OCCUPATIONAL SAFETY AND HEALTH STATUS AMONG WORKERS OF INFORMAL AUTOMOTIVE GARAGES IN ELDORET TOWN, KENYA

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RESEARCH THESIS SUBMITTED IN PARTIAL FULFILMENT FOR THE REQUIREMENT OF THE DEGREE IN MASTERS OF PUBLIC HEALTH OF MOI UNIVERSITY

DECLARATION

Declaration by the student

This thesis is my original work and has not been presented for a degree award in another university. No part of this thesis may be reproduced without permission of the author and or the University.

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DEDICATION

As all that was and all that is, I give glory to God. In memory of my father: Mr. Limo Tuwei, who held a dream worth waking, to my mother: Mrs. Hellen Tuwei, my wife: Mrs. Chepkemboi Cheruiyot, and my two children: Chepchumba Cheruiyot and Limoh Cheruiyot.

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ABSTRACT

Background: The informal economy sprawl contributes to challenges in occupational safety. Assessing the extent of primary occupational safety and health services compliance in informal automotive garages informs tailored interventions to improve workplace safety standards and reduce health problems in the sector.

Objective: The study's specific objectives were to assess the extent of occupational health services' implementation, common hazards, and work-related illnesses among workforces' in the informal automotive garages.

Method: A cross-sectional study of the informal automotive garages in Eldoret town was conducted between January and February 2021. Garage registration under Eldoret Juakali Association-North Rift served as the sampling frame, with finite population sampling of 130 workforces from 65 of the 80 registered garages. Stratified and systematic sampling of the eligible garages and purposive sampling of a manager/employer and a senior employee on duration of service was conducted in the survey. The study used a Likert scale questionnaire developed from the Occupational Safety and Health Act 2007 guidelines for the Directorate of Occupational Safety and Health Services on implementing occupational safety services. Quantitative data on occupational safety services implementation, hazard distribution, and work-related illnesses occurrence among the workforce were collected and analyzed using R statistical software version 3.6.3. Descriptive statistics were performed for occupational safety service implementation, hazard characteristics, and work-related illness. Simple linear regression was conducted to determine the association between occupational safety service coverage and work-related illnesses occurrence, using standard significance, $\alpha = 0.05$, at 95% confidence interval.

Results: Occupational safety services implementation was low (M = 2.33, SD = 0.64) in the informal auto garages. Twenty-six workshops (40%) conducted safety training, with a statistically significant difference in enterprise characteristics (type, $p = 0.001$; size, $p = 0.020$). Health surveillance, workplace inspection, and medical services were lacking in all the establishments. Physical (M = 4.00, SD = 1.64) and ergonomic (M = 4.00, SD = 1.73) hazards were the common occupational risks. Cuts/injuries (57.2%), musculoskeletal pain (52.5%), chest aches (49.2%), eye problems (45%), and breathing challenges (39.2%) were found to be the common work-related illnesses. The relationship between occupational safety coverage and workplace-related illnesses was not statistically significant ($p > 0.05$).

Conclusion: The informal automotive garages have low occupational safety services implementation. Inadequate primary occupational safety service coverage compromised workplace safety conditions indicated by high occupational hazards distribution and prevalence of work-related health problems among the garage workforces.

Recommendations: Relevant bodies including garage owners to ensure standard occupational safety services' implementation at worksites. Adequate occupational safety services coverage and inspection across the garages to foster adoption of standard health and safety practices in the workplaces would be beneficial in transforming the sector into a safe work environment.

LIST OF ABBREVIATIONS

CBD	Central Business District
DOSHS	Directorate of Occupational Safety and Health Services
EJANR	Eldoret Juakali Association- North Rift
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immunodeficiency syndrome
ILO	International Labor Organization/International Labor Office
ISO	International Organization for Standardization
KNBS	Kenya National Bureau of Statistics
OH	Ocuupational Health
OHL	Occupational Health Literacy
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Act
PPE	Personal Protective Equipment
SMB	Small and Medium-Sized Businesses
SMEs	Small and Medium Scale Enterprises
WHO	World Health Organization
WRI(s)	Work-Related Illness (es)

DEFINITION OF TERMS

Biological Hazards: Organic substances or those of biotic origins found in work environments consisting of unsanitary workstations, unhygienic equipment, rodents, insects, and bats posing diverse health threats to workforces (ILO, 2013a).

Chemical Hazards: Inorganic (non-biological) substances comprising solvents, fossil fuels, metal cleaners, lubricants, brake fluids, plastic glues, diesel exhaust fumes, and dust, with toxic properties capable of causing adverse health effects under workforces' exposure (ILO, 2013a).

Ergonomic Hazards: Workplace situations such as lifting heavy objects, uncomfortable postures, repetitive movements, and attacks and violence creating discomfort or strain and adverse effect on the musculoskeletal system (ILO, 2013a).

Exposure: The amount of hazardous substances from any particular material in a workplace in contact with a worker (ILO, 2013b)

First aid in work site: the immediate medical attention given to an individual following hazard exposure before seeking further health interventions from qualified health personnel (ILO, 2013b)

Hazard*:* A substance or condition of work environment with the potential to cause any form of damage to the health of an individual (ILO, 2013b)

Health risk assessment: The systematic assessment of nature and potential of hazard effect on an individual or population wellbeing, for estimating future risks and developing appropriate interventions (World Health Organization. International Expert Working Group, 2013).

Informal Sector/Economy: Business entities where sector characteristics consist of small non-registered enterprises with little division between capital and labor, lack of contractual relations and casual employment (ILO, 2013b).

Mixed Garages**:** A closed area undertaking car repairs in private owned plots, consisting or lacking structural establishments but operate extended roadside car repair services (ILO, 2015).

Open-Air Garages**:** A closed area undertaking car repairs in private owned plots, consisting of or lacking other structural establishments (ILO, 2015).

Occupational Accidents**:** An unexpected or unplanned occurrence of any form of injury or violence in a workplace (ILO, 2013a)

Occupational Diseases**:** Health conditions that arise through exposure to hazardous substances or conditions in a workplace (ILO, 2013a)

Occupational medical examination: Assessment of workers health at regular intervals during employment, resumption of work after occupation-related illness, and on termination of specific hazard-related action (Los et al. 2019)

Occupational Safety and Health Services: The primary health protection and promotion services under the guidelines of International Labor regulations such as health risk assessment, occupational medical examination, first aid, and safety and health training that guide the safety establishment of a workplace for the achievement of optimal health for the workforce (ILO, 2013b)

Occupier (or Employer): Garage owner responsible for the business establishment, providing and maintaining safe work systems and supervising compliance with safety guidelines (ILO, 2013b)**.**

Physical Hazards: A harmful agent or circumstance such as heat, cold, extreme weather conditions, noise, welding radiations, electric shock, sharp objects, and littered working space causing physical damage to workforces' body on exposure (ILO, 2013a).

Roadside Garages**:** An open area for undertaking car repair works located on specific sites of public road systems in urban centers, deficient of workspaces and any structural establishments (ILO, 2015).

Worker (or Employee): A person who provide services to an employer or client under a prescribed program for or no monetary compensation (Public Service Commission GOK, 2007).

Workplace: A place or area composed of premises or just a location where employees engage in work or related activities (Public Service Commission GOK, 2007)

Workplace Audit: A systematic process for examining hazard levels and risks to determine whether laid strategies meet the safety goals of a work environment (Public Service Commission GOK, 2007)

Work-Related Illness (es)**:** A negative health outcome or ill-health among workers, with etiology partly affected by work-related hazard exposures (ILO, 2013a)

Safety and health training: Educating workforces on occupational hazard characteristics, related illness, and safety approaches, shifting the responsibility of health management to a personal obligation (Garrido et al. 2020).

Unhygienic equipment**:** Dirty working equipment, including unclean work clothes or gloves resulting from inadequate cleaning or pests' contamination (ILO, 2021).

Unsanitary workstations: Unclean, dirty, or contaminated working environments with the potential to generate, promote, or transmit infections, injuries, or diseases (ILO, 2021).

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CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

1.1.1 Occupational Safety and Health.

Occupational safety and health (OSH) programs focus on instituting safe work practices and enhancing the population's wellbeing (International Labour Office, 2013a). However, despite this milestone in workplace safety regulation (Bonney, Forst, Rivers, and Love et al., 2017; International Labour Office, 2013a), work-related health problems continue to negate efforts towards the worldwide objective of improved quality of life. Rantanen, Lehtinen, Valenti, and Iavicoli (2017) established that high-income countries have higher coverage of occupational health services estimated at over 75%, while middle and low-income countries have below 30% accessibility. The United States has adopted workplace health promotion programs aimed at the informal economy's comprehensive integration into the OSH's regulatory framework (Linnan et al., 2019). However, the extension of occupational health protection in low-income countries remains a workplace safety challenge (Rantanen et al., 2017), upsetting efforts towards safe work practices.

Despite its significance in global health promotion, the goal for the achievement of decent work is yet to receive enough attention and priority in developing countries (ILO, 2016). Africa, in particular, suffers from OSH infrastructural and personnel challenges, creating huge workplace safety problems, with less than 10% of the workforce accessing OSH services (Lucchini and London 2014). The authors note the implications of workplace definition limited to typical manufacturing or processing industries to cause inadequate consideration of all workplaces in hazard mitigation. However, with the expanding informal economy attributable to poverty and limited educational attainment, competing socioeconomic and political interests have shifted

OSH concerns down the priority list in these economies (ILO, 2016). Export of high risks productions in developing countries and limited assimilation of safety knowledge have contributed to the increase of occupational challenges in these regions. Although the focus includes developing low-cost context-specific safety programs (Lehtinen and Rantanen 2018), the omission of workplace safety among developing countries has implications for the global health burden.

1.1.2 Occupational Hazards.

Although every work entails some risks, the physical layout of a workplace determines the level of exposure, with the magnitude varying widely across regions, sectors, and work types (Şenhaz et al., 2021; Shahzad et al., 2021). Work pressures compromise precautionary measures limiting recognition and response to hazards in the workplace (Ricci et al., 2021). With enhanced safety management ideologies, technological advances, and the export of high health risk labor-intensive productions to low-income countries, workplace hazards and exposure have substantially reduced in developed nations (Shahzad et al., 2021). Despite these achievements in mitigating occupational hazards, mature economies are experiencing significant trends in population and workplace with new distinct occupational risks. Inadequate replacement of aging OSH professionals and workforce and traditional work disruption by emerging technologies limits understanding and mitigation of occupational risks (ILO, 2019). These challenges disrupt work characteristics and undermine established safety programs compromising gains in hazard prevention and health protection.

High occupational risks in developing countries are due, in part, to informal economic sprawl and cracks in workplace regulations (Şenhaz et al., 2021). Most work environments suffer from poorly designed workplaces, including inappropriate location and structures, increasing the potential of occupational risk exposures and related health

problems (Lucchini and London 2014). The workplace risks concept in Africa omits psychosocial risks and hazard conditions in non-traditional industry settings such as domestic or agricultural occupations that likely experience high child and women labor. With the growth of the informal economies, most workplaces have inadequate risk prevention strategies resulting in a high proportion of occupation risks (Amponsah-tawiah and Mensah 2016; Keitany 2014b; Menya, 2012). High hazard exposures have also been reported in the manufacturing, mining, and automobile industries, highlighting the potential cumulative risks in most occupations (Elenwo, 2018; Gakire, 2016). These statistics show that occupational exposure to hazardous conditions remains one of the significant challenges of public health concern.

1.1.3 Work-Related Illnesses.

The occurrence of occupational-related health problems depends, in part, on the level of implementation of safety regulations (Hämäläinen, Takala, and Kiat, 2017). According to Hämäläinen et al. (2017), Europe has recorded a drop in occupational accidents over the years, achieving the lowest fatality rate of approximately 3.6 per 100,000 persons, while low-income countries, Africa in particular, have the highest proportion of over 16 per 100,000 persons. Although mature economies have integrated robust workplace health protection strategies, unregulated working hours have been implicated in increased alcohol abuse and associated mortalities (Pachito et al., 2021). Autism (Lam et al., 2016), skin dermatitis, and occupational asthma (Jarolímek et al., 2017) have been linked to systemic accumulations of chemicals and small particulate matter from toxic occupational exposures. Other common occupational-related health challenges include wrist injuries (Jarolímek et al., 2017), musculoskeletal, and osteoarthritis (Hulshof et al., 2021) from ergonomic hazard exposure.

Rushton (2017) analyzing the global burden of occupational diseases, reported over 313 million non-fatal accidents and 2.3 million work-related annual deaths. Hämäläinen et al. (2017) noted that developing nations contributed to two-thirds of the cases with occupational diseases accounting for over 85% of mortalities. Driscoll (2020) reported 76.1 million disability-adjusted life years attributable to occupational hazards, with developing countries contributing the highest proportion (36%) as of 2016. The ILO 2016 report indicated that Kenya had recorded an increase in work-related accidents from 355 in 2006-2007 to 6023 in 2010-2011. Occupational asthma has also been reported among spray paint workers in Kenya's informal auto garages (Mwatu 2011). Thus, as emerging economies develop, efforts must focus on enhancing occupational safety to minimize risk exposure and promote employee welfare.

1.1.4 Informal Sector.

In Africa, despite the insufficient availability of data on occupational-based health problems due to poor reporting (Antao and Pinheiro, 2015; Hämäläinen et al., 2017; ISO - International Organization for Standardization, 2017), a critical issue is that a vast majority of employees work in the informal sector. In Kenya, the 2018 economic survey shows a growth of the informal economy by 6.0 percent in the last five years, with current sector employment accommodating 14.1 million workforces as of 2017 (Kenya National Bureau of Statistics, 2018). Consequently, Rantanen et al. (2017) estimated that approximately 4% of the total workforce in Kenya receives occupational health services. Thus, with the expanding capacity of the informal economy, understanding and improving the informal sector's safety characteristics is fundamental in economic development.

The automotive garages in Kenya fall under the informal economy, making them vulnerable to governance neglect and a potential source of employee health problems.

Locational and structural problems resulting from urban planning challenges are typical characteristics of these informal enterprises (Siakilo, 2014). As profit-oriented and apprenticeship-based enterprises, most auto-garage employees in the informal sector have limited professional knowledge, negatively affecting occupational safety (Kenya National Bureau of Statistics (KNBS), 2018). The unsafe work environments expose employees to numerous hazards, with the potential to cause adverse health conditions, including acute and chronic health effects, besides acting as a suitable path for disease transmission in the population.

Therefore, given the informal economy's rapid growth, including massive demand for automotive garages driven by industrialization (KNBS 2018), developing countries must focus on enhancing occupational safety in this sector as a health protection and promotion tool to improve workforce's and overall population wellbeing.

1.2 Problem Statement

Occupational safety has received consideration from both leadership and regulatory institutions globally. Still, the informal sector is not the focus of attention, especially in developing countries. While the health concerns of employees in the formal sector have been extensively studied (ILO, 2016), there is inadequate knowledge of workers' safety and health characteristics in the informal economy (Menya 2012). Pressing sociopolitical and economic priorities in developing countries continue to negate attention toward workplace safety. These regions suffer from inadequate OSH expert capacity and face limited integration of appropriate safety processes and equipment, resulting in high occupational hazards and exposure, posing health risks to the population. The expanding capacity of the informal sector due to increased poverty and low educational achievement (ILO, 2016), as profit-oriented initiatives, undermine

efforts to workplace safety and increase occupational-related health burden in the population.

Eldoret town's strategic location as a business hub linking East and Central African Countries makes it a dynamic metropolitan center. A high rural-urban influx has led to rapid urban growth, with the informal economy sprawl contributing to challenges in occupational safety (Badoux et al. 2018). Menya (2012) reported high (26%) health complaints associated with workplace hazard exposures in informal metalwork sector of Eldoret town, with an estimated 20% of the workforce changing their jobs for health considerations. However, the informal sector occupational characteristics' implications on the population wellbeing in the area are under-researched (Menya, 2012); with little work exploring informal sector automotive garage workers' safety and health experiences (Ladou, London, and Watterson 2018). Therefore, it is necessary to understand the contribution of safety standards to the occurrence of health problems in the informal sector. The purpose of this study was to assess the extent of implementation of OH services, hazard characteristics, and the health conditions of the workforce in the informal automotive garages.

1.3 Justification of the Study

In the contemporary era of heightened industrialization of developing countries, the work environment is significant in controlling infectious and chronic diseases. Despite aggravated occupational safety challenges and increased work-related health burden in developing countries owing to the export of high-risk production by mature economies and the rapid poverty-driven growth of the informal economy, occupational safety in the economic sector is yet to receive adequate attention in these regions. This study provides information on OSH services, hazard distribution, and the occurrence of work-related illnesses among employees in informal automotive garages. The data collected

in this project provide insight into the safety characteristics of the informal auto garages and the health burden on the workforce. This statistical information is crucial in raising awareness of workers' safety and health needs in the informal sector, useful in prioritizing health protection and promotion programs, policy review, improving risk prevention plans, and training on workplace hazards and health problems. Thus, in guiding the strengthening of workplace safety programs, neglected low-income environments could potentially avoid becoming a higher risk, as happened previously with other occupational settings (ILO, 2016). Therefore, the project findings provide regulatory institutions with information to address employees' workplace safety needs in the informal sector.

1.4 Objectives

1.4.1 Main Objective

To investigate the occupational safety and health status in informal automotive garages of Eldoret town, Kenya

1.4.2 Specific Objectives

1. To determine the extent of occupational health services' implementation in informal automotive garages in Eldoret town
2. To determine the common workplace hazards in informal automotive garages in Eldoret town.
3. To find out common work-related illnesses among the workforce of informal automotive garages in Eldoret town.
4. To determine the relationship between the occupational safety and health service and the occurrence of work-related illnesses among informal automotive garages in Eldoret town.

1.5 Research Questions

a) What are the major occupational safety measures available in the informal automotive garages in Eldoret town?

b) Which are the common workplace hazards among informal automotive garages in Eldoret town?

c) What are the common work-related illnesses affecting the workforce of informal automotive garages in Eldoret town?

d) What is the relationship between OSH services implementation and occurrence of work-related illnesses among workforces of the informal automotive garages?

1.6 Significance of the Study

The study gives insight into occupational safety and employee health status in the automotive garage industry's informal sector. The results can guide relevant authorities in formulating policies and interventions for health promotion strategies within the country. Besides, workers in automobile garages may benefit from the availability of information to mitigate occupational risk and improve working conditions. Overall, a significant outcome of the study involves providing information that will aid modify the regulatory system and occupation-based interventions in automobile garages to advance the overall health outcome of the population.

1.7 Scope of the Study

The research focused on examining the extent of implementation of occupational health services, hazard characteristics, and workers' health status in automotive garages in Eldoret town.

1.8 Assumptions of the Study

A major assumption of the study encompassed the elements defining automotive garages. The study considered an open or closed area, undertaking motor vehicle repairs as an automotive garage.

CHAPTER TWO: LITERATURE REVIEW

2.1Occupational Safety and Health Services implementation

The level of OSH service coverage varies between countries based on socio-economic development and leadership priorities. In their study to ascertain the global status of OSH on a sample of 49 representative countries, Rantanen et al. (2017) established that approximately over 75 % of the workforce lack OSH coverage, most of which is the informal sector and small enterprises. High-income countries recorded comprehensive data on employee health with over 80% OSH coverage, while low- and middle-income nations lacked a robust OSH framework. The research identified low resource capacity as a significant element limiting the enactment of occupational safety guidelines in scarce resource settings. Jahangiri et al. (2016) published similar findings in small-scale Iranian workplaces. The results showed a poor implementation of OSH services, with employees reporting a lack of occupational health training programs.

In a 2019 national survey of occupational health programs in America, Linnan et al., assessed the implementation of health promotion programs in public and private organizations. In a sample of seven industry categories comprising of public administration, hospitals, information, agriculture and related production organizations, and wholesale/retail institutions, the study reported low implementation of workplace health programs across the studied industrial sectors. The study findings indicate that, despite existence of OSH initiatives, most small-sized organizations did not offer occupational health programs.

Similarly, focusing in infrastructural innovations in United States workplaces, Weidman et al. (2015)conducted a study on ergonomic approach to occupation safety to assess key factors in dissemination of the preventive strategy in occupational settings. The authors noted the significance of user intentions in the adoption and diffusion of design-based prevention approach to occupational safety. Product design and

technological flexibility were some of the factors identified as essential in modelling workplace safety. However, management commitment and employee involvement were crucial in the success of the designed-based safety implementation. Flexible transition processes was shown to positively predict integration of new ergonomic-related design approaches in advancing workplace safety conditions.

In a study of OSH risks and opportunities, Rudakov et al. (2021) assessed the effectiveness of safety systems in Russian mining industries. While analyzing a 10-year mine's operations focusing on workplace conditions and state regulations, the researchers assessed factors influencing OSH risk and opportunities. The study revealed the significance of employee negligence, poor communication, and non-compliance to safety measures in workplace safety management. The findings indicated the fundamental influence of human factors on safety margin associated with reduced OSH compliance. The poor human-system interaction resulting from this human element negatively affected workplace safety culture, OSH perception and implementation.

With Petersen's accident model highlighting the significance of system-human interaction in occupational safety, some research work have focused on identifying the correlation of this association. In an assessment of human factor effect on OSH status, Ünal et al. (2021) conducted a cross sectional study on 533 participants from private company in Turkey. Using a Likert scale, the study evaluated managers' commitment to workplace safety, promotion of safety culture, safety practices, and OSH performance. The findings indicate that managers' commitment to OSH is a key factor of the human component positively influencing safety culture, employees' behaviors, and overall OSH performance. Although leadership did not directly influence OSH performance, its positive effect on employees' involvement in workplace safety had

fundamental impact on OSH outcome. A key finding of this association is the strong and positive association between managers' commitment and safety culture.

Tuhul et al. (2021)conducted a study on OSH status among Palestinian manufacturing industries. Using data of 175 industries, the researchers reported poor OSH coverage with associated increase in WRIs among employees in the studied companies. Employee attitude and organization's safety culture were identified as some of the fundamental factors influencing OSH implementation. A comparison of the organizational safety performances indicated poor OSH implementation among metal industries compared to other manufacturing firms.

Yu, Tse, and Wong. (2002) outlined in their study on OSH service implementation in the informal sector of Hong Kong that safety practices differed across organizations, with larger companies registering high scores compared to smaller enterprises. The study conducted on the construction industry assessed the four service elements of occupational safety involving workers' health surveillance, environmental assessment, health training, and provision of medical services show a generally low score on monitoring at 20% for periodic checkups across the industry. These findings imply that workers in larger industries are more likely to have better health outcomes in their tasks than those in smaller enterprises who experience a higher level of exposure to hazardous conditions. Based on ILO's objective to promote safe work practices for all (ILO, 2016), the low scores in small enterprises act as an indicator of limited integration of OSH policies in the informal economy.

In the Czech Republic, Jarolímek, Urban, Pavlínek, and Dzúrová (2017) conducted a study to determine the effectiveness of OSH services in enhancing employee safety within the automotive industry. The researchers conducted an on-site investigation and reviewed National registry records between 2001 and 2014 to establish the trend in

occupational-related health problems among these workforces. The research underscored an excellent implementation of OSH services above 75% coverage in all the sampled companies. However, employee rehabilitation to work after occupational-related health problems received less attention across the entire industry, with less than 20% of the companies reporting the service's availability. Notably, the researchers limited the study to motor vehicles' manufacturing process, which guided the interest to focus on auto garages' additional investigation as a significant occupation influencing population health.

In Africa, some studies conducted to assess the informal economy's contribution have highlighted the effect of the non-compliance to safety practices as the major setback undermining development efforts (Amfo-Otu & Agyemang, 2016; Keitany, 2014, 2018; Menya, 2012). Fundamentally, political goodwill and socioeconomic contributions are the significant factors influencing OSH coverage and safety in these settings. Antao and Pinheiro (2015), in their study on occupational disease surveillance in developing countries, described infrastructural challenges, policy, and low professional capacity as the significant factors associated with a low implementation of OSH services in these settings. The comparative assessment of occupational surveillance in developed and developing countries showed that high-income countries have well-established workplace safety systems, data and adequate records on occupational diseases than low-income nations. In Africa, the study found that only one country, South Africa, had a relatively structured work surveillance system comprising two data sources involving the mining industry's morbidity and mortality records. Despite this achievement, the system captures data from a single occupational setting. These findings demonstrate that most work environments in Africa suffer from OSH

services' insufficiency with a potential for high prevalence of poor health outcomes among the workforce.

In Kenya, the directorate of occupational safety and health services under the ministry of labor and social protection monitors all OSH policies' implementation processes. The International Labour Office (2013a) report indicates that of the over 140,000 identified workplaces, only 7,500 meet Occupational Safety and Health Act (OSHA) 2007 regulations for operations(ILO, 2013a). Interestingly, the study reveals that work surveillance covers approximately half (4,000 stations, 2.86%) of these registered workplaces. Thus, an estimated 136,000 workstations in the country operate under no principal supervision, which leaves the workforce at risk of various levels of hazards depending on the specific occupation characteristics.

2.2 Workplace Hazards

Following global concerns for environmental management amidst the current climate crises, most countries and research works have focused on identifying potential approaches to reducing country-specific carbon emissions. In their study on the economic complexity and associated hazard characteristics in United States, Shahzad et al. (2021) developed econometric model to test the relationship between productivity structures, energy consumption and environmental pollution. The study revealed the fundamental influence of economic complexity in the country’s carbon footprint. The research linked interaction between non-renewable energy use and productivity structures to increase in environmental pollution. These results reflect the findings from Şenhaz et al. (2021) study on environmental effects of the informal sector in Organization for Economic Co-operation and Development (OECD) countries. The 10-year study reported an association between shadow economies, energy consumption,

and carbon emissions. Informal sector had long-term influence on the energy market and carbon emission.

Ricci et al. (2021)conducted a study on the significance of ethnic diversity on risk perception among construction workers in Italy. In a sample of 562 employees from different ethnic backgrounds, the study assessed four elements of risk perception involving behavior control, workplace hazards, safety culture, and attitude on safety behaviors. The results revealed the negative effect of working conditions on behavior control. Most employees indicated pressure and fatigue as significant factors contributing to poor compliance with safety practices and reduced control of individual safety behaviors. Although participants rated their workplaces as riskier compared to their colleagues, most of them underestimated the risk of harm in their occupations. While their hazard estimation may have been attributable to exposure levels, the employees highlighted limited management involvement in OSH implementation to contribute to their ignorance on occupational safety.

Baloch et al. (2021) assessed the significance of informal sector in environmental challenges in Pakistan. Modeling over five decade data on autoregressive distribution lag (ARDL), the authors tested the association between the informal economy's market growth and country's environmental problems. The study established positive association between shadow economy and environmental pollution. The growth in informal economy contributed fundamentally to increased carbon emission and overall environmental damage. A key outcome was the strong relationship between expansion of the informal economy and rise in pollution sources. These findings are consistent with the results reported by Pang et al. (2021) in their empirical analysis of the informal economy's contribution to carbon footprints in China. Informal economy positively

contributed to increase in environmental pollution. The study further established a positive correlation between economic growth, shadow economy and pollution.

In their study of hazard distribution in the manufacturing sector, Rivera Domínguez et al. (2021) noted apparent variation in risk exposures across the different sections of equipment production chains in Mexico. The study reported poor compliance with safety standards and high occurrence of occupational risks. Hazard ratings indicated approximately 70% of these problems were significant, requiring immediate attention. The risk distribution in these organizations depended mainly on location, environmental conditions, planning challenges, structural design, and commitment to implementing occupational safety guidelines. Similar findings were reported by Forsyth and Peiser (2021) in their study on disaster management approaches for climate change. The research highlighted the significant contribution of urban planning, economic needs, and leadership commitment to enhanced workplace safety for sustainable development.

Other research works have also noted the significant contribution of leadership in occupational hazard exposures and health burden on the population (Bouwer et al. 2014; Fekete et al. 2021). De Ruiter et al. (2021) highlighted the conflicting hazard effect of non-integrated hazard prevention approaches. The authors noted the potential impact of extreme weather conditions on disaster management strategies and human health in different geographical areas. The findings indicate that while developed countries have advanced occupational hazard prevention systems, health risks still find their way through the cracks in OSH implementation processes and population commitment.

A cross-sectional study conducted by Amfo-Otu and Agyemang (2016) in Ghana among 70 auto mechanics observed a lack of a robust framework for coordinating

occupational health services in the informal economy. The occupational safety problem was attributable to governance neglect exposing employees in auto garages to numerous occupational hazards. Some of the safety challenges affecting employees in these settings include lack of sanitary facilities, insufficient working spaces, and overcrowding. High hazard occurrences have also been reported among automobile mechanics (Elenwo, 2018) and miners (Gakire, 2016) in Africa. However, geographical and state differences exist in OSH services implementation and occupational health problems in various regions. These differences are associated with the socio-economic and political characteristics of the countries (Rantanen et al. 2017), indicating potential geographical-based differences in workplace hazard characteristics.

In 2014, Siakilo conducted a study in Nairobi County to determine development challenges affecting and shaping the informal economy's growth. The study identified significant operational problems facing this economic sector. The industry's safety challenges included neglect by relevant leadership to integrate the small companies into the structural urban planning framework. These challenges impair occupational health services' implementation with a resulting adverse effect on work environments' safety status. A major problem was poor or lack of appropriate structures and limited social facilities resulting in unsanitary conditions and increased occupational hazards. Common hazards in these informal segments include dust, noise, wastes, objects, biological agents such as bacteria, and chemical spills associated with poor health outcomes. Besides this policy problem on employees' wellbeing, there is potential for communicability of health problems to the entire population through service delivery.

Another study conducted by Menya (2012) investigated occupational risks in the informal metalwork sector of Eldoret. The author established that the most common occupational hazards include mechanical objects, noise, and fumes or gases exposures

associated with a poor implementation of safety practices. Lack of appropriate structural establishments (61%) and limited workspaces (65%) seemed to be the major problems affecting the industry's growth and workforces' wellbeing. Another study by Keitany (2014) to determine employees' safety status in the Juakali Kamukunji area of Nairobi published similar findings on metal enterprises' occupational risks. A common problem in the two different geographical settings encompassed crowded workplaces with limited risk control approaches. The majority of workplaces (97.2 %) lacked periodic inspection, with approximately 73% of the workforce reporting one of the various kinds of occupational-related health problems. A key concern involved government neglect of the informal economy in implementation of safety policies and the workforce's training on occupational health.

2.3 Workforce Health Problems

Some major health problems associated with automotive garages include skin dermatitis, respiratory disorders, physical injuries, eye problems, hearing impairment, and muscle pains. These health conditions result primarily from exposure to various levels of occupational hazards ranging from improper working postures, dust, consistently high-pitched noise, flying objects, and numerous chemical elements (Hämäläinen et al., 2017). The overall outcome of these health problems involves the capacity to cause disability, reduce the quality of life, and even cause death. Apart from these apparent health conditions, automotive garages' location and functions facilitate the genesis and spread of contagious diseases (Jarolímek et al., 2017). Unsanitary environmental conditions in these settings play a primary role in enhancing business activities' capacity to compromise the population's health and quality of life.

In developed nations, studies conducted on work-related illnesses indicate a high OSH coverage with occupational-based accidents contributing minimally to the overall effect

on population wellbeing. In their research on global estimates of occupational-related ill health, Hämäläinen et al. (2017) reported the lowest fatality rate of 3.61 per 100,000 persons in the European region. However, the study highlighted an overall global increase in fatalities from 2.33 million in 2011 to 2.78 in 2015. The findings show that an estimated 7,500 occupational-related deaths occurred in a day, with approximately 6,500 cases resulting from work-related illnesses. Africa registered the highest mortality rate of 16.6 on occupational accidents, followed by Asia, with 12.7 per 100,000 persons. Work-related illnesses contributed to an estimated 90% of all occupational-based deaths. Considerably, circulatory and infectious diseases remain the major health problems associated with work environments in high and low-income countries.

In their study on automotive workforces, Jarolímek et al. (2017) noted a positive relationship between OSH status and occupational disease occurrence. The findings indicate that two groups of employees, stratified as older workforce and women personnel, were more likely to suffer from occupation-based diseases than their colleagues below 40 years of age and men coworkers with an odds ratio of 2.4 and 3.0, respectively. The common health problems were skin dermatitis, occupational asthma, and wrist injuries associated with exposures to chemical compounds and repetitive handwork.

Although health challenges of air pollution on employees are well documented (Hämäläinen et al., 2017; Jarolímek et al., 2017), concern on other developmental effects has informed studies on congenital risk of air pollution in maternal exposure. Some studies have highlighted the link between air pollution and increased cases of autism in the general population. In a systematic review of 23 studies, Lam et al. (2016) meta-analyzed epidemiological evidence on the association between air pollution

exposure and autism risk in the population. In 9,557 autistic children and 143, 997 controls, the authors established evidence of positive association between particulate matter and autism. However, the study also reported insufficient evidence linking autism diagnosis to toxicity in maternal exposure to air pollution. Smaller particulate matter (<2.5mm) resulting from chemicals and fuel burns had stronger effect than larger air pollutants (10mm). This disparity in neurophysiological effects may be explained by differences in air suspension time attributable to potential variation in exposure levels.

Other studies have established a link between exposure conditions and development of occupational-related health problems. A positive association between length of exposure and WRI were reported by Hulshof et al. (2021) in a study of the occupational effect of ergonomic hazards on individual health among WHO member European countries. The researchers developed two study groups represented by occupational hazard exposure patterns. The no exposure study group comprised of individuals experiencing less than 2 hours of daily ergonomic hazard conditions, with risk exposure category comprising of employees having more than 2 hours daily ergonomic hazard conditions. Focusing on musculoskeletal and osteoarthritis as outcome health conditions, the study found a positive association between exposure and development of work-related illness. Biomechanical exposure conditions increased the risk of developing musculoskeletal health problems and occupational-related osteoarthritis.

In a systematic review of occupational-related health challenges, Pachito et al. (2021) sampled 28 sources with 110, 043 participants from studies in developed countries from WHO regions. Using 35-40 work hours a week as control group with three experimental categories of working hours in a week (41-48, 49-54, and >54), the researchers assessed the effect of these work characteristics on alcohol use, risky drinking, and related

mortalities. While studying workers in both the formal and the informal economy, the authors established a link between unstandardized working conditions and poor health outcome. The study reported a positive association between exposure to harsh occupational environment and alcohol use disorder. Employees undertaking long weekly working hours had increased alcohol consumption than the control group. However, there were no relationships between long working hours and risky drinking. Age characteristics had associated influence on alcohol consumption with young employees more likely to engage in alcohol abuse than older adults. However, the research reported no gender-based difference in alcohol use disorder.

In India, Vyas, Das, and Mehta (2011) conducted a descriptive study on 153 male participants sampled from 35 workshops to assess occupational injuries among automobile mechanics. The research established that 63% of the workers reported having suffered from work-related physical injuries in one year. Moreover, 16% of the workforce indicated respiratory problems, with 20% and 8% reporting eye and skin issues, respectively. These findings show that auto garages contribute a significant proportion of health problems to the populations in different regions.

Rongo, Barten, Msamanga, Heedrerik, and Dolmans (2004) conducted a descriptive study in Tanzania to determine the impact of occupational exposure on workers' health status in the informal sector. The study involved a sample of 310 participants from the Dar es Salaam small-scale industry. The findings indicate that the majority of the subjects, over 90% reported risk exposure and suffered from at least one of the occupational-related health problems. High prevalence of respiratory conditions has also been reported among informal auto garage workforce (Mwatu, 2011). The study reported high occurrence of occupational asthma, bronchitis, and eye problems among spray painters. Regarding respiratory morbidity, the 56.7% prevalence of pulmonary

function impairment recorded among 97 automobile repair workers investigated by Krishna and George (2017) in India corroborate these findings.

In Ghana, Monney, DwumfourAsare, OwusuMensah, and Kuffour (2014) rated musculoskeletal disorders and cuts/injuries as the most common health problems experienced by mechanics. Ninety-five percent of the mechanics reported musculoskeletal ill health in their duties, while 58% suffered from physical injuries. In 2017, a study conducted by Thangaraj and Shireen (2017) in India on a sample of 150 mechanics in automotive garages reported similar findings on common health problems among this workforce. Musculoskeletal injuries contributed the highest proportion, 62%, followed by wounds at 58%, and stress accounting for 48%, respectively.

In Kenya, Abanga (2016) investigated the effect of automotive garage works on the safety and health of workers in Nakuru town. This broad descriptive study sampled 112 subjects from 66 auto garages and assessed their occupational safety practices and health status. The research identified chest pain reported in 74.4% and physical injuries experienced by 69.4% of the study subjects as the leading health problems attributed to the occupational risks. However, the study's key result is the high proportion of participants, 79.1%, reporting a lack of formal training on occupational safety and health practices. An intervention directed on this safety element has a likely chance to influence the study's observed outcome. Thus, given the regulating body's oversight role on occupational health services implementation across various workplaces in the country, which includes the training on workplace safety, it is necessary to understand the capacity of OSH policies in covering employees in all sectors of the economy. Based on the impact of county administrations on development and policy implementation, the findings of regulatory practices adopted in different geographic

areas and the health outcome allow for comparing the contribution of occupation activities on population well-being.

However, considering that most of these studies were conducted in similar settings comprising dry locations of urban areas with a high environmental pollution capacity, these findings could be unique. In light of this fact, the proportion of both the respiratory conditions and eye problems is not solely attributable to auto garage activities. There is a background risk associated with general air pollution from the vehicles and neighboring manufacturing industries' discharge of gaseous waste. Thus, there is a need to quantify the relevant and generalizable health risks posed by the automotive garage activities to the entire population.

The reported findings of health problems from studies conducted on auto mechanics differ on the regional scale. While several studies have published results indicating physical or respiratory disorders as the common health problems among either mechanics or spray paint workers, no study provides data on employees' health challenges in the informal small-scale auto garage industry. It is important to note that these small-scale establishments work in crowded shared spaces and hypothetically have almost similar risk exposure levels and types of hazards.

2.4 Occupational Safety and Health Services Coverage and Work-Related Illnesses

One of the critical aspects surrounding the implementation of OSH services is the divergent views among researchers on its fundamental role in enhancing occupational safety. Most studies have shaped up based on Ferell's human factor model that highlights the influence of work characteristics on employee wellbeing (Petersen 1996).

Despite the crucial role of work characteristics on health status, other safety aspects such as regulatory guidelines are essential in modeling employee health protective behaviors and safe work culture.

Sorensen, McLellan, Sabbath, and Dennerlein et al. (2016), in their examination of the safety model in small and medium scale enterprises, underscored the vital role of integrating unconventional traditional safety processes in workplaces. The researchers formulated a conceptual model indicating the effects of workplace policies on work conditions, which serves as a health protection and promotion strategy influencing employee well-being. The authors developed the framework mainly from the Boston and Minnesota study conducted by McLellan, Caban-Martinez, Nelson, and Pronk et al. (2015), describing the contribution of policies in modeling the work environment and organizational cultures. The results indicated that organizational characteristics such as leadership, capacity, and support significantly affect OSH implementation and worksite health promotion and protection programs. These findings point to the need to provide further evidence on OSH services' role in the association of site-specific hazard level and employee health status.

In a Thailand health promotion program for the informal sector study, Manothum and Rukijkanpanich (2010) assessed the impact of participatory approach training on employee safety behaviors. The researchers noted an improvement in risk analysis skills among the employees during the study period. The findings show a positive effect of the participatory training approach on organizational safety culture, working conditions, and employee health. Further studies on occupational training have provided contradicting results. Rauscher and Myers in their 2013 study on employee literacy and occupational injuries among United States high school students, analyised survey data from two cross-sectional studies on assocaition between workplace

conditions and injury rate among US working youth population. Focusing on adolescent population, the study assessed the influence of OSH awareness and employee safety training on work-related physical injuries. Using a dichotomous measures of burns and injuries/cuts as the outcome variable, the study established a negative association between safety training and work-related physical injuries. However, OSH knowledge and awareness showed no effect on injury outcome.

Other research works have also documented evidence on the lack of assocaition between OSH service implementation and employee wellbeing. In a randomized pilot study to assess occupational effectiveness of onsite health programs among construction workers in Netherlands, Oude Hengel et al. (2014) conducted a six month intervention study on health empowerment. The research assessed employee health and work ability in a 12 month follow-up program. The study reported no significant difference in health outcome and work ability between the intervention and control group, with both groups reporting relatively similar measurements at baseline and at the end of the intervention program.

However, in Jarolímek et al. (2017) study of Czechia automotive workers, the results showed a linear relationship between occupational health services and the occurrence of work-related illnesses. The contradicting increase of cases with the implementation of safety regulations, from the expected protection of employees, is attributable to the fact that improved OSH services facilitates early detection and reporting on the occurrence of health problems. Thus, ultimately, the implementation of OSH services helps reduce risk and improve employee wellbeing.

This positive effect of workplace safety program on workforces' health has also been reported in other economic sectors. For example, in a 2018 prospective study on organizational culture conducted by Jia, Fu, Gao, Dai, and Zheng, in China, on a sample

of 10 government agencies consisting of 719 participants, the researchers established that employees' health improved after the two-year health intervention. The research utilized direct observation, qualitative interviews, and questionnaires to collect data on employee health status during baseline and 12 months. The results indicated the existence of a positive association between workplace safety culture and employee wellbeing. Interestingly, the quality of the physical environment showed a negative association with workers' welfare. These findings reflect Petersen's human factor conception on the significance of workplace accident/incident prevention. However, it is worth noting that the study population comprised of organizations and employees from the formal sector.

Contradictory results have also been reported on the OSH moderating effects on the occurrence of occupational illnesses. In their 2020 cross-sectional study on Ghana-based energy organizations, Liu et al. assessed the OSH effect on hazard control in gas and oil companies. The study established a negative association between OSH implementation, hazard mitigation, and work-related illnesses. In contrast, Mwatu's (2011) study of respiratory conditions among spray painters in Kenya's informal auto garages reported a positive link between the spray paint method and asthma symptoms. However, paint type, amount, and exposure time had no significant effect on workers' health conditions.

Therefore, given the various contributions and contradictory results of integrated safety practices on improving working conditions, it is necessary to conduct localized studies to establish the influence of primary OSH services on occupational safety and protection of workforce well-being. Therefore, this research aims to determine the relationship between the level of OSH service implementation and the occurrence of work-related health conditions among the informal automotive garage workforces.

2.5 Theoretical Framework

2.5.1 Petersen's Accident/Incident Theory.

Petersen conceptualized and introduced the notion that occupational-related health problems center around two central elements involving the structural interaction between human and system components. The model integrates Ferrell's causation concept and Heinrich's accident framework to outline a workstation's safety apparatus (Petersen, 1996). Petersen's model's significance is its emphasis that work-related health problems result from a sequence of human errors in the different levels of responsibilities. Based on specific decision needs of tasks, Aven (2016) argues that human responses to stimuli from environmental risks are essential in enhancing safety and maintaining health. According to Petersen (1996), the fundamental factors contributing to human errors include the scope of work, rational perspective, and ergonomic traps. Errors in the work scope encompass competency, inadequate training, fatigue, drug abuse, and work pressure. Err concept decision covers situational factors involving temporal deadlines, peer pressure, financial constraints, a coping mechanism, and low-risk perception. Consequently, work traps include organizational culture, structural design, and incompatibility of needs.

The model considers system factors to comprise the aspects of safety attributed to governance and management structure. One of the significant variables under this component includes the OHS service coverage that serves as an independent element influencing workplace safety and employees' health status across different sectors.

Therefore, Petersen's theory is relevant to the current study providing the foundation for understanding the significance of OSH services as a worksite health protection program essential in modeling workforce behaviors and promoting workplace safety. In this regard, while appreciating the influence of system efficiencies in molding human

actions, the model underscores human-system interaction's competency in enhancing occupational safety. Based on this theoretical concept, the interaction model of factors responsible for increased risk and poor health outcomes in informal automotive garages is illustrated by the causation model (see Figure 1).

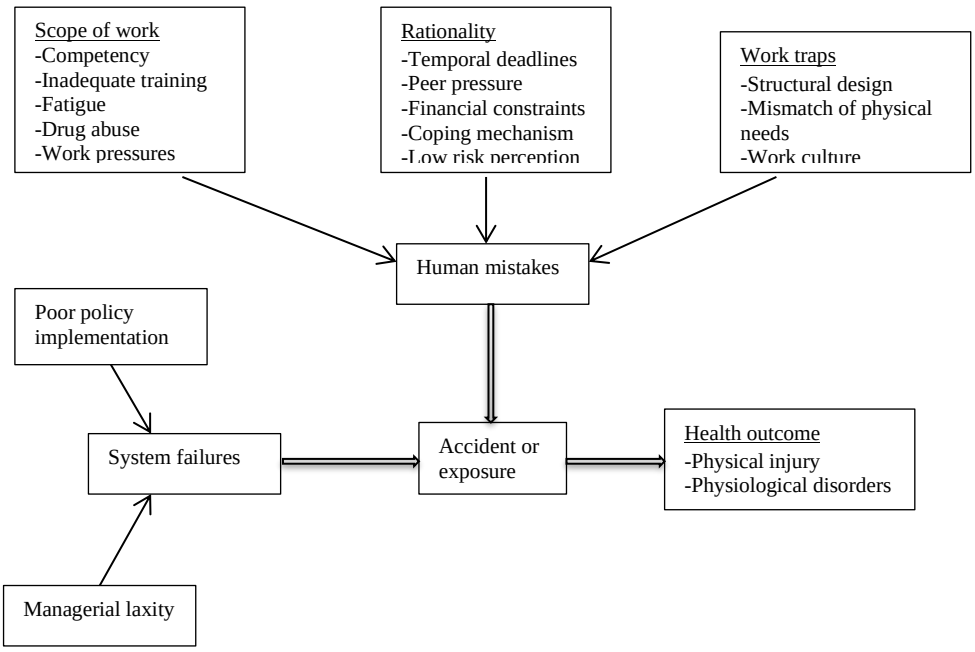


Figure 1. Petersen's Accident/Incident Model

(Source: Adopted from Petersen, 30)

2.6 Conceptual Framework

The current study postulates that effective workplace safety intervention requires economic and technical assistance in informal automotive garages. This support program entails expanding OSH service coverage to eliminate or reduce hazard levels and minimize human errors for improved workplace safety (see Figure 2).

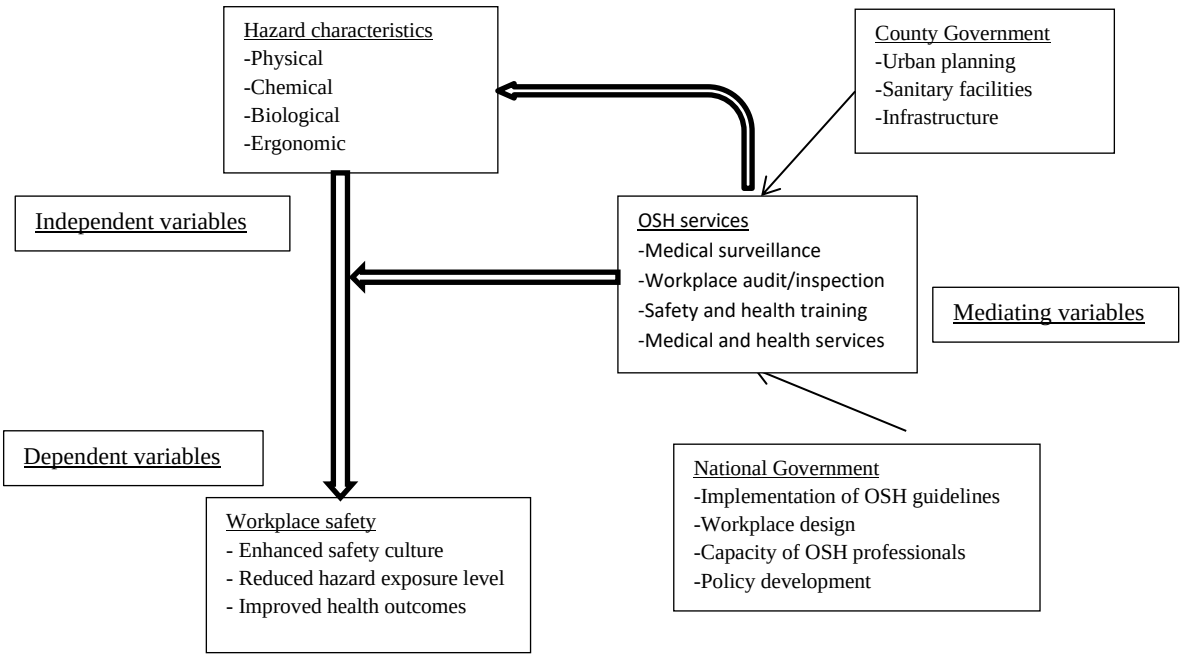


Figure 2. Conceptual Framework

Note: Link between OSH services, hazard characteristics, and health outcome in the informal automotive garage works

CHAPTER THREE: METHODS AND MATERIALS

3.0 Methodology

3.1 Study Area

The study was conducted in Eldoret town, located in Uasin Gishu County, one of Kenya's largest cosmopolitan centers. The urban area experiences a vast expansion and growth of the informal sector, with an estimated population of 80 small-scale auto garages registered under Eldoret Juakali Association-North Rift, which contributes immensely to the lives of the low-scale business owners and the economy of the region. The urban area serves its nearby Trans Nzoia to the North, Kakamega to the Northwest, Nandi to the South, and Elgeyo Marakwet to the East. Eldoret's urban sprawl is mostly a result of its convenience as a business hub of these five counties. The 2019 Kenya's census places its population at 378,000 of the total Uasin Gishu county population of 1,163,186 people (Kenya National Bureau of Statistics 2019). Uasin Gishu County government manages all the town's administrative affairs through local assembly ward legislative representation. The study area lies at an average altitude of over 2000m above sea level and experiences a relatively moderate to cool climate with heavy rains lasting from April to August. The area also experiences a dry period that lasts from December to February (Figure 3).

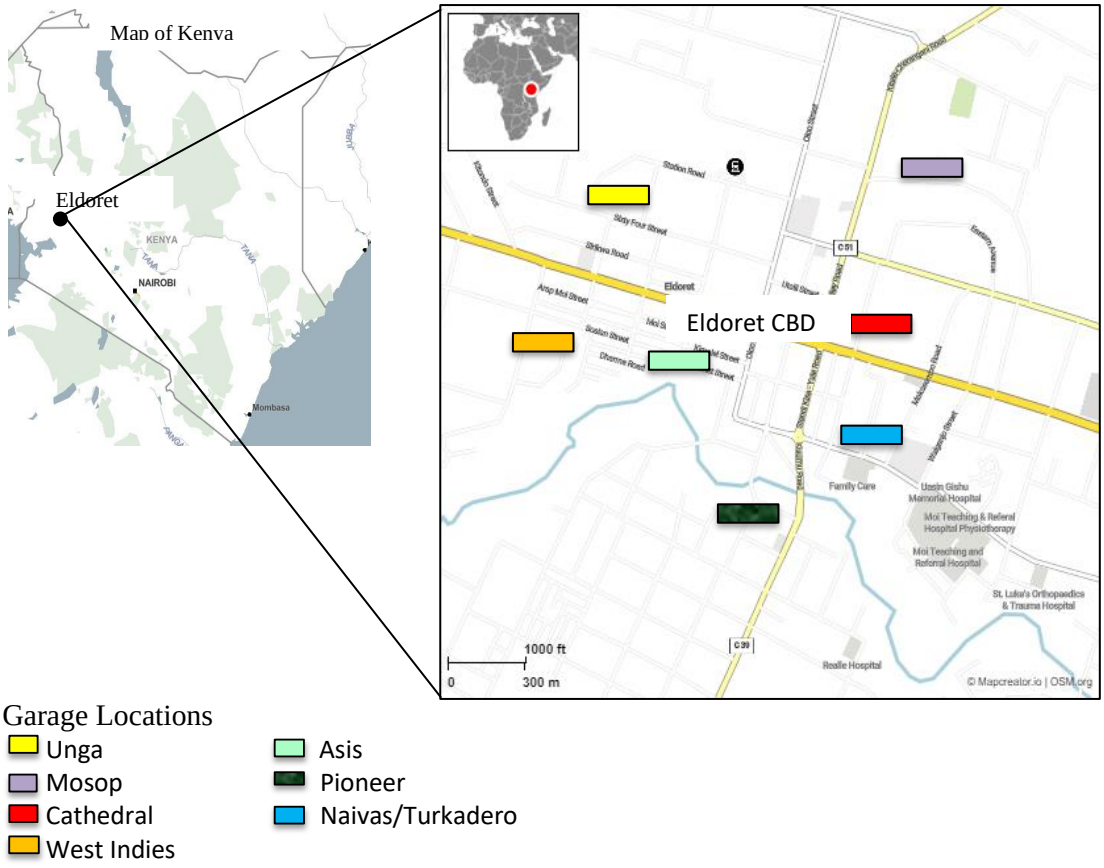


Figure 3. Locations of the Selected Automotive Garages in the Study Area

3.2 Target and Study Population

The target population was all workforces in the informal automotive garages of Eldoret town. Currently, studies have not provided an estimated population of informal automotive garages and the workforce within the area. However, membership in the automotive garages with Eldoret Juakali Association-North Rift provided the structural platform for identifying and sampling the respondents for the study. The establishments' sampling involved stratification of the garages based on the Juakali registration zones categorized as Asis, Naivas/Turkadero, Cathedral, Mosop, Unga, West Indies, and Pioneer workshop locations. A manager/employer and one employee were purposely sampled as respondents from each of the identified garages.

3.3 Study Design

A cross-sectional study was conducted in the informal automotive garages within Eldoret town from January to February 2021.

3.4 Sample Size Determination

In determining a representative sample size, the study adopted Kothari (2004) formula for sample size, n, estimation from finite population, N.

$$n = \frac{z^2 Np(1-p)}{e^2(N-1) + z^2 p(1-p)}$$

Where,

- e is the desired margin of error (level of precision) = 0.05
- p is the proportion of workforce in each garage, assumed to be 50% = 0.50
- 1- p is q =0.50
- n= desired sample size
- z= the standard normal deviate, 1.96, corresponding to 95% confidence level
- N = 196, which is the number of workforce in the 80 informal automotive garages registered under Eldoret Juakali Association-North Rift

Therefore,

$$n = \frac{1.96^2 * 196 * 0.50(1-0.50)}{0.05^2(196-1) + 1.96^2 * 0.50(1-0.50)}$$

n = (188.2384/ 1.4479) = 130 participants

The study interviewed two respondents, a manager/employer and one employee, in each workplace. Therefore, 65 (130/2 workforces from each workshop) garages were systematically selected from the stratified regions for the study.

3.5 Sampling Procedures

A sampling of the workshops involved consideration of their distribution based on Juakali Association stratification zones. These locations included Asis, Naivas (Turkadero), Cathedral, Mosop, Unga, West Indies, and Pioneer. The research acquired a list of the registered garages from Eldoret town Juakali Association-North Rift operating under the department of small and medium scale businesses. After weighing to determine locational representation (Table 1), systematic sampling was applied in

selecting garages for the study at a sampling interval of 1 on a random starting point. Based on the proportional sampling, more workshops from concentrated zones were sampled for the research, with few garages selected from sparsely populated locations. Purposive sampling of a manager and a senior employee on the duration of service from each automotive garage was employed to pick out the respondents. The determination of senior staff on service duration was considered as over a year of service in the worksite, based on OSHA's 2007 guidelines for yearly OSH services delivery (Public Service Commission GOK, 2007). Thus, two workforces, a manager and an employee, were interviewed in each of the selected auto garages.

Table 1

Auto Garage Locational Distribution and Selected Sample Size

Location	Distribution	Sample
Asis	8	7
Naivas/Turkadero	8	7
Cathedral	13	10
Mosop	10	8
Unga	11	9
West Indies	10	8
Pioneer	20	16
Total	80	65

3.6 Study Variables

Two variable groups: independent and dependent variables were used in the study (Table 2). Independent variables included elements of OSH services and occupational hazards. OSHA (2007) recommendations identified the primary OSH service components to include employee medical surveillance (screening) programs, health and safety training, workplace risk assessment (at least once every year), and medical and health services (Public Service Commission GOK, 2007). Medical surveillance

includes pre-employment and periodic health assessment and presence of health problems reporting systems. Health and safety training consisted of training programs on workplace safety and health protection, first aid, PPE use, and material safety data sheet guidelines. Workplace risk assessment services included yearly workplace inspection, presence of health and safety committee and sanitary facilities. Medical and health services comprised first aid equipment, an emergency treatment facility, and presence of health records.

Workplace hazard types include physical, chemical, ergonomic, and biological agents. Physical hazards comprise noise, vibration from power-driven hand tools such as grinders, welding radiations, fires and explosions, heat, cold, and extreme weather conditions involving flooding, lightning, wind, and thunderstorms. Chemical hazards cover the dangers of solvents, battery acids, fuels, metal cleaners, lubricants, brake fluids, plastic glues, and dust. Lifting of heavy objects, working in uncomfortable postures, involvement in repetitive movements, and psychosocial hazards constituted auto garages ergonomic hazards. The working conditions that harbored biological hazards includes unsanitary working areas, contaminated or dirty working equipment, and insects and bats' presents.

Dependent variables consisted of the self-reported work-related illnesses experienced by the workforce. These health outcomes were hearing impairment, eye problems, musculoskeletal pains, sleeping disorders, chest pain, breathing disorders, chronic cough, burns, forgetfulness, finger and forearm numbness, physical injuries or cuts, skin conditions, and stomach upsets.

Table 2

Operationalization of Variables

Variable	Data type	Measurements	Indicators
Health surveillance	Interval	Pre-employment assessment, periodic on-site examination, and available system for reporting health problems	During employment, resumption of work after work-related illness, and on termination of specific hazard-related action
Health education and safety training	Interval	Workplace health and safety education/training, first aid training, and guidelines on material safety	Training programs in workplaces, first aid, and provision of material safety data sheet, and PPEs
Workplace Audit	Interval	Inspection of the workplace and facilitates	Yearly workplace inspection, committee for workplace safety, and sanitary facilities (toilets and safe drinking water)
Medical and health services	Interval	First aid toolkits, an emergency treatment facility, and presence of health records	First aid procedures, provision of occupation-based outpatient medical care, and presence of employee health records
Hazards	Interval	Physical, chemical, ergonomic, and biological risks	Workforces' rating the presence of physical, chemical, ergonomic, and biological risks in the workplace

Work-Related Illnesses	Interval	Self-reported work-related illnesses experienced in the workplace	Workforces rating of common work-related illnesses in their workplaces

3.7 Data Collection Tools

3.7.1 Questionnaire.

The study used an interviewer-administered questionnaire in collecting data on OH services, hazard distribution, and health conditions from workshop managers and the employees. This Likert scaled instrument was developed from OSHA, 2007 guidelines for DOSHS on implementing OSH services (Public Service Commission GOK, 2007). The questionnaire document comprised of four parts: demographic, OSH service, hazard characteristics, and health status sections (See Appendix 2). The instrument's reliability scale was 0.71 for OSH services, 0.78 for hazard characteristics, and 0.74 for work-related illness.

3.8 Eligibility Criteria

3.8.1 Inclusion Criteria.

All managers and senior employees on the duration of service aged 18 years and above working in the informal automotive garages within Eldoret town and registered under Eldoret Juakali Association-North Rift were considered for the study.

3.8.2 Exclusion Criteria.

The research excluded all workforces who had less than a year of service in the workplace. OSHA guidelines recommend scheduled delivery of OSH services within one year (Harrison & Dawson, 2016; Public Service Commission GOK, 2007). This guideline informed the adoption of the one-year exclusion criteria. In this view, new

workforces in the establishments may not have settled to access the OSH services in the stated period.

3.9 Data Quality Control

A pre-test on questionnaires was conducted at Kapsabet town before the full-scale study was carried out. Kapsabet town is one of the fast-growing cosmopolitan neighborhoods of Eldoret town. This geographical association facilitated correct evaluation of the study's feasibility, including resource planning, potential problems, and time required for the research. The pilot study guided the investigators in modifying the scoring of the self-reported responses in the research instrument facilitating the generation of the necessary research data.

3.10 Data Management and Analysis

SPSS version 26 was utilized in data entry, coding, and cleaning with the analysis done using R software version 3.6.3. Descriptive statistics (frequencies and proportions) were conducted for enterprise characteristics: gender characteristics, workplace size, garage location, and garage type. Summary statistics were also provided for OSH services, workplace hazards, and occupational health conditions. The implementation of OSH services was calculated as proportion/percentage based on the OSHA recommended guidelines (Public Service Commission GOK, 2007). The level of significance for the inferential statistics in this study was set at 5% ($p \leq 0.05$) on a 95% confidence interval. T-test was used to examine the association between enterprise gender characteristics, OSH service coverage, and hazard distribution. Chi-square analysis was done to determine the association between workplace type, size, and occupational diseases. Linear regression analysis was performed to test the relationship between the extent of occupational health services' implementation and occurrence of work-related health conditions. Finally, the research findings have been reported in

Microsoft word, with results presented in diagrams and graphs to compare and show the variables' relationships.

3.11 Ethical Consideration

The researchers acquired ethical clearance as a written approval by the Institutional Research Ethics Committee (IREC) of Moi University. The study also sought additional permission from Eldoret Juakali Association-North Rift administrators and participants. The convention of confidentiality has been upheld by using study codes during data collection, with the information secured from unauthorized access through password protection and regular monitoring. Besides, no cash or other forms of inducement to participate have been used in the study. The communication of the occupation-based safety information would benefit participants in prioritizing workplace safety practices and guiding tailored initiatives to transform the sector into a safe work environment.

CHAPTER FOUR: RESULTS

4.0 Results

4.1 Respondents Demographics

Hundred and thirty respondents, with skewed gender distribution (hundred and twenty-nine male (99.2%) and one female (0.8%)), were interviewed. Most of the respondents (93.1%) were aged between 21 and 40 years, with a few (6.9%) aged above 40. Married workforce were 89.2% (*n* = 116). The majority of the interviewees, 93.1% (*n* = 121), had secondary and below education qualifications. Hundred and twenty of respondents (92.3%) reported having spent six years and over in the informal automotive garage employment (Table 3).

Table 3

Respondents' Demographics

Variable		Frequency	Percent
Age			
Min	21		
Max	54		
	21-30	70	53.8
	31-40	51	39.2
	41-50	6	4.6
	>50	3	2.3
Gender			
	Male	129	99.2
	Female	1	.8
Marital Status	Married	116	89.2
	Single	13	10.0
	Separated	1	.8
Education level			
	Primary	72	55.4
	Secondary	49	37.7
	Technical college	9	6.9

Duration of employment			
	1-5	10	7.7
	6-10	45	34.6
	11-15	35	26.9
	>15	40	30.8

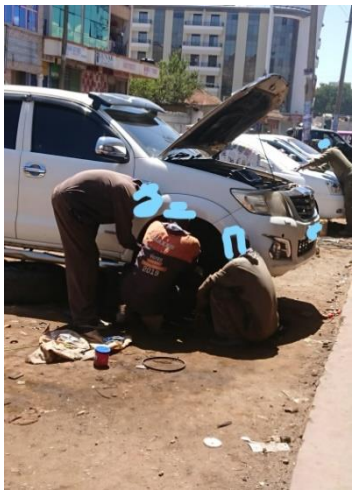
4.2 Enterprise Characteristics

Nine workshops (13.8%) were mixed auto-garages operating as closed establishments with extended roadside operations while thirty four were open-air (52.3%) with twenty two (33.8%) engaging in roadside auto-repairs. Enterprise characteristics by gender showed 7.69% (n = 5) of the establishments had both male and female workers, with 92.31% (n = 60) having male only employees, indicating the gender biased nature of the occupation. On workforce distribution, 20 establishments (30.8%) of the 65 studied enterprises had less than three employees, 13 (20.0%) had 3 to 5, while 32 (49.2%) had over five employees (Table 4).

Table 4

Enterprise Characteristics

Variables	Frequency	Percentage (%)
Type of garage		
Mixed	9	13.8
Roadside	22	33.9
Open-air	34	52.3
Gender		
Males only	60	92.3
Including females	5	7.7
Number of employees		
1-2	20	30.8
3-5	13	20.0
> 5	32	49.2



Roadside worksite

Open-air worksite

Mixed worksite

Figure 4. Types of Automotive Garages

(Source: Photo by the researcher)

Note: Photos of the three types of automotive garage worksites. Roadside worksites are garages located along public roads. Open-air worksite consists of iron-sheet, brick/block, or between permanent housing perimeter wall enclosure conducting repair services. Mixed worksites are open-air worksites with extended roadside auto repair activities.

4.3 Reliability Analysis

In research, Cronbach's Alpha values serve as reliable estimates of the internal consistency of data collection instruments (Cronbach and Shavelson 2004; Tavakol and Dennick 2011). Although there have been debates over the acceptable alpha score in research (Shelby 2011; Vaske, Beaman, and Sponarski 2017), some statistical studies provide that values ranging from .65 to .80 are acceptable (Beaman and Vaske 2008; Cortina 1993; Spector 2011). In the present study, Cronbach's Alpha test was performed for OSH services implementation, hazard distribution, and work-related illnesses (Table 5). Reliability analysis revealed Cronbach's Alpha coefficient of 0.71 for OSH

services, 0.78 for hazards, and 0.75 for work-related illnesses assessment, indicating strong internal consistency of the data collection instrument. Statistically, the test results for the data collection tool used in this study are relatively larger than the recommended minimum alpha value (0.65) for the reliability test (Vaske et al., 2017).

Table 5

Reliability Test

Variable	Cronbach's alpha coefficient	Likert types in each variable category
OSH services Likert scale	.706	13
Hazard Likert scale	.783	24
WRIs Likert Scale	.747	14

4.4 Occupational Health Services implementation

The analysis of workplace health and safety practices, considered on a 5-response Likert scale (*1 = none to 5 = very high*), revealed low OSH services implementation (*M* = 2.33, *SD* = 0.64) in the informal auto garages. All the studied enterprises lacked health surveillance, yearly inspection, and medical services (first aid and emergency treatment facility) in the last one year. Workforces OSH services' ratings based on the 5-response scale revealed an identical low workplace safety and health training coverage (*M* = 2.17, *SD* = 0.32), health and safety training, (*M* = 1.55, *SD* = 0.76), and first aid training (*M* = 1.60, *SD* = 0.78). There was moderate (*M* = 2.84, *SD* = 1.40) scores for material safety data sheet and high mean rating for PPE use training (*M* = 3.36, *SD* = 1.02). Of the 65 sampled garages, the present study found health and safety training only in 26 (40%) workplaces. Majority of these workshops, 61.5% (*n* = 16) had low OSH training implementation, with moderate and high application in 30.8% (*n* = 8) and 7.7% (*n* = 2), respectively (Table 6).

Table 6

Occupation Safety and Health Services Coverage

OSH conditions	Mean	*SD*
OSH service implementation	2.33	0.64
Workplace safety and health training coverage	2.17	0.32
Safety and health training	1.55	0.76
First aid training	1.60	0.78
PPE use training	3.36	1.02
Material safety data sheet (Hazardous ingredients, prevention and first aid)	2.84	1.40
Extend of training coverage		
Level	Frequency	Proportion (%)
Safety and health training	26	40.0
Low	16	61.5
Moderate	8	30.8
High	2	7.7
1= none, 2 = low, 3= moderate, 4 = high, 5 = very high		

4.4. 1 Occupational Safety and Health Services Implementation by Enterprise Characteristics

In exploring whether OSH services implementation differed by enterprise characteristics, mean comparison results revealed significant difference in safety program coverage on garage size, F (2, 127) = 4.048, p = .020 and type, F (2, 127) = 7.735, p = .001. However, there was no significant difference in OSH services by enterprise location F (6, 123) = 1.871, p = .091, and enterprise by gender, t (1, 128) = 0.637, p = .5363 (Table 7).

Tukey's post hoc analysis showed that OSH services differed on workshop size for 1-2 and >5 employees and workshop type for roadside and open-air establishments. Enterprises with more than five employees had higher (M = 1.79, SD = 0.78) OSH services coverage than establishments with 1 – 2 employees (M = 1.12, SD = 0.33).

However, there was no statistical difference in OSH service coverage ($p > .05$) between enterprises with more than five employees and those with 3 – 5 employees. Analysis of workshop type influence on OSH services coverage showed a higher mean rating for OSH services coverage in open-air auto garage establishments ($M = 1.75$, $SD = 0.79$) than those in roadside workshops ($M = 1.24$, $SD = 0.57$). This OSH services coverage was not significantly different between open-air and the mixed auto garage workshops ($p > .05$).

Table 7

Occupational Safety Services Coverage by Enterprise Characteristics

Enterprise characteristic	*Df*	*F/t*	Sign.
ANOVA test			
Garage type	2 (127)	7.735	0.000695
Garage size	2 (127)	4.048	0.019909
Garage location	6 (123)	1.871	0.091393
T-test			
Enterprise by gender	1(128)	0.637	0.5363

Mean OSH services implementation

Variable	Mean	*SD*	95% CI	
			Low. Lim	Upp. Lim
Garage type				
Roadside	1.24	.57	1.06	1.41
Open-air	1.75	.79	1.56	1.94
Mixed	1.65	.64	1.34	1.96
Garage size				
1-2	1.12	.33	1.00	1.24
3-5	1.42	.67	1.09	1.74
>5	1.79	.78	1.61	1.96
Workshop location				
Asis	1.82	.72	1.44	2.19
West Indies	1.13	.35	.93	1.32
Mosop	1.55	.66	1.23	1.86

Unga	1.22	.54	.94	1.49
Cathedral	1.87	.86	1.41	2.33
Turkadero	1.82	.91	1.29	2.34
Pioneer	1.60	.74	1.32	1.87
Enterprise by gender				
Male only	1.55	.73	.63	2.29
Including female	1.72	.84	.74	2.41

4.5 Distribution of Occupational Hazards

The study, using a 5-point (*1 = none to 5 = very high*) response scale, identified physical hazards (*M* = 4, *SD* = 1.64) and ergonomic agents (*M* = 4, *SD* = 1.73) as the common occupational hazards in informal auto garages. All the studied garages showed a high level of exposure to heat (*M* = 5, *SD* = 0.53), extreme weather conditions (*M* = 5, *SD* = 0.99), sharp objects (*M* = 5, *SD* = 0.96), littered working areas (*M* = 5, *SD* = 0.62), and dust (*M* = 5, *SD* = 0.37). Uncomfortable working postures (*M* = 5, *SD* = 0.49) and repetitive movements (*M* = 5, *SD* = 0.59) were found to be the common ergonomic hazards in the establishments. The biological agents of relatively high occupational risk identified in the garages were unsanitary working conditions (*M* = 5, *SD* = 0.47) and the use of unhygienic (*M* = 5, *SD* = 0.81) equipment (Table 8).

Table 8

Distributions of Occupational Hazards

Harmful agents	Mean	*SD*
Physical	4	1.64
Heat	5	0.53
Cold	4	1.13
Extreme weather conditions	5	0.99
Noise	3	1.17
Welding radiation	2	1.50

Electric shock	2	1.55
Sharp objects	5	0.96
Littered working space	5	0.62
Chemical	3	1.79
Solvents	3	1.80
Fossil fuels	3	1.85
Metal cleaners	3	1.76
Lubricants	3	1.85
Brake fluids	3	1.87
Plastic glues	1	1.18
Diesel exhaust fumes	4	0.94
Dust	5	0.37
Ergonomic	4	1.73
Lifting heavy objects	4	1.22
Uncomfortable postures	5	0.49
Repetitive movements	5	0.59
Psychosocial challenges	1	0.41
Biological	3	1.74
Unsanitary workstations	5	0.47
Unhygienic equipment	5	0.81
Rodents and insects	2	0.91
Bats	1	0.00

4.5.1 Location-Based Hazard Distribution.

With the potential of varying effects of location characteristics on auto garage working conditions, a comparison of hazard distributions was conducted (Table 9). A one-way ANOVA test showed a statistically significant difference in occupational risks across locations; physical hazards, F (6, 123) = 5.60, $p < .001$, chemical F (6, 123) =2.69, $p < .05$, and biological F (6, 123) = 4.47, $p < .001$. None of the enterprise locations significantly differed on ergonomic hazard characteristics, F (6, 123) = 1.69, $p > .05$. Tukey's Post hoc analysis showed significantly ($p < .05$) lower mean physical hazard

ratings in Asis location (*M* = 3.32, *SD* = 0.54) than Mosop (*M* = 3.93, *SD* = 0.47), Unga (*M* = 4.00, *SD* = 0.41), Pioneer (*M* = 4.01, *SD* = 0.54), and West Indies (*M* = 4.03 *SD* = 0.45). Enterprises in Cathedral (*M* = 3.68, *SD* = 0.34) and Turkadero (Naivas) (*M* = 3.71, *SD* = 0.38) had lower mean ratings but were not significantly different from those in Asis area.

On chemical hazards distribution, Asis location (*M* = 3.93, *SD* = 0.59) had statistically significantly ($p < .05$) higher mean hazard ratings than Turkadero (Naivas) (*M* = 2.96, *SD* = 1.26), Mosop (*M* = 2.96, *SD* = 0.76), Pioneer (*M* = 2.89, *SD* = 0.88) and Mosop (*M* = 2.96, *SD* = 1.08). However, the Asis's chemical hazard distribution did not significantly differ with Cathedral (*M* = 3.07, *SD* = 1.13), and Unga (*M* = 3.20, *SD* = 0.95) locations. Biological hazards mean difference were significant ($p < .05$). Establishments in Mosop (*M* = 3.31, *SD* = 0.14) and Pioneer (*M* = 3.30, *SD* = 0.19) had higher mean ratings than in Turkadero / Naivas (*M* = 2.89, *SD* = 0.63) and Asis (*M* = 2.82, *SD* = 0.58). All the other locations did not significantly differ from these two categories' biological hazard mean ratings; Cathedral (*M* = 3.06, *SD* = 0.57), West Indies (*M* = 3.17, *SD* = 0.07), and Unga (*M* = 3.17, *SD* = 0.19).

Table 9

Location-Based Occupational Hazards Distribution

Hazard type	*Df*	*F*	Sign.
Physical	6 (123)	5.60	.000
Chemical	6 (123)	2.69	.017
Ergonomic	6 (123)	2.69	.064
Biological	6 (123)	4.47	.000

Mean hazard ratings

Hazard type / Workplace location		Mean	*SD*	95% CI	
				Low. Lim	Upp. Lim
Physical hazards	Asis	3.32	.54	3.04	3.60
	West Indies	4.03	.44	3.78	4.28

	Mosop	3.93	.46	3.71	4.14
	Unga	4.00	.41	3.80	4.21
	Cathedral	3.67	.34	3.49	3.86
	Turkadero (Naivas)	3.71	.38	3.49	3.93
	Pioneer	4.01	.54	3.81	4.21
Chemical hazards	Asis	3.93	.58	3.63	4.23
	West Indies	2.93	1.07	2.33	3.52
	Mosop	2.95	.76	2.59	3.31
	Unga	3.20	.95	2.72	3.67
	Cathedral	3.07	1.13	2.46	3.67
	Turkadero (Naivas)	2.95	1.25	2.22	3.68
	Pioneer	2.88	.87	2.55	3.21
Ergonomic hazards	Asis	3.54	.79	3.13	3.95
	West Indies	3.88	.26	3.73	4.03
	Mosop	3.77	.32	3.62	3.92
	Unga	3.95	.17	3.87	4.04
	Cathedral	3.54	.42	3.32	3.77
	Turkadero (Naivas)	3.55	.41	3.31	3.79
	Pioneer	3.74	.34	3.61	3.87
Biological hazards	Asis	2.82	.57	2.52	3.12
	West Indies	3.16	.27	3.01	3.32
	Mosop	3.31	.13	3.24	3.37
	Unga	3.16	.19	3.07	3.26
	Cathedral	3.06	.57	2.75	3.36
	Turkadero (Naivas)	2.89	.62	2.53	3.25
	Pioneer	3.30	.19	3.22	3.37

4.5.2 Hazard Distribution by Work-type.

An analysis of work type effect on hazard exposure showed statistically significant difference in physical, F (3, 126) = 9.41, $p < .001$ and chemical, F (3, 126) =14.44, $p < .001$, risks distribution. However, there was no significant difference in ergonomic, F (3, 126) = 1.15, $p > .05$ and biological, F (3, 126) = 1.73, $p > .05$ hazards exposure on

work type characteristics (Table 10). Welding had significantly higher mean ratings (*M* = 4.32, *SD* = 0.98) for physical hazards than body works (*M* = 3.70, *SD* = 0.44), engine repairs (*M* = 3.76, *SD* = 0.40), and wiring (*M* = 3.79, *SD* = 0.19). Chemical hazard exposure was significantly higher in body works (*M* = 3.31, *SD* = 0.40) and engine repairs (*M* = 3.53, *SD* = 0.40) than wiring (*M* = 2.38, *SD* = 0.40) and welding (*M* = 2.34, *SD* = 0.40).

Table 10

Occupational Hazards Distribution by Work Type

Hazard type	*Df*	*F*	Sign.
Physical	3 (126)	9.41	.000
Chemical	3 (126)	14.44	.000
Ergonomic	3 (126)	1.15	.331
Biological	3 (126)	1.73	.164

Mean hazard ratings

Hazard type/Work type		Mean	*SD*	95% CI	
				Low. Lim	Upp. lim
Physical hazards	Engine repairs	3.76	.40	3.64	3.87
	Body works	3.70	.44	3.56	3.83
	Wiring	3.78	.18	3.68	3.88
	Welding	4.31	.72	3.99	4.64
	Total	3.83	.51	3.74	3.92
Chemical hazards	Engine repairs	3.53	.85	3.28	3.78
	Body works	3.31	.82	3.06	3.56
	Wiring	2.37	.87	1.91	2.83
	Welding	2.34	.92	1.92	2.75
	Engine repairs	3.81	.33	3.71	3.91

Ergonomic hazards	Body works	3.67	.53	3.51	3.83
	Wiring	3.62	.39	3.41	3.83
	Welding	3.70	.43	3.51	3.89
	Engine repairs	3.14	.40	3.02	3.26
Biological hazards	Body works	3.19	.43	3.06	3.32
	Wiring	3.15	.31	2.98	3.32
	Welding	2.95	.44	2.75	3.15

4.5.3 Worksite Hazard Distribution.

Garage type had limited influence on hazard distribution, with ANOVA results showing no significant difference in chemical, F (2, 127) = 0.21, $p > .05$, ergonomic, F (2, 127) = 1.06, $p > .05$, and biological, F (2, 127) = 1.38, $p > .05$, risks characteristics in all types of establishments (Table 11). Physical hazards, F (2, 127) = 3.36, $p < .05$, significantly differed across the garages. Tukey Post hoc results showed that mean physical hazard ratings were higher in roadside establishments (M = 3.97, SD = 0.53) than mixed auto garages (M = 3.62, SD = 0.50). However, open-air garage physical hazard characteristic (M = 3.82, SD = 0.49) did not significantly differ with those in roadside and mixed establishments

Table 11

Hazard Comparisons by Garage Type

Hazard type	*Df*	*F*	Sig
Physical	2 (127)	3.36	.038
Chemical	2 (127)	0.21	.810
Ergonomic	2 (127)	1.06	.350
Biological	2 (127)	1.38	.255

Mean hazard ratings

Hazard type		Mean	*SD*	95% CI	
				Low. lim	Upp. lim
Physical hazards	Roadside	3.97	.52	3.80	4.13
	Open-air	3.81	.48	3.69	3.93
	Mixed	3.61	.50	3.37	3.86
Chemical hazards	Roadside	3.07	1.12	2.73	3.42
	Open-air	3.16	.91	2.94	3.38
	Mixed	3.01	.92	2.56	3.45
Ergonomic hazards	Roadside	3.80	.41	3.67	3.92
	Open-air	3.68	.47	3.56	3.79
	Mixed	3.69	.33	3.53	3.86
Biological hazards	Roadside	3.04	.38	2.92	3.16
	Open-air	3.17	.44	3.06	3.28
	Mixed	3.18	.36	3.00	3.35

4.5.3 Hazard Distribution by Enterprise Size.

The results of stratified enterprise size analysis showed difference in establishment mean ratings for physical hazards F (2, 127) = 3.48, p = .034. Enterprise size by number of employees did not influence chemical F (2, 127) = 0.96, p > .05, ergonomic F (2, 127) = 2.49, p > .05, and biological F (2, 127) = 1.82, p > .05 hazard distribution. Tukey post hoc results showed significantly (p < .05) high mean ratings for physical hazards in enterprises with 1-2 employees (M= 4.01, SD = 0.42) than establishments with more than five personnel (M = 3.75, SD = 0.56). However, there was no significant difference (p > .05) in hazard mean rating between enterprises with more than 5 staff and establishments with 3-5 employees (M = 3.77, SD = 0.46) (Table 12).

Table 12

Hazard Distribution by Enterprise Size

Hazard type	*Df*	*F*	Sig
Physical	2 (127)	3.48	.034
Chemical	2 (127)	0.96	.387
Ergonomic	2 (127)	2.49	.087
Biological	2 (127)	1.82	.167

Mean hazard ratings

		Mean	SD	95% CI	
				Low. lim	Upp. lim
	1-2	4.08	.44	3.92	4.24
Physical hazards	3-5	3.71	.39	3.51	3.90
	>5	3.76	.53	3.64	3.88
	1-2	2.91	1.07	2.52	3.30
Chemical hazards	3-5	3.30	1.25	2.70	3.91
	>5	3.14	.86	2.95	3.34
	1-2	3.88	.22	3.80	3.96
Ergonomic hazards	3-5	3.63	.58	3.34	3.91
	>5	3.68	.45	3.57	3.78
	1-2	2.96	.41	2.82	3.11
Biological hazards	3-5	3.21	.47	2.98	3.43
	>5	3.18	.39	3.09	3.26

4.5.4 Hazard Distribution by Enterprise Gender Characteristics.

In an independent sample t-test using enterprise by gender characteristics (male only vs. including female) as explanatory variables, the results showed statistically significant difference in group means on chemical, t (1, 128) = 2.24, p = .027 and

biological, t (1, 128) = 2.88, p = .005 hazard distribution (Table 13). Enterprises with female employees had higher mean ratings (M = 3.74, SD = 0.98) for chemical hazards than male only (M = 3.06, SD = 0.97) establishments. However, enterprises with female employees had lower biological hazard distribution (M = 2.80, SD = 0.62) than male only establishments (M = 3.16, SD = 0.38). Physical, t (1, 128) = 0.75, p = .455 and ergonomic, t (1, 128) = 1.59, p = .114 hazards distribution did not significantly differ on enterprise gender characteristics

Table 13

Hazard Distribution by Enterprise Gender Characteristics

Hazard type	*Df*	*T*	Sig
Physical	1(128)	0.75	.455
Chemical	1(128)	2.24	.027
Ergonomic	1(128)	1.59	.114
Biological	1(128)	2.88	.005

Mean hazard ratings

		Mean	*SD*	95% CI	
				Low. lim	Upp. lim
Physical hazards	Male only	3.84	.52	2.92	4.04
	Including female	3.72	.42	3.51	4.90
Chemical hazards	Male only	3.05	.96	2.52	3.30
	Including female	3.73	.97	2.70	3.91
Ergonomic hazards	Male only	3.74	.41	2.60	4.36
	Including female	3.52	.62	3.04	3.85
Biological hazards	Male only	3.16	.38	2.68	3.71
	Including female	2.79	.62	2.04	3.44

4.6 Work-Related Illnesses

An analysis of the self-reported data on common work-related illnesses in the last one year indicated a high occurrence of five major work-related health problems (Table 14). Three of the five common accidents/illnesses: cuts/injuries, 57.2% (n = 65); musculoskeletal, 52.5% (n = 63); and chest pain, 49.2% (n = 59), affected approximately half of the workforce. Chi-square test of association was significant for type of workplace, $\chi 2$ (2) = 52.06, $p < .001$, work type, $\chi 2$ (3) = 332.9, $p < .001$, location, $\chi 2$ (6) = 110.66, $p < .001$, and employment category, $\chi 2$ (1) = 21.28, $p < .031$, indicating a strong relationship between these workshop characteristics and occurrence of work-related illnesses.

Table 14

Common Work-Related Illnesses among the Workforce

Work-related illnesses	Frequency	Percentage (%)
Cuts/Injuries	65	57.2
Musculoskeletal pains	63	52.5
Chest pain	59	49.2
Eye Problems	54	45.0
Breathing problems	47	39.2

WRI Distribution by Workplace Characteristics

Work-related illnesses	Frequency	Percentage (%)	χ2 (*df*)	Sign.
Type of workplace			52.06(2)	<0.001
Roadside	Cuts/Injuries	32 (29.9)		
Open air	Chest pain	41 (15.2)		
Mixed	Musculoskeletal	9 (14.3)		
Work type			332.9 (3)	2.2e16
Body works	Eye problems	37 (18.3)		
Engine repairs	Cuts/Injuries	33 (30.0)		
Welding	Burns	19 (19.4)		
Wiring	Cuts/Injuries	10 (34.5)		
Workshop location			110.66(6)	<0.001

Asis	Breathing problems	13(19.7)		
Cathedral	Musculoskeletal pains	11 (19.3)		
Mosop	Chest pain	12(16.2)		
Pioneer	Chest pain	18(14.8)		
Turkadero/Naivas	Cuts/Injuries	11(20.4)		
Unga	Musculoskeletal pains	10 (28.6)		
West Indies	Cuts/Injuries	14(45.2)		
Enterprise size by number of workforce			21.65(2)	0.481
1-2	Cuts/Injuries	26 (24.3)		
3-5	Musculoskeletal pains	15 (16.3)		
>5	Musculoskeletal and Chest pains	34 (14.2)		
Age category			31.30 (3)	0.552
21-30	Cuts/Injuries	32 (15.0)		
31-40	Cuts/Injuries	27 (15.5)		
41-50	Musculoskeletal	10 (23.8)		
>50	Musculoskeletal	6 (60.0)		
Employment period			49.30 (4)	0.270
1-5	Breathing and Eye problems	9 (20.9)		
6-10	Cuts/Injuries	22 (15.5)		
11-15	Cuts/Injuries	16 (20.0)		
>15	Musculoskeletal	32 (18.5)		
Employment category			21.28 (1)	0.031
Employer	Musculoskeletal	48 (16.8)		
Employee	Eye problems	26 (16.9)		
Enterprise by gender			9.35(1)	0.590
Men only	Cuts/Injuries	58 (14.7)		
Including female	Breathing problems	8 (17.8)		

4.6.1 Proportional Distribution of Work-related Illnesses.

The analysis of the burden of work-related illness in the informal autogarages revealed the occurrence of other health challenges besides the five common illnesses (Figure 5). On overall proportions of occurrence, cut/injuries were more prevalent (14.8%), followed by musculoskeletal pains (14.4%), chest pain (13.4%), eye problems (12.3%), and breathing challenges (10.7%). The prevalence of chronic cough was 8.2%, followed by burns (5.9%), skin conditions (5.5%), hearing problems (5.0%), finger and forearm numbness (4.1%), and forgetfulness (3.6), and electric shock (2.1%).

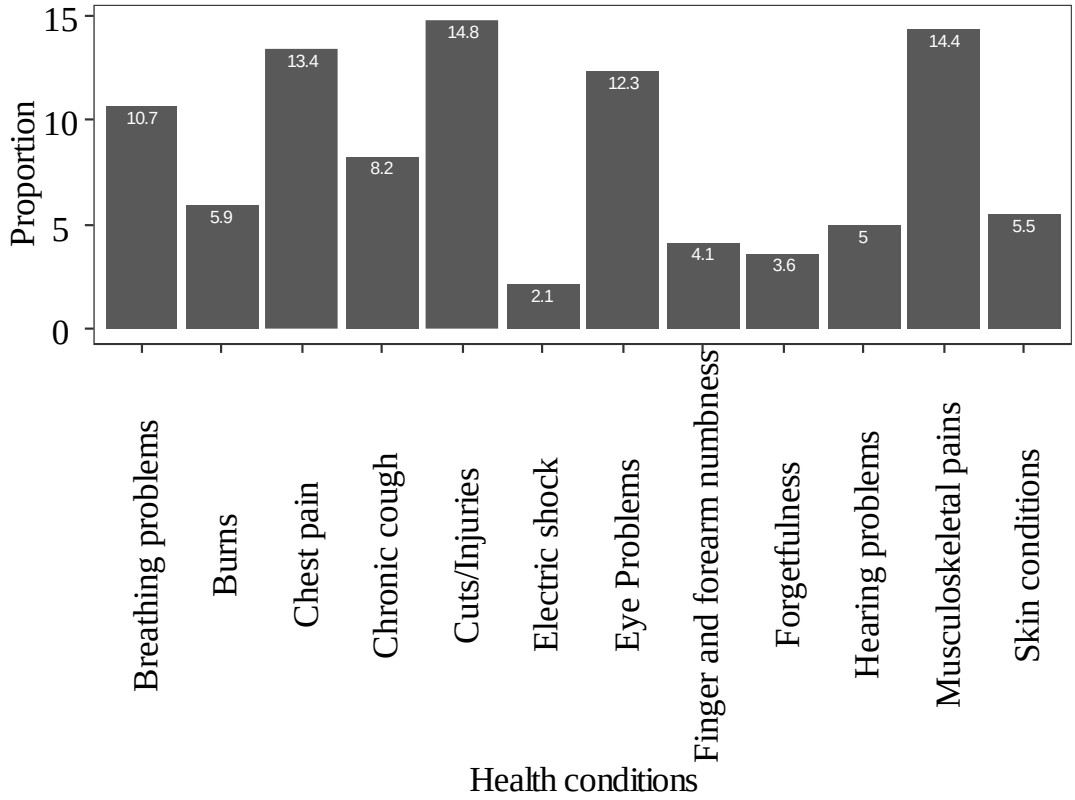


Figure 5. Distribution Proportions of Work-Related Illnesses in the Enterprises

Note: A burden of the work-related illnesses among selected Eldoret town automotive garages

4.6.2 Diagnosed Work-Related Illnesses Distribution by Enterprise Characteristics.

The study also tested whether the diagnosed WRI differed on workshop characteristics, using workshop characteristics as independent variables and workforces' ratings of how

frequently they are diagnosed with WRIs as the dependent variable. ANOVA results showed significant relationship between workshop type, F (2, 127) = 9.47, $p < .001$, enterprise size, F (2, 127) = 3.17, $p = .045$, workplace location, F (6, 123) = 6.32, $p < .001$, and diagnosed health problems among the workforce. However, enterprise gender characteristics, t (1, 128) = 0.48, $p > 0.05$, did not influence diagnosed health conditions among employees (Table 15).

Post hoc test showed mean ratings of respiratory problems, dermatitis, memory loss, and finger and forearm numbness diagnosis differed by garage characteristics. Employees in open air had higher (M = 1.42, SD = 0.24) diagnosed illnesses than those in roadside (M = 1.21, SD = 0.26). There was no statistical difference ($p > .05$) for diagnosed WRI between open air and mixed establishments. In enterprise size, mean ratings of respiratory diseases, dermatitis, eye problems and memory loss diagnosis differed by type of worksite. Establishments with more than 5 employees had higher mean ratings for WRI diagnosis (M = 1.38, SD = 0.25) than those with 1-2 employees (M = 1.26, SD = 0.26). However, mean ratings for WRI diagnosis in workshops with more than 5 employees did not significantly differ from those with 3- 5 employees. The mean ratings of respiratory diseases and memory loss diagnosis also differed by auto garage location. Establishments in West Indies (M = 1.14, SD = 0.21), Unga (M = 1.16, SD = 0.19), and Cathedral (M = 1.25, SD = 0.30) had the lowest diagnosed WRI than those in Asis (M = 1.41, SD = 0.18), Pioneer (M = 1.43, SD = 0.22), Mosop (M = 1.43, SD = 0.22), and Turkadero/Naivas (M = 1.47, SD = 0.31).

Table 15

Diagnosed Work-Related Illnesses by Enterprise Characteristics

Establishment characteristic	*Df*	*F/t*	Sig
ANOVA Test			
Garage type	2 (127)	9.47	0.000

Garage size	2 (127)	3.17	0.045
Workplace location	6 (123)	6.32	0.000
T-test			
Enterprise by gender	1(128)	0.48	0.636

Mean ratings of self-reported diagnosed work-related illnesses

	Mean	*SD*	95% CI	
			Low. lim	Upp. Lim
Garage type				
Roadside	1.21	.25	1.13	1.29
Open-air	1.41	.23	1.36	1.47
Mixed	1.32	.22	1.22	1.43
Garage size				
1-2	1.21	.25	1.11	1.30
3-5	1.30	.25	1.18	1.43
>5	1.39	.24	1.34	1.45
Garage location				
Asis	1.40	.18	1.31	1.49
West Indies	1.14	.21	1.02	1.25
Mosop	1.43	.21	1.33	1.53
Unga	1.16	.18	1.06	1.25
Cathedral	1.25	.29	1.09	1.40
Turkadero (Naivas)	1.46	.30	1.29	1.64
Pioneer	1.42	.21	1.34	1.51
Enterprise by gender				
Male only	1.34	.25	0.87	2.01
Including female	1.30	.25	045	1.92

df - degrees of freedom, *F* - Fishers, *t* - t-statistics, sig – significance

4. 7Occupational Health Services Implementation and Work-related Illnesses

As shown in Table 16, the linear regression analysis revealed no significant association between OSH service coverage and occurrence of WRIs in the informal auto garages ($p > .05$). The results further indicate failure of the current OSH status in the sampled

informal auto garages to explain the occurrence of work-related illness among the workforce (adjusted R-squared = -0.00757). A plot representation of the relationship between the OSH status and WRIs in the sampled garages showed a nonlinear trend indicating a lack of liner association between the two variables (see Figure 5).

Table 16

Relationship between Occupational Safety and Work-Related Illness

Coefficients	Estimate	*t*	*p*
(Intercept)	1.46457	9.552	<2e-16 ***
OSH status	-0.01844	0.175	0.861
R-squared: 0.00024			
F-statistic: 0.03077		p-value: 0.861	

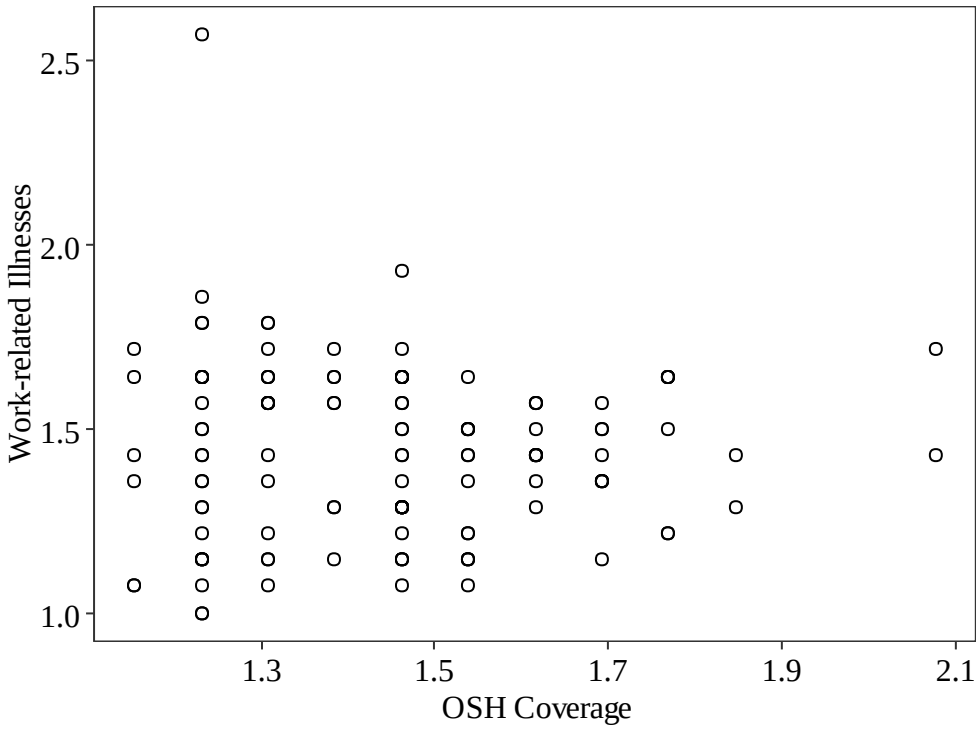


Figure 6. Plot of the relationship between OSH Status and WRIs

Note: Scatter plot representation of the relationship between OSH status and WRIs

CHAPTER FIVE: DISCUSSIONS

5.1 Enterprise Characteristics

The informal automotive garages in the study area are largely open-air and roadside establishments with few enterprises operating as mixed workshops, pointing to the contribution of unmonitored garage distribution to occupational safety challenges in the sector. The result affirms Siakilo's (2014) research that noted government neglect in urban planning as a major socio-economic problem affecting informal enterprises. The majority of these workplaces are predominantly masculine-occupied enterprises highlighting the possible effects of gender stereotypes in workplaces. The finding is consistent with studies that reported predominant masculine characteristics among mechanics (Amponsah-tawiah & Mensah, 2016; Jahangiri et al., 2016; Thangaraj & Shireen, 2017). Beddoes (2021) explains that gender stereotype rooted in most socio-cultural frameworks trigger perception biases and creates socially discriminatory mindsets in various spheres of life, including work categories. In the automotive industry, this discriminatory mindset creates a major gap in mechanical knowledge opportunities for women (Heilman & Caleo, 2015), crucial in explaining their limited number in the sampled informal automotive garages and exclusion in the study. Although enterprise sizes differed by the number of employees, most workshops had more than five personnel. These workplace characteristics indicate that infrastructural challenges, shared working conditions, and congestion increases exposure to occupational risks. These findings underscore the potential application of the study to other occupations with identical working conditions.

Figure 7. Photo of shared and congested workspace in the garages

(Source: Photo by the researcher)

5.2 Occupational Safety and Health Services Implementation

The study assessed OSH services implementation, hazard distribution, and work-related health problems in Kenya's informal automotive garages to establish the workforce's safety concerns. The concept that OSH coverage is fundamental in modeling the workplace safety, employee health, and population wellbeing is well documented and supported by quantitative findings (Gunnarsson, Andersson, and Josephson 2011; Jarolímek et al. 2017a). The study results answered our research question showing low OSH coverage in the sampled enterprises suggesting poor implementation of OSH services in the informal sector. Workplace training is the only occupational safety intervention implemented in these establishments, revealing failure in meeting the minimum OSH standards established by ILO (ILO, 2013b; ISO - International Organization for Standardization, 2017). This poor OSH implementation may be attributable to the informal auto garage characteristics noted in the study. The roadside and open-air locations suggest temporary and unmonitored distribution of the

establishments in non-designated areas, restricting the integration of robust safety structures in the workplaces.

The poor OSH implementation was identical across all the establishments, corroborating findings of inadequate OSH coverage in Kenya's metalwork industry (Keitany, 2014). This safety characteristic may be explained by Siakilo (2014) study, highlighting the contribution of unmonitored distribution and infrastructural challenges in aggravating the informal sector's occupational risk conditions. Auto garage type and size by the number of employees were associated with varying occupational safety services implementation in the study area. Open-air garages and those with over three employees reported better OSH services coverage than roadside garages and establishments with less than three employees. The findings are consistent with Jahangiri et al.'s (2016) study on OSH service coverage among 1758 employees of Iranian Nano-Scale Enterprises. The researchers found low OH activities among enterprises with less than six personnel.

These findings are worse than results from Rauscher and Myers (2013) study that reported moderate OHL levels among adolescent employees. However, other studies have also reported low OSH service coverage among SMEs in the informal sector (Lucchini and London 2014; Yu et al. 2002). Antao and Pinheiro (2015) study on occupational safety in Africa noted the poor OSH coverage linked to insufficient implementation of OSH services. Md Deros et al. (2014), in a study on compliance to necessary workplace safety regulations, revealed poor OSH implementation among Malaysian chemical industry SMEs. In two separate systematic reviews on occupational safety and health services; Joronen and Hahn (2011) African study and Chang-Hee (2016) ILO Vietnamese study reported poor OSH implementation among enterprises. The findings are also consistent with inadequate OSH coverage reported

among the shellfish divers in Chile (Garrido et al. 2020) and SMB in North Cyprus (Işık and Atasoylu 2017). Despite the relatively similar SME's occupational risk characteristics across regions, the OSH coverage in the informal auto garages was poorer than those reported in most countries implying more significant health risks. This finding suggests the need to implement more OSH programs to modify the informal auto garages' safety and health conditions.

The results also confirm geographical disparity in OSH coverage between developed and developing economies. In the Czech Republic, Jarolímek et al. (2017) assessed workplace safety in the automotive industry. The study revealed extensive OSH implementation and improved workplace safety conditions in the industry. Rantanen et al. (2017) reported similar findings in a global survey of OSH implementation among 49 ILO member states, where high-income countries recorded high OSH coverage compared to emerging and developing economies. Another notable occupational safety characteristic in the global survey was the higher OSH coverage among larger enterprises and the formal economy than small-scale enterprises and the informal sector. Developed countries also show improved occupational health programs in the informal sector. Linnan et al. (2019) noted the informal economy's comprehensive integration into the OSH service regulatory framework in America. This regional disparity in OSH coverage between developed and developing countries may be partially explained by Los et al. (2019) study in the Netherlands that linked employers' motivation and commitment to OSH implementation opportunities in workplaces.

5.3 Occupational Hazard Characteristics

In assessing hazard conditions across the establishments, the results supported the notion that informal sectors suffer from shared occupational risks resulting from overcrowded workspaces (Jahangiri et al. 2019). Physical and ergonomic hazards were

the most common harmful agents in the workplace. The findings are consistent with previous studies conducted in the developing countries' informal sector (Amfo-Otu & Agyemang, 2016; Jahangiri et al., 2016; Keitany, 2014; Menya, 2012). Heat, cold, extreme weather conditions, sharp objects, and littered workspaces were common physical hazards. Ergonomic agents included uncomfortable postures, repetitive movements, and lifting of heavy materials. These hazard distributions may be attributable to poor structural establishments and unsuitable workspaces in the informal auto garages noted in the study, associated with urban planning challenges and government neglect (Amfo-Otu and Agyemang 2016; Siakilo 2014).

Figure 8. Photo showing physical and ergonomic conditions of the garages

(Source: Photo by the researcher)

Most enterprises revealed comparatively lower levels of chemical and biological hazards. However, dust and diesel exposures, unsanitary working conditions, and use of unhygienic equipment were relatively high across the surveyed workplaces. These findings contradict those reported in Iranian Nano-scale enterprises comprising low physical hazards levels (Jahangiri et al. 2016). The author noted improved control of physical hazards among the majority of these Nano-scale enterprises explaining this

disparity. This variation in hazard distribution indicates Iran has adopted better strategies in the occupational risks control among small-scale enterprises compared to Kenya. Although the findings correspond with Chauhan et al. (2014) study of welders, the proportions are much higher. Fire outbreak has been reported a common hazard among formal auto garages (Abanga 2016; Akple et al. 2013). The observed risk proportions are higher among these open-air or roadside mechanics than formal auto garages pointing to the disparity of OSH practices between the two sectors as reported by Akple et al. (2013). However, in agreement with African-based research findings (Amfo-Otu & Agyemang, 2016; Keitany, 2014; Menya, 2012), the results generally show poor working conditions in the informal sector.

The distribution of occupational hazards may be of considerable health concern to different populations. Enterprise characteristics influenced hazard distribution in the auto garages. Establishment location influenced physical, chemical and biological hazard distribution in the informal workshops. Worksite and enterprise size by number of employees were associated with varying distribution of physical hazards, while gender characteristics showed association with chemical and biological hazard distribution. Other studies have also reported similar findings. For example, McLellan et al. (2015) discussed the influence of organizational factors in occupational risk distribution. Similarly, Qvotrup et al. (2014) in their study on work-related accidents highlighted the significant role of gendered perspective in shaping occupational safety and mitigating associated health problems. Stergiou-kita et al. (2016) described how enterprise gender characteristics modify risk normalization in workplaces, supporting the observed hazard distribution disparity between men only and including female occupied establishments. Since most of these informal enterprises operate in crowded

areas with infrastructure challenges, hazard conditions appear significant health threat to the majority of the urban population.

5.4 Work-Related Illnesses

Cuts/injuries and musculoskeletal disorders were the common WRIs in the workshops, which may be explained by the high levels of physical and ergonomic hazards in these informal enterprises. This observation is consistent with the World Health Organization (2017) report that noted the contribution of poor OSH service coverage and occupational risks to an increased burden of chronic diseases and mortalities in developing countries. Some studies have linked the occurrence of work-related illnesses to working conditions (Jahangiri et al. 2016; Monney et al. 2014; Thangaraj and Shireen 2017; Vyas et al. 2011; Yusof et al. 2019). Other common WRIs reported in these informal SMEs were chest pains, eye problems, and respiratory challenges. The findings are consistent with the results of studies conducted by Abanga (2016) and Ahmad and Balkhyour (2020), which reported cuts and chest problems as the common health challenges among the workforce.

The high occurrence of eye problems, chest and respiratory challenges may partly be explained by spray paint's exposure due to unprotected areas of the establishments. Respiratory conditions among auto garage employees have previously been linked with diisocyanate exposure (Fisseler-Eckhoff et al. 2011; Pauluhn 2015). However, the findings contradict results from other studies that reported contact dermatitis and carpal tunnel syndrome as significant health problems among automotive workers (Jarolímek et al., 2017). Szeszenia-Dabrowska and Wilczyńska (2013), in their study, also published contradicting findings involving the high occurrence of hearing impairment and carpal tunnel syndrome manifesting as finger and arm numbness among automotive assembly employees. Of particular note is that these studies were conducted in the

formal automotive industry, suggesting the difference in findings may be attributable to the disparity in occupational characteristics and OSH coverage. The variation in these health problems across the different study settings may also be linked to disparity in hazard exposure levels in the work environments (Adela, Ambelu, & Tessema, 2012; Senapati et al., 2020).

Other studies have also linked the occurrence of WRIs to worksite characteristics (Jarolímek et al., 2017b; Vyas et al., 2011). The present study revealed the influence of workshop type, location, and size on the occurrence of WRIs. Location characteristics, infrastructural challenges, and congestion among informal automotive garages may have contributed to increased employees' hazard exposure. These findings differ from other previous studies that reported safety perception and risk normalization to influence safety culture in male-dominated workplaces (Balanay et al., 2014; Qvotrup et al., 2014; Reeder, Gray, Mccool, 2013; Senapati, 2019; Stergiou-Kita et al., 2016). The present study's results on OSH coverage, showing a significant disparity in OSH training on location and enterprise size, helps explain this variation. A high WRIs among open-air and mixed workshops than roadside establishments may be attributable to improved safety and health awareness enhancing healthcare-seeking behaviors and occupational safety cultures in these establishments.

5.5 Occupational Health Services Implementation and Work-Related Illnesses

A focus on the potential influence of OSH service coverage on occurrence of WRIs showed lack of association between implemented safety guidelines and diagnosed health conditions. Although the study noted significant differences in OSH training in the establishments, this association did not translate to the fundamental protection of employee health. This finding is consistent with the results from a randomized control pilot study on a construction worksite conducted by Oude Hengel et al. (2014); that showed identical health outcomes between the control and experimental groups. Petersen's theory of occupational diseases highlights the significant contribution of human-system interactions in disease causation (Petersen, 1999). The model supports the present study's findings suggesting the possible outweighing effect of other occupational system components over OSH training influence on hazard exposure. Establishment characteristics, including location, worksite, gender, and enterprise size by the number of employees, influenced hazard distribution and may have outweighed OSH services protection of employees.

Despite the inadequate effects of the low OSH status in health protection, other extant studies shows an association between OSH training and WRIs (Jarolímek et al., 2017b; Jia et al., 2018; Liu et al., 2020; Rauscher & Myers, 2013). ILO (2013b) and ISO (2017) reports stipulate basic guidelines for standard OSH implementation, highlighting the significant contribution of each OSH service in health promotion and protection in workplaces. Other studies have also noted the fundamental contribution of workplace health programs in modeling occupational safety (McLellan et al. 2015; Sorensen et al. 2016). While these literatures acknowledge the significant contribution of varying safety interventions in enhancing occupational health, the present findings suggest failure of OSH training to influence occurrence of WRIs. With these studies conducted

in formal occupations, differences in occupational characteristics in the study areas, the sample sizes, and research design may account for the observed disparities. Overall, the findings demonstrate the complexity of human-system factors interaction and safety influence in occupational settings.

The present finding implies that partial implementation of primary OSH services resulting in minimum OSH standards may not have any significant protective effect on employees. Some studies have shown limitations in integrating safety and health knowledge into protective behaviors among the workforce (Bejan, Xi, and Parker 2020; Johnson and Motilewa 2016). This concept may partially explain the observed lack of relationship between OSH coverage and WRI in the present study. The shared working environments may also account for the observed lack of association between OSH and the occurrence of WRIs. The inadequate OSH coverage limits health and safety facilitation for the majority population in the informal sector, highlighting workplace urgency areas in occupational safety. Future research should evaluate OSH training processes and services in these workplaces to determine best practices for enhanced health promotion programs.

5.6 Limitations and Future Research

The expansive contextual factors in the informal sector, particularly the unpredictability and flexible work characteristics, make it difficult to link the observed outcome with the existing OSH services' implementation. The reported hazard conditions and health challenges involve collective exposure experiences from different work areas, suggesting the need for care in linking the findings to specific workplaces. Since the study sampled garages registered under local informal sector Sacco (the Eldoret Juakali Association- North Rift), there is possibility of outdated records potentially affecting informal automotive garages representation. It is suggested that given complex

characteristics of the informal automotive garages, future research work should consider the non-registered informal automotive establishments' inclusion to accommodate all garages representation in the study.

Another fundamental limitation was the concurrent assessment of hazard characteristics and related illnesses in the cross-sectional study. The complexity of workplace characteristics limits comparisons of study variables in these enterprises. Detailed research assessing hazard concentration and exposure levels in formal and informal automotive garages is required to compare the potential effects of the respective occupational risks on workers' health. There is also a need for comprehensive research on quantitative analysis of systemic levels and toxicity of hazardous agents among this workforce in the informal sector.

CHAPTER SIX: CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The growth of the informal economy due to rapid industrialization and poverty has contributed to occupational safety challenges and health burdens in developing countries. Assessing the extent of occupational safety practice compliance is imperative to maintaining workplace safety, workforce health protection, and promotion of public wellbeing. The informal automotive garages have inadequate OSH services coverage compromising workplace safety conditions indicated by high occupational hazards distribution and prevalence of work-related health problems among the garage workforces. The unmonitored distribution of these work environments along congested public roads and poor OSH services implementation contribute to increased distribution and exposure to physical, ergonomic, chemical, and biological hazards. Occupational risk exposure has led to the prevalence of work-related health problems among the garage workforce, including cuts/injuries, musculoskeletal pain, chest aches, eye problems, and breathing challenges.

The flexible work characteristics and shared working conditions affect the existing OSH service protection of workforces. With the complex workplace characteristics and poor OSH coverage, most workforces and the neighboring population get exposed to various occupational hazards. Public health, environmental, and research institutions should seek to integrate standard safety practices into all sectors of the economy to combat the health challenges of hazard exposures in work environments. This research highlights the informal automotive garage industry as a high-priority area in occupational safety, essential in population health protection. If these health institutions fail to combat occupational risks, there is a risk of these informal automotive garages

transforming into high health risk settings. More research is needed to formulate new OSH compliance strategies to support the informal sector needs of the global economy.

6.2 Recommendations

1. Garage owners should ensure standard OSH services' implementation and utilization at worksites.
2. National and county government public and environmental health regulatory agencies, including garage owners, to ensure adequate OSH services coverage to transform the sector into a safe work environment.
3. National and county government health regulatory agencies should also collaborate to ensure frequent inspection of the workplaces for standard safety practices, including appropriate workplace design, equipment, work practices, health services, sanitation, and personal protective equipment to enhance workforce health protection.

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APPENDICES

Appendix 1: Consent Form

Consent for Participation in the Research

Study Title: Occupational Safety and Health Status in Car Repair Workshops
Principal Investigator: Cheruiyot D. Abraham
Name of the Institution: Moi University
Name of Sponsor: Self
IRB Study Number: [-----]

Occupational Safety and Health Status in Car Repair Workshops Consent Form

I am Cheruiyot Abraham, a Public Health master's student of Moi University. I am doing a research on Occupational Safety and Health status, which is a focus area in the protection and promotion of population wellbeing in the country. The aim of this survey is to get information on the status of occupational health and safety practices in informal car repair workshops within Eldoret. The data collected will be used only for scientific purposes.

I am going to give you information and invite you to participate in the study. This research will involve filling of the questionnaire related to your work. In order to get the real situation of occupational health and safety in informal (Juakali) car repair workshops, please answer the questions fully and correctly as possible. We will not be accessing any personally identifying information about you in the research.

Your participation in this research is voluntary and can withdraw from the study at any stage without losing any of your rights. This proposal has been reviewed and approved by Institutional Research Ethics Committee (IREC) of Moi University, which is a committee whose task it is to make sure that research participants are protected from harm.

There may be words you do not understand or any question, please ask me to explain.

Certificate of Consent

I have read the above information, and have received answers to any question I asked. I consent voluntarily to participate in this study.

Name of Participant_____
Signature of Participant _____
Date _____
Day/month/year

Appendix 2. Questionnaire

Occupational Safety and Health Status of Car Repair Workshops in Eldoret Town

Workplace number	……..
Workplace Location	……..
Type of Workshop	Roadside [ ] Open-air [ ]

Section A: Socio-Demographic Characteristics

1. Please indicate your employment status in the workshop
    a. Employer/ Manager [ ]
    b. Employee [ ]
2. Indicate your age_____
3. Indicate your Sex
    a. Male [ ]
    b. Female [ ]
4. Indicate you marital status
    a. Married [ ]
    b. Single [ ]
    c. Divorced [ ]
    d. Widowed [ ]
    e. Separated [ ]
5. Indicate the level of education you have attained
    a. Primary [ ]
    b. Secondary [ ]
    c. Technical college [ ]
    d. University degree and above [ ]
6. How long have you been working in car repair sector?
    a. 1- 5 [ ]
    b. 6- 10 [ ]
    c. 11- 15 [ ]
    d. Over 15 years [ ]
7. Apart from management/supervisory responsibilities, are you also involved in other workshop activities?
    a. Yes [ ]
    b. No [ ]
    c. Does not apply [ ]
8. If yes in the above, state the kind of work you do currently (You can select more than one)

	Type of work	**Indicate by marking on this Column**
1.	Welding	
2.	Engine repair/servicing	
3.	Tire repair and replacements	
4.	Oil change	
5.	Spray painting	

6.	Brush painting	
7.	Wiring	
8.	Panel beating	
9.	Wheel alignment/balancing	
10.	Replacing filters (oil, air, and fuel filters)	
11.	Marketing personnel	
12.	Glazing (Glass) repair and replacement	
13.	Sanding	
14.	Car Valeting (washing and polishing cars)	
15.	Brake works	

SECTION B: OCCUPATIONAL HEALTH SERVICES CHARACTERISITC

9.Are you familiar with Occupational Safety and Health Act (OSHA 2007)?

a) Yes [ ]
b) No [ ]

10. If yes in the above, indicate whether the following safety services are covered in your workplace (You can choose more than one)

	Topic	**Mark in this column**
Surveillance of workers health	Pre-employment medical examination	
	Periodic on-site medical examination	
	System for reporting health problems	
Health and safety training	Workplace health and safety education/training	
	Trained staff for first aid	
	Provision of Material Safety Data Sheet	
	PPE use training	
Workplace Inspection	Yearly inspection	
	Presence of committee for health and safety	
	Presence of sanitary facilities-toilets, safe drinking water	
Medical and Health services	First Aid procedures	
	Provision of curative or occupation-based outpatient medical care	
	Presence of employee health records	
	Provision of personal protective equipment	

11. To what extend do you apply the following OSH services in improving safety and health in your workplace

1= None, 2 = Low, 3 = Moderate, 4 = High, 5 = Very high

	Challenge	**1**	**2**	**3**	**4**	**5**
1.	Pre-employment medical examination					
2.	Periodic on-site medical examination					
3.	System for reporting health problems					
4.	Workplace health and safety education/training					
5.	Trained staff for first aid					
6.	Provision of Material Safety Data Sheet					
7.	PPE use training					
8.	Yearly inspection					
9.	Presence of committee for health and safety					
10.	Presence of sanitary facilities-toilets, safe drinking water					
11.	First Aid procedures					
12.	Provision of curative or occupation-based outpatient medical care					
13.	Presence of employee health records					
14.	Provision of personal protective equipment					

SECTION C: HAZARD CHARACTERISITCS

12. Do you think there are any safety and health hazards in your work environment?
    a. Yes [ ]
    b. No [ ]
13. Kindly, indicate how common you encounter each of the following hazards in your workplace.

1 = None, 2 = Low, 3 = Moderate, 4= High, 5 = Very high

	a). Physical hazards	1	2	3	4	5
1.	Heat					
2.	Cold					
3.	Extreme weather conditions					
4.	Noise					
5.	Welding radiation					
6.	High voltage electrical appliances					
7.	Mechanical and sharp parts					

8.	Dirty and littered working floors (grease, oil, and obstructive objects)					
	b) Chemical hazards	1	2	3	4	5
1.	Solvents					
2.	Fuels					
3.	Metal cleaners					
4.	Lubricants					
5.	Brake fluids					
6.	Plastic glues					
7.	Diesel exhaust fumes					
8.	Dust					
	c) Ergonomics hazards	1	2	3	4	5
1.	Lifting and moving heavy objects					
2.	Working in uncomfortable postures					
3.	Repetitive movements					
4.	Attack and violence					
	d) Biological hazards	1	2	3	4	5
1.	Unsanitary conditions/ dirty working areas					
2.	Unhygienic working equipment					
3.	Presence of rodents and insects					
4.	Presence of Bats and Bat-droppings					

14. Indicate whether the following welfare facilities/utilities are present in your workplace (**1 = Absent, 2 = Inadequate, 3 = Adequate**)

Facilities/Utilities	**1**	**2**	**3**
Drinking water			
Toilet/Latrine			
Food canteen/hotel			
Resting place			
First aid Equipment			
Fire equipment			
Garbage Collection			
Wastewater drainage			

SECTION D: WORK-RELATED HEALTH CHARACTERISITCS

15. Have you been involved in a workplace accident or illness that limited your work capacity, made you take a rest, or required medical attention
    a. Yes [ ]
    b. No **[ ]**

16. Indicate how frequent you or are clinically diagnosed in a hospital visit with any of the following conditions?

(1. = Never, 2 = occasionally, 3 = Half the time, 4 = Almost always, 5 = Always)

	Health problem	**1**	**2**	**3**	**4**	**5**
1	Respiratory disorders					
2	Dermatitis					
3	Eye/Vision problems					
4	Hearing Impairment					
5	Burns					
6	Cholera					
7	Memory loss					
8	Finger and forearm numbness					
9	Typhoid					

17. Rate the contribution of each of the following health problems to absenteeism from work in your workshop

(1. = Not at all, 2 = occasionally, 3 = Half the time, 4 = Almost always, 5 = Always)

	Health problem	**1**	**2**	**3**	**4**	**5**
1.	Musculoskeletal pains					
2.	Hearing problems					
3.	Cuts/Injuries					
4.	Sleeping disorders					
5.	Skin conditions					
6.	Eye Problems					
7.	Chest pain					
8.	Breathing problems					
9.	Chronic cough					
10.	Burns					
11.	Electric shock					
12.	Forgetfulness					
13.	Finger and forearm numbness					
14.	Stomach upsets					

18. Indicate the priority of the below possible solutions to improving safety and health in the workplace (**1 = Not a priority, 2 = Low priority, 3 = Medium priority, 4 = High priority, 5 = Essential**)

	Solution/Strategy	**1**	**2**	**3**	**4**	**5**
1	Support from government agencies in planning considerations					
2	Upgrading equipment					
3	Government financial support					
4	Government intervention and strict implementation of business regulations					

5	Health and safety Training					
6	Provision of personal protective equipment					
7	Technical Training					
8	Others (Name)					

Appendix 3: IREC Approval

INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)

MOI TEACHING AND REFERRAL HOSPITAL
P.O. BOX 3
ELDORET
Tel: 33471//2/3

MOI UNIVERSITY
COLLEGE OF HEALTH SCIENCES
P.O. BOX 4606
ELDORET
Tel: 33471/2/3

2nd April, 2020

Reference: IREC/2020/02
Approval Number: 0003584

INSTITUTIONAL RESEARCH & ETHICS COMMITTEE
02 APR 2020
APPROVED
P. O. Box 4606 - 30100 ELDORET

Mr. Abraham Daniel Cheruiyot,
Moi University,
School of Public Health,
P.O. Box 4606-30100,
ELDORET-KENYA.

Dear Mr. Cheruiyot,

OCCUPATIONAL SAFETY AND HEALTH STATUS AMONG WORKERS OF CAR REPAIR WORKSHOPS IN ELDORET TOWN, KENYA.

This is to inform you that ***MU/MTRH-IREC*** has reviewed and approved your above research proposal. Your application approval number is ***FAN:0003584.*** The approval period is ***2nd April, 2020 – 1st April, 2021.***

This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consents, study instruments, MTA) will be used.
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by ***MU/MTRH-IREC***.
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to ***MU/MTRH-IREC*** within 72 hours of notification.
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to ***MU/MTRH-IREC*** within 72 hours.
v. Clearance for export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to ***MU/MTRH-IREC.***

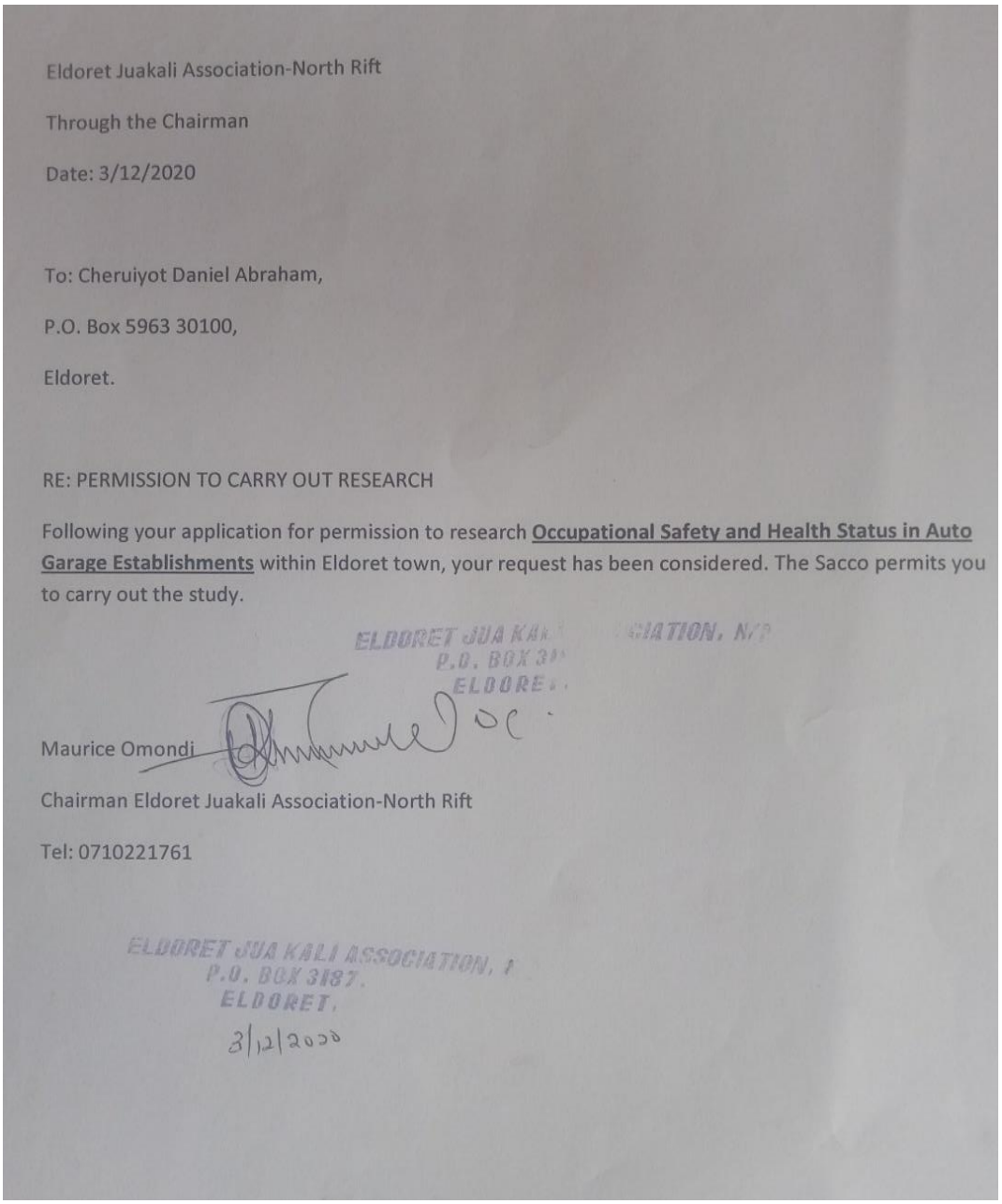
Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://oris.nacosti.go.ke and also obtain other clearances needed.

Sincerely,

PROF. E. WERE
CHAIRMAN
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE

cc CEO - MTRH Dean - SOP Dean - SOM
Principal - CHS Dean - SON Dean - SOD

Appendix 4: Eldoret Juakali Association-North Rift Permission Letter



Eldoret Juakali Association-North Rift

Through the Chairman

Date: 3/12/2020

To: Cheruiyot Daniel Abraham,

P.O. Box 5963 30100,

Eldoret.

RE: PERMISSION TO CARRY OUT RESEARCH

Following your application for permission to research **Occupational Safety and Health Status in Auto Garage Establishments** within Eldoret town, your request has been considered. The Sacco permits you to carry out the study.

ELDORET JUA KA[illegible] [illegible]CIATION, N/R
P.O. BOX 3[illegible]
ELDORE[illegible]

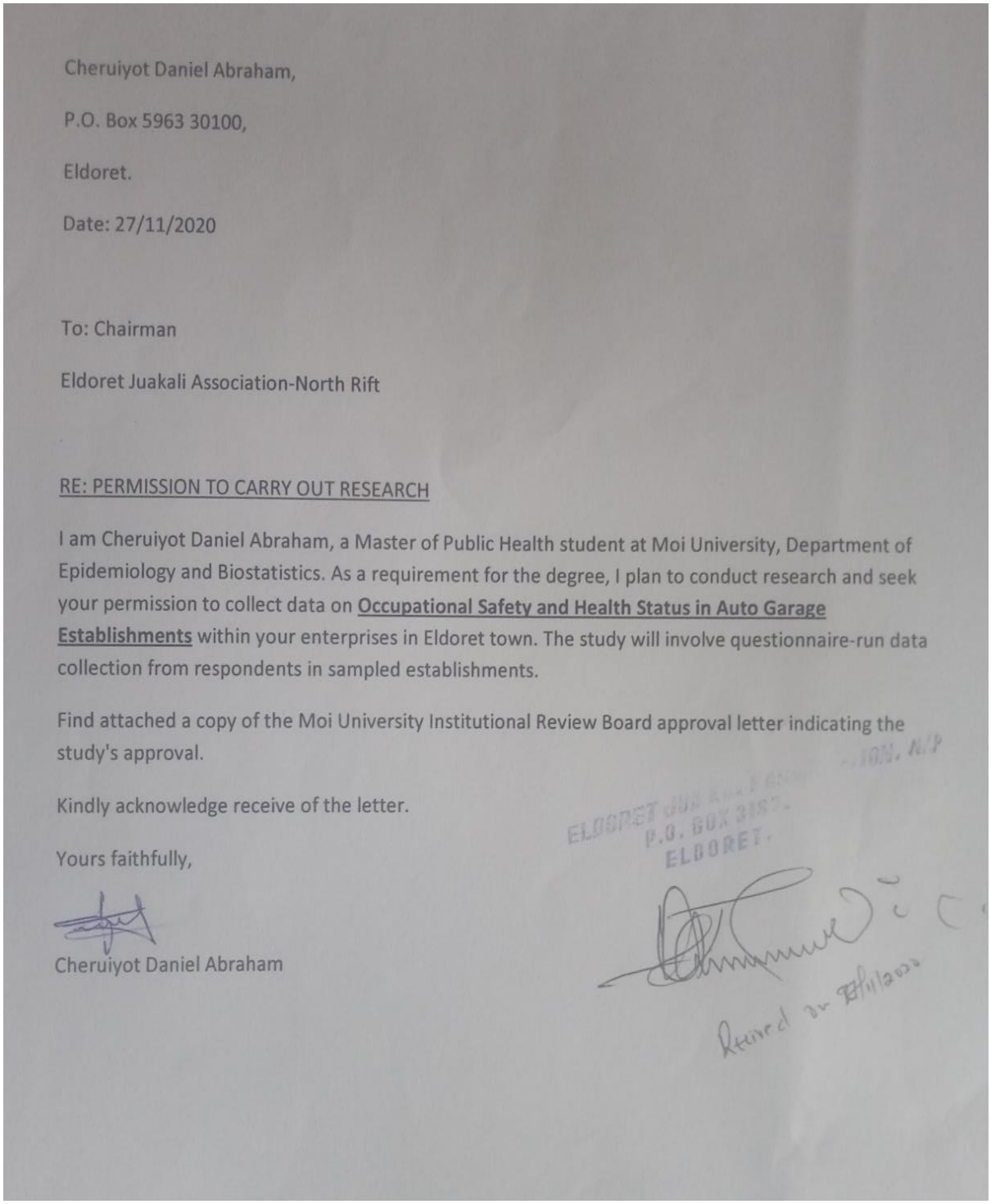
Maurice Omondi

Chairman Eldoret Juakali Association-North Rift

Tel: 0710221761

ELDORET JUA KALI ASSOCIATION, [illegible]
P.O. BOX 3187.
ELDORET.
3/12/2020

Appendix 5: Data Collection Application Letter



Cheruiyot Daniel Abraham,

P.O. Box 5963 30100,

Eldoret.

Date: 27/11/2020

To: Chairman

Eldoret Juakali Association-North Rift

RE: PERMISSION TO CARRY OUT RESEARCH

I am Cheruiyot Daniel Abraham, a Master of Public Health student at Moi University, Department of Epidemiology and Biostatistics. As a requirement for the degree, I plan to conduct research and seek your permission to collect data on **Occupational Safety and Health Status in Auto Garage Establishments** within your enterprises in Eldoret town. The study will involve questionnaire-run data collection from respondents in sampled establishments.

Find attached a copy of the Moi University Institutional Review Board approval letter indicating the study's approval.

Kindly acknowledge receive of the letter.

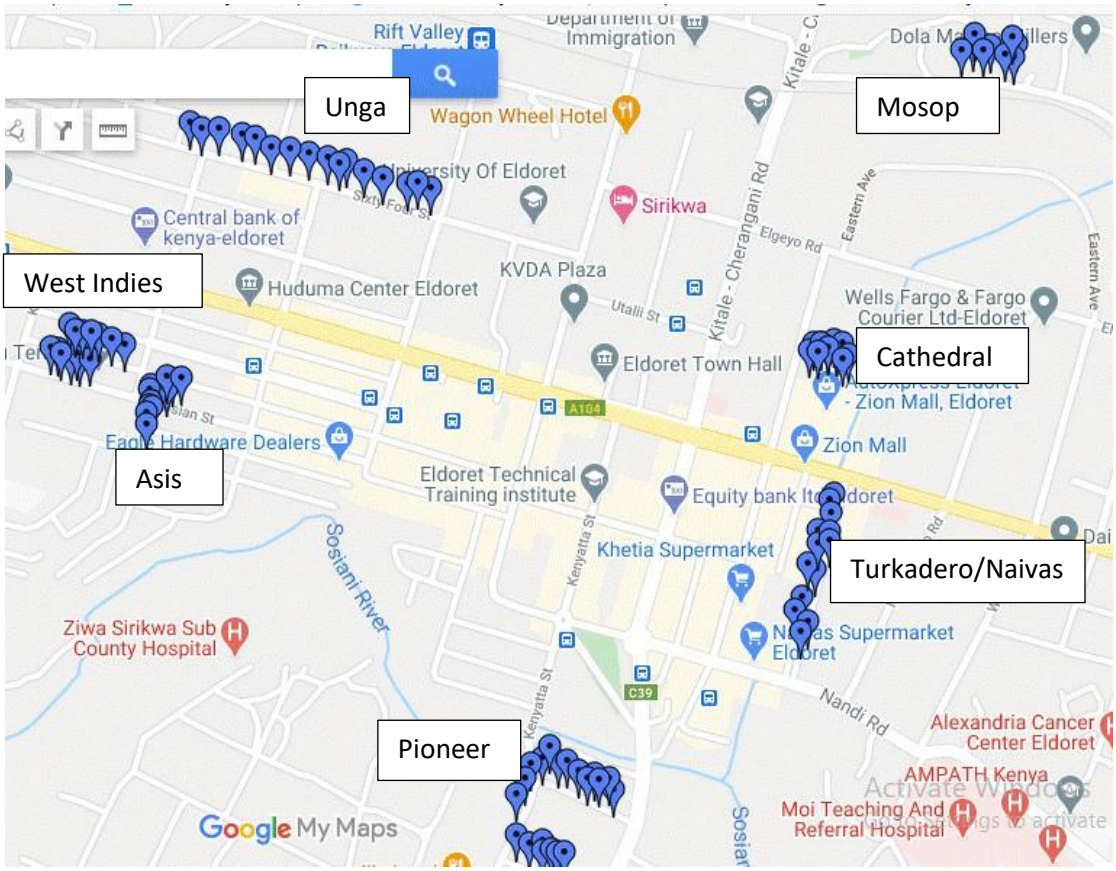
Yours faithfully,

Cheruiyot Daniel Abraham

ELDORET JUA
P.O. BOX 3153
ELDORET.

Received on 27/11/2020

Appendix 6: Study Area Map



Appendix 7: Automotive Garage Photographs