

TOPIC: AN ASSESSMENT OF OCCUPATIONAL HEALTH AND SAFETY IN THE INFORMAL CAR MAINTENANCE, WELDING AND SPRAY PAINTING INDUSTRY IN MBABANE.

1. Introduction

1.1 Background on Mbabane:

Mbabane city is the capital of Swaziland. According to the 1997 census report, the population of Mbabane was 58 063. Unemployment is very high, an estimated 15% of the urban population. The total population of Swaziland is estimated to be 1.2 million. About 70% of the population of the country is rural and only 30% is urban. Rural-urban migration is estimated to be 7% per annum and it makes the city prone to the mushrooming of informal industrial operations. Informal industrial operations are increasing in Mbabane and in Swaziland in general. However, there is no documentation to that effect and therefore it is difficult to know the size and profile of the informal sector.

1.2 Literature Review

1.2.1 General

The International Labour Organisation (ILO) describes the Informal Sector as economic activity that takes place outside the formal norms of economic transaction established by the state¹. According to ILO sustainable development to occur a healthy environment is required². The informal sector does not have nor follow any standards on health and safety and environmental hazards are a problem. Workers are often exposed to poor working environments including inadequate premises and unsatisfactory hygiene facilities, and occupational health services are not available².

¹ <http://www.openair.org>

² <file://A:\ILO SafeWork-inf.sect.htm>

The general well being, health and the quality of life of Informal Industrial Sector workers and their families are impaired and adversely affected². According to the World Health Organisation (WHO), the Informal Sector suffers particularly more from occupational injuries and diseases because the risk of exposure is higher and the Sector does not have the much-needed relevant legislative, administrative and technological provisions³.

A study of working conditions among Informal Sector operators, found that they were prevalent problems of housekeeping, working postures and unsafe use of equipment, inadequate ventilation and lighting⁴.

A pilot study carried out in Dar- es- Salaam found that workers suffered from respiratory illnesses, back pains, joint and muscle pain, headaches, hernia and fungal infection of the feet and hands, all of which were associated with exposure to solvents and dust; strenuous work, improper work posture and poor seats, long working hours, heavy lifting of loads including lifting postures⁴. Women, children, migrant workers, and minorities are viewed as vulnerable to occupational hazards, especially in the Informal Sector, where workers are often subjected to highly unsafe conditions in makeshift factories⁵. An evaluation of health hazards in Informal Businesses in Soweto, Johannesburg, found that workers lacked information on the health implications of substances they worked with and exposed to and felt that they had no financial muscle to improve their occupational health and safety⁷. A survey of occupational risks and health impact carried out in the informal sector in Zimbabwe found that annual rates of injuries and illness exceeded those from the formal sector⁸.

³ <http://w3.whosea.org/rdhome/rdspeech/322ocupat.htm>

⁴ <file://A:\International OSH Programme of Informal Sector.htm>

⁵ <http://www.who.int/inf-fs/en/fact084.html>

⁷ Myeni S, 1999:p4 A report on health hazard evaluation in the Informal Businesses in Soweto

⁸ <file://A:\ch 4 Zim.htm>

According to ILO, protection of the health and welfare of Informal Industrial Sector workers is a challenge that needs to be met with appropriate strategies that include health promotion, social protection and quality employment creation aimed at improving the basic living conditions of the urban poor². Support to the informal sector should be part of a long-term strategy that includes increasing Formal Sector employment and improvement of working conditions and employment opportunities for the poor. The ILO recognises the fact that the Informal Sector workers could bring about changes in their working and living conditions if they are convinced of the need to, and that through education and training, they could be empowered to perform their tasks safely under healthy and protected conditions².

Entry into the Informal Sector more frequently depends on the availability of gainful employment. Family members are often found working together. Women and children are mostly found in unskilled manual jobs. Apprenticeships in the Sector constitute one of the major means to gain skills and knowledge and I believe that it is at this point that a lot of exposure to hazards is at its worst.

The educational background of the operators is often very low. The production of goods and services is of low quality due to lack of expertise and frequent turnover from one type of occupation to another with restricted access to markets and formal training².

1.2.2 Interventions

Some attempts have been made by various countries to deal with the Informal Sector in the area of health promotion and protection, through

assistance from the ILO, WHO and UNDP. Evidence from those interventions show that with appropriate support, Informal Industrial Sector workers can move from a situation of mere survival to a stronger economic position enhancing their contribution to economic growth and social integration, as well as participating in the improvement of their own working and living conditions².

Productivity of informal sector workers could be raised by developing measures that effectively increase their income and provide services to assist them in protecting their health and improving their working conditions². Between 1994 and 1996 the ILO carried out projects aimed at improving safety, health and working conditions in the Informal Sector in Bogotá (Colombia), Manila (Philippines) and Dar es Salaam (Tanzania).² Access to health care was improved and the improvement of standards of safety and health were achieved through measures instituted with the aim of improving working and living conditions for Informal Sector workers. The project also aimed at, among others, reducing accidents and diseases; development of management skills and capacity building. A safety and health programme including a health insurance scheme was established in Dar es Salaam. The project was so successful that it was extended from 1996 to 1999⁹. The components of the project included raising awareness of occupational health hazards and the provision of occupational health and preventive services using existing primary health care structures. Ten business clusters were involved in which safety and health was promoted. In those clusters only five were given health insurance cover, however, in all of them safety and health committees were established and trained. A total of sixty-one members were trained to

⁹ Xaba J, Horn P & Motala S, 2002:p24&32, The informal Sector in Sub-Saharan Africa.

be in charge of health promotion and received technical supervision from a safety engineer.

There was also a training program modules of which were made to show the effects of improved working conditions on productivity. The programme dealt with, among other things, physical, chemical and biological hazards in the working environment. Other interventions included the application of measures meant to improve ergonomics, work practices and appropriate use of tools.

In 1988 UNDP initiated a programme whose objective was to develop an integrated approach to productivity, employment creation, health promotion and social protection for Informal Sector workers².

Lessons learnt from all the above-mentioned interventions indicate that occupational safety and health in the Informal Sector could be improved and that sustainability of interventions is possible if these are introduced to them through existing local structures.

The Bali declaration of 1997 acknowledged the fact that the Informal Sector represented a significant component of the economies of developing countries and that every worker had the right to occupational health and safety.

The Primary Health Care (PHC) strategy was seen as appropriate and cost effective in improving occupational safety and health of the Informal Sector workers¹⁰.

1.2.3 Importance of the Informal Sector

¹⁰ <http://www.aposho.org>

According to ILO this Sector employs between 30 and 80 per cent of the urban workforce in many countries. In Asia it is estimated that the Sector absorbs about 40 to 50 per cent of the urban labour force. However, in Indonesia the Informal Sector is said to provide employment to about 70 per cent of the workforce. Informal Sector workers are said to be facing occupation health and safety problems worst than those faced by workers of the Formal Sector and they include exposure to toxic substances, weather, bad working environment and malnutrition¹⁰. In Africa it is estimated that the urban Informal Sector employs about 61 per cent of the urban labour force. In Latin America informal sector-employment grew at an annual rate of 4.7 percent compared to the 1.1 percent annual growth of Formal Sector employment between 1990 and 1994². Seemingly, the number of Informal Sector workers is on the increase⁴. Most Informal Traders do not comply with regulations pertaining to registration, licensing, tax payments, occupational safety and health, and working conditions⁹. In Bangkok, Thailand, 87% of the city's slums population were found to work in the Informal Sector. Health reports in Indonesia indicate that workers in Informal Sector suffered from health problems such as malnutrition, occupational asthma, skin allergy, chemical poisoning, food poisoning, muscle and tendon diseases, lymphoid and blood diseases.

In Swaziland the Informal Sector is said to be continuing to offer jobs to workers retrenched from the Formal Business Sector. It is estimated that in 2003 a growth rate of 27 percent has been realised⁶. The unemployment rate is estimated to be 22%; the school dropout rate is about 10%, while the

⁶ <http://www.swazibusiness.com/sby2003/index.php?=19>

transition rate from school to higher education is 20%. The informal sector is fast growing in the country, however, its size and profile is not documented.

1.2.4 Legal Aspects and Labour Relations

In many Informal Sector micro-enterprises, there is no clear employer/employee relationship. Labour relations are based on casual employment kinship or personal and social relations rather than contractual arrangements with formal guarantees. Very often Informal Sector operators and workers may not be registered with the appropriate regulatory authorities ⁴.

Most of the micro-enterprises from the Informal Sector operate on open land or locations not legally recognized for the purpose and with no right of ownership. Thus, municipal regulatory standards are not applicable to them. Since they do not own the land, they cannot have access to sanitary facilities, permanent and suitable working environments, access to potable water or electricity as these services are provided only to lawful owners of land. Existing occupational safety and health regulations do not cover these workers.

1.2.5 Available Data

Most Informal Sector activities are un-recorded or are partially recorded in official statistics. Information on occupational accidents and diseases collected as a result of claims does not include the Informal Sector workers, and data on the Informal Sector is missing from information collected by

Labour Inspectors⁴. Available data are scattered and not up-to-date. Given the size of the labour force, the diversity of operations and various social demographic characteristics of the Informal Sector operators, substantial efforts are necessary in order to obtain adequate background information on the occupational safety and health problems of its workers².

This Sector is not covered by national recording, notification and compensation systems; there is scarce information on occupational accidents and diseases arising from hazardous working conditions, which could be used for the identification of priority areas of prevention. Therefore, to obtain such information it would be necessary to carry out ad-hoc surveys or to include occupational safety and health modules in national household and similar surveys. This would contribute to cover gaps, validate existing data, enlighten earlier unmapped areas and produce more reliable estimates, in order to propose preventive and control measures against accidents and diseases in the informal sector.

1.2.7 Working Conditions

The majority of urban Informal Sector workers live in poor areas, lack basic health and welfare services and social protection and work in an unhealthy and unsafe working environment. For many Informal Sector operators their home and workplace are one and the same place. The conditions under which most Informal Sector workers operate are precarious and unsafe.

Many of the micro-enterprises in which they operate have ramshackle structures, lack sanitary facilities or potable water and have poor waste disposal systems.²

The combination of occupational hazards and poor living conditions coupled with poor working practices and poor working conditions can exacerbate the health problems of Informal Sector workers. According to results of a study in the Philippines showed that prevalent problems in the Informal Sector included poor housekeeping, work postures, un-safe use of equipment, inadequate ventilation and lighting⁴. A pilot survey in Dar es Salaam found that common health complaints among Informal Sector workers were; respiratory illnesses, back pain, joint and muscle pain, headache, hernia and fungal infection of feet and hands⁴. Complaints were associated with exposure to dust and solvents, strenuous work, improper postures, lifting of heavy loads, and working on damp surfaces without shoes.

1.2.8 Informal Car Maintenance, Welding and Spray painting

In a study by the ILO on occupational and chemical safety and health in small and medium enterprises, it was found that workers in auto repair shops had the following complaints; headache, skin problems and addiction to solvents¹³.

Spray painting

According to the Government of the United Kingdom, exposure to isocyanates can cause long-term and at times life-threatening illness and spray mist and vapours containing these may cause or worsen existing asthma or dermatitis¹⁴. In the United Kingdom spray painting was found to produce the highest exposure and was one of the main causes of occupational asthma and sprayers had an 80 fold higher risk of getting asthma compared to the rest of the working population¹⁴.

¹³<http://www.ilo.org/public/English/protection/safework/papers/smechem/ch3.htm> p8 (accessed 15.11.2005)

¹⁴ <http://www.hse.gov.uk/mvr/main-illhealth.htm> p1-4 (accessed 15.11.2005)

According to the Government of Western Australia, there are many hazards that workers in spray painting may be exposed to. Many paints are classified as hazardous substances because they contain potentially harmful ingredients exposure to which may cause injury and illness through inhalation of toxic vapours and mists, or absorption of irritants through the skin¹⁵. Other hazardous substances that spray painting workers could be exposed to include thinners, resins, degreasers, surface preparation products, dusts from sanding, rust converters and rust removers¹⁵. It is the duty of the employer to ensure that all substances in the workplace are correctly labelled and that safety and health information has been obtained from the supplier, manufacturer or importer¹⁵.

According to the Government of Western Australia, exposure to hazardous substances used in spray painting can cause serious health effects such as occupational asthma; allergic contact dermatitis; lung cancer; 'painter's syndrome', due to long term exposure to organic solvents and affects the brain; damage to the reproductive system; and kidney or liver damage¹⁵. Short-term effects include: irritant contact dermatitis; burns to the skin or eyes; vomiting and diarrhoea; irritation of the nose, throat and lungs; and headaches, nausea, fatigue and dizziness¹⁵. Hazardous substances used in spray painting are volatile; the resulting vapour can be inhaled. The basis for the curing and drying of many paints is the evaporation of organic solvents¹⁶. The spray painting process converts substances to aerosol form, which can be inhaled. This means that there is potential exposure through vapours from evaporation and aerosols¹⁶. The number of employees involved and the number of hours spent working with or near paint spraying activities increase the risk¹⁶. If adequate control measures are in place, the probability of severe effects is reduced¹⁶. If spray painting is always done in a properly

¹⁵ <File://C:\Documents and Settings\Miriam Sunker\Desktop\Code of Practice Spray Paint...>

¹⁶ <http://www.safetyline.wa.gov.au/pagebin/codewswa0182.htm>

designed, well-maintained spray booth, using safe and well-maintained equipment, following safety and health procedures, and wearing suitable PPE, then employees are less likely to be directly exposed and the risk is reduced. But if workers are regularly exposed to vapours and aerosols because adequate control measures are not in place, the probability of severe effects is increased¹⁶. The level of risk from each hazard is a combination of the nature of the hazard and the workers' interaction with it. The risk is greater when the harm is likely to be more and also when the interaction with the hazard increases the probability of exposure¹⁶. The object being sprayed can influence the risk; and the spray-painting process used. The object should be positioned such that workers do not spray paint towards each other, towards other workers or up wind of other workers¹⁶. In conventional compressed air spray painting there is extensive overspray; bounce in cavities and at corners. In airless (high pressure) spray painting there is less overspray, bounce and aerosol than conventional air spraying; less solvent is needed in the paint; risk of injection injury and static electricity that could cause a spark¹⁶. In hot spraying very little thinner is used; there is reduced overspray; increased fire or explosion potential¹⁶.

Risk could be reduced or lowered in instances where the amounts of substances used are small; or substances can cause minor health effects, but its use is strictly controlled in the manner indicated in the material safety data sheet (MSDS), and employees have been trained; or the substance can cause minor effects, but its use can be readily controlled according to the MSDS¹⁶.

Risk is medium where although the substance falls under Category 2 and there are a number of people who could be affected on a daily basis but the use of the substance is strictly controlled according to the MSDS and engineering controls are used and they are effective¹⁶.

Risk is high where the substance used is in Category 1; dusts and fume are visible in the air; there are widespread complaints of illness, discomfort and irritation; splashes occur; and employees have not been trained; and the potential harm is serious and the probability of exposure is high¹⁶.

Risk is uncertain where the level of exposure cannot be estimated with confidence; available information on the substance is not enough or more complex processes and exposures are involved, for example, if there is potential exposure to a number of different substances¹⁶.

The health of the workers should be periodically checked. Health surveillance is an important tool in preventing adverse health effects from hazardous substances¹⁶.

Car Maintenance

Some motor vehicles still use asbestos as friction material in clutches, automatic transmission and brake lining, and gaskets. Care should be taken when removing them. Breathing in air containing asbestos fibres can lead to asbestos-related diseases, such as cancers of the lungs and chest¹⁴.

According to the Health and Safety Injury Lawyers Network, auto and truck brake and clutch mechanics who made a career of servicing auto and/or truck brakes and clutches may have been exposed to asbestos dust sufficient to cause disease²¹.

According to the United States of America's Department of Labour, the removal of the brake drum to inspect or repair the brake parts can generate a large quantity of asbestos fibres into the workplace; therefore, the drum should not be beaten with a hammer²⁴.

Workers in the car maintenance industry are potentially exposed to high levels of asbestos, a heat resistant toxic substance, found in some vehicle

²¹ http://www.healthandsafetyinjurylawyers.com/toxic_injury_lawyers/asbestos_mesothelio...

²⁴ http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIO...

brake pads¹⁷. People can be exposed to high levels of asbestos fibres, especially during brake assembly and cleaning, repair and maintenance of rear drum-style brakes poses the greatest risk of overexposure¹⁷. In Brazil, asbestos is extensively used in car maintenance and it is believed to cause mesothelioma and asbestosis in workers in this industry²³.

A study measuring exposure to asbestos during brake maintenance of automotive vehicles in workplaces in Finland revealed that: during an 8hour workday, the estimated average asbestos exposure was 0.1 to 0.2 fibres/cm³ and 0.05 fibres/cm³ during repair of passenger car brakes¹⁸. During brake maintenance of buses and trucks there was heavy exposure of 0.3-125 fibres/cm³ that was observed during machine grinding of new brake linings; and during brake servicing of passenger cars, the concentration exceeded 1 fibre/cm³.

¹⁷ <http://www.meritcare.com/specialties/occupational/resources/asbestos.asp>

²³ <http://www.iisg.nl/collections/asbestos.html>

¹⁸ http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=3...

The grinding of brake shoes during installation creates high levels of asbestos dust that accumulates in the brake drum area and become air borne when old brakes are replaced with new ones²⁰. Inhalation of asbestos fibre may lead to severe lung disease lung cancer, asbestosis and mesothelioma²⁰. Workers are sometimes exposed to contaminants such as antifreeze and chemical degreasers, noise and hazardous situations that result in cuts, bruises, or minor burns²⁰.

Workers sometimes work in cramped workspaces that require them to get into awkward positions and are at times exposed to poor lighting conditions²⁰. Some cleaning/degreasing substances were also found to be harmful from either direct skin or eye contact or through breathing in the mist or vapour given off¹⁴. Frequent and prolonged contact with used engine oil may cause dermatitis and other skin disorders such as cancer¹⁴. Work on some body fillers, generate toxic fumes and dust and are at times strong skin sensitizers causing dermatitis¹⁴.

Exposure to benzene can lead to headache, tiredness, nausea and dizziness. Long-term exposure can lead to serious disorders such as anaemia and leukaemia¹⁴.

Wastes from auto repair shops should be managed; they should be segregated and recycled²². Brake fluid and used oil can go in the same container; antifreeze should be kept separate from other types of waste. Many of the fluids used in repair shops can be detrimental to the environment and the health and safety of the workers that are using them²².

²⁰ <http://www.mesoinfo.com/about/brakemechanic.html>

²² <http://www.pprc.org/pubs/factsheets/regfact.html>

Welding

According to the Government of Western Australia, welding poses a serious threat to the health and safety of workers; therefore, workers need to be made aware of the dangers that arise in different welding situations¹⁹. The common health risks are smoke and fumes generated by welding because they are toxic. Substances found in smoke can affect the heart, lungs, kidneys, and the central nervous system. Short-term effects include irritation of the eyes, nose, chest, and the respiratory tract; chills, muscle ache, coughing, fatigue and nausea. Long-term effects include increased risk of lung, larynx, and urinary tract cancers due to cancer-causing agents found in smoke. Welders suffer from lung problems such as bronchitis, asthma, pneumonia and emphysema; other health problems include heart disease, skin disease, hearing loss and kidney damage¹⁹. Some effects can be fatal, fumes and gases from welding can be deadly at high doses. Intense heat of welding and sparks can cause burns to the body and eyes of the worker; intense light from the arc welding can cause harm to the retina and infrared radiation may harm the cornea and cause cataracts to form.

Workers at times work at awkward positions and therefore when they move their bodies injure their backs, suffer from shoulder pain, tendonitis and knee joint disease¹⁹.

Fire and explosion risks are more prevalent and dangerous, the intense heat and sparks produced from welding can ignite any combustible materials present. Welding should therefore be undertaken in areas free from combustible materials such as wood, paper, plastics, chemicals, and liquid gases¹⁹.

¹⁹ <file:///C:/Documents> and Settings\Mariam Sucker\Desktop\Safety_com-Welding Recuci...

Health and safety risk is made worst when the welder has to work in confined spaces. If ventilation is not adequate there can be a build-up of toxic fumes and gases, concentrations of which can be explosive¹⁹.

2. Relevance of the Study

The number and type of Informal Mechanical Industries in Mbabane was not known. And the occupational health and safety risks associated with each type of industrial operation or job had not been documented. This study was the first of its kind in Mbabane and in the whole country. The study findings will be useful to the Mbabane City Council in the planning of occupational health and safety interventions for the Informal Mechanical Industrial Sector within the urban boundary. There are some interventions that the City Council put in place for street vendors by providing shelters for them in order to improve hygiene conditions under which they sold their vegetables. There are no similar interventions in the informal mechanical industrial sector, yet I believe it posed the most challenges of health and safety. Interventions could be instituted to address occupational health and safety issues of the Informal Mechanical Industrial Sector too. No one will lose his job as a result of the study for the simple reason that other similar businesses such as street vending are allowed within the city.

This study would assist in many ways, such as; documentation of the sector, planning of interventions including, perhaps development of health and safety programmes for the sector. The findings of the study may also be useful to other towns with similar occupational health and safety problems to those of Mbabane.

2.1 Objectives

The study was conducted during September and October 2004.

The objective of the study was as follows:

1. To assess the risks workers are exposed to in the informal car maintenance, welding and spray-painting industry.

2.2 Hypothesis

The hypothesis for the study was that people working in the informal car maintenance, welding and spray-painting were at high risk of exposure to occupational health and safety problems.

3. Methodology

3.1 Study Population

The study population comprised all Informal car maintenance, welding and spray-painting Industries in Mbabane. All of Mbabane was covered to determine the number of these industries. Seventy (70) workplaces were identified but only sixty-five (65) agreed to participate in the study. Because the number was less than one hundred no sampling was done, all were included in the study.

A questionnaire and observer checklist was administered to those informal mechanical industries, which were engaged in: informal car maintenance, welding and spray-painting.

3.2 Data Collection Techniques

Data was collected through the following steps:

Step 1.

Identification of industries

The Informal car maintenance, welding and spray-painting industries were first identified through a physical walk-through exercise of Mbabane, carried out by the Research Team and the data collectors. The walk-through surveys aimed at locating the geographic positions of the Industries. Informal car maintenance, welding and spray-painting industries that were identified were given the consent forms. Those that agreed to participate signed them while those that refused to participate did not.

Step 2.

Interviewing of managers and workers

Managers of those industries that had signed the consent forms were interviewed by the student assistants from the University of Swaziland using the questionnaire. The managers gave the information pertaining to the establishments: description of tasks done by the manager and the individual workers, work hours per day.

Step 3.

Observational survey

The student assistants carried out observational surveys of workers while engaged in their various tasks and filled the observer checklist.

3.5 Ethical Considerations

Permission to conduct the study was sought and obtained verbally from the Mbabane City Council. The study was explained to workers in the Informal Mechanical Industrial Sector in Mbabane. Workers were informed that participation in the study was voluntary and therefore should they feel like withdrawing at any time during the study they were free to do so. Participating workers were signed an informed consent form (See appendix 2). Confidentiality

and anonymity had been guaranteed. Ethical approval was sought and obtained from the Wits Human Ethics Committee. (See appendix 3).

Permission to carry out the study was obtained from the Postgraduate Committee (See Appendix 4).

The study commenced in September 2004 and finished in October 2004.

4. Measurement Tools:

The following measurement tools were used in the research:

1. A walk through survey was carried out of the Informal car maintenance, welding and spray painting industries in Mbabane, and a checklist was used
2. A questionnaire was used to collect data on the informal industries in Mbabane. (For details see Annex 1). It was administered to managers of those informal industries. The whole city was covered; east, west, south and north. The managers gave short descriptions of the work carried out by themselves and by the workers. Hours worked by both the managers and the workers were derived from the starting and finishing times. Data on house keeping; condition of working surfaces and floors; waste management; posture while working (if most of the work was done bending or arms above shoulders throughout the day); availability of sanitary facilities were derived from observations and interview questions. Specific data on the various jobs; spray painting, welding and car maintenance were based purely on observations whereas data on type of emission were based on both the materials used and on observation. Other control measures expected for welding were engineering controls such as a good ventilation system to remove vapours and gases; administrative controls such as job rotation and adjusting work schedules to avoid long hours.
3. Data on whether workers were trained in the application of artificial respiration and how to treat burns were based on answers given by the workers (that is, they were self-reported).

The questionnaire was used to collect qualitative information. As part of the research, workers were observed while doing their respective jobs. Hazards that the workers were exposed to were noted.

A trained research team of three members and eleven data collectors (student assistants) were used to carry out a walk-through survey of Mbabane. The students were trained on the use of the questionnaires and the checklist for a period of one day. This was to ensure they understood the questions to be asked and to deal with bias interpretation of questions and responses. The data collectors also carried out the observational survey and administered the questionnaires. The team members were all experienced Environmental Health Officers, lecturers at the University of Swaziland, with Masters Degrees, and specialising in occupational health and safety in Swaziland and the data collectors were University students doing Environmental Health. I, as project manager, trained, supervised and led the research team during data collection; received filled questionnaires and field notes; entered data into computer, carried out data analysis; reviewed hypothesis and statistics, interpretation of results; and prepared the research report.

4.1 Data Entry

Before data could be entered into a computer, the questionnaire was first created using the EPI-INFO 2000 software. The data was then entered into the computer; there were a total of sixty-five cases that was entered. These comprised sixty-five informal car maintenance, welding and spray-painting industries identified during the walk through surveys

5. Results and their Interpretation

Variable description	N	%
Mbabane-East	24	36.9
Mbabane-West	19	29.2
Mbabane-North	13	20
Mbabane-South	9	13.9
Car maintenance	20	30.8
Welding	25	38.4
Spray painting	20	30.8
High density areas	58	89.2
Low density areas	7	10.8

Of the seventy (70) workplaces identified, sixty-five participated in the study. There were twenty-four (24) workplaces in Mbabane-East; nineteen (19) from Mbabane-West; thirteen (13) from Mbabane-North; and nine (9) from Mbabane-South.

Almost all the workplaces (92.86%) participated in the study and only 7.14% refused. With such a high response rate the study was therefore a success. The mechanical industrial operations or workplaces were found in clusters with spray-painting, car maintenance and welding close by. That therefore increased the risk of exposure of the workers, especially to solvents, welding fumes and gases.

Variable description	N	%
< 8 hours	14	26.4
8 hours	15	28.3
> 8 hours	24	45.3
Total	53	100.00%

Some of the establishments did not have managers. 45.3% of the managers said that they were working more than eight (8) hours per day. This means that if they were exposed to any of the hazards their time of exposure would be longer and therefore more at risk than those working eight hours or less.

Only 26.4% of the managers said they worked less than eight hours each day and 28.3% said they worked eight hours.

Variable description	N	%
< 8 hours	10	15.4
8 hours	28	43.1
> 8 hours	27	41.5
Total	65	100.00%

41.5% of the workers said that they worked more than eight hours per day. Only 15.4% said they worked less than eight hours per day and 43.1% said they worked for eight hours. Because of the number of workers working in excess of eight hours a day, one is inclined to say that for those workers the duration of exposure is an important factor to risk of exposure. The workers who worked longer hours were exposed for a longer period and therefore they were at high risk to occupational health & safety problems.

Variable description	N	%
Separation of work area and walkway	65	64.4
Condition of working surfaces and floors	65	90.8
Waste storage	65	63.1
Waste disposed of	65	80.0
Working posture: bending	65	81.5
Working posture: arms above shoulders	65	35.4
Worker can do work standing and seated	65	55.4
Availability of sanitary facilities	65	78.5

64.4% of the workplaces had demarcated work areas and walkways. 35.4% of them, however, did not have such demarcation. For those areas without separation of work areas and separation of work areas and walkways, there was risk of accidents to both the workers and visitors/clients especially falling objects. House keeping was found to be an important factor in the informal mechanical industrial sector in Mbabane. Fortunately most of the

establishments were okay in terms of house keeping since they had separate areas for work and walking.

90.8% of the work surfaces and floors were rough and only 9.2% were smooth. This means therefore that there was less risk of slipping in a majority of them. Only those establishments that had smooth floors (9.2%) had workers at high risk of slipping and falling.

63.1% of the workplaces had some sort of waste management practised, waste was stored and collected by the City Council Waste Truck or sold as scrap material to a scrap yard. 36.9% did not store the waste but recycled it.

80% of the workplaces had some form of waste disposal. The waste was either collected by city trucks to sanitary landfill or burnt.

81.5% of the workers said they worked most of the time in a bending position. That meant that they were at risk of ergonomics related conditions such as musculoskeletal disorders.

Most of the workers (64.6%) said they worked with arms not above shoulders. Only 35.4% said they worked with their arms above shoulders, and were therefore at risk from posture related conditions.

55.4% of the workers said they could do work standing and seated. Only 44.6% said they could not. This means almost half of the workplaces had workstations suited to the work they were doing and half were not appropriate.

78.5% of the workplaces had some form of sanitary facility and only 21.5% did not. Workers in those workplaces without sanitary facilities were therefore at risk of contracting excreta borne diseases.

Spray painting:

Variable description	N	%
Spray painting process open	20	90
Workers exposed to emission	20	90
Exposure to paint	20	95
Exposure to solvents	20	5
Personal protective equipment provided	20	75
Other control measures existing	20	0

90% of the workplaces doing spray painting had the process done in the open. This made them less vulnerable to exposure to spray aerosols and fumes because of the effect of air dilution.

90% of the workers were exposed to emissions while carrying out their jobs of spray painting and 10% of them were exposed to paint.

All the workers that were doing spray painting were exposed to paint (95%) and solvents 5%).

Although 75% of the workers, doing spray painting had some kind of personal protection provided however the usage rate was very low.

In all the workplaces that were doing spray painting, there were no other existing control measures for protecting the workers from paint emissions. The only positive thing was that most of the spray-painting jobs were carried out in open spaces or areas.

Welding:

Variable description	N	%
Safety against electric shock	2	0
Use of no load low voltage devices	2	0
Workers trained in application of artificial respiration	2	0
Eye and head protection provided	25	80
Type of PPE for eye and head protection provided	25	92
Usage of PPE provided (eye & head)	23	56.5
Respiratory protection provided	25	24
Usage respiratory PPE provided	6	33.3
Hand protection provided	25	32
Use of hand protection provided	8	25
Use of clear goggles when removing slag	25	28
Welding done in booth	25	0
Surroundings free from combustible materials	25	52
Availability of fire extinguishers	25	24
Precautions against burns	25	32
Workers knew how to treat burns	25	28
Availability of First Aid Kit	25	28
Availability of medicines & equipment First Aid Kit	7	28.6

Most workplaces (92%) where welding was done, did not use electricity but welding gas. Most workers were not exposed to electric shock. There were only two workplaces where there was a possibility for them to suffer from electric shock. This is because in Mbabane the standard supply is 240 volts

There were only two (2) workplaces that carried out welding using electricity and both did not use load-low voltage devices when doing welding.

Most workers (80%) had equipment to protect their eyes and heads, in the form of filter glasses, eye goggles, and welder's helmet.

52% had welder's helmets and 4% had filter glasses as means of protection when carrying out welding. Only 8% did not have any form of PPE. However, only 56.5% of the workers used the personal protective equipment and 43.5% did not. Some said they were not using the PPE because they felt they were doing the job well (experts) therefore they did not need to wear it. This was of

course due to lack of awareness on their part of the hazards associated with their jobs.

Only 24% of the workers had respiratory protection and 76% did not have any. However, only 33.3% of them were using the PPE provided and 66.7% were not using them. Therefore most of the workers were at risk of breathing in welding fumes and other welding related gases. This means 92 % of workers were at risk to welding fumes and gases.

68% of the workers did not have protection for the hands, only 32% had. Those workers that had hand protection (32%) had gloves with shorter cuffs and separate sleeves (12%). Others had leather gauntlet gloves with canvas or cuffs (20%). 75% of these workers who had PPE were not using them, only 25% did. Since most of the workers did not use hand protection, this means that their hands were not protected against heat, spatter, and radiation.

Most of the workers (72%) did not wear eye protection when removing slag and that put them at risk of eye injuries.

All welding operations were not done in a booth. This means that the workers and co-workers were at risk of exposure to welding gases and fumes.

48% of the workplaces had their surroundings with materials that could catch fire. 52% had their surroundings free from burnable material. Therefore almost half of the workplaces were at risk of catching fire.

76% of the working places had no fire extinguishers. Only 24% had fire extinguishers, but only two had been serviced accordingly. The workplaces were less prepared for outbreaks of fire.

68% of the workers took no precautions against burns; they had their sleeves rolled up and forearms without gloves or sleeves when carrying out their work. Only 32% of the workers took precautions against burns.

72% of the workers said that they did not know how to treat burns. Only 28% said they knew how to treat them.

72% of the workplaces did not have first aid kits. The means that they were not prepared for accident, only 28% had first aid kits.

71.4% of the work places had first aid kits without the necessary medicines, bandages, and equipment, only 28.6% had. This indicated a lack of preparedness for accidents on their part.

Almost all of the workplaces (92%) used welding gas, not electricity for welding and therefore the workers were not at risk to electric shock. Only 8% of the welders used electricity and therefore only those workers were at risk of electric shock.

All the workers were not trained in the application of artificial respiration.

Car maintenance:

Table 7: Car maintenance		
Variable description	N	%
Exposure to solvents	20	85
Method of disposal of oil	20	35
Any other type of exposure	20	25

90% of workers carrying out car maintenance were exposed to solvents and only 10% was not.

35% of workplaces had some form of disposal method for waste oil ranging from using it to blast rocks to using it as fuel for burning things.

25% of workers said they had some other type of exposure and 75% said they did not have. The exposures included asbestos when changing break linings and noise during panel beating.

Analyses comparing exposure in spray painting, eye and head protection for the welder and exposure to solvents, to hours of work were done but were non-significant.

6. Discussion

The objective of the study was to assess the risks workers were exposed to in the informal car maintenance, welding and spray painting in Mbabane. The informal mechanical sector in Swaziland is similar in many ways to what is happening in other parts of the world. Informal Traders do not comply with regulations pertaining to registration, licensing and tax payments. In Swaziland, only formal industries are registered, licensed and pay tax. According to the ILO, Informal sector operators and workers may not be registered with appropriate regulatory authorities⁴.

Most of the workers in the sector, in Mbabane were the owners of the workplaces. According to the ILO, in the informal sector there is no clear employer/employee relationship⁴.

In the few places where PPE had been provided almost all the workers were not using them. Some said they were not using the PPE because they were now “experts” in their work and therefore did not need to. A study on occupational exposure and health problems in small-scale industry workers in Dar es Salaam, Tanzania found that there was a low reported use of PPE²⁵. This is sure evidence that the workers lacked knowledge on hazards and how they cause health and safety problems. An evaluation of health hazards in informal business in Soweto, Johannesburg, found that workers lacked information on the health implications of substances they worked with or exposed to⁷.

Most of the workers did not use hand protection and therefore their hands were exposed to heat, spatter, radiation and engine oil. The workers were therefore at risk to burns and dermatitis respectively. Frequent and prolonged contact with used engine oil may cause dermatitis and other skin disorders such as cancer¹⁴. Work on some body fillers, generate toxic fumes and dust and are at times strong skin sensitizers causing dermatitis¹⁴.

Most of the workers doing welding did not wear respiratory protection; therefore they were exposed to welding fumes and gases. Exposure to high levels of welding fumes and gases may lead to respiratory tract irritation, metal fume fever and life threatening poisoning ¹².

A large number of establishments did not have sanitary facilities therefore the workers had no access to such facilities. According to the ILO many of the micro-enterprises lack sanitary facilities and potable water⁴. The lack of access to these facilities put the workers at risk to excreta borne diseases. In a study of environmental hazards of automobile mechanics in Ibadan, Nigeria, only one out of thirty three (33) workshops had toilet facilities and protective clothing was not used by the majority of the workers ²⁶.

Most of the informal mechanical industrial operations were carried out in the open at locations not recognized for that purpose. According to the ILO very often Informal Sector operators and workers may not be registered with the appropriate regulatory authorities⁴. The municipality environmental health services did not visit those workplaces to enforce standards or provide occupational health and safety education. According to the ILO workers are often exposed to poor working environments including inadequate premises and unsatisfactory hygiene facilities, and occupational health services are not available². In survey of working conditions in small-scale industries in Nigeria it was found that the provision of drinking water, hand washing and toilet facilities was generally unsatisfactory ²⁷.

Many workplaces had no fire fighting equipment and the few that had were not serviced. This means they were not prepared for fire outbreaks. Fire and explosion risks are more prevalent and dangerous, the intense heat and sparks produced from welding can ignite any combustible materials present¹⁹.

The majority of the people working in the informal mechanical industrial sector worked more than eight hours a day and therefore were more exposed

to and at high risk to occupational health and safety problems. This is in line with the findings of a pilot study carried out in Dar-es-Salaam that workers in the informal sector were working for long hours⁴.

Unlike in other countries, the informal mechanical industrial sector did not have problems of house keeping, inadequate ventilation and lighting. This is contrary to results of a study done in the Philippines that listed house keeping and inadequate ventilations as problems associated with their informal sector⁴.

Workers were exposed to solvents, welding fumes and gases; asbestos fibre; strenuous work; improper postures; lifting of heavy loads; and spray painting aerosols and fumes, and exposure to dust. This is in line with findings of a study in the United Kingdom, which found that spray painting produced the highest exposure and was the main cause of the occupational asthma¹⁴. Working in awkward positions, workers move and injure their backs suffer from shoulder pain, tendonitis and knee joint disease¹⁹.

In conclusion the study suggests that in informal car maintenance, welding and spray painting in Mbabane were at high risk of exposure to occupational health and safety problems.

7. Recommendations

Long-Term Strategy:

1. A long-term strategy should be developed to address the issue of occupational health and safety in the informal sector as a whole and in the informal mechanical industrial sector in particular. The strategy should include measures aimed at improving the structures under which workers in this sector work. In Mbabane, a similar project was undertaken to improve conditions of structures used by street vendors. Lessons learnt from that project could be used as a starting point.

2. **Occupational Health Safety Education and Training:**
The workers of the sector need to be empowered through education and training to perform their tasks safely and under healthy working conditions. Occupational Health & Safety training modules should be developed and used to equip the Informal Sector.

3. **Participatory Approaches to Improve Occupational Health & Safety:**
Workers and owners of Informal Industries should participate in the formulation of measures or interventions aimed at assisting them. These should include improvement of standards of safety and occupational health, development of management skills and capacity building. It is important to ensure that the members of this Sector are made to drive the improvements of occupational health and safety. There must be a sense of ownership on their part and that would lead to sustainability of the improvements that would have been made.

4. Establishment of Structures within the Informal Sector:

Structures should be established through which assistance could be channelled into the Sector. These structures could be associations or committees formed by the owners of the informal mechanicals industries in Mbabane as entry points for provision of occupational health and safety improvements in the sector. The City Council should spearhead the formation of these organisations and use them to mobilise assistance to the Informal Mechanical Industrial Sector in Mbabane.

5. The Ministry of Housing & Urban Development under which the City Council falls should try these recommendations out and use them in the other cities and towns in the country in a bid to improve the occupational health and safety in their respective Informal Mechanical Industrial Sectors.

Training:

6. Training modules alluded to earlier should include information on the use of Personal Protective Equipment (PPE) and in particular the reasons for using it. This is to address the fact that most workers did not wear PPE even in cases where these were available.

7. Visits to Informal Mechanical industries by Environmental Health Officers:

The City Council should dispatch Environmental Health Officers responsible for occupational health and safety to carryout periodic walk through surveys of the Informal mechanical industries and provide advice accordingly. For a start they can use the questionnaire and checklist developed for this study.

8. Provision of Occupational Health Services:

The City Council should consider providing occupational health services to the Informal Sector in the form of primary health care. The workers' health should be periodically assessed and treatment provided for those affected.

Informal Sector:

9. The welders should wear gloves and should be of the leather gauntlet types with canvas or leather cuffs. Alternatively, gloves with shorter cuffs together with separate sleeves should be worn.
10. The welders should make sure that their clothing is free from oil or grease and that the work place is tidy and free from inflammable material, which may ignite. Care should also be taken to make sure that the surroundings are free from material that can catch fire.
11. When removing slag after welding, clear goggles, a clear face shield, or clear spectacles should be used to protect the eyes from injury.
12. Workers should not work for long hours daily in excess of eight hours. The Environmental Health Department of the City Council should consider providing sanitary facilities with hand washing facilities close to the work areas and also ensure that these facilities are kept clean.
13. The Environmental Health Department should ensure that the workers are provided with appropriate types of personal protective equipment such as goggles, face shields, masks, safety ware, helmets and gloves. The Department should also monitor the use of the PPE to ensure that the workers use them.

14. The workplaces should be provided with enough fire extinguishers of the appropriate type and these should be serviced accordingly.
15. Passage ways should be marked clear or free from obstacles or stumbling hazards

8. Limitations of the Study:

The time for doing the study was limited and therefore students from the University had to be mobilized to carry out the walk through surveys and also administer the questionnaire. The go ahead from the Research Committee came in September.

9. Conclusion:

The study was the first of its kind in Mbabane. Workers were observed while doing their work and a questionnaire administered to the owners or managers of the informal mechanical industrial operations. Through walk-through surveys further information about the occupational health and safety conditions were noted.

The findings of this study support the hypothesis that people working in the informal mechanical industrial sector are at high risk of exposure to occupational health and safety problems. The evaluation was based on many factors that included: working hours per day of the workers, whether the workers used PPE, availability of sanitary facilities and so on.

Most of the workers and managers worked for long hours per day and were therefore assumed to be at higher risk of exposure. Most workers did not have nor used personal protective equipment (PPE) and that too, made them to be at higher risk of exposure.

The workplaces themselves were mostly just open places with no roof covers or walls. The workers were therefore exposed to unfavourable weather conditions with no protection from the elements.

Most of the workplaces did not have fire-fighting equipment and the few that had them had not been serviced for a number of years.

The potential health risks to the workers included smoke inhalation (in case of fire) skin sensitisation, eyes and skin irritation and asthma.

Almost all the workplaces (92.86%) visited, agreed to participate in the study and only 7.14% refused. With such a high response rate the study was therefore a success. There were a total of seventy (70) workplaces visited. The mechanical Industrial operations or workplaces were found in clusters with spray-painting, car maintenance and welding close by. That therefore increased the risk of exposure of the workers, especially to solvents, welding fumes and gases