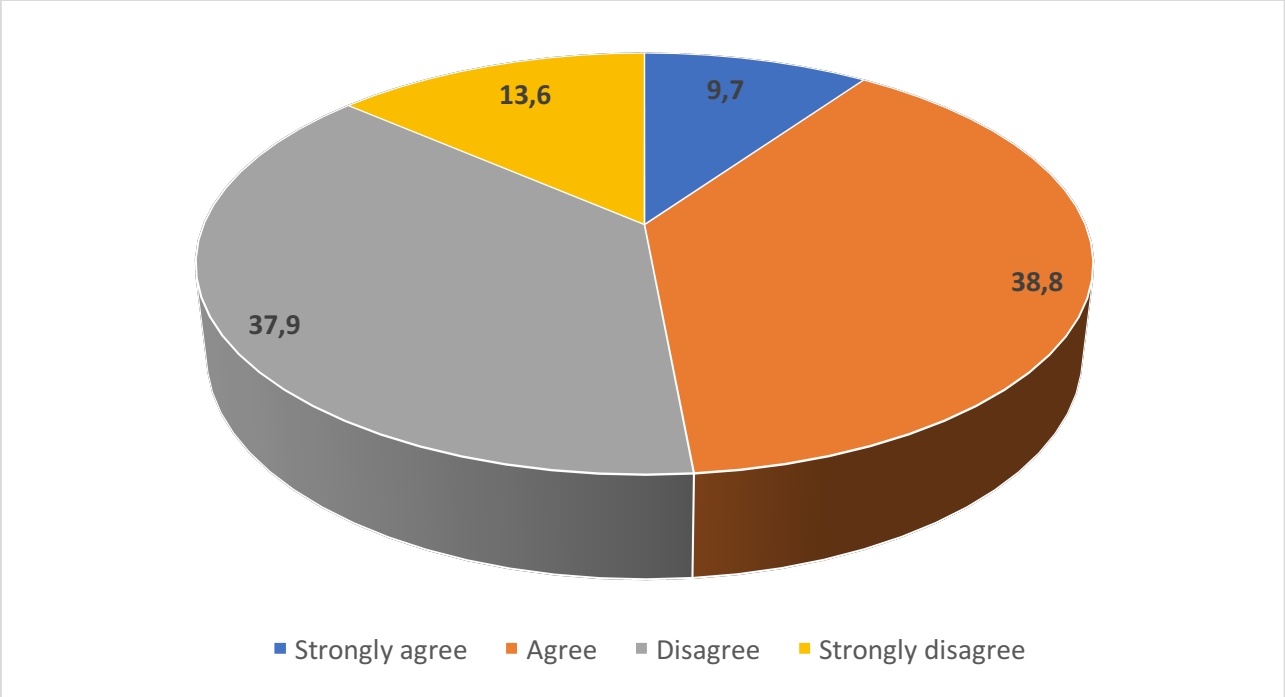


*Figure 4.17. Odours emanating from waste.*

Figure 4.17 confirms that waste accumulation in units is not conducive to hygienic conditions. Respondents agreed that smells were produced by unremoved waste. In addition, Figure 4.18 revealed that flies and cockroaches in units were present due to waste accumulation, with $p$=0.375, 0.922, which means there is no statistically significant difference between those observed flies and cockroaches in their units.

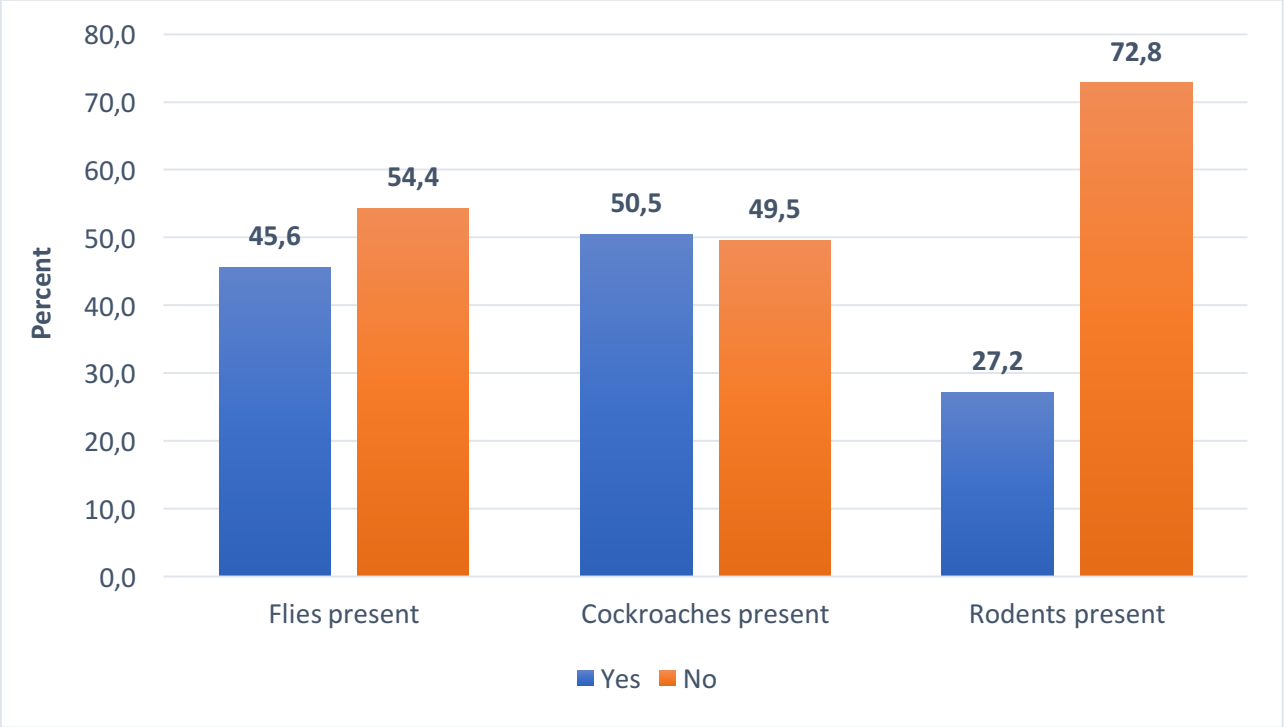


*Figure 4.18. Vectors present in the unit due to accumulation of waste.*

## 7. IMPACTING ACTIVITIES IN THE UNITS

*Table 4.5. Impacting Activities.*

| Impacting Activity | Frequency | % | Source(s) of impacting activity (within yes %) | | | | |
|---|---|---|---|---|---|---|---|
| | | | Neighbour Unit (%) | Roommate (%) | Visitors (%) | Neighbour buildings (%) | Other (%) |
| Theft | 69 | 67 | 25 | 19.6 | 16,7 | - | 38.7 |
| Crime | 93 | 90 | 11.4 | - | 5,4 | 18,4 | 64,8 |
| Loud music | 73 | 70,9 | 31,5 | 32,9 | 4,1 | 9,6 | 21,9 |
| Drug addicts | 88 | 85,4 | 9,7 | 4,9 | - | 12,2 | 73,2 |
| Alcohol Drinkers | 75 | 72,8 | 32,7 | 20,3 | 8,2 | 20,4 | 18,4 |
| Smoking | 64 | 62 | 46 | 38,5 | 11,4 | - | 4.1 |
| Prostitution | 75 | 73 | 23,6 | 14 | 3,4 | 14,2 | 44,8 |
| **n=103** | | | | | | | |

The respondents had to determine if activities in their units had a negative impact on their health status, living conditions and or well-being. The distribution of the impacting activities in units in Table 4.5 is not similar ($p$<0.001). One third (70.9%) of respondents were exposed to excessively loud music, mainly from neighbouring groups (31.5%) and roommates (32.9%). More than half of the respondents experienced other activities in the category for example: robbery (67%), criminal activity (90%), drug addicts (85.4%), drunkenness (72.8%), smoking (62%), and prostitution (73%) respectively.

The analysis shows, however, that the main sources of smoking and alcohol use include neighbouring units and roommate drinkers. Crime, drug addiction and prostitution seemed to emanate more from other sources that can include streets outside the buildings. Nevertheless, a minor proportion of crime, drug addiction and prostitution activities emanated from the building, which was alleged to be mainly caused by neighbor units and visitors. With regards to reporting of those experienced impacting activities, Figure 4.19 shows that HoHs disagreed (59.2%) on the availability of procedures in reporting negative experienced impacting activities to the management. A further 69.6% disagree that actions are not taken against the perpetrators of negative or criminal activities.

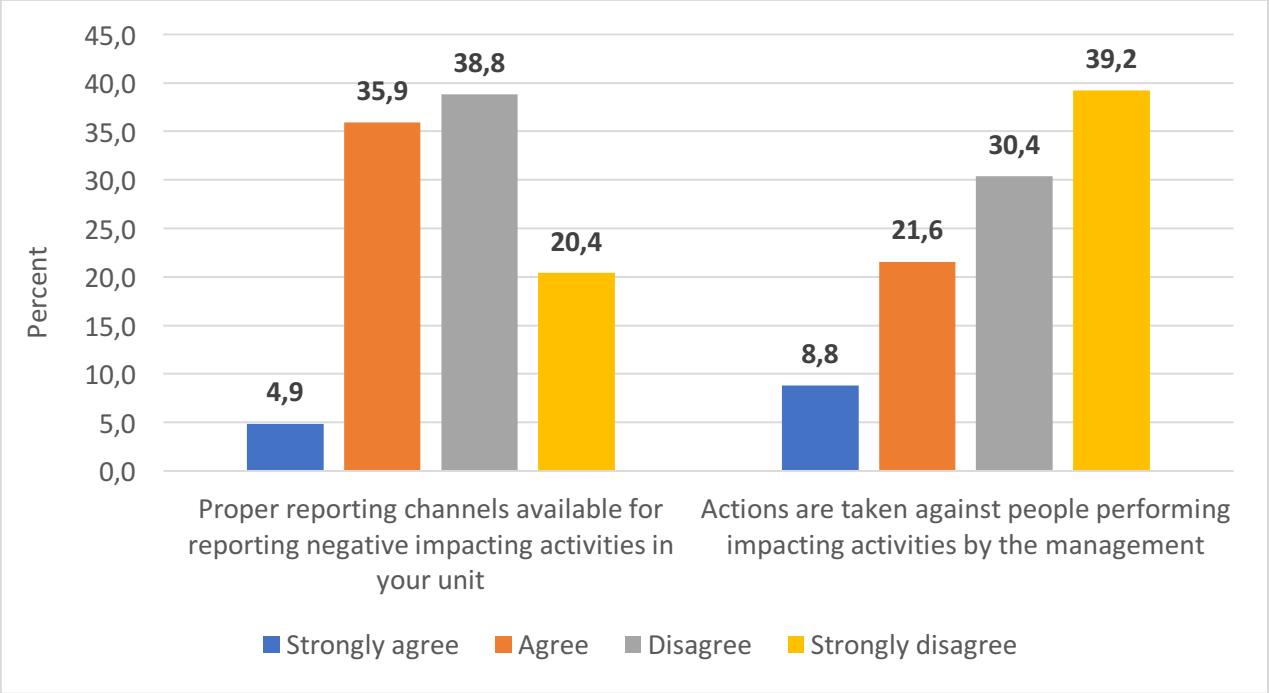


*Figure 4.19. Reporting of impacting activities.*

## 8. GENERAL STATE OF HEALTH AND HEALTH SYMPTOMS

### 8.1. Smoking

*Table 4.6. Smoking habits in the building.*

| Are you smoking? | Frequency | % |
|---|---|---|
| Yes | 33 | 32 |
| No | 68 | 66 |
| Sometimes | 2 | 1,9 |
| **Total** | **103** | **100** |
| **n=103** | | |

Table 4.6 displays smoking habits in the building. The ratio of the number of people smoking and non-smoking is 1:2. The results analysis shows that more than half of those who smoke (61.8%) smoked three times and more per day (Figure 4.20). Those who smoked were asked to indicate whether or not they smoked inside the building. The response indicated that, more than three quarter of the smokers (76%) smoked inside the building. Almost half (44.8%) of those smokers smoked in their building's designated smoking area, whereas just under half (42.3%) smoked within their units.

A smaller proportion smoked in the lounge, dining room and bedroom. Noting that more than a quarter (34%) of the respondents not smoking indicated they are in their units with smoking individuals.

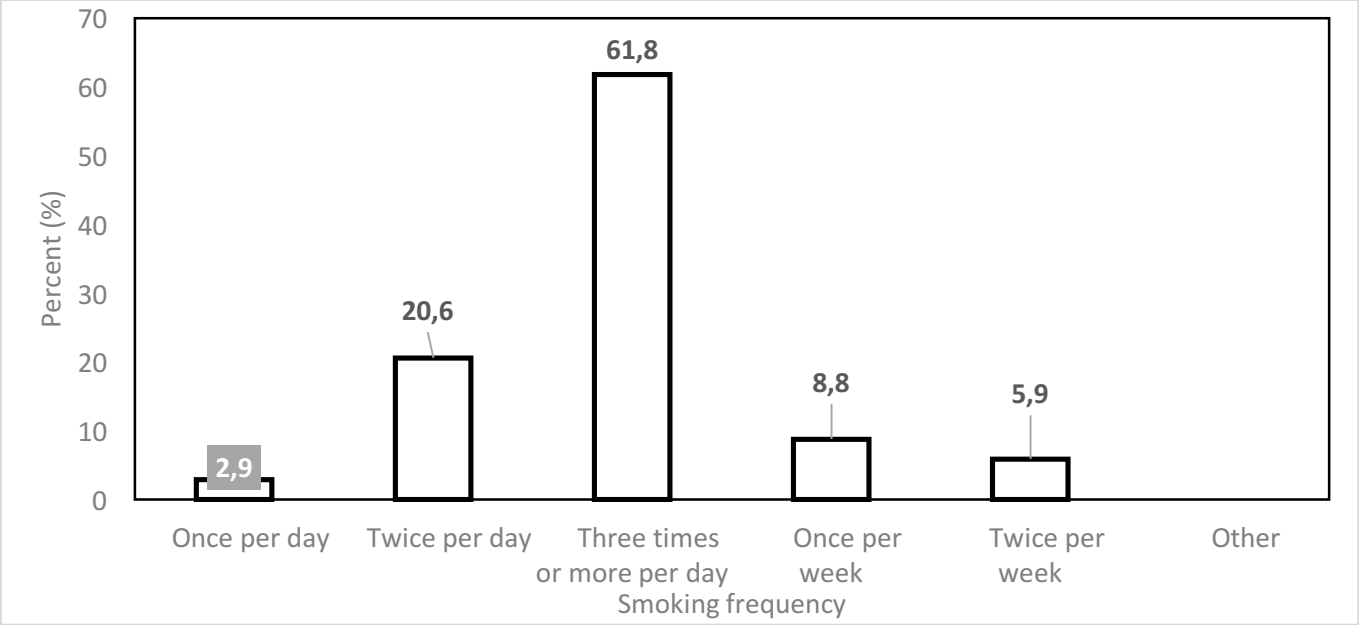


*Figure 4.20. Frequency of smoking.*

## 8.2. Alcohol consumption

*Table 4.7. Alcohol Drinking in the Building.*

| Drinking of alcohol | Frequency | % |
|---|---|---|
| Yes | 38 | 36,3 |
| No | 44 | 43,1 |
| Sometimes | 21 | 20,6 |
| **n=103** | | |

Alcohol consumption seemed to be higher, since 43.1% of the respondents reported that they did not participate in the use of alcohol. More than a quarter of the respondents (36.3%) participated in alcohol consumption, while 20.6% admitted to imbibing alcohol intermittently. Over half (57.5%) of those who drink alcohol, have consumed alcohol within the lounge area. Frequency of drinking alcohol was distributed unevenly (Figure 4.21), noting those who drank three times or more per day (27.6%).

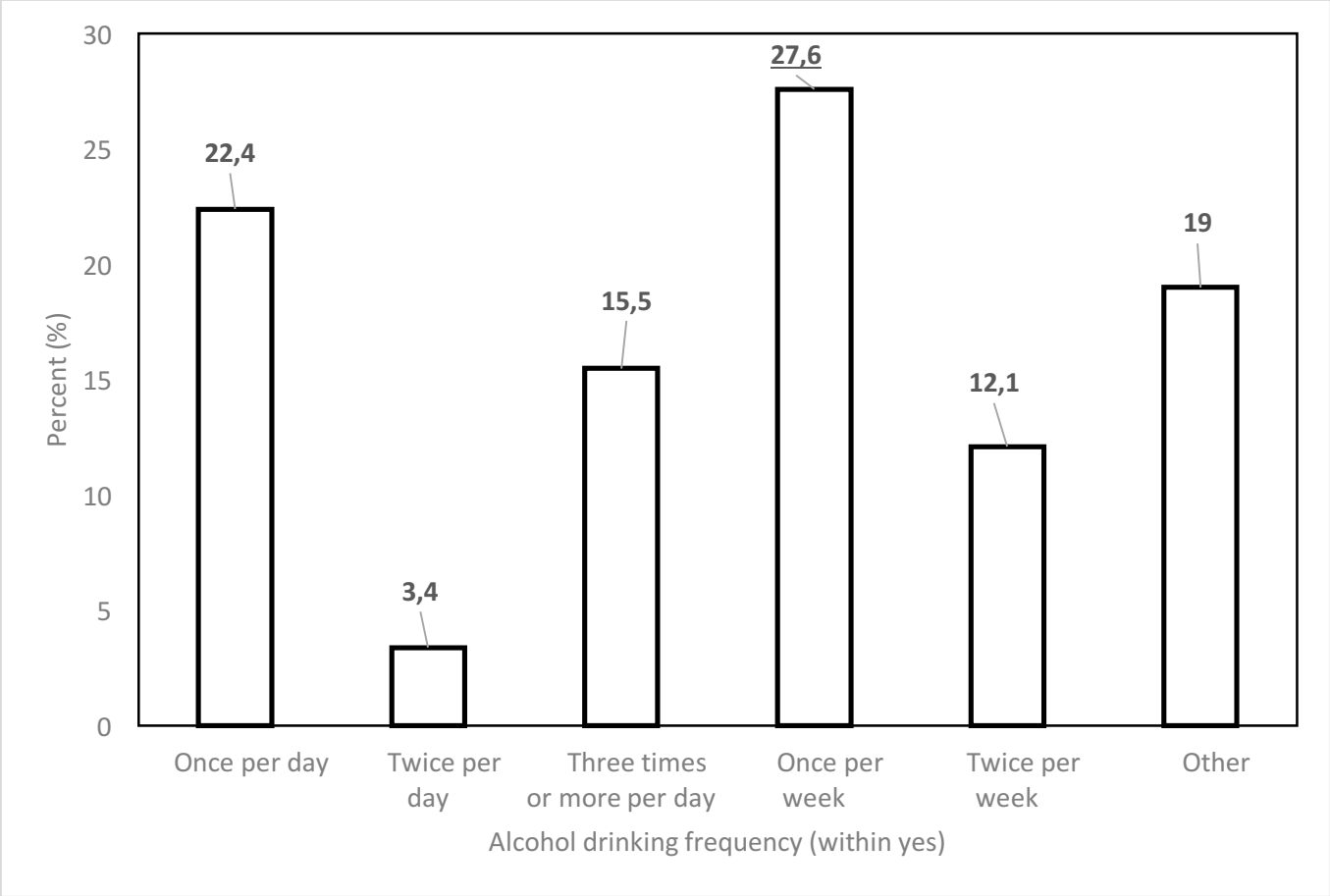


*Figure 4.21. Frequency of drinking alcohol.*

## 8.3. Medical Attention

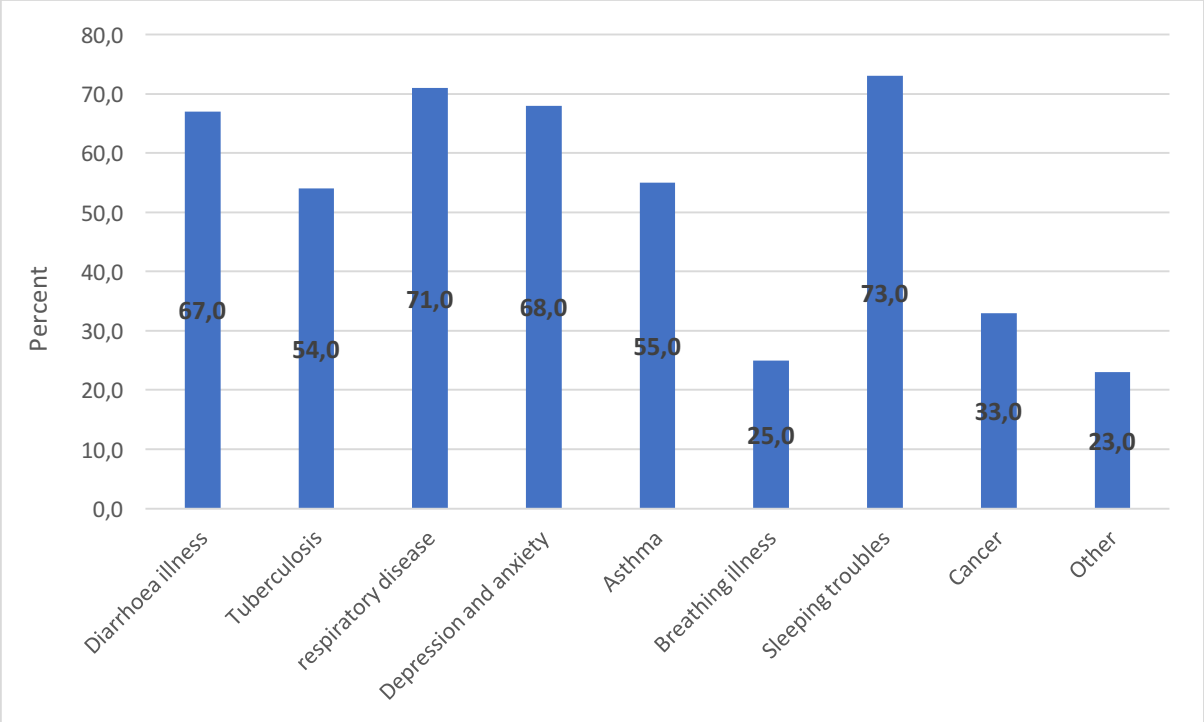


*Figure 4.22. Experienced health symptoms and reasons for seeking medical attention in the past three months.*

In the examination of residents' health status at the building, interviewees were asked to indicate whether they have sought medical care during the last three months. Over half (67.4%) of the respondents in the last three months have sought medical care. Figure 4.22 shows symptoms of poor health and reasons for seeking medical treatment in the past three months. In the last three months, medical care was sought for both communicable and chronic conditions. Communicable diseases included diarrheal illnesses (67%, TB (54%), respiratory infections (71%), while chronic diseases included depression and anxiety (68%), asthma (55%), insomnia (73%), and cancer (33%).

## 8.4. Experienced Health Symptoms

*Table 4.8. Experienced health symptoms.*

| Health Symptoms | Health symptoms experienced in the last 6 months | | Period health symptoms experienced (within yes) | | |
|---|---|---|---|---|---|
| | Yes (%) | No (%) | All the times (%) | Certain hours (%) | Certain Seasons (%) |
| Coughing | 39,8 | 60,2 | 57,1 | 40,5 | 2,4 |
| Felt Fatigue | 40,8 | 59,2 | 33,3 | 64,3 | 2,4 |
| Painful ankles | 25,5 | 74,5 | 22,2 | 74,1 | 3,7 |
| Chest pains | 34 | 66 | 31,4 | 48,6 | 20 |
| Severe Headache | 52,9 | 47,1 | 31,5 | 57,4 | 11,1 |
| Sweating more than usual at night | 52 | 48 | 50 | 23,1 | 26,9 |
| Fever | 11,7 | 88,3 | 50 | 33,3 | 16,7 |
| Difficulty in breathing | 25,2 | 74,8 | 23,1 | 61,5 | 15,4 |
| Sleeplessness | 44,7 | 55,3 | 30,4 | 58 | 10,9 |
| Other | 20,4 | 79,6 | 66,7 | 28,6 | 4,8 |
| **n=103** | | | | | |

Respondents were also asked to indicate any health symptoms that have presented in the last six months. Table 4.8 shows that severe headaches and sweating more than usual at night were the most commonly experienced symptoms of poor health. Among those with severe headaches, 57.4% reported experiencing that symptom at certain times only, while 50% experienced night sweating symptoms constantly.

Other symptoms most prevalent included sleeplessness (44.7%), 58% experienced coughing at certain times, 39.8% had a cough rate of 1: 1 at all times (57.1%) and certain times (40.5%), while many experienced fatigue (40.8%) with 33.3% experiencing a ratio of 1:2 at all times and 64.3% sometimes. Health symptoms subsided for the following categories of health symptoms when leaving the unit: average: 80.68% (Table 4.9).

*Table 4.9. Subsiding of health symptoms.*

| Health Symptoms experienced | Health symptoms subsides when leaving your unit? | | |
|---|---|---|---|
| | Yes (%) | No (%) | Not sure% |
| Coughing | 83,3 | 4,8 | 11,9 |
| Felt Fatigue | 71,4 | 4,8 | 23,8 |
| Painful ankles | 73,1 | 3,8 | 23,1 |
| Chest pains | 65,7 | 14,3 | 20 |
| Severe Headache | 81,1 | 9,4 | 9,4 |
| Sweating more than usual at night | 84,9 | 3,8 | 11,3 |
| Fever | 91,7 | 8,3 | |
| Difficulty in breathing | 80 | 4 | 16 |
| Sleeplessness | 80,4 | 4,3 | 15,2 |
| Other | 95,2 | 4,8 | |

## SECTION B: INSPECTION SURVEY

The inspection survey was conducted solely to determine the health risk factors in the units and to observe the living conditions in the units. Inspection included a walk-through for direct observation in the kitchen, bathroom, bedroom and lounge areas. The inspection sheet was administered, covering the minimum requirements of the General Hygiene and Structural Requirements in the building facilities, as laid down in the “National Building Regulations and Building Act, 1977”, and the National environmental health norms and standards for premises and acceptable monitoring standards for environmental health practitioners 2015.

### 1. KITCHENS

#### 1.1. General Hygiene and Structural Facility in the kitchen

Every unit in the building had a kitchen. The average of kitchen users was five persons with a standard deviation of 1.94. Figure 4.23 shows whether the structural facility criteria have been fulfilled. In certain areas, paint was peeling off walls which were built of hard wall. Cables and dirt in the ceiling was exposed in at least 31% of the kitchens, coupled with Inadequate lighting (35%) due to the malfunctioning of lighting. Over half of the kitchen facilities (52%) have not been properly maintained. Some windows were un-openable, some were obstructed, there was no cross ventilation due to illegal partitioning, and broken windows were evident. These factors are indicative that ventilation is poor.

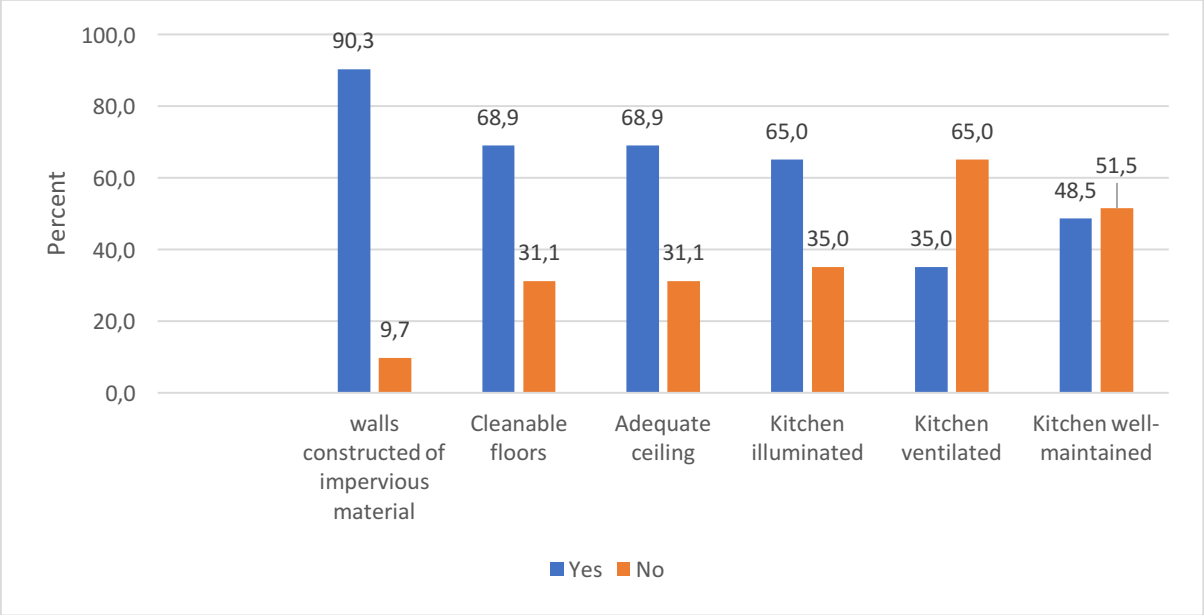


*Figure 4.23. General hygiene and structural requirements in kitchens.*

Figure 4.24 indicates that waste is often not collected in more than half of the units (68.9%). This seemed to occur in almost half the units (38.8%) in the kitchen areas. Although the approved method of waste management, including the use of bins and plastics, appeared to be 68.9%, many of these containers have not been kept clean (83.5%).

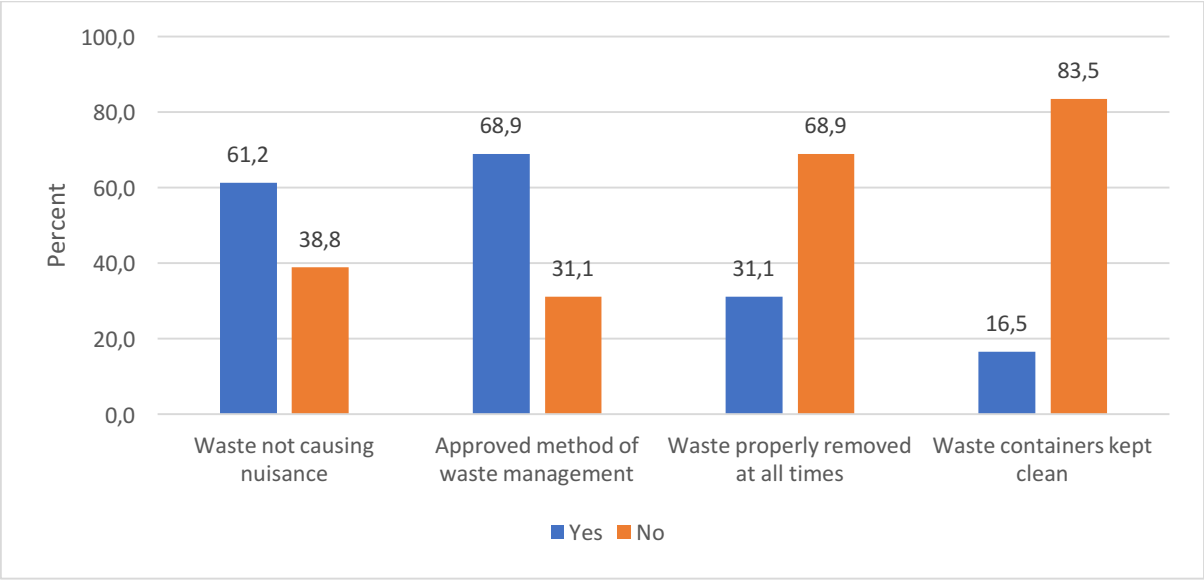


*Figure 4.24. Waste management in the kitchen.*

## 1.2. Water supply in the kitchen

The majority of the kitchens in the units (96.1%) had running water supplies which indicates that the water quality was aesthetically acceptable. Nevertheless, approximately half of the total kitchen installation had water leakage due to improper piping (48.5%). Figure 4.25 showed also that effective methods for disposing of used water in some areas were not sufficient (30.1 percent). This was due mainly to the accumulation of particles and dirt (63.1%). As a result, in some areas (45%) grey water was not safely disposed of due to overflow and slow water circulation

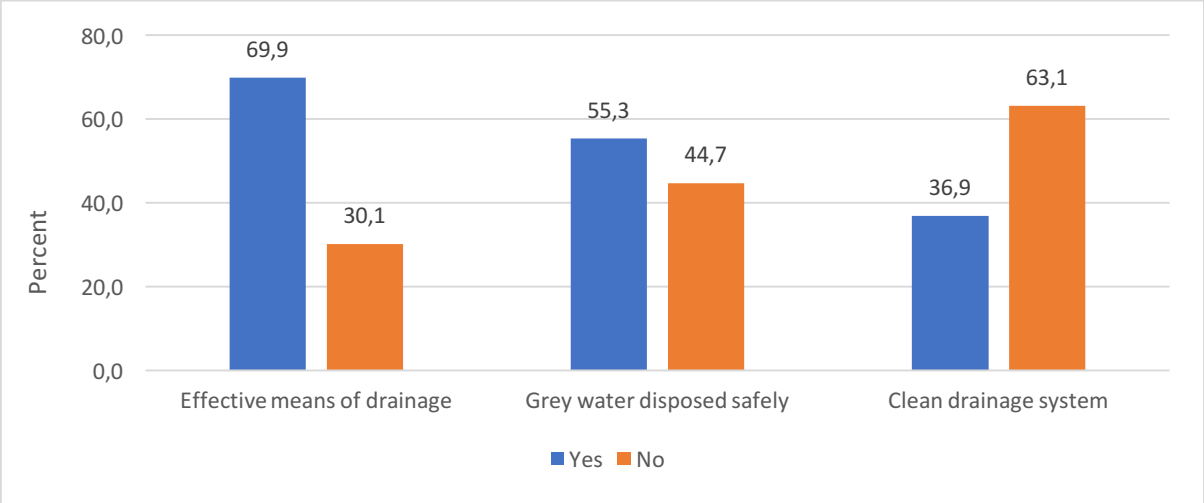


*Figure 4.25. Disposal of water in the kitchen.*

## 2. BEDROOMS

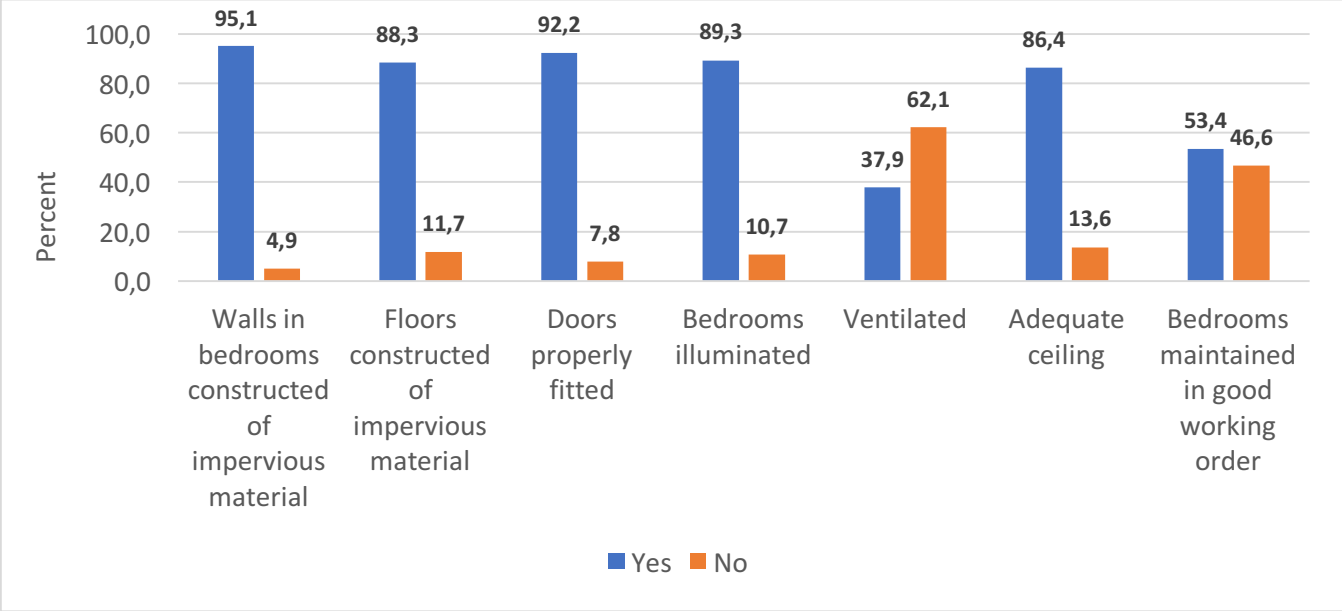


*Figure 4.26. Housekeeping and structural requirements in bedrooms.*

Figure 4.26 shows the structural facility and conditions in the bedrooms. Although the building structure appeared to be constructed of hard material. However, there were areas where bedrooms were divided by board materials to form separation. ventilation appeared was also inadequate more than half of the bedrooms (62.1%). This appeared to be resulted on some windows that were un-openable, obstructed, and illegal partitioning. There was poor housekeeping in almost half of the bedrooms in the units (46.6%).

## 3. ABLUTION FACILITY

### 3.1. General Hygiene and Structural Facility in the Ablution areas

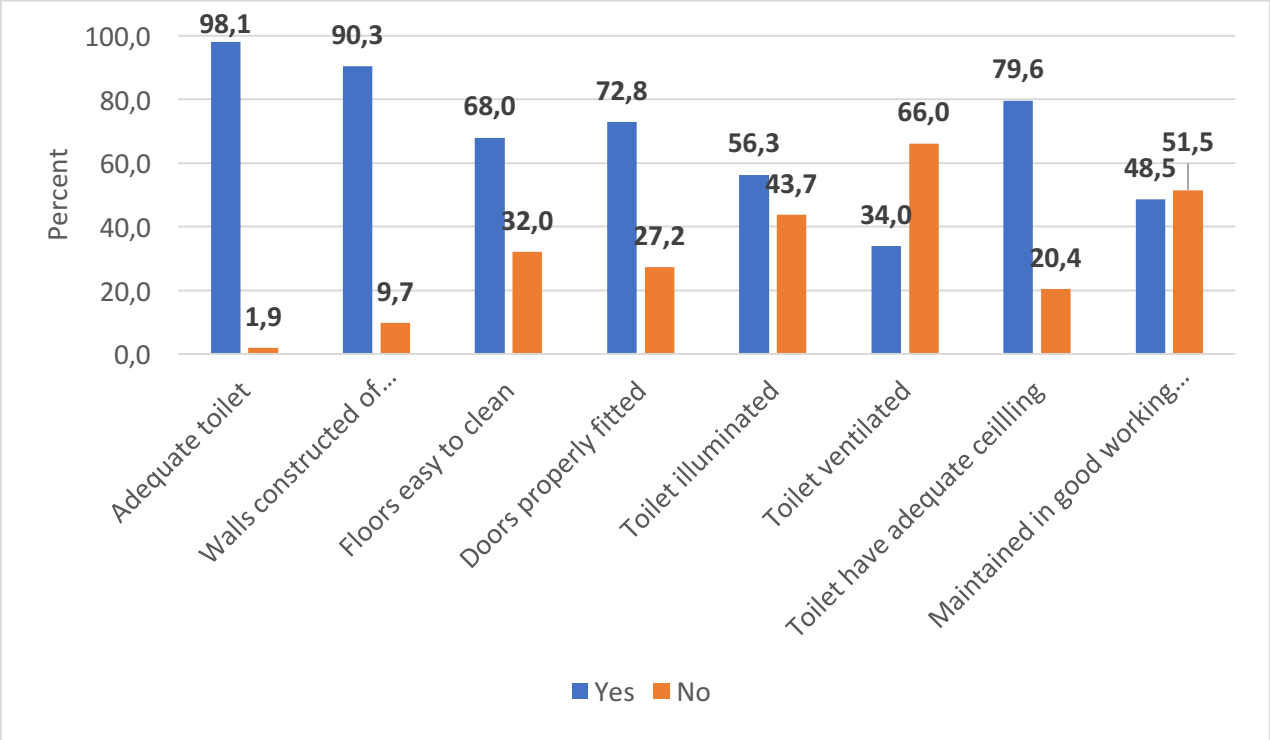


*Figure 4.27. General hygiene and structural condition of the ablution facilities.*

Each unit housed one bathroom. Figure 4.27 records the general hygienic conditions of bathroom areas and their structural condition. The walls have been built with hard walls, which are impervious (90.3%) and with a sufficient ceiling (79.6%). However, 27% of the doors of toilet facilities were not properly fitted and illumination (43.7 %) was poor. Just over half (51.5%) of the ablution facilities were not adequately maintained. This included a lack of cleanliness, disposal of foreign articles, leaking pipes, and a lack of seat covers. Poor ventilation (66%) was also noted.

## SECTION C. INFERENTIAL STATISTICS

### 1. CHI SQUARED STATISTICAL TEST OF INDEPENDENCE

A Pearson chi squared independent statistical test was performed to determine the significance of the results in relation to the null hypothesis. The null hypothesis indicates that there is no relationship between the two variables being studied (health risk factors and health symptoms). The *p* value <0.05 is statistically significant, which indicates strong evidence against the null hypothesis. This means that the null hypothesis will be retained and the alternative hypothesis will be rejected. *P* value <0.05 states that the results are due to chance and are not significant in terms of supporting the idea being investigated. The alternative hypothesis is more credible if it is concluded that the null hypothesis is not true.

The alternative hypothesis states that the independent variable has had an impact on the dependent variable and that the results are significant in terms of supporting the theory being investigated and that the results are not due to chance. The level of significance between the risk factors and the health outcome was presented as *p* values between 0 and 1. A *p* value of <0.05 is statistically significant. This indicates strong evidence against the null hypothesis. This means that the null hypothesis will be rejected and the alternative hypothesis accepted, while the *p* value of >0.05 is statistically insignificant. It indicates a strong evidence of the null hypothesis. This means that the null hypothesis will be retained or will not be a rejected null hypothesis.

### 2. PHI COEFFICIENT AND CRAMER'S V CORRELATION TEST

After a Chi squared test was determined, Phi Coefficient and Cramer's V Correlation test was then performed to determine the strength of association between variables. Following a Chi squared test, the Phi and Cramer 's V correlation test were then performed to determine the association strength between variables. Haldun (2018. 92) explained Phi and Cramer 's V correlation test as a measure for the strength of an association between two categorical variables. It varies between 0 and 1. Haldun

(2018: 92) added that an interpretation of Phi and Cramer's V include >0.25: Very strong, >0.15: Strong, >0.10: Moderate, >0.05: Weak, >0: No or very weak.

## 3. SIGNIFICANCE AND STRENGTH OF ASSOCIATION BETWEEN HEALTH RISK FACTORS AND HEALTH OUTCOME

*Table 4.10. The relationships of health risk factors in a dilapidated building and health status of respondents.*

| Health Risk Factor | Health outcome | P-value | Phi/ Cramer's V (φ) |
|---|---|---|---|
| Loud music | Sleeplessness | .020 | .275 |
| Loud music | Severe Headache | .114 | .207 |
| Not using elevator | Painful ankles | .002 | .351 |
| Crime | Depression and anxiety | .003 | .018 |
| No openable windows | TB | .035 | .197 |
| Number of windows | Sweating | .018 | .314 |
| Removed waste zero times | Medical attention | .004 | .021 |
| Removed waste once per week | Medical attention | .003 | .08 |
| Removal of waste | Cancer | .267 | .715 |
| Removal of waste | Respiratory infections | .321 | .500 |

Table 4.10 shows the level of significant (*p* values) and strength of association (Phi/ Cramer's V) between health risk factors and health outcome. The chi-square independence test between loud music and severe headache was statistically insignificant, $p$=0.114, with very strong evidence, Phi and Cramer's V=0.207. However, sleeplessness was found to depend on loud music ($p$=0.002) with very strong evidence, Phi and Cramer's V=0.275. The results also show a statistically significant association ($p$=0.002, phi and V=0.351) between the painful ankles experienced and the elevator not being used to reach the upper floors.

With regard to the above results, there was also a strong evidence of alternative hypothesis, including crime and depression / anxiety ($p$=0.003, phi and V=0.018), lack of air circulation through open windows and TB ($p$=0.035, phi and V=0.197), enervated waste removal versus medical attention seeking ($p$=0.003, phi and V=0.197). In this regard, a strong evidence against the null hypothesis was presented. While findings in certain variables indicated that there was strong evidence of a null hypothesis, null hypothesis was not therefore rejected. These included wastes removal versus cancer

(*p*=0.267, phi and V=0.715), respiratory illness (*p*=0.321 phi and V=0.500). Table 11 further shows the significance and strength of association between other significant variables to be noted.

*Table 4.11. Significance and strength of association between other significant variables.*

| Variable 1 | Variable 2 | p-value | Phi/ Cramer's V |
|---|---|---|---|
| Monthly income | Highest level of education | .003 | .368 |
| Removal of waste | Odours emanating from waste | .988 | .000 |
| Monthly income | Occupation | <001 | 455 |
| Monthly income | Number of people share the unit | .183 | .287 |
| Monthly lease | Occupation | <001 | .361 |

## 4.3. CONCLUSION

This chapter presented results of the study. Raw data was transformed into meaningful information through statistical analysis which included both descriptive statistics in the form of graphs, tables, and inferential statistics using chi square, Phi and Cramer's V tests. The chapter described health risk factors in a dilapidated building and thus determined how those factors influenced the health conditions of the building occupants. The following chapter discusses the findings of the study.

# CHAPTER 5

# DISCUSSION

## 5.1. INTRODUCTION

The main objective of this chapter is to discuss the findings of this study. The study focused on determining the health risk factors impacting occupants of a dilapidated building in Durban, South Africa. The study also determined how identified health risk factors had an impact on the health status of occupants.

## 5.2. DEMOGRAPHICS AND SOCIO ECONOMIC PROFILE

In the context of the administered questionnaire survey, demographics and socio-economic profiles were obtained. One of the primary objectives of the demographic profile was to understand the living conditions in the units and the profile of the respondents. There was no statistically significant difference between males and females with regard to gender. A significant difference ($p$<0.001) has been found in the age distributions. The majority of the respondents were between age 18 – 45, both males and females. This age category could have been enlarged by the fact that majority of occupants were students (32%) and employed (48%).

The monthly revenue of the HoH had to be determined, as the individual may be involved in the operating costs and financing of the household utilities. The minority of respondents (12.6%) earned R10 000 and more while less than half (44,7%) earned an average income below R4000 ($p$<0,001). This could be attributed to the level of education and the type of job held by the ~~of~~ respondents. The results showed that the monthly revenue from HoH and their level of education ($p$=0.003, phi and V=0.368) is significantly linked to employment ($p$=0.002, phi and V=0.445).

Major (2013) as cited by Kenneth, Faith and Nkechi (2019: 109) found that people who earned less than the average were more likely to have insufficient building resources. Inadequate building costs may lead to compromised alternatives, as in the context of an inspection survey, for example, certain units have constructed a make-shift separation from sheets/boards rather than from steel or other standardised materials, Poor lighting was also evident in certain areas. Significantly, more respondents paid rental between R1000 and R2000 per month ($p$<0.001) which was the lowest amount paid. The occupation and respondents have had a significant association with the monthly rental ($p$=<0.001, phi and V=<0.361). Mainly the self-employed and students fell into this category. The majority of employees with higher education were in the R3000 – R4000 or > R4000 pay category.

## 5.3. HEALTH RISK FACTORS IN THE UNITS AND THEIR IMPACT UPON THE HEALTH STATUS OF THE RESIDENTS

A building is a key determinant of occupant health (Yusuf 2012: 33). Similar health risk factors present in dilapidated buildings have been identified as those outlined by Zhang, Mo and Weschler (2013: 751). These factors include poor air quality indoors, violence and crime, poor sanitation, poor waste disposal, hazardous electrical installations, malfunctioning, lift failure, and overcrowding. A survey on the health consequences of these health risk factors has revealed that more than 50% of the sample group sought medical care in the last three months. Diarrheal illness (67%), TB (54%), respiratory infection (71%), depression and anxiety (68%), asthma (55%), insomnia (53%) and cancer (33%) were some of the reasons submitted for seeking medical attention, along with other reasons, which accounted for 23%. Kenneth, Faith and Nkechi (2019: 105) consider buildings to be an environment with a significant impact on the health, satisfaction and overall well-being of the occupants. The impact of these health risk factors on occupant's health is discussed below:

### 5.3.1. Ventilation and Air Circulation

Zhang, Mo and Weschler (2013: 751) identified poor indoor air quality as a main health risk factor in dilapidated buildings, mostly due to emissions from peeling paints, deteriorating furnishings, floors and wall coverings. The results showed that 26.2% of areas used mostly during the day did not have windows open to allow air circulation, while 36.9% of these areas had only one window. The inspection survey found that some areas had inadequate ventilation due to boards/curtains separating the area according to desires of the owner of the unit. Observation from the inspection survey showed that broken windows had been replaced by boards, which caused obstructed windows that prevented air from circulating in the units.

Kondo *et al*. (2015: 11) added in similar conclusions, that broken windows in dilapidated buildings also indicate social unrest and tolerance of criminal acts, noting that new doors, new windows and newly cleaned buildings could indicate to the potential offenders that the building is occupied and violent and nuisance crimes would not be tolerated. The absence of air circulation in the building was a major health risk factor in the symptoms of TB and sweat at night. The null hypothesis between the lack of circulation of air through open windows and TB ($p$=0.035, phi and V=0.197) was strongly demonstrated. Sweating ($p$ =0.018, phi, and V=0.314) was also associated with lack of circulation of air through open windows.

### 5.3.2. Waste Management

The results of the study showed that deficiencies in waste management practices created an unconducive environment which directly affected hygienic standards. These impacts included the presence of flies (46%), rodents (27%) and cockroaches (51%) in the units. Most of these hazards could be attributed to the retention of generated waste in units for a longer period of time prior to disposal. Waste removal took place once a week (15.5%) and non-removal of waste at all accounted for 10.7%. The findings confirm a statement by Kenneth, Faith and Nkechi (2019: 109)-that the lack of proper waste management practices creates poor housing conditions and unconducive environments.

Unremoved waste materials led to offensive smells that affected the surroundings. and 49% agreed that smells emanated from waste accumulated (p =.012, phi and V=0.114). (*p*= 0.012). The majority of respondents (77%) stored generated waste material in the kitchen, 61% utilised bins (61%), while other occupants left plastic waste lying around with no means of managing it. Such results reflect the findings of Yoada, Chirawurah and Adongo (2014: 3) regarding the types of waste and disposal methods used by households for solid residues generated. Food waste was identified as the largest waste in the study area with 93.1% stating that food was produced as solid waste. Other waste types identified included plastics (64.3%), bottles (47.3%), paper (36.0%) and old clothing (21.2%). It was also found that most households (82,7%) did not separate waste into different sections before disposal, whereas 75% did not contain their waste during storage.

Despite evidence in literature linking the exposure to solid waste and health outcomes, the results show that waste management practices are insignificantly related to seeking medical attention, with cancer (*p*=0.267, phi and V=0.715) and respiratory (*p*=0.321, phi and V=0.500). These findings were not consistent with the results of Ziraba, Haregu and Mberu (2016: 7), which demonstrated that the health impacts of waste range from mild psychological effects to severe morbidity, disability or death. Ziraba, Haregu and Mberu (2016: 7) further illustrated a framework (Figure 5.1) for understanding the linkages between poor solid waste management and adverse health outcomes. Such inconsistent research findings could be attributed to the fact that Ziraba, Haregu and Mberu (2016) examined potential health impacts of solid waste management on broader scale, including all solid materials discarded from households, industries, healthcare, buildings, farming, commercial and institutional sources, as well as municipal solid waste. This comparison, however, shows that waste accumulation at household level could have health consequences. Therefore, evidence of the link between poor solid residues and adverse health outcomes calls for all stakeholders to understand, prioritise and address the issue of solid waste among us, so that a sanitary environment and good is health are maintained (Ziraba, Haregu and Mberu 2016: 8).

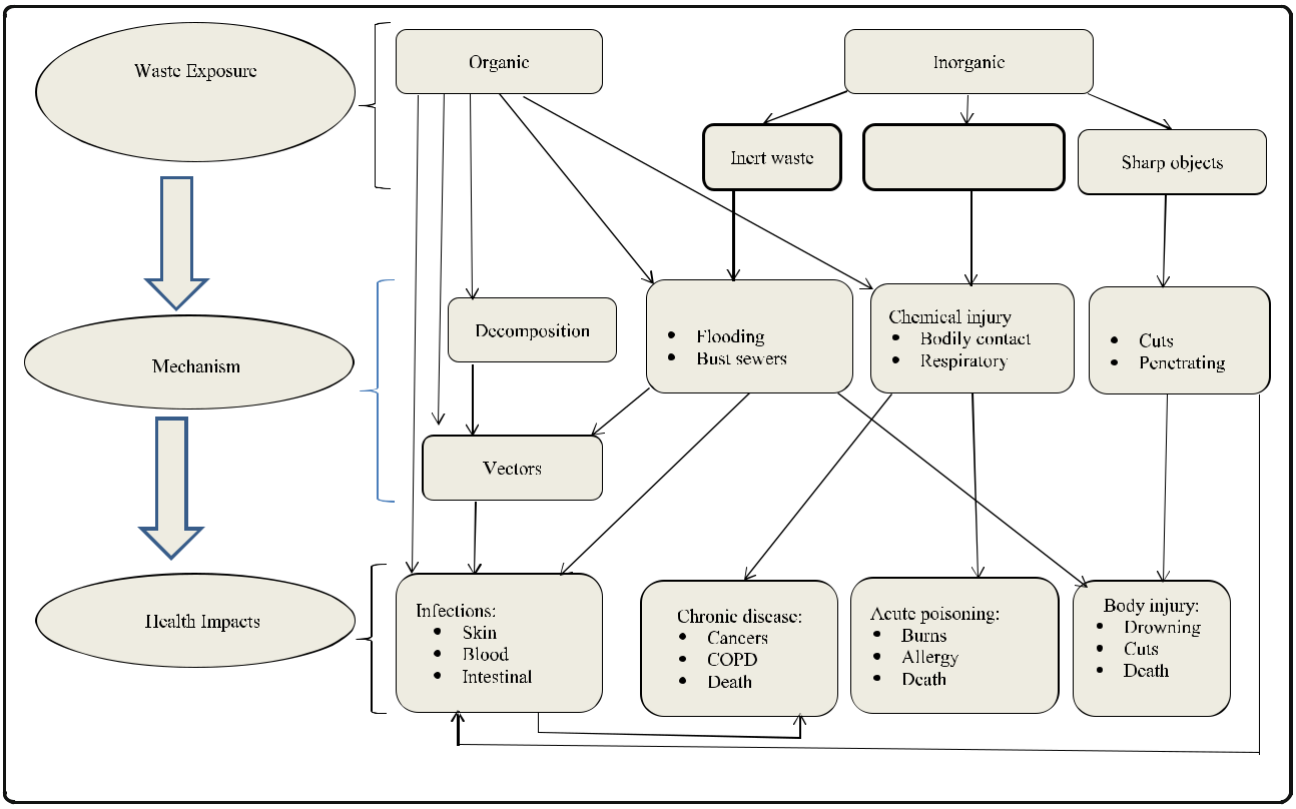


*Figure 5.1. Linkages between poor solid poor solid waste management and adverse health outcomes (Ziraba, Haregu and Mberu 2016: 7).*

### 5.3.3. Violence and Crime

Dilapidated buildings have been shown to become a major source of social concern due to the growth in criminal activity (Badiora and Afon, 2013: 23). The results show that respondents in the building experienced various criminal activities (91%). Badiora and Afon (2013: 23) reported higher rates of crime in neglected buildings, including unit breaking and stealing, child abuse, sexual harassment, child abandonment, attempted rape, pick-pocketing, impersonation, car hijacking, robbery, prostitution robbery and the receipt of stolen property. Furthermore, Badiora and Afon (2013: 16) reported on the persistence of high criminality in urban slum buildings and further demonstrated the link between declining urban buildings and criminal activities. The effects of drug use in the building seemed also greater and could lead to violence and criminal activities. Eighty-six percent of the occupants reported being affected by activities involving drug users.

Kondo *et al*. (2015: 2) have correlated abandoned, dilapidated buildings with drug addiction, an increased sexually transmitted disease rate, and premature death. The findings of this study also support the current knowledge, by identifying prostitution (73.2%), smoking (62.7%), alcohol consumption (73.6%) to be perpetuating factors of crime and violence and the seeking of medical attention.

These results are consistent with the existing knowledge. For example, Kondo *et al*. (2015: 11) have also found a link between abandoned and dilapidated buildings and crime. The effect of the new regulation on crime involving abandoned buildings was further tested in the town of Philadelphia between January 2011 and April 2013. The new regulation required property owners of abandoned buildings to install working doors and windows in all structural openings or face significant fines. The researcher used a difference-in-differences approach and a Poisson regression models to compare differences in pre-and post-treatment measures of crime for buildings that were remediated as a result of the regulation (n=676) and randomly-matched control buildings that were not remediated (n=676). The researcher also controlled sociodemographic and other confounders measured around each building. Building remediation was significantly associated with citywide reductions in overall crimes, total assaults, gun assaults and nuisance crimes ($p$<0.001).

### 5.3.4. Water Suppliers

The results from the interviewees largely indicated that water was sufficient and there was no concern about the quality of that water. The quality of water has also been shown to be aesthetically acceptable. Inspection observations revealed that about half of the total number of kitchens had water leaks, appearing to be brought by lack of maintenance of the water piping system. In some kitchen and ablution areas, some of the units managed the liquid wastes poorly, and in some areas efficient means of disposal of water used were not adequate (30%). The main reason for this was that the discharge was filled with particles and dirt (63.1%). Thus, in some areas (44,7%) gray water was not safe because of overflow and slow movement of water.

Improper management of suppliers of water, waste water and drainage include odours, water contamination and mosquito breeding areas, causing infections and diseases like diarrheal diseases. In the last three months, 67% of respondents reported experiencing diarrheal symptoms. The study did not, however, determine microbiological water contamination in the building. Nevertheless, a significant number of respondents, just under 50%, reported that the water had an unusual colour (39%), 20% believed that the water had an unusual taste and 28% that there was dust residue in their potable water. In addition, the World Health Organization (2017: 30) has indicated that poor supply of drinking water, poor sanitation and poor health conditions may cause diarrheal infection.

### 5.3.5. Sanitation

Each unit has one toilet shared between unit inhabitants. However, 14.6% purported to be sharing the bathroom with the inhabitants of other units. This activity could be attributed to friendly associations and toilet dysfunction in other units. Within the units, 83.5% stated they shared the toilet with three or more people (5% was shared by >10 people ($p$<0.001)). With respect to each unit's cleanliness, 33% of respondents cleansed their toilet at least once a day, whereas other respondents had different cleaning frequencies, including two times a day (10.7%), three times more (12.6%), and once a week (22%), Astoundingly, 10.7% admitted that they did not clean their toilet facilities.

Observation from the inspection survey showed that little more than half (51.5%) of the ablution facilities had not been maintained in good order. Areas of defect include cleanliness, disposal of foreign objects, leakage of pipes and absence of seat covers. Poor ventilation (66%) was also noted. Olukanni *et al*. (2014: 37) found similar results in relation to urban household sanitation. Moreover, poor sanitation was mostly characterized by indifference, which was essentially associated with poor maintenance, indiscriminate dumping of waste in drains and ineffective drainage systems (Olukanni *et al.* 2014: 37). it is then proposed that sustained cooperation between key players be developed to address poor sanitation and access to drinking water, as well as ongoing public awareness and awareness campaigns on the dangers of building facilities neglect.

### 5.3.6. Electrical Installations

The results showed that 29% of respondents felt that their electrical installation was unsafe. Some explained that when engaging with electrical equipment, they encountered electrical shock. Fire-extinguishers were not supplied to their units.

### 5.3.7. Overcrowding

Over the years, literature showed that overcrowding contributed to poor housing conditions. An analysis of occupancy of unit rooms was conducted by Kenneth, Faith and Nkechi (2019: 113). Its findings averaged six to ten people living in a room. Kenneth, Faith and Nkechi (2019) further explained that this was the main factor contributing to the poor living conditions. Similar results also indicate that the average size of the households in the study area dropped to between five and six people (Owoeye and Adedeji 2013: 100). In this study, similar findings were confirmed for the number of people living in units (mean = 5.8) and people living with bedroom (mean = 5). Results of the inspection survey reveal that increased occupancy resulted of people give up their apartment in exchange for rent, as the Major (2013) had revealed. Inspection survey findings show that many households (72.3%) have accommodated and used a single room for several household activities; watch TV, sleep, eat, clothes and closet.

Owoeye and Adedeji (2013: 100) revealed some elements that have compounded the increase in occupancy. The report stated that 57.2% of the population lived with their families; 17.8% preferred to live in low housing rental levels compared to other areas of the city, whilst 25.2% live in the region due to proximity to their working places in order to reduce transportation costs. The results of this study show that residents were students, staff and self-employed alike. Populated environments generally have a considerable impact on human health. The health consequences of building overcrowding were underlined by Lucas (2011). Those effects involved the lack of comfort, development of diseases such as tuberculosis and respiratory infections.

### 5.3.8. Use of Elevator

Elevator usage was observed in the building and it was that 37 % of respondents said they did not use a lift to reach their units, while 20% said they used the lift intermittently. Seventy-five percent (75%) of those who do not use the elevator, cited lift delays and overloaded (17.9%) amongst reasons for not utilising the lift. The results of the study show that painful ankles and access units without lift are statistically significant ($p$=0.002, phi and V=0.351). Furthermore, the results show an increase in the use of the lift as the number of floors increases. Contradictoriy, the $10^{th}$ floor was the highest floor in the building, yet of the total, the results showed a steady decrease in the number of people using the elevator (6.5%). This could be mainly due to the time spent waiting for the elevator. Analysis showed that age was also an important factor in the use of the elevator. Eighty per cent (80%) of the total number of people over 65 years of age used the elevator to reach their units, while less than half of the total number of people between the ages of 18 and 35 used the lift to reach their units.

## 5.4. CONCLUSION

The results of the study were discussed in relation to its patterns and current literature. The following chapter presents conclusions and recommendations for the study results.

# CHAPTER 6

# CONCLUSION AND RECOMMENDATIONS

## 6.1. CONCLUSION

The survey showed that conditions in a dilapidated building are strongly linked with adverse health results. A wide range of risk groups has affected occupants' health, mainly from poor solid waste management, crowded units, and crime. Dilapidated building conditions were linked to a wide range of health problems and symptoms including respiratory infections, headaches, sleepless asthma, crime, ankle pain and mental health. The results of this survey are similar to the findings made by Kenneth, Faith and Nkechi (2019: 116), that population density was the cause of poor housing conditions in the study area, poor waste management, degrading congestion and overcrowding of housing standards, lack of water supply in the field and poor quality of building materials. The researcher has also disclosed the consequences of poor housing conditions similar to the findings of this study, including poor conditions, unconducive environment, the easy spread of disease, degenerating housing standards, constant repairs, congestion and overcrowding as factors contributing to transmissible diseases.

The current policies are not sufficient to cover the challenge of combating harsh living conditions in residential buildings and their implementation is far from adequate. Interventions to protect building occupants, including supervision and fines and sanctions, are not completely implemented and many people in high-risk buildings are overlooked. In recognition of the scope of the challenge and in recognition of the limited government authorities' resources, it is important to participate strategically on a number of levels in order to produce evidence that helps to highlight the problem and to foster awareness of the responsibilities of landlords, residents and public health authorities.

There is a paucity of research in relevant literature, in particular with regard to the evaluation of risks and results on health outcomes in hazardous buildings. This study formed a framework that could be utilised as a tool to promote awareness at all levels including policymakers, researchers and building owners. Further research studies in relation to dilapidated buildings is vital because the impact is not limited only to those who live in bad buildings, the safety of the public and the health system in general is also challenged. A well-founded approach is therefore required to ensure that buildings are adequately maintained. This will assist in the reduction of infectious diseases and fire risks, a reduction of injuries and the protection of human health to relieve our immensely stressed health systems.

## 6.2. RECOMMENDATIONS

Building dilapidation in South African cities is an increasing phenomenon. The literature has revealed that this phenomenon affects both residential and workplace buildings, where occupants face a variety of health risk factors that affect their state of health. Evidence from the results of this study regarding the connection between health risk factors in dilapidated buildings and negative health outcomes, calls for action from all stakeholders to understand and to prioritise the issue of building dilapidation. Interventions to ensure healthy buildings and to prevent building dilapidation require a tripartite approach which will include government, building owners and occupants working together for the interest of maintaining and preserving buildings for better health of the occupants. Every stake-holder has a role to play in ensuring building health. The following is an example of this proposed model (Figure 6.1);

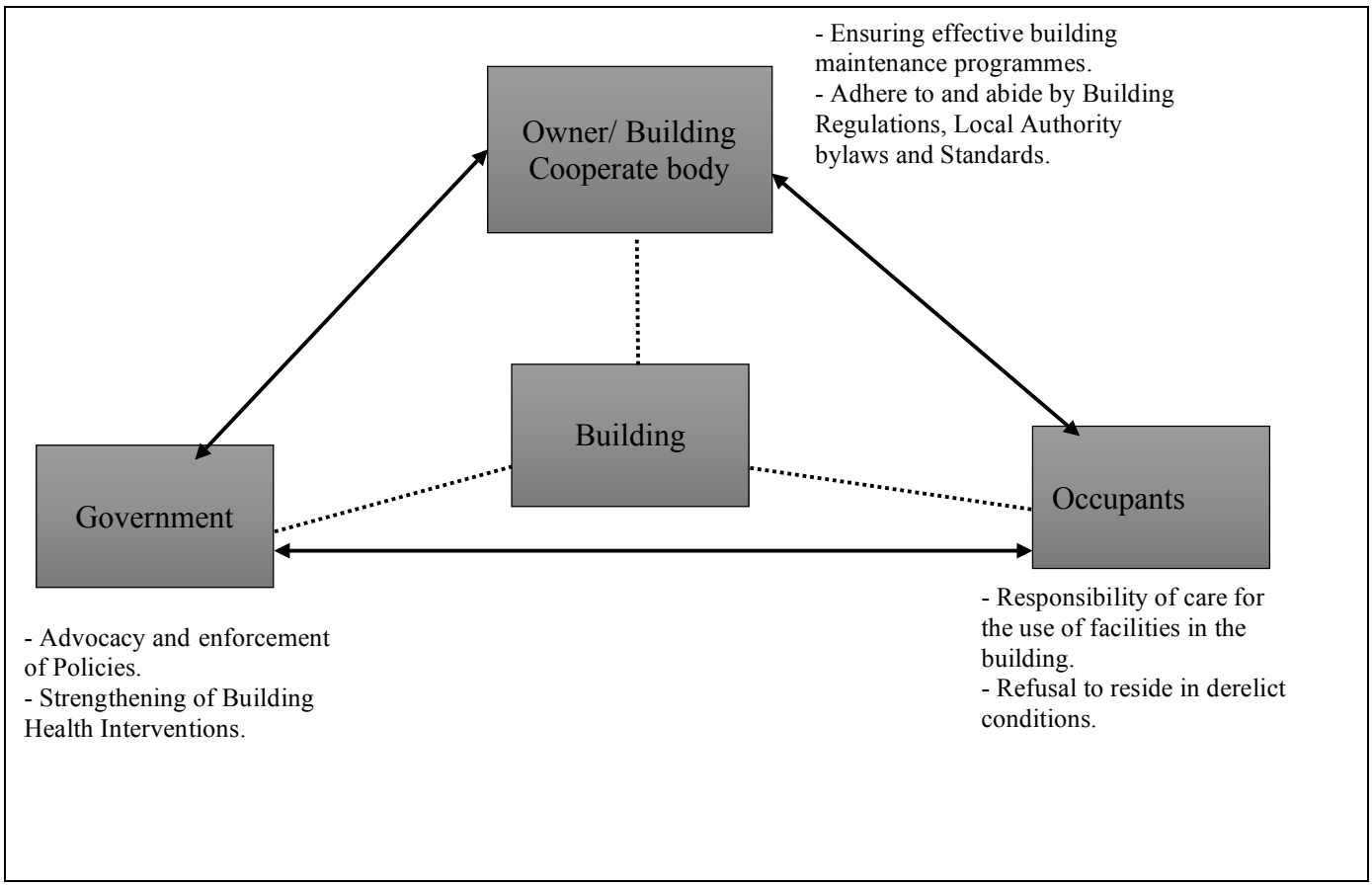


*Figure 6.1. Proposed Model for building health Tripartite approach.*

*Table 6.1. Roles to be played by each stake-holder in ensuring building health.*

| PARTY | ROLE | DESCRIPTION | SUCCESS ASURANCE |
|---|---|---|---|
| All Spheres of Government (National, Provincial, and Local | • Reinforcement of health interventions in building<br>• Transition from policy to full implementation.<br>• Strict fines or detention for hijacking perpetrators, abandoned buildings. | Strengthening areas such as Environmental Health Services, Municipal Health Services and Labour Inspections on Occupational Health and Safety will be a key strategy to guarantee building health.<br><br>Although these Departments already have multiple housing improvement strategies such as building legislation development and enforcement, housing assessment standards and health and safe building advocacy, implementing these policies and regulations in these sectors, however, is still a challenge. Some issues relate to the allocation of resources and to the political will to take decisions. | In order to ensure successful implementation, these areas must be fully supported, both in the areas of political will, resource allocation, legal proceedings and prosecution when dealing with building non-compliances such as poor sanitation, overcrowding and inadequate ventilation in buildings. When these measures are put into place within a policy framework, public health officials are more equipped and willing to build healthier homes in the face of poorer buildings. |

| | | | |
|---|---|---|---|
| Owner/ Building Corporate Body | • Maintenance and Monitoring. of building.<br>• Arrange / promote education and awareness programmes on building occupants' roles and responsibilities.<br>- Refrain from hijacking buildings, abandoned buildings. | The results of the study showed that the maintenance of buildings is a necessity for occupant health. Therefore, it is necessary to constantly change to safer buildings. This could include progressive implementation of specific actions, such as sorting waste at the point of production. | Engage multiple stakeholders in building maintenance activities, i.e. waste recycling, to generate a sense of responsibility and interest from all stakeholders. |
| Building Occupants | • Participate in and encourage building maintenance education and awareness programs.<br>• Take care of the facilities / amenities available.<br>• Refrain from occupying hijacked building, abandoned building. | Education on the role of the individual to ensure proper management of the building. That means that simpler actions like not littering/ smoking, and a grasp of negative effects of illegal wall separation can go a long way to ensuring sustainable buildings that will have positive health benefits. | Commit to building maintenance activities, develop building representatives and committees to be fully recognised and supported by building owner / Building Corporate bodies. |

## 6.3. LIMITATIONS

Although this study closes an important gap in the literature, there are a few limiting factors worth noting;

- The study focused on individual variable levels to obtain individual data for health symptoms and health status at the individual level. This data has been collected from participants by respondents. The decision concerning the health status of residents who live in a dilapidated building would also have been informed by individual diagnoses or a medical examination by the registered medical practitioner.

- The research found health risk factors in a dilapidated building by direct observation, based on physical identification of risk factors. Indoor air quality measurements such as ventilation, temperature and relative humidity are essential for identifying risk factors for indoor health in buildings.

## 6.4. STRENGTHS

- The study collected data from direct observations about the real living conditions in the units. In order to effectively collect useful information on a potential problem, the inspection sheet used organised facts and guided the researcher to establish boundaries for the data collection effort to prevent the collection of misinformation, insufficient data or irrelevant data.

- Although public health departments such as local authorities already offer Municipal Health Services to improve housing conditions, local governments may not, however, have the maximum resources to conduct household surveys and seek individual responses in a residential environment as per this study.

## 6.5. GENERALISATION OF THE FINDINGS

Generalisation concerns the extension to the general population of the research findings and findings of a study of sample populations. Provided that procedures regarding handling data have been heightened to ensure external validity of the study as per this study, this included sampling strategies and response rates. The findings of the study can therefore be generalised to the population in different buildings, where similar problems of abandoned/dilapidated buildings have been experienced, for instance, workplace buildings and other residential buildings. However, in those settings, further similar studies such as this may be carried out to be approximate.

## 6.6. AREAS FOR FURTHER RESEARCH

The study could not evaluate the effect of identified health risk factors on building occupants' health over time, as only cross-sectional data was available. The impact of health risk factors on building occupants' health over time can also be investigated by future studies. Control of possible confounding influences were also taken into account in this connection.

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## APPENDICES

## APPENDIX 1: PERMISSION FROM ETHEKWINI METROPOLITAN MUNICIPALITY

AREA-BASED MANAGEMENT UNIT
OFFICE OF THE HEAD ABM
77 Monty Naicker Road
Durban
4000

Tel: (031) 332
0442

17 December 2018

**Letter of support to M. Mdoda (Student No. 21429059), Granting permission to conduct the research study within the EThekwini Municipality**

Inner-City eThekwini Regeneration and Urban Management Programme in partnership with the Municipal Institute for Learning (MILE) considered your request to use EThekwini Municipality as a study area for your Masters degree in Health Sciences: Environmental Health. Titled; **Determining the health risk factors impacting residents living in dilapidated buildings in Durban, South Africa.**

It is a pleasure to inform you about the acceptance of your request

We also hereby assure you of our utmost cooperation towards achieving your academic journey. We believe the outcome of the study will benefit our Municipality in the future. **We therefore, stipulate as conditional that you present the results and recommendations of this study on completion to the related unit(s).**

Wish you all the best in this academic journey.

**iTRUMP Senior Manager: Inner-City eThekwini Regeneration and Urban Management Programme**

2018-12-18
**Date**

ETHEKWINI MUNICIPALITY
SAFETY AND SECURITY CLUSTER
18 -12- 2018
ITRUMP UNIT

## APPENDIX 2: PERMISSION FROM COUNCILLOR

ETHEKWINI MUNICIPALITY

**To Whom It May Concern**

This is to indicate our awareness of the research proposed by Mzimasi Mdoda, a student at Durban University of Technology. We are informed that the survey will be conducted at South Beach area (Ward 26), and will require participants from South Beach residents. The research is about determining the health risk factors impacting residents living in dilapidated buildings in Durban, South Africa.

This letter serves to confirm that Mr. Mdoda granted a permission to conduct research study at South Beach, Ward 26.

Yours faithfully,

_____

**Councillor C.B. Dlamini**
**(Ward – 26)**
**eThekwini Municipality**

19/12/2018
**Date**

Councillor Conrad Bongimusa Dlamini

COMMISSIONER OF OATHS
ETHEKWINI MUNICIPALITY
EX OFFICIO DISTRICT OF DURBAN IN
TERMS OF SECTION 6 OF ACT 16 OF 1963
(AS AMENDED) CITY HALL SECRETARIAT
Dr Pixley Ka Seme Street, Durban, 4001

## APPENDIX 3: PERMISSION FROM THE BUILDING OWNER

**19 December 2018**

**Permission to** use [redacted] **for piloting of your research study**

Dear,

Permission is granted to Mzimasi Mdoda to carry out work study related activities for his dissertation at [redacted] street, Durban. The title of the dissertation is **"Determining the health risk factors impacting residents living in dilapidated buildings in Durban, South Africa".**

Kindly contact Jameson for access into building 0313686974 or (078) 577-2230

Kind Regards,

Keith Naidu
**(Building owner)**

Signature

## APPENDIX 4: PERMISSION FROM THE BUILDING CORPORATE BODY

[redacted] Rd
South Beach, Durban
4001
17 December 2018

**Approval Letter to Conduct Research at [redacted] Building**

Dear Mr. Mdoda

Thank you for your request. As indicated we hereby grant permission to conduct research in line with your Master's dissertation, on the title of research: **Determining the health risk factors impacting residents living in dilapidated buildings in Durban, South Africa.**

We support this effort and will provide any assistance necessary for the successful implementation of this study.

Please ensure you always sign in with the building security, and sign out after completing any interviews.

Brandon Rennie

[redacted] Body Corporate:
Building Chair Person

Sign

17/12/18

Date

[redacted]
SUPERVISOR OFFICE: 031-3685682
[redacted] POINT ROAD

18/12/2018

## APPENDIX 5: FULL APPROVAL OF THE STUDY FROM INSTITUTIONAL RESEARCH COMMITTEE


**Institutional Research Ethics Committee**
Research and Postgraduate Support Directorate
2nd Floor, Berwyn Court
Gate 1, Steve Biko Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2375
Email: lavishad@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

**www.dut.ac.za**

15 January 2019

Mr M Mdoda
BB 1665 Isandlwana Clofe
Umlazi Township
4066

Dear Mr Mdoda

**Determining the health risk factors impacting residents living in dilapidated buildings in Durban, South Africa.**

The Institutional Research Ethics Committee acknowledges receipt of your final data collection tool for review.

We are pleased to inform you that the data collection tool has been approved. Kindly ensure that participants used for the pilot study are not part of the main study.

In addition, the IREC acknowledges receipt of your gatekeeper permission letters.

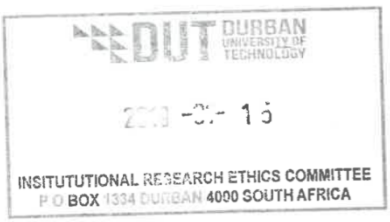
Please note that FULL APPROVAL is granted to your research proposal. You may proceed with data collection.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the IREC according to the IREC Standard Operating Procedures (SOP's).

Please note that any deviations from the approved proposal require the approval of the IREC as outlined in the IREC SOP's.

Yours Sincerely,

Professor J K Adam
Chairperson: IREC



## APPENDIX 6: LETTER OF INFORMATION


### LETTER OF INFORMATION

**Title of the Research Study:**
Determining the health risk factors impacting residents living in dilapidated buildings in Durban, South Africa.

**Principal Investigator/s/researcher:** (Mzimasi Mdoda, BTech: Environmental Health)

**Co-Investigator/s/supervisor/s:**
Supervisor: Ms. Emilie Joy Kistnasamy (MTech: Environmental Health)

**Brief Introduction and Purpose of the Study:**
The main purpose of the investigation is to determine the health risk factors impacting residents living in dilapidated buildings in Durban, South Africa

**Outline of the Procedures:**
The research team will administer a questionnaire to the head of the household after informed consent is received. Questions will be asked regarding any health symptoms experienced, the frequency of occurrence and the overall assessment of your experiences and living conditions in the building. You will be asked to indicate your health symptoms in some cases, whether they occur at work and in the building, or in the building only. The questionnaire could be completed within a maximum period of 30 minutes. The study includes head of the household residents who have resided for a period of six months and more. Visitors in the building, residents who are not head of their household who resided for a period of less than six months will be excluded. A researcher will also undertake an inspection survey in your unit using an inspection check sheet.

**Risks or Discomforts to the Participant:** Your participation in the study should not lead to any risk, including distress, discomfort, or anxiety. There is no physical or emotional hazard attached to this research. Any unexpected problems will be resolved sympathetically, however, the researcher is not able to offer assistance and may refer you to the appropriate personnel or authority.

**Benefits:** The study will encourage the city authorities and policy makers and bring attention to problematic housing which may strengthen current public health efforts to improve building conditions. Additionally, emerging issues such as indoor environmental quality, sanitation, overcrowding, and building maintenance can be

assessed further and solutions sought. These efforts may consequently improve health and benefits people's lives who are living in buildings in the city.

**Reason/s why you may withdraw from the study:** You may withdraw from participating in the study if you so wish to do with no need to give the reason.

**Remuneration:** There is no payment or other types of remuneration for participating in this study.

**Costs of the study:** You are not expected to cover any costs towards the study.

**Confidentiality:** This research involves two types of data collection methods (as described earlier: i.e. questionnaire administration and the inspection checklist). In all cases, confidentiality is maintained and the data collected will only be treated with confidentiality.

**Research-related injury:** Possibility of research related injury is not feasible. However, should there be a research-related injury or adverse reaction, it will be reported to the relevant authority with no compensation.

**Persons to contact in the event of any problems or queries:**

**The researcher**

| | |
|---|---|
| Name: | Mr. Mzimasi Mdoda |
| Cell no: | 084 083 2210 |
| Email: | 21429059@dut4life.ac.za |

**The supervisor**

| | |
|---|---|
| Name: | Ms. Joy Kistnasamy |
| Work no: | 031 373 2249/2696 |
| Email: | joyk@dut.ac.za |

**or**

The Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the Acting Director: Research and Postgraduate Support, Prof S Moyo on 031 373 2577 or moyos@dut.ac.za

## APPENDIX 7: CONSENT FORM


### CONSENT

**Statement of Agreement to Participate in the Research Study:**

- I hereby confirm that I have been informed by the researcher,

  _____ (name of researcher), about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: _____.
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

| _____ | _____ | _____ | _____ |
|---|---|---|---|
| **Full Name of Participant** | **Date** | **Time** | **Signature / Right Thumbprint** |

I, _____ (name of researcher) herewith confirm that the above participant has been Fully informed about the nature, conduct and risks of the above study.

| _____ | _____ | _____ |
|---|---|---|
| **Full Name of Researcher** | **Date** | **Signature** |
| _____ | _____ | _____ |
| **Full Name of Witness (If applicable)** | **Date** | **Signature** |
| _____ | _____ | _____ |
| **Full Name of Legal Guardian (If applicable)** | **Date** | **Signature** |

## APPENDIX 8: QUESTIONNAIRE


### QUESTIONNAIRE: HEALTH STATUS AND LIVING CONDITIONS

**Study ID No.: _____**

The objective of this questionnaire is to evaluate your health status and your living conditions.

**Investigator Introduction:**

My name is …….. I am conducting the research on Health risk factors. May I ask you few questions?

**IMPORTANT NOTICE:** I will ask each question and read out the options to you. Please **let me know which** option(s) applies to you and I will tick this / these off in the appropriate space provided.

Date questionnaire started (dd/mm/yyyy): ……/…../…….

Time interview started: _____

Interviewer's Name and Surname: _____

| SECTION A: DEMOGRAPHICS |
|---|

**1. SEX**

| | |
|---|---|
| 1. Male | |
| 2. Female | |
| 3. Other | |

**2. Age**

| | |
|---|---|
| 1. 18-25 Years | |
| 2. 26-35 Years | |
| 3. 36-45 Years | |
| 4. 46-55 Years | |
| 5. 56-65 Years | |
| 6. 66 Years and older | |

**3. What is your highest qualification?**

| | |
|---|---|
| 1. No education | |
| 2. Primary School | |
| 3. High School but did not pass Matric / Grade 12 | |
| 4. Matric / Grade 12 | |
| 5. Certificate | |
| 6. Diploma | |
| 7. Undergraduate Degree | |
| 8. Honours/ BTech | |
| 9. Masters | |
| 10. PhD | |

**4. Occupation**

| | |
|---|---|
| 1. Employed | |
| 2. Unemployed | |
| 3. Self employed | |
| 4. Full time student | |
| 5. Part time student | |
| 6. Other (please specify) _____ | |

**5. What is your personal monthly income?**

| | |
|---|---|
| 1. <R2000 | |
| 2. R2001-R4000 | |
| 3. R4001-R6000 | |
| 4. R6001-R8000 | |
| 5. R8001-R10 000 | |
| 6. R10 000 and > | |

**6. Ethnicity**

| | |
|---|---|
| 1. African | |
| 2. Coloured | |
| 3. Indian | |
| 4. White | |
| 5. Other (please specify)<br><br>_____ | |

**SECTION B: DESCRIPTION OF THE UNIT**

**7. Indicate the number of years you have been staying in this building**

| | |
|---|---|
| 1. Greater >6 months | |
| 2. <1 year | |
| 3. 1 year | |
| 4. 2 years | |
| 5. 3 years | |
| 6. 4 years | |
| 7. 5 years | |
| 8. > 5 years | |

**8. How much do you pay for rent per month in your household unit?**

| **Amount** | **Tick** |
|---|---|
| 1. Nothing | |
| 2. < R1000 | |
| 3. R1001-R2000 | |
| 4. R2001-R3000 | |
| 5. R3001-R4000 | |
| 6. R4001 and > | |

**9. What is the total rent paid for this unit?**

| | |
|---|---|
| 1. < R1000 | |
| 2. R1001-R2000 | |
| 3. R2001-R3000 | |
| 4. R3001-R4000 | |
| 5. R4001 and > | |
| 6. Not sure | |

**10. How many people are you sharing accommodation with in the unit?**

| | |
|---|---|
| 1. Number of people | |
| 2. Number of adults | |
| 3. Number of male children <5 years | |
| 4. Number of female children < 5 years | |
| 5. Number of people > 65years | |
| 6. Number of disabled | |

**11. Indicate the number of rooms you can use in the unit**

**(*Do not count Kitchen, Bathroom, entrance and Toilet*)**

| | |
|---|---|
| 1. One | |
| 2. Two | |
| 3. Three | |
| 4. Four and more | |

**12. What part do you mainly use to sleep at night and how many people sleep in that part of the unit?**

| **Part** | **Tick** | **No. of People** |
|---|---|---|
| 1. Lounge | | |
| 2. Dining room | | |
| 3. Kitchen | | |
| 4. Bedroom | | |
| 5. Sleep outside (balconies, terraces, passage) specify _____ | | |
| 6. Sleep away from the building (specify) _____ | | |

**13. How many windows can be opened directly in the open space, allowing the air circulation in the most used room during the day?**

| | |
|---|---|
| 1. None | |
| 2. Only one | |

| | |
|---|---|
| 3. Two | |
| 4. > two | |

**14. Which room you mostly use during the day? Indicate the number of people you normally stay with.**

| Room | Tick | No. of People |
|---|---|---|
| 1. Lounge | | |
| 2. Dining room | | |
| 3. Kitchen | | |
| 4. Bedroom | | |
| 5. Other (specify) _____ | | |

**15. How many windows can be opened directly in the open space, allowing the air circulation in the most used room during the day?**

| | |
|---|---|
| 5. None | |
| 6. Only one | |
| 7. Two | |
| 8. > two | |

**16. Do you use elevator to reach your unit?**

| | |
|---|---|
| 1. Yes | |
| 2. No | |
| 3. Sometimes | |

**17. On which floor is your unit located?**

| Ground Floor | 1st Floor | 2nd Floor | 3rd Floor | 4th Floor | 5th Floor | 6th Floor | 7th Floor | 8th Floor | 10th Floor | Other (specify) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |

**18.** (If no) **Q 15. Why you do you not use elevator to reach your unit?**

| | |
|---|---|
| 1. Not provided | |
| 2. Frequently stuck | |
| 3. Looks unsafe | |
| 4. Delays | |
| 5. Does not stop on my floor | |
| 6. Always overloaded | |

## SECTION B: ACCESS TO WATER SERVICES AND WATER QUALITY

**19. Indicate how do you get water in your unit.**

| | |
|---|---|
| 1. Tap Water System | |
| 2. Jojo Tank | |
| 3. Stand pipe taps | |
| 4. No water provided | |
| 5. Other (please specify) _____ | |

**20. What is the frequency of water supply in your unit?**

| | |
|---|---|
| 1. 24 hour supply | |
| 2. Once in two days | |
| 3. Once in three days | |
| 4. No water supply | |

**21. Is the water supply sufficient for your needs?**

| | |
|---|---|
| 1. Yes | |
| 2. No | |
| 3. Sometimes | |

**22. Have you observed any of the following in your drinking water?**

| | Yes | No |
|---|---|---|
| 1. Unusual colour | | |
| 2. Unusual odour | | |
| 3. Unusual taste | | |
| 4. Small living organisms | | |
| 5. Dust residue | | |

## SECTION C: SANITATION SERVICES

**23. How many toilet facilities do you have access to in your unit?**

| | |
|---|---|
| 1. Only one | |
| 2. > one | |
| 3. None | |

**24. What kind of toilet facility do you have in your unit?**

| | |
|---|---|
| 1. Water-borne system | |
| 2. Other (please specify _____ | |

| |
|---|

**25. Do you share this toilet facility with other residents from other units?**

| | |
|---|---|
| 1. Yes | |
| 2. No | |
| 3. Sometimes | |

**26. How many individuals are using a single toilet?**

| | |
|---|---|
| 9. <3 | |
| 10. 3-5 | |
| 11. 6-10 | |
| 12. > 10 | |

**27. How often is the toilet facility cleaned? By whom?**

| **Frequency** | **Tick** | **Responsible Person** |
|---|---|---|
| 1. 0 times | | |
| 2. once per day | | |
| 3. twice per day | | |
| 4. three times and more per day | | |
| 5. once per week | | |
| 6. twice per week | | |
| 7. Other | | |

**SECTION D: ELECTRICAL INSTALLATION**

**28. Indicate how you access electricity in your household unit?**

| | |
|---|---|
| 1. Prepaid electricity | |
| 2. Metered electricity | |
| 3. No electricity provided | |
| 4. Other (please specify) _____ | |

**29. Your electricity is safe to use.**

| | |
|---|---|
| 1. Strongly agree | |
| 2. Agree | |
| 3. Disagree | |
| 4. Strongly disagree | |

**30. Have you experienced any electrical shock when using electrical appliances in the unit?**

| | |
|---|---|
| 1. Yes | |
| 2. No | |
| 3. Sometimes | |

**31. Has the electricity caused fire in the past three months in the unit?**

| | |
|---|---|
| 1. Yes | |
| 2. No | |
| 3. Sometimes | |

**32. Is fire extinguisher provided in the unit for the event of a fire?**

| | |
|---|---|
| 1. Yes | |
| 2. No | |
| 3. Sometimes | |

**SECTION E: WASTE MANAGEMENT**

**33. How do you store general waste that you have generated in the unit?**

| | |
|---|---|
| 1. Bin | |
| 2. Plastic | |
| 3. No means provided | |

**34. Where do you keep general waste in the unit?**

| | |
|---|---|
| 1. kitchen | |
| 2. bedroom | |
| 3. other (please specify) | |

**35. Which of the following vectors are present in the unit due to accumulation of waste?**

| | |
|---|---|
| 1. Flies | |
| 2. Cockroaches | |
| 3. Rodents | |

**36. How often is the general waste removed from the unit?**

| **Frequency** | **Tick** |
|---|---|
| 1. 0 times | |
| 2. Once per day | |
| 3. Twice per day | |
| 4. Three times and more per day | |
| 5. Once per week | |
| 6. Twice per week | |
| 7. Other | |

**37. There are odours in the unit emanating from the waste.**

| | |
|---|---|
| 1. Strongly agree | |
| 2. Agree | |
| 3. Disagree | |
| 4. Strongly disagree | |
| | |

**SECTION F: ACTIVITIES IN THE BUILDING**

**38. Indicate whether you are affected by any of the following activities in your unit?**

| **Activity** | **Yes** | **No** | **Source of the impacting activity** | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | ***Neighbour unit*** | ***Roommate(s)*** | ***Visitors*** | ***Neighbour building*** | ***other*** *please specify* | ***Don't know*** |
| 1. Theft | | | | | | | | |
| 2. Crime | | | | | | | | |
| 3. Loud music | | | | | | | | |
| 4. Drug edicts | | | | | | | | |
| 5. Alcohol Drinkers | | | | | | | | |
| 6. Smoking | | | | | | | | |
| 7. Prostitution | | | | | | | | |
| 8. Other activities | | | | | | | | |

**39. Proper reporting channels available for reporting negative impacting activities in your unit.**

| | |
|---|---|
| 1. Strongly agree | |
| 2. Agree | |
| 3. Disagree | |
| 4. Strongly disagree | |

**40. Actions are taken against people performing impacting activities by the management.**

| | |
|---|---|
| 1. Strongly agree | |
| 2. Agree | |
| 3. Disagree | |
| 4. Strongly disagree | |

| SECTION G: GENERAL STATE AND HEALTH |
|---|

**41. Do you smoke?**

| | |
|---|---|
| 1. Yes | |
| 2. No | |
| 3. Sometimes | |

**42.** (If yes) **Q 41. How often do you smoke?**

| **Frequency** | **Tick** |
|---|---|
| 1. Once per day | |
| 2. Twice per day | |
| 3. Three times and more per day | |
| 4. Once per week | |
| 5. Twice per week | |
| 6. Other (specify) | |

**43. Have you smoked inside the building?**

| | |
|---|---|
| 1. Yes | |
| 2. No | |
| 3. Sometimes | |

**44.** (If YES) **Q 43. Which place you mostly use when smoking in the building?**

| | **Place** | **Tick** |
|---|---|---|
| 1. | Lounge | |
| 2. | Dining room | |
| 3. | Kitchen | |
| 4. | Bedroom | |
| Smoke designated area | | |
| 5. | smoke outside (balconies, terraces, passage) specify _____ | |

**45.** (If no) **Q 41. Do you stay with a person who smokes?**

| | |
|---|---|
| 1. Yes | |
| 2. No | |

**46. Has that person smoked at any of these places in the unit?**

| Place | Yes | No |
|---|---|---|
| 1. Lounge | | |
| 2. Dining room | | |
| 3. Kitchen | | |
| 4. Bedroom | | |
| 5. Smoke designated area | | |
| 6. smoke outside (balconies, terraces, passage) specify _____ | | |

**47. How often does that person smoke the unit?**

| Frequency | Tick |
|---|---|
| 1. Once per day | |
| 2. Twice per day | |
| 3. Three times and more per day | |
| 4. Once per week | |
| 5. Twice per week | |
| 6. Other (specify) _____ | |

**48. Do you drink alcohol?**

| | |
|---|---|
| 1. Yes | |
| 2. No | |
| 3. Sometimes | |

**49.** (If yes) **Q 48. How often do you drink?**

| Frequency | Tick |
|---|---|
| 1. Once per day | |
| 2. Twice per day | |
| 3. Three times and more per day | |
| 4. Once per week | |
| 5. Twice per week | |
| 6. Other (specify) | |

**50. Do you drink alcohol inside the building?**

| | |
|---|---|
| 1. Yes | |
| 2. No | |
| 3. Sometimes | |

**51.** (If yes) **Q 50. Which place do you mostly use when drinking in the building?**

| **Place** | **Tick** |
|---|---|
| 1. Lounge | |
| 2. Dining room | |
| 3. Kitchen | |
| 4. Bedroom | |
| Smoke designated area | |
| Neighbour's unit | |
| 5. Drink outside (balconies, terraces, passage) specify _____ | |

**52. Have you consulted a doctor in the last three months?**

| | |
|---|---|
| 1. Yes | |
| 2. No | |

**53.** (If yes) **Q 52. For what reasons (many possible responses)**

| **Reason** | **Tick** |
|---|---|
| 1. Breathing illness | |
| 2. Sleeping troubles | |
| 3. Depression and anxiety | |
| 4. Impaired mental health | |
| 5. Cancer | |
| 6. Asthma | |
| 7. Respiratory disease | |
| 8. Diarrheal illness | |
| 9. Tuberculosis | |
| 10. Other (specify) _____ | |

**54. Have you experienced any of the following symptoms in the last 6 months? (You may tick more than one).**

| Health Symptoms | Tick | | When are the Health Symptoms experienced? | | | Do symptoms subside when you leave your apartment? | | How soon do the symptoms subside? | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | All the times | Certain hours | Certain Seasons | | | | | |
| | Yes | No | | | | Yes | No | 5-10 min | 10-20 min | 20 and more |
| 1. Have you been coughing for two weeks and more? | | | | | | | | | | |
| 2. Have you felt fatigued? | | | | | | | | | | |
| 3. Have you experienced painful ankles? | | | | | | | | | | |
| 4. Have you recently coughed blood in the sputum? | | | | | | | | | | |
| 5. Have you experienced loss of appetite? | | | | | | | | | | |
| 6. Have you experience any chest pains? | | | | | | | | | | |
| 7. Have you experienced severe Headache? | | | | | | | | | | |
| 8. Have you been sweating more than usual at night? | | | | | | | | | | |
| 9. Have you had current fever or chills lasting more than three (3) days? | | | | | | | | | | |
| 10. Have you experienced fast breathing, and or difficulty in breathing? | | | | | | | | | | |
| 11. Have you experienced sleeplessness? | | | | | | | | | | |
| 12. Other | | | | | | | | | | |

**55. Do you have any chronic diseases?**

| | |
|---|---|
| 1. Yes | |
| 2. No | |
| 3. Not sure | |

**56.** (If yes) **Q 56. List these chronic diseases:**

i. _____
ii. _____
iii. _____
iv. _____
v. _____

**57. For each chronic disease, state what primary medication you take to help relieve your signs and symptoms**

| **Chronic disease** | **primary medication** |
|---|---|
| 1. | |
| 2. | |
| 3. | |
| 4. | |
| 5. | |

**SECTION G: GENERAL**

**58. Do you have any comments relating to the study?** _____

_____
_____
_____
_____
_____
_____

**Your participation in and contribution to this study is appreciated. Thank you.**

Time ended: _____

Date questionnaire completed (dd/mm/yyyy): ……/……/…….

## APPENDIX 9: INSPECTION CHECKSHEET


### Inspection Check Sheet

**Date inspection survey conducted (dd/mm/yyyy): ……/……./…….**

**Time inspection survey started: _____**

| | | | | |
|---|---|---|---|---|
| **Coding of the Building:** | | | | |
| **Floor Number** | | | | |
| **Room Number** | | | | |
| **ARE THE FOLLOWING FACILITIES AVAILABLE IN THE APARTMENT?** | | | | |
| | **YES** | **NO** | **No. of facility** | **No. of people using the facility** |
| **Kitchen** | | | | |
| **Lounge** | | | | |
| **Bed room** | | | | |
| **Toilet** | | | | |
| **Shower** | | | | |
| **Laundry** | | | | |
| | | | | |

### A. KITCHEN

| **STRUCTURAL FACILITIES** | | | |
|---|---|---|---|
| | **YES** | **NO** | **COMMENTS** |
| 1. Adequate and accessible kitchen provided. | | | |
| 2. Walls constructed of impervious material. | | | |
| 3. Floors constructed of a smooth surface that is easily cleanable and prevents the permeation of dampness. | | | |

| | | | |
|---|---|---|---|
| 4. Kitchen facility has adequately ceiling. | | | |
| 5. Kitchen facility adequately illuminated. | | | |
| 6. Kitchen facility adequately ventilated. | | | |
| 7. Kitchen facility maintained in good working order and in good repair. | | | |
| **Water supply** | | | |
| 8. Water supply is available in the kitchen for drinking and cooking purposes. | | | |
| 9. The water provided acceptable in appearance, taste, and odour? (Aesthetically acceptable). | | | |
| 10. Pipes and taps are firmly fitted to prevent water leaks. | | | |
| **DRAINAGE SYSTEMS** | | | |
| 11. Suitable and effective means of drainage and sewage. | | | |
| 12. Grey water disposed of quickly and safely. | | | |
| 13. Drainage systems kept clean and maintained so as to prevent any blockages. | | | |
| **HYGIENE PRACTICES** | | | |
| 14. The kitchen maintained in good order and cleaned regularly to prevent the occurrence of offensive smells and attraction of flies. | | | |
| **WASTE MANAGEMENT** | | | |
| 15. Waste storage area located such that it is not causing a nuisance. | | | |
| 16. Approved methods of solid waste collection, storage, and disposal adopted. | | | |

| | | | |
|---|---|---|---|
| 17. Waste generated in the apartment properly removed and stored at all times. | | | |
| 18. Waste storage containers are kept closed, and cleaned regularly to avoid attracting pests. | | | |
| **SAFETY ISSUES** | | | |
| 19. All electrical wiring properly insulated. | | | |
| 20. All electrical wiring properly mounted on the wall in a sound manner. | | | |
| 21. Is there enough free space in the room. | | | |

**B. TOILET**

| **STRUCTURAL FACILITIES** | | | |
|---|---|---|---|
| | **YES** | **NO** | **COMMENTS** |
| 22. Adequate and accessible toilet, bathing and washing facilities are provided. | | | |
| 23. Walls constructed of impervious material. | | | |
| 24. Floors constructed of a smooth surface that is easily cleanable and prevents the permeation of dampness. | | | |
| 25. Doors are properly fitted. | | | |
| 26. Toilet facility adequately illuminated. | | | |
| 27. Toilet facility adequately ventilated. | | | |
| 28. Toilet facility has adequately ceiling. | | | |
| 29. Toilet facility maintained in good working order and in good repair. | | | |
| **DRAINAGE SYSTEMS** | | | |
| 30. Suitable and effective means of drainage and sewage. | | | |
| 31. Waste water disposed of quickly and safely. | | | |
| 32. Drainage systems kept clean and maintained so as to prevent any blockages. | | | |
| **HYGIENE PRACTICES** | | | |
| 33. The toilets are maintained in good order and cleaned regularly to prevent the occurrence of offensive smells and attraction of flies. | | | |

| | | | |
|---|---|---|---|
| 34. Disposal of foreign objects/ items i.e. newspapers, sanitary towels, and food remains. | | | |

**C. BEDROOM**

| | YES | COMMENTS |
|---|---|---|
| 35. Number of people sharing the bed bedroom. | | |
| 36. Number of beds. | | |
| 37. Number of people sharing each bed. | | |
| 38. Beds in a good condition. | | |
| 39. Adequate bedding and linen available. | | |

40. **Other Items in the bedroom**

| ITEM NO. | ITEM DESCRIPTION | NO. OF ITEMS | COMMENTS |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| **STRUCTURAL FACILITIES** | | | |
| 41. Walls constructed of impervious material. | | | |
| 42. Floors constructed of a smooth surface that is easily cleanable and prevents the permeation of dampness. | | | |
| 43. Doors are properly fitted. | | | |

| | | |
|---|---|---|
| 44. Bedroom adequately illuminated. | | |
| 45. Bedroom adequately ventilated. | | |
| 46. Bedroom has adequate~~ly~~ ceiling. | | |
| 47. Bedroom maintained in good working order and in good repair. | | |
| **SAFETY ISSUES** | | |
| 48. All electrical wiring properly insulated. | | |
| 49. All electrical wiring properly mounted on the wall in a sound manner. | | |
| 50. There is enough free space in the room. | | |

**Time inspection survey ended: _____**

**Date inspection survey completed (dd/mm/yyyy): ……/……/…….**